MALCOLM J. CHISHOLM, JR.
ATTORNEY AT LAW
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Unfair Competition • Related Matters *Fax (413) 243-0552*
www.mjcpatents.com *mjc@mjcpatents.com*
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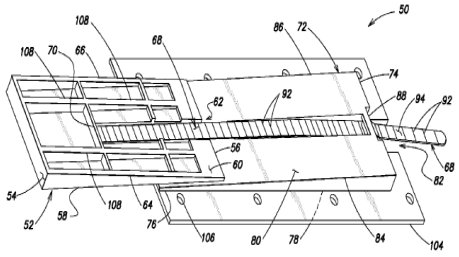
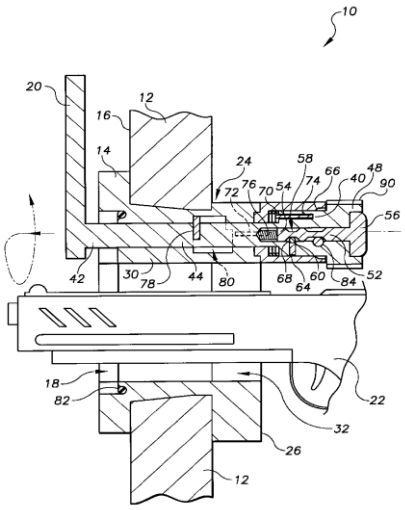
ON THE PAGES BELOW IS A LISTING OF SOME OF THE PATENTS I HAVE SUCCESSFULLY PROSECUTED FOR MY CLIENTS.

PLEASE NOTE THAT THE FIRST PAGES OF THE PATENTS ARE ALSO ATTACHED STARTING AT PAGE 6.

FOR EXAMPLE:



U.S. Patent No. 8,813,437 To Spofford
Integral Shim Pack With An Adjustment Pull Tang



U.S. Patent No. 6,425,311 To Caron
Pry-Proof Gun Port

Search Report

Generation date: Wednesday, February 17, 2021

Project: Atty Chisholm Issued Patents as of 16 Feb 21

Invention: Atty Chisholm Issued Patents as of 16 Feb 21

Client Name: Atty Chisholm

1. Leverage plates for transforming bicycle pedal arms into first-class levers for propelling a bicy (No: 10,919,598).
2. Shatter-resistant, optically-transparent panels and methods of use of the panels for on-site retr (No: 9,925,742).
3. Hand-held, self-powered paver moving tool with an operator-supported rechargeable vacuum power pa (No: 9,919,432).
4. Portable, collapsible ergonomic tipping chair (No: 9,908,002).
5. Shatter-resistant, optically-transparent panels and methods of use of the panels for on-site retr (No: 9,657,513).
6. Title Not Available. (No: 9,410,310).
7. Automated product engager, transporter and patterened depositor system (No: 9,399,529).
8. Pulse detonation engine having a scroll ejector attenuator (No: 9,021,783).
9. Solid oxide fuel cell power plant with a molten metal anode (No: 8,518,598).
10. Rapid start-up and operating system for a fuel cell power plant utilizing a reformate (No: 8,455,146).
11. Galvanic electrochemical cells for generating alternating current electricity (No: 8,394,518).
12. Fuel cell stack having an integrated end plate assembly (No: 8,354,197).
13. Integrated contaminant separator and water-control loop for a fuel reactant stream (No: 8,343,256).
14. Electrochemical cells utilizing taylor vortex flows (No: 8,283,062).
15. Hydrogen passivation shut down system for a fuel cell power plant (No: 8,277,991).
16. Contaminant separator and isolation loop for a fuel reactant stream for a fuel cell (No: 8,206,490).
17. Galvanic electrochemical cells utilizing taylor vortex flows (No: 8,187,737).
18. Fuel reformers utilizing Taylor Vortex Flows (No: 8,187,560).
19. Cross-flow electrochemical batteries (No: 8,158,277).
20. Chemical process accelerator systems utilizing taylor vortex flows (No: 8,147,767).
21. Hydrogen passivation shut down system for a fuel cell power plant (No: 8,142,950).
22. Thick electrode direct reaction fuel cells utilizing cross-flows and taylor vortex flows (No: 8,124,296).
23. Pre-engineered building for an integral mobile imaging unit (No: 8,112,944).
24. Frame for a wall cut-out (No: 8,109,401).
25. High temperature ceramic dielectric composition and capacitors made from the composition (No: 8,076,257).
26. Ammonia contact scrubber system for a fuel cell (No: 8,029,753).
27. Electrochemical cells utilizing Taylor Vortex Flows (No: 8,017,261).
28. Cut-out tool for making a utility receptacle cut-out in sheeting material (No: 8,006,401).
29. Product display system having an integral protective case for housing and displaying a product (No: 7,987,987).
30. Direct reaction fuel cells utilizing taylor vortex flows (No: 7,972,747).
31. Care funding and care planning system (No: 7,945,458).
32. Fuel cell with randomly-dispersed carbon fibers in a backing layer (No: 7,931,996).
33. Hydrogen passivation shut down system for a fuel cell power plant (No: 7,855,020).
34. Vehicle having non-circular wheels propelled by a moving weight (No: 7,803,031).
35. Frame for a wall cut-out (No: 7,789,257).
36. Robotic tread system having a net-zero motion head for moving objects (No: 7,712,598).
37. Light bag rack for a bicycle (No: 7,614,535).
38. Battery tube storage system, system container, and container latch-lock (No: 7,597,199).
39. Protective case for a plurality of different sized memory cards (No: 7,475,816).
40. Voltage biased capacitor circuit for a loudspeaker (No: 7,443,990).
41. Decontamination procedure for a fuel cell power plant (No: 7,442,453).
42. Desiccant container and method of manufacture (No: 7,427,314).
43. Electron turbulence damping circuit for a complimentary-symmetry amplification unit (No: 7,411,454).
44. Helicopter blade-section display plaque (No: D565,999).
45. Protective case for six different sized memory cards (No: 7,306,159).

46. Freeze tolerant fuel cell power plant with a direct contact heat exchanger (No: 7,282,290).
47. Double entry water bottle carrier for a runner (No: 7,237,703).
48. "Toilet king" automatic water limiting supply shut off safety valve flo-control (No: 7,210,498).
49. Fuel cell with passive water balance (No: 7,201,992).
50. Direct antifreeze cooled fuel cell power plant with passive water management (No: 7,179,557).
51. System for determining a gas composition within a shut down fuel cell power plant and method of (No: 7,147,945).
52. Optically embossed sheet for a laminate and method of making (No: 7,141,295).
53. Freeze tolerant fuel cell power plant with a direct contact heat exchanger (No: 7,090,940).
54. Performance enhancing break-in method for a PEM fuel cell (No: 7,078,118).
55. Passive water management system for a fuel cell power plant (No: 7,063,907).
56. Transportable security portal for screening potential terrorists (No: 7,023,339).
57. Vacuum separation, transport and collection system for immiscible liquids (No: 7,014,779).
58. Hydrogen passivation shut down system for a fuel cell power plant (No: 6,984,464).
59. Freeze tolerant fuel cell power plant with a two-component mixed coolant (No: 6,979,509).
60. Fuel cell power plant having a fuel concentration sensor cell (No: 6,977,121).
61. High molecular weight direct antifreeze cooled fuel cell (No: 6,911,275).
62. Reversible fuel cell power plant (No: 6,858,337).
63. Fuel cell having a corrosion resistant and protected cathode catalyst layer (No: 6,855,453).
64. High water permeability proton exchange membrane (No: 6,841,283).
65. Start up system and method for a fuel cell power plant using a cathode electrode fuel purge (No: 6,838,199).
66. Method of using a temporary dilute surfactant water solution to enhance mass transport in a fuel (No: 6,835,480).
67. System and method for shutting down a fuel cell power plant (No: 6,835,479).
68. Fuel cell stack having a reduced volume (No: 6,833,211).
69. Direct antifreeze cooled fuel cell (No: 6,794,073).
70. Variable damping circuit for a loudspeaker (No: 6,771,781).
71. Fuel cell stack having an improved pressure plate and current collector (No: 6,764,786).
72. Porous carbon body for a fuel cell having an electronically conductive hydrophilic agent (No: 6,746,982).
73. Memory device protective container (No: 6,739,452).
74. High dielectric constant very low fired X7R ceramic capacitor, and powder for making (No: 6,727,200).
75. High dielectric constant very low fired X7R ceramic capacitor, and powder for making (No: 6,723,673).
76. Bi-fluid actuator (No: 6,711,984).
77. Fuel cell power plant having a reduced free water volume (No: 6,699,612).
78. Moveable presser rail assembly (No: 6,589,148).
79. Freeze tolerant fuel cell power plant (No: 6,562,503).
80. Freeze tolerant fuel cell power plant (No: 6,528,194).
81. Automated peeler (No: 6,523,464).
82. Fuel cell with an electrolyte dry-out barrier (No: 6,521,367).
83. Pull spreader (No: 6,488,443).
84. Fuel cell with a direct antifreeze impermeable cooler plate (No: 6,461,753).
85. Direct antifreeze cooled fuel cell power plant (No: 6,432,566).
86. Pry-proof gun port (No: 6,425,311).
87. Interdigitated enthally exchange device for a fuel cell power plant (No: 6,416,892).
88. Operating system for a direct antifreeze cooled fuel cell power plant (No: 6,416,891).
89. Sprayable organic fertilizer (No: 6,406,511).
90. Reformate fuel treatment system for a fuel cell power plant (No: 6,376,114).

91. Direct antifreeze solution concentration control system for a fuel cell power plant (No: 6,365,291).
92. Direct antifreeze cooled fuel cell power plant system (No: 6,361,891).
93. Operating system for a fuel cell power plant (No: 6,331,366).
94. Humidification system for a fuel cell power plant (No: 6,322,915).
95. Direct antifreeze cooled fuel cell (No: 6,316,135).
96. Water retention system for a fuel cell power plant (No: 6,312,842).
97. Hydride bed water recovery system for a fuel cell power plant (No: 6,277,509).
98. Fine pore enthalpy exchange barrier (No: 6,274,259).
99. Ground anchor (No: 6,238,143).
100. Dual coolant loop fuel cell power plant (No: 6,232,006).
101. Memory card protective carrier (No: 6,230,885).
102. Alcohol and water recovery system for a direct aqueous alcohol fuel cell power plant (No: 6,110,613).
103. Mass transfer composite membrane for a fuel cell power plant (No: 6,048,383).
104. Method of selective corrosion rate analysis for a fluid processing plant (No: 6,047,241).
105. Ergonomic canoe paddle (No: 6,042,438).
106. Float platform for aquatic instruction and therapy (No: 6,039,572).
107. Electrochemical cell with a porous support plate (No: 6,024,848).
108. Mass and heat recovery system for a fuel cell power plant (No: 6,007,931).
109. Porous support layer for an electrochemical cell (No: 5,998,058).
110. Cement mixer sand spreader (No: 5,950,934).
111. Graded metal hardware component for an electrochemical cell (No: 5,942,350).
112. Teapot cup (No: 5,941,409).
113. Channeled pulp rotor (No: 5,918,822).
114. Electroformed sheath (No: 5,908,285).
115. Portage system for light watercraft (No: 5,875,946).
116. Process for formation of an electrode on an anion exchange membrane (No: 5,853,798).
117. Spherical section electrochemical cell stack (No: 5,837,110).
118. Motility channel pathogen detector and method of use (No: 5,733,736).
119. Center post electrochemical cell stack (No: 5,716,503).
120. Integrated environmental control system (No: 5,704,218).
121. Liquid-gas separator (No: 5,693,125).
122. Gutter liquid separator (No: 5,678,360).
123. Stringed instrument practice bow guide (No: 5,670,727).
124. Blind snap mounted clip fastener (No: 5,632,584).
125. Retracting ring seal valve (No: 5,620,165).
126. Automatic temperature alarm system (No: 5,608,383).
127. Facial insulator (No: 5,592,687).
128. Mechanical contour follower (No: 5,576,492).
129. Hybrid braze alloy (No: 5,512,081).
130. Pressure differential regulator (No: 5,507,309).
131. Propellant generator and method of generating propellants (No: 5,505,824).
132. Metal compression pad for an electrolysis cell (No: 5,466,354).
133. System for downloading software (No: 5,444,861).
134. Electrochemical cell having crossed-ridge sealing surface (No: 5,441,621).
135. Redundant engine starting system (No: 5,435,125).

136. High pressure electrochemical cell structure (No: 5,316,644).
137. Liquid recycling system (No: 5,160,443).
138. Laser catheter diffuser (No: 5,151,096).
139. Accuset micrometer lathe (No: 5,113,621).

US010919598B1

(12) **United States Patent**
Beamon

(10) **Patent No.: US 10,919,598 B1**
(45) **Date of Patent: Feb. 16, 2021**

(54) **LEVERAGE PLATES FOR TRANSFORMING BICYCLE PEDAL ARMS INTO FIRST-CLASS LEVERS FOR PROPELLING A BICYCLE**

(71) Applicant: **Norman Beamon**, Tyringham, MA (US)

(72) Inventor: **Norman Beamon**, Tyringham, MA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 112 days.

(21) Appl. No.: **16/037,897**

(22) Filed: **Jul. 17, 2018**

(51) **Int. Cl.**
B62M 1/26 (2013.01)
B62M 9/00 (2006.01)

(52) **U.S. Cl.**
CPC ***B62M 1/26*** (2013.01); ***B62M 9/00*** (2013.01)

(58) **Field of Classification Search**
CPC B62M 1/26; B62M 9/00
USPC 280/252
See application file for complete search history.

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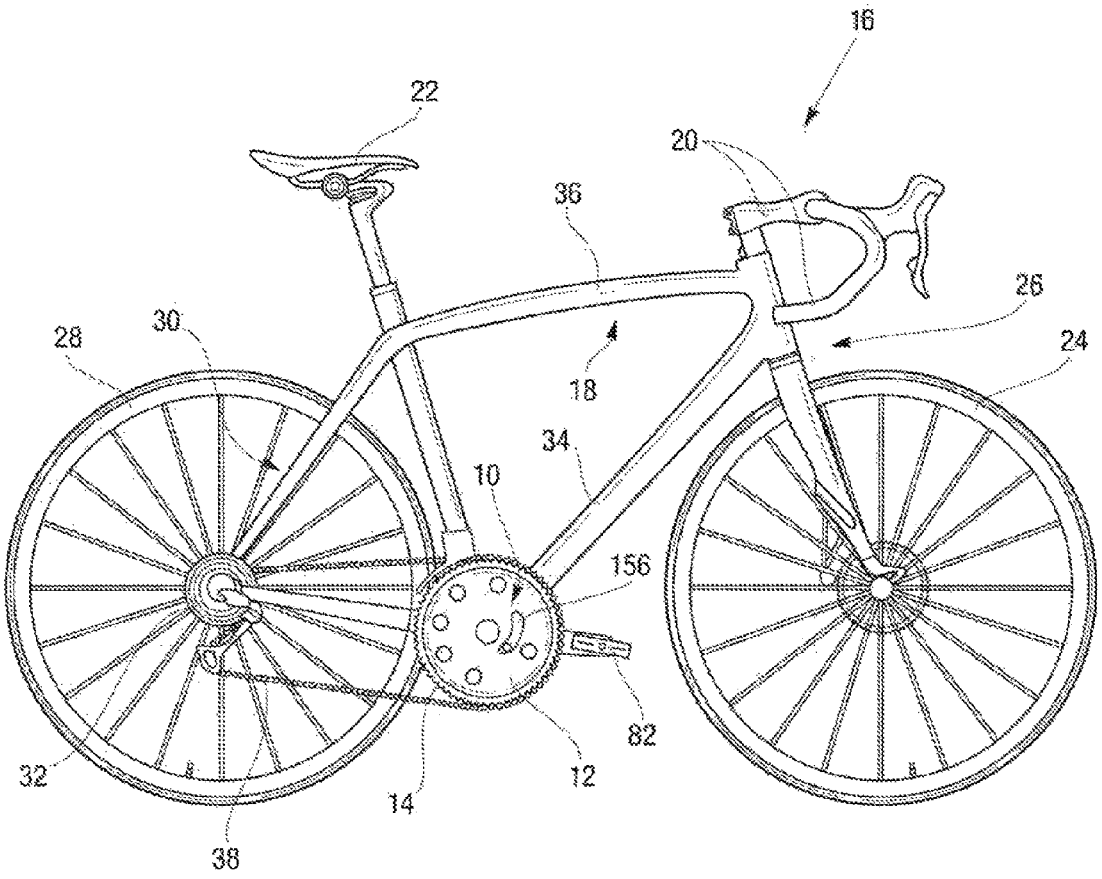
Primary Examiner — Jacob D Knutson
Assistant Examiner — Felicia L. Brittman
(74) *Attorney, Agent, or Firm* — Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

Each plate (**10**) includes a plate throughbore (**64**) secured to an end of a drive axle (**52**) of a bicycle (**16**). A pedal arm (**72**) is secured to an attachment post (**68**) that extends from the leverage plate (**10**) between the drive axle (**52**) and a perimeter edge (**70**) of the plate (**10**). Moving a pedal (**82**) on the pedal arm (**72**) downward to move the bicycle (**16**) in a forward, desired direction of motion (**56**), causes the pedal arm (**72**) to contact the drive axle (**52**). An inner end (**74**) of the pedal arm (**72**) moves the pedal arm attachment post (**68**) and leverage plate (**10**) around the plate throughbore (**64**). The drive axle (**52**) therefore becomes a fulcrum (**52**) of a first-class lever (**88**) as the pedal arm (**72**) is moved downward. The leverage plates (**10**) may retro-fit to any bicycle (**16**).

20 Claims, 14 Drawing Sheets



US009925742B1

(12) **United States Patent**
Kapiloff et al.

(10) **Patent No.: US 9,925,742 B1**
(45) **Date of Patent: Mar. 27, 2018**

(54) **SHATTER-RESISTANT, OPTICALLY-TRANSPARENT PANELS AND METHODS OF USE OF THE PANELS FOR ON-SITE RETROFITTING AND REINFORCING OF PASSAGEWAYS**

(71) Applicants: **Christopher Kapiloff**, Williamstown, MA (US); **Jeffrey Besse**, Pittsfield, MA (US)

(72) Inventors: **Christopher Kapiloff**, Williamstown, MA (US); **Jeffrey Besse**, Pittsfield, MA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **15/444,714**

(22) Filed: **Feb. 28, 2017**

Related U.S. Application Data

(60) Division of application No. 15/179,007, filed on Jun. 10, 2016, now Pat. No. 9,657,513, which is a (Continued)

(51) **Int. Cl.**

E06B 3/00	(2006.01)
B32B 17/10	(2006.01)
E06B 3/66	(2006.01)
E06B 5/11	(2006.01)
B32B 3/06	(2006.01)
B32B 7/12	(2006.01)

(Continued)

(52) **U.S. Cl.**
CPC ***B32B 17/10082*** (2013.01); ***B32B 3/06*** (2013.01); ***B32B 7/12*** (2013.01); ***B32B 17/10036*** (2013.01); ***B32B 17/1077*** (2013.01); ***B32B 17/10293*** (2013.01); ***B32B 17/10752*** (2013.01); ***B32B 27/08*** (2013.01); ***B32B 27/365*** (2013.01); ***B32B 27/40*** (2013.01); ***E06B 3/6608*** (2013.01); ***E06B 5/11*** (2013.01); *B32B 2307/412* (2013.01); *B32B 2307/558* (2013.01); *B32B 2419/00* (2013.01); *E06B 3/549* (2013.01)

(58) **Field of Classification Search**
CPC B32B 17/10082; B32B 7/12; B32B 17/10293; B32B 27/08; B32B 27/40; B32B 27/365; B32B 17/10036; B32B 17/1077; B32B 17/10752; B32B 3/06; B32B 2419/00; E06B 5/11; E06B 3/6608; E06B 3/549
USPC 52/204.5, 204.591, 204.593, 204.67
See application file for complete search history.

(56) **References Cited**

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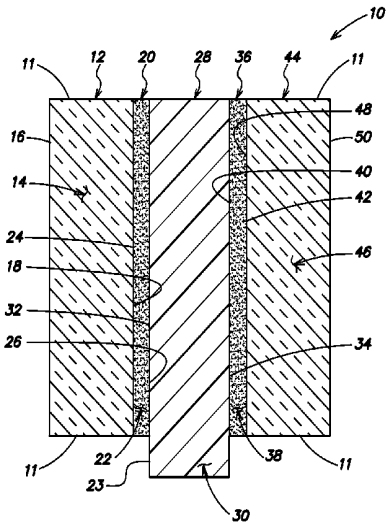
Primary Examiner — Basil Katcheves
(74) *Attorney, Agent, or Firm* — Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

The disclosure includes multi-layered panels (**10**, **60**, **204**) including exterior layers of glass (**12**, **44**) and interior layers of urethane (**20**, **36**) and at least one layer of polycarbonate (**16**) between the urethane layers (**20**, **36**) that result in enhanced shatter resistance within panels (**10**, **60**, **204**) that weigh between about 4.1 and 4.6 pounds per square foot. The panels (**10**, **60**, **204**) include an insertion tab (**23**, **61**, **23"**) of the polycarbonate layer (**16**) that enhances performance of the panel (**10**). Reinforced passageways (**70**, **200**, **300**), such as doors and windows of schools, hospitals and other public and private buildings, are disclosed using the multi-layered panels (**10**, **60**, **204**) with the insertion tab (**23**, **61**, **23"**).

2 Claims, 8 Drawing Sheets



US009919432B1

(12) **United States Patent**
Morin et al.

(10) **Patent No.: US 9,919,432 B1**
(45) **Date of Patent: Mar. 20, 2018**

(54) **HAND-HELD, SELF-POWERED PAVER MOVING TOOL WITH AN OPERATOR-SUPPORTED RECHARGEABLE VACUUM POWER PACK**

(71) Applicants: **David Paul Morin**, Cheshire, MA (US); **Thomas Michael Morin**, Adams, MA (US)

(72) Inventors: **David Paul Morin**, Cheshire, MA (US); **Thomas Michael Morin**, Adams, MA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **15/493,641**

(22) Filed: **Apr. 21, 2017**

Related U.S. Application Data

(60) Provisional application No. 62/326,184, filed on Apr. 22, 2016.

(51) **Int. Cl.**
B25J 15/06 (2006.01)
E01C 19/52 (2006.01)
B65G 47/91 (2006.01)

(52) **U.S. Cl.**
CPC ***B25J 15/0691*** (2013.01); ***B25J 15/0625*** (2013.01); ***B65G 47/91*** (2013.01); ***B65G 47/917*** (2013.01); ***E01C 19/524*** (2013.01); ***E01C 19/526*** (2013.01)

(58) **Field of Classification Search**
CPC .. B25J 15/0625; B25J 15/0633; B25J 15/065; B25J 15/0691; B65G 47/91; B65G 47/917; B66C 1/0225; B66C 1/0231; B66C 1/0256; B66C 1/0281; E01C 19/524; E01C 19/526
USPC 294/185, 186, 189
See application file for complete search history.

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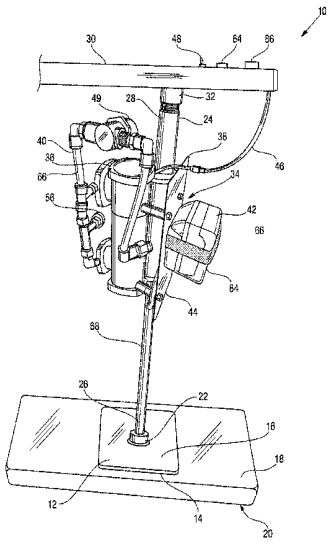
Primary Examiner — Dean J Kramer
(74) *Attorney, Agent, or Firm* — Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

The paver moving tool (**10**) includes a suction head (**12**), a shaft (**24**) secured to the suction head (**12**), a lift-handle (**30**) secured to a top end (**28**) of the shaft (**24**), and one of a first and a second rechargeable vacuum power pack (**34**, **50**) operably coupled in fluid communication with the suction head (**12**) for selectively applying a vacuum force through the suction head (**12**) to an adjacent paver (**20**). The rechargeable vacuum power packs (**34**, **50**) are supported on either the shaft (**24**), the lift handle (**30**) or on a backpack (**53**) on an operator of the self-powered paver moving tool (**10**) while the operator is using the tool (**10**).

14 Claims, 7 Drawing Sheets



US009908002B2

(12) **United States Patent**
Robertson

(10) **Patent No.: US 9,908,002 B2**
(45) **Date of Patent: Mar. 6, 2018**

(54) **PORTABLE, COLLAPSIBLE ERGONOMIC TIPPING CHAIR**

(71) Applicant: **James Craig Robertson**, Williamstown, MA (US)

(72) Inventor: **James Craig Robertson**, Williamstown, MA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **15/036,950**

(22) PCT Filed: **Nov. 20, 2015**

(86) PCT No.: **PCT/US2015/061865**
§ 371 (c)(1),
(2) Date: **May 16, 2016**

(87) PCT Pub. No.: **WO2016/081840**
PCT Pub. Date: **May 26, 2016**

(65) **Prior Publication Data**

US 2017/0252608 A1 Sep. 7, 2017

Related U.S. Application Data

(60) Provisional application No. 62/082,877, filed on Nov. 21, 2014.

(51) **Int. Cl.**
A47C 1/00 (2006.01)
A63B 21/00 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***A63B 26/00*** (2013.01); ***A47C 1/00*** (2013.01); ***A63B 21/0023*** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC A47C 1/00; A47C 9/002; A63B 21/0004; A63B 21/00058; A63B 21/00069; A63B 21/00072; A63B 21/00178; A63B 21/00181; A63B 21/00185; A63B 21/002; A63B 21/0023; A63B 21/0615; A63B 21/0616; A63B 21/0617; A63B 21/065;
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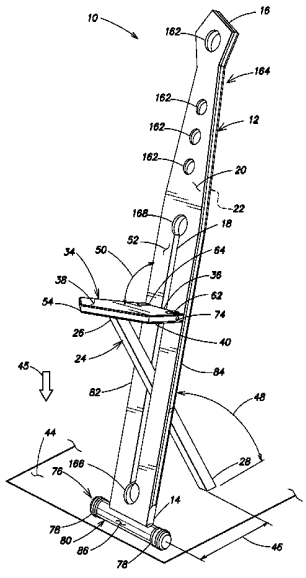
(Continued)

Primary Examiner — Andrew S Lo
Assistant Examiner — Gary D Urbiel Goldner
(74) *Attorney, Agent, or Firm* — Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

A tipping chair (**10**) includes a main strut (**12**),a pivot seat (**34**) on the main strut (**12**), a pivot slot (**18**) defined the main strut (**12**) and a pivot strut (**24**) pivotally secured within the pivot slot (**18**). Pivoting a prop end (**28**) of the pivot strut (**24**) out of the pivot slot (**18**) of the main strut (**12**) backward toward a bottom end (**14**)of the main strut (**12**) causes a seat end (**26**) of the pivot strut (**24**) to raise the pivot seat(**34**) , and the seat end (**26**) becomes secured to a latch (**42**) on a brace surface (**40**) opposed to a seating surface (**38**) of the pivot seat (**34**) to postion the chair (**10**) in a seated.configuration. Reversing the process returns the chair (**10**) to a flat, stored configuration to be optionally stored as wall art.

19 Claims, 11 Drawing Sheets



US009657513B1

(12) **United States Patent**
Kapiloff et al.

(10) **Patent No.: US 9,657,513 B1**
(45) **Date of Patent: May 23, 2017**

(54) **SHATTER-RESISTANT, OPTICALLY-TRANSPARENT PANELS AND METHODS OF USE OF THE PANELS FOR ON-SITE RETROFITTING AND REINFORCING OF PASSAGEWAYS**

(71) Applicants: **Christopher Kapiloff**, Williamstown, MA (US); **Jeffrey Besse**, Pittsfield, MA (US)

(72) Inventors: **Christopher Kapiloff**, Williamstown, MA (US); **Jeffrey Besse**, Pittsfield, MA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **15/179,007**

(22) Filed: **Jun. 10, 2016**

Related U.S. Application Data

(63) Continuation-in-part of application No. 14/710,048, filed on May 12, 2015, now Pat. No. 9,365,015.

(60) Provisional application No. 61/992,065, filed on May 12, 2014.

(51) **Int. Cl.**

E06B 3/00	(2006.01)
E06B 5/10	(2006.01)
E06B 3/56	(2006.01)
E06B 3/02	(2006.01)
E06B 3/54	(2006.01)
B32B 17/10	(2006.01)

(52) **U.S. Cl.**
CPC ***E06B 5/10*** (2013.01); ***B32B 17/10036*** (2013.01); ***B32B 17/1077*** (2013.01); ***B32B 17/10752*** (2013.01); ***E06B 3/02*** (2013.01); ***E06B 3/549*** (2013.01); ***E06B 3/5454*** (2013.01); ***E06B 3/56*** (2013.01); *B32B 2307/412* (2013.01); *B32B 2607/00* (2013.01); *E06B 2003/5472* (2013.01)

(58) **Field of Classification Search**
CPC E06B 5/10; E06B 3/549; E06B 3/5454; E06B 3/02; E06B 3/56; E06B 2003/5472; B32B 17/10036; B32B 17/1077; B32B 17/10752; B32B 2307/412; B32B 2607/00
USPC 52/204.5, 204.591, 204.593, 204.67; 156/102
See application file for complete search history.

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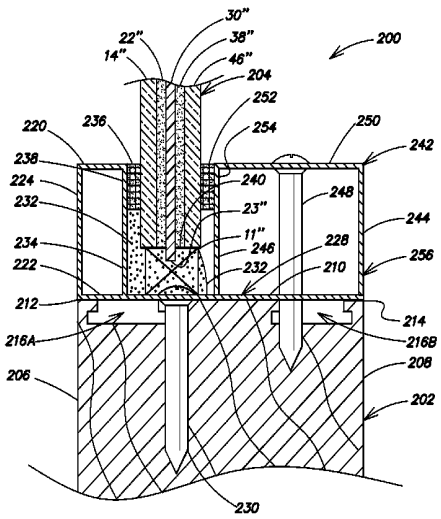
(Continued)

Primary Examiner — Basil Katcheves
(74) *Attorney, Agent, or Firm* — Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

The disclosure includes multi-layered panels (**10**, **60**, **204**) including exterior layers of glass (**12**, **44**) and interior layers of urethane (**20**, **36**) and at least one layer of polycarbonate (**16**) between the urethane layers (**20**, **36**) that result in enhanced shatter resistance within panels (**10**, **60**, **204**) that weigh between about 4.1 and 4.6 pounds per square foot. The panels (**10**, **60**, **204**) include an insertion tab (**23**, **61**, **23"**) of the polycarbonate layer (**16**) that enhances performance of the panel (**10**). Reinforced passageways (**70**, **200**, **300**) such as doors and windows of schools, hospitals and other public and private buildings, are disclosed using the multi-layered panel (**10**, **60**, **204**) with the insertion tab (**23**, **61**, **23"**).

8 Claims, 8 Drawing Sheets



US009410310B1

(12) **United States Patent**
Eckert et al.

(10) **Patent No.: US 9,410,310 B1**
(45) **Date of Patent: Aug. 9, 2016**

(54) **VERTICALLY AND HORIZONTALLY ADJUSTABLE SINK SYSTEM FOR USE BY PERSONS USING A WHEELCHAIR AND/OR A WALKER**

(71) Applicants: **Gene Eckert**, Hamburg, NJ (US); **Stephen Derby**, Troy, NY (US); **David Brown**, Pittsford, NY (US)

(72) Inventors: **Gene Eckert**, Hamburg, NJ (US); **Stephen Derby**, Troy, NY (US); **David Brown**, Pittsford, NY (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 221 days.

(21) Appl. No.: **14/474,838**

(22) Filed: **Sep. 2, 2014**

Related U.S. Application Data

(60) Provisional application No. 61/959,841, filed on Sep. 3, 2013.

(51) **Int. Cl.**
A47K 1/05 (2006.01)
E03C 1/32 (2006.01)
E03C 1/18 (2006.01)

(52) **U.S. Cl.**
CPC ... ***E03C 1/32*** (2013.01); ***E03C 1/18*** (2013.01); *A47K 1/05* (2013.01)

(58) **Field of Classification Search**
CPC E03C 1/328
USPC 4/619–660
See application file for complete search history.

(56) **References Cited**

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An advertisement on the world wide web for a vertically adjustable sink avaiable under the brane name "APPROACH" by the Populas Furniture Company.
The advertisement is avaliable at the following URL address: http://www.populasfurniture.com/product/approach%e2%84%a2-adjustable-sink/.

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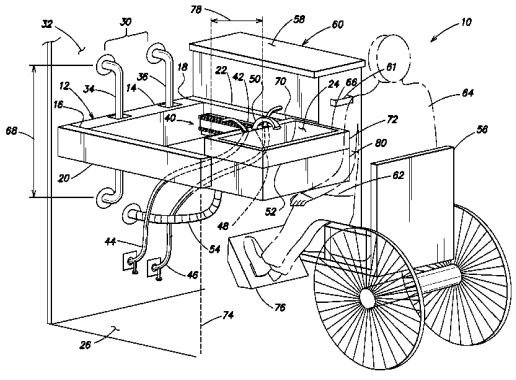
Primary Examiner — Lori Baker
(74) *Attorney, Agent, or Firm* — Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

The sink system (**10**) includes a sink support frame (**12**) for supporting a sink (**24**). A vertical adjustment mechanism (**30**) secured between the sink support frame (**12**) and a rear wall (**32**) permits selective vertical movement of the sink support frame (**12**). A horizontal adjustment mechanism (**40**) secured between the sink support frame (**12**) and the sink (**24**) permits selective horizontal movement of the sink (**24**) away from and toward the rear wall (**32**). Flexible cold and hot water delivery lines (**44**, **46**) and a flexible drain pipe (**54**) are secured between the rear wall (**32**) and a bottom surface of the sink. Vertical and horizontal movement of the sink (**24**) greatly facilitates use of the sink (**24**) by elderly and disabled persons using a wheelchair (**56**) and/or a walker. A two-sink cabinet embodiment (**130**) is also disclosed.

14 Claims, 10 Drawing Sheets



US009399529B2

(12) **United States Patent**
Derby et al.

(10) **Patent No.: US 9,399,529 B2**
(45) **Date of Patent: Jul. 26, 2016**

(54) **AUTOMATED PRODUCT ENGAGER, TRANSPORTER AND PATTERENED DEPOSITOR SYSTEM**

(75) Inventors: **Stephen Derby**, Troy, NY (US); **John McFadden**, Fairlee, VT (US); **David Brown**, Pittsford, NY (US); **Eugene Eckert**, Hamburg, NJ (US)

(73) Assignee: **PACK FLOW CONCEPTS LLC**, Pittsford, NY (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 646 days.

(21) Appl. No.: **13/810,620**

(22) PCT Filed: **Aug. 9, 2011**

(86) PCT No.: **PCT/US2011/047051**

§ 371 (c)(1),
(2), (4) Date: **Jan. 16, 2013**

(87) PCT Pub. No.: **WO2012/021495**

PCT Pub. Date: **Feb. 16, 2012**

(65) **Prior Publication Data**

US 2013/0152511 A1 Jun. 20, 2013

Related U.S. Application Data

(60) Provisional application No. 61/401,203, filed on Aug. 9, 2010.

(51) **Int. Cl.**

B65B 5/08	(2006.01)
B65B 35/24	(2006.01)
B65G 47/26	(2006.01)

(Continued)

(52) **U.S. Cl.**

CPC . ***B65B 3/00*** (2013.01); ***B65B 5/105*** (2013.01); ***B65B 35/246*** (2013.01); ***B65B 61/28*** (2013.01); ***B65G 15/44*** (2013.01); ***B65G 47/5118*** (2013.01); ***B65G 47/52*** (2013.01); *B65B 2220/18* (2013.01)

(58) **Field of Classification Search**

CPC B65B 35/50; B65B 43/54; B65B 35/44; B65B 35/24; B65B 2220/22; B65B 31/021; B65B 61/04

USPC 53/542, 543, 443, 475, 251

See application file for complete search history.

(56) **References Cited**

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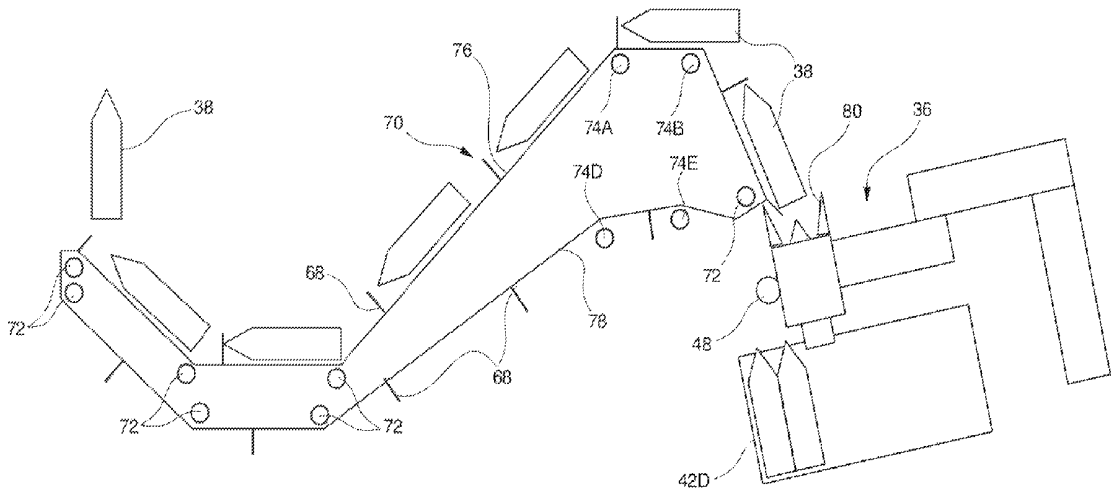
(Continued)

Primary Examiner — Andrew M Tecco
Assistant Examiner — Praachi M Pathak
(74) *Attorney, Agent, or Firm* — Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

The system (**30**) includes a product engager (**32**), a transporter (**34**) and a patterned depositor (**36**) for engaging products (**38**) and transporting the products (**38**) from the product engager (**32**) to the patterned depositor (**36**), such as between a product bagging machine (**56**) that forms and fills a bag (**24**), a conveyor that transports the bags as the products (**38**) and delivers them to a case packing machine as the patterned depositor (**36**). The product engager (**32**) and the patterned depositor (**36**) include first and second drivers (**46**, **48**) and the transporter (**34**) includes an adjustable-length buffer (**50**) to compensate for any temporary difference between a first product delivery rate of the product engager (**32**) and a rate of movement of the products (**38**) passing from the product engager (**32**) along the transporter (**34**) to the patterned depositor (**36**).

7 Claims, 16 Drawing Sheets



US009021783B2

(12) **United States Patent**
Hill et al.

(10) **Patent No.: US 9,021,783 B2**
(45) **Date of Patent: May 5, 2015**

(54) **PULSE DETONATION ENGINE HAVING A SCROLL EJECTOR ATTENUATOR**

(71) Applicant: **United Technologies Corporation**, Hartford, CT (US)

(72) Inventors: **James D. Hill**, Tolland, CT (US); **Michael J. Cuozzo**, Palm City, FL (US)

(73) Assignee: **United Technologies Corporation**, Hartford, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 264 days.

(21) Appl. No.: **13/650,523**

(22) Filed: **Oct. 12, 2012**

(65) **Prior Publication Data**

US 2014/0311121 A1 Oct. 23, 2014

(51) **Int. Cl.**

F02K 7/02	(2006.01)
F23R 3/52	(2006.01)
F23R 7/00	(2006.01)
F02C 5/00	(2006.01)

(52) **U.S. Cl.**

CPC ... ***F02K 7/02*** (2013.01); *F23R 7/00* (2013.01); *F02C 5/00* (2013.01); ***F23R 3/52*** (2013.01)

(58) **Field of Classification Search**

CPC F02K 7/02; F02C 5/00; F23R 7/00; F23R 3/52

USPC 60/247, 39.76, 39.38, 39.37, 752–760; 415/184; 431/1

See application file for complete search history.

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Primary Examiner — William H Rodriguez

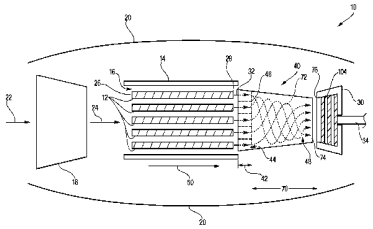
Assistant Examiner — Rene Ford

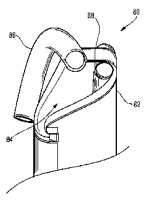
(74) *Attorney, Agent, or Firm* — Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

The engine (**10**) includes at least one firing tube (**12**) wherein an exhaust stream (**32**) from the firing tube (**12**) drives a turbine (**30**). A scroll ejector attenuator (**40**) is secured between and in fluid communication with an outlet end (**28**) of the firing tube (**12**) and an inlet (**76**) of the turbine (**30**). The attenuator (**40**) defines a turning, narrowing passageway (**72**) that extends a distance the exhaust stream (**32**) travels before entering the turbine (**30**) to attenuate shockwaves and mix the pulsed exhaust stream (**32**) into an even stream with minimal temperature differences to thereby enhance efficient operation of the turbine (**30**) without any significant pressure decline of exhaust stream (**32**) pressure and without any back-pressure from the attenuator (**40**) on the firing tube (**12**).

11 Claims, 2 Drawing Sheets





US008518598B1

(12) **United States Patent**
Yamanis

(10) **Patent No.: US 8,518,598 B1**
(45) **Date of Patent: Aug. 27, 2013**

(54) **SOLID OXIDE FUEL CELL POWER PLANT WITH A MOLTEN METAL ANODE**

(75) Inventor: **Jean Yamanis**, South Glastonbury, CT (US)

(73) Assignee: **UTC Power Corporation**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 22 days.

(21) Appl. No.: **13/455,191**

(22) Filed: **Apr. 25, 2012**

(51) **Int. Cl.**
H01M 4/38 (2006.01)

(52) **U.S. Cl.**
USPC **429/485**; 429/408; 429/428; 429/479; 429/482; 429/484; 429/523

(58) **Field of Classification Search**
USPC 429/101, 102, 104
See application file for complete search history.

(56) **References Cited**

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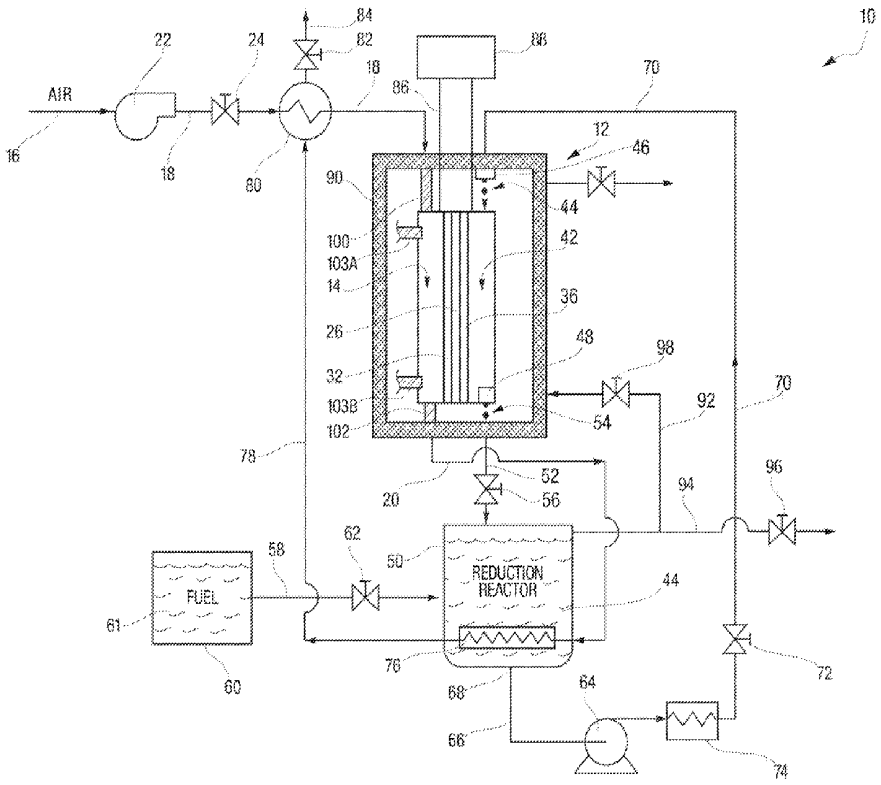
Primary Examiner — Ula C Ruddock
Assistant Examiner — Scott J Chmielecki
(74) *Attorney, Agent, or Firm* — Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

The plant (**10**) includes a molten metal anode (**44**) passing through a fuel cell (**12**) anode inlet (**46**) having a first interrupted flow generator (**104**), then into an anode flow field (**42**) of the fuel cell (**12**), and leaving the anode flow field (**42**) through an anode outlet (**48**) having a second interrupted flow generator (**113**). The molten anode (**44**) then flows into a reduction reactor (**50**) where the oxidized anode (**44**) is reduced by a reducing fuel (**61**). The molten anode (**44**) is then cycled back into the first interrupted flow generator (**104**) and anode flow field (**42**). Interrupting flow of the molten anode (**44**) prevents electrical continuity between the anode inlet (**46**) and the anode outlet (**48**) through the molten anode (**44**) within the anode flow field (**42**). This facilitates stacking the planar fuel cells in series within a fuel cell stack to build voltage.

22 Claims, 3 Drawing Sheets



US008455146B2

(12) **United States Patent**
Perry

(10) **Patent No.: US 8,455,146 B2**
(45) **Date of Patent: Jun. 4, 2013**

(54) **RAPID START-UP AND OPERATING SYSTEM FOR A FUEL CELL POWER PLANT UTILIZING A REFORMATE**

(75) Inventor: **Michael L. Perry**, Glastonbury, CT (US)

(73) Assignee: **UTC Power Corporation**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 50 days.

(21) Appl. No.: **12/734,862**

(22) PCT Filed: **Dec. 20, 2007**

(86) PCT No.: **PCT/US2007/026096**

§ 371 (c)(1),
(2), (4) Date: **May 27, 2010**

(87) PCT Pub. No.: **WO2009/082368**

PCT Pub. Date: **Jul. 2, 2009**

(65) **Prior Publication Data**

US 2010/0304239 A1 Dec. 2, 2010

(51) **Int. Cl.**
H01M 8/04 (2006.01)
H01M 8/06 (2006.01)

(52) **U.S. Cl.**
USPC **429/422**; 429/429; 429/443

(58) **Field of Classification Search**
USPC 429/400–535
See application file for complete search history.

(56) **References Cited**

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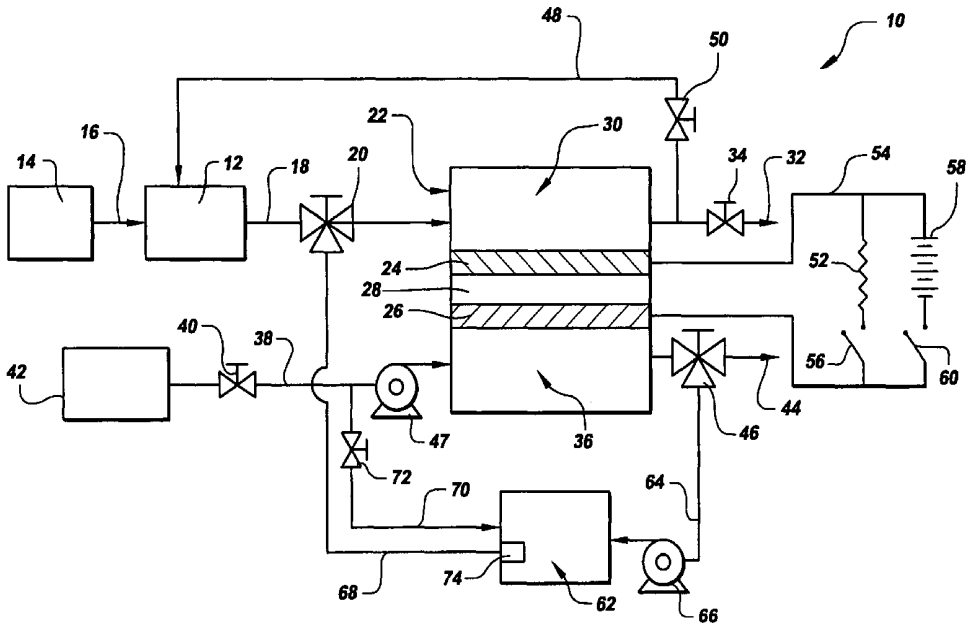
Primary Examiner — Basia Ridley
Assistant Examiner — James Lee
(74) *Attorney, Agent, or Firm* — Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

A fuel cell power plant (**10**) includes a power supply (**58**) that directs a direct current to catalysts (**24**), (**26**) of a fuel cell (**22**) after terminating flow of electricity to a primary load (**52**), and after flow of an oxidant adjacent the cathode catalyst (**26**) is terminated, and while a reformate fuel is directed adjacent the anode catalyst (**24**). Pure hydrogen fuel generated thereby at the cathode catalyst (**26**) is directed into a hydrogen storage tank (**62**). Upon start-up of the power plant (**10**), the stored hydrogen gas is directed from the tank (**62**) to flow adjacent the anode catalyst (**24**) while a reformer (**12**) is being warmed up for operation, to provide virtually instantaneous start-up of the plant (**10**). Optionally, the stored hydrogen may be used occasionally during operation with the reformate fuel to meet an increased demand for electricity.

11 Claims, 1 Drawing Sheet



US008394518B2

(12) **United States Patent**
Fischel et al.

(10) **Patent No.: US 8,394,518 B2**
(45) **Date of Patent: Mar. 12, 2013**

(54) **GALVANIC ELECTROCHEMICAL CELLS FOR GENERATING ALTERNATING CURRENT ELECTRICITY**

(75) Inventors: **Halbert Fischel**, Santa Barbara, CA (US); **Sheldon L Epstein**, Wilmette, IL (US)

(73) Assignee: **Global Energy Science, LLC (California)**, Santa Barbara, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **13/437,771**

(22) Filed: **Apr. 2, 2012**

(65) **Prior Publication Data**

US 2012/0189875 A1 Jul. 26, 2012

Related U.S. Application Data

(60) Continuation-in-part of application No. 13/194,049, filed on Jul. 29, 2011, now Pat. No. 8,283,062, which is a division of application No. 12/800,658, filed on May 20, 2010, now Pat. No. 8,017,261.

(51) **Int. Cl.**
H01M 2/38 (2006.01)
H01M 8/04 (2006.01)

(52) **U.S. Cl.** **429/69**; 429/72; 429/451; 429/498; 429/513

(58) **Field of Classification Search** 429/67–69, 429/72, 450–451, 453, 498, 512–513
See application file for complete search history.

(56) **References Cited**

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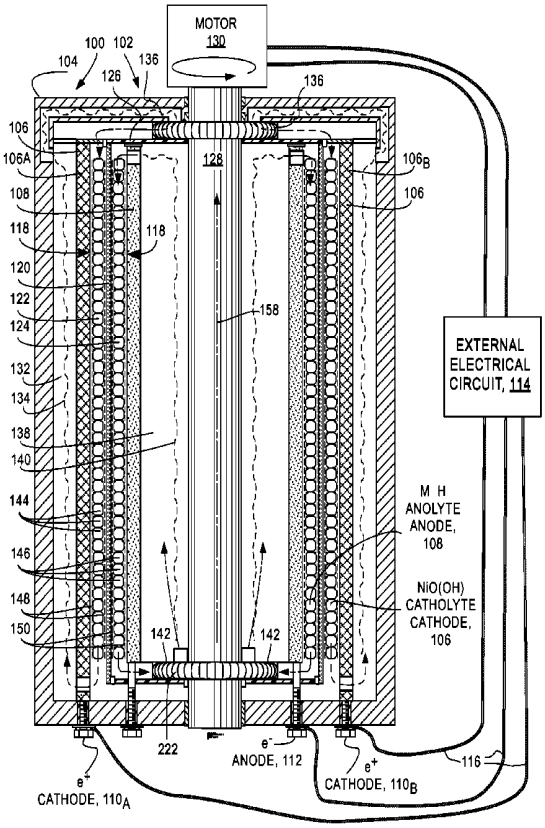
Primary Examiner — Basia Ridley
Assistant Examiner — Jonathan G Leong
(74) *Attorney, Agent, or Firm* — Sheldon L. Epstein; Malcolm J. Chisholm, Jr.; Pamela J. Curbelo

(57) **ABSTRACT**

Galvanic electrochemical cells (**100**, **300**, **700**, **900**) for converting chemical energy into electrical energy, such as batteries, flow cells and fuel cells with a cylindrical rotating filter (**120**$_X$, **326**, **726**, **910**) having ion-porous (**120**$_P$, **326**$_P$, **726**$_P$, **910**$_P$) and ion-non-porous filter (**120**$_N$, **326**$_N$, **726**$_N$, **910**$_N$) for use with both thixotropic and non-conducting electrolytes that generates fluid flows in electrolytes between static cylindrical current collector segments (**106**, **304**$_X$, **306**$_X$, **710**$_X$, **902**$_X$; **108**, **314**$_X$, **316**$_X$, **712**$_X$, **906**) and the filter (**120**, **326**, **726**, **910**) are disclosed that generate electric currents varying in amplitude that can be converted into alternating current electricity.

16 Claims, 11 Drawing Sheets



US008354197B2

(12) **United States Patent**
Lake et al.

(10) **Patent No.: US 8,354,197 B2**
(45) **Date of Patent: Jan. 15, 2013**

(54) **FUEL CELL STACK HAVING AN INTEGRATED END PLATE ASSEMBLY**

(75) Inventors: **Jeffrey G. Lake**, Vernon, CT (US); **Leonard A. Bach**, West Hartford, CT (US); **Pedro Inigo**, Hartford, CT (US); **Evan C. Rege**, Portland, OR (US); **Chris Vargas**, Hamden, CT (US); **Stephen P Victor**, Guilford, CT (US)

(73) Assignee: **UTC Fuel Cells, LLC**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 555 days.

(21) Appl. No.: **12/448,400**

(22) PCT Filed: **Dec. 21, 2006**

(86) PCT No.: **PCT/US2006/049001**

§ 371 (c)(1),
(2), (4) Date: **Dec. 22, 2009**

(87) PCT Pub. No.: **WO2008/088308**

PCT Pub. Date: **Jul. 24, 2008**

(65) **Prior Publication Data**

US 2010/0167156 A1 Jul. 1, 2010

(51) **Int. Cl.**
H01M 2/20 (2006.01)
H01M 2/14 (2006.01)

(52) **U.S. Cl.** **429/470**; 429/467; 429/511; 429/508

(58) **Field of Classification Search** 429/467, 429/470, 507, 508, 511
See application file for complete search history.

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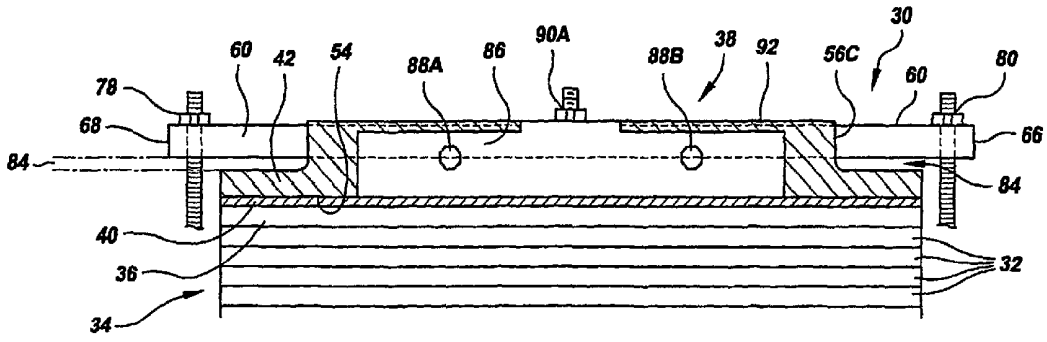
Primary Examiner — Maria J Laios
Assistant Examiner — Robert S Carrico
(74) *Attorney, Agent, or Firm* — Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

A fuel cell stack (**30**) includes an integrated end plate assembly having a current collector (**40**) secured adjacent and end cell (**36**) of the stack, a pressure plate (**42**) secured adjacent the current collector (**40**), and a backbone (**60**) secured within a backbone-support plane (**44**) defined within the plate (**42**). Tie rod ends (**62**, **64**, **66**, **68**) of the backbone (**60**) extend over a gap (**84**) defined between the backbone-support plane (**44**) and a deflection plane (**50**) defined within the pressure plate (**42**) so that the tie rod ends deflect within the gap (**84**) upon tightening of tie rods (**78**, **80**). Deflection of the backbone enables the backbone (**60**) to permit limited expansion of the fuel cell stack (**30**) during operation, and the backbone (**60**) has adequate flexural strength to prohibit expansion of the stack (**30**) beyond operating dynamic limits of the stack (**30**).

9 Claims, 4 Drawing Sheets



US008343256B2

(12) **United States Patent**
Lines et al.

(10) **Patent No.: US 8,343,256 B2**
(45) **Date of Patent: Jan. 1, 2013**

(54) **INTEGRATED CONTAMINANT SEPARATOR AND WATER-CONTROL LOOP FOR A FUEL REACTANT STREAM**

(75) Inventors: **Michael T. Lines**, South Windsor, CT (US); **Derek W. Hildreth**, Manchester, CT (US); **John L. Preston, Jr.**, Hebron, CT (US)

(73) Assignee: **UTC Power Corporation**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 407 days.

(21) Appl. No.: **12/734,863**

(22) PCT Filed: **Dec. 27, 2007**

(86) PCT No.: **PCT/US2007/026342**

§ 371 (c)(1),
(2), (4) Date: **May 27, 2010**

(87) PCT Pub. No.: **WO2009/085029**

PCT Pub. Date: **Jul. 9, 2009**

(65) **Prior Publication Data**

US 2010/0304231 A1 Dec. 2, 2010

(51) **Int. Cl.**
B01D 53/14 (2006.01)

(52) **U.S. Cl.** **95/16**; 95/17; 95/18; 95/196; 95/205; 95/211; 95/232; 429/410

(58) **Field of Classification Search** 429/17, 429/19–20, 30, 33–34, 410; 423/243.01, 423/210, 650, 651

See application file for complete search history.

(56) **References Cited**

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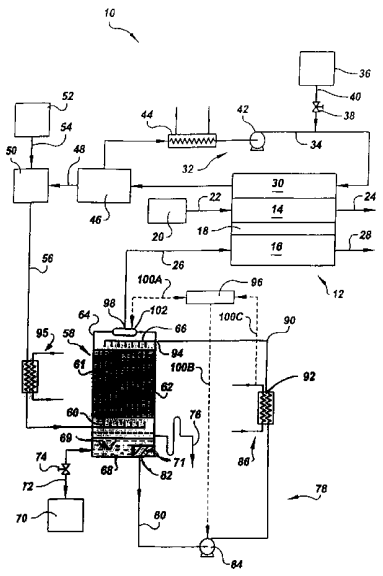
Primary Examiner — Duane Smith
Assistant Examiner — Ives Wu
(74) *Attorney, Agent, or Firm* — Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

An integrated contaminant separator and water-control loop (**10**) decontaminates a fuel reactant stream of a fuel cell (**12**). Water passes over surfaces of an ammonia dissolving means (**61**) within a separator scrubber (**58**) while the fuel reactant stream simultaneously passes over the surfaces to dissolve contaminants from the fuel reactant stream into the water. An accumulator (**68**) collects the separated contaminant stream, and ion exchange material (**69**) integrated within the accumulator removes contaminants from the stream. A water-control pump (**84**) directs flow of a de-contaminated water stream from the accumulator (**68**) through a water-control loop (**78**) having a heat exchanger (**86**) and back onto the scrubber (**58**) to flow over the packed bed (**62**). Separating contaminants from the fuel reactant stream and then isolating and concentrating the separated contaminants within the ion exchange material (**69**) minimizes cost and maintenance requirements.

4 Claims, 2 Drawing Sheets



US008283062B2

(12) **United States Patent**
Fischel

(10) **Patent No.: US 8,283,062 B2**
(45) **Date of Patent: *Oct. 9, 2012**

(54) **ELECTROCHEMICAL CELLS UTILIZING TAYLOR VORTEX FLOWS**

(75) Inventor: **Halbert Fischel**, Santa Barbara, CA (US)

(73) Assignee: **Global Energy Science, LLC**, Santa Barbara, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **13/194,049**

(22) Filed: **Jul. 29, 2011**

(65) **Prior Publication Data**

US 2012/0077100 A1 Mar. 29, 2012

Related U.S. Application Data

(62) Division of application No. 12/800,658, filed on May 20, 2010, now Pat. No. 8,017,261.

(60) Provisional application No. 61/220,583, filed on Jun. 26, 2009.

(51) **Int. Cl.**

H01M 2/38	(2006.01)
H01M 8/06	(2006.01)
H01M 8/04	(2006.01)
H01M 8/08	(2006.01)

(52) **U.S. Cl.** **429/69**; 429/416; 429/444; 429/451; 429/498

(58) **Field of Classification Search** 429/69, 429/416, 444, 451, 498

See application file for complete search history.

(56) **References Cited**

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6,319,293	B1	11/2001	Debe et al.	
6,713,206	B2	3/2004	Markoski et al.	
7,488,547	B1	2/2009	Iacovelli	
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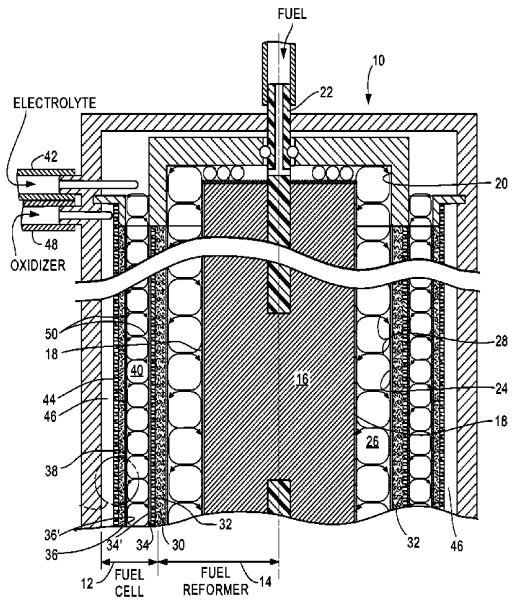
(Continued)

Primary Examiner — Basia Ridley
Assistant Examiner — Jonathan G Leong
(74) *Attorney, Agent, or Firm* — Sheldon L. Epstein; Malcolm J. Chisholm, Jr.; Pamela Curbelo

(57) **ABSTRACT**

Electrochemical cells (**10**), such as fuel cells (**12**) and fuel reformers (**14**), with rotating elements or electrodes (**34**, **24**) that generate Taylor Vortex Flows (**28**, **50**) and Circular Couette Flows (**58**) in fluids such as electrolytes and fuels are disclosed.

39 Claims, 6 Drawing Sheets



US008277991B2

(12) **United States Patent**
Reiser et al.

(10) **Patent No.: US 8,277,991 B2**
(45) **Date of Patent: Oct. 2, 2012**

(54) **HYDROGEN PASSIVATION SHUT DOWN SYSTEM FOR A FUEL CELL POWER PLANT**

(75) Inventors: **Carl A. Reiser**, Stonington, CT (US); **Tommy Skiba**, East Hartford, CT (US); **Timothy W. Patterson, Jr.**, West Hartford, CT (US)

(73) Assignee: **UTC Power Corporation**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 495 days.

(21) Appl. No.: **12/386,950**

(22) Filed: **Apr. 24, 2009**

(65) **Prior Publication Data**

US 2009/0214906 A1 Aug. 27, 2009

Related U.S. Application Data

(60) Continuation-in-part of application No. 11/978,270, filed on Oct. 29, 2007, now abandoned, which is a division of application No. 11/284,867, filed on Nov. 22, 2005, now abandoned, which is a continuation of application No. 10/635,779, filed on Aug. 6, 2003, now Pat. No. 6,984,464.

(51) **Int. Cl.**
H01M 8/04 (2006.01)
H01M 2/02 (2006.01)

(52) **U.S. Cl.** **429/429**; 429/415; 429/443; 429/444

(58) **Field of Classification Search** ..... None
See application file for complete search history.

(56) **References Cited**

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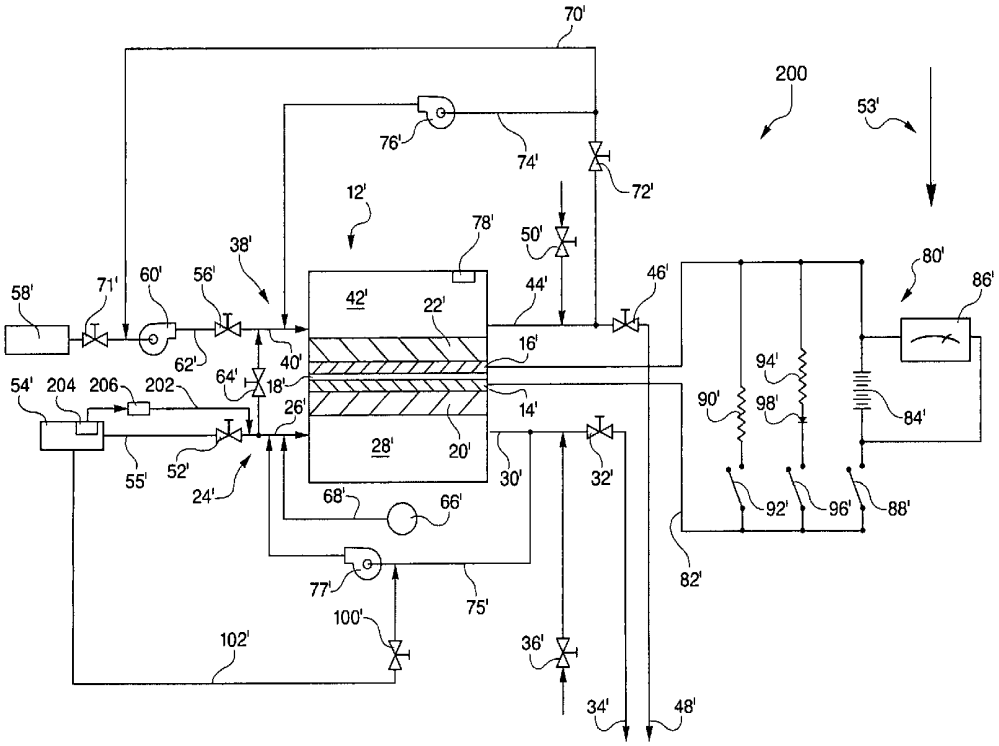
Primary Examiner — Robert Hodge
(74) *Attorney, Agent, or Firm* — Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

The invention is a hydrogen passivation shut down system for a fuel cell power plant (**10**, **200**). During shut down of the plant (**10**, **200**), hydrogen fuel is permitted to transfer between an anode flow path (**24**, **24'**) and a cathode flow path (**38**, **38'**). A passive hydrogen bleed line (**202**) permits passage of a smallest amount of hydrogen into the fuel cell (**12'**) necessary to maintain the fuel cell (**12'**) in a passive state. A diffusion media (**204**) may be secured in fluid communication with the bleed line (**202**) to maintain a constant, slow rate of diffusion of the hydrogen into the fuel cell (**12'**) despite varying pressure differentials between the shutdown fuel cell (**12'**) and ambient atmosphere adjacent the cell (**12'**).

7 Claims, 2 Drawing Sheets



US008206490B2

(12) **United States Patent**
Grasso et al.

(10) **Patent No.: US 8,206,490 B2**
(45) **Date of Patent: Jun. 26, 2012**

(54) **CONTAMINANT SEPARATOR AND ISOLATION LOOP FOR A FUEL REACTANT STREAM FOR A FUEL CELL**

(75) Inventors: **Albert P. Grasso**, Vernon, CT (US); **John L. Preston, Jr.**, Hebron, CT (US); **Francis Kocum**, Glastonbury, CT (US); **Richard J. Assarabowski**, Vernon, CT (US); **Derek Hildreth**, West Hartford, CT (US)

(73) Assignee: **UTC Fuel Cells, LLC**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 553 days.

(21) Appl. No.: **12/310,269**

(22) PCT Filed: **Sep. 20, 2006**

(86) PCT No.: **PCT/US2006/036712**

§ 371 (c)(1),
(2), (4) Date: **Feb. 17, 2009**

(87) PCT Pub. No.: **WO2008/036090**

PCT Pub. Date: **Mar. 27, 2008**

(65) **Prior Publication Data**

US 2009/0246573 A1 Oct. 1, 2009

(51) **Int. Cl.**
B01D 53/14 (2006.01)

(52) **U.S. Cl.** **95/196**; 95/205; 95/211; 95/232; 95/236; 96/234; 96/242; 429/410

(58) **Field of Classification Search** 429/17, 429/20, 410; 95/205, 211, 232, 195–196, 95/234, 290, 296–297, 300; 96/234, 240, 96/242, 290, 296–297, 300; 423/224, 228–229
See application file for complete search history.

(56) **References Cited**

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5,792,572	A *	8/1998	Foley et al.	429/423
6,376,114	B1 *	4/2002	Bonville et al.	429/425
7,628,847	B2 *	12/2009	Pope et al.	96/242

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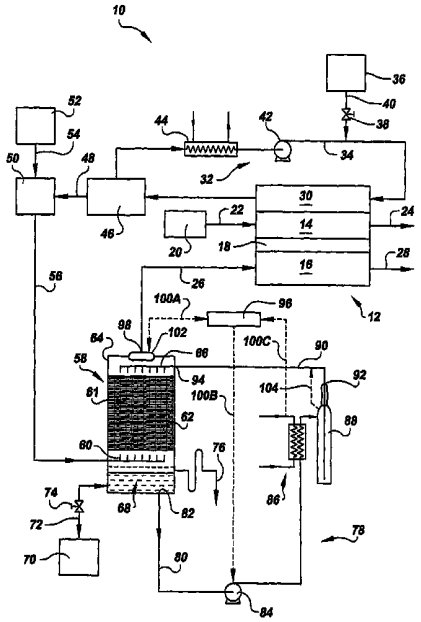
Primary Examiner — Duane Smith
Assistant Examiner — Ives Wu
(74) *Attorney, Agent, or Firm* — Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

A separator scrubber (**58**) and isolation loop (**78**) decontaminates a fuel reactant stream of a fuel cell (**12**). Water passes over surfaces of an ammonia dissolving means (**61**) within the scrubber (**58**) while the fuel reactant stream simultaneously passes over the surfaces to remove contaminants from the fuel reactant into the water. An accumulator (**68**) collects the separated contaminants and water, and an isolation loop pump (**84**) directs flow of the separated contaminant stream through the isolation loop (**78**). A heat exchanger (**86**) and an ion exchange bed (**88**) modify the heat of, and remove contaminants from, the separated contaminant stream, and the isolation loop (**78**) directs the decontaminated stream back onto the packed bed (**62**)-. Separating contaminants from the fuel reactant stream and then isolating and concentrating the separated contaminants within the ion exchange bed (**88**) minimizes cost and maintenance requirements.

14 Claims, 1 Drawing Sheet



US008187737B2

(12) **United States Patent**
Fischel

(10) **Patent No.: US 8,187,737 B2**
(45) **Date of Patent: May 29, 2012**

(54) **GALVANIC ELECTROCHEMICAL CELLS UTILIZING TAYLOR VORTEX FLOWS**

(75) Inventor: **Halbert Fischel**, Santa Barbara, CA (US)

(73) Assignee: **Global Energy Science, LLC**, Santa Barbara, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **13/235,480**

(22) Filed: **Sep. 18, 2011**

(65) **Prior Publication Data**

US 2012/0003518 A1 Jan. 5, 2012

Related U.S. Application Data

(60) Continuation-in-part of application No. 13/194,049, filed on Jul. 29, 2011, which is a division of application No. 12/800,658, filed on May 20, 2010, now Pat. No. 8,017,261.

(60) Provisional application No. 61/220,583, filed on Jun. 26, 2009.

(51) **Int. Cl.**
H01M 2/38 (2006.01)

(52) **U.S. Cl.** **429/67**; 429/69; 429/416; 429/451; 429/498

(58) **Field of Classification Search** 429/67, 429/69, 416, 451, 498
See application file for complete search history.

(56) **References Cited**

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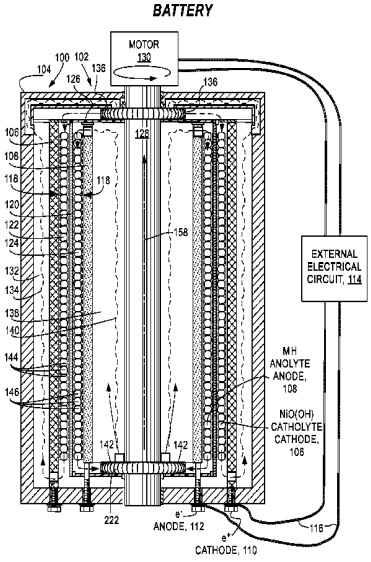
Primary Examiner — Jane Rhee

(74) *Attorney, Agent, or Firm* — Sheldon L. Epstein; Malcolm J. Chisholm, Jr.; Pamela J. Curbelo

(57) **ABSTRACT**

Electrochemical cells (**100**, **500**, **600**) for converting chemical energy into electrical energy, such as batteries (**102**), flow cells (**502**) and fuel cells (**602**) with a cylindrical rotating ion-permeable filter (**120**, **414**, **520**, **620**) that generates Taylor Vortex Flows (**144**, **146**, **404**, **544**, **546**, **664**, **666**) and Circular Couette Flows (**148**, **150**, **568**, **570**, **668**, **670**) in thixotropic catholytes and anolytes between a cylindrical current collector (**106**, **506**, **606**, **108**, **508**, **608**) and the filter (**120**, **414**, **520**, **620**) are disclosed.

18 Claims, 7 Drawing Sheets



US008187560B2

(12) **United States Patent**
Fischel

(10) **Patent No.: US 8,187,560 B2**
(45) **Date of Patent: May 29, 2012**

(54) **FUEL REFORMERS UTILIZING TAYLOR VORTEX FLOWS**

(75) Inventor: **Halbert Fischel**, Santa Barbara, CA (US)

(73) Assignee: **Global Energy Science, LLC**, Santa Barbara, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 230 days.

(21) Appl. No.: **12/800,710**

(22) Filed: **May 20, 2010**

(65) **Prior Publication Data**

US 2010/0330445 A1 Dec. 30, 2010

Related U.S. Application Data

(60) Provisional application No. 61/220,583, filed on Jun. 26, 2009.

(51) **Int. Cl.**
B01J 8/00 (2006.01)
H01M 8/06 (2006.01)

(52) **U.S. Cl.** **422/625**; 422/187; 422/629; 422/630; 422/631; 422/634; 422/638; 429/69; 429/68; 429/67; 429/498; 429/400; 429/535; 429/444; 429/499; 429/164; 429/122; 429/525; 429/524; 429/526; 429/527; 429/528; 429/497; 429/480; 429/423; 429/416; 429/424; 429/425

(58) **Field of Classification Search** 422/187, 422/625, 629, 630, 631, 634, 638; 429/67–69, 429/400–535

See application file for complete search history.

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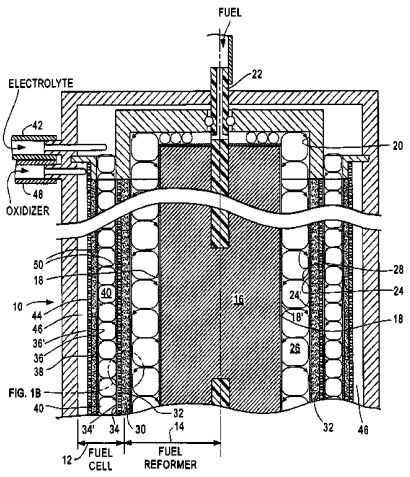
Primary Examiner — Kaity V. Handal

(74) *Attorney, Agent, or Firm* — Sheldon L. Epstein; Malcolm J. Chisholm, Jr.; Pamela J. Curbelo

(57) **ABSTRACT**

Steam, partial oxidation and pyrolytic fuel reformers (**14** or **90**) with rotating cylindrical surfaces (**18**, **24** or **92**, **96**) that generate Taylor Vortex Flows (**28** or **98**) and Circular Couette Flows (**58**, **99**) for extracting hydrogen from hydrocarbon fuels such as methane (CH_4), methanol (CH_3OH), ethanol (C_2H_5OH), propane (C_3H_8), butane (C_4H_{10}), octane (C_8H_{18}), kerosene ($C_{12}H_{26}$) and gasoline and hydrogen-containing fuels such as ammonia (NH_3) and sodium borohydride ($NaBH_4$) are disclosed.

30 Claims, 9 Drawing Sheets



US008158277B1

(12) **United States Patent**
Fischel

(10) **Patent No.: US 8,158,277 B1**
(45) **Date of Patent: Apr. 17, 2012**

(54) **CROSS-FLOW ELECTROCHEMICAL BATTERIES**

(75) Inventor: **Halbert Fischel**, Santa Barbara, CA (US)

(73) Assignee: **Global Energy Science, LLC (California)**, Santa Barbara, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **13/171,080**

(22) Filed: **Jun. 28, 2011**

Related U.S. Application Data

(60) Provisional application No. 61/388,359, filed on Sep. 30, 2010.

(51) **Int. Cl.**
H01M 2/38 (2006.01)
H01M 10/44 (2006.01)
H01M 2/40 (2006.01)

(52) **U.S. Cl.** **429/51**; 429/70; 429/50; 429/81

(58) **Field of Classification Search** 429/447–457, 429/513–514, 50–52, 61, 63–64, 67, 70, 429/74–81, 118, 347; 29/623.1–623.5
See application file for complete search history.

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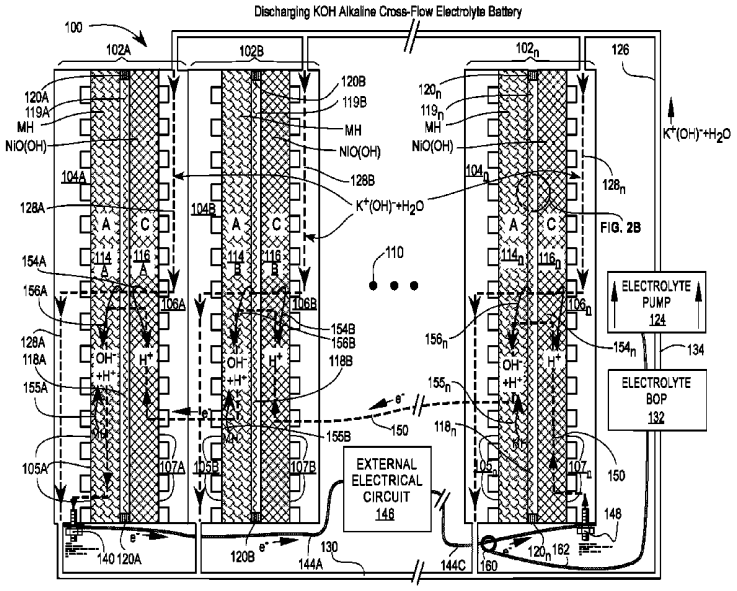
Primary Examiner — Barbara Gilliam
Assistant Examiner — Claire L Roe
(74) *Attorney, Agent, or Firm* — Sheldon L. Epstein; Malcolm J. Chisholm; Pamela J. Curbelo

(57) **ABSTRACT**

A cross-flow electrochemical cell for producing electricity is disclosed that incorporates means for cross-flow pumping of electrolyte through both anode and cathode electrodes in the same direction to achieve markedly higher discharging and charging currents. Cross-flow pumping enabling use of thick mesh electrodes comprising scaffolds impregnated with high-surface-area metal nanoparticles and having high porosity are also taught.

27 Claims, 7 Drawing Sheets



US008147767B2

(12) **United States Patent**
Fischel

(10) **Patent No.: US 8,147,767 B2**
(45) **Date of Patent: *Apr. 3, 2012**

(54) **CHEMICAL PROCESS ACCELERATOR SYSTEMS UTILIZING TAYLOR VORTEX FLOWS**

(75) Inventor: **Halbert Fischel**, Santa Barbara, CA (US)

(73) Assignee: **Global Energy Science, LLC**, Santa Barbara, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 50 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **12/800,657**

(22) Filed: **May 20, 2010**

(65) **Prior Publication Data**

US 2010/0329947 A1 Dec. 30, 2010

Related U.S. Application Data

(60) Provisional application No. 61/220,583, filed on Jun. 26, 2009.

(51) **Int. Cl.**

B01J 19/00	(2006.01)
B01J 8/08	(2006.01)
B01J 8/02	(2006.01)
B01J 35/02	(2006.01)

(52) **U.S. Cl.** **422/198**; 422/129; 422/209; 422/211

(58) **Field of Classification Search** 422/129, 422/198, 209, 211; 977/700

See application file for complete search history.

(56) **References Cited**

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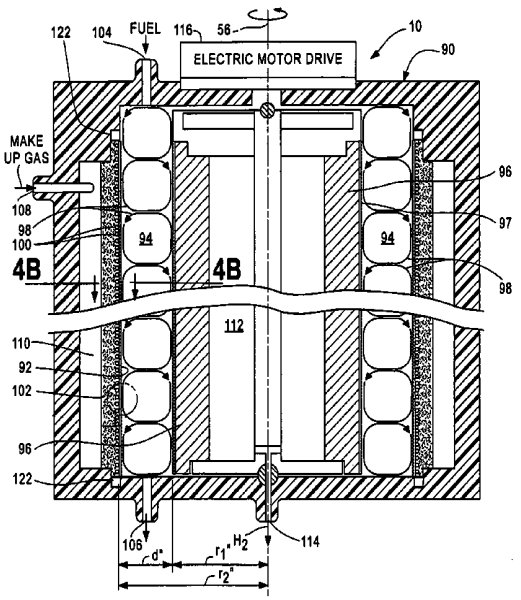
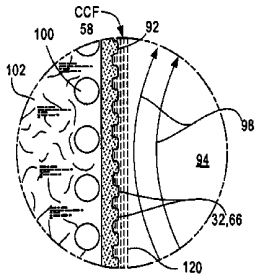
Primary Examiner — Walter D Griffin
Assistant Examiner — Natasha Young
(74) *Attorney, Agent, or Firm* — Seldon L. Epstein; Malcolm J. Chisholm, Jr.; Pamela J. Curbelo

(57) **ABSTRACT**

Chemical process accelerator systems comprising viscid fluid Taylor Vortex Flows (**98**, **50***a*) with high-shear-rate laminar Circular Couette Flows (**58**) in contact with catalysts (**92**, **92'**, **30**, **32**, **32***f*, **32***g*, **36**, **40**, **44**, **45**, **46**, **47**, **48**), catalytic compositions and structures in chemical reactors and electrochemical cells (e.g. fuel cells, fuel reformers) are disclosed.

28 Claims, 6 Drawing Sheets





US008142950B2

(12) **United States Patent**
Reiser et al.

(10) **Patent No.: US 8,142,950 B2**
(45) **Date of Patent: Mar. 27, 2012**

(54) **HYDROGEN PASSIVATION SHUT DOWN SYSTEM FOR A FUEL CELL POWER PLANT**

(75) Inventors: **Carl A. Reiser**, Stonington, CT (US); **Venkateshwarlu Yadha**, Richardson, TX (US); **Matthew P. Wilson**, Groton, CT (US)

(73) Assignee: **UTC Power Corporation**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 400 days.

(21) Appl. No.: **12/387,515**

(22) Filed: **May 4, 2009**

(65) **Prior Publication Data**

US 2009/0220832 A1 Sep. 3, 2009

Related U.S. Application Data

(60) Continuation-in-part of application No. 11/978,270, filed on Oct. 29, 2007, now abandoned, which is a division of application No. 11/284,867, filed on Nov. 22, 2005, now abandoned, which is a continuation of application No. 10/635,779, filed on Aug. 6, 2003, now Pat. No. 6,984,464.

(51) **Int. Cl.**
H01M 2/38 (2006.01)
H01M 8/04 (2006.01)

(52) **U.S. Cl.** **429/454**; 429/443; 429/444

(58) **Field of Classification Search** ..... None
See application file for complete search history.

(56) **References Cited**

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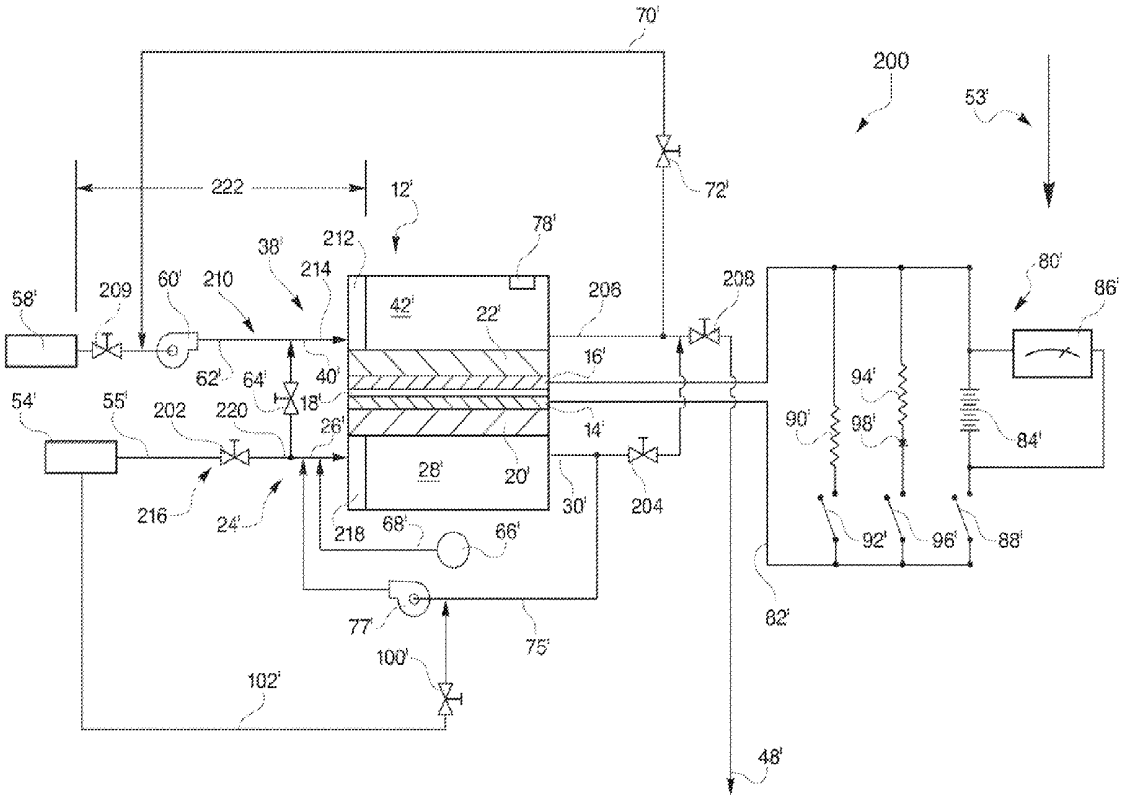
Primary Examiner — Robert Hodge
(74) *Attorney, Agent, or Firm* — Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

The invention is a hydrogen passivation shut down system for a fuel cell power plant (**10**, **200**). During shut down of the plant (**10**, **200**), hydrogen fuel is permitted to transfer between an anode flow path (**24**, **24'**) and a cathode flow path (**38**, **38'**). A controlled-oxidant flow device (**209**) near an oxygen source (**58'**) permits a minimal amount of atmospheric oxygen to enter the power plant (**200**) during shut down to equalize pressure between ambient atmosphere and the flow paths (**24'**, **28'**) and to keep limited atmospheric oxygen entering the power plant (**200**) through the device (**209**) as far as possible from fuel cell flow fields (**28'**, **42'**). A non-leaking hydrogen inlet valve (**202**), a non-leaking cathode exhaust valve (**208**), and a combined oxidant and fuel exhaust line (**206**) also minimize penetration of oxygen into the shut down power plant (**200**).

5 Claims, 2 Drawing Sheets



US008124296B1

(12) **United States Patent**
Fischel

(10) **Patent No.: US 8,124,296 B1**
(45) **Date of Patent: *Feb. 28, 2012**

(54) **THICK ELECTRODE DIRECT REACTION FUEL CELLS UTILIZING CROSS-FLOWS AND TAYLOR VORTEX FLOWS**

(75) Inventor: **Halbert Fischel**, Santa Barbara, CA (US)

(73) Assignee: **Global Energy Science, LLC (California)**, Santa Barbara, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **13/174,686**

(22) Filed: **Jun. 30, 2011**

Related U.S. Application Data

(60) Provisional application No. 61/388,359, filed on Sep. 30, 2010.

(51) **Int. Cl.**
H01M 8/02 (2006.01)

(52) **U.S. Cl.** **429/513**; 429/454

(58) **Field of Classification Search** 429/513
See application file for complete search history.

(56) **References Cited**

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2010/0068623	A1	3/2010	Braun et al.	

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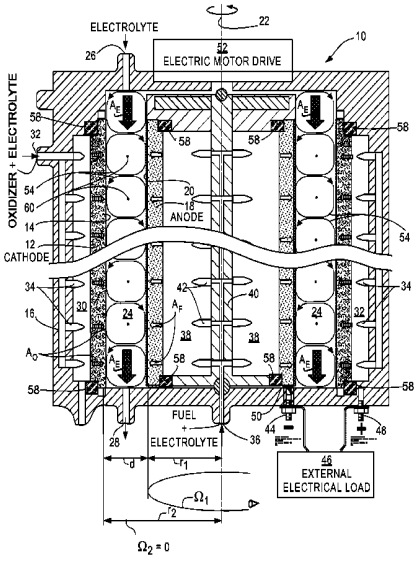
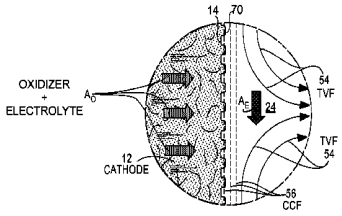
Primary Examiner — Patrick Ryan
Assistant Examiner — Brent Thomas
(74) *Attorney, Agent, or Firm* — Sheldon L. Epstein; Malcolm J. Chisholm, Jr.; Pamela Curbelo

(57) **ABSTRACT**

Direct reaction fuel cells (**10**) with cross-flow of an electrolyte mixture through thick, porous electrodes (**12**, **18**) that contain a mixture of catalyst particles and that rotate to generate Taylor Vortex Flows (**54**) and Circular Couette Flows (**56**) in electrolyte chambers (**24**) are disclosed.

13 Claims, 2 Drawing Sheets





US008112944B2

(12) **United States Patent**
Miller et al.

(10) **Patent No.: US 8,112,944 B2**
(45) **Date of Patent: Feb. 14, 2012**

(54) **PRE-ENGINEERED BUILDING FOR AN INTEGRAL MOBILE IMAGING UNIT**

(75) Inventors: **William G. Miller**, Stafford Springs, CT (US); **Robert F. Currie**, North Granby, CT (US)

(73) Assignee: **William G. Miller**, Stafford Springs, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 524 days.

(21) Appl. No.: **12/290,072**

(22) Filed: **Oct. 27, 2008**

(65) **Prior Publication Data**

US 2010/0101154 A1 Apr. 29, 2010

(51) **Int. Cl.**
E04H 3/00 (2006.01)

(52) **U.S. Cl.** **52/79.7**; 52/79.1; 52/175

(58) **Field of Classification Search** 52/79.1–79.9, 52/174, 175, 2.12

See application file for complete search history.

(56) **References Cited**

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Primary Examiner — Brian Glessner

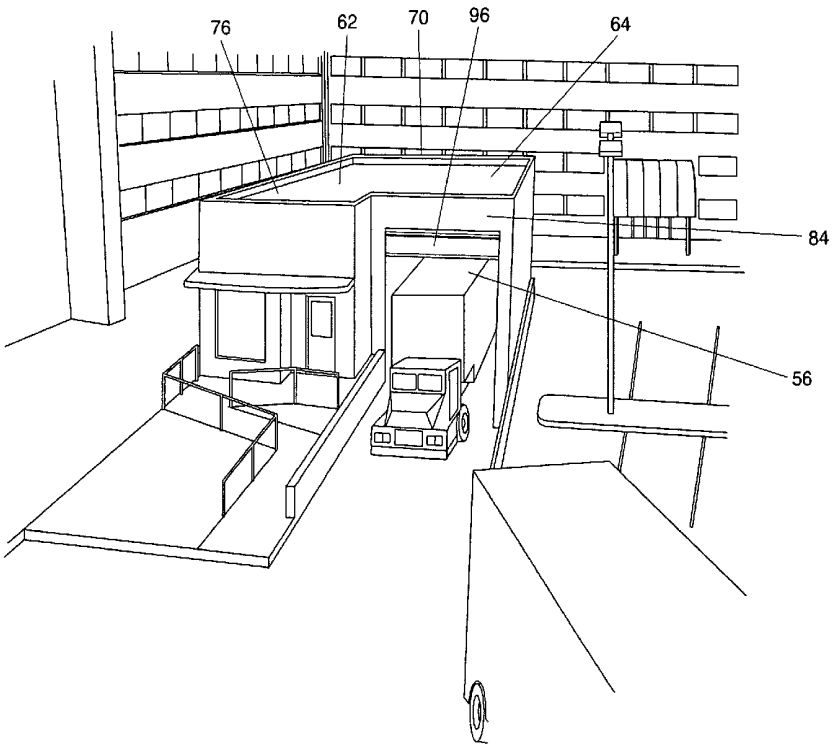
Assistant Examiner — Adam Barlow

(74) *Attorney, Agent, or Firm* — Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

A pre-engineered building (**50**) includes a patient service enclosure (**62**) and a mobile imaging unit enclosure (**64**) sharing a common wall (**66**) to seamlessly wrap a mobile imaging unit (**18**, **56**) within the mobile imaging unit enclosure (**64**) of the building (**50**), thereby providing patient service rooms (**94**) integral with an adjacent the mobile imaging unit (**18**, **56**). Walls (**66**, **70**, **72**, **74**, **84**, **86**, **88**) of the building (**50**) are pre-engineered so that the walls (**66**, **70**, **72**, **74**, **84**, **86**, **88**) are manufactured in panelized configurations that may include structural support components, exterior sheathing, and utility components prior to installation of the walls (**66**, **70**, **72**, **74**, **84**, **86**, **88**) upon a foundation (**58**) supporting the pre-engineered building (**50**).

2 Claims, 10 Drawing Sheets



US008109401B2

(12) **United States Patent**
Davis

(10) **Patent No.: US 8,109,401 B2**
(45) **Date of Patent: Feb. 7, 2012**

(54) **FRAME FOR A WALL CUT-OUT**

(76) Inventor: **Morgan C. Davis**, Hinsdale, MA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **12/381,822**

(22) Filed: **Mar. 17, 2009**

(65) **Prior Publication Data**

US 2009/0178822 A1 Jul. 16, 2009

Related U.S. Application Data

(63) Continuation-in-part of application No. 11/482,271, filed on Jul. 7, 2006, now Pat. No. 7,789,257.

(51) **Int. Cl.**
B65D 6/28 (2006.01)

(52) **U.S. Cl.** **220/4.02**; 220/3.5; 220/3.9; 220/3.2

(58) **Field of Classification Search** 220/3.2, 220/4.02, 3.5, 3.9; 174/58

See application file for complete search history.

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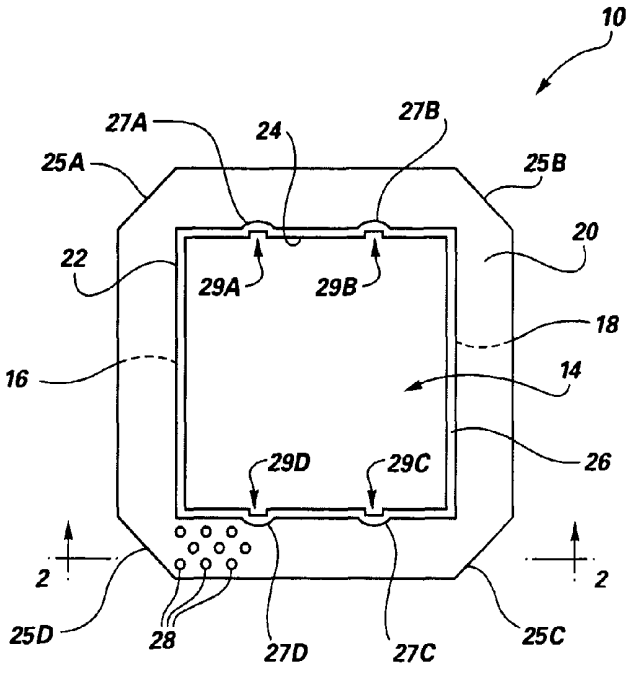
Primary Examiner — Anthony Stashick
Assistant Examiner — Christopher McKinley
(74) *Attorney, Agent, or Firm* — Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

For a wall cut-out (**100**) defining a void (**101**) within a wall (**102**) for receiving a utility receptacle (**104**) wherein the cut-out has a perimeter edge (**103**) surrounding the void (**101**), the frame (**10**) includes an insert-flange (**12**) dimensioned to be inserted into and to sit within the void (**101**) adjacent the perimeter edge (**103**). The insert-flange (**12**) defines a through void frame opening (**14**) between opposed edges of the insert-flange (**12**). A wall-shelf (**20**) is secured to the insert-flange (**12**), and a mud-ridge (**22**) is secured to the wall-shelf (**20**) adjacent to and surrounding an interior perimeter (**24**) of the frame opening (**14**). The mud-ridge extends away from the wall-shelf (**20**) to facilitate application of a bonding compound and secure mounting of a receptacle component (**106**) within the utility receptacle (**104**).

9 Claims, 11 Drawing Sheets



US008076257B1

(12) **United States Patent**
Wilson

(10) **Patent No.: US 8,076,257 B1**
(45) **Date of Patent: Dec. 13, 2011**

(54) **HIGH TEMPERATURE CERAMIC DIELECTRIC COMPOSITION AND CAPACITORS MADE FROM THE COMPOSITION**

(75) Inventor: **James M. Wilson**, North Adams, MA (US)

(73) Assignee: **MRA Laboratories, Inc**, Adams, MA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 357 days.

(21) Appl. No.: **12/386,736**

(22) Filed: **Apr. 22, 2009**

Related U.S. Application Data

(60) Provisional application No. 61/125,155, filed on Apr. 23, 2008.

(51) **Int. Cl.**
C04B 35/465 (2006.01)
C04B 35/468 (2006.01)
H01G 4/06 (2006.01)

(52) **U.S. Cl.** **501/139**; 501/136; 361/321.4

(58) **Field of Classification Search** 501/139, 501/136; 361/321.4
See application file for complete search history.

(56) **References Cited**

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"Effect of A-site Substitution on Crystal Component and Dielectric Properties in Bi.5Na.5TiO3 Ceramics", Materials Science and Engineering, B 121, 2005.

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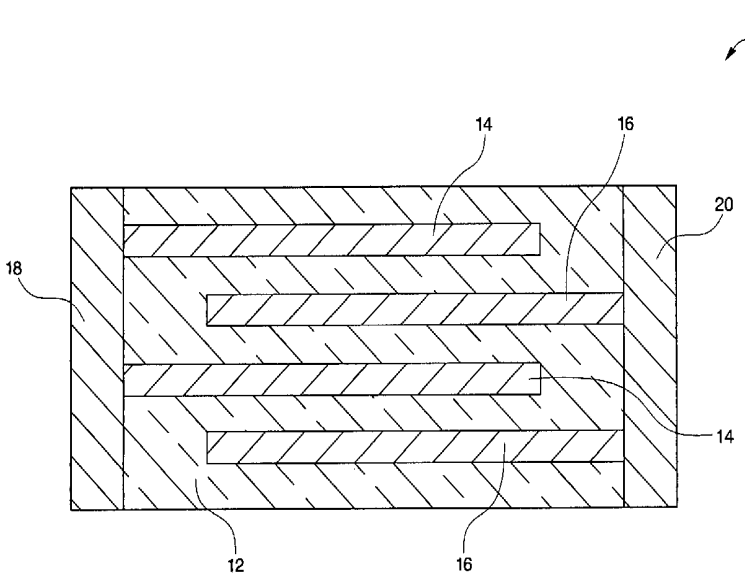
Primary Examiner — Karl Group
(74) *Attorney, Agent, or Firm* — Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

A bismuth sodium titanate ($Bi_{0.5}Na_{0.5}TiO_3$) base material is modified by the partial substitution of aliovalent A-site cations such as barium (as BaO) or strontium (as SrO), as well as certain b-site donor/acceptor dopants and sintering aids to form a multi-phase system, much like known "core/shell" X7R dielectrics based solely on $BaTiO_3$. The resulting ceramic dielectric composition is particularly suitable for producing a multilayer ceramic capacitor (**10**) that maintains high dielectric constant (and thus the capability of maintaining high capacitance) over a broad temperature range of from about 150° C. to about 300° C. Such capacitors (**10**) are appropriate for high temperature power electronics applications in fields such as down-hole oil and gas well drilling.

17 Claims, 11 Drawing Sheets



US008029753B2

(12) **United States Patent**
Breault

(10) **Patent No.: US 8,029,753 B2**
(45) **Date of Patent: Oct. 4, 2011**

(54) **AMMONIA CONTACT SCRUBBER SYSTEM FOR A FUEL CELL**

(76) Inventor: **Richard D Breault**, North Kingston, RI (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 31 days.

(21) Appl. No.: **12/448,380**

(22) PCT Filed: **Dec. 20, 2006**

(86) PCT No.: **PCT/US2006/048701**

§ 371 (c)(1),
(2), (4) Date: **Jun. 18, 2009**

(87) PCT Pub. No.: **WO2008/079113**

PCT Pub. Date: **Jul. 3, 2008**

(65) **Prior Publication Data**

US 2010/0024648 A1 Feb. 4, 2010

(51) **Int. Cl.**
B01D 53/14 (2006.01)

(52) **U.S. Cl.** **423/238**; 95/197; 95/211; 95/232; 96/234; 96/244; 96/290

(58) **Field of Classification Search** 95/232, 95/211, 197; 96/234, 236, 290, 244
See application file for complete search history.

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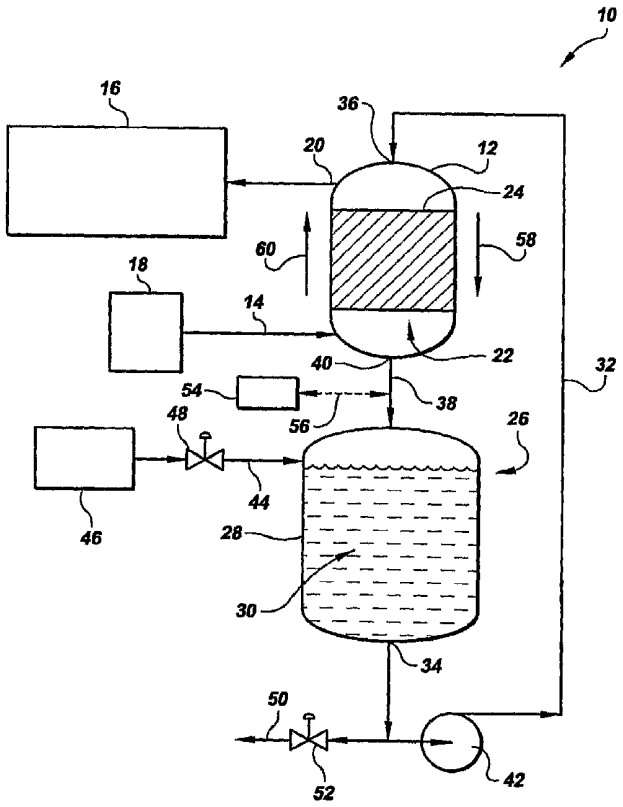
Primary Examiner — Duane Smith
Assistant Examiner — Tiffany N Palmer
(74) *Attorney, Agent, or Firm* — Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

An ammonia contact scrubber system (**10**) for removing ammonia from a fuel stream for a fuel cell (**16**) includes a contact scrubber (**12**) having a scrubber fuel inlet (**14**) and a scrubber fuel exhaust (**20**) for directing flow of the fuel stream through support material (**24**) within the scrubber (**12**) and into the fuel cell (**16**). An acid circulating loop (**26**) has an acid holding tank (**28**) holding a liquid acid solution (**30**), an acid feed line (**32**) secured in fluid communication between the holding tank (**28**) and a scrubber acid inlet (**36**) of the contact scrubber (**12**), an acid return (**38**) for returning the acid solution from the scrubber (**12**) to the acid holding tank (**28**), and an acid circulation pump (**42**) for pumping the acid solution (**30**) through the acid circulating loop (**26**) and through the support material (**24**) within the scrubber (**12**).

9 Claims, 1 Drawing Sheet



US008017261B2

(12) **United States Patent**
Halbert

(10) **Patent No.: US 8,017,261 B2**
(45) **Date of Patent: *Sep. 13, 2011**

(54) **ELECTROCHEMICAL CELLS UTILIZING TAYLOR VORTEX FLOWS**

(75) Inventor: **Fischel Halbert**, Santa Barbara, CA (US)

(73) Assignee: **Global Energy Science, LLC (California)**, Santa Barbara, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **12/800,658**

(22) Filed: **May 20, 2010**

(65) **Prior Publication Data**

US 2010/0330439 A1 Dec. 30, 2010

Related U.S. Application Data

(60) Provisional application No. 61/220,583, filed on Jun. 26, 2009.

(51) **Int. Cl.**

H01M 2/38	(2006.01)
H01M 8/06	(2006.01)
H01M 8/04	(2006.01)
H01M 8/08	(2006.01)

(52) **U.S. Cl.** **429/69**; 429/416; 429/444; 429/451; 429/498

(58) **Field of Classification Search** 429/400–535, 429/67–69

See application file for complete search history.

(56) **References Cited**

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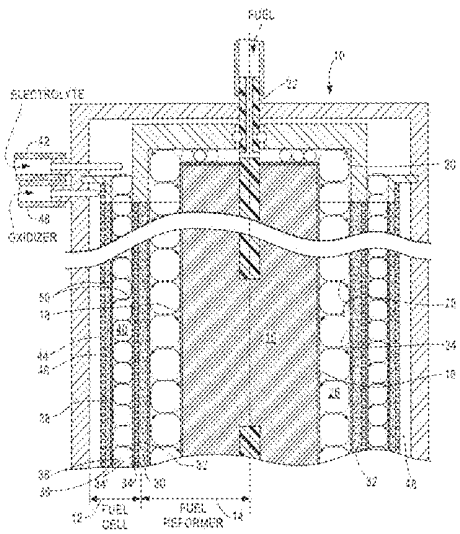
(Continued)

Primary Examiner — Basia Ridley
Assistant Examiner — Jonathan G Leong
(74) *Attorney, Agent, or Firm* — Sheldon L. Epstein; Malcolm J. Chisholm, Jr.; Pamela J. Curbelo

(57) **ABSTRACT**

Electrochemical cells (**10**), such as fuel cells (**12**) and fuel reformers (**14**), with rotating elements or electrodes (**34**, **24**) that generate Taylor Vortex Flows (**28**, **50**) and Circular Couette Flows (**58**) in fluids such as electrolytes and fuels are disclosed.

30 Claims, 6 Drawing Sheets



US008006401B1

(12) **United States Patent**
Shapiro

(10) **Patent No.: US 8,006,401 B1**
(45) **Date of Patent: Aug. 30, 2011**

(54) **CUT-OUT TOOL FOR MAKING A UTILITY RECEPTACLE CUT-OUT IN SHEETING MATERIAL**

(76) Inventor: **Allan Shapiro**, North Adams, MA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 235 days.

(21) Appl. No.: **12/288,830**

(22) Filed: **Oct. 23, 2008**

Related U.S. Application Data

(60) Provisional application No. 61/000,045, filed on Oct. 23, 2007.

(51) **Int. Cl.**
G01B 1/00 (2006.01)

(52) **U.S. Cl.** **33/528**; 33/DIG. 10

(58) **Field of Classification Search** ..... 144/144.1, 144/144.51, 144.52, 145.1, 371, 372; 33/528, 33/262, DIG. 10

See application file for complete search history.

(56) **References Cited**

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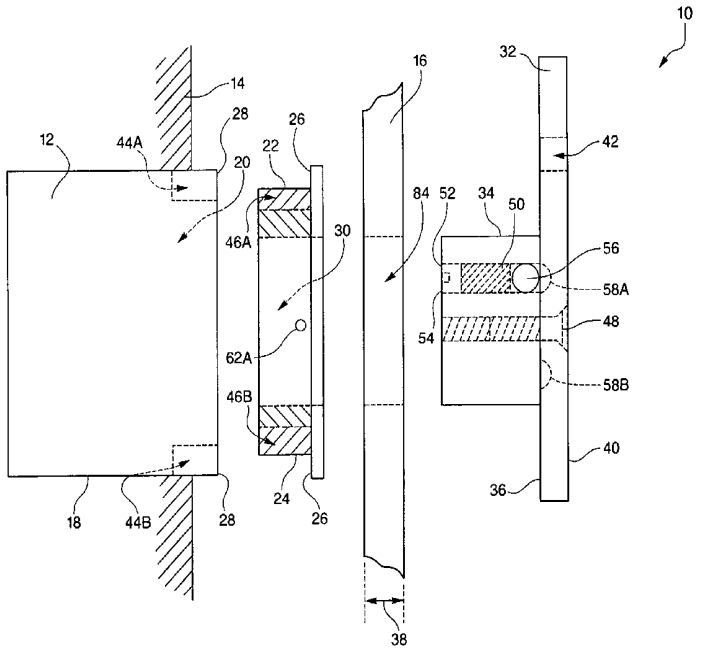
Primary Examiner — David J. Walczak
Assistant Examiner — Jennifer Chiang
(74) *Attorney, Agent, or Firm* — Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

The cut-out tool (**10**) includes an insert adaptor (**22**) configured to insert into and be secured within a utility receptacle (**12**) prior to sheeting material (**16**) overlying the receptacle (**12**), such as an electric receptacle (**12**). The insert adaptor (**22**) defines a mounting sleeve (**30**), and whenever the sheeting material (**16**) is secured over the receptacle (**12**) and insert (**22**), an insert hole (**84**) is cut adjacent and around an interior perimeter of the mounting sleeve (**30**). A mounting post (**34**) of an exterior template (**32**) is then secured within the mounting sleeve (**30**), and the exterior template (**32**) defines a cutting slot (**42**) that is dimensioned to contiguously and substantially overlie an exterior perimeter (**28**) of the receptacle (**12**). A cut is them made through the cutting slot (**42**) to define a template hole (**86**), and the sheeting material (**16**) then slides over the receptacle (**12**).

12 Claims, 5 Drawing Sheets



US007987987B1

(12) **United States Patent**
Rochelo

(10) **Patent No.: US 7,987,987 B1**
(45) **Date of Patent: Aug. 2, 2011**

(54) **PRODUCT DISPLAY SYSTEM HAVING AN INTEGRAL PROTECTIVE CASE FOR HOUSING AND DISPLAYING A PRODUCT**

(76) Inventor: **Donald R. Rochelo**, Pittsfield, MA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **13/008,212**

(22) Filed: **Jan. 18, 2011**

Related U.S. Application Data

(60) Provisional application No. 61/336,066, filed on Jan. 15, 2010.

(51) **Int. Cl.**
B65D 73/00 (2006.01)

(52) **U.S. Cl.** **206/701**; 206/462; 206/779

(58) **Field of Classification Search** 206/763, 206/769, 461, 462, 463, 775, 779, 784, 701, 206/722
See application file for complete search history.

(56) **References Cited**

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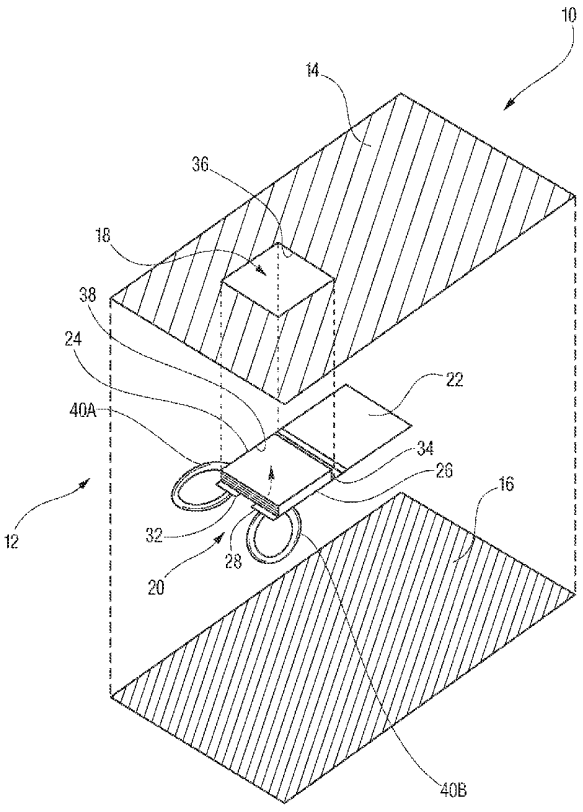
Primary Examiner — Jacob K Ackun, Jr.
(74) *Attorney, Agent, or Firm* — Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

A bi-layer product package (**12**) includes a protective case (**20**) secured between opposed display and backing layers (**14**, **16**) of the product package (**12**). A product display base (**24**) of the case projects through a display void (**18**) of the display layer (**14**) and houses a product (**30**). A capture lid (**22**) and twist-off securing structures (**32**, **40**A, **40**B, **42**) of the case are secured between the display and backing layers (**14**, **16**) of the package (**12**) to prevent the display base (**24**) from passing completely through the display layer (**14**). The display base (**24**) replaces a traditional transparent blister or projection of a blister pack during display of the product (**30**), and during usage of the product (**30**), thereby minimizing materials and manufacturing costs, while providing in one package (**12**) both a product (**30**) and a removable protective case (**20**) integral with the package (**12**).

5 Claims, 2 Drawing Sheets



US007972747B2

(12) **United States Patent**
Fischel

(10) **Patent No.: US 7,972,747 B2**
(45) **Date of Patent: Jul. 5, 2011**

(54) **DIRECT REACTION FUEL CELLS UTILIZING TAYLOR VORTEX FLOWS**

(75) Inventor: **Halbert Fischel**, Santa Barbara, CA (US)

(73) Assignee: **Global Energy Science, LLC (California)**, Santa Barbara, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **12/800,672**

(22) Filed: **May 20, 2010**

(65) **Prior Publication Data**

US 2010/0330459 A1 Dec. 30, 2010

Related U.S. Application Data

(60) Provisional application No. 61/220,583, filed on Jun. 26, 2009.

(51) **Int. Cl.**
H01M 8/04 (2006.01)

(52) **U.S. Cl.** **429/513**; 429/454

(58) **Field of Classification Search** 429/400, 429/428, 454, 472, 476, 498, 499, 512, 523, 429/51

See application file for complete search history.

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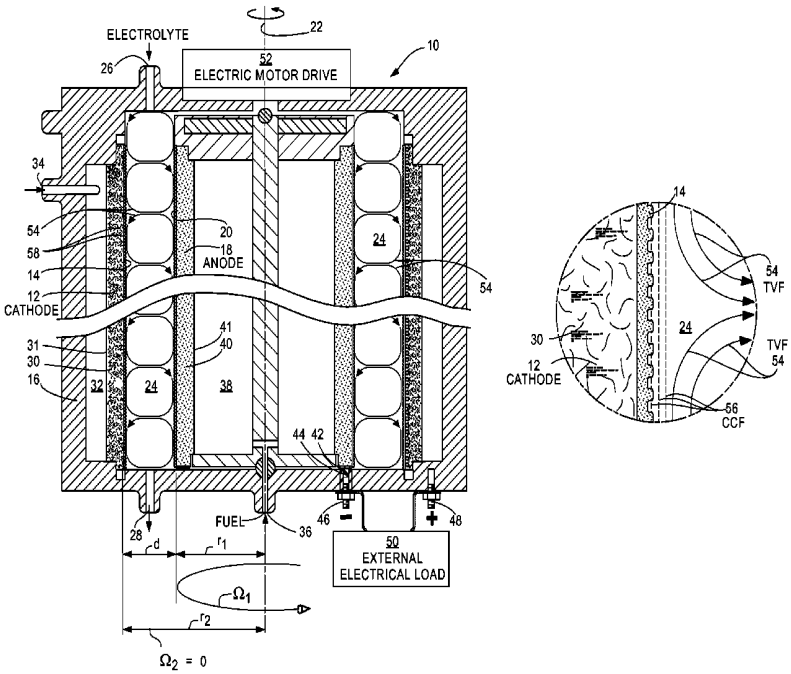
Primary Examiner — Jennifer K. Michener
Assistant Examiner — Carlos Barcena
(74) *Attorney, Agent, or Firm* — Sheldon L. Epstein; Malcolm J. Chisholm, Jr.; Pamela J. Curbelo

(57) **ABSTRACT**

Direct reaction fuel cells (**10**) and fuel cell batteries (**200**) with rotating electrodes (**18**) that generate Taylor Vortex Flows (**54**) and Circular Couette Flows (**56**) in electrolyte chambers (**24**) are disclosed.

70 Claims, 8 Drawing Sheets



US007945458B1

(12) **United States Patent**
Jackson

(10) **Patent No.: US 7,945,458 B1**
(45) **Date of Patent: May 17, 2011**

(54) **CARE FUNDING AND CARE PLANNING SYSTEM**

(76) Inventor: **Joseph A. Jackson**, Lenox, MA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 366 days.

(21) Appl. No.: **12/150,564**

(22) Filed: **Apr. 29, 2008**

Related U.S. Application Data

(60) Provisional application No. 60/927,797, filed on May 4, 2007.

(51) **Int. Cl.**

G06Q 10/00	(2006.01)
G06Q 50/00	(2006.01)
A61B 5/00	(2006.01)
G06F 19/00	(2006.01)

(52) **U.S. Cl.** **705/2**; 705/3

(58) **Field of Classification Search** 705/2–3
See application file for complete search history.

(56) **References Cited**

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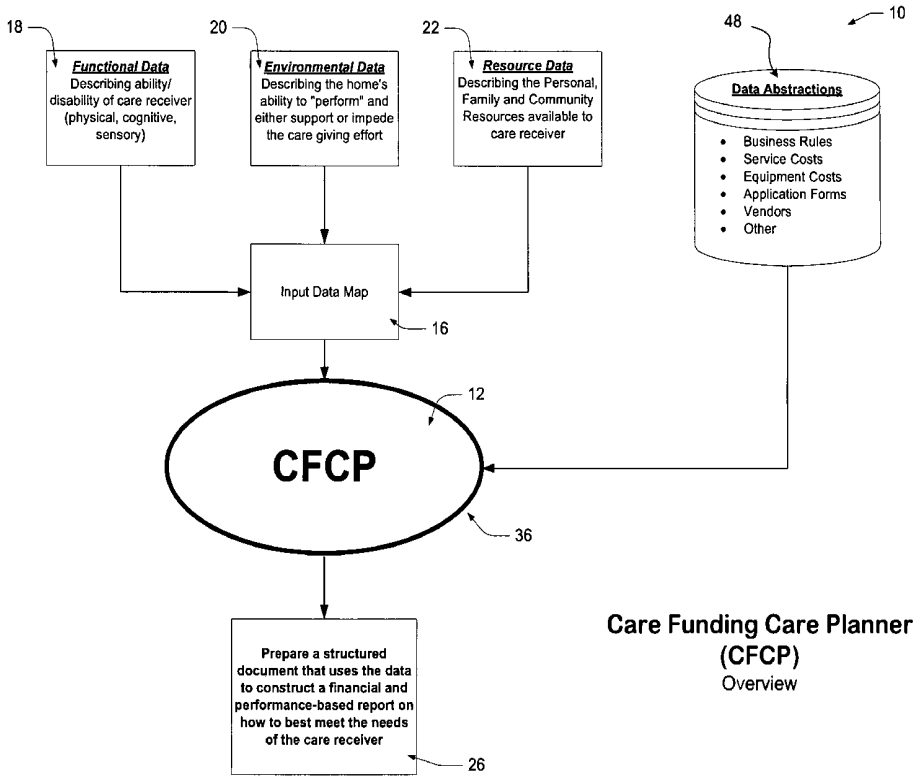
Primary Examiner — Luke Gilligan
Assistant Examiner — Joy Chng
(74) *Attorney, Agent, or Firm* — Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

A care funding and care planning system (**10**) generates a care plan option report (**192**) for a care receiver. The system (**10**) includes a client computer (**14**) having an input data map (**16**) for receiving and storing care-receiver data (**13**) including predetermined, critical categories of care-receiver information. A system processor (**36**) processes the care-receiver data (**13**) through knowledge management software (**12**) to evaluate and select from the care-receiver data (**13**) at least physical functional status (**72**), cognitive and sensory status (**74**), prospective functional status (**76**), living environment status (**84**), and long-term care resource status abstractions (**88**). A meta needs-resource weighting engine (**56**) assigns care-receiver specific values (**160**A) to the care-receiver data abstractions (**72**). A dynamic data base (**48**) allocates values to the weighted care-receiver data abstractions (**72**). A report generator (**58**) produces a care plan options report (**192**) for the care receiver.

9 Claims, 22 Drawing Sheets



Care Funding Care Planner (CFCP)
Overview

US007931996B2

(12) **United States Patent**
Reiser

(10) **Patent No.: US 7,931,996 B2**
(45) **Date of Patent: Apr. 26, 2011**

(54) **FUEL CELL WITH RANDOMLY-DISPERSED CARBON FIBERS IN A BACKING LAYER**

(75) Inventor: **Carl A. Reiser**, Stonington, CT (US)

(73) Assignee: **UTC Power Corporation**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1136 days.

(21) Appl. No.: **11/638,147**

(22) Filed: **Dec. 13, 2006**

(65) **Prior Publication Data**

US 2007/0111882 A1 May 17, 2007

Related U.S. Application Data

(62) Division of application No. 10/747,373, filed on Dec. 29, 2003, now abandoned.

(51) **Int. Cl.**
H01M 8/02 (2006.01)
H01M 8/10 (2006.01)

(52) **U.S. Cl.** **429/481**; 429/480

(58) **Field of Classification Search** 429/40–45, 429/480, 481

See application file for complete search history.

(56) **References Cited**

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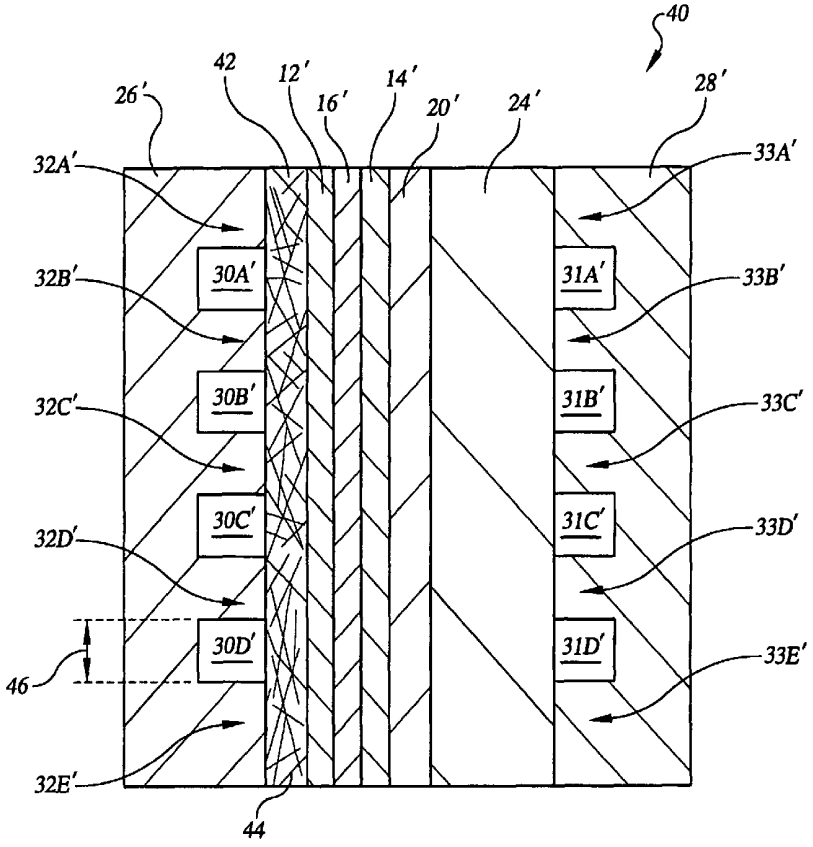
Primary Examiner — Tracy Dove

(74) *Attorney, Agent, or Firm* — Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

A fuel cell (**40**) includes first and second catalysts (**12'**), (**14'**) secured to opposed surfaces of an electrolyte (**16'**); a first flow field (**26'**) secured in fluid communication with the first catalyst (**12'**) defining a plurality of flow channels (**30A'**, **30B'**, **30C'**, **30D'**) between a plurality of ribs (**32A'**, **32B'**, **32C'**, **32D'**, **32E'**) of the first flow field (**26'**); and a backing layer (**42**) secured between the first flow field (**26'**) and the first catalyst (**12'**). The backing layer (**42**) includes a carbon black, a hydrophobic polymer, and randomly-dispersed carbon fibers (**44**). The carbon fibers (**44**) are at least twice as long as a width (**46**) of the flow channels (**30A'**, **30B'**, **30C'**, **30D'**) defined in the adjacent first flow field (**26'**). The backing layer (**42**) replaces a known substrate (**22**) and diffusion layer (**18**).

2 Claims, 2 Drawing Sheets



US007855020B1

(12) **United States Patent**
Margiott et al.

(10) **Patent No.: US 7,855,020 B1**
(45) **Date of Patent: Dec. 21, 2010**

(54) **HYDROGEN PASSIVATION SHUT DOWN SYSTEM FOR A FUEL CELL POWER PLANT**

(75) Inventors: **Paul R. Margiott**, South Windsor, CT (US); **Francis R. Preli, Jr.**, Cromwell, CT (US); **Galen W Kulp**, Vernon, CT (US); **Michael L Perry**, South Glastonbury, CT (US); **Carl A Reiser**, Stonington, CT (US); **Ryan J Balliet**, West Hartford, CT (US)

(73) Assignee: **UTC POWER Corporation**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **12/880,493**

(22) Filed: **Sep. 13, 2010**

Related U.S. Application Data

(62) Division of application No. 11/978,270, filed on Oct. 29, 2007.

(51) **Int. Cl.**
H01M 8/02 (2006.01)

(52) **U.S. Cl.** **429/415**; 429/444; 429/492; 429/513; 429/514

(58) **Field of Classification Search** ..... None
See application file for complete search history.

(56) **References Cited**

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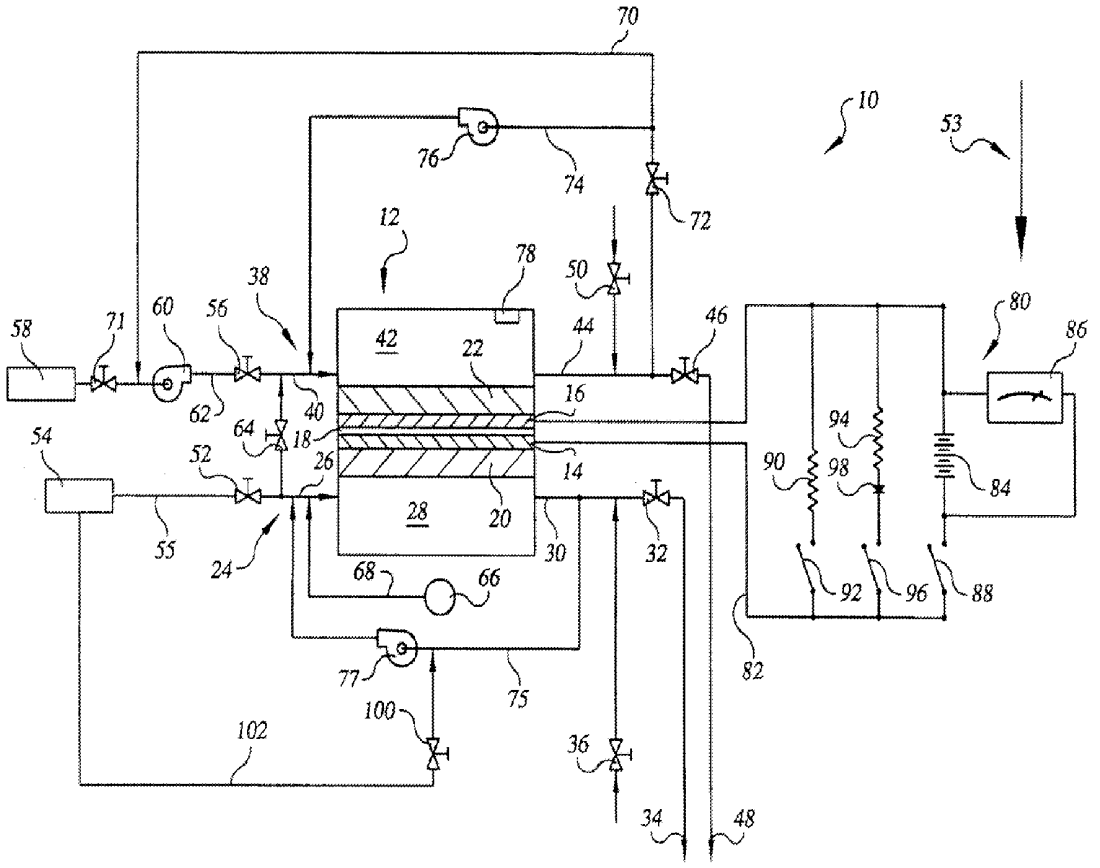
Primary Examiner—Robert Hodge
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

The invention is a hydrogen passivation shut down system for a fuel cell power plant (**10**). An anode flow path (**24**) is in fluid communication with an anode catalyst (**14**) for directing hydrogen fuel to flow adjacent to the anode catalyst (**14**), and a cathode flow path (**38**) is in fluid communication with a cathode catalyst (**16**) for directing an oxidant to flow adjacent to the cathode catalyst (**16**) of a fuel cell (**12**). Hydrogen fuel is permitted to transfer between the anode flow path (**24**) and the cathode flow path (**38**). A hydrogen reservoir (**66**) is secured in fluid communication with the anode flow path (**24**) for receiving and storing hydrogen during fuel cell (**12**) operation, and for releasing the hydrogen into the fuel cell (**12**) whenever the fuel cell (**12**) is shut down.

9 Claims, 1 Drawing Sheet



US007803031B1

(12) **United States Patent**
Winckler et al.

(10) **Patent No.: US 7,803,031 B1**
(45) **Date of Patent: Sep. 28, 2010**

(54) **VEHICLE HAVING NON-CIRCULAR WHEELS PROPELLED BY A MOVING WEIGHT**

(76) Inventors: **Jason M. Winckler**, 477 Brunswick Rd., Troy, NY (US) 12180; **Steven J. Winckler**, 477 Brunswick Rd., Troy, NY (US) 12180

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 644 days.

(21) Appl. No.: **11/591,811**

(22) Filed: **Nov. 2, 2006**

Related U.S. Application Data

(60) Provisional application No. 60/733,320, filed on Nov. 3, 2005.

(51) **Int. Cl.**
A63H 17/00 (2006.01)
A63H 29/00 (2006.01)

(52) **U.S. Cl.** **446/437**; 446/457; 446/465; 446/237

(58) **Field of Classification Search** 446/3, 446/237, 238, 437, 449, 457, 458, 465; D21/539; 180/24.08, 7.1
See application file for complete search history.

(56) **References Cited**

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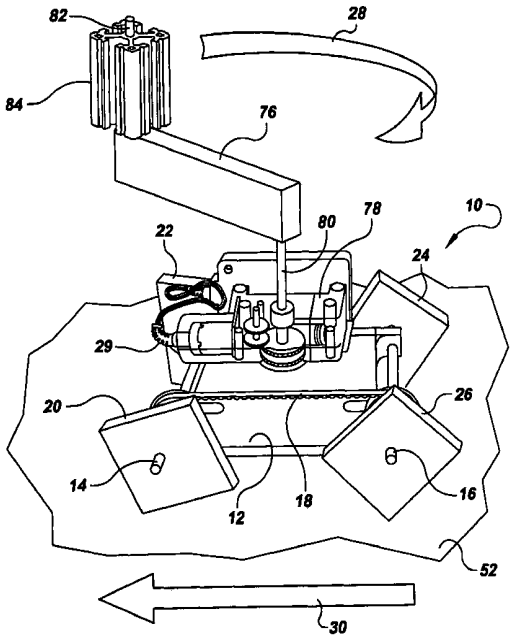
Primary Examiner—Gene Kim
Assistant Examiner—Alyssa M Hylinski
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

The vehicle (**10**) includes a frame (**12**) having at least three non-circular wheels (**20**, **22**, **24**) secured to a frame (**12**), wherein the wheels are mechanically secured to each other so that whenever one non-circular wheel moves, the other wheels (**20**, **22**, **24**) move. An offset arm (**76**) powered by a motor (**78**) rotates a weight (**84**) around a geometric center adjacent the wheels to sequentially tip them so that their sequential tipping moves the vehicle (**10**). The non-circular wheels (**20**, **22**, **24**) are sequentially aligned with respect to each other so that whenever one wheel is tipped from a collapse alignment (**32**) into a contact alignment (**34**), sequentially the next non-circular wheel (**20**, **22**, **24**) is moved into a collapse alignment (**32**). Any driving force may be used to sequentially tip the non-circular wheels (**20**, **22**, **24**, **26**), instead of the rotating weight (**84**).

14 Claims, 3 Drawing Sheets



US007789257B2

(12) **United States Patent**
Davis

(10) **Patent No.: US 7,789,257 B2**
(45) **Date of Patent: Sep. 7, 2010**

(54) **FRAME FOR A WALL CUT-OUT**

(76) Inventor: **Morgan C. Davis**, 21 Bullards Crossing, Hinsdale, MA (US) 01235

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 126 days.

(21) Appl. No.: **11/482,271**

(22) Filed: **Jul. 7, 2006**

(65) **Prior Publication Data**

US 2008/0006624 A1 Jan. 10, 2008

(51) **Int. Cl.**
H02G 3/08 (2006.01)

(52) **U.S. Cl.** **220/3.2**; 220/3.5; 220/3.9; 220/4.02; 174/58

(58) **Field of Classification Search** 220/3.2, 220/3.5, 3.9, 4.02; 174/58
See application file for complete search history.

(56) **References Cited**

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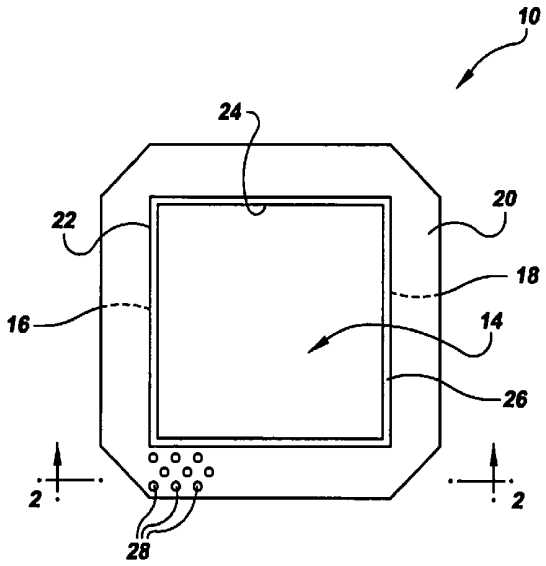
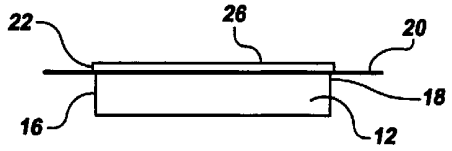
Primary Examiner—Anthony Stashick
Assistant Examiner—Christopher B McKinley
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

For a wall cut-out (**100**) defining a void (**101**) within a wall (**102**) for receiving a utility receptacle (**104**) wherein the cut-out has a perimeter edge (**103**) surrounding the void (**101**), the frame (**10**) includes an insert-flange (**12**) dimensioned to be inserted into and to sit within the void (**101**) adjacent the perimeter edge (**103**). The insert-flange (**12**) defines a frame opening (**14**) between opposed sides of the insert-flange (**12**). A wall-shelf (**20**) is secured to the insert-flange (**12**), and the wall-shelf defines a plane that is parallel to a plane defined by the wall (**102**). A mud-ridge (**22**) is secured to the wall-shelf (**20**) adjacent to and surrounding an interior perimeter (**24**) of the frame opening (**14**) and extends away from the wall-shelf (**20**) to facilitate application of a bonding compound and secure mounting of a receptacle component (**106**) within the utility receptacle (**104**).

6 Claims, 9 Drawing Sheets





US007712598B1

(12) **United States Patent**
Derby

(10) **Patent No.: US 7,712,598 B1**
(45) **Date of Patent: May 11, 2010**

(54) **ROBOTIC TREAD SYSTEM HAVING A NET-ZERO MOTION HEAD FOR MOVING OBJECTS**

(76) Inventor: **Stephen J. Derby**, 172 Lockrow Rd., Troy, NY (US) 12180

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 113 days.

(21) Appl. No.: **12/229,707**

(22) Filed: **Aug. 26, 2008**

Related U.S. Application Data

(60) Provisional application No. 60/966,367, filed on Aug. 27, 2007.

(51) **Int. Cl.**
B65G 15/00 (2006.01)

(52) **U.S. Cl.** **198/343.1**; 198/343.2

(58) **Field of Classification Search** 198/343.1, 198/343.2, 465.1, 465.4, 474.1; 901/7
See application file for complete search history.

(56) **References Cited**

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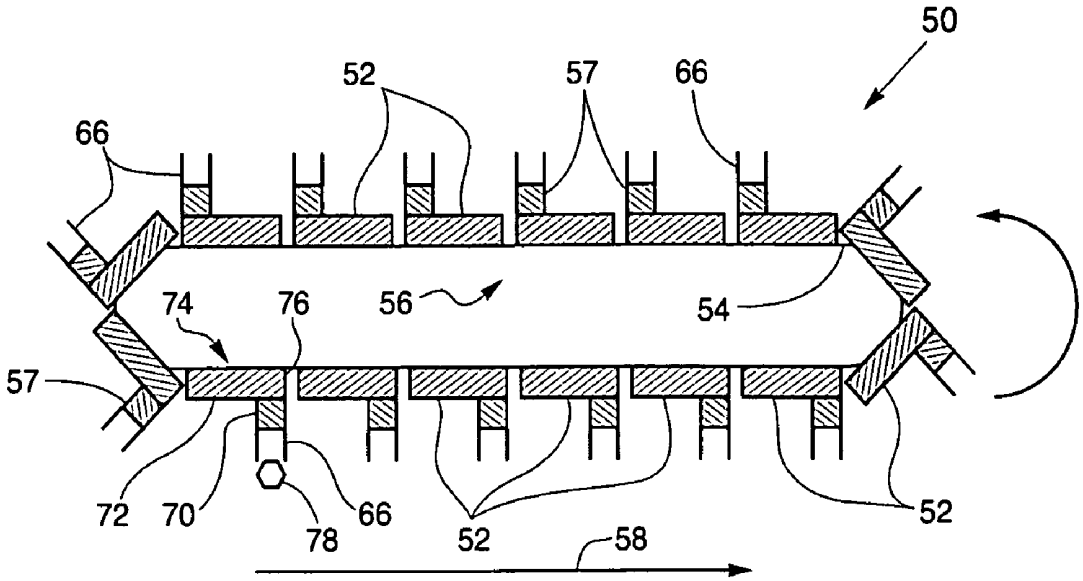
Primary Examiner—James R Bidwell
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

The system (**50**) includes at least one tread (**52**) secured to a tread drive means (**54**) for moving the tread (**52**) in a direction of a tread work-axis of motion (**58**) adjacent an object (**78**) to be moved. A head (**57**) is secured to the tread (**52**), and the head (**57**) includes a device (**66**) for grabbing the object (**78**). The head (**57**) selectively moves in at least a direction opposed to the tread work-axis of motion (**58**) and at a rate of speed at least the same as the rate of speed the drive means (**54**) moves the tread (**52**) in the tread work-axis of motion (**58**) direction to thereby achieve a net-zero motion relative to the object (**58**) to facilitate picking and placing the object (**58**). A plurality of treads (**52**) with such heads (**57**) may be secured in an endless loop (**56**).

13 Claims, 8 Drawing Sheets



US007614535B2

(12) **United States Patent**
Hubbe

(10) **Patent No.: US 7,614,535 B2**
(45) **Date of Patent: Nov. 10, 2009**

(54) **LIGHT BAG RACK FOR A BICYCLE**

(76) Inventor: **Raymond E. Hubbe**, 222 Strong St., Amherst, MA (US) 01002

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 820 days.

(21) Appl. No.: **11/061,580**

(22) Filed: **Feb. 18, 2005**

(65) **Prior Publication Data**

US 2006/0186160 A1 Aug. 24, 2006

(51) **Int. Cl.**
B62J 7/06 (2006.01)
B62J 7/00 (2006.01)

(52) **U.S. Cl.** **224/427**; 224/420; 224/421; 224/453; 224/457; 224/463

(58) **Field of Classification Search** 224/427, 224/275, 924, 420, 421, 453, 457, 463; 248/352, 248/503.1
See application file for complete search history.

(56) **References Cited**

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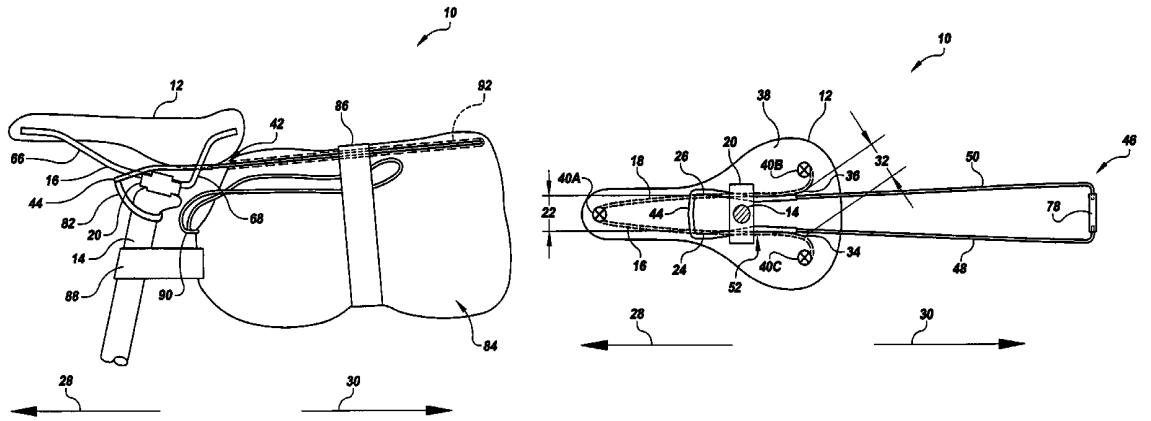
Primary Examiner—Nathan J Newhouse
Assistant Examiner—Lester L Vanterpool
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

A light bag rack (**10**) for a bicycle includes a U-shaped frame (**42**) having first and second rods (**48**, **50**) extending between a closed securing end (**44**) and an open mounting end (**46**) of the rack (**10**) and defining a pinch point (**52**) between the ends (**44**, **46**). The rods (**48**, **50**) are sufficiently flexible to permit the open mounting end (**46**) to expand around first and second bicycle seat frame rails (**16**, **18**) forward of a seat post (**14**) and to pass between the seat frame rails (**16**, **18**) rearward of the seat post (**14**) so that the closed securing end (**44**) contacts the seat frame rails (**16**, **18**) forward of the seat post (**14**) to secure the rack (**10**) to the seat frame rails (**16**, **18**). A load portion (**70**) of the rack (**10**) supports a utility bag (**84**).

15 Claims, 3 Drawing Sheets



US007597199B1

(12) **United States Patent**
Rochelo

(10) **Patent No.: US 7,597,199 B1**
(45) **Date of Patent: Oct. 6, 2009**

(54) **BATTERY TUBE STORAGE SYSTEM, SYSTEM CONTAINER, AND CONTAINER LATCH-LOCK**

(76) Inventor: **Donald R. Rochelo**, 323 Red Barn Rd., Dalton, MA (US) 01226

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 778 days.

(21) Appl. No.: **11/146,172**

(22) Filed: **Jun. 6, 2005**

Related U.S. Application Data

(60) Provisional application No. 60/577,646, filed on Jun. 7, 2004.

(51) **Int. Cl.**
B65D 85/00 (2006.01)

(52) **U.S. Cl.** **206/703**; 429/96

(58) **Field of Classification Search** 206/703, 206/704, 705, 560, 507, 775, 776, 443, 446; 429/96, 97, 98, 99, 100, 9, 159; 220/507, 220/4.21, 4.24, 23.2–23.8, 4.26; D13/103
See application file for complete search history.

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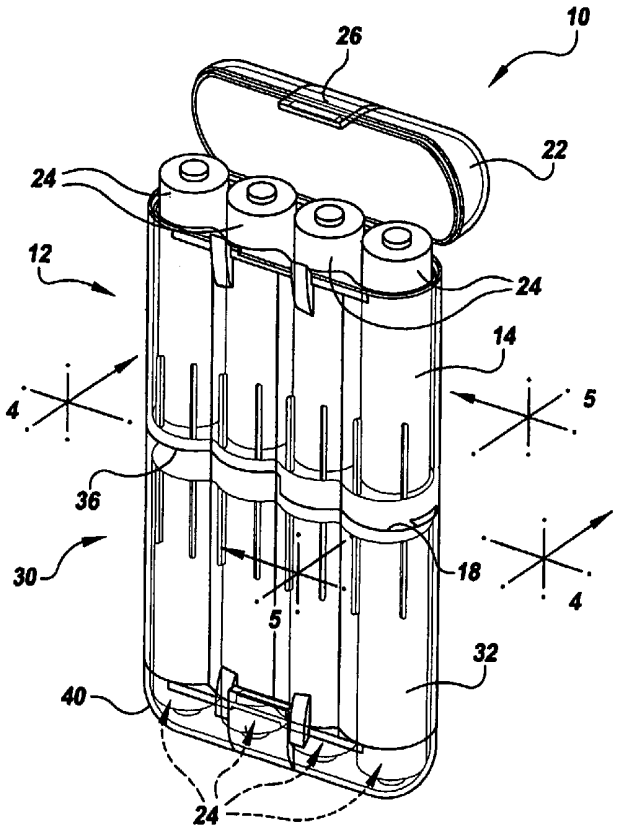
Primary Examiner—Bryon P Gehman
Assistant Examiner—Ernesto A Grano
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

A battery tube storage system (**10**) includes a first container (**12**) having a first light transmitting, rigid shell (**14**) including a first color, such as green, that defines a plurality of tubes (**16**A, **16**B, **16**C, **16**D) dimensioned to receive and secure cylindrical shaped batteries (**24**). A first latch-lock (**26**) secures a top (**22**) to an entry-end (**20**) of the first shell (**14**). A similar second shell (**32**) is made of or includes a second color that is distinct from the first color, such as red. The first shell (**14**) can be detachably secured to the second shell (**32**) so that the battery storage system (**10**) may be used to carry varying numbers of batteries (**24**) depending upon the needs of a user, and by the distinct colors, a user can quickly distinguish between used and unused batteries (**24**).

6 Claims, 6 Drawing Sheets



US007475816B1

(12) **United States Patent**
Rochelo

(10) **Patent No.: US 7,475,816 B1**
(45) **Date of Patent: Jan. 13, 2009**

(54) **PROTECTIVE CASE FOR A PLURALITY OF DIFFERENT SIZED MEMORY CARDS**

(76) Inventor: **Donald R. Rochelo**, 323 Red Barn Rd., Dalton, MA (US) 01226

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 523 days.

(21) Appl. No.: **11/202,555**

(22) Filed: **Aug. 12, 2005**

Related U.S. Application Data

(63) Continuation-in-part of application No. 10/860,471, filed on Jun. 3, 2004, now Pat. No. 7,306,159.

(60) Provisional application No. 60/601,544, filed on Aug. 13, 2004.

(51) **Int. Cl.**

G06K 17/00	(2006.01)
G06K 19/00	(2006.01)
G06K 19/06	(2006.01)
G07C 13/00	(2006.01)
B65D 85/30	(2006.01)
B65D 85/57	(2006.01)
B65D 85/48	(2006.01)

(52) **U.S. Cl.** **235/386**; 235/487; 235/492; 235/493; 206/308.1; 206/450

(58) **Field of Classification Search** 206/307, 206/701, 722, 308.1, 387.1, 387.13, 450, 206/472, 491, 455, 316.1, 316.2, 706, 725; 235/386, 487, 492, 493

See application file for complete search history.

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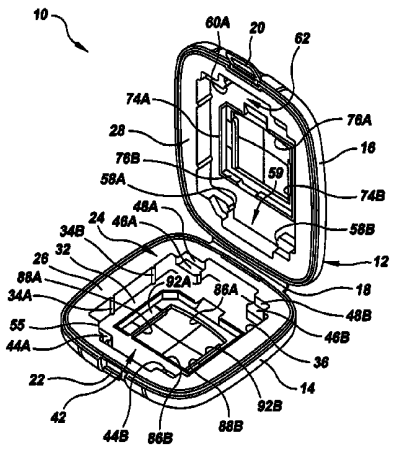
(Continued)

Primary Examiner—Daniel Walsh
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

A protective case (**10**) for securing and protecting a plurality of different sized memory cards (**31**, **39**, **54**, **66**, **77**, **82**, **90**) includes a rigid exterior container (**12**) having a first shell (**14**) and a second shell (**16**). First and second resilient inserts (**26**, **28**) are dimensioned to nest within the first and second shells (**14**, **16**) and the inserts (**26**, **28**) each define five memory card securing means (**30**, **42**, **56**, **72**, **84**) for securing differing sized memory cards (**31**, **39**, **54**, **66**, **77**, **82**, **90**) against unassisted removal from the case. Abutment edges (**36**, **48**A, **48**B) are defined to contact a peripheral edge of a memory card secured by the securing means. Extraction cavities (**38**A, **38**B, **50**A, **50**B) are also defined on opposed edges of the secured cards for facilitating removal of the memory cards from the case.

11 Claims, 4 Drawing Sheets



US007443990B2

(12) **United States Patent**
Chattin

(10) **Patent No.: US 7,443,990 B2**
(45) **Date of Patent: Oct. 28, 2008**

(54) **VOLTAGE BIASED CAPACITOR CIRCUIT FOR A LOUDSPEAKER**

(76) Inventor: **Daniel A. Chattin**, 75 Perkins Hill Rd., Harwinton, CT (US) 06791

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 934 days.

(21) Appl. No.: **10/978,766**

(22) Filed: **Nov. 1, 2004**

(65) **Prior Publication Data**

US 2006/0093162 A1 May 4, 2006

(51) **Int. Cl.**
H04R 3/00 (2006.01)

(52) **U.S. Cl.** **381/111**; 381/55; 381/116

(58) **Field of Classification Search** 381/111, 381/98–99, 116–117, 55, 120; 330/251, 330/10, 69, 207, 297
See application file for complete search history.

(56) **References Cited**

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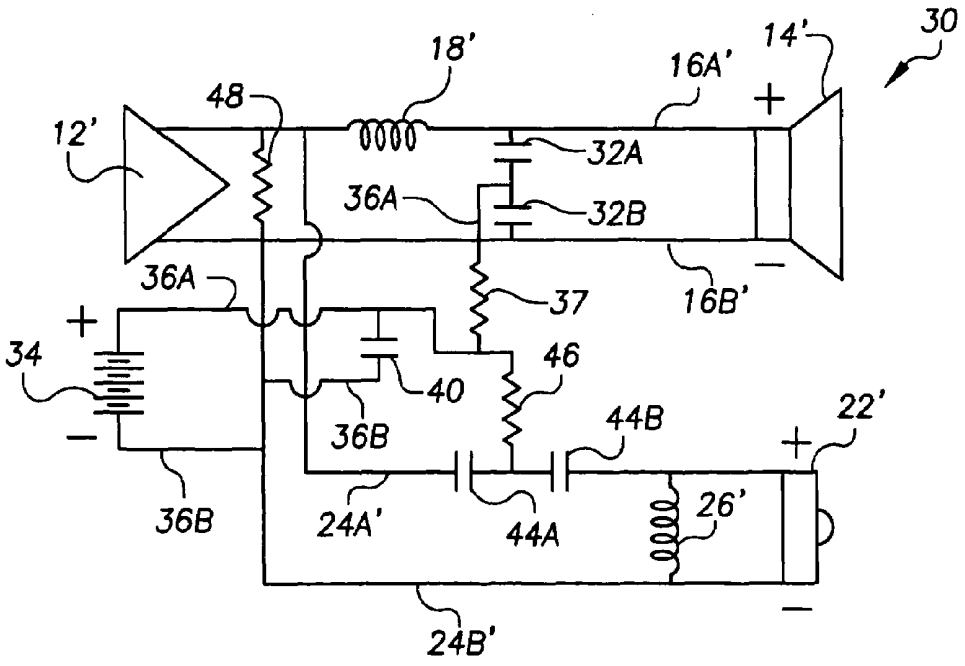
Primary Examiner—Vivian Chin
Assistant Examiner—Disler Paul
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

A voltage biased capacitor circuit (**10**) for a loudspeaker (**14'**) includes at least two audio circuit capacitors (**32**A, **32**B) wired in series either on one of an audio connector or between audio connectors (**16**A', **16**B'). A direct current voltage source (**34**) is wired in electrical communication with the audio circuit capacitors (**32**A, **32**B) for transmitting through direct current voltage connectors (**36**A, **36**B) a direct current to provide a bias voltage to the audio circuit capacitors (**32**A, **32**B). At least one resistor (**37**) is secured between the audio circuit capacitors (**32**A, **32**B) and the voltage source (**34**), to prevent dissipation of an audio signal through the resistor (**37**) and direct current voltage connectors (**36**A, **36**B). A voltage source capacitor (**40**) is also wired between the voltage source (**34**) and the audio connectors (**16**A' **16**B') to stabilize the direct current transmitted to the capacitors (**32**A, **32**B).

8 Claims, 1 Drawing Sheet



US007442453B1

(12) **United States Patent**
Patterson, Jr. et al.

(10) **Patent No.: US 7,442,453 B1**
(45) **Date of Patent: Oct. 28, 2008**

(54) **DECONTAMINATION PROCEDURE FOR A FUEL CELL POWER PLANT**

(75) Inventors: **Timothy W. Patterson, Jr.**, East Hartford, CT (US); **Michael L. Perry**, South Glastonbury, CT (US); **Tommy Skiba**, East Hartford, CT (US); **Ping Yu**, West Hardford, CT (US); **Thomas D. Jarvi**, Manchester, CT (US); **James A. Leistra**, Penfield, NY (US); **Hiroshi Chizawa**, Yokohama (JP); **Tsutomu Aoki**, Kawasaki (JP)

(73) Assignee: **UTC Fuel Cells, LLC**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 661 days.

(21) Appl. No.: **11/023,148**

(22) Filed: **Dec. 27, 2004**

(51) **Int. Cl.**
H01M 8/10 (2006.01)

(52) **U.S. Cl.** **429/13**; 429/23

(58) **Field of Classification Search** 429/13, 429/22, 23
See application file for complete search history.

(56) **References Cited**

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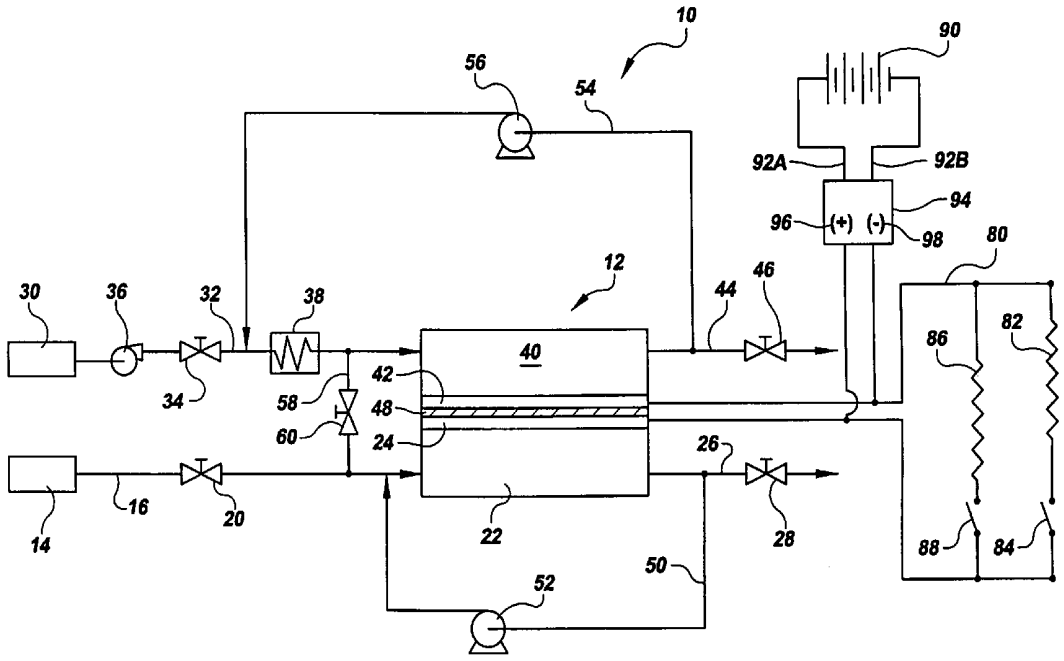
Primary Examiner—Stephen J. Kalafut
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

A decontamination procedure for a fuel cell power plant (**10**) includes operating the plant to produce electrical power for an operating period, and then terminating operation of the plant (**10**) for a decontamination period, and then, whenever optimal electrical production of a plant fuel cell (**12**) is reduced by at least 5% by contaminants adsorbed by fuel cell electrodes (**24**, **42**), decontaminating the fuel cell (**12**) of the plant (**10**) during the decontamination period by oxidizing contaminants adsorbed by electrodes (**24**, **42**) of the fuel cell. Oxidizing the contaminants may be accomplished by various steps including exposing the electrodes (**24**, **42**) to flowing oxygen; to heated flowing oxygen; to a sequence of start-stop cycles; and, to varying controlled potentials.

10 Claims, 3 Drawing Sheets



US007427314B2

(12) **United States Patent**
Young et al.

(10) **Patent No.: US 7,427,314 B2**
(45) **Date of Patent: Sep. 23, 2008**

(54) **DESICCANT CONTAINER AND METHOD OF MANUFACTURE**

(75) Inventors: **Robert W. Young**, Belen, NM (US); **Stephen J. Derby**, Troy, NY (US)

(73) Assignee: **Aridien, Inc.**, Belen, NM (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 609 days.

(21) Appl. No.: **11/150,735**

(22) Filed: **Jun. 10, 2005**

(65) **Prior Publication Data**

US 2005/0274259 A1 Dec. 15, 2005

Related U.S. Application Data

(60) Provisional application No. 60/579,442, filed on Jun. 14, 2004.

(51) **Int. Cl.**
B01D 53/02 (2006.01)

(52) **U.S. Cl.** **96/108**

(58) **Field of Classification Search** 96/108
See application file for complete search history.

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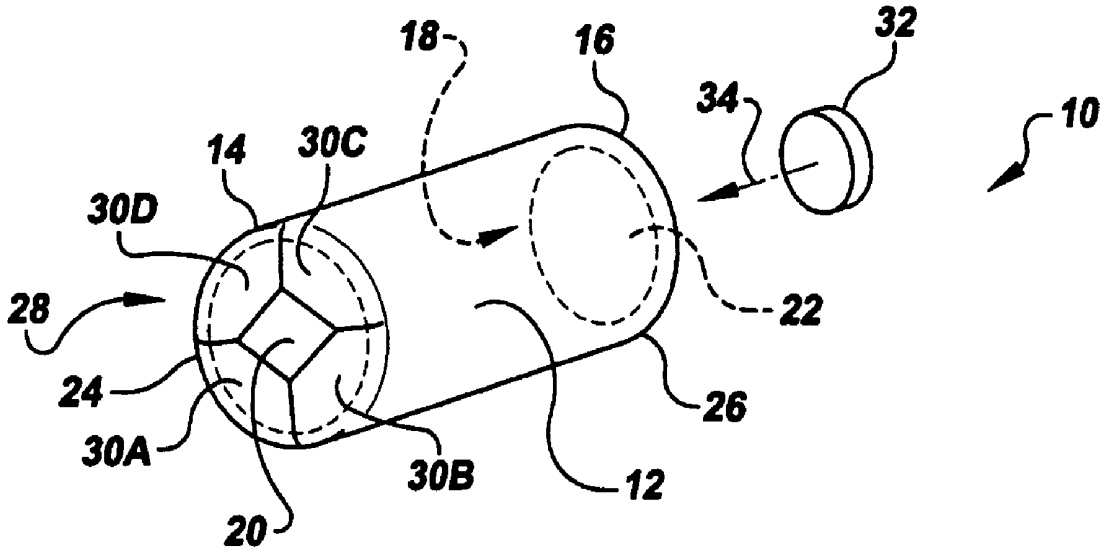
Primary Examiner—Robert A Hopkins
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

A desiccant container (**10**) includes a cylindrical body (**12**) having a first end (**14**) and an opposed second end (**16**). The cylindrical body (**12**) defines a desiccant chamber (**18**) within the cylindrical body (**12**) for holding the desiccant material within the chamber (**18**) between the first and second ends (**14**, **16**). The cylindrical body (**12**) is made of a flexible, gas permeable, liquid impermeable material. A first disk (**20**) is secured adjacent the first end (**14**), and a second disk (**22**) secured adjacent the second end (**16**) to facilitate closing of the ends (**14**, **16**) and to support maintenance of a cylindrical shape of the container (**10**) during usage of the desiccant container (**10**) in high-speed automated packaging machinery.

17 Claims, 1 Drawing Sheet



US007411454B1

(12) **United States Patent**
Chattin

(10) **Patent No.: US 7,411,454 B1**
(45) **Date of Patent: Aug. 12, 2008**

(54) **ELECTRON TURBULENCE DAMPING CIRCUIT FOR A COMPLIMENTARY-SYMMETRY AMPLIFICATION UNIT**

(76) Inventor: **Daniel A. Chattin**, 75 Perkins Hill Rd., Harwinton, CT (US) 06791

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 35 days.

(21) Appl. No.: **11/655,455**

(22) Filed: **Jan. 19, 2007**

(51) **Int. Cl.**
H03F 3/18 (2006.01)

(52) **U.S. Cl.** **330/263**; 330/311

(58) **Field of Classification Search** 330/263, 330/311, 310
See application file for complete search history.

(56) **References Cited**

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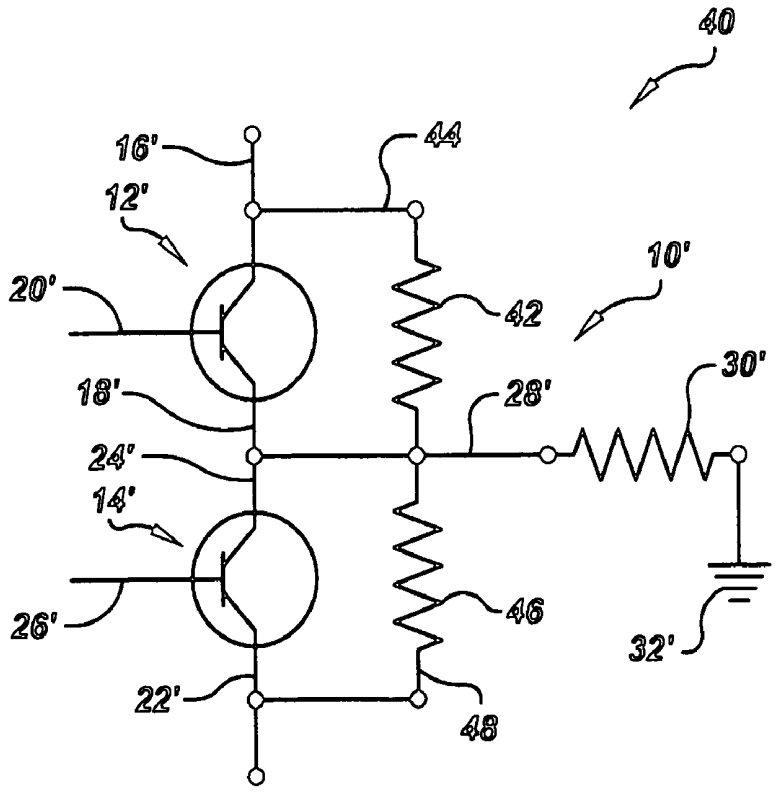
Primary Examiner—Henry K Choe
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

An electron turbulence damping circuit (**40**) for a complimentary-symmetry unit (**10'**) includes a first output device (**12'**) having a first conductivity and a second output device (**14'**) having a second conductivity that is opposite the conductivity of the first output device (**12'**). A common load connector (**28'**) is secured in electrical communication between a load (**30'**), a first current output (**18'**) of the first output device (**12'**) and a second current output (**24'**) of the second output device (**14'**). First and second resistive elements (**42**, **46**) are secured in parallel between current inputs (**16'**, **22'**) of the output devices (**12'**, **14'**) and the common load connector (**28'**). The first and second resistive elements have a virtually identical resistance value that is greater than ten times a minimum impedance of the load (**30'**). The output devices (**12'**, **14'**) may be transistors.

12 Claims, 2 Drawing Sheets



US007306159B1

(12) **United States Patent**
Rochelo

(10) **Patent No.: US 7,306,159 B1**
(45) **Date of Patent: Dec. 11, 2007**

(54) **PROTECTIVE CASE FOR SIX DIFFERENT SIZED MEMORY CARDS**

(76) Inventor: **Donald R. Rochelo**, 66 Leona Dr., Pittsfield, MA (US) 01201

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 499 days.

(21) Appl. No.: **10/860,471**

(22) Filed: **Jun. 3, 2004**

Related U.S. Application Data

(60) Provisional application No. 60/476,518, filed on Jun. 7, 2003.

(51) **Int. Cl.**

G06K 19/06	(2006.01)
G06K 7/00	(2006.01)
H05K 1/14	(2006.01)
B65D 73/00	(2006.01)
B65D 85/30	(2006.01)

(52) **U.S. Cl.** **235/492**; 235/486; 361/737; 206/472; 206/473; 206/483; 206/308.3

(58) **Field of Classification Search** 206/472, 206/473, 474, 477, 480, 482, 483, 485–486, 206/320, 305, 308.3; 361/737, 727, 686; 40/642.02; 220/4.22, 526; 190/109; 235/486, 235/492; 439/61, 135, 945–946; 224/277, 224/929

See application file for complete search history.

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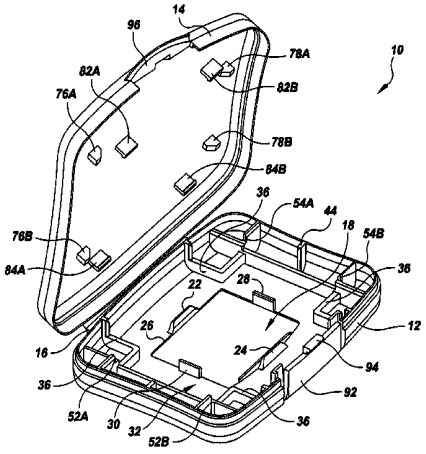
Primary Examiner—Daniel Walsh
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

A protective case (**10**) for six different sized memory cards (**20**, **34**, **50**, **62**, **75**, **90**) having distinct exterior dimensions of length, width and/or thickness includes a base (**12**) and a top (**14**) hinged to the base (**12**) for opening and closing. The base (**12**) includes securing means (**18**, **32**, **48**, **60**) for securing a first small sized memory card (**20**) and first, second and third large sized memory cards (**34**, **50**, **62**). The top (**14**) includes a second small sized memory card securing means (**74**) for securing second and third small sized memory cards (**75**, **90**). The securing means define rectangular alignments (**26**, **42**, **56**, **70**, **80**) approximating exterior length and width dimensions of the six cards (**20**, **34**, **50**, **62**, **75**, **90**) and the rectangular alignments (**26**, **42**, **56**, **70**, **80**) overlie each other resulting in a very small case (**10**).

14 Claims, 6 Drawing Sheets



US007282290B2

(12) **United States Patent**
Perry et al.

(10) **Patent No.: US 7,282,290 B2**
(45) **Date of Patent: Oct. 16, 2007**

(54) **FREEZE TOLERANT FUEL CELL POWER PLANT WITH A DIRECT CONTACT HEAT EXCHANGER**

(75) Inventors: **Michael L. Perry**, South Glastonbury, CT (US); **Jeremy A. Schrooten**, Hebron, CT (US)

(73) Assignee: **UTC Fuel Cells, LLC**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 738 days.

(21) Appl. No.: **10/750,347**

(22) Filed: **Dec. 31, 2003**

(65) **Prior Publication Data**

US 2005/0095477 A1 May 5, 2005

Related U.S. Application Data

(63) Continuation-in-part of application No. 10/701,988, filed on Nov. 5, 2003, now Pat. No. 7,090,940.

(51) **Int. Cl.**
H01M 8/04 (2006.01)

(52) **U.S. Cl.** **429/26**; 429/13

(58) **Field of Classification Search** ..... None
See application file for complete search history.

(56) **References Cited**

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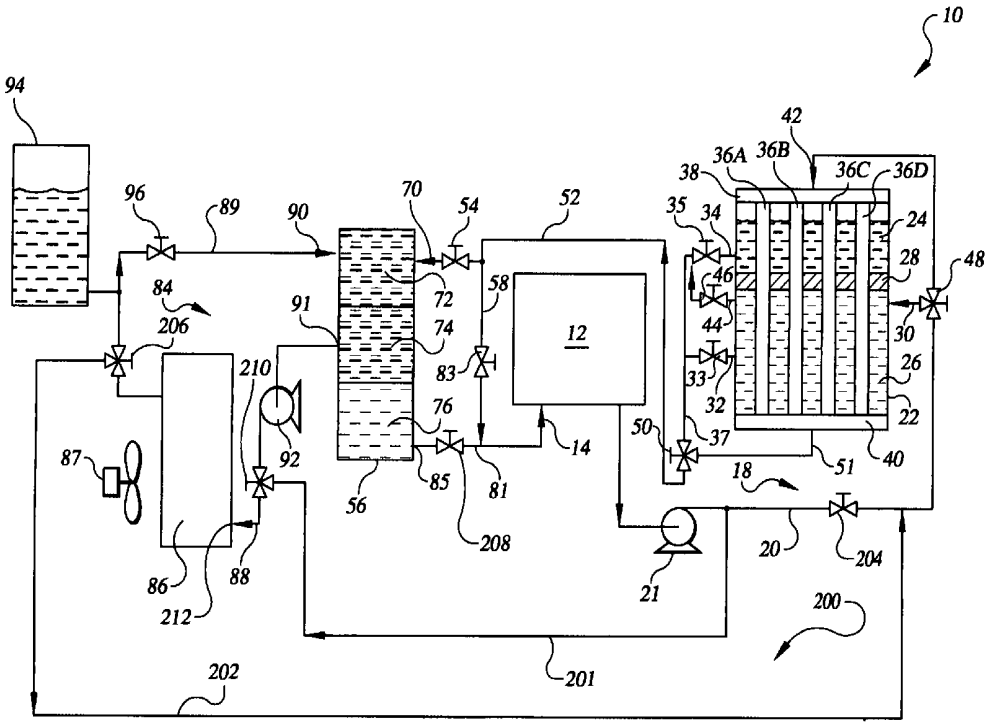
Primary Examiner—Susy Tsang-Foster
Assistant Examiner—Alix Echelmeyer
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

A power plant (**10**) includes at least one fuel cell (**12**), a coolant loop (**18**) including a freeze tolerant accumulator (**22**) for storing and separating a water immiscible fluid and water coolant, a direct contact heat exchanger (**56**) for mixing the water immiscible fluid and the water coolant within a mixing region (**72**) of the heat exchanger (**56**), a coolant pump (**21**) for circulating the coolant through the coolant loop (**18**), a radiator loop (**84**) for circulating the water immiscible fluid through the heat exchanger (**56**), a radiator (**86**) for removing heat from the coolant, and a direct contact heat exchanger by-pass system (**200**). The plant (**10**) utilizes the water immiscible fluid during steady-state operation to cool the fuel cell and during shut down of the plant to displace water from the fuel cell (**12**) to the freeze tolerant accumulator (**22**).

18 Claims, 2 Drawing Sheets



US007237703B1

(12) **United States Patent**
Nathan et al.

(10) **Patent No.: US 7,237,703 B1**
(45) **Date of Patent: Jul. 3, 2007**

(54) **DOUBLE ENTRY WATER BOTTLE CARRIER FOR A RUNNER**

(75) Inventors: **Michael Nathan**, Stockbridge, MA (US); **Robert A. Hartz**, Watertown, NY (US)

(73) Assignee: **Penguin Brands, Inc.**, Sharon Hill, PA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 556 days.

(21) Appl. No.: **10/869,171**

(22) Filed: **Jun. 16, 2004**

(51) **Int. Cl.**
A45F 5/00 (2006.01)

(52) **U.S. Cl.** **224/148.5**; 224/148.4; 224/148.7

(58) **Field of Classification Search** 224/148.1, 224/148.4–148.6, 196, 245, 246, 251, 680, 224/681, 683; D3/229; 383/41; 222/175; 206/583
See application file for complete search history.

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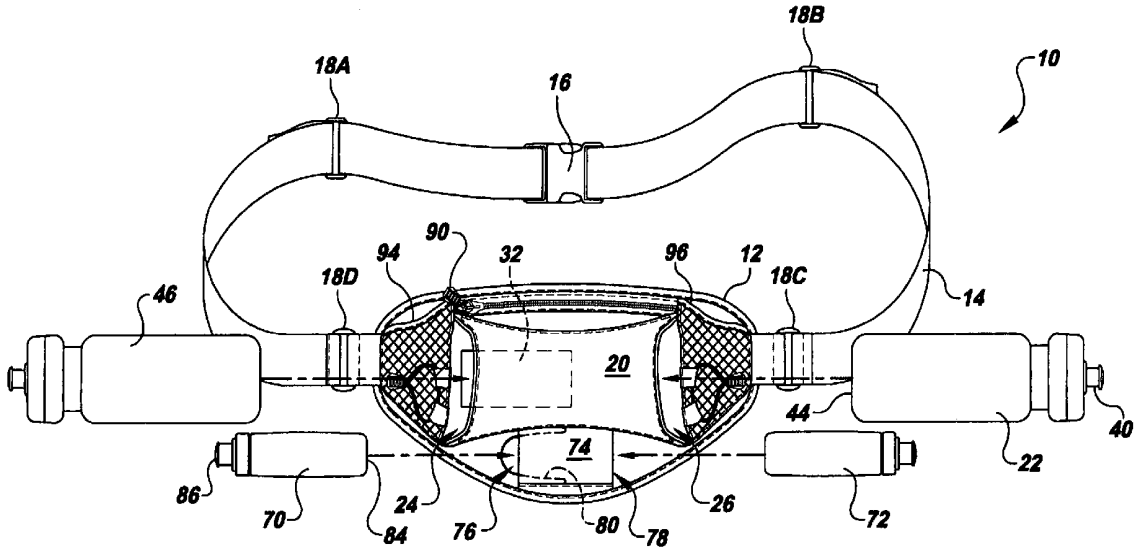
Primary Examiner—Nathan J. Newhouse
Assistant Examiner—Jack Morgan
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm; Fox Rothschild LLP

(57) **ABSTRACT**

A double entry water bottle carrier (**10**) for runners includes a base (**12**) having a belt (**14**) for securing the base (**12**) to the runner. A sleeve (**20**) secured to the base (**12**) is dimensioned to receive a water bottle (**22**) and defines a first entry (**24**) and an opposed second entry (**26**) at opposed ends of the sleeve (**20**). A flexible securing strap (**32**) is secured between opposed interior surfaces of the sleeve (**20**), and is dimensioned so that a central portion (**42**) of the strap (**32**) contacts and secures the bottom surface (**44**) of the water bottle (**32**) whether a spout (**40**) of the water bottle extends out of the first entry (**24**) or second entry (**26**) of the sleeve (**20**).

8 Claims, 4 Drawing Sheets



US007210498B2

(12) **United States Patent**
Arigoni

(10) **Patent No.: US 7,210,498 B2**
(45) **Date of Patent: May 1, 2007**

(54) **"TOILET KING" AUTOMATIC WATER LIMITING SUPPLY SHUT OFF SAFETY VALVE FLO-CONTROL**

(76) Inventor: **John Henry Arigoni**, 924 River Rd., Clarksburg, MA (US) 01247

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **11/090,602**

(22) Filed: **Mar. 26, 2005**

(65) **Prior Publication Data**

US 2005/0217737 A1 Oct. 6, 2005

Related U.S. Application Data

(60) Provisional application No. 60/560,003, filed on Apr. 6, 2004.

(51) **Int. Cl.**
F16K 21/00 (2006.01)

(52) **U.S. Cl.** **137/624.14**; 4/378

(58) **Field of Classification Search** 137/624.14, 137/624.12, 614.2; 4/378, 379
See application file for complete search history.

(56) **References Cited**

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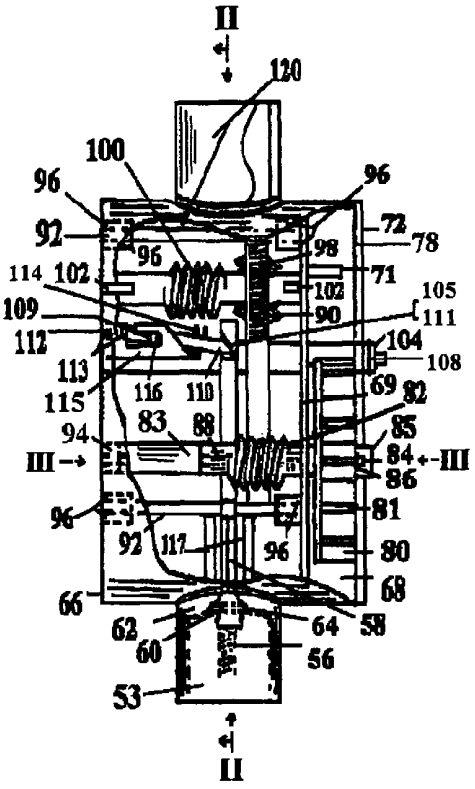
Primary Examiner—Kevin Lee
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

A geared mechanical device designed to limit a finite amount of water per flush to a tank reservoir of the common household toilet, providing positive shutoff of flow and anti-siphon back flow prevention. The toilet is flushed, the actuator lever opens the flo-control valve stopper by means of linkage to the flush lever. The water enters the back flow chamber into the primary valve chamber thence to the flow control chamber, and on to the float valve into the toilet tank for fill up. Force of the water rotates the drive impeller gearably linked to the hold release mechanism. On release the flo-control valve stopper closes. The back flow prevention chamber allows the water to pass in the direction of flow and reseats itself when the flow has stopped or if water pressure is lost at any time eliminating a need for a anti-siphon tube. A replenish tube restores water level to the bowl. A water delivery chamber may be affixed to the flo-control in place of the float valve. For the purpose of adjusting the volume of water per flush a modified slotted disk hold release mechanism is used in the flo-control, gearably connected to the drive impeller.

12 Claims, 4 Drawing Sheets



US007201992B2

(12) **United States Patent**
Yang et al.

(10) **Patent No.: US 7,201,992 B2**
(45) **Date of Patent: Apr. 10, 2007**

(54) **FUEL CELL WITH PASSIVE WATER BALANCE**

(75) Inventors: **Deliang Yang**, Torrance, CA (US); **Jung S. Yi**, Mansfield, CT (US)

(73) Assignee: **UTC Fuel Cells, LLC**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 236 days.

(21) Appl. No.: **10/750,609**

(22) Filed: **Dec. 31, 2003**

(65) **Prior Publication Data**

US 2005/0142420 A1 Jun. 30, 2005

(51) **Int. Cl.**
H01M 2/14 (2006.01)

(52) **U.S. Cl.** **429/39**; 429/38

(58) **Field of Classification Search** ..... None
See application file for complete search history.

(56) **References Cited**

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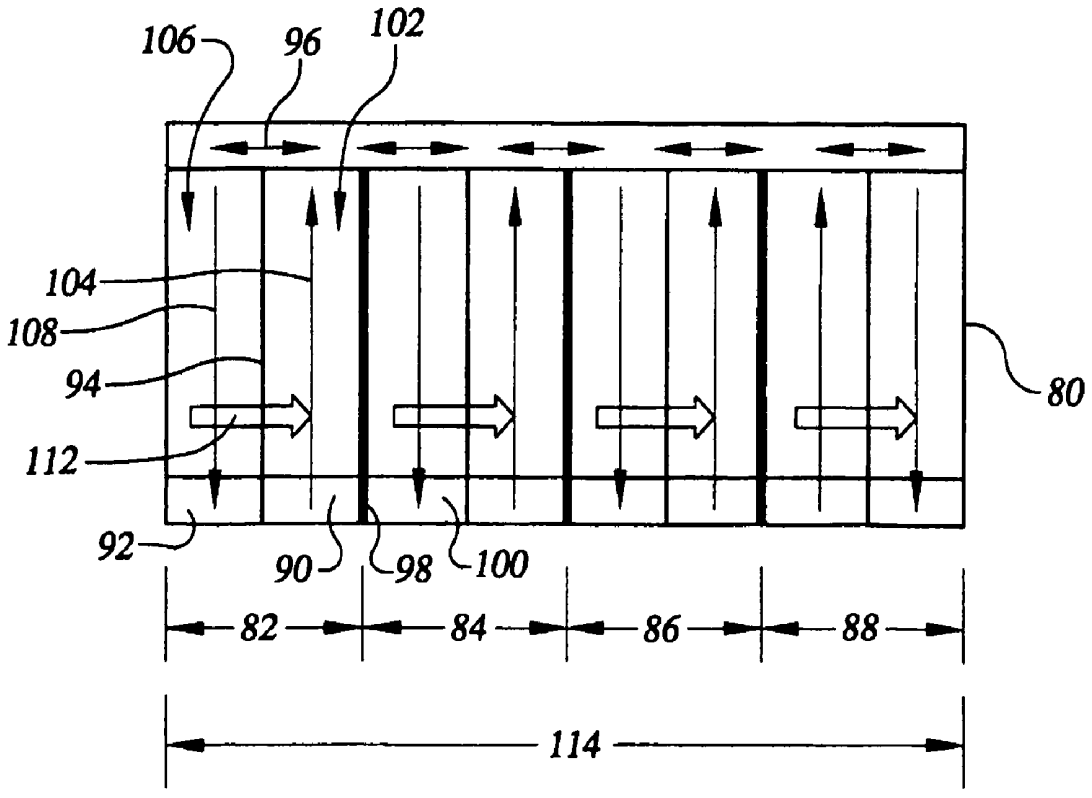
Primary Examiner—Patrick Joseph Ryan
Assistant Examiner—Julian Mercado
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

A fuel cell includes a membrane electrode assembly (**46**) having a first reactant flow field (**80**) secured adjacent a first or second surface (**48**, **50**) of the assembly (**46**) for directing flow of a first reactant adjacent the first or second surface of the assembly (**46**). The first reactant flow field (**80**) defines a plurality of two-pass circuits (**82**, **84**, **86**, **88**), and each two-pass circuit (**82**) is in fluid communication with both a first reactant inlet (**90**) for directing the first reactant into the fuel cell (**12**), and with a first reactant outlet (**92**) for directing the first reactant out of the fuel cell (**12**). The plurality of two-pass circuits (**82**) facilitate water movement (**112**) toward the reactant inlet (**90**) to aid in passive maintenance of fuel cell (**12**) water balance.

8 Claims, 2 Drawing Sheets



US007179557B2

(12) **United States Patent**
Breault

(10) **Patent No.: US 7,179,557 B2**
(45) **Date of Patent: Feb. 20, 2007**

(54) **DIRECT ANTIFREEZE COOLED FUEL CELL POWER PLANT WITH PASSIVE WATER MANAGEMENT**

(75) Inventor: **Richard D. Breault**, North Kingstown, RI (US)

(73) Assignee: **UTC Fuel Cells, LLC**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 300 days.

(21) Appl. No.: **10/748,473**

(22) Filed: **Dec. 30, 2003**

(65) **Prior Publication Data**

US 2005/0142408 A1 Jun. 30, 2005

(51) **Int. Cl.**
H01M 8/04 (2006.01)
H01M 2/02 (2006.01)
H01M 2/08 (2006.01)

(52) **U.S. Cl.** **429/26**; 429/34; 429/35

(58) **Field of Classification Search** 429/26, 429/34, 35

See application file for complete search history.

(56) **References Cited**

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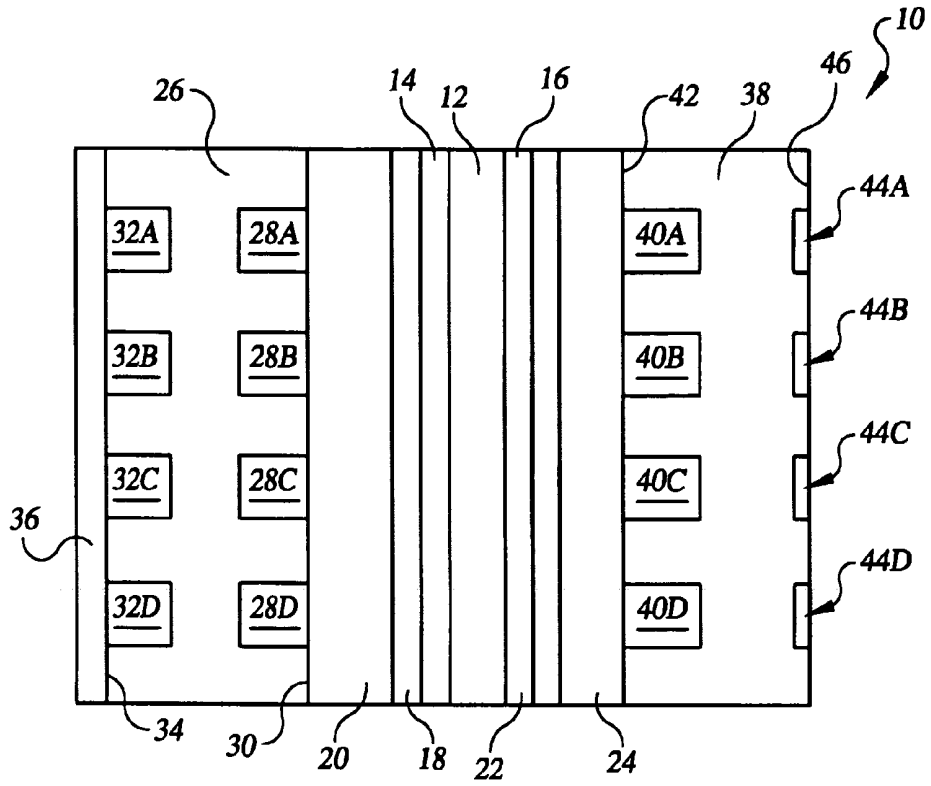
Primary Examiner—Dah-Wei Yuan
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

The plant (**60**) includes at least one fuel cell (**10**, **62**) having a wetproofed anode support (**20**) and a cathode support (**24**) for directing reactant streams adjacent catalysts (**14**, **16**). A porous anode cooler plate (**26**) has its fuel channels (**28**A, **28**B, **28**C, **28**D) secured adjacent the anode support (**20**). A porous cathode water management plate (**38**) has its oxidant channels (**40**A, **40**B, **40**C, **40**D) secured adjacent the cathode support (**24**). A direct antifreeze solution passes only through coolant channels (**32**A, **32**B, **32**C, **32**D) of the anode cooler plate (**26**) so the solution cannot poison the catalysts (**14**, **16**), while fuel cell product water flows passively through the water management plate (**38**) and water management channels (**44**A, **44**B, **44**C, **44**D) defined in the plate (**38**) to humidify reactant streams and be discharged from the fuel cell (**62**).

7 Claims, 2 Drawing Sheets



US007147945B2

(12) **United States Patent**
Balliet et al.

(10) **Patent No.: US 7,147,945 B2**
(45) **Date of Patent: *Dec. 12, 2006**

(54) **SYSTEM FOR DETERMINING A GAS COMPOSITION WITHIN A SHUT DOWN FUEL CELL POWER PLANT AND METHOD OF OPERATION**

(75) Inventors: **Ryan J. Balliet**, West Hartford, CT (US); **Carl A. Reiser**, Stonington, CT (US)

(73) Assignee: **UTC Fuel Cells, LLC**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 590 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **10/244,495**

(22) Filed: **Sep. 16, 2002**

(65) **Prior Publication Data**

US 2004/0053089 A1 Mar. 18, 2004

(51) **Int. Cl.**

H01M 8/00	(2006.01)
H01M 8/04	(2006.01)
H01M 10/44	(2006.01)
H01M 2/00	(2006.01)
G01N 21/00	(2006.01)

(52) **U.S. Cl.** **429/12**; 429/13; 429/22; 429/50; 429/61; 429/64; 422/83; 422/98; 73/1.01; 73/1.02; 73/23.2

(58) **Field of Classification Search** 429/12, 429/13, 22, 50, 61, 64; 422/83, 98; 73/1.01, 73/1.02, 23.2

See application file for complete search history.

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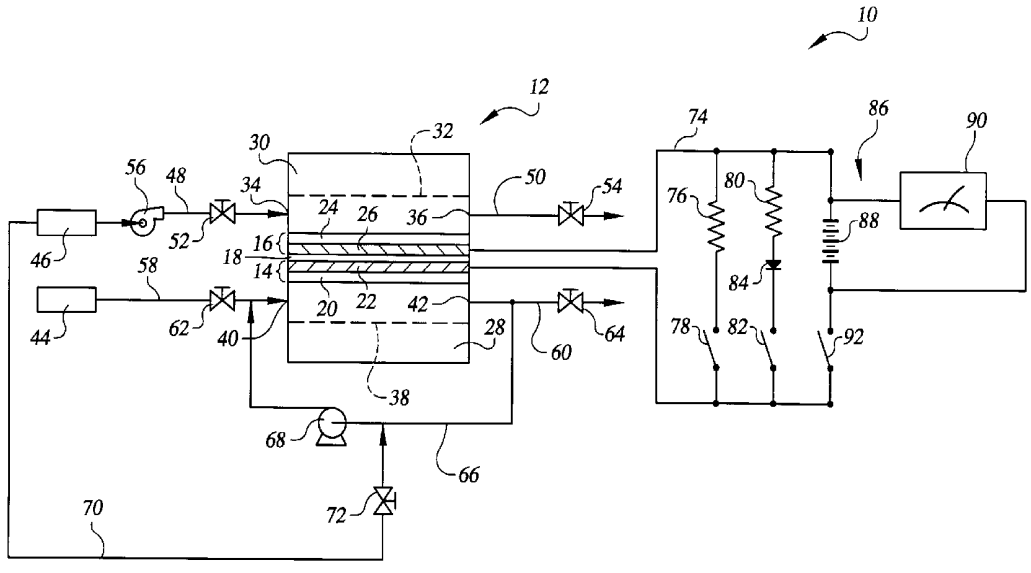
Primary Examiner—Brian J. Sines
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

The invention is a system (**10**) and method for determining a gas composition within a fuel cell (**12**) of a shut down fuel cell power plant. The system (**10**) includes at least one fuel cell (**12**), a sensor circuit (**86**) secured in electrical connection with the fuel cell (**12**), wherein the circuit (**86**) includes a power source (**88**), a voltage-measuring device (**90**), and a sensor circuit switch (**92**). The circuit (**86**) is secured so that the power source (**88**) may selectively deliver a pre-determined sensing current to the fuel cell (**12**) for a pre-determined sensing duration. The system (**10**) selectively admits the reducing fluid into an anode flow field (**28**) of the cell (**12**) whenever the sensor circuit (**86**) senses that a shut down monitoring voltage of the fuel cell (**12**) is the same as or exceeds a calibrated sensor voltage limit of the fuel cell (**12**).

10 Claims, 2 Drawing Sheets



US007141295B2

(12) **United States Patent**
Genzabella et al.

(10) **Patent No.: US 7,141,295 B2**
(45) **Date of Patent: Nov. 28, 2006**

(54) **OPTICALLY EMBOSSED SHEET FOR A LAMINATE AND METHOD OF MAKING**

(75) Inventors: **John Carmelo Genzabella**, Hinsdale, MA (US); **William Michael Hines, Jr.**, Pittsfield, MA (US); **George Anthony Baldasarre**, Pittsfield, MA (US)

(73) Assignee: **Interprint, Inc.**, Pittsfield, MA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 114 days.

(21) Appl. No.: **11/119,953**

(22) Filed: **May 2, 2005**

(65) **Prior Publication Data**

US 2006/0246264 A1 Nov. 2, 2006

(51) **Int. Cl.**
B32B 3/00 (2006.01)
B05D 5/00 (2006.01)

(52) **U.S. Cl.** **428/195.1**; 428/207; 427/258; 427/288

(58) **Field of Classification Search** ..... None
See application file for complete search history.

(56) **References Cited**

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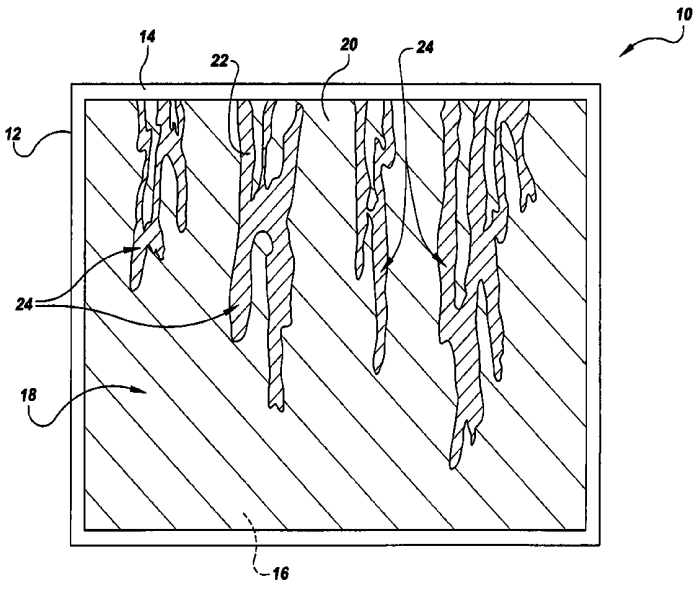
Primary Examiner—Stephen Stein
Assistant Examiner—Timothy M. Speer
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm

(57) **ABSTRACT**

An optically embossed sheet (**10**) for a laminate (**107**) for decorative boards includes a base layer (**12**) having a print surface (**14**) and an opposed resin application surface (**16**), wherein the print surface (**14**) defines a decorative area (**18**). A small particle ink (**20**) overlies the decorative area (**18**), and a large particle ink (**22**) overlies the small particle ink (**20**) within a low-gloss region (**24**) defined within the decorative area (**18**). A thermosetting resin is applied only to the resin application surface so that more than fifty percent of the particles of the small particle ink (**20**) at the print surface (**14**) are coalesced by the thermosetting resin (**26**) into agglomerations (**27**), and less than about thirty percent of the particles of the large particle ink (**22**) are coalesced into agglomerations (**27**) giving rise to a substantial gloss differential at the print surface (**14**).

11 Claims, 13 Drawing Sheets



US007090940B2

(12) **United States Patent**
Schrooten et al.

(10) **Patent No.: US 7,090,940 B2**
(45) **Date of Patent: Aug. 15, 2006**

(54) **FREEZE TOLERANT FUEL CELL POWER PLANT WITH A DIRECT CONTACT HEAT EXCHANGER**

(75) Inventors: **Jeremy A. Schrooten**, Hebron, CT (US); **Wayde R. Schmidt**, Pomfret Center, CT (US); **Cynthia A. Rice**, Newington, CT (US); **Michael L. Perry**, South Glastonbury, CT (US); **H. Harvey Michels**, West Hartford, CT (US); **Jesse M. Marzullo**, Ellington, CT (US); **Patrick L. Hagans**, Columbia, CT (US)

(73) Assignee: **UTC Fuel Cells, LLC**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 485 days.

(21) Appl. No.: **10/701,988**

(22) Filed: **Nov. 5, 2003**

(65) **Prior Publication Data**

US 2005/0095476 A1 May 5, 2005

(51) **Int. Cl.**
H01M 8/04 (2006.01)

(52) **U.S. Cl.** **429/26**; 429/24; 429/34; 429/13; 165/110; 68/393; 68/434

(58) **Field of Classification Search** 429/13, 429/24, 26, 34; 165/110; 65/393, 434
See application file for complete search history.

(56) **References Cited**

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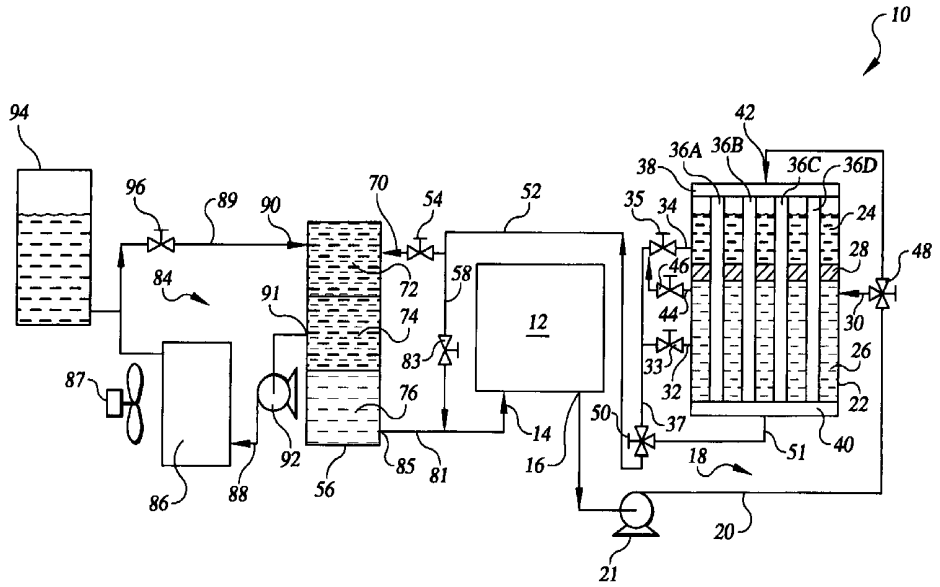
Primary Examiner—Patrick Joseph Ryan
Assistant Examiner—Alix Echelmeyer
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

A freeze tolerant fuel cell power plant (**10**) includes at least one fuel cell (**12**), a coolant loop (**18**) including a freeze tolerant accumulator (**22**) for storing and separating a water immiscible fluid and water coolant, a direct contact heat exchanger (**56**) for mixing the water immiscible fluid and the water coolant within a mixing region (**72**) of the heat exchanger (**56**), a coolant pump (**21**) for circulating the coolant through the coolant loop (**18**), a radiator loop (**84**) for circulating the water immiscible fluid through the heat exchanger (**56**), and a radiator (**86**) for removing heat from the coolant. The plant (**10**) utilizes the water immiscible fluid during steady-state operation to cool the fuel cell and during shut down of the plant to displace water from the fuel cell (**12**) to the freeze tolerant accumulator (**22**).

14 Claims, 1 Drawing Sheet



US007078118B2

(12) **United States Patent**
Schrooten et al.

(10) **Patent No.: US 7,078,118 B2**
(45) **Date of Patent: Jul. 18, 2006**

(54) **PERFORMANCE ENHANCING BREAK-IN METHOD FOR A PEM FUEL CELL**

(75) Inventors: **Jeremy A. Schrooten**, Hebron, CT (US); **Jesse M. Marzullo**, Ellington, CT (US); **Michael L. Perry**, South Glastonbury, CT (US)

(73) Assignee: **UTC Fuel Cells, LLC**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 97 days.

(21) Appl. No.: **10/702,181**

(22) Filed: **Nov. 5, 2003**

(65) **Prior Publication Data**

US 2005/0095472 A1 May 5, 2005

(51) **Int. Cl.**

H01M 8/04	(2006.01)
H01M 8/00	(2006.01)
H01M 8/18	(2006.01)
H01M 8/12	(2006.01)
H01M 8/10	(2006.01)
H01M 2/14	(2006.01)

(52) **U.S. Cl.** **429/17**; 429/13; 429/19; 429/22; 429/30; 429/33; 429/38; 429/39

(58) **Field of Classification Search** 429/3, 429/12, 13, 17, 23, 26, 52, 112, 219; 324/444, 324/713; 320/101

See application file for complete search history.

(56) **References Cited**

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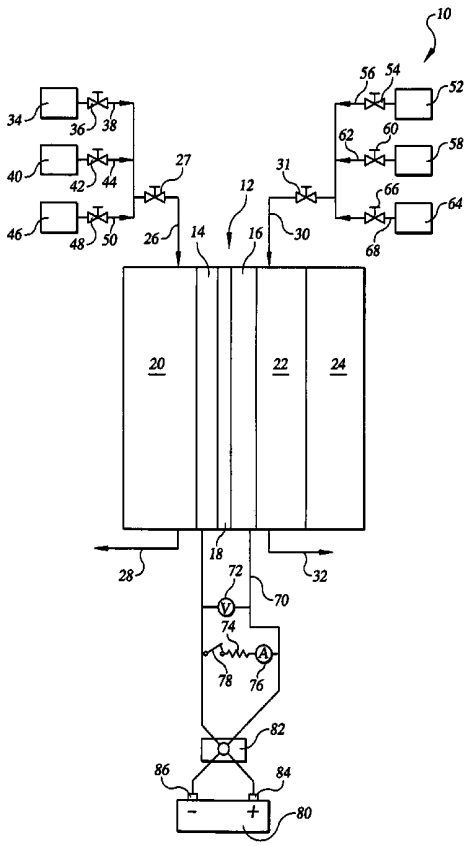
Primary Examiner—Bruce F. Bell
Assistant Examiner—Robert Hodge
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

A performance enhancing break-in method for a proton exchange membrane ("PEM") fuel cell (**12**) includes cycling potentials of an anode electrode (**14**) and a cathode electrode (**16**) from a first potential to a second potential and back to the first potential, and repeating the cycling for each electrode (**14**, **16**) for at least two electrode cycles. The potential cycling may be achieved in a first embodiment by applying a direct current from a programmable direct current power source (**80**) to the electrodes. Alternatively the potential cycling may be achieved by varying reactants to which the anode and cathode electrodes (**14**, **16**) are exposed.

5 Claims, 3 Drawing Sheets



US007063907B2

(12) **United States Patent**
Breault

(10) **Patent No.: US 7,063,907 B2**
(45) **Date of Patent: Jun. 20, 2006**

(54) **PASSIVE WATER MANAGEMENT SYSTEM FOR A FUEL CELL POWER PLANT**

(75) Inventor: **Richard D. Breault**, North Kingstown, RI (US)

(73) Assignee: **UTC Fuel Cells, LLC**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 98 days.

(21) Appl. No.: **10/612,688**

(22) Filed: **Jul. 2, 2003**

(65) **Prior Publication Data**

US 2005/0003252 A1 Jan. 6, 2005

(51) **Int. Cl.**
H01M 8/04 (2006.01)

(52) **U.S. Cl.** **429/26**; 429/34

(58) **Field of Classification Search** 429/26, 429/34, 39

See application file for complete search history.

(56) **References Cited**

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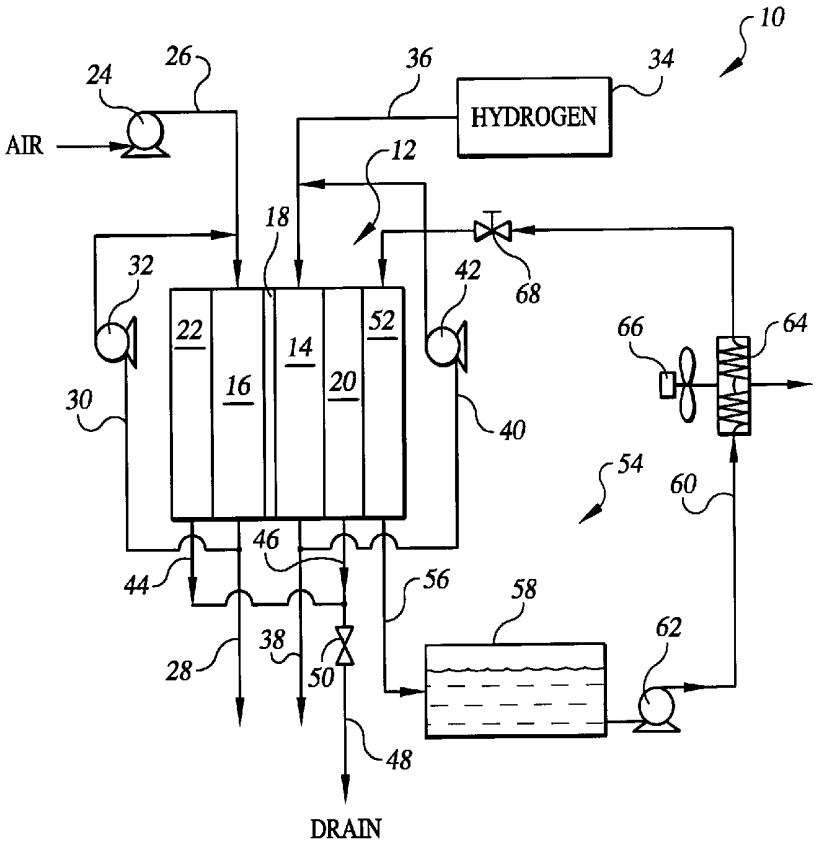
Primary Examiner—Gregg Cantelmo
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

The invention includes an anode fuel flow field (**100**) adjacent a fuel cell (**12**) electrolyte (**18**) that defines a fuel path (**102**) between a fuel inlet (**108**) and a fuel outlet (**110**) and includes a cooler plate (**118**) in heat exchange relationship with the anode fuel flow field (**100**) that defines a coolant path (**120**) between a coolant inlet (**126**) and a coolant outlet (**128**). The fuel path (**102**) has a width (**132**) that is about the same as a width (**134**) of the coolant path (**120**) where the fuel path (**102**) and the coolant path (**120**) are closest to each other, and the fuel path (**102**) substantially overlies the coolant path (**120**) to minimize evaporation of water from water management flow fields (**20**) (**22**) and/or the electrolyte (**18**) into the fuel within the fuel path (**102**).

3 Claims, 2 Drawing Sheets



US007023339B2

(12) **United States Patent**
Stomski

(10) **Patent No.: US 7,023,339 B2**
(45) **Date of Patent: Apr. 4, 2006**

(54) **TRANSPORTABLE SECURITY PORTAL FOR SCREENING POTENTIAL TERRORISTS**

(76) Inventor: **Gerald D. Stomski**, 54 Washington Rd., Woodbury, CT (US) 06798

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 66 days.

(21) Appl. No.: **10/822,917**

(22) Filed: **Apr. 13, 2004**

(65) **Prior Publication Data**

US 2005/0237178 A1 Oct. 27, 2005

(51) **Int. Cl.**
G08B 21/00 (2006.01)

(52) **U.S. Cl.** **340/540**; 109/3; 109/26; 109/64; 160/351; 340/551

(58) **Field of Classification Search** 340/540, 340/999, 551; 109/3, 26, 49.5, 58, 64; 116/DIG. 9; 160/351
See application file for complete search history.

(56) **References Cited**

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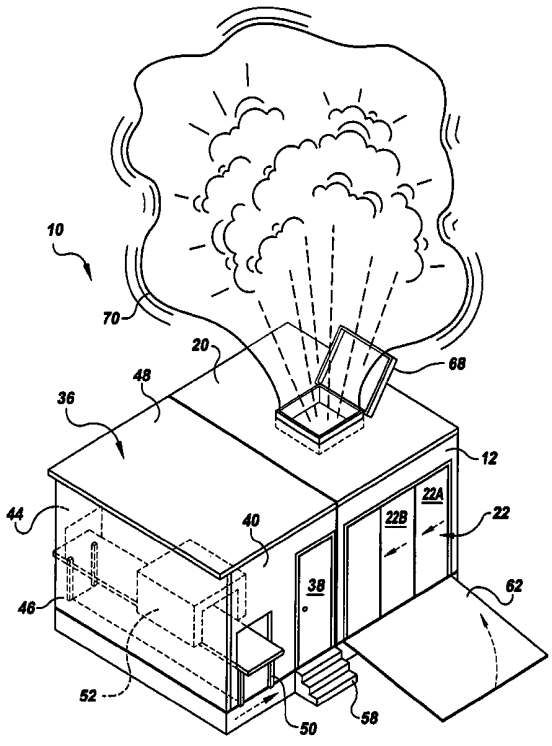
Primary Examiner—Thomas Mullen
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

The security portal (**10**) is dimensioned to be readily mounted and transported on a trailer (**54**) alone as a single security portal (**10**) or with a plurality of security portals to provide screening for a short term, high security event. The portal (**10**) includes bullet-resistant, bomb-blast proof and at least partially transparent walls (**12**, **14**, **16**, **18**) and doors (**22**, **24**, **26**). Monitors (**32**, **34**) are secured to the portal (**10**) for monitoring an individual within an interior (**30**) of the portal (**10**) for detecting weapons, bio-hazards, chemical toxins, illegal drugs, contraband, or other hazardous materials. The security portal also includes a security monitoring station (**36**) adjacent the security access door (**26**) and a bomb-blast enclosure (**66**) having a flap (**68**) and bomb-blast containment balloon (**70**) for containing hazardous materials in the event of a bomb-blast within the portal (**10**).

16 Claims, 3 Drawing Sheets



US007014779B1

(12) **United States Patent**
Kirchner

(10) **Patent No.: US 7,014,779 B1**
(45) **Date of Patent: Mar. 21, 2006**

(54) **VACUUM SEPARATION, TRANSPORT AND COLLECTION SYSTEM FOR IMMISCIBLE LIQUIDS**

(76) Inventor: **Edward C. Kirchner**, 131 Churchill St., Pittsfield, MA (US) 01201

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 149 days.

(21) Appl. No.: **10/801,280**

(22) Filed: **Mar. 16, 2004**

Related U.S. Application Data

(60) Provisional application No. 60/455,894, filed on Mar. 19, 2003.

(51) **Int. Cl.**
C02F 1/40 (2006.01)

(52) **U.S. Cl.** **210/739**; 210/744; 210/776; 210/799; 210/800; 210/804; 210/808; 210/86; 210/109; 210/138; 210/143; 210/523; 210/538

(58) **Field of Classification Search** 210/739, 210/744, 776, 799, 800, 804, 808, 86, 109, 210/138, 143, 523, 538
See application file for complete search history.

(56) **References Cited**

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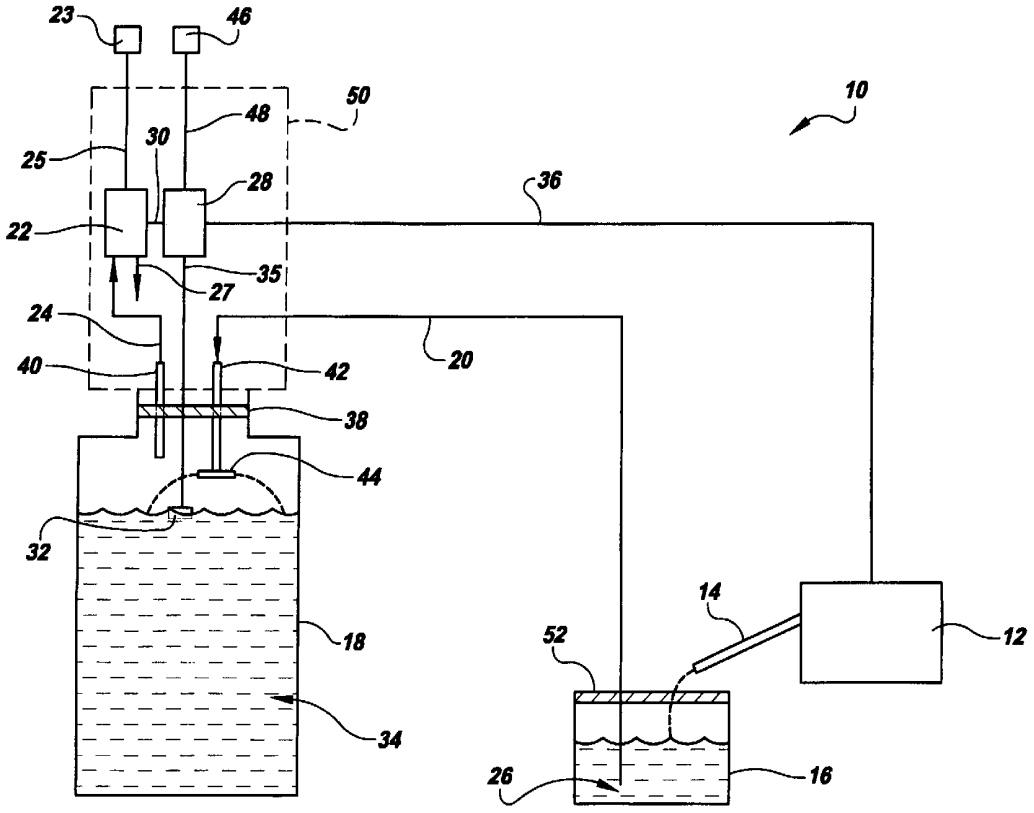
Primary Examiner—Robert A. Hopkins
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

A vacuum separation, transport and collection system for immiscible liquids includes a separator (**12**) for separating two immiscible liquids such as oil and a water-based coolant, and for directing the separated immiscible liquid into a holder (**16**). A collector (**18**) is secured through a vacuum line (**20**) with the holder (**16**) and a vacuum generator (**22**) applies a vacuum to the collector (**18**) and holder (**16**). A controller (**28**) controls the vacuum generator (**22**) to apply a vacuum to the collector (**18**) and the holder (**16**) for a predetermined vacuum duty cycle for periodically removing separated immiscible liquid (**26**) from the holder (**16**) into the collector (**18**). Contaminants in the immiscible liquid cannot degrade performance of the system because such contaminants do not contact the vacuum generator (**22**) or controller (**28**).

20 Claims, 3 Drawing Sheets



US006984464B2

(12) **United States Patent**
Margiott et al.

(10) **Patent No.: US 6,984,464 B2**
(45) **Date of Patent: Jan. 10, 2006**

(54) **HYDROGEN PASSIVATION SHUT DOWN SYSTEM FOR A FUEL CELL POWER PLANT**

(75) Inventors: **Paul R. Margiott**, South Sindsor, CT (US); **Francis R. Preli, Jr.**, Cromwell, CT (US); **Galen W. Kulp**, Vernon, CT (US); **Michael L. Perry**, South Glastonbury, CT (US); **Carl A. Reiser**, Stonington, CT (US); **Ryan J. Balliet**, West Hartford, CT (US)

(73) Assignee: **UTC Fuel Cells, LLC**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 71 days.

(21) Appl. No.: **10/635,779**

(22) Filed: **Aug. 6, 2003**

(65) **Prior Publication Data**

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(51) **Int. Cl.**
H01M 8/00 (2006.01)

(52) **U.S. Cl.** **429/12**

(58) **Field of Classification Search** 429/38, 429/13, 22, 25, 34, 23, 20, 17, 40, 26, 19; 222/3; 700/79; 205/787; 422/88; 320/137
See application file for complete search history.

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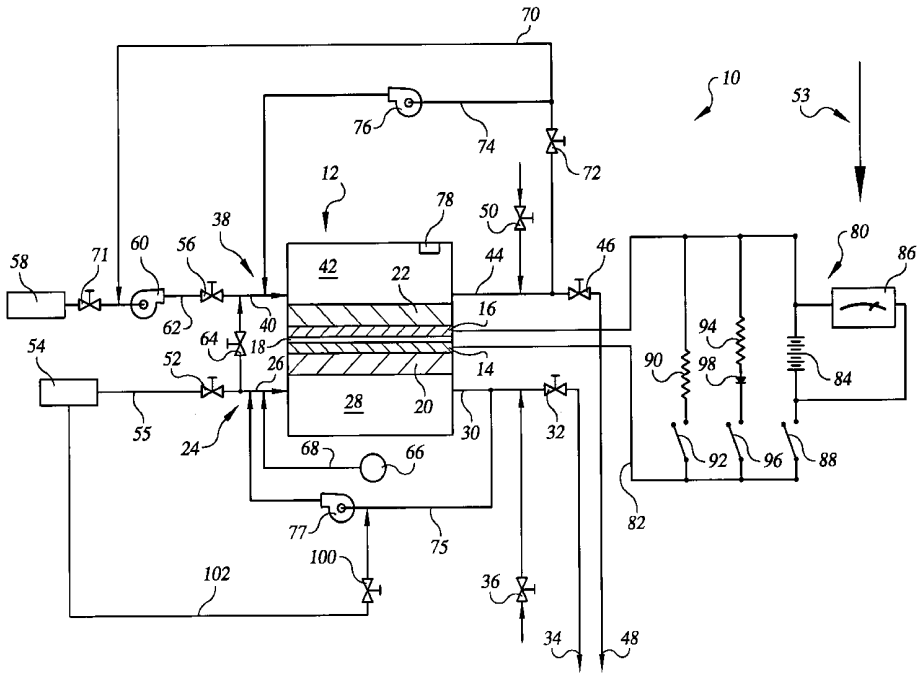
Primary Examiner—Michael Barr
Assistant Examiner—Robert Hodge
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

The invention is a hydrogen passivation shut down system for a fuel cell power plant (**10**). An anode flow path (**24**) is in fluid communication with an anode catalyst (**14**) for directing hydrogen fuel to flow adjacent to the anode catalyst (**14**), and a cathode flow path (**38**) is in fluid communication with a cathode catalyst (**16**) for directing an oxidant to flow adjacent to the cathode catalyst (**16**) of a fuel cell (**12**). Hydrogen fuel is permitted to transfer between the anode flow path (**24**) and the cathode flow path (**38**). A hydrogen reservoir (**66**) is secured in fluid communication with the anode flow path (**24**) for receiving and storing hydrogen during fuel cell (**12**) operation, and for releasing the hydrogen into fuel cell (**12**) whenever the fuel cell (**12**) is shut down.

6 Claims, 1 Drawing Sheet



US006979509B2

(12) **United States Patent**
Breault et al.

(10) **Patent No.: US 6,979,509 B2**
(45) **Date of Patent: Dec. 27, 2005**

(54) **FREEZE TOLERANT FUEL CELL POWER PLANT WITH A TWO-COMPONENT MIXED COOLANT**

(75) Inventors: **Richard D. Breault**, North Kingstown, RI (US); **Patrick L. Hagans**, Columbia, CT (US); **Jeremy A. Schrooten**, Hebron, CT (US)

(73) Assignee: **UTC Fuel Cells, LLC**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 111 days.

(21) Appl. No.: **10/701,987**

(22) Filed: **Nov. 5, 2003**

(65) **Prior Publication Data**

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(51) **Int. Cl.**[7] **H01M 8/04**; H01M 2/00
(52) **U.S. Cl.** **429/26**; 429/24; 429/36
(58) **Field of Search** 429/24, 26, 34

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6,562,503 B2 * 5/2003 Grasso et al. 429/26

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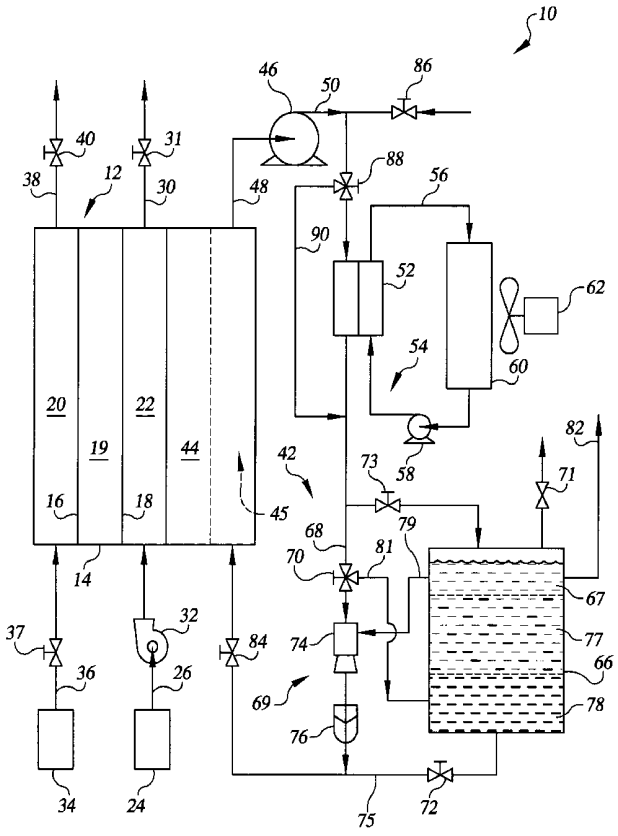
Primary Examiner—Patrick Joseph Ryan
Assistant Examiner—Melissa Austin
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

A freeze tolerant fuel cell power plant (**10**) includes at least one fuel cell (**12**), a coolant loop (**42**) having a porous water transport plate (**44**) secured in a heat and mass exchange relationship with the fuel cell (**12**) and a coolant pump (**46**) for circulating a coolant through the plate (**44**) and for transferring water into or out of the plate (**44**) with the coolant. A coolant heat exchanger (**52**) removes heat from the coolant, and an accumulator (**66**) stores the coolant and fuel cell product water and directs the product water out of the accumulator (**66**). The coolant is a two-component mixed coolant liquid circulating through the coolant loop (**42**) consisting of between 80 and 95 volume percent of a low freezing temperature water immiscible fluid component and between 5 and 20 volume percent of a water component.

12 Claims, 2 Drawing Sheets



US006977121B2

(12) **United States Patent**
Balliet et al.

(10) **Patent No.: US 6,977,121 B2**
(45) **Date of Patent: Dec. 20, 2005**

(54) **FUEL CELL POWER PLANT HAVING A FUEL CONCENTRATION SENSOR CELL**

(75) Inventors: **Ryan J. Balliet**, West Hartford, CT (US); **Thomas D. Jarvi**, Manchester, CT (US); **Lars M. Pedersen**, Wethersfield, CT (US); **Michael L. Perry**, South Glastonbury, CT (US); **Carl A. Reiser**, Stonington, CT (US)

(73) Assignee: **UTC Fuel Cells, LLC**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 193 days.

(21) Appl. No.: **10/406,453**

(22) Filed: **Apr. 3, 2003**

(65) **Prior Publication Data**

US 2004/0197621 A1 Oct. 7, 2004

(51) **Int. Cl.**[7] **H01M 8/04**; H01M 8/00

(52) **U.S. Cl.** **429/22**; 429/23; 429/25; 429/13; 429/12; 429/26; 429/40

(58) **Field of Search** 429/22, 23, 25, 429/13, 12, 26, 40

(56) **References Cited**

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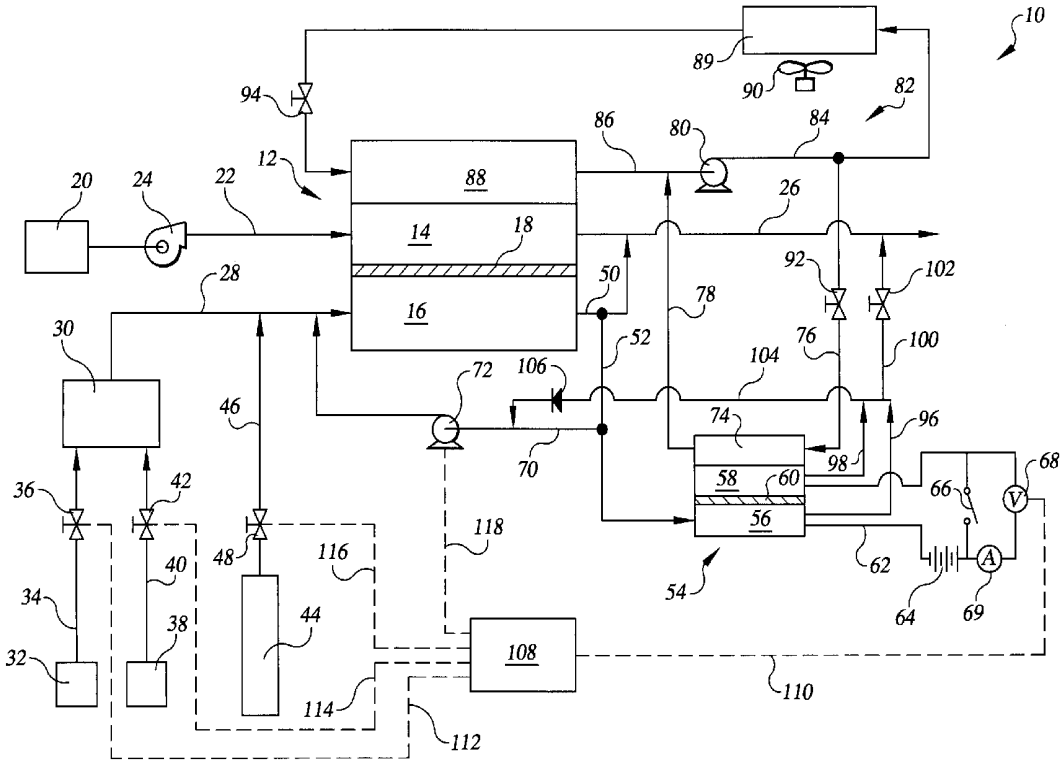
Primary Examiner—Patrick Joseph Ryan
Assistant Examiner—Angela J. Martin
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

A fuel cell power plant (**10**) having a fuel concentration sensor cell (**54**) is disclosed for detecting a concentration of fuel in a fuel cell (**12**) of the plant (**10**). A portion of a fuel exhaust stream is directed to flow through the sensor cell (**54**) adjacent to a membrane electrode assembly (**60**) of the sensor cell (**54**). A power circuit (**62**) may or may not deliver an electrical current to the cell (**12**), while changes in voltage across the cell (**12**) that are proportional to changes in hydrogen concentrations within the fuel exhaust stream are detected by a detector (**68**) which communicates the changes to a controller (**108**) for controlling a rate of fuel supply to the fuel cell (**12**). A porous sensor water transport plate (**74**) cools, humidifies delivers and removes liquid from the sensor cell (**12**).

12 Claims, 3 Drawing Sheets



US006911275B2

(12) **United States Patent**
Michels et al.

(10) **Patent No.: US 6,911,275 B2**
(45) **Date of Patent: Jun. 28, 2005**

(54) **HIGH MOLECULAR WEIGHT DIRECT ANTIFREEZE COOLED FUEL CELL**

(75) Inventors: **H. Harvey Michels**, West Hartford, CT (US); **Richard D. Breault**, North Kingstown, RI (US)

(73) Assignee: **UTC Fuel Cells, LLC**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 115 days.

(21) Appl. No.: **10/194,122**

(22) Filed: **Jul. 12, 2002**

(65) **Prior Publication Data**

US 2004/0009383 A1 Jan. 15, 2004

(51) **Int. Cl.**[7] **H01M 8/04**
(52) **U.S. Cl.** **429/26**; 429/25; 429/34
(58) **Field of Search** 429/24, 25, 26, 429/34, 38, 39

(56) **References Cited**

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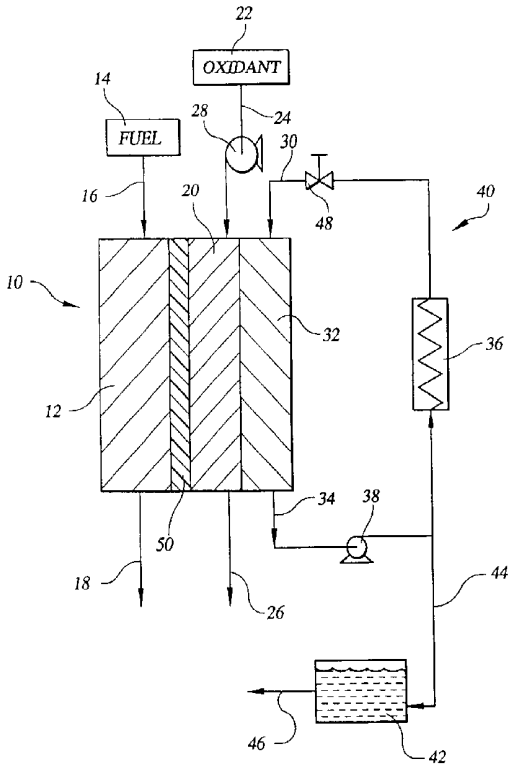
Primary Examiner—Stephen J. Kalafut
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

A high molecular weight direct antifreeze cooled fuel cell **10** includes an electrolyte **52** secured between an anode catalyst **54** and a cathode catalyst **56**; a porous anode substrate **58** secured in direct fluid communication with and supporting the anode catalyst **54**; a porous wetproofed cathode substrate **62** secured in direct fluid communication with and supporting the cathode catalyst **56**; a porous water transport plate **64** secured in direct fluid communication with the porous cathode substrate **62**; and, a high molecular weight direct antifreeze solution passing through the porous water transport plate **64** to cool and remove product water from the fuel cell **10**. The high molecular weight direct antifreeze solution preferably includes polyethylene glycol having a molecular weight ranging from 200 to 8,000 AMU. The direct antifreeze solution does not leave the water transport plate **64** in significant quantities to poison the catalysts.

6 Claims, 4 Drawing Sheets



US006858337B2

(12) **United States Patent**
Reiser

(10) **Patent No.: US 6,858,337 B2**
(45) **Date of Patent: Feb. 22, 2005**

(54) **REVERSIBLE FUEL CELL POWER PLANT**

(75) Inventor: **Carl A. Reiser**, Stonington, CT (US)

(73) Assignee: **UTC Fuel Cells, LLC**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 157 days.

(21) Appl. No.: **10/330,815**

(22) Filed: **Dec. 27, 2002**

(65) **Prior Publication Data**

US 2004/0126629 A1 Jul. 1, 2004

(51) **Int. Cl.**[7] **H01M 8/00**

(52) **U.S. Cl.** **429/13**; 429/12; 429/17; 429/18; 429/19; 429/20; 429/21; 429/22; 429/23; 429/26; 429/32; 320/101

(58) **Field of Search** 429/13, 19, 12, 429/17–23, 26, 32; 320/101

(56) **References Cited**

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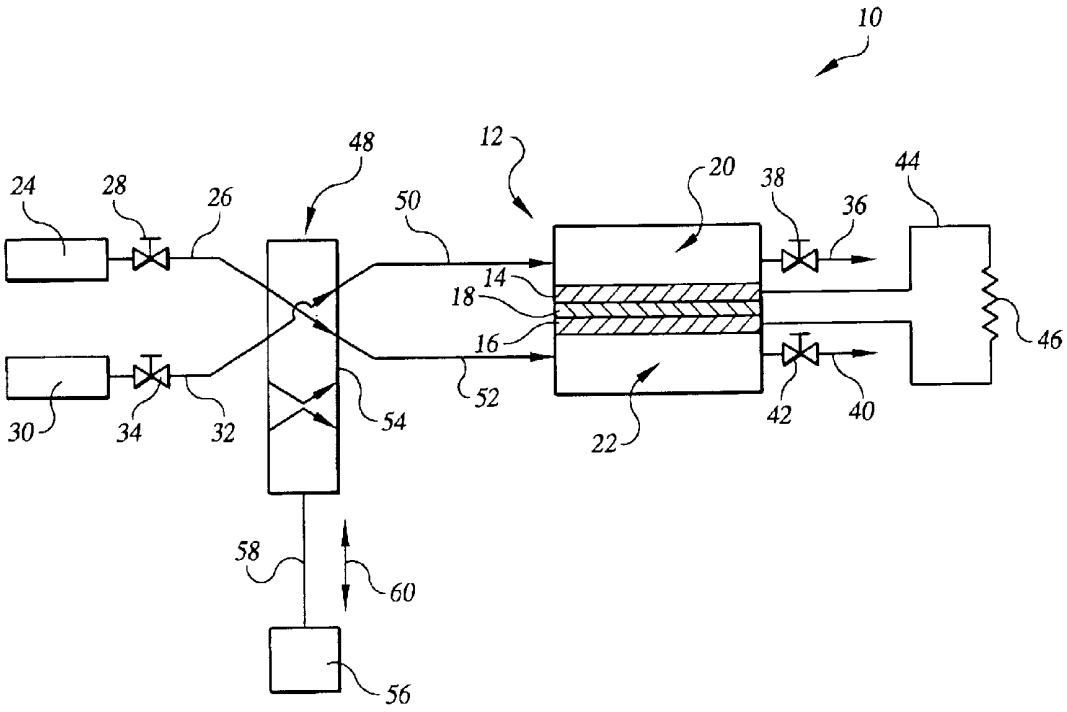
Primary Examiner—Michael Barr
Assistant Examiner—Gentle E. Winter
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

The invention is a reversible fuel cell power plant (**10**). A reactant switch-over assembly (**48**) is secured between a reducing fluid fuel source (**30**), an oxygen containing oxidant source (**24**), and first and second flow fields (**20**) (**22**) of a fuel cell (**12**). The switch-over assembly (**48**) first directs a reducing fluid fuel stream to flow into the first flow field (**20**) while it simultaneously directs the oxygen containing oxidant stream to flow into the second flow field (**22**). Then, after a first half of a useful life span of the fuel cell (**12**) but before a final one quarter of the useful life span, the switch-over assembly (**48**) directs the reducing fluid fuel stream to flow into the second flow field (**22**) while it simultaneously directs the oxygen containing oxidant stream to flow into the first flow field (**20**).

10 Claims, 4 Drawing Sheets



US006855453B2

(12) **United States Patent**
Bett et al.

(10) **Patent No.: US 6,855,453 B2**
(45) **Date of Patent: Feb. 15, 2005**

(54) **FUEL CELL HAVING A CORROSION RESISTANT AND PROTECTED CATHODE CATALYST LAYER**

(75) Inventors: **John A. S. Bett**, Hamden, CT (US); **Ned E. Cipollini**, Enfield, CT (US); **Thomas D. Jarvi**, Manchester, CT (US); **Richard D. Breault**, North Kingstown, RI (US)

(73) Assignee: **UTC Fuel Cells, LLC**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 96 days.

(21) Appl. No.: **10/331,421**

(22) Filed: **Dec. 30, 2002**

(65) **Prior Publication Data**

US 2004/0126644 A1 Jul. 1, 2004

(51) **Int. Cl.**[7] **H01M 4/90**; H01M 8/10

(52) **U.S. Cl.** **429/42**; 429/30; 429/40

(58) **Field of Search** 429/40, 44, 30, 429/42

(56) **References Cited**

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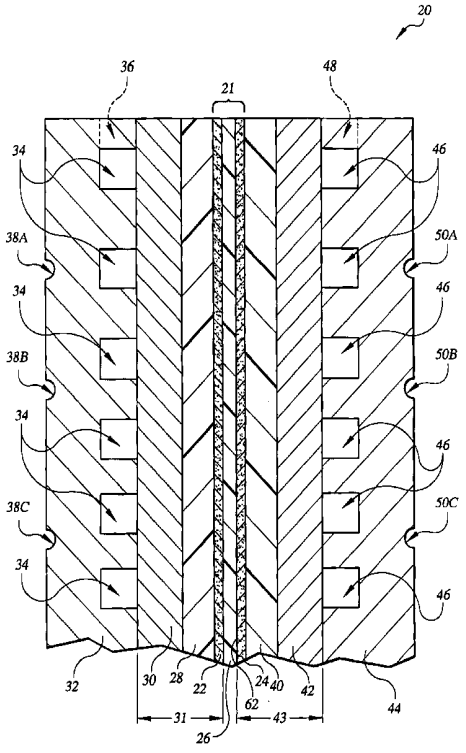
Primary Examiner—Patrick Ryan
Assistant Examiner—Thomas H Parsons
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

The invention is a fuel cell (**20**) having a corrosion resistant and protected cathode catalyst layer (**24**). The cathode catalyst layer (**24**) includes a platinum oxygen reduction catalyst and an oxygen evolution catalyst selected from the group consisting of catalysts that are more active than platinum for oxygen evolution. The oxygen evolution catalyst may be uniformly applied within the cathode catalyst layer, or non-uniformly applied to identified high corrosion areas (**82**) (**84**) of the cathode catalyst layer (**24**). The cathode catalyst layer (**24**) may include heat-treated carbon support material, and/or a heat-treated carbon black within a diffusion layer (**40**) supporting the cathode catalyst layer (**24**). The fuel cell (**20**) may also include an anode catalyst layer (**22**) having a poor oxygen reduction catalyst having a greater oxygen reduction over potential than platinum.

20 Claims, 4 Drawing Sheets



US006841283B2

(12) **United States Patent**
Breault

(10) **Patent No.: US 6,841,283 B2**
(45) **Date of Patent: Jan. 11, 2005**

(54) **HIGH WATER PERMEABILITY PROTON EXCHANGE MEMBRANE**

(75) Inventor: **Richard D. Breault**, North Kingstown, RI (US)

(73) Assignee: **UTC Fuel Cells, LLC**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 276 days.

(21) Appl. No.: **10/274,747**

(22) Filed: **Oct. 21, 2002**

(65) **Prior Publication Data**

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(51) **Int. Cl.**[7] **H01M 8/10**
(52) **U.S. Cl.** **429/30**; 429/33; 429/40; 429/41; 429/309; 521/27
(58) **Field of Search** 429/30, 33, 40, 429/41, 309; 521/27

(56) **References Cited**

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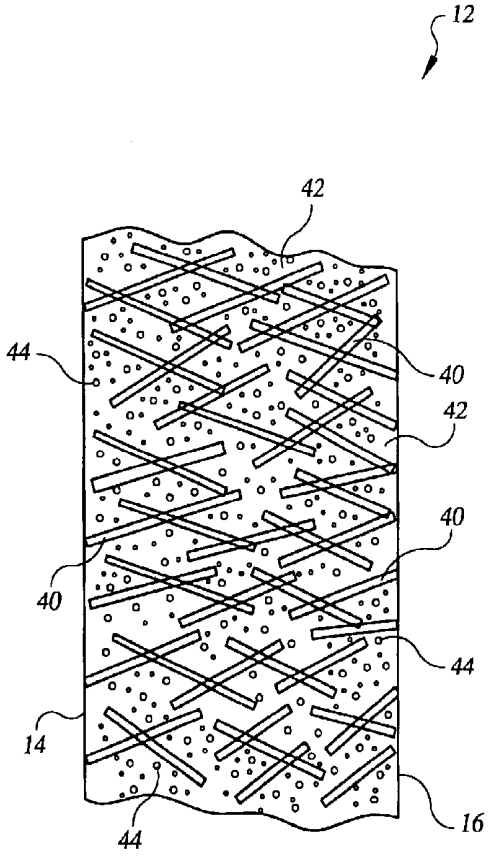
Primary Examiner—Laura Weiner
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

A high water permeability proton exchange membrane (**12**) is disclosed for use in an electrochemical cell, such as a fuel cell (**10**) or an electrolysis cell. The membrane (**12**) includes: a. between about 20 volume percent ("vol. %") and about 40 vol. % of a structural insulating phase (40); between about 50 vol. % and about 70 vol. % of a hydrated nanoporous ionomer phase (**42**); and, about 10 vol. % of a microporous water-filled phase (**44**). The structural insulating material (**40**) defines an overall membrane volume, and the ionomer phase (**42**) fills all but 10% of the overall volume so that the microporous water-filled phase (**44**) is defined within the ionomer phase (**42**) and consists of open pores having a diameter of between 0.3 microns and 1.0 microns. Water transport is enhanced between opposed catalytic surfaces (**14**), (**16**) of the membrane (**12**).

9 Claims, 2 Drawing Sheets



US006838199B2

(12) **United States Patent**
Balliet et al.

(10) **Patent No.: US 6,838,199 B2**
(45) **Date of Patent: Jan. 4, 2005**

(54) **START UP SYSTEM AND METHOD FOR A FUEL CELL POWER PLANT USING A CATHODE ELECTRODE FUEL PURGE**

(75) Inventors: **Ryan J. Balliet**, West Hartford, CT (US); **Carl A. Reiser**, Stonington, CT (US); **Timothy W. Patterson**, East Hartford, CT (US); **Michael L. Perry**, South Glastonbury, CT (US)

(73) Assignee: **UTC Fuel Cells, LLC**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 195 days.

(21) Appl. No.: **10/329,874**

(22) Filed: **Dec. 26, 2002**

(65) **Prior Publication Data**

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(51) **Int. Cl.**[7] **H01M 8/00**
(52) **U.S. Cl.** **429/13**; 429/17; 429/22
(58) **Field of Search** 429/13, 17, 22

(56) **References Cited**

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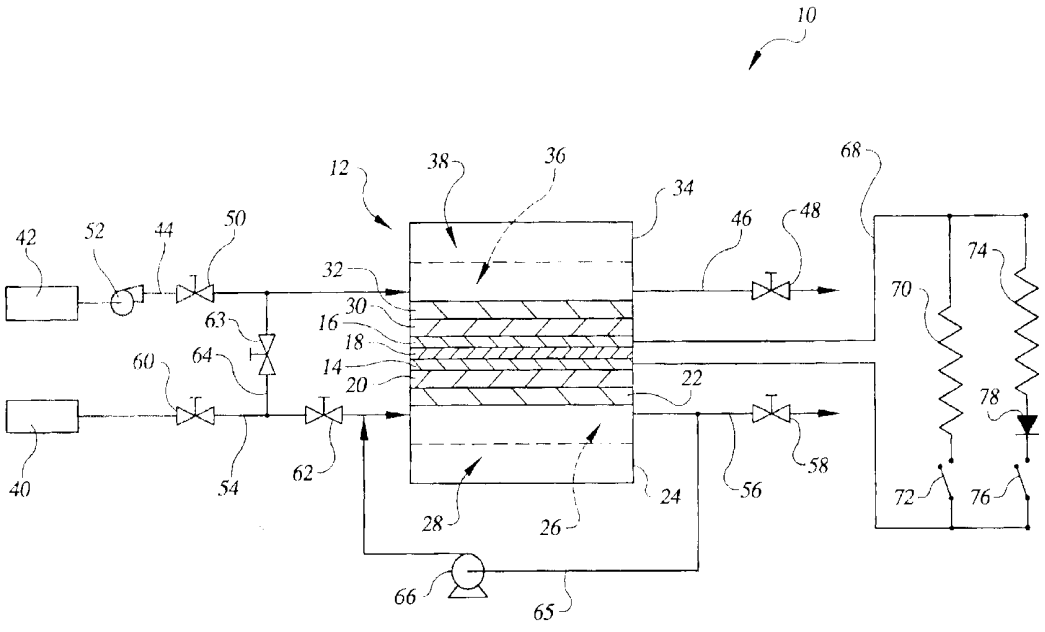
Primary Examiner—Dah-Wei Yuan
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

The invention is a start up system and method for a fuel cell power plant (**10**) using a purging of the cathode flow field (**38**) with a hydrogen rich reducing fluid fuel to minimize corrosion of the cathode electrode (**16**). The method for starting up the shut down fuel cell power plant (**10**) includes the steps of: a. purging the cathode flow field (**38**) with the reducing fluid fuel; b. then, directing the reducing fluid fuel to flow through an anode flow field (**28**); c. next, terminating flow of the fuel through the cathode flow field (**38**) and directing an oxygen containing oxidant to flow through the cathode flow field (**38**); and, d. finally, connecting a primary load (**70**) to the fuel cell (**12**) so that electrical current flows from the fuel cell (**12**) to the primary load (**70**).

11 Claims, 1 Drawing Sheet



US006835480B2

(12) **United States Patent**
Dykeman et al.

(10) **Patent No.: US 6,835,480 B2**
(45) **Date of Patent: Dec. 28, 2004**

(54) **METHOD OF USING A TEMPORARY DILUTE SURFACTANT WATER SOLUTION TO ENHANCE MASS TRANSPORT IN A FUEL CELL**

(75) Inventors: **Emily A. Dykeman**, Cheyenne, WY (US); **Patrick L. Hagans**, Columbia, CT (US); **Leslie L. Van Dine**, Manchester, CT (US)

(73) Assignee: **UTC Fuel Cells, LLC**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **10/331,570**

(22) Filed: **Dec. 30, 2002**

(65) **Prior Publication Data**

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(51) **Int. Cl.**[7] **H01M 8/04**
(52) **U.S. Cl.** **429/13**; 429/34
(58) **Field of Search** 429/13, 34

(56) **References Cited**

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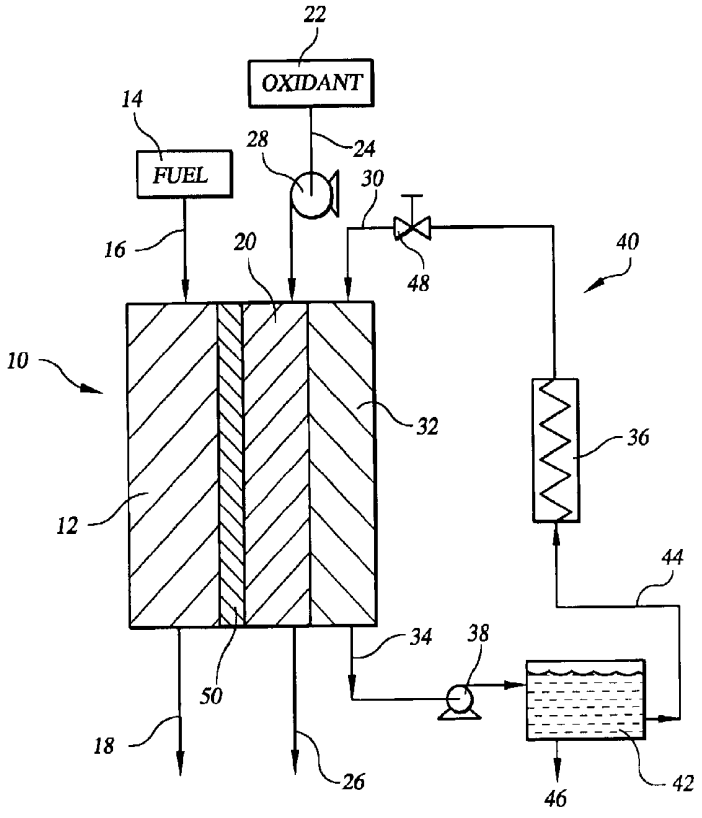
Primary Examiner—John S. Maples
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

The invention is a method of using a temporary dilute surfactant water solution to enhance mass transport in a fuel cell **(10)** that generates electrical current from hydrogen containing reducing fluid and oxygen containing oxidant reactant streams. The method includes the steps of: a. directing the dilute surfactant water solution to flow through a cathode flow field **(20)** of a fuel cell **(10)**; b. then removing the solution from the fuel cell **(10)**; and, c. then directing flow of the reactant streams through the flow fields **(12)** **(20)**. The temporary dilute surfactant water solution has a surface tension of not less than 50 dynes/cm. Flowing the temporary dilute surfactant water solution through the fuel cell **(10)** for a temporary, short duration improves mass transport of the cell **(10)** even after the solution is removed from the cell **(10)**.

13 Claims, 5 Drawing Sheets



US006835479B2

(12) **United States Patent**
Balliet et al.

(10) **Patent No.: US 6,835,479 B2**
(45) **Date of Patent: Dec. 28, 2004**

(54) **SYSTEM AND METHOD FOR SHUTTING DOWN A FUEL CELL POWER PLANT**

(75) Inventors: **Ryan J. Balliet**, West Hartford, CT (US); **Carl A. Reiser**, Stonington, CT (US)

(73) Assignee: **UTC Fuel Cells, LLC**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 338 days.

(21) Appl. No.: **10/180,393**

(22) Filed: **Jun. 26, 2002**

(65) **Prior Publication Data**

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(51) **Int. Cl.**[7] **H01M 8/04**
(52) **U.S. Cl.** **429/13**; 429/19; 429/22
(58) **Field of Search** 429/13, 19, 22, 429/30, 12

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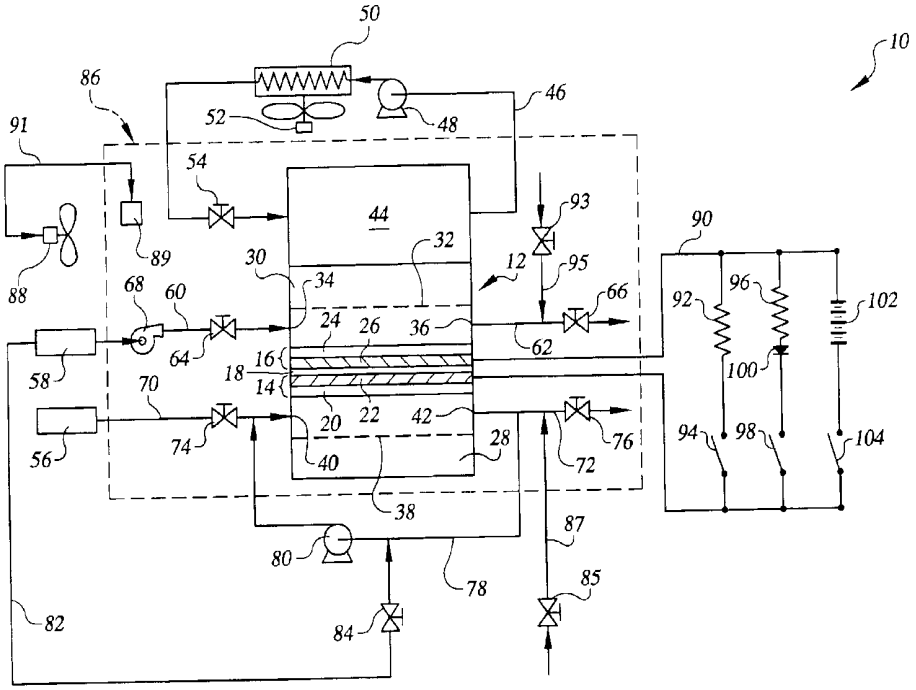
Primary Examiner—Patrick Ryan
Assistant Examiner—Tracy Dove
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

The invention is a system and method for shutting down a fuel cell power plant having at least one fuel cell, a primary load, and an auxiliary load that receive electrical current from electrodes of the fuel cell through an external circuit. Shutting down the plant includes disconnecting the primary load; terminating flow of the oxidant through a cathode flow field; connecting the auxiliary load to consume oxygen within the fuel cell; disconnecting the auxiliary load; connecting a power supply to the fuel cell electrodes to increase a concentration of hydrogen within the cathode flow field; and, then, decreasing or eliminating flow of hydrogen into an anode flow field after an equilibrium gas concentration of at least 0.0001% hydrogen, balance fuel cell inert gases, is achieved in both the anode and cathode flow fields.

8 Claims, 1 Drawing Sheet



US006833211B1

(12) **United States Patent**
Yang

(10) **Patent No.: US 6,833,211 B1**
(45) **Date of Patent: Dec. 21, 2004**

(54) **FUEL CELL STACK HAVING A REDUCED VOLUME**

(75) Inventor: **Deliang Yang**, Torrance, CA (US)

(73) Assignee: **UTC Fuel Cells, LLC**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **10/689,238**

(22) Filed: **Oct. 20, 2003**

(51) **Int. Cl.**[7] **H01M 8/04**; H01M 8/02

(52) **U.S. Cl.** **429/26**; 429/12; 429/34; 429/39

(58) **Field of Search** 429/26, 34, 39, 429/12

(56) **References Cited**

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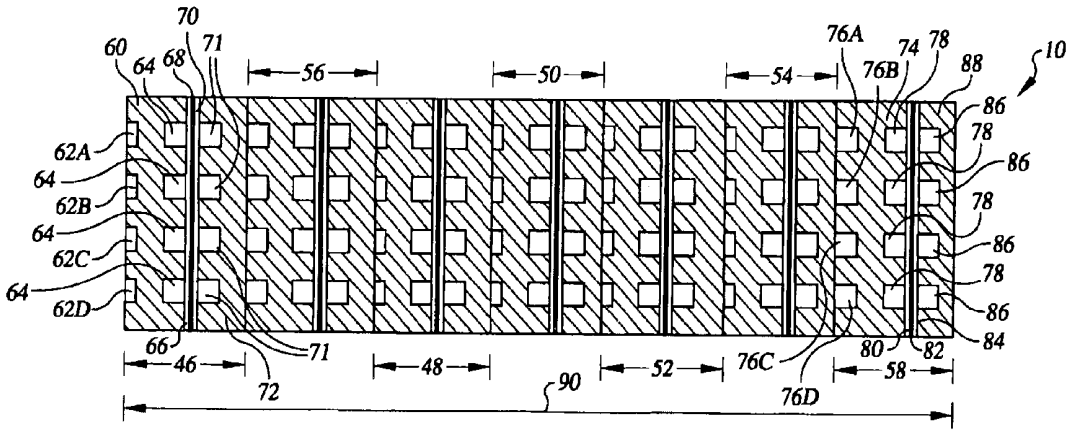
Primary Examiner—John S. Maples

(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

A reduced volume fuel cell stack (**10**) includes a plurality of thin fuel cells (**46**, **48**, **50**, **52**, **54**) and a plurality of thick fuel cells (**56**, **58**). The thin fuel cells include water management channels (**62**A, **62**B, **62**C, **62**D) and the thick fuel cells include cooling channels (**76**A, **76**B, **76**C, **76**D). At least two thin fuel cells (**48**, **50**) are secured adjacent each other and adjacent each thick fuel cell (**56**, **58**) within the stack (**10**). The water management channels (**62**A, **62**B, **62**C, **62**D) have a depth that is at least four times less than a depth of the cooling channels (**76**A, **76**B, **76**C, **76**D) so that volume, weight and water content of the stack (**10**) are reduced.

4 Claims, 3 Drawing Sheets



US006794073B2

(12) **United States Patent**
Breault et al.

(10) **Patent No.: US 6,794,073 B2**
(45) **Date of Patent: Sep. 21, 2004**

(54) **DIRECT ANTIFREEZE COOLED FUEL CELL**

(75) Inventors: **Richard D. Breault**, North Kingstown, RI (US); **David A. Condit**, Avon, CT (US); **Albert P. Grasso**, Vernon, CT (US); **Michael E. Gorman**, Glastonbury, CT (US)

(73) Assignee: **International Fuel Cells, LLC**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 196 days.

(21) Appl. No.: **10/037,195**

(22) Filed: **Nov. 9, 2001**

(65) **Prior Publication Data**

US 2002/0102448 A1 Aug. 1, 2002

Related U.S. Application Data

(62) Division of application No. 09/359,475, filed on Jul. 22, 1999, now Pat. No. 6,316,135.

(51) **Int. Cl.**[7] **H01M 8/04**
(52) **U.S. Cl.** **429/26**; 252/73
(58) **Field of Search** 429/22, 26; 252/73

(56) **References Cited**

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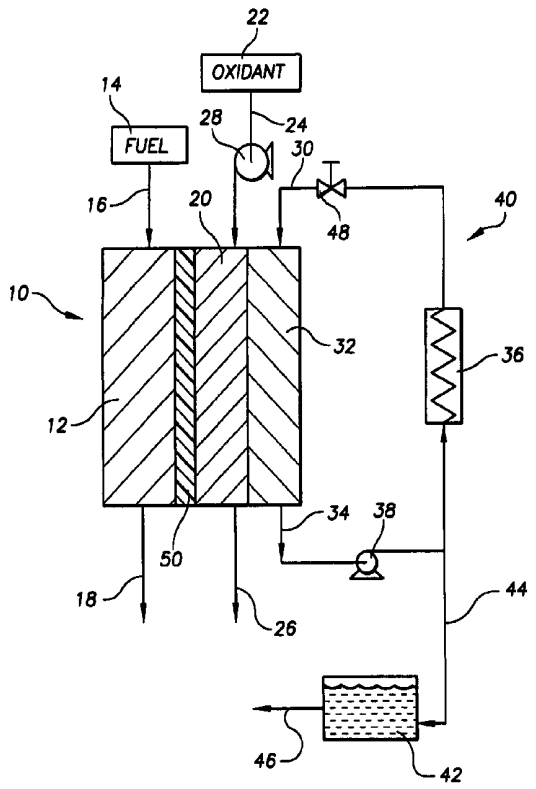
Primary Examiner—Stephen J. Kalafut
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

A direct antifreeze cooled fuel cell is disclosed for producing electrical energy from reducing and process oxidant fluid streams that includes an electrolyte secured between an anode catalyst and a cathode catalyst; a porous anode substrate secured in direct fluid communication with and supporting the anode catalyst; a porous wetproofed cathode substrate secured in direct fluid communication with and supporting the cathode catalyst; a porous water transport or cooler plate secured in direct fluid communication with the porous cathode substrate; and, a direct antifreeze solution passing through the porous water transport plate. A preferred direct antifreeze solution passing through the porous water transport plate remains essentially within the water transport plate and does not poison the catalysts.

11 Claims, 2 Drawing Sheets



US006771781B2

(12) **United States Patent**
Chattin

(10) **Patent No.: US 6,771,781 B2**
(45) **Date of Patent: Aug. 3, 2004**

(54) **VARIABLE DAMPING CIRCUIT FOR A LOUDSPEAKER**

(76) Inventor: **Daniel A. Chattin**, 75 Perkins Hill Rd., Harwington, CT (US) 06791

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 623 days.

(21) Appl. No.: **09/851,023**

(22) Filed: **May 8, 2001**

(65) **Prior Publication Data**

US 2002/0168072 A1 Nov. 14, 2002

(51) **Int. Cl.**[7] **H04B 3/00**; H04B 15/00; H04R 29/00

(52) **U.S. Cl.** **381/77**; 55/59; 55/94.9

(58) **Field of Search** 381/59, 58, 55, 381/94.9, 77; 333/124, 17.3, 32

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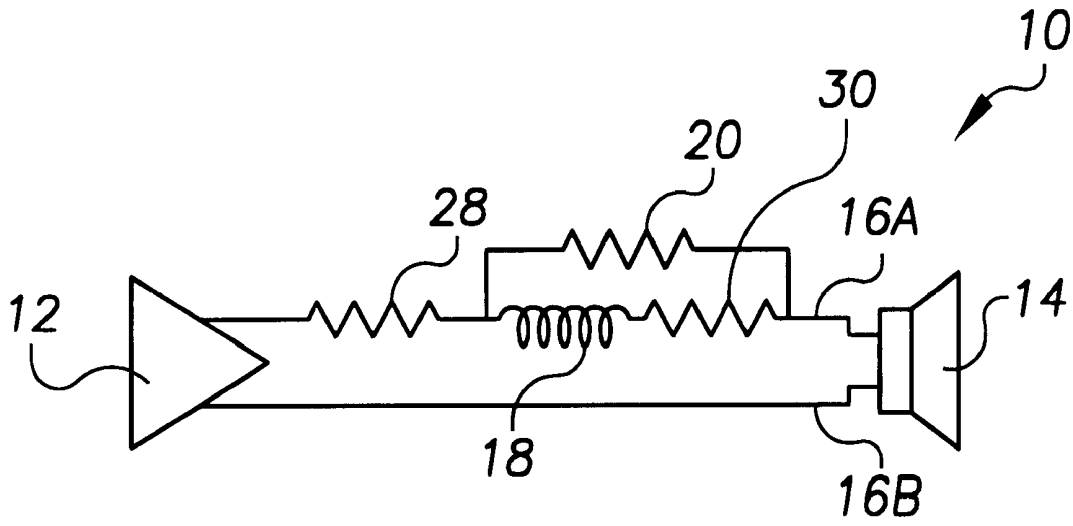
Primary Examiner—Minsun Oh Harvey
Assistant Examiner—Laura A. Grier
(74) *Attorney, Agent, or Firm*—Malcolm Chisholm, Jr.

(57) **ABSTRACT**

The invention is a variable damping circuit for a loudspeaker that provides for frequency dependent control of a loudspeaker by an amplifier. The variable damping circuit includes an amplifier, at least one loudspeaker, a pair of connectors between the amplifier and the loudspeaker, and a reactive component wired in parallel with a resistor connected to one of the pair of connectors between the amplifier and loudspeaker, wherein the resistance value of the reactive component and resistor does not exceed fifty percent of a resistance value of the loudspeaker. The reactive component may be a coil, a capacitor, or both a coil and a capacitor both of which are connected in parallel with the resistor.

11 Claims, 2 Drawing Sheets



US006764786B2

(12) **United States Patent**
Morrow et al.

(10) **Patent No.: US 6,764,786 B2**
(45) **Date of Patent: Jul. 20, 2004**

(54) **FUEL CELL STACK HAVING AN IMPROVED PRESSURE PLATE AND CURRENT COLLECTOR**

(75) Inventors: **Aaron W. Morrow**, East Longmeadow, MA (US); **Grant M. Erlich**, West Hartford, CT (US); **Javier Resto**, Jacksonville, FL (US)

(73) Assignee: **UTC Fuel Cells, LLC**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 90 days.

(21) Appl. No.: **10/141,612**

(22) Filed: **May 8, 2002**

(65) **Prior Publication Data**

US 2003/0211379 A1 Nov. 13, 2003

(51) **Int. Cl.**[7] **H01M 2/08**; H01M 2/14; H01M 2/00; H01M 2/02

(52) **U.S. Cl.** **429/37**; 429/34; 429/39

(58) **Field of Search** 429/34, 37, 39

(56) **References Cited**

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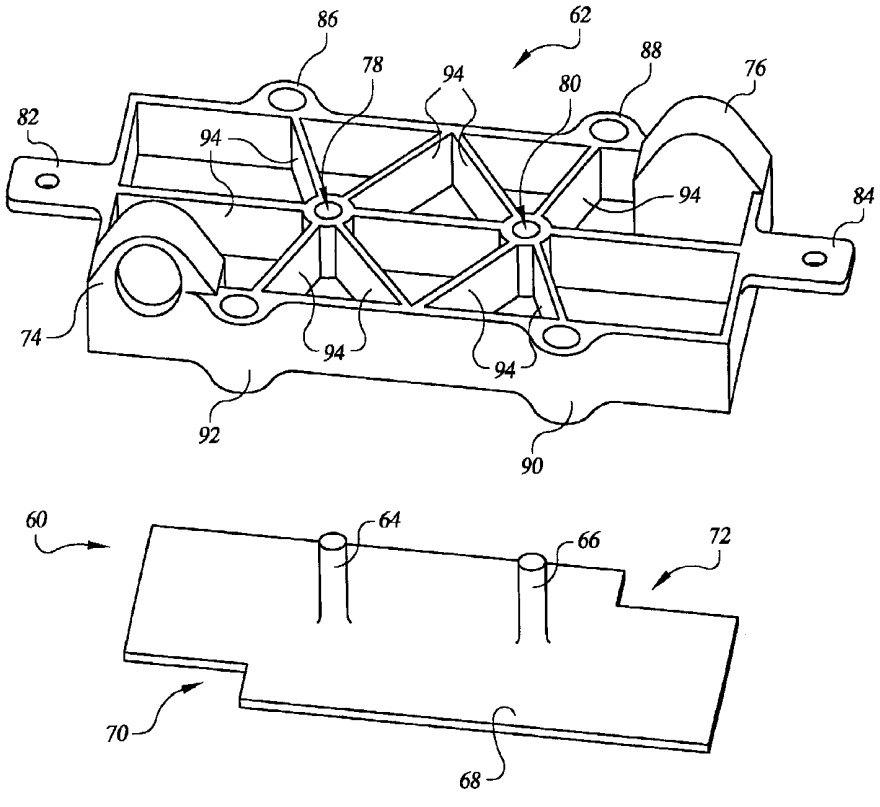
Primary Examiner—Patrick Ryan
Assistant Examiner—Julian Mercado
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

The invention is a fuel cell stack having an improved pressure plate and current collector. The fuel cell stack includes a plurality of fuel cell component plates stacked adjacent each other to form a reaction portion of the fuel cell stack. A current collector is secured adjacent a first end of the stack of fuel cell component plates and a pressure plate is secured adjacent to the current collector. The current collector is made from a non-porous, electrically conductive graphite material and includes at least one conductive stud secured to the collector. The pressure plate is made of an electrically non-conductive, non-metallic, fiber reinforced composite material, so that the current collector and pressure plate are light, compact and have a low thermal capacity.

13 Claims, 5 Drawing Sheets



US006746982B2

(12) **United States Patent**
Hertel et al.

(10) **Patent No.: US 6,746,982 B2**
(45) **Date of Patent: Jun. 8, 2004**

(54) **POROUS CARBON BODY FOR A FUEL CELL HAVING AN ELECTRONICALLY CONDUCTIVE HYDROPHILIC AGENT**

(75) Inventors: **Christopher J. Hertel**, Wethersfield, CT (US); **John A. S. Bett**, Hampden, CT (US); **Foster P. Lamm**, South Windsor, CT (US); **Carl A. Reiser**, Stonington, CT (US)

(73) Assignee: **UTC Fuel Cells, LLC**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 341 days.

(21) Appl. No.: **10/034,884**

(22) Filed: **Dec. 27, 2001**

(65) **Prior Publication Data**

US 2003/0124414 A1 Jul. 3, 2003

(51) **Int. Cl.**[7] **B01J 21/18**; B01J 31/00; C01B 31/00; D01F 9/12; C01D 3/00

(52) **U.S. Cl.** ..... **502/180**; 502/150; 502/159; 423/445 R; 423/447.1; 423/448; 423/449.1; 252/511

(58) **Field of Search** 502/180, 150, 502/159; 423/448, 449.1; 106/31.6, 476; 252/511

(56) **References Cited**

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Primary Examiner—Mark L. Bell
Assistant Examiner—Patricia L. Hailey
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

The invention is a porous carbon body for a fuel cell having an electronically conductive hydrophilic agent and method of manufacture of the body. The porous carbon body comprises an electronically conductive graphite powder in an amount of between 60%–80% by weight of the body; a carbon fiber in an amount of between 5%–15% by weight of the body; a thermoset binder in an amount of between 6%–18% by weight of the body; and, a modified carbon black electronically conductive hydrophilic agent in an amount of between 2%–20% by weight of the body. The body provides for increased wettability without any decrease in electrical conductivity, and also provides for an efficient manufacture without any need for high temperature, costly steps to graphitize the body, or to incorporate post molding hydrophilic agents into pores of the body.

12 Claims, 3 Drawing Sheets

US006739452B2

(12) **United States Patent**
Rochelo

(10) **Patent No.: US 6,739,452 B2**
(45) **Date of Patent: May 25, 2004**

(54) **MEMORY DEVICE PROTECTIVE CONTAINER**

(76) Inventor: **Donald R. Rochelo**, 66 Leona Dr., Pittsfield, MA (US) 01201

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **10/256,372**

(22) Filed: **Sep. 27, 2002**

(65) **Prior Publication Data**

US 2003/0062275 A1 Apr. 3, 2003

Related U.S. Application Data

(60) Provisional application No. 60/326,290, filed on Oct. 1, 2001.

(51) **Int. Cl.**[7] **B69D 85/48**
(52) **U.S. Cl.** **206/454**; 206/591
(58) **Field of Search** 206/449, 308.1, 206/454, 521, 591, 592, 594, 372, 373; 220/521, 528

(56) **References Cited**

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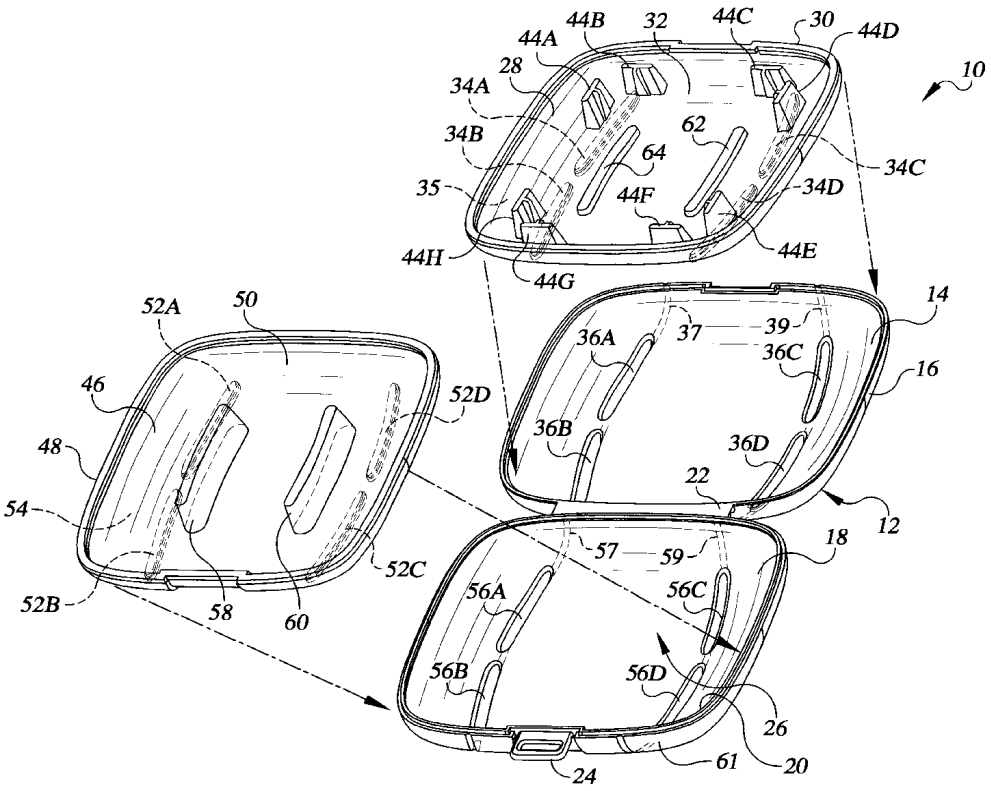
Primary Examiner—Shian Luong
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

A memory device protective carrier is disclosed for protecting small memory devices. The container includes a non-deformable, rigid exterior case having first and second shells and a securing mechanism to adjustably secure the shells in an open or closed position so that a containment chamber is defined between the shells in the closed position. A deformable, resilient receiving insert and a resilient securing insert are secured respectively within the first and second shells. Sealing lips of the inserts are compressed in the closed position to form a fluid seal so that a memory device secured within the containment chamber is protected by the rigid case and resilient inserts against damage from impact injury or fluid contaminants.

15 Claims, 2 Drawing Sheets



US006727200B2

(12) **United States Patent**
Maher et al.

(10) **Patent No.: US 6,727,200 B2**
(45) **Date of Patent: Apr. 27, 2004**

(54) **HIGH DIELECTRIC CONSTANT VERY LOW FIRED X7R CERAMIC CAPACITOR, AND POWDER FOR MAKING**

(75) Inventors: **Galeb H. Maher**, Williamstown, MA (US); **Samir Maher**, Williamstown, MA (US)

(73) Assignee: **MRA Laboratories, Inc.**, Adams, MA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 351 days.

(21) Appl. No.: **10/036,205**

(22) Filed: **Oct. 29, 2001**

(65) **Prior Publication Data**

US 2002/0058580 A1 May 16, 2002

Related U.S. Application Data

(63) Continuation-in-part of application No. 09/652,562, filed on Aug. 31, 2000, now Pat. No. 6,309,995.

(51) **Int. Cl.**[7] **C04B 35/468**; H01G 4/10; H01G 4/30

(52) **U.S. Cl.** **501/139**; 264/605; 264/615; 361/301.4; 361/321.3; 361/321.4; 361/321.5; 501/138

(58) **Field of Search** 501/139, 138; 264/605, 615; 361/301.4, 321.3, 321.4, 321.5

(56) **References Cited**

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Primary Examiner—David Brunsman
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

A dielectric ceramic powder and multilayer ceramic capacitors made from the powders are disclosed. A dielectric start powder mixture includes at least ninety weight percent essentially pure barium titanate powder having an average particle size of from 0.2 to 1.2 microns; from 0.2 to 2.5 weight percent of barium lithium borosilicate; from 0.1 to 0.3 weight percent of $MnCO_3$; 0.4 to 1.50 weight percent Nb_2O_5 or a niobate compound, or a molar equivalent of Ta_2O_5 or a tantalum compound as a grain growth inhibitor; and, 0.4 to 1.2 weight percent of gadolinium oxide (Gd_2O_3). The start powder mixture is calcined and then sintered in an open zirconia setter at from 950° C. to 1,025° C. to produce a dielectric ceramic body that satisfies X7R capacitor performance characteristics; that includes no hazardous heavy metal oxides; and, that may include silver-palladium electrodes having 85 weight percent or more of silver.

19 Claims, 46 Drawing Sheets

US006723673B2

(12) **United States Patent**
Maher et al.

(10) **Patent No.: US 6,723,673 B2**
(45) **Date of Patent: Apr. 20, 2004**

(54) **HIGH DIELECTRIC CONSTANT VERY LOW FIRED X7R CERAMIC CAPACITOR, AND POWDER FOR MAKING**

(75) Inventors: **Galeb H. Maher**, Williamstown, MA (US); **Samir Maher**, Williamstown, MA (US); **James M. Wilson**, North Adams, MA (US)

(73) Assignee: **MRA Laboratories, Inc.**, Adams, MA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **10/409,808**

(22) Filed: **Apr. 9, 2003**

(65) **Prior Publication Data**

US 2003/0203805 A1 Oct. 30, 2003

Related U.S. Application Data

(63) Continuation-in-part of application No. 10/036,205, filed on Oct. 29, 2001, which is a continuation-in-part of application No. 09/652,562, filed on Aug. 31, 2000, now Pat. No. 6,309,995.

(51) **Int. Cl.**[7] **C04B 35/468**; H01G 4/10; H01G 4/30

(52) **U.S. Cl.** **501/138**; 501/139; 264/605; 264/615; 361/301.4; 361/321.3; 361/321.4; 361/321.5

(58) **Field of Search** 501/139, 138; 264/605, 615; 361/301.4, 321.3, 321.4, 321.5

(56) **References Cited**

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6,544,916	B1 *	4/2003	Sato et al.	501/137

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Primary Examiner—David Brunsman
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

The invention includes a dielectric ceramic powder mixture comprising at least ninety weight percent essentially pure barium titanate powder having an average particle size of from 0.2 to 1.2 microns; from 0.2 to 2.5 weight percent of barium lithium borosilicate flux; from 0.1 to 0.3 weight percent of $MnCO_3$; a grain growth inhibitor such as niobium oxide or other niobate compound; and, 0.4 to 1.2 weight percent of an additive selected from the group consisting of a rare earth oxide, yttrium oxide, a combination of rare earth oxides, and a combination of yttrium oxide and rare earth oxides, such that ions of the additive(s) have an average ionic radius of about 0.97 angstroms. The dielectric ceramic powder provides a start powder for making very low firing multilayer ceramic capacitors satisfying X7R performance requirements.

20 Claims, 1 Drawing Sheet

US006711984B2

(12) **United States Patent**
Tagge et al.

(10) **Patent No.: US 6,711,984 B2**
(45) **Date of Patent: Mar. 30, 2004**

(54) **BI-FLUID ACTUATOR**

(76) Inventors: **James E. Tagge**, 41 Bentrup Ct., Lenox, MA (US) 01240; **Andrew P. Howansky**, 31 Palmer Rd., Craryville, NY (US) 12521; **James G. Koneazny**, 240 Campbell Falls Rd., Southfield, MA (US) 01259

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 4 days.

(21) Appl. No.: **10/140,483**

(22) Filed: **May 7, 2002**

(65) **Prior Publication Data**

US 2002/0166445 A1 Nov. 14, 2002

Related U.S. Application Data

(60) Provisional application No. 60/289,774, filed on May 9, 2001.

(51) **Int. Cl.**[7] **F15B 15/22**
(52) **U.S. Cl.** **92/9**; 92/82
(58) **Field of Search** ..... 92/9, 143, 114, 92/82, 181 P

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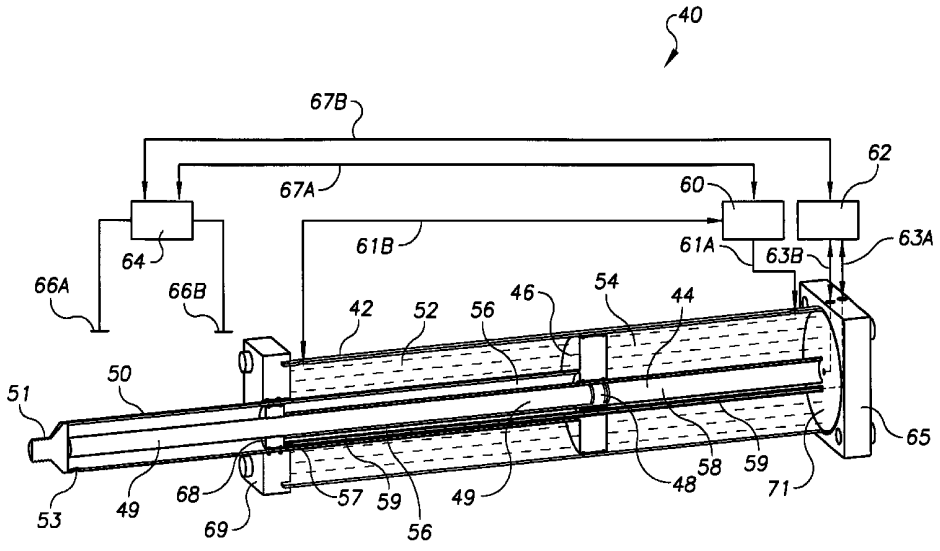
Primary Examiner—Thomas E. Lazo
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

The invention is a bi-fluid actuator for precise bi-directional movement and positioning of a mechanical object or load. The bi-fluid actuator includes a pneumatic fluid container defining opposed first and second pneumatic fluid chambers, and having a first mechanical object secured between the chambers; a hydraulic fluid container defining opposed first and second hydraulic fluid chambers, and having a second mechanical object secured between the first and second hydraulic chambers; a pneumatic fluid controller; and, a hydraulic fluid controller. Directing pneumatic fluid into either the first or second pneumatic chambers, while controlling flow of hydraulic fluid between the first and second hydraulic chambers, controls movement and positioning of the mechanical objects which may be secured to a load.

13 Claims, 11 Drawing Sheets



US006699612B2

(12) **United States Patent**
Breault et al.

(10) **Patent No.: US 6,699,612 B2**
(45) **Date of Patent: Mar. 2, 2004**

(54) **FUEL CELL POWER PLANT HAVING A REDUCED FREE WATER VOLUME**

(75) Inventors: **Richard D. Breault**, North Kingstown, RI (US); **Leslie L. Van Dine**, Manchester, CT (US)

(73) Assignee: **UTC Fuel Cells, LLC**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 232 days.

(21) Appl. No.: **10/034,739**

(22) Filed: **Dec. 26, 2001**

(65) **Prior Publication Data**

US 2003/0118883 A1 Jun. 26, 2003

(51) **Int. Cl.**[7] **H01M 08/04**
(52) **U.S. Cl.** **429/26**; 429/13; 429/34
(58) **Field of Search** 429/13, 26, 34

(56) **References Cited**

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6,274,259 B1 8/2001 Grasso et al.
6,316,135 B1 * 11/2001 Breault et al. 429/22

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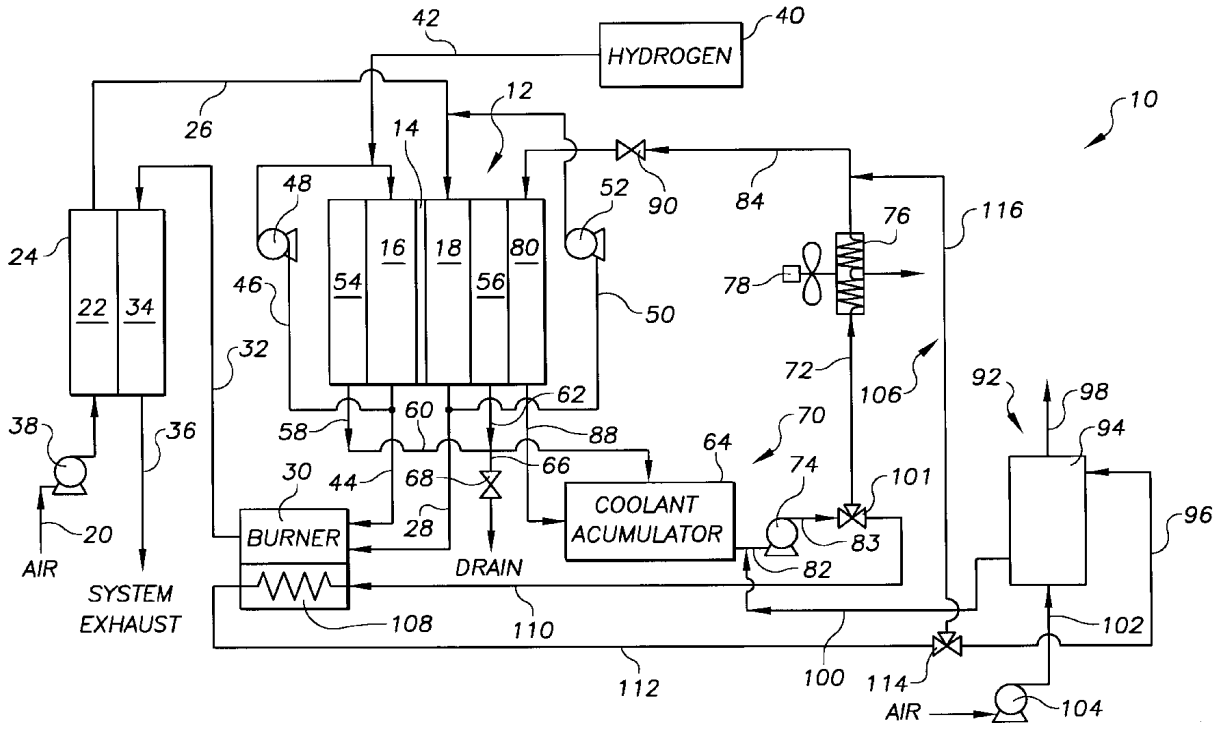
Primary Examiner—Carol Chaney
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

The invention reduces free water volume in a fuel cell power plant so support systems of the plant are freeze tolerant. The fuel cell power plant includes a coolant system having a sealed cooler plate that circulates an antifreeze coolant in heat exchange with a fuel cell and that collects fuel cell water; a water vapor removal system that removes water vapor from the antifreeze coolant to regulate the antifreeze concentration; and a start-up system having a start-up heat exchanger and a start-up valve that selectively direct heated antifreeze coolant into the cooler plate for a start-up procedure. The plant may also include a fuel processing system that utilizes the removed water vapor, and that is in heat exchange with the start-up heat exchanger. The antifreeze coolant is a low vapor pressure solution, such as an alkanetriol or polyethylene glycol.

23 Claims, 5 Drawing Sheets



US006589148B2

(12) **United States Patent**
Tarka

(10) **Patent No.: US 6,589,148 B2**
(45) **Date of Patent: Jul. 8, 2003**

(54) **MOVEABLE PRESSER RAIL ASSEMBLY**

(76) Inventor: **Michael P. Tarka**, 4 Pell St., Apartment 2, Ludlow, MA (US) 01238

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 66 days.

(21) Appl. No.: **09/924,809**

(22) Filed: **Aug. 8, 2001**

(65) **Prior Publication Data**

US 2003/0032539 A1 Feb. 13, 2003

(51) **Int. Cl.**[7] **B65H 35/00**
(52) **U.S. Cl.** **493/373**; 493/468; 493/82; 493/83; 493/73; 493/56; 493/473; 493/478
(58) **Field of Search** 493/373, 468, 493/82, 83, 73, 56, 473, 478; 225/97, 103, 104; 83/640, 543; 269/266

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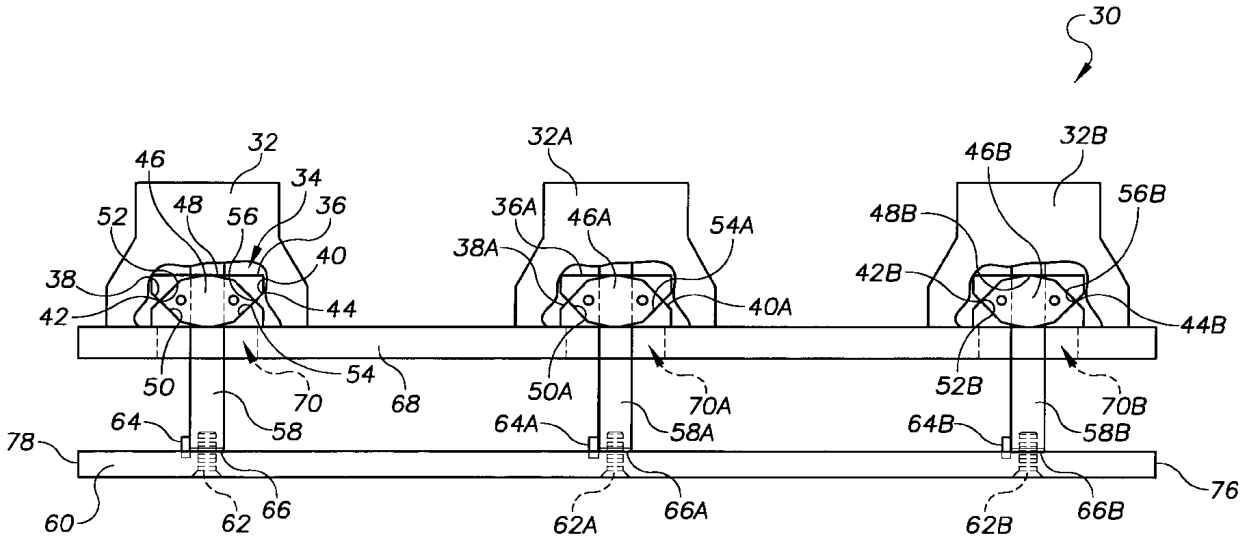
Primary Examiner—Stephen F. Gerrity
Assistant Examiner—Brian D Nash
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

The invention is a moveable presser rail assembly for supporting blanking material during operation of a blanking tool for making packaging blanks. The moveable presser rail assembly includes a mount housing having a cavity that pivotally secures a pivot sleeve, and a guide strut is secured within the pivot sleeve by a spring biasing mechanism so that a fastening end of the guide strut may be rigidly secured to a presser rail. Because the guide strut may pivot within the mount housing, the presser rail may be rigidly secured to the guide strut and still provide reciprocating and non-parallel or limited lateral motion relative to a support plate that supports the mount housing.

9 Claims, 8 Drawing Sheets



US006562503B2

(12) **United States Patent**
Grasso et al.

(10) **Patent No.: US 6,562,503 B2**
(45) **Date of Patent: May 13, 2003**

(54) **FREEZE TOLERANT FUEL CELL POWER PLANT**

(75) Inventors: **Albert P. Grasso**, Vernon, CT (US); **David A. Condit**, Avon, CT (US)

(73) Assignee: **UTC Fuel Cells, LLC**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **10/146,606**

(22) Filed: **May 15, 2002**

(65) **Prior Publication Data**

US 2003/0039872 A1 Feb. 27, 2003

Related U.S. Application Data

(63) Continuation-in-part of application No. 09/935,254, filed on Aug. 22, 2001.

(51) **Int. Cl.**[7] **H01M 8/04**
(52) **U.S. Cl.** **429/26**; 429/24; 429/34
(58) **Field of Search** 429/26, 24, 34

(56) **References Cited**

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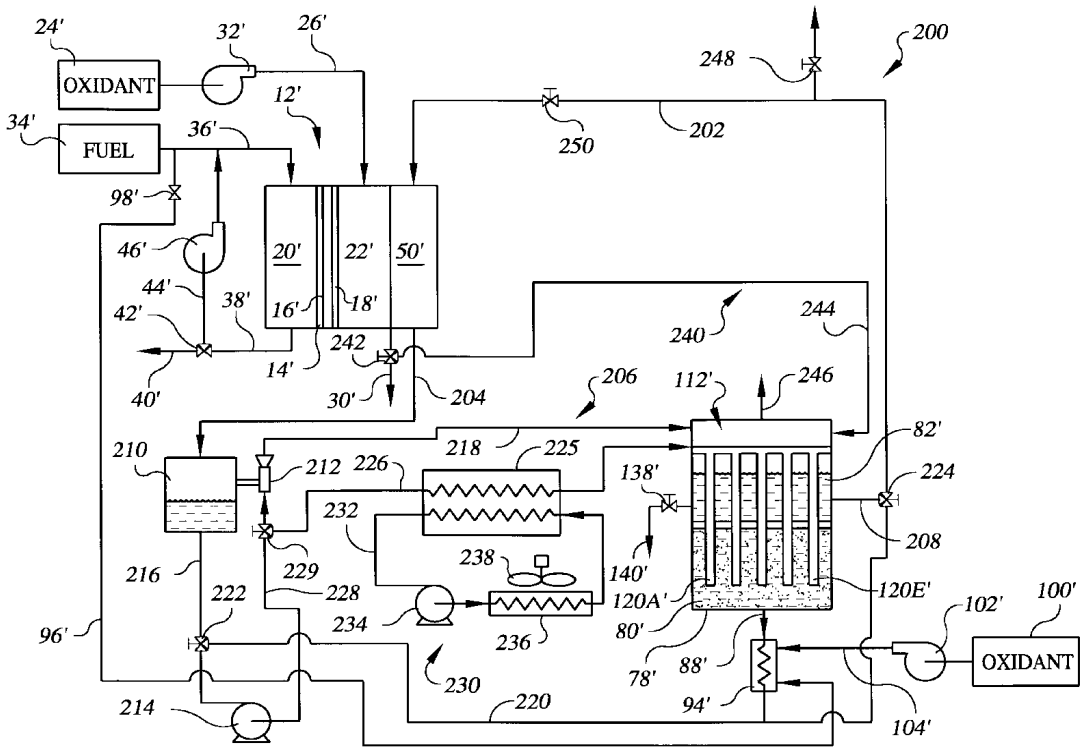
Primary Examiner—John S. Maples
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

The invention is a freeze tolerant fuel cell power plant that includes at least one fuel cell and a water transport plate secured within the fuel cell having a coolant inlet and a coolant outlet that direct a water coolant through the plate. A suction water displacement system includes a freeze tolerant accumulator secured to the coolant inlet and a vacuum separator secured to the coolant outlet having a suction generating eductor secured to the separator. Control valves and a coolant pump selectively direct either the water coolant, heated, or unheated water immiscible fluid to cycle from the accumulator, through the coolant inlet, water transport plate, coolant outlet, vacuum separator and back to the accumulator in order to permit operation and storage of the plant in sub-freezing ambient temperatures.

11 Claims, 3 Drawing Sheets



US006528194B1

(12) **United States Patent**
Condit et al.

(10) **Patent No.: US 6,528,194 B1**
(45) **Date of Patent: Mar. 4, 2003**

(54) **FREEZE TOLERANT FUEL CELL POWER PLANT**

(75) Inventors: **David A. Condit**, Avon, CT (US); **Michael L. Perry**, South Glastonbury, CT (US); **Richard D. Breault**, North Kingstown, RI (US)

(73) Assignee: **UTC Fuel Cells, LLC**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 17 days.

(21) Appl. No.: **09/935,254**

(22) Filed: **Aug. 22, 2001**

(51) **Int. Cl.**[7] **H01M 8/04**
(52) **U.S. Cl.** **429/26**; 429/24; 429/34
(58) **Field of Search** 429/26, 24, 34

(56) **References Cited**

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6,171,718	B1	1/2001	Murach et al.	
6,232,006	B1	5/2001	Breault	
6,316,135	B1 *	11/2001	Breault et al.	429/26 X
6,440,595	B1 *	8/2002	Herdeg et al.	429/26

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The Author is "3M Speciality Fluids"; The title is "Practical Two Phase Cooling of Fuel Cells with 3M "Novec" Engineered Fluids"; Published on the world wide web, at www.3m.com/market/industrial/fluids/refheat/fuelcell.html. (No Date).

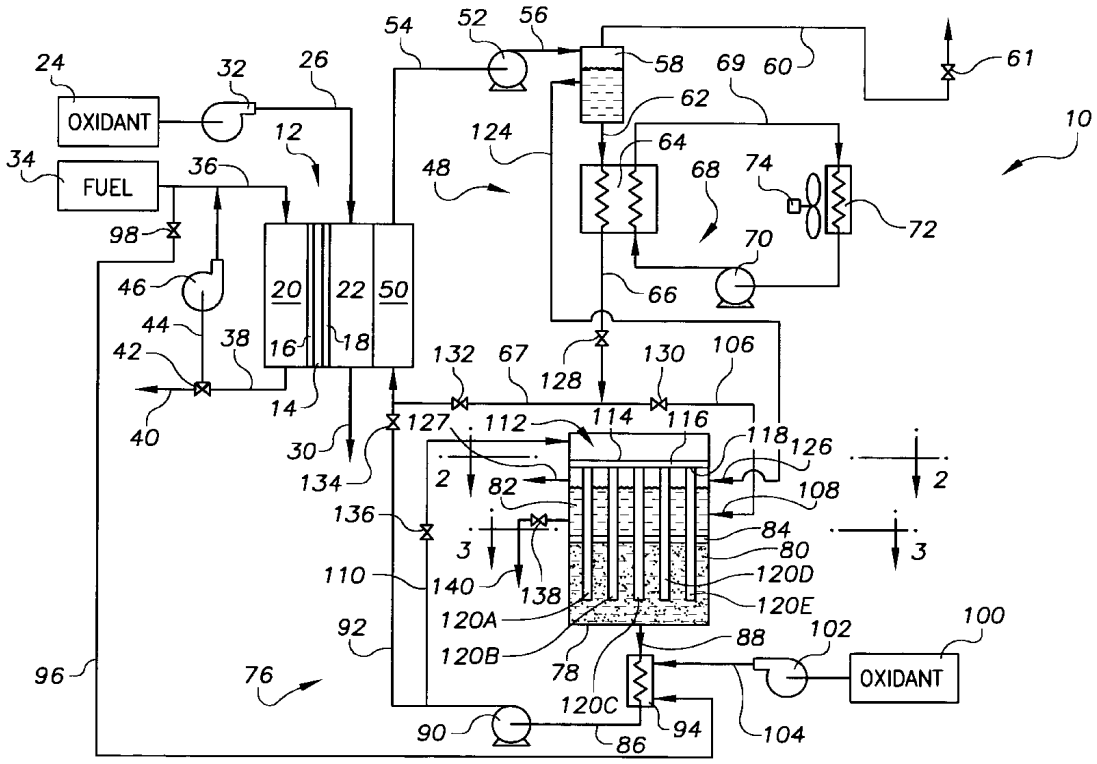
* cited by examiner

Primary Examiner—John S. Maples
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

The invention is a freeze tolerant fuel cell power plant that includes at least one fuel cell; a coolant loop having a coolant circulating device that directs a water coolant through a water transport plate within the fuel cell; and a water displacement system having a freeze tolerant accumulator that contains a water immiscible fluid and water coolant. The water displacement system also includes a water immiscible fluid pump, heater and displacement valves for directing the water immiscible fluid to flow from the accumulator into the coolant loop; for directing the water coolant in the coolant loop to flow into the accumulator; and, for directing heated water immiscible fluid to flow from the accumulator into the coolant loop and back into the accumulator.

18 Claims, 2 Drawing Sheets



US006523464B1

(12) **United States Patent**
Widelo

(10) **Patent No.: US 6,523,464 B1**
(45) **Date of Patent: Feb. 25, 2003**

(54) **AUTOMATED PEELER**

(76) Inventor: **Ronald J. Widelo**, 326 West St., Hatfield, MA (US) 01066

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **10/244,498**

(22) Filed: **Sep. 16, 2002**

Related U.S. Application Data

(60) Provisional application No. 60/323,495, filed on Sep. 19, 2001.

(51) **Int. Cl.**[7] **A23N 7/00**; A47J 17/00; A47J 17/14; A47J 17/16

(52) **U.S. Cl.** **99/541**; 99/590; 99/593; 99/594; 99/599

(58) **Field of Search** 99/539–541, 584, 99/588–599; 426/481–483

(56) **References Cited**

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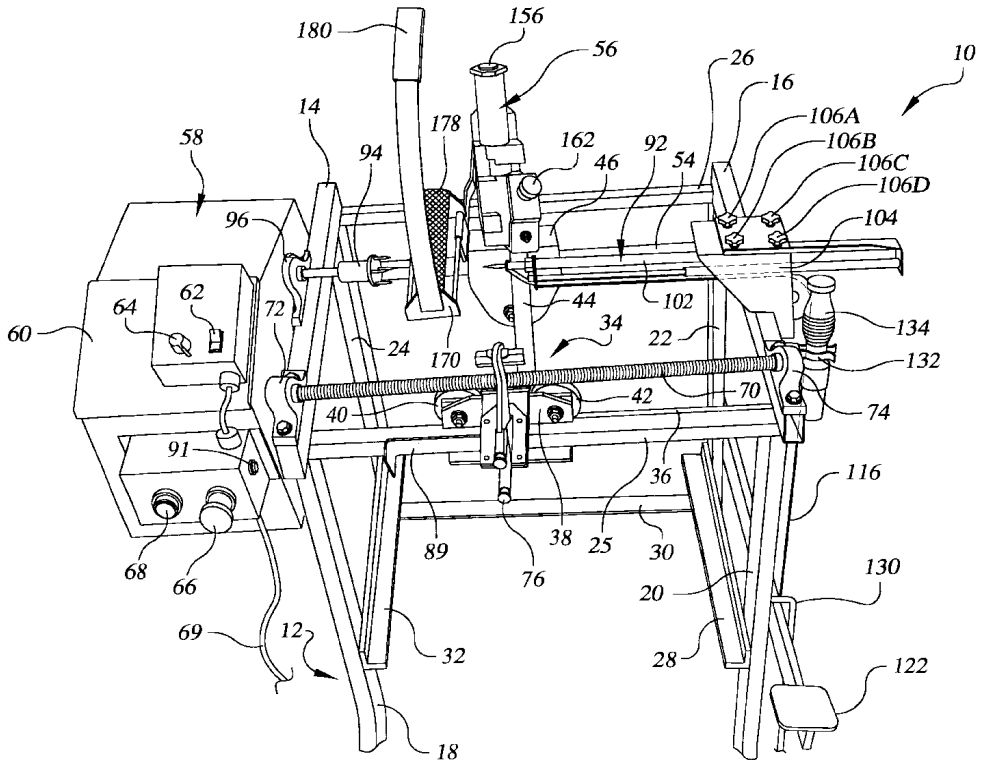
Primary Examiner—Timothy F. Simone
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

The invention is an automated peeler for peeling vegetables or fruit. The peeler includes a split axle support for securing and rotating an object to be peeled within a frame, and a peeling blade supported on an articulating peeler blade mount secured through a blade arm to a peeler support. As the peeler support is driven along a peeler carriage, a torsion drive forces the peeler blade against the rotating object. The articulating peeler blade mount permits the peeling blade to track an irregular surface of a vegetable such as a butternut squash. The peeling blade comprises an arcuate cutting surface having at least one blade tip extending above a throughbore defined in the surface of the peeling blade so that a peel of the object passes through the throughbore defined in the peeling blade.

17 Claims, 8 Drawing Sheets



US006521367B2

(12) **United States Patent**
Reiser

(10) **Patent No.: US 6,521,367 B2**
(45) **Date of Patent: Feb. 18, 2003**

(54) **FUEL CELL WITH AN ELECTROLYTE DRY-OUT BARRIER**

(75) Inventor: **Carl Anthony Reiser**, Stonington, CT (US)

(73) Assignee: **UTC Fuel Cells, LLC**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 118 days.

(21) Appl. No.: **09/731,307**

(22) Filed: **Dec. 6, 2000**

(65) **Prior Publication Data**

US 2002/0068214 A1 Jun. 6, 2002

(51) **Int. Cl.**[7] **H01M 2/00**
(52) **U.S. Cl.** **429/34**; 429/35; 429/38
(58) **Field of Search** 429/39, 38, 36, 429/34, 26, 35

(56) **References Cited**

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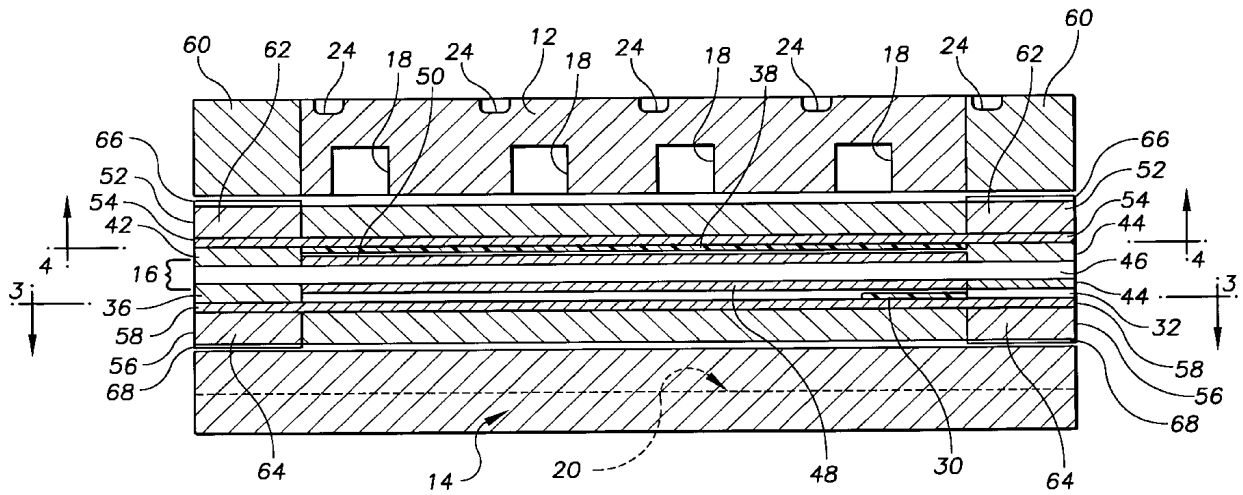
Primary Examiner—Stephen Kalafut
Assistant Examiner—R Alejandro
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

The invention is a fuel cell with an electrolyte dry-out barrier to restrict loss of water from the electrolyte. The fuel cell includes: an anode catalyst and a cathode catalyst secured to opposed sides of an electrolyte; an anode flow field disposed adjacent the anode catalyst for directing the reducing fluid to pass adjacent the anode catalyst, and a cathode flow field disposed adjacent the cathode catalyst for directing the process oxidant stream to pass adjacent the cathode catalyst; and, an anode electrolyte dry-out barrier secured between the electrolyte and the anode flow field for restricting transfer of water from the electrolyte into the anode flow field. The anode electrolyte dry-out barrier extends from adjacent an entire reducing fluid inlet and along an entire reducing fluid flow path a distance that is adequate for the reducing fluid stream flowing through the anode flow field to become saturated with water. The fuel cell may also include a cathode electrolyte dry-out barrier secured between the electrolyte and the cathode flow field. The anode and/or cathode electrolyte dry-out barriers may consist of polymeric sealants coating or impregnating barrier regions of porous layers between the electrolyte and the anode and/or cathode flow fields.

13 Claims, 3 Drawing Sheets



US006488443B2

(12) **United States Patent**
Garrity, Jr.

(10) **Patent No.: US 6,488,443 B2**
(45) **Date of Patent: Dec. 3, 2002**

(54) **PULL SPREADER**

(76) Inventor: **Robert A. Garrity, Jr.**, P.O. Box 1671, Pittsfield, MA (US) 01201

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/758,733**

(22) Filed: **Jan. 11, 2001**

(65) **Prior Publication Data**

US 2002/0090263 A1 Jul. 11, 2002

(51) **Int. Cl.**[7] **E01C 19/18**
(52) **U.S. Cl.** **404/110**; 404/108; 404/101; 404/118; 298/27
(58) **Field of Search** 404/101, 104, 404/105, 108, 110, 118; 298/27; 171/16

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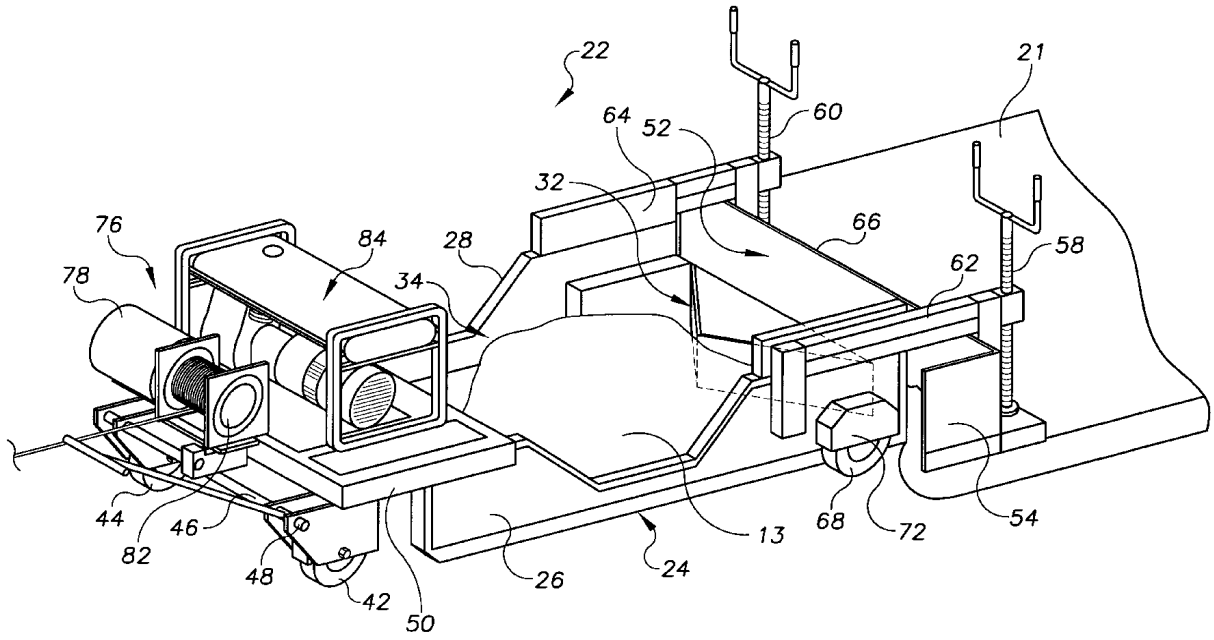
Primary Examiner—Gary S. Hartmann
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

A pull spreader for spreading a surface material such as asphalt on a path. The pull spreader includes an open-bottomed frame having a first side wall and an opposed second side wall, a front wall extending between the first and second side walls, a screed wall opposed to the front wall and extending between the first and second side walls so that the first and second side walls, front wall and screed wall define a storage chamber for the surface material, wherein the storage chamber has an inlet area defined between top edges of the side walls, front wall and screed wall that is about the same as or smaller than a discharge area of the storage chamber defined between bottom edges of the side walls, front wall and screed wall which bottom edges are adjacent the path over which the pull spreader travels. The pull spreader also includes at least one steering wheel secured to a front frame extension extending from the front wall in a direction away from the storage chamber. A pull coupling is also secured to the front frame extension so that the pull spreader may be pulled and steered along the path by a cable secured to the pull coupling. The pull coupling may be a power winch and a power source for the winch. A screed discharge secured to the frame forms the surface material as the pull spreader is pulled along the path.

16 Claims, 5 Drawing Sheets



US006461753B1

(12) **United States Patent**
Breault et al.

(10) **Patent No.: US 6,461,753 B1**
(45) **Date of Patent: Oct. 8, 2002**

(54) **FUEL CELL WITH A DIRECT ANTIFREEZE IMPERMEABLE COOLER PLATE**

(75) Inventors: **Richard D. Breault**, North Kingstown, RI (US); **Margaret M. Steinbugler**, East Windsor; **David A. Condit**, Avon, both of CT (US)

(73) Assignee: **UTC Fuel Cells, LLC**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/542,209**

(22) Filed: **Apr. 4, 2000**

(51) **Int. Cl.**[7] **H01M 8/04**
(52) **U.S. Cl.** **429/26**; 429/22
(58) **Field of Search** 429/22.26

(56) **References Cited**

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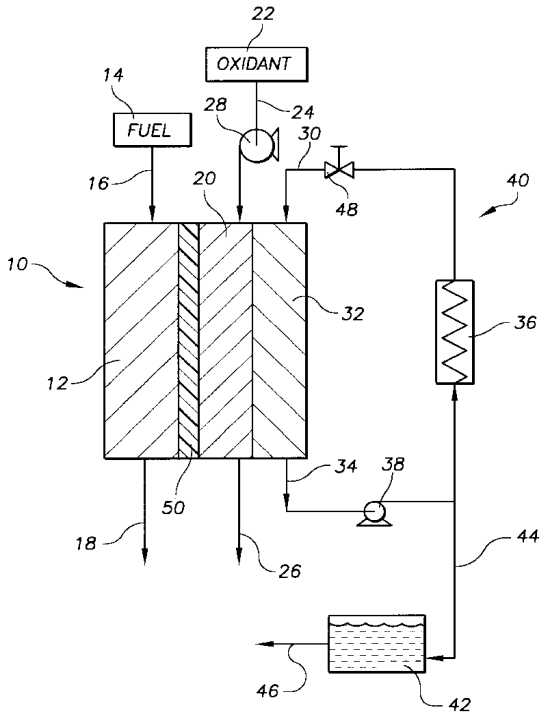
Primary Examiner—Stephen Kalafut
Assistant Examiner—Tracy Dove
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

A fuel cell with a direct antifreeze impermeable cooler plate is disclosed for producing electrical energy from reducing fluid and process oxidant reactant streams. The fuel cell includes an electrolyte secured between an anode catalyst and a cathode catalyst; an anode flow field secured adjacent the anode catalyst for directing the reducing fluid to pass adjacent the anode catalyst; a cathode flow field secured adjacent the cathode catalyst for directing the process oxidant stream to pass adjacent the cathode catalyst; a direct antifreeze impermeable cooler plate secured in heat exchange relationship with the cathode flow field; and a direct antifreeze solution passing through the cooler plate for controlling temperature within the fuel cell. The direct antifreeze solution is an organic antifreeze solution that is not volatile at cell operating temperatures. A preferred direct antifreeze solution is an alkanetriol selected from the group consisting of glycerol, butanetriol, and pentanetriol having favorable low volatility and high surface tension characteristics. The direct antifreeze impermeable cooler plate may be constructed of any material that is impermeable to liquid and compatible with a fuel cell operating environment such as plated metals, or in a preferred embodiment, the cooler plate may be a fine pore commercial graphite material.

11 Claims, 2 Drawing Sheets



US006432566B1

(12) **United States Patent**
Condit et al.

(10) **Patent No.: US 6,432,566 B1**
(45) **Date of Patent: Aug. 13, 2002**

(54) **DIRECT ANTIFREEZE COOLED FUEL CELL POWER PLANT**

(75) Inventors: **David A. Condit**, Avon, CT (US); **Richard D. Breault**, North Kingstown, RI (US); **Leslie L. Van Dine**, Manchester; **Margaret M. Steinbugler**, East Windsor, both of CT (US)

(73) Assignee: **UTC Fuel Cells, LLC**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/426,357**

(22) Filed: **Oct. 25, 1999**

(51) **Int. Cl.**[7] **H01M 8/04**
(52) **U.S. Cl.** **429/17**; 429/26
(58) **Field of Search** 429/12, 13, 17, 429/20, 26, 34, 38

(56) **References Cited**

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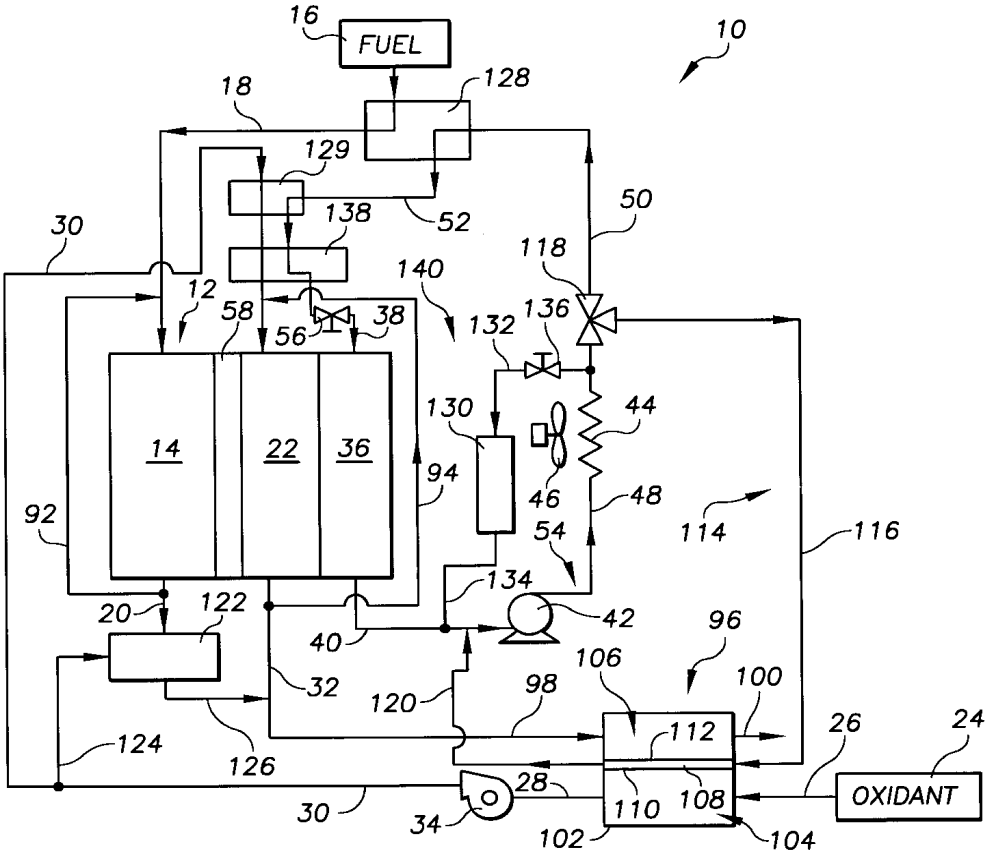
* cited by examiner

Primary Examiner—Patrick Ryan
Assistant Examiner—M. Wills
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

A direct antifreeze cooled fuel cell power plant is disclosed. The plant includes at least one fuel cell a thermal management system that directs flow of a cooling fluid for controlling heat within the plant, including a direct antifreeze solution passing through the water transport plate. The plant also integrates the direct antifreeze solution with a direct mass and heat transfer device, a water treatment system, and a steam injection system so that the direct antifreeze solution minimizes problems related to operation of the plant in sub-freezing conditions. A preferred antifreeze solution is an alkanetriol selected from the group consisting of glycerol, butanetriol, and pentanetriol. The direct antifreeze solutions minimize movement of the antifreeze as a vapor out of a water transport plate into contact with cathode or anode catalysts, and also minimize direct antifreeze solution loss from other power plant systems.

47 Claims, 4 Drawing Sheets



US006425311B1

(12) **United States Patent**
Caron

(10) **Patent No.: US 6,425,311 B1**
(45) **Date of Patent: Jul. 30, 2002**

(54) **PRY-PROOF GUN PORT**

(75) Inventor: **Jeffrey A. Caron**, Adams, MA (US)

(73) Assignees: **Christopher M. Light**; **Gail V. Light**, both of Pittsfield, MA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 9 days.

(21) Appl. No.: **09/631,020**

(22) Filed: **Aug. 2, 2000**

(51) **Int. Cl.**[7] **F41H 5/26**
(52) **U.S. Cl.** **89/36.14**; 109/58.5
(58) **Field of Search** 89/36.14, 36.03; 109/58.5

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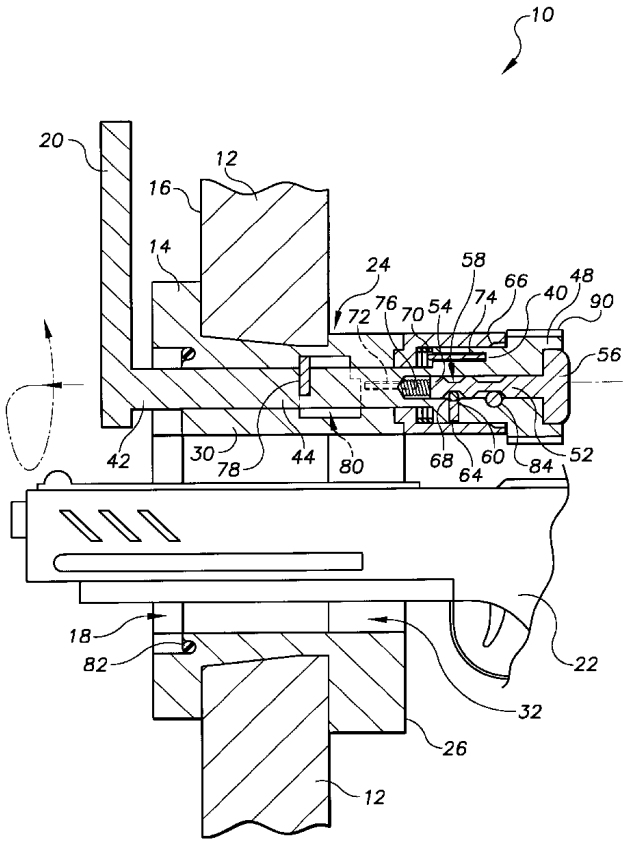
Primary Examiner—Michael L. Carone
Assistant Examiner—M Thomson
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

The invention is a pry-proof gun port for shielding a gun whenever the gun port is in a closed position and for permitting the gun to be discharged through the gun port whenever the gun port is in an open position. The gun port includes a frame mountable to a support structure such as a currency transport vehicle, the frame including an exterior mount plate that defines a discharge port dimensioned to support a closure shield. A push rod has an exterior end secured to a peripheral region of the closure shield and an intermediate portion passing through a chamber of the frame. The push rod moves axially to position the closure shield out of the discharge port, and the push rod then rotates the closure shield away from the discharge port to place the gun port in the open position. A lock rod interacts between a shoulder of the chamber of the frame and a lock shaft coaxial with and within the push rod to restrict opening of the closure shield from the exterior mount plate. An operator must move the lock shaft toward the exterior mount plate before moving the push rod so that the lock rod moves out of abutment with a shoulder of a chamber of the frame to allow the push rod to move the closure shield out of the discharge port.

20 Claims, 5 Drawing Sheets



US006416892B1

(12) **United States Patent**
Breault

(10) **Patent No.: US 6,416,892 B1**
(45) **Date of Patent: Jul. 9, 2002**

(54) **INTERDIGITATED ENTHALLY EXCHANGE DEVICE FOR A FUEL CELL POWER PLANT**

(75) Inventor: **Richard D. Breault**, North Kingstown, RI (US)

(73) Assignee: **UTC Fuel Cells, LLC**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 62 days.

(21) Appl. No.: **09/627,989**

(22) Filed: **Jul. 28, 2000**

(51) **Int. Cl.**[7] **H01M 8/04**
(52) **U.S. Cl.** **429/13**; 429/20; 429/26; 429/34
(58) **Field of Search** 429/13, 20, 26, 429/34

(56) **References Cited**

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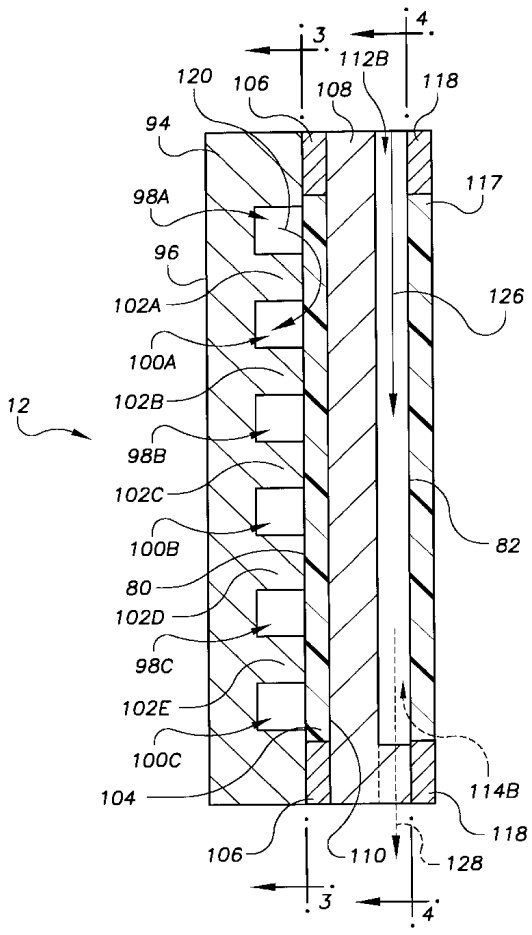
Primary Examiner—John S. Maples
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

An interdigitated enthalpy exchange device is disclosed for a fuel cell power plant that includes at least one fuel cell and a direct mass and heat transfer device secured in fluid communication with both an oxidant stream entering the fuel cell and an exhaust stream leaving the fuel cell. The direct mass and heat transfer device secures the interdigitated enthalpy exchange device in mass transfer relationship between the oxidant and exhaust streams. The device includes discontinuous oxidant entry and oxidant exit channels and discontinuous exhaust entry and exhaust exit channels, thereby providing for direct transfer of mass and heat from the exhaust stream to the oxidant stream while also restricting loss of liquid from the plant in the exhaust stream, filtering of dust entering the plant in the oxidant stream, and dampening of noise of the plant.

20 Claims, 4 Drawing Sheets



US006416891B1

(12) **United States Patent**
Condit et al.

(10) **Patent No.: US 6,416,891 B1**
(45) **Date of Patent: Jul. 9, 2002**

(54) **OPERATING SYSTEM FOR A DIRECT ANTIFREEZE COOLED FUEL CELL POWER PLANT**

(75) Inventors: **David A. Condit**, Avon, CT (US); **Richard D. Breault**, North Kingstown, RI (US); **Leslie L. Van Dine**, Manchester; **Margaret M. Steinbugler**, East Windsor, both of CT (US)

(73) Assignee: **UTC Fuel Cells, LLC**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/443,267**

(22) Filed: **Nov. 22, 1999**

(51) **Int. Cl.**[7] **H01M 8/02**
(52) **U.S. Cl.** **429/13**; 429/26
(58) **Field of Search** 429/12, 13, 17, 429/20, 26, 34, 38

(56) **References Cited**

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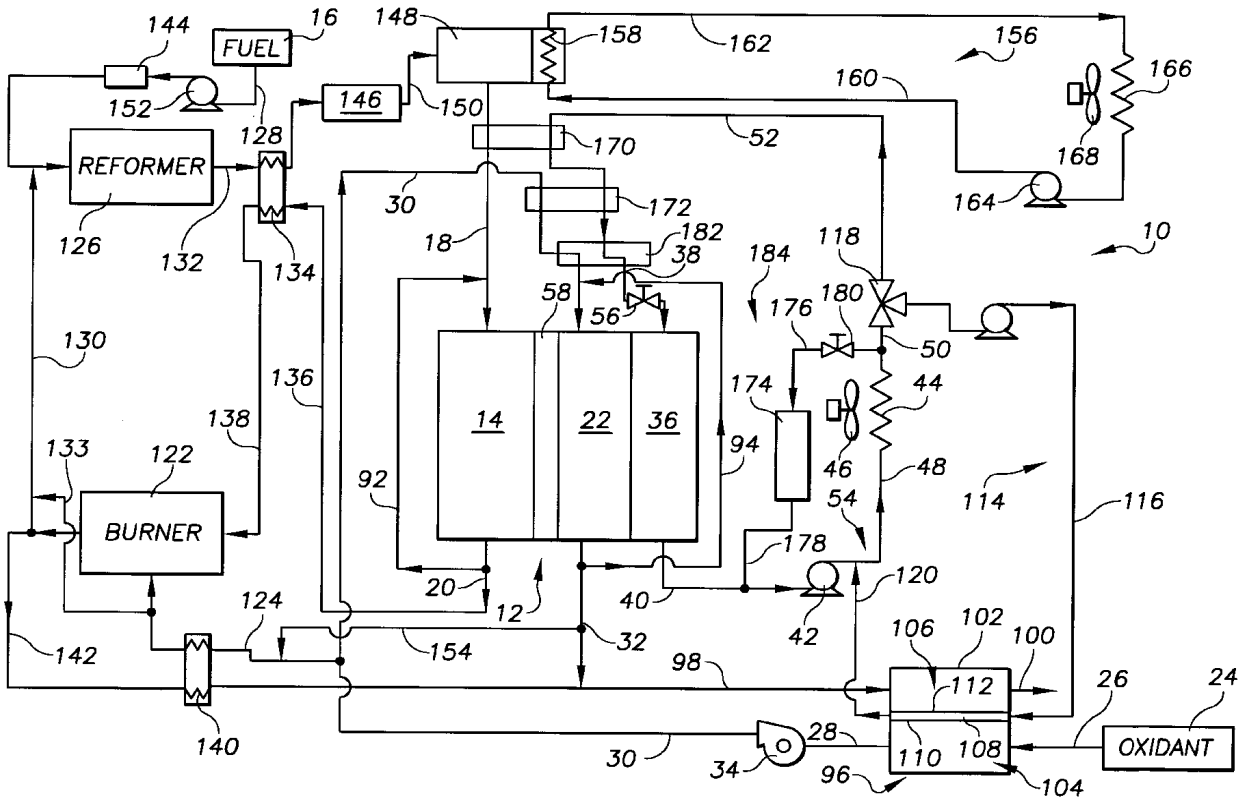
Primary Examiner—Patrick Ryan
Assistant Examiner—M. Wills
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

An operating system for a direct antifreeze cooled fuel cell power plant is disclosed for producing electrical energy from reducing and process oxidant fluid reactant streams. The system includes at least one fuel cell for producing electrical energy from the reducing and oxidant fluid streams; fuel processing components for processing a hydrocarbon fuel into the reducing fluid; a thermal management system that directs flow of a cooling fluid for controlling heat within the plant including a porous water transport plate adjacent and in fluid communication with a cathode catalyst of the fuel cell; a direct antifreeze solution passing through the water transport plate; and, a split oxidant passage that directs the process oxidant stream into and through the fuel cell.

28 Claims, 4 Drawing Sheets



US006406511B2

(12) **United States Patent**
Gunner et al.

(10) **Patent No.: US 6,406,511 B2**
(45) **Date of Patent: Jun. 18, 2002**

(54) **SPRAYABLE ORGANIC FERTILIZER**

(75) Inventors: **Haim B. Gunner**, Amherst; **William A. Torello**, South Deerfield; **Ming-Jung Coler**, Anmherst, all of MA (US)

(73) Assignee: **EcoOrganics, Inc.**, Amherst, MA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/878,563**

(22) Filed: **Jun. 11, 2001**

Related U.S. Application Data

(60) Provisional application No. 60/211,640, filed on Jun. 14, 2000.

(51) **Int. Cl.**[7] **C05F 11/00**

(52) **U.S. Cl.** **71/23**; 71/64; 71/64.13; 71/904

(58) **Field of Search** 71/23, 64, 64.13, 71/904

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Primary Examiner—Chhaya D. Sayala
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

The invention is a sprayable organic fertilizer for application to a plant or plant soil that includes denatured soybean particles having a total protein content of at least fifty and up to ninety percent by weight, wherein the denatured soybean particles have a particle size of no greater than 250 microns, and wherein the denatured soybean particles are dispersed in an adequate amount of a liquid carrier so that the particles may be evenly sprayed onto the plant or plant soil through a liquid applicator. The denatured soybean particles may be mixed with a yeast extract that stimulates microbial growth. The sprayable organic fertilizer cannot be leached from the soil; cannot burn target plants; enhances the ecosystem of the root zone of the target plants; and, provides a high nitrogen analysis.

13 Claims, 3 Drawing Sheets

US006376114B1

(12) **United States Patent**
Bonville, Jr. et al.

(10) **Patent No.: US 6,376,114 B1**
(45) **Date of Patent: Apr. 23, 2002**

(54) **REFORMATE FUEL TREATMENT SYSTEM FOR A FUEL CELL POWER PLANT**

(75) Inventors: **Leonard J. Bonville, Jr.**, Marlborough; **Ned E. Cipollini**, Enfield; **Jay Garow**, Ellington; **Roger R. Lesieur**, Enfield; **Donald F. Szydlowski**, Ellington; **Zebulon D. Vance**, Plantsville; **Douglas J. Wheeler**, Tolland, all of CT (US)

(73) Assignee: **UTC Fuel Cells, LLC**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 25 days.

(21) Appl. No.: **09/583,824**

(22) Filed: **May 30, 2000**

(51) **Int. Cl.**[7] **H01M 8/06**; H01M 8/10
(52) **U.S. Cl.** **429/19**; 429/20; 429/30
(58) **Field of Search** 429/17, 19, 20, 429/30, 33, 34

(56) **References Cited**

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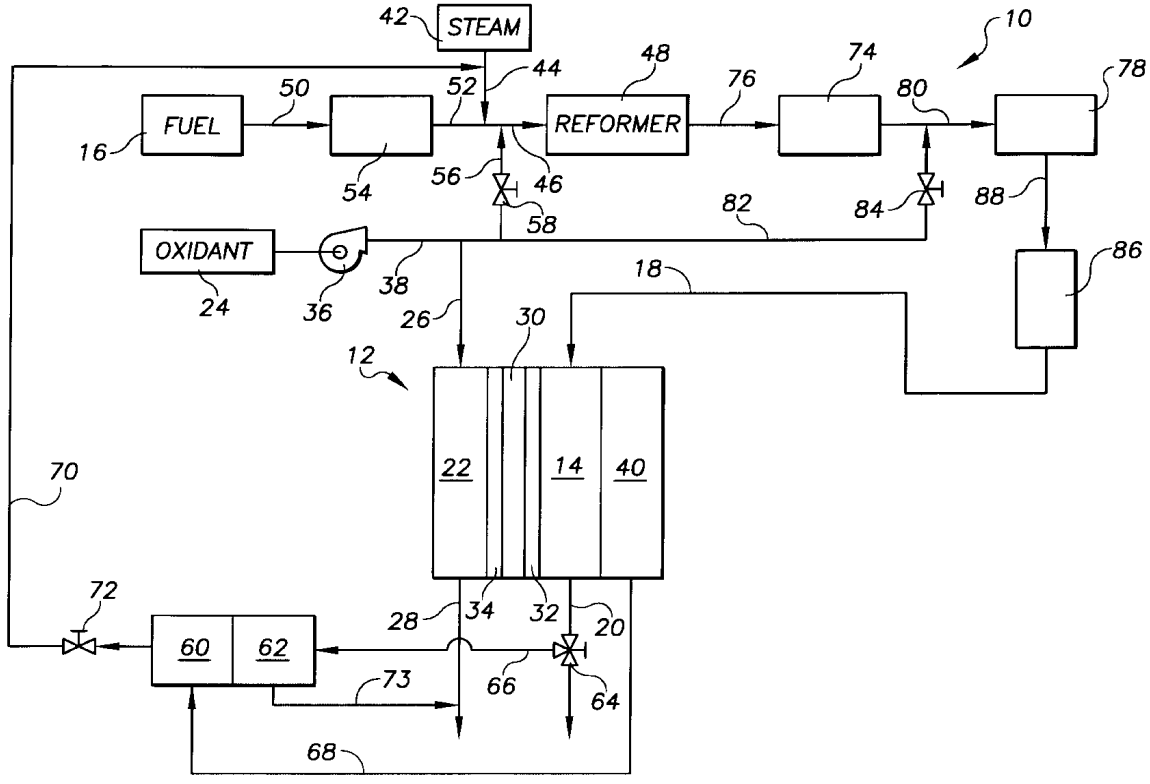
Primary Examiner—Stephen Kalafut
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

The invention is a reformate fuel treatment system for a fuel cell power plant that includes at least one fuel cell for generating electricity from process oxidant and reducing fluid reactant streams; fuel processing components including a steam supply and a reformer for producing a hydrogen enriched reformate fuel for the fuel cell from a hydrocarbon fuel; and, an ammonia removal apparatus that treats the reformate fuel to make it appropriate for supplying hydrogen to an anode electrode of the fuel cell. The ammonia removal apparatus may be a disposable ammonia scrubber, an ammonia scrubbing cool water bed and an ammonia stripping warm water bed, a pair of first and second regenerable scrubbers, or a single regenerable ammonia scrubber.

10 Claims, 4 Drawing Sheets



US006365291B1

(12) **United States Patent**
Margiott

(10) **Patent No.: US 6,365,291 B1**
(45) **Date of Patent: Apr. 2, 2002**

(54) **DIRECT ANTIFREEZE SOLUTION CONCENTRATION CONTROL SYSTEM FOR A FUEL CELL POWER PLANT**

(75) Inventor: **Paul R. Margiott**, Windsor, CT (US)

(73) Assignee: **UTC Fuel Cells, LLC**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/543,210**

(22) Filed: **Apr. 5, 2000**

(51) **Int. Cl.**[7] **H02M 8/04**
(52) **U.S. Cl.** **429/25**; 429/26; 429/34
(58) **Field of Search** 429/25, 26, 34

(56) **References Cited**

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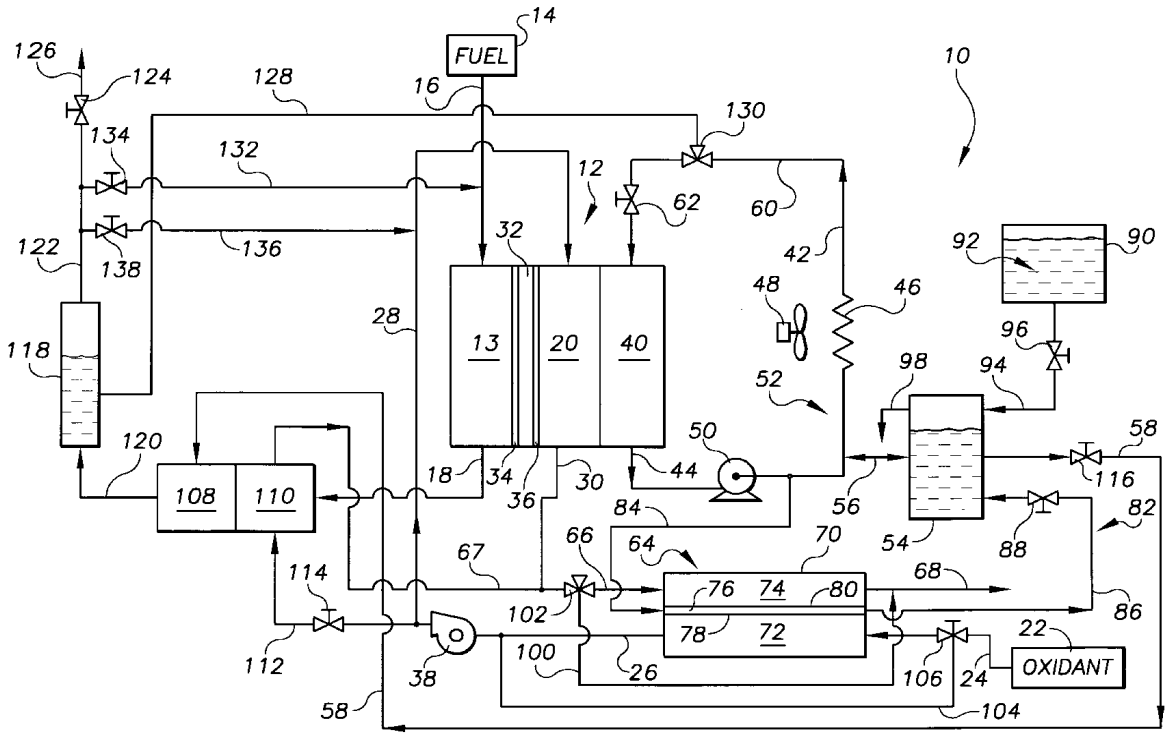
* cited by examiner

Primary Examiner—Stephen Kalafut
(74) *Attorney, Agent, or Firm*—Malcolm J Chisholm, Jr.

(57) **ABSTRACT**

The invention is a direct antifreeze solution concentration control system for a fuel cell power plant that controls a concentration of a direct antifreeze within a direct antifreeze solution cooling fluid within the plant. The concentration control system includes at least one fuel cell; a thermal management system that controls a temperature within the fuel cell including a porous water transport plate secured in direct fluid communication with a cathode catalyst of the fuel cell, wherein the direct antifreeze solution passes through the water transport plate; a water recovery device in fluid communication with a process exhaust stream exiting the fuel cell for recovering water from the process exhaust stream; and, a process exhaust by-pass line in fluid communication between the fuel cell and a plant exhaust vent that selectively directs some or all of the process exhaust stream to by-pass the water recovery device and to pass out of the plant through the plant exhaust vent. Whenever water recovery by the water recovery device exceeds a specified maximum rate, the process exhaust by-pass line directs the process exhaust to by-pass the water recovery device and thereby restrict dilution of the direct antifreeze solution. The concentration control system may also include a boiler in fluid communication with the thermal management system that boils the direct antifreeze solution to produce steam for selectively directing steam out of the power plant through a steam exhaust vent.

24 Claims, 2 Drawing Sheets



US006361891B1

(12) **United States Patent**
Breault et al.

(10) **Patent No.: US 6,361,891 B1**
(45) **Date of Patent: Mar. 26, 2002**

(54) **DIRECT ANTIFREEZE COOLED FUEL CELL POWER PLANT SYSTEM**

(75) Inventors: **Richard D. Breault**, North Kingstown, RI (US); **David A. Condit**, Avon, CT (US); **Leslie L. Van Dine**, Manchester, CT (US); **Margaret M. Steinbugler**, East Windsor, CT (US)

(73) Assignee: **UTC Fuel Cells, LLC**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/467,810**

(22) Filed: **Dec. 20, 1999**

(51) **Int. Cl.**[7] **H01M 8/04**; H01M 8/10; H01M 8/06

(52) **U.S. Cl.** **429/26**; 429/24; 429/22

(58) **Field of Search** 429/22, 26, 24

(56) **References Cited**

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6,013,385 A	*	1/2000	Dubose	429/17

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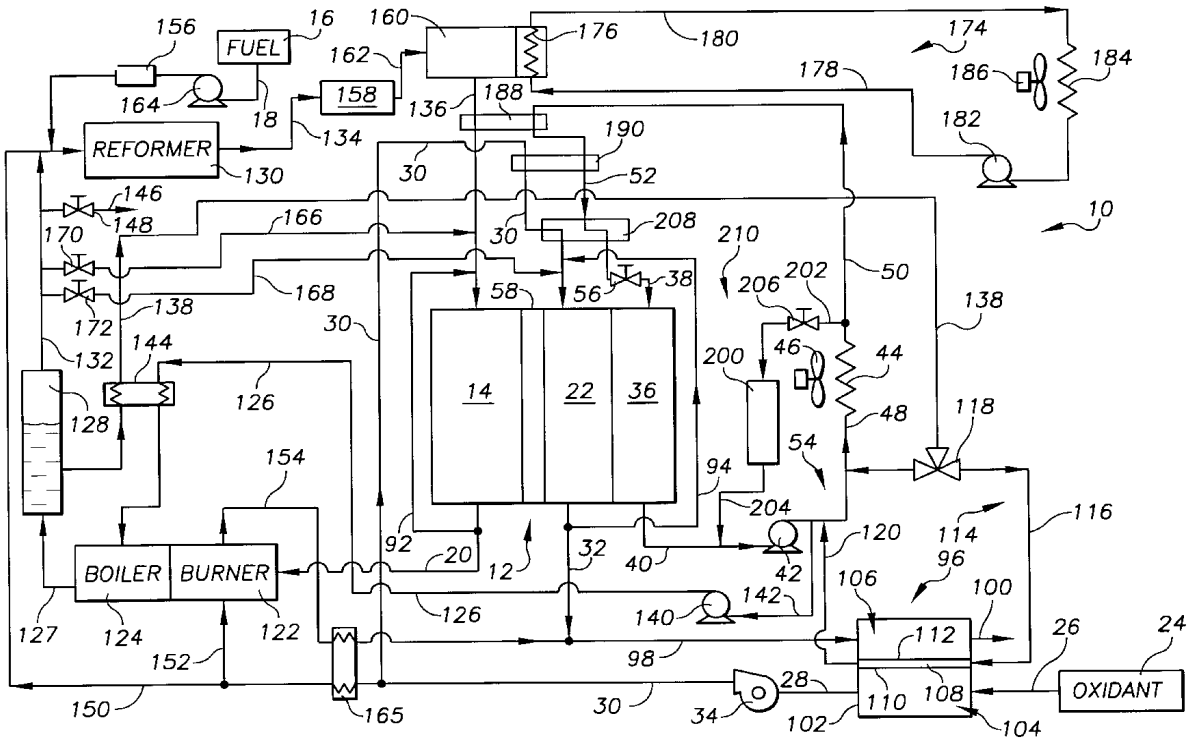
Primary Examiner—Carol Chaney
Assistant Examiner—Tracy Dove
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

A direct antifreeze cooled fuel cell power plant system is disclosed for producing electrical energy from reducing and process oxidant fluid reactant streams. The system includes at least one fuel cell for producing electrical energy from the reducing and oxidant fluid streams; a thermal management system that directs flow of a cooling fluid for controlling temperature within the plant including a porous water transport plate adjacent and in direct fluid communication with a cathode catalyst of the fuel cell; a direct antifreeze solution passing through the water transport plate; and, fuel processing components secured in fluid communication with the thermal management system for processing a hydrocarbon fuel into the reducing fluid and for controlling a concentration of a direct antifreeze in the direct antifreeze solution. The fuel processing components may include a boiler that receives a portion of the direct antifreeze solution from the thermal management system; a steam separator that directs separated steam from the boiler to a reformer for reforming the hydrocarbon fuel to the reducing fluid, and that directs separated liquid direct antifreeze solution back to the thermal management system. A preferred direct antifreeze solution is an alkanetriol selected from the group consisting of glycerol, butanetriol, and pentanetriol.

37 Claims, 4 Drawing Sheets



US006331366B1

(12) **United States Patent**
Van Dine et al.

(10) **Patent No.: US 6,331,366 B1**
(45) **Date of Patent: Dec. 18, 2001**

(54) **OPERATING SYSTEM FOR A FUEL CELL POWER PLANT**

(75) Inventors: **Leslie L. Van Dine**, Manchester; **Albert P. Grasso**, Vernon, both of CT (US)

(73) Assignee: **International Fuel Cells LLC**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/338,608**

(22) Filed: **Jun. 23, 1999**

(51) **Int. Cl.**[7] **H01M 8/06**
(52) **U.S. Cl.** **429/17**; 429/20; 429/26
(58) **Field of Search** 429/17, 19, 20, 429/26

(56) **References Cited**

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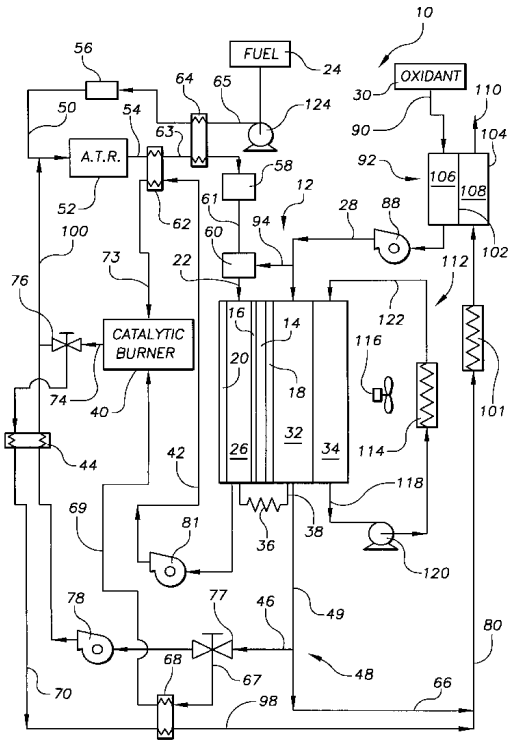
Primary Examiner—Stephen Kalafut
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

The invention is an operating system for a fuel cell power plant that includes at least one fuel cell for producing electrical energy from a reducing and oxidant fluid and fuel processing components including a reformer and a burner for processing a hydrocarbon fuel into the reducing fluid, and a direct mass and heat transfer device secured in fluid communication with both a process oxidant stream and a plant exhaust passage, so that the device directly transfers mass such as water exiting the plant in a plant exhaust stream back into the plant within the process oxidant stream. The invention also includes a split oxidant passage that directs the process oxidant stream through the fuel cell and a reformer feed portion of the process oxidant stream into fluid communication with the fuel processing components. The system may also include an anode exhaust passage that directs an anode exhaust from the fuel cell into the burner, then directs the oxidized anode exhaust stream from the burner in heat exchange relationship with the reformer feed portion.

24 Claims, 2 Drawing Sheets



US006322915B1

(12) **United States Patent**
Collins et al.

(10) **Patent No.: US 6,322,915 B1**
(45) **Date of Patent: Nov. 27, 2001**

(54) **HUMIDIFICATION SYSTEM FOR A FUEL CELL POWER PLANT**

(75) Inventors: **William P. Collins**, South Windsor; **Leslie L. Van Dine**, Manchester, both of CT (US)

(73) Assignee: **International Fuel Cells LLC**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/357,259**

(22) Filed: **Jul. 20, 1999**

(51) **Int. Cl.**[7] **H01M 8/02**; H01M 8/04; H01M 8/10

(52) **U.S. Cl.** **429/13**; 429/25; 429/26; 429/30; 429/34; 429/38; 429/39

(58) **Field of Search** 429/13, 25, 26, 429/30, 34, 38, 39

(56) **References Cited**

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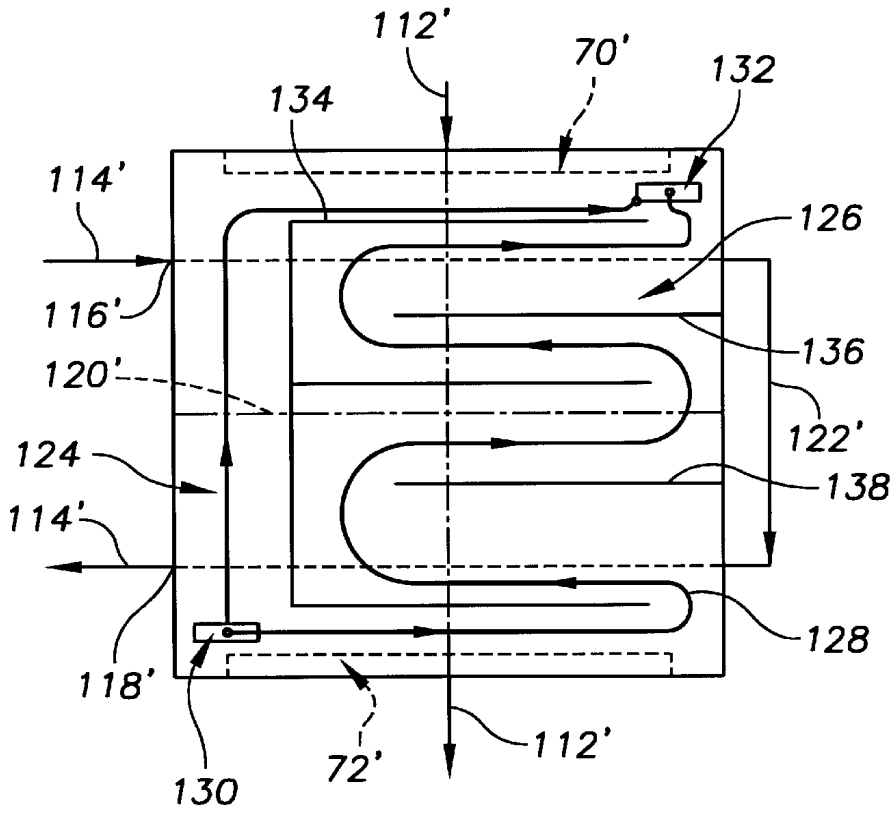
Primary Examiner—Stephen Kalafut
Assistant Examiner—Jonathan Crepeau
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

The invention is a humidification system for a fuel cell power plant. The system includes at least one fuel cell comprising a coolant flow field adjacent the cathode flow field. The coolant flow field includes a coolant inlet, a coolant outlet, and a split-path coolant distribution channel between the coolant inlet and outlet. The split-path distribution channel directs some of the coolest portion of the coolant stream to flow adjacent the cathode inlet and some of the coolest portion to flow adjacent the cathode outlet. The humidification system lowers a temperature of the process oxidant stream adjacent the cathode inlet, thereby increasing relative humidity of the stream in the cathode flow field adjacent the cathode inlet.

16 Claims, 5 Drawing Sheets



US006316135B1

(12) **United States Patent**
Breault et al.

(10) **Patent No.: US 6,316,135 B1**
(45) **Date of Patent: Nov. 13, 2001**

(54) **DIRECT ANTIFREEZE COOLED FUEL CELL**

(75) Inventors: **Richard D. Breault**, North Kingstown, RI (US); **David A. Condit**, Avon, CT (US); **Albert P. Grasso**, Vernon, CT (US); **Michael E. Gorman**, Glastonbury, CT (US)

(73) Assignee: **International Fuel Cells LLC**, South Winsdor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/359,475**

(22) Filed: **Jul. 22, 1999**

(51) **Int. Cl.**[7] **H01M 8/04**
(52) **U.S. Cl.** **429/22**; 429/26
(58) **Field of Search** 429/22, 26

(56) **References Cited**

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5,776,624	*	7/1998	Neutzler	429/26
6,013,385	*	1/2000	DuBose	429/26 X

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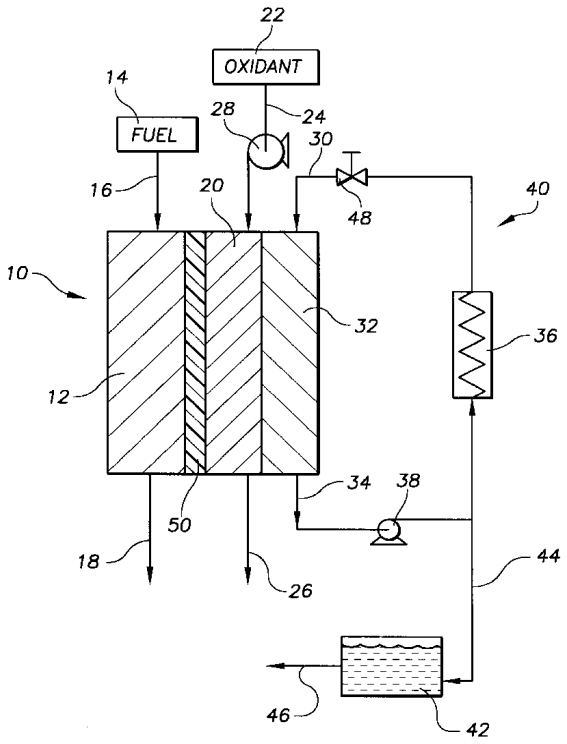
Primary Examiner—Stephen Kalafut
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

A direct antifreeze cooled fuel cell is disclosed for producing electrical energy from reducing and process oxidant fluid streams that includes an electrolyte secured between an anode catalyst and a cathode catalyst; a porous anode substrate secured in direct fluid communication with and supporting the anode catalyst; a porous wet proofed cathode substrate secured in direct fluid communication with and supporting the cathode catalyst; a porous water transport plate secured in direct fluid communication with the porous cathode substrate; and, a direct antifreeze solution passing through the porous water transport plate. In operation of the fuel cell, because product water generated electrochemically at the cathode catalyst flows away from the cathode catalyst into the cathode substrate and into the water transport plate and because the cathode substrate is wetproofed, the anti-freeze solution passing through the water transport plate remains essentially within this plate. In a preferred embodiment, the antifreeze solution passing through the water transport plate may be directed to flow at a pressure less than that of the oxidant stream passing adjacent the cathode substrate.

18 Claims, 2 Drawing Sheets



US006312842B1

(12) **United States Patent**
Reiser et al.

(10) **Patent No.: US 6,312,842 B1**
(45) **Date of Patent: Nov. 6, 2001**

(54) **WATER RETENTION SYSTEM FOR A FUEL CELL POWER PLANT**

(75) Inventors: **Carl Anthony Reiser**, Stonington; **Leslie L. Van Dine**, Manchester, both of CT (US)

(73) Assignee: **International Fuel Cells LLC**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/201,262**

(22) Filed: **Nov. 30, 1998**

(51) **Int. Cl.**[7] **H01M 8/00**
(52) **U.S. Cl.** **429/13**; 429/26
(58) **Field of Search** 429/26, 19, 13

(56) **References Cited**

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5,700,595		12/1997	Reiser	429/13

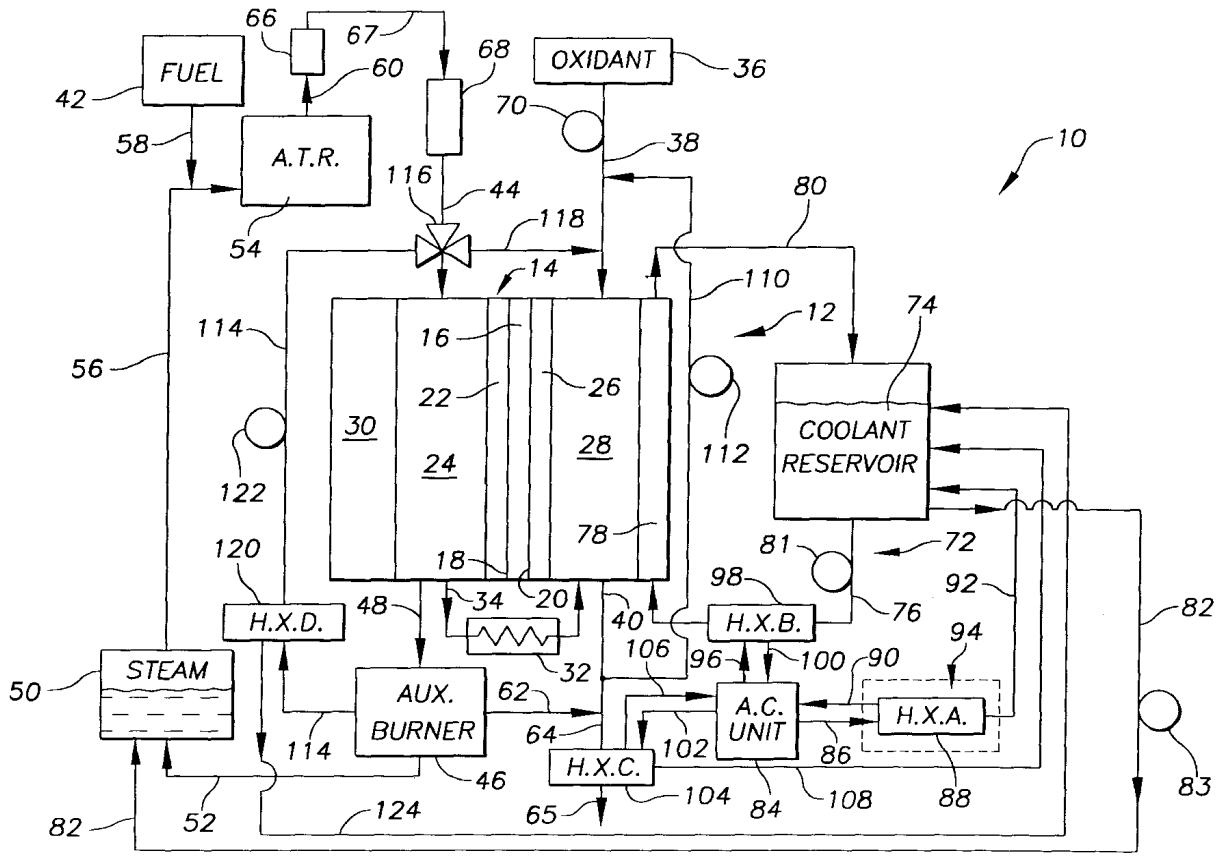
* cited by examiner

Primary Examiner—Stephen Kalafut
Assistant Examiner—Julian A. Mercado
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

The invention is a water retention system for a fuel cell power plant having at least one fuel cell and a coolant loop with a coolant reservoir and coolant passages for directing a coolant fluid through the fuel cell. An air conditioning unit is provided for directing a refrigerant to a first heat exchanger that cools secondary process air and for directing water condensed from the secondary process air to the coolant reservoir. The air conditioning unit also directs the refrigerant to a second heat exchanger that cools the coolant fluid within the coolant loop, and to a third heat exchanger that cools a plant exhaust stream exiting the plant. Water condensed from the plant exhaust is also directed from the third heat exchanger into the coolant reservoir.

12 Claims, 2 Drawing Sheets



US006277509B1

(12) **United States Patent**
Wheeler

(10) **Patent No.: US 6,277,509 B1**
(45) **Date of Patent: Aug. 21, 2001**

(54) **HYDRIDE BED WATER RECOVERY SYSTEM FOR A FUEL CELL POWER PLANT**

(75) Inventor: **Douglas J. Wheeler**, Tolland, CT (US)

(73) Assignee: **International Fuel Cells LLC**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/290,132**

(22) Filed: **Apr. 12, 1999**

(51) **Int. Cl.**[7] **H02M 8/06**
(52) **U.S. Cl.** **429/17**; 429/20; 429/26
(58) **Field of Search** 429/17, 19, 20, 429/26

(56) **References Cited**

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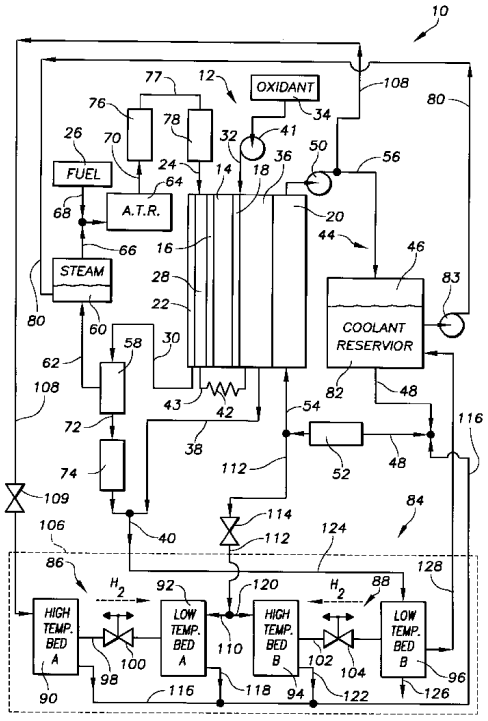
Primary Examiner—Stephen Kalafut
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

The invention is a hydride bed water recovery system for a fuel cell power plant that has at least one fuel cell having an electrolyte between anode and cathode electrodes for producing an electric current from a reducing fluid and an oxidant stream. A coolant loop directs a coolant fluid from a coolant reservoir through a coolant passage to the fuel cell and back to the reservoir. A process exhaust passage receives a cathode exhaust stream from the fuel cell and directs the stream away from the fuel cell and into a hydride bed cooler that passes the stream in heat exchange relationship with a condensing hydride bed of the cooler so that the bed cools the process exhaust stream to condense water out of the stream. In a preferred embodiment, the hydride bed cooler is a two-pair hydride bed cooler that includes a first pair and a second pair of hydride beds, and each pair includes a high temperature hydride bed, and a low temperature hydride bed so that each pair of hydride beds operates in alternating regeneration and cooling modes.

19 Claims, 3 Drawing Sheets



US006274259B1

(12) **United States Patent**
Grasso et al.

(10) **Patent No.: US 6,274,259 B1**
(45) **Date of Patent: Aug. 14, 2001**

(54) **FINE PORE ENTHALPY EXCHANGE BARRIER**

(75) Inventors: **Albert P. Grasso**, Vernon; **Ned E. Cipollini**, Enfield, both of CT (US); **Richard D. Breault**, North Kingstown, RI (US)

(73) Assignee: **International Fuel Cells LLC**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/395,704**

(22) Filed: **Sep. 14, 1999**

(51) **Int. Cl.**[7] **H02M 8/04**
(52) **U.S. Cl.** **429/13**; 429/26; 429/34
(58) **Field of Search** 429/13, 22, 24, 429/25, 26, 34

(56) **References Cited**

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6,013,385	*	1/2000	DuBose	429/26 X

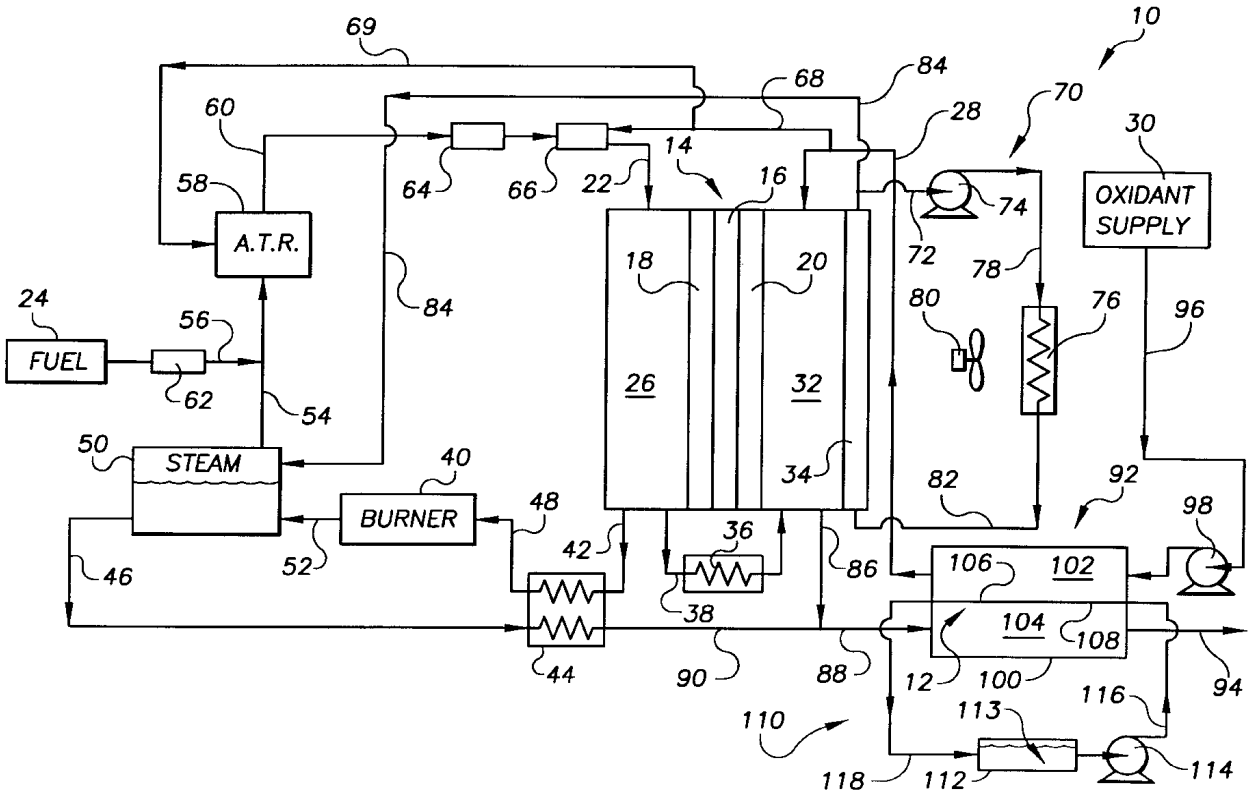
* cited by examiner

Primary Examiner—Stephen Kalafut
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

A fine pore enthalpy exchange barrier is disclosed for use with a fuel cell power plant. The barrier includes a support matrix that defines pores and a liquid transfer medium that fills the pores creating a gas barrier. An inlet surface of the fine pore enthalpy exchange barrier is positioned in contact with a process oxidant inlet stream entering a fuel cell power plant, and an opposed exhaust surface of the barrier is positioned in contact with an exhaust stream exiting the plant so that water and heat exchange from the exhaust stream directly into the process oxidant inlet stream to heat and humidify the stream as it enters the plant. The liquid transfer medium may include water, aqueous salt solutions, aqueous acid solutions, or organic antifreeze water solutions.

28 Claims, 2 Drawing Sheets



US006238143B1

(12) **United States Patent**
Zablonski

(10) **Patent No.: US 6,238,143 B1**
(45) **Date of Patent: May 29, 2001**

(54) **GROUND ANCHOR**

(76) Inventor: **Alan Zablonski**, Route 7A, Box 591, Sheffield, MA (US) 01257

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/411,816**

(22) Filed: **Oct. 1, 1999**

(51) **Int. Cl.**[7] **E02D 5/80**
(52) **U.S. Cl.** **405/259.1**; 52/163
(58) **Field of Search** 405/172, 244, 405/259.1; 52/162–166

(56) **References Cited**

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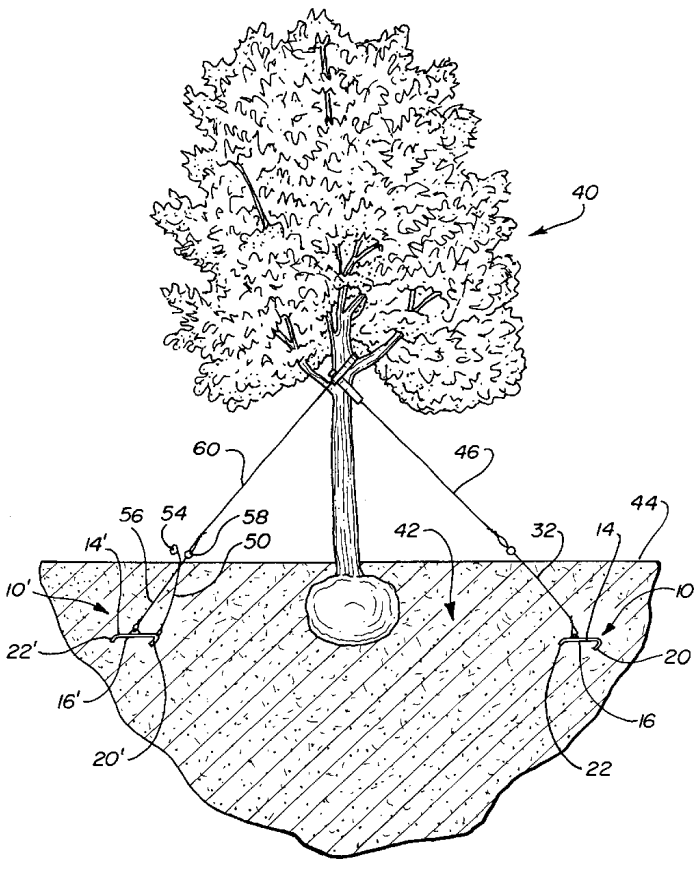
* cited by examiner

Primary Examiner—David Bagnell
Assistant Examiner—Tara L. Mayo
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm, Jr.

(57) **ABSTRACT**

The invention is an improved ground anchor for securing an anchor cable to the ground. The ground anchor includes a body having a cable mount surface and an opposed drive rod surface, and a drive end defining a curled tip with a guide end opposed to the drive end defining first and second guide forks. An anchor cable mount projects from the cable mount surface of the body about midway between the drive and guide ends. The curled tip defines a guide bore, the first and second guide forks define a drive rod slot, and the curled tip and guide forks extend from the drive rod surface in the same or first direction so that a drive rod may pass through the drive rod slot into the guide bore. The anchor cable mount extends away from the cable mount surface in a second direction opposed to the first direction so that the cable mount does not interfere with the drive rod passing through the drive rod slot and guide bore. In alternative embodiments of the present ground anchor, the drive end or guide end of the body define extraction cable mounts dimensioned to receive an extraction cable. The guide bore and drive rod slot provide for use of any drive rod narrow enough to rest in the drive rod slot and having a pointed tip that engages but does not pass through the guide bore.

14 Claims, 7 Drawing Sheets



US006232006B1

(12) **United States Patent**
Breault

(10) **Patent No.: US 6,232,006 B1**
(45) **Date of Patent: May 15, 2001**

(54) **DUAL COOLANT LOOP FUEL CELL POWER PLANT**

(75) Inventor: **Richard D. Breault**, North Kingstown, RI (US)

(73) Assignee: **International Fuel Cells LLC**, South Windsor, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/215,964**

(22) Filed: **Dec. 18, 1998**

(51) **Int. Cl.**[7] **H01M 8/04**
(52) **U.S. Cl.** **429/26**; 429/34
(58) **Field of Search** 429/26, 34, 24, 429/20

(56) **References Cited**

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5,573,866		11/1996	Van Dine et al.	429/13
5,700,595		12/1997	Reiser	429/13

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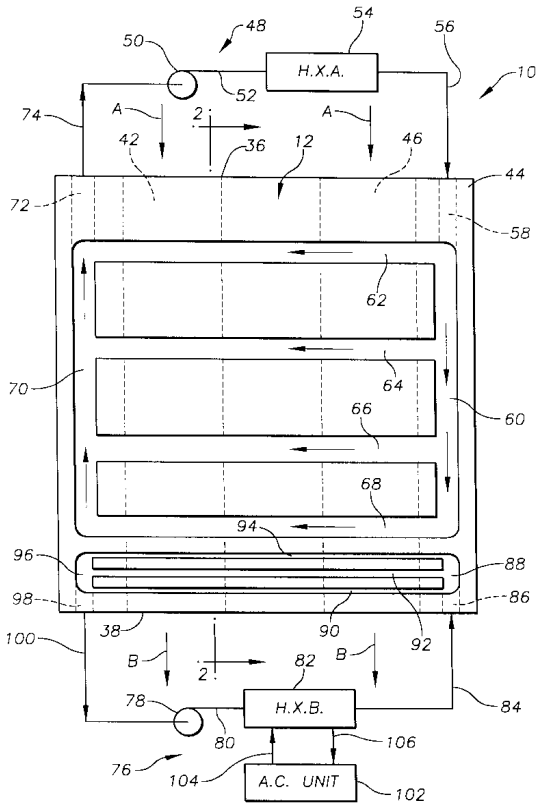
Primary Examiner—Stephen Kalafut
Assistant Examiner—Julian A. Mercado
(74) *Attorney, Agent, or Firm*—Malcolm J. Chisholm

(57) **ABSTRACT**

A dual coolant loop fuel cell power plant is disclosed that includes at least one fuel cell for producing an electric current from a reducing fluid and an oxidant stream, wherein the fuel cell includes an electrolyte secured between an anode catalyst and a cathode catalyst. An anode flow field is defined adjacent the anode catalyst and extends between a reducing fluid inlet and a reducing fluid outlet. A cathode flow field is defined adjacent the cathode catalyst and extends between an oxidant inlet and an oxidant outlet. A reaction zone is defined within the anode and cathode flow fields co-extensive with the anode and cathode catalysts, and a condensation zone is defined extending from the oxidant outlet into the anode and cathode flow fields. A primary coolant loop directs a circulating primary coolant stream through the reaction zone of the fuel cell, and into a primary heat exchanger to remove heat from the reaction zone, and a secondary coolant loop directs a circulating secondary coolant stream through the condensation zone of the fuel cell, and into a secondary heat exchanger to remove heat from the condensation zone, and thereby condense water vapor in the oxidant stream and reducing fluid passing through the condensation zone. An air conditioning unit directs a refrigerant to the secondary heat exchanger to cool the circulating secondary coolant stream.

19 Claims, 3 Drawing Sheets



US006230885B1

(12) **United States Patent**
Rochelo et al.

(10) **Patent No.: US 6,230,885 B1**
(45) **Date of Patent: May 15, 2001**

(54) **MEMORY CARD PROTECTIVE CARRIER**

(75) Inventors: **Donald R. Rochelo**; **Robert W. Jones**, both of Pittsfield, MA (US)

(73) Assignee: **Donald Rochelo**, Pittsfield, MA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/547,268**

(22) Filed: **Apr. 11, 2000**

(51) **Int. Cl.**[7] **B65D 85/30**
(52) **U.S. Cl.** **206/308.3**; 206/454; 206/1.5
(58) **Field of Search** 206/308.3, 449, 206/1.5, 555, 451, 454, 459.5, 456, 309.2

(56) **References Cited**

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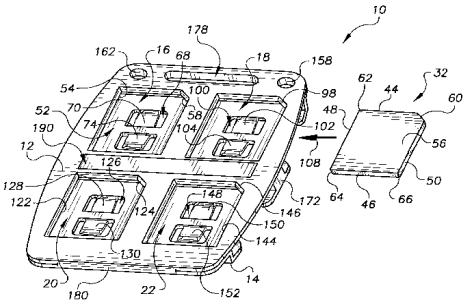
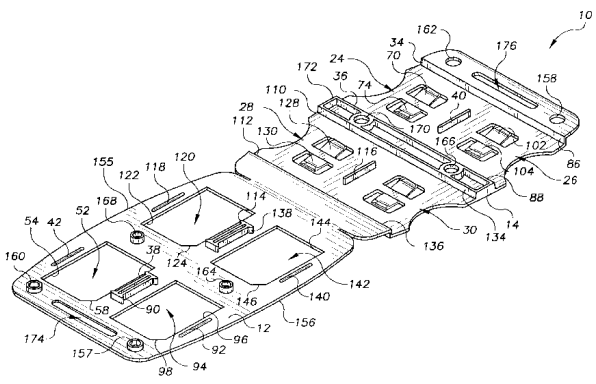
Primary Examiner—Paul T. Sewell
Assistant Examiner—Shizan Luong
(74) *Attorney, Agent, or Firm*—Malcolm Chisholm

(57) **ABSTRACT**

The invention is a memory card protective carrier for carrying memory cards and for protecting data transfer ports of the cards. The carrier includes a back frame secured adjacent a front frame having at least one memory card sleeve between the back and front frames. The card sleeve includes a top strut opposed to a bottom strut, an inside strut positioned between the top and bottom struts, wherein the top, bottom and inside struts cooperate to define a card slot dimensioned to house a memory card so that top and bottom edges of the card are adjacent the top and bottom struts. The front frame includes a window perimeter that defines a card window and includes a positioning guide adjacent the top strut in the shape of an asymmetrical corner dimensioned to correspond to an asymmetrical corner of the memory card. The back frame defines a compression tap aperture opposed to the card window, and includes at least one compression tab projecting into the card slot. The memory card sleeve also includes a protective band defined within the back frame that extends from adjacent the top strut toward the bottom strut a distance that is adequate to overlie and protect data transfer ports of the memory card whenever the memory card is positioned within the card slot with the asymmetrical corner of the memory card adjacent the asymmetrical corner of the window perimeter.

19 Claims, 5 Drawing Sheets





US006110613A

United States Patent [19]

Fuller

[11] Patent Number: 6,110,613

[45] Date of Patent: Aug. 29, 2000

[54] **ALCOHOL AND WATER RECOVERY SYSTEM FOR A DIRECT AQUEOUS ALCOHOL FUEL CELL POWER PLANT**

[75] Inventor: **Thomas F. Fuller**, Glastonbury, Conn.

[73] Assignee: **International Fuel Cells Corporation**, South Windsor, Conn.

[21] Appl. No.: **09/121,500**

[22] Filed: **Jul. 23, 1998**

[51] **Int. Cl.**[7] **H01M 8/04**

[52] **U.S. Cl.** **429/17**; 429/19; 429/13; 429/30; 210/502.1

[58] **Field of Search** 429/17, 19, 13, 429/30; 210/483, 502.1

[56] **References Cited**

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Primary Examiner—Maria Nuzzolillo

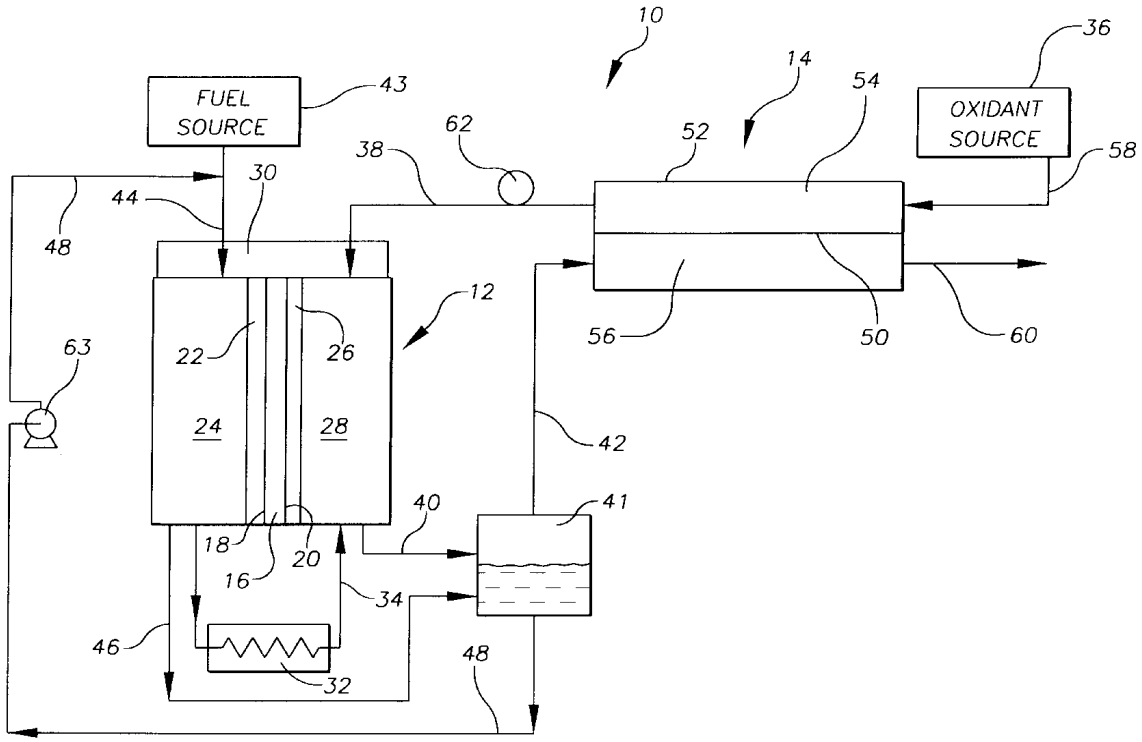
Assistant Examiner—Ray Alejandro

Attorney, Agent, or Firm—Malcolm J. Chisholm, Jr.

[57] **ABSTRACT**

An alcohol and water recovery system for a direct aqueous alcohol fuel cell power plant includes at least one direct aqueous alcohol fuel cell for producing electrical energy, and a direct alcohol and water transfer device for recovering alcohol and water leaving the plant and transferring the recovered alcohol and water back into the plant. The direct alcohol and water transfer device passes a process oxidant stream upstream of the plant in mass transfer relationship with a plant exhaust stream that includes aqueous alcohol fuel and process oxidant fluid streams that have passed through the fuel cell, so that alcohol and water in the plant exhaust stream transfer directly through a mass transfer medium of the device to the process oxidant stream entering the fuel cell. The device includes a separator housing for supporting the transfer medium and for preventing bulk mixing of the streams. An exemplary mass transfer medium such as a liquid water portion of a water saturated polyfluorosulfonic ionomer selectively sorbs fluid substances consisting of polar molecules such as alcohol and/or water molecules from the plant exhaust stream containing polar and non-polar molecules, and desorbs the polar molecules into the process oxidant stream to directly recover and transfer alcohol fuel and water leaving the plant back into the fuel cell, and to thereby also humidify and add heat to the process oxidant stream.

16 Claims, 2 Drawing Sheets



US006048383A

United States Patent [19]

Breault et al.

[11] **Patent Number: 6,048,383**

[45] **Date of Patent: Apr. 11, 2000**

[54] **MASS TRANSFER COMPOSITE MEMBRANE FOR A FUEL CELL POWER PLANT**

[75] Inventors: **Richard D. Breault**, North Kingstown, R.I.; **Thomas F. Fuller**, Glastonbury; **Leslie L. Van Dine**, Manchester, both of Conn.

[73] Assignee: **International Fuel Cells, L.L.C.**, South Windsor, Conn.

[21] Appl. No.: **09/168,511**

[22] Filed: **Oct. 8, 1998**

[51] **Int. Cl.**[7] **B01D 53/22**

[52] **U.S. Cl.** **95/44**; 95/45; 95/52; 96/5; 96/7; 96/12

[58] **Field of Search** 95/43–45, 52; 96/7, 12, 13, 5

[56] **References Cited**

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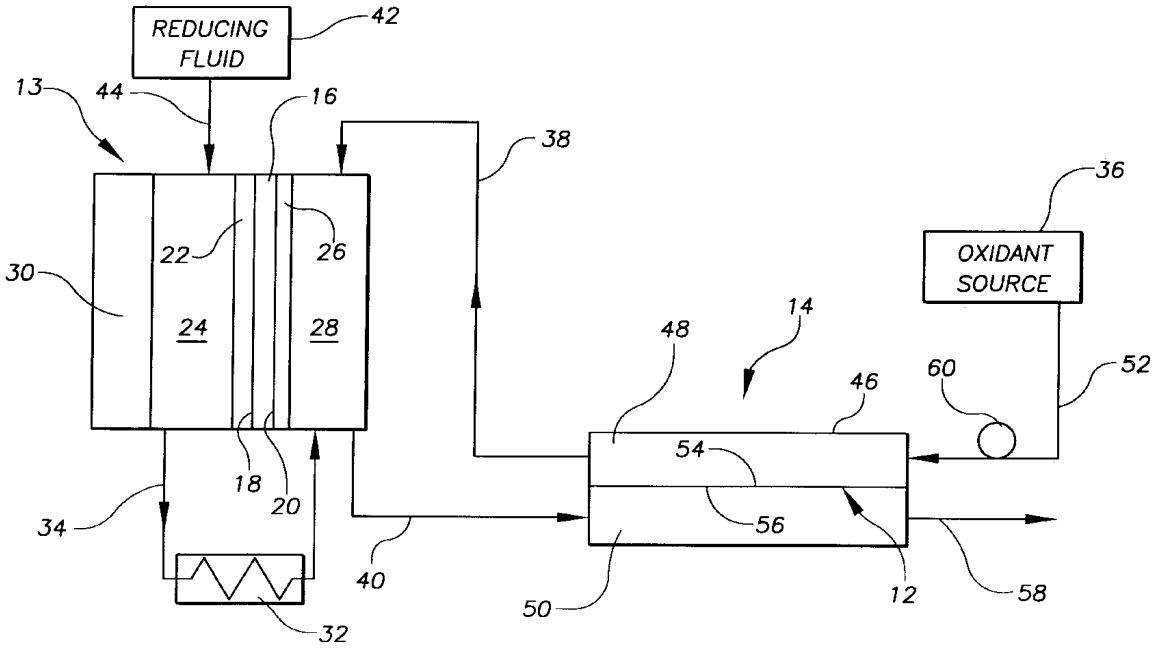
Primary Examiner—Robert H. Spitzer

Attorney, Agent, or Firm—Malcolm J. Chisholm, Jr.

[57] **ABSTRACT**

A mass transfer composite membrane for use with a fuel cell power plant includes a transfer medium core between opposed, rigid, porous support sheets. An inlet surface of the composite membrane is positioned in contact with an oxidant inlet stream of a fuel cell power plant, and an opposed exhaust surface of the composite membrane is positioned in contact with an exhaust stream exiting the fuel cell power plant to recover mass such as water from the exhaust stream and transfer it into the oxidant inlet stream entering the fuel cell. The transfer medium core may comprise any of a variety of materials for sorbing a fluid substance consisting of polar molecules such as water molecules from a fluid stream consisting of polar and non-polar molecules. A preferred transfer medium core is an ionomeric membrane such as a water saturated polyfluorosulfonic acid ionomer membrane. The porous support sheets may comprise a reinforcing fiber with a thermoset resin, such as a carbon sheet with a phenolic resin, or a glass fiber with an epoxy resin, wherein the sheets are thermoset into a rigid configuration. The mass transfer composite membrane may be a flat or a mounded layer defining protrusions and depressions. A plurality of the mounded layer membranes may be disposed within a frame in mirror-image association wherein protrusions and depressions formed by the mounds of adjacent membranes contact each other to define serpentine passages for the inlet and exhaust streams.

16 Claims, 6 Drawing Sheets



US006047241A

United States Patent [19]

Sparago

[11] Patent Number: 6,047,241

[45] Date of Patent: Apr. 4, 2000

[54] **METHOD OF SELECTIVE CORROSION RATE ANALYSIS FOR A FLUID PROCESSING PLANT**

[76] Inventor: **Michael T. Sparago**, 5 Blueberry Hill Rd., Wilbraham, Mass. 01095

[21] Appl. No.: **08/956,909**

[22] Filed: **Oct. 23, 1997**

[51] **Int. Cl.**[7] **G01N 27/00**; G21C 17/00

[52] **U.S. Cl.** **702/34**; 702/36; 702/179; 376/305; 73/804

[58] **Field of Search** 702/33, 34, 35, 702/36, 179, 180; 73/86, 592, 804; 376/249, 305

[56] **References Cited**

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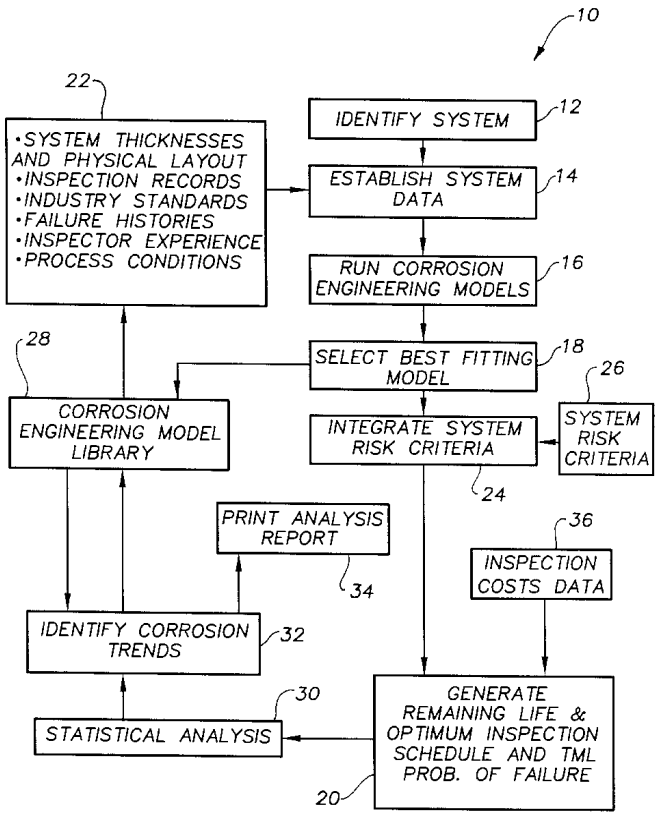
Primary Examiner—Marc S. Hoff
Assistant Examiner—Bryan Bui
Attorney, Agent, or Firm—Malcolm J. Chisholm, Jr.

[57] **ABSTRACT**

A method of selective corrosion rate analysis is shown for generating an inspection and replacement schedule for a fluid processing plant. The method includes the steps of identifying a system from a division of the plant into one or more systems wherein each system has mechanical components that are expected to experience a common corrosion environment, and wherein each system has at least one thickness measurement location for performing thickness inspections. The next steps are establishing system corrosion data for each thickness measurement location and running the data through a plurality of corrosion engineering models. Running the corrosion engineering models includes coordinating the system corrosion data of the thickness measurement locations into a plurality of physical relationship data groups, and applying a plurality of statistical distribution/goodness-of-fit tests to each physical relationship data group. The final step is selecting a best fitting corrosion engineering model for generating an inspection schedule for the fluid containment components within each system of the plant. In a preferred embodiment of the method of selective corrosion rate analysis, the step of running the corrosion engineering models includes the additional step of identifying sub-populations within the application of the statistical distribution/goodness-of-fit tests so that identification of such sub-populations assists the user in identifying unknown corrosion mechanisms, and establishing specific inspection schedules for the sub-populations.

20 Claims, 3 Drawing Sheets



US006042438A

United States Patent [19]

Dean

[11] Patent Number: 6,042,438

[45] Date of Patent: Mar. 28, 2000

[54] **ERGONOMIC CANOE PADDLE**

[76] Inventor: **W. Clark Dean**, 43 Northgate, Simsbury, Conn. 06070

[21] Appl. No.: **09/271,560**

[22] Filed: **Mar. 18, 1999**

[51] **Int. Cl.**[7] **B63H 16/04**

[52] **U.S. Cl.** **440/101**; 416/74

[58] **Field of Search** ..... 16/110 R, DIG. 12; 440/101; 416/74; D12/215

[56] **References Cited**

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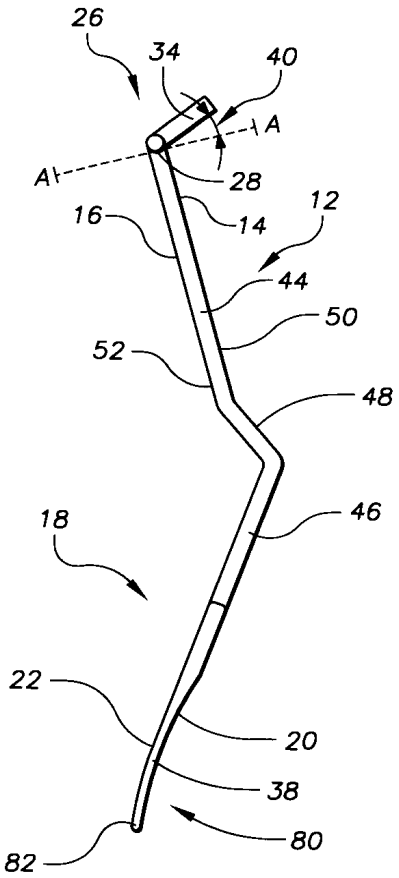
Primary Examiner—Stephen Avila

Attorney, Agent, or Firm—Malcolm J. Chisholm, Jr.

[57] **ABSTRACT**

The invention is an ergonomic canoe paddle. The paddle includes a shaft having a shear side and an opposed drag side, a blade having a shear surface and an opposed drag surface, wherein the blade is secured to a bottom end of the shaft so that the shear surface of the blade is secured to the shear side of the shaft and the drag surface of the blade is secured to the drag side of the shaft, and a handle secured to a top end of the shaft. The handle includes a central grip bar secured to the top end of the shaft, a right grip stem and a left grip stem secured to opposed ends of the grip bar. The right and left grip stems extend away from the shaft in a direction that is both about twenty degrees from a plane perpendicular to a longitudinal axis of the shaft, and that is also away from the drag side of the shaft about sixty-five degrees from a plane roughly parallel to the shear surface of the blade. The right and left grip stems are dimensioned to receive a user's grip so that when a user wraps a hand around either right or left grip stem, the blade is disposed in an angular alignment that compensates for non-linear thrust of the paddle as the shear surface of the blade shears water to propel a canoe through the water.

16 Claims, 5 Drawing Sheets



US006039572A

United States Patent [19]

Meier et al.

[11] Patent Number: 6,039,572

[45] Date of Patent: Mar. 21, 2000

[54] **FLOAT PLATFORM FOR AQUATIC INSTRUCTION AND THERAPY**

[76] Inventors: **William R. Meier**; **Maureen E. Meier**, both of Star Rte. 62, Box 18B, Great Barrington, Mass. 01230

[21] Appl. No.: **09/179,772**

[22] Filed: **Oct. 27, 1998**

[51] **Int. Cl.**[7] **A63B 69/12**

[52] **U.S. Cl.** **434/254**; 441/130; 441/132

[58] **Field of Search** 434/247, 254; 446/153, 160, 161; 482/1, 2, 3, 4, 5, 6, 7, 8, 9, 55, 901; 441/39, 125, 126, 129, 130, 132

[56] **References Cited**

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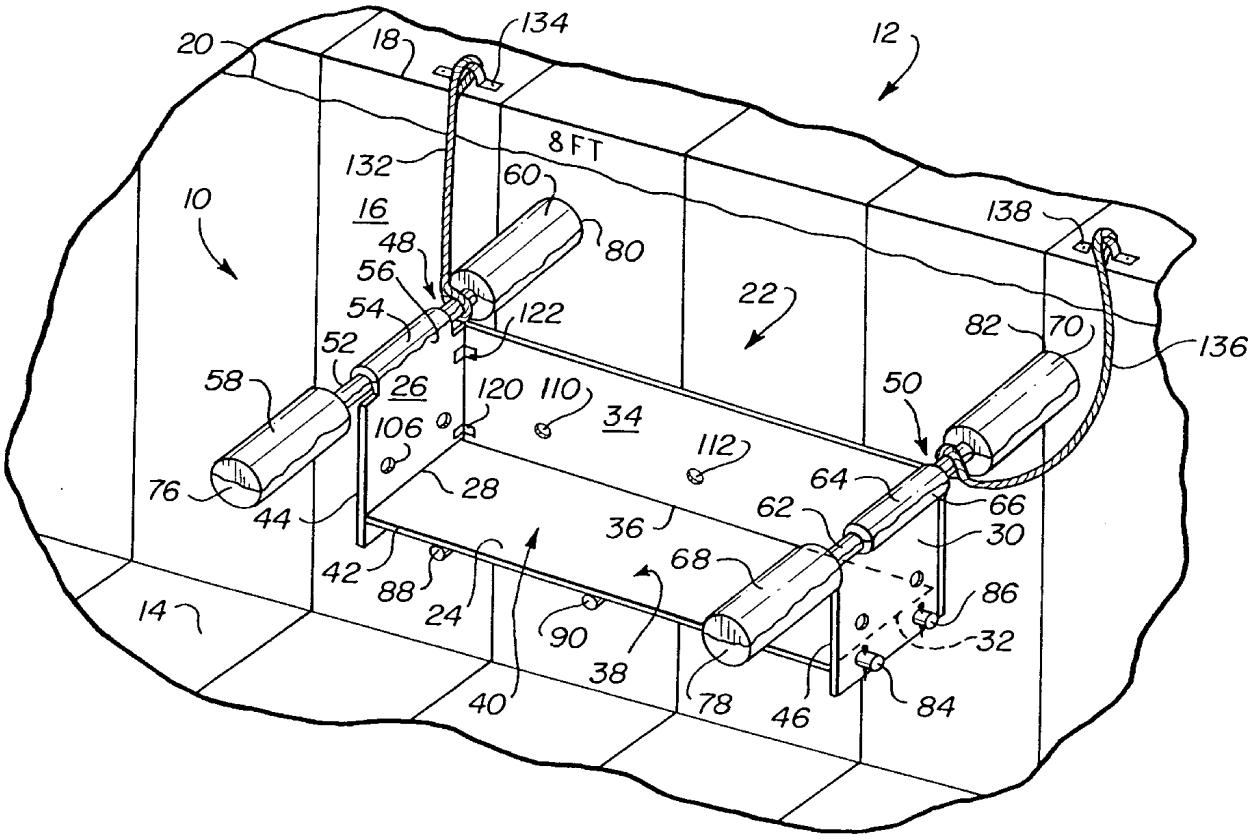
5,439,405	8/1995	Storey	441/127
5,628,658	5/1997	Clifford	441/130

Primary Examiner—Robert A. Hafer
Assistant Examiner—Kurt Fernstrom
Attorney, Agent, or Firm—Malcolm J. Chisholm, Jr.

[57] **ABSTRACT**

The invention is a float platform for aquatic instruction and therapy for use in swim training facilities that includes three basic components, a frame and first and second flotation arms. The frame has a base platform with a first end wall, a second end wall and a back wall secured between the first and second end walls and extending above the base platform and cooperate to partially surround a user support area on the base platform. An unrestricted entry-exit is defined between the first and second end walls above a front edge of the base platform opposed to the back edge of the platform. The first and second flotation arms are detachably secured to top edges of the first and second end walls so that the top edges of the end walls float near a surface of the water above the base platform that is below the surface of the water, thereby enabling users on the support area to be partially supported above the surface of the water and enabling users to readily enter and exit the support area through the unrestricted entry-exit. In an alternative embodiment, the base platform may be secured at variable positions to the end walls and back wall to deploy the float platform in swim-training mode or a therapy mode.

17 Claims, 3 Drawing Sheets



US006024848A

United States Patent [19]

Dufner et al.

[11] **Patent Number: 6,024,848**

[45] **Date of Patent: Feb. 15, 2000**

[54] **ELECTROCHEMICAL CELL WITH A POROUS SUPPORT PLATE**

[75] Inventors: **Bryan Franz Dufner**, West Hartford, Conn.; **Richard David Breault**, North Kingstown, R.I.

[73] Assignee: **International Fuel Cells, Corporation**, South Windsor, Conn.

[21] Appl. No.: **09/060,583**

[22] Filed: **Apr. 15, 1998**

[51] **Int. Cl.**[7] **C25B 9/00**; H01M 8/10; H01M 2/14

[52] **U.S. Cl.** **204/252**; 204/263; 204/283; 429/33; 429/39

[58] **Field of Search** 204/283, 252, 204/254–258, 263–266; 429/34–40

[56] **References Cited**

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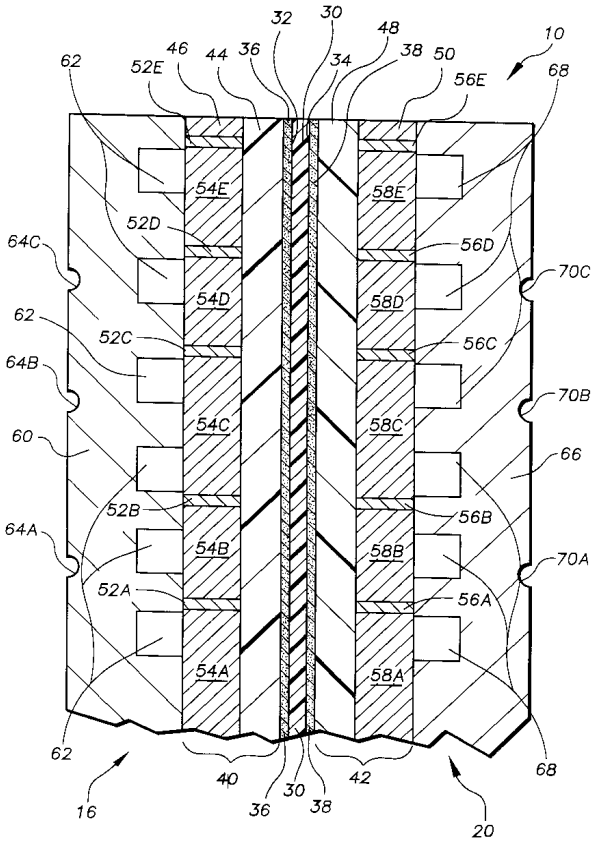
Primary Examiner—Donald R. Valentine
Attorney, Agent, or Firm—Malcolm J. Chisholm, Jr.

[57] **ABSTRACT**

An improved electrochemical cell such as a fuel cell is disclosed including a porous support plate for enhancing transport of fluids throughout the cell and for enhancing capacitance and transient response capability of the cell. The electrochemical cell includes an electrolyte having opposed major surfaces with an anode and a cathode electrode supported in intimate contact with the opposed major surfaces. A porous support plate is secured adjacent each electrode, and each porous support plate includes a contact bi-layer in intimate contact with the electrode. Each contact bi-layer is comprised of a hydrophobic phase including a mixture of carbon black and a hydrophobic polymer defining a network of hydrophobic gas passages and each contact bi-layer also includes a hydrophilic phase including a mixture of carbon black and a proton exchange resin defining a network of hydrophilic liquid passages integrated throughout the contact bi-layer. Each porous support plate also includes a porous substrate layer adjacent and supporting the contact bi-layer. A method of manufacture of the porous support plate includes the steps of preparing a hydrophobic phase compound, preparing a hydrophilic phase compound, mixing and filtering the two compounds to form a contact bi-layer, transferring the contact bi-layer onto a porous substrate layer to form a porous support plate. An alternative method includes an additional step of activating the contact bi-layer in an acid bath at controlled electrical potentials to enhance capacitance of the cell.

14 Claims, 4 Drawing Sheets



US006007931A

United States Patent [19]

Fuller et al.

[11] Patent Number: 6,007,931

[45] Date of Patent: Dec. 28, 1999

[54] **MASS AND HEAT RECOVERY SYSTEM FOR A FUEL CELL POWER PLANT**

[75] Inventors: **Thomas F. Fuller**, Glastonbury; **Paul R. Margiott**, South Windsor; **Leslie L. Van Dine**, Manchester, all of Conn.

[73] Assignee: **International Fuel Cells Corporation**, South Windsor, Conn.

[21] Appl. No.: **09/103,908**

[22] Filed: **Jun. 24, 1998**

[51] **Int. Cl.**[6] **H01M 8/00**; H01M 8/04; H01M 8/18; H01M 2/00

[52] **U.S. Cl.** **429/13**; 17/20; 17/26; 17/34

[58] **Field of Search** 429/13, 17, 20, 429/26, 34

[56] **References Cited**

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Printed article entitled "Making Fuel Cells Cheaper, Lighter and Smaller", by Ron DuBose in a publication of the Emprise Corporation of Marietta GA 30067 Which publication is entitled "Electric & Hybrid Vehicle Technology '97", was published in 1997, and has no page or periodical numbers. (No Month).

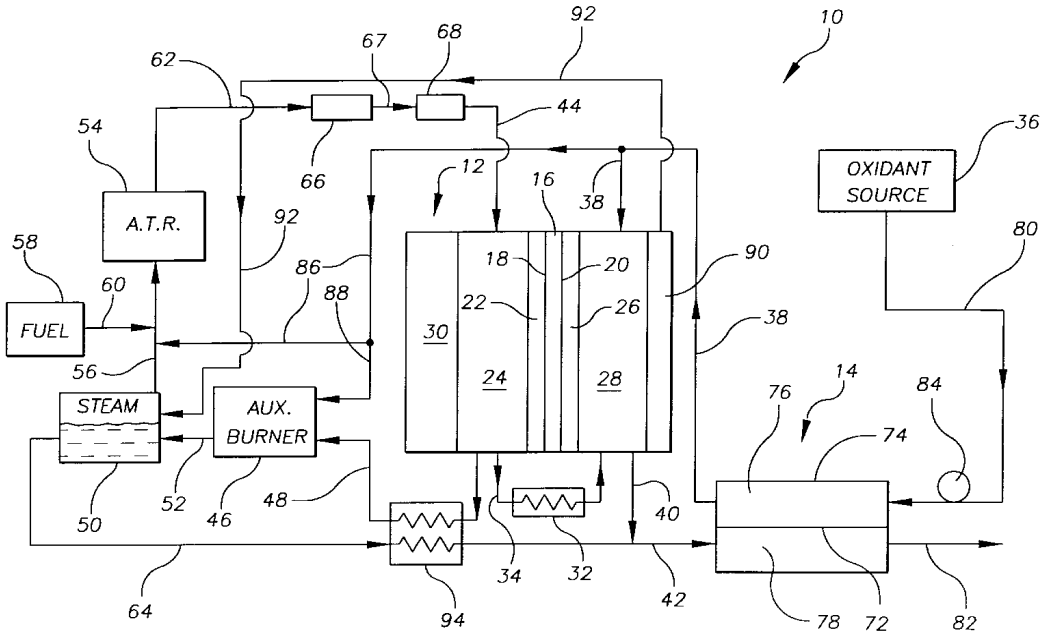
Primary Examiner—Donald R. Valentine

Attorney, Agent, or Firm—Malcolm J. Chisholm, Jr.

[57] **ABSTRACT**

A mass and heat recovery system for a fuel cell power plant includes at least one fuel cell for producing electrical energy, hydrocarbon fuel processing components for producing a hydrogen rich reducing fluid for the fuel cell, and a direct mass and heat transfer device for recovering mass and heat such as water vapor leaving the plant. The fuel processing components include an auxiliary burner that provides heat to generate steam and a reformer that receives the steam mixed with a hydrocarbon fuel along with a small amount of air and converts the mixture to a hydrogen rich stream appropriate for supplying hydrogen to the anode electrode. The direct mass and heat transfer device passes a process oxidant stream upstream of the plant in mass transfer relationship with a plant exhaust stream that includes both a cathode exhaust stream and an anode exhaust stream wherein the anode exhaust stream has first been burned in the auxiliary burner so that mass and heat such as water vapor in the plant exhaust stream transfer directly through a mass transfer medium of the device to the process oxidant stream entering the plant. The device includes a separator housing for supporting the transfer medium and for preventing bulk mixing of the streams. An exemplary transfer medium such as a liquid water portion of a water saturated polyflourosulfonic ionomer selectively sorbs a fluid substance consisting of polar molecules such as water molecules from a fluid stream containing polar and non-polar molecules.

20 Claims, 1 Drawing Sheet



US005998058A

United States Patent [19]

Fredley

[11] Patent Number: 5,998,058

[45] Date of Patent: Dec. 7, 1999

[54] **POROUS SUPPORT LAYER FOR AN ELECTROCHEMICAL CELL**

[75] Inventor: **Robert Raymond Fredley**, Tolland, Conn.

[73] Assignee: **International Fuel Cells Corporation**, South Windsor, Conn.

[21] Appl. No.: **09/067,882**

[22] Filed: **Apr. 29, 1998**

[51] **Int. Cl.**[6] **H01M 4/86**

[52] **U.S. Cl.** **429/44**; 429/40; 429/41; 429/42; 429/245; 204/296; 29/592.1

[58] **Field of Search** 429/40, 41, 42, 429/44, 245; 204/296; 29/592.1

[56] **References Cited**

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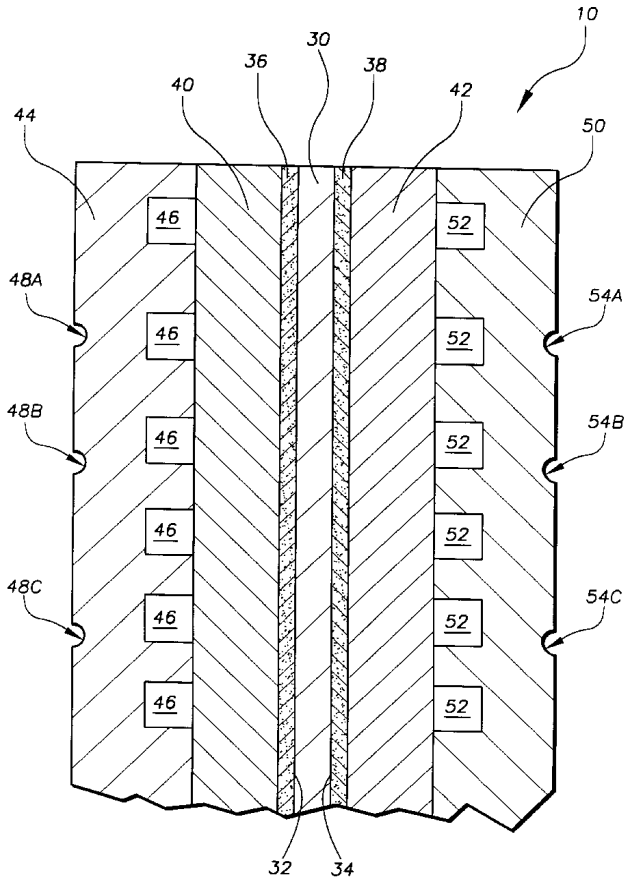
Primary Examiner—Aaron S. Phasge

Attorney, Agent, or Firm—Malcolm J. Chisholm, Jr.

[57] **ABSTRACT**

An improved porous support layer is disclosed for use in an electrochemical cell such as a fuel cell having a proton exchange membrane ("PEM") as an electrolyte. In a preferred embodiment the porous support layer is positioned near and in fluid communication with an electrode to facilitate fluid transport to and away from each electrode. Each such porous support layer includes hydrophobic pores and hydrophilic pores integrated throughout the layer, wherein the hydrophobic pores are coated with a hydrophobic substance and include about 75 percent to about 95 percent of the total pore volume of the porous support layer, and the hydrophilic pores comprise about 25 percent to about 5 percent of the total pore volume of the porous support layer. The hydrophobic pores of the porous support layers facilitate gas transfer and restrict liquid water absorption into the hydrophobic pores, while the hydrophilic pores facilitate simultaneous liquid water transport through the layers. A method of manufacture of the porous support layer includes the steps of filling about 25 percent to about 5 percent of the pore volume of a carbon fiber substrate layer with a blocking material; applying a hydrophobic substance to the remaining, unfilled pore volume of the substrate layer; and heat treating the dried substrate at a temperature adequately high to volatilize or decompose the blocking material and fuse the hydrophobic substance to coat the hydrophobic pores to produce the porous support layer.

16 Claims, 3 Drawing Sheets



US005950934A

United States Patent [19]

Podesta et al.

[11] **Patent Number: 5,950,934**

[45] **Date of Patent: Sep. 14, 1999**

[54] **CEMENT MIXER SAND SPREADER**

[76] Inventors: **Robert J. Podesta**, 955 Northfield Rd., Woodmere, N.Y. 11598; **Alexander Cicciari**, 249 Bronte Trace, Virginia Beach, Va. 23462

[21] Appl. No.: **09/040,493**

[22] Filed: **Mar. 18, 1998**

[51] **Int. Cl.**[6] **E01C 19/20**

[52] **U.S. Cl.** **239/663**; 239/650; 239/681

[58] **Field of Search** 239/651, 657, 239/663, 668, 670, 681, 687, 650

[56] **References Cited**

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4,491,275	1/1985	Holsworth	239/663
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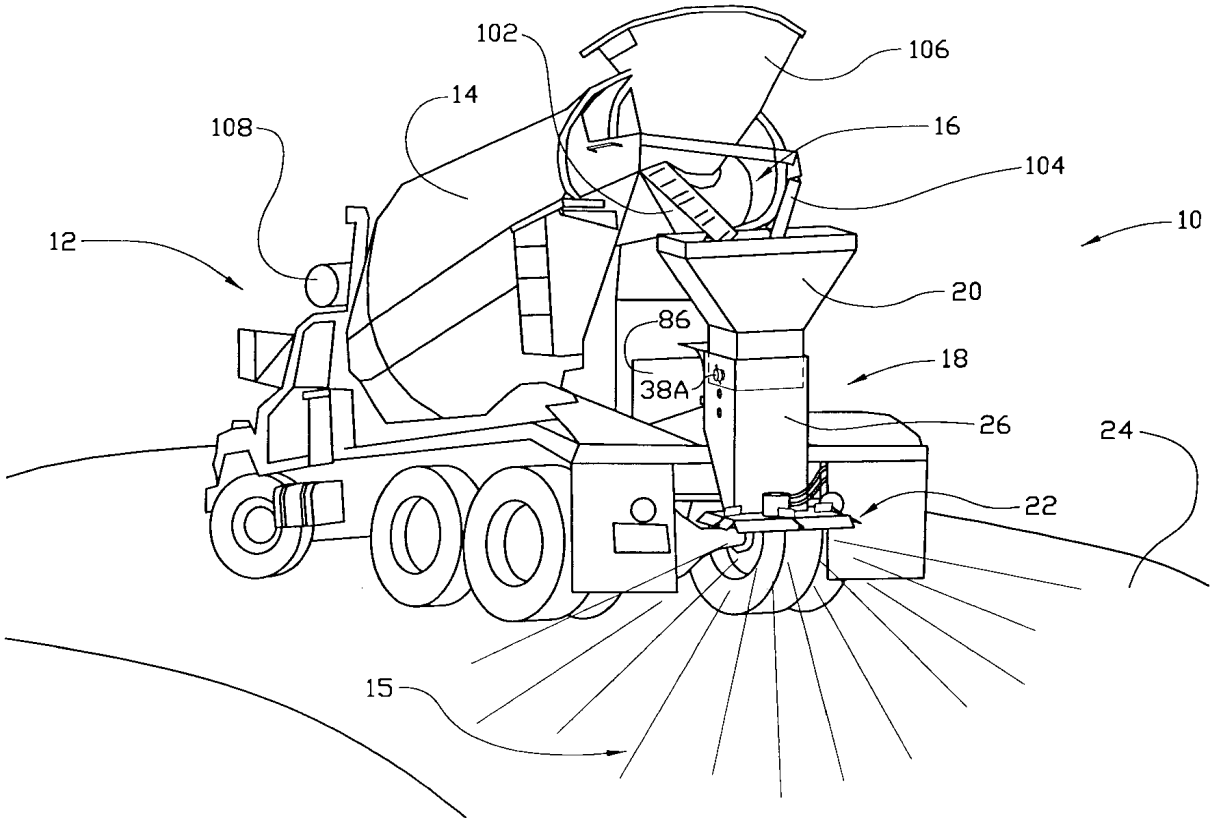
Primary Examiner—Andres Kashnikow
Assistant Examiner—David Deal
Attorney, Agent, or Firm—Malcolm J. Chisholm, Jr.

[57] **ABSTRACT**

The invention is a cement mixer sand spreader for applying a sand mixture to a roadway to enhance friction for motorized traffic passing over the roadway and to simultaneously lower a freezing temperature of the ice and/or snow on the roadway. One form of the invention includes two major components. The first is a self-propelled cement mixer vehicle having a powered barrel for rotatably storing the sand mixture, wherein the barrel defines a discharge outlet for discharging the sand mixture upon rotation of the barrel in a discharge direction. The second is a sand spreader having a hopper secured adjacent the discharge outlet of the cement mixer for receiving the sand mixture discharged out of the barrel, the sand spreader also having a powered spinner plate rotatably secured adjacent a discharge end of the hopper for spreading the sand mixture over a roadway whenever the sand mixture passes through the hopper and contacts the rotating spinner plate. In other forms of the invention, the cement mixer sand spreader also includes a drop chute positioned between the hopper and spinner plate, wherein the drop chute is detachable from the hopper to facilitate securing the sand spreader to the cement mixer. The drop chute may also include a mounting post dimensioned to slide into a standard pinnacle mount on known cement mixers, which pinnacle mount supports standard cement flow chutes secured to known cement mixers.

12 Claims, 4 Drawing Sheets



US005942350A

United States Patent [19]

Roy et al.

[11] **Patent Number: 5,942,350**

[45] **Date of Patent: Aug. 24, 1999**

[54] **GRADED METAL HARDWARE COMPONENT FOR AN ELECTROCHEMICAL CELL**

[75] Inventors: **Robert J. Roy**, West Springfield, Mass.; **Andrei Leonida**, West Hartford, Conn.; **Thomas J. Garosshen**, Glastonbury, Conn.; **Trent M. Molter**, Enfield, Conn.

[73] Assignee: **United Technologies Corporation**, Hartford, Conn.

[21] Appl. No.: **08/814,140**

[22] Filed: **Mar. 10, 1997**

[51] **Int. Cl.**[6] **H01M 8/02**

[52] **U.S. Cl.** **429/38**; 429/34; 429/186; 429/208; 204/409; 204/418

[58] **Field of Search** 429/7, 9, 208, 429/186, 34, 38; 204/409, 418

[56] **References Cited**

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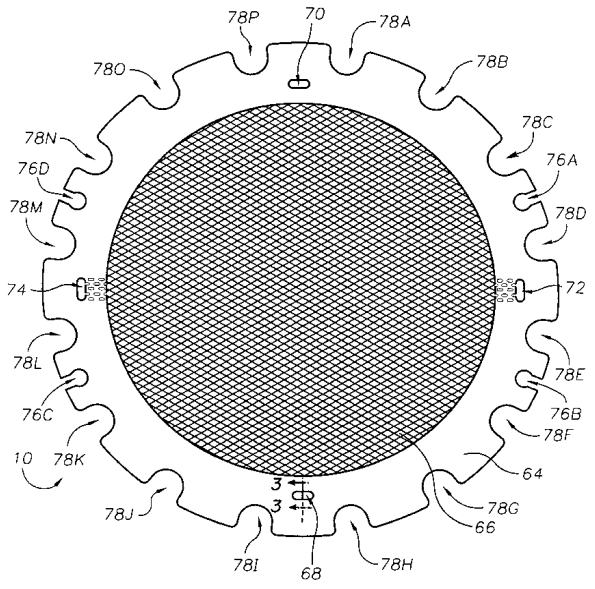
Primary Examiner—Maria Nuzzolillo
Assistant Examiner—Carol Chaney
Attorney, Agent, or Firm—Malcolm J. Chisholm, Jr.

[57] **ABSTRACT**

A graded metal hardware component for an electrochemical cell is shown for mechanically supporting electrochemical cell structures and defining fluid cavities and fluid passages in a cell employing a solid polymer electrolyte membrane. The graded metal hardware component includes a substrate such as stainless steel, a surface layer made of a precious metal such as gold, and a graded boundary layer adjacent to and between the substrate and surface layer, wherein the graded boundary layer is an interdiffusion of the substrate and surface layer so that the graded boundary layer is between 0.5 wt. %–5.0 wt. % of the material making up the substrate, and between 99.5 wt. %–95.0 wt. % of the material making up the surface layer, and the graded boundary layer has a thickness of between 10%–90% of a shortest distance between the substrate and an exterior surface of the surface layer. In a preferred embodiment a shortest distance between the substrate and an exterior surface of the surface layer is between 50 to 120 microinches, and the exterior surface of the surface layer has a hardness of between 150 to 200 on the Knoop scale.

13 Claims, 3 Drawing Sheets



US005941409A

United States Patent [19]

Leaderman

[11] Patent Number: 5,941,409

[45] Date of Patent: Aug. 24, 1999

[54] **TEAPOT CUP**

[76] Inventor: **Richard N. Leaderman**, 82 Tanglewood Dr., Longmeadow, Mass. 01106

[21] Appl. No.: **08/908,684**

[22] Filed: **Aug. 7, 1997**

[51] **Int. Cl.**[6] **B65D 47/00**

[52] **U.S. Cl.** **220/717**; 220/703

[58] **Field of Search** 220/771, 717, 220/703, 661

[56] **References Cited**

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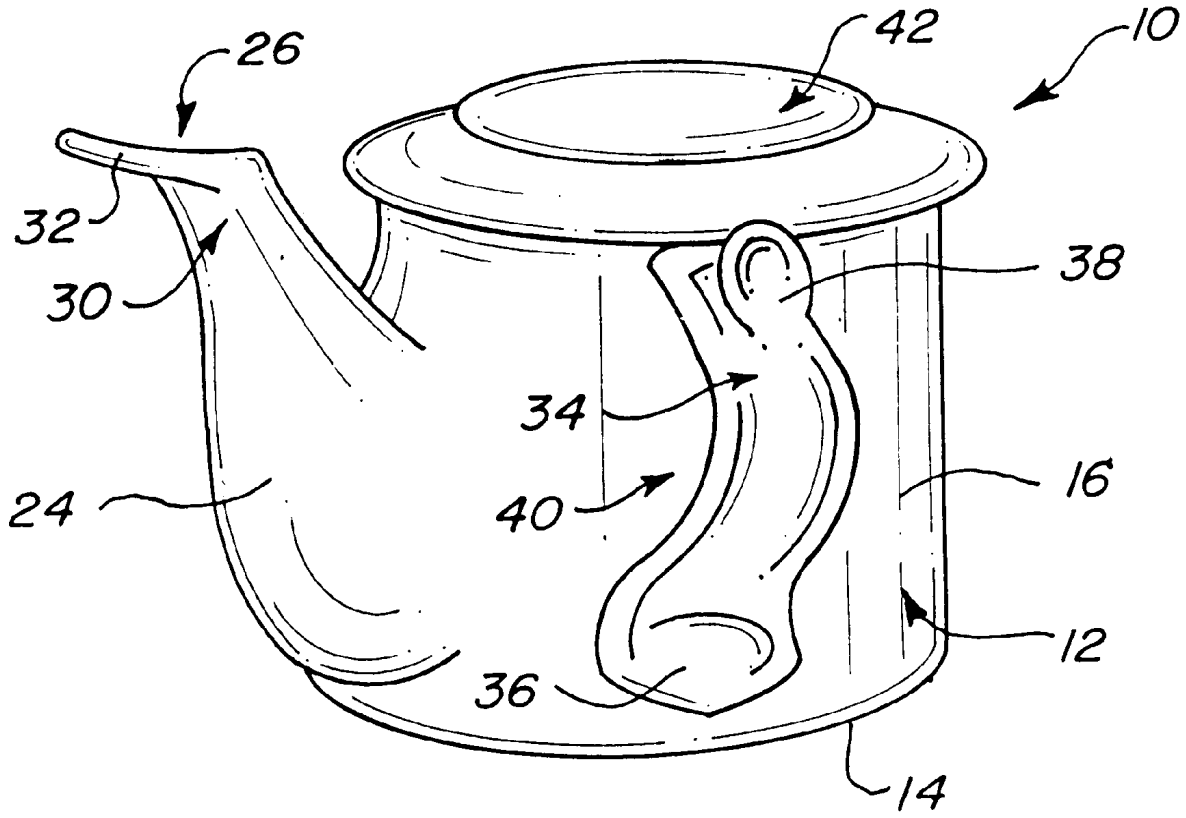
Primary Examiner—Steven Pollard

Attorney, Agent, or Firm—Malcolm J. Chisholm, Jr.

[57] **ABSTRACT**

A teapot cup is shown for brewing and drinking a heated beverage such as tea. The teapot cup includes a cup body having a cup base and a cup wall surrounding the base to define a liquid chamber. A drinking spout is secured to the cup wall and defines a liquid passage extending between a screened entry passage secured to the cup body adjacent the cup base and a mouthpiece positioned adjacent a top edge of the cup wall. The drinking spout includes a lip flair secured to the mouthpiece. Openings in the screened entry passage are dimensioned to permit flow of liquid into the liquid passage, but to restrict passage of particles having a length of a longest axis greater than one millimeter, such as tea leaves. A cup handle is secured to the cup wall and is positioned within a handle range that is between thirty-five degrees and one-hundred and thirty-five degrees from the drinking spout. In use of the teapot cup, a user selects a desired type and amount of dry tea leaves, and stirs them into hot water within the liquid chamber. When the tea beverage has reached a desired strength, the user lifts the cup body by the cup handle; places the lip flair of the drinking spout mouthpiece on the user's lower lip and tips the cup body to allow the tea beverage to flow into the user's mouth through the spout.

16 Claims, 1 Drawing Sheet



US005918822A

United States Patent [19]

Sternby

[11] Patent Number: 5,918,822

[45] Date of Patent: Jul. 6, 1999

[54] **CHANNELED PULP ROTOR**

[76] Inventor: **Arthur J. Sternby**, 450 Williams St., Pittsfield, Mass. 01201

[21] Appl. No.: **09/013,088**

[22] Filed: **Jan. 26, 1998**

[51] **Int. Cl.**[6] **B02B 1/00**

[52] **U.S. Cl.** **241/46.17**; 241/46.11; 241/292.1; 241/297

[58] **Field of Search** 241/261.2, 261.3, 241/296, 297, 46.17, 46.11, 292.1

[56] **References Cited**

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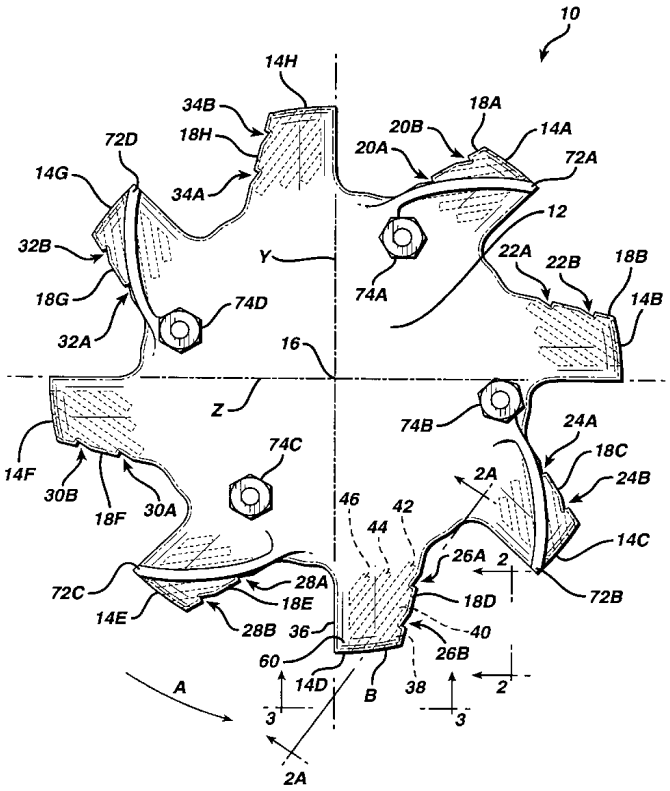
Primary Examiner—Joseph J. Hail, III
Assistant Examiner—Susan R. Kingsbury
Attorney, Agent, or Firm—Malcolm J. Chisholm, Jr.

[57] **ABSTRACT**

A channeled pulp rotor for use in a generally cylindrical or tub shaped pulper apparatus to make a slurry out of a mixture of solid and liquid materials for such things as paper making includes a rotor hub having at least one vane extending radially from a central axis of rotation of the rotor hub. The vane defines an impact surface between opposed top and bottom surfaces for impacting the solid materials upon rotation of the rotor and the impact surface defines a feed channel. The bottom surface defines a defibrating channel continuous with the feed channel so that materials flowing along or positioned in front of the rotating impact surface flow into the feed channel and continue from the feed channel to flow into the defibrating channel. In alternative embodiments, the feed channel and defibrating channels are eccentric to the axis of rotation of the rotor so that entries of the feed channel and defibrating channel are closer to the axis of rotation than exits of the channels. Centrifugal forces generated by rotation of the rotor act on the solid materials to force them through the feed and defibrating channels where they are sheared by cutting edges of a non-rotating plate adjacent the defibrating channel as the vanes rotate with the rotor hub.

20 Claims, 5 Drawing Sheets



US005908285A

United States Patent [19]

Graff

[11] Patent Number: 5,908,285

[45] Date of Patent: Jun. 1, 1999

[54] **ELECTROFORMED SHEATH**

[75] Inventor: **John M. Graff**, West Suffield, Conn.

[73] Assignee: **United Technologies Corporation**, Hartford, Conn.

[21] Appl. No.: **08/401,833**

[22] Filed: **Mar. 10, 1995**

[51] **Int. Cl.**[6] **F01D 5/14**

[52] **U.S. Cl.** ..... **416/224**; 416/213 R; 416/241 R; 205/67

[58] **Field of Search** ..... 416/224, 213 R, 416/229 A, 241 R; 205/67, 73

[56] **References Cited**

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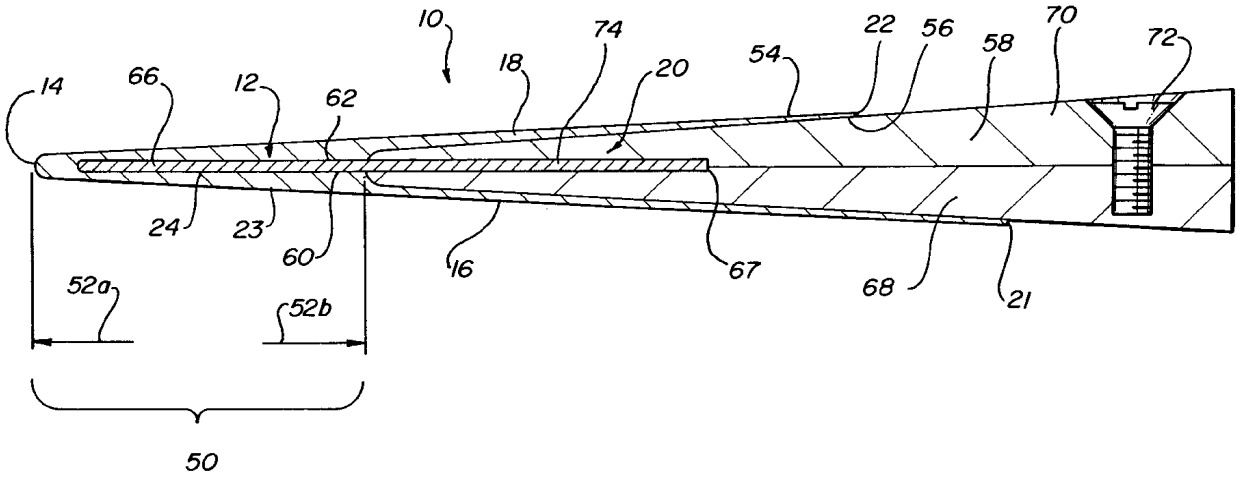
Primary Examiner—Edward K. Look
Assistant Examiner—Richard Woo
Attorney, Agent, or Firm—Malcolm J. Chisholm, Jr.

[57] **ABSTRACT**

An electroformed sheath is disclosed for protecting composite components of a part, such as a fan blade of a modern gas turbine engine. The electroformed sheath includes a sheath body having a leading edge; a pressure side and an opposed suction side of the body that meet at the leading edge and extend away from the leading edge to define a sheath cavity therebetween; a head section of the body between the leading edge and the sheath cavity; and an electrically conductive mandrel insert positioned between the pressure and suction sides of the body. In manufacture of the electroformed sheath, the mandrel insert is secured in an appropriate mandrel having an exterior surface approximating the blade's airfoil configuration. The leading edge, head section and pressure and suction sides are electroplated around the mandrel insert so that the insert remains in the sheath body after removal of the mandrel. The position occupied by the mandrel defines the sheath cavity, and the component parts of the blade are secured within the cavity. The mandrel insert enhances electroformation of material from the electroplate bath around the mandrel insert so that the resulting electroformed sheath has a thickness range ratio (being a ratio of the thickness of a thickest part of the sheath (e.g., its leading edge) to the thickness of a thinnest part of the sheath (e.g., trailing edges of the pressure or suction sides)) in excess of 30:1.

10 Claims, 3 Drawing Sheets



US005875946A

United States Patent [19]

Knudsen

[11] Patent Number: 5,875,946

[45] Date of Patent: Mar. 2, 1999

[54] **PORTAGE SYSTEM FOR LIGHT WATERCRAFT**

[76] Inventor: **Eric H. Knudsen**, 755 Tyringham Rd., Lee, Mass. 01238

[21] Appl. No.: **910,886**

[22] Filed: **Aug. 13, 1997**

[51] **Int. Cl.**[6] **A45F 3/08**

[52] **U.S. Cl.** **224/262**; 224/263; 224/634; 224/636; 224/153; 114/343; 114/347; 383/3

[58] **Field of Search** 224/153, 581, 224/582, 583, 184, 191, 627, 628, 633–636, 259–263; 114/343, 347; D12/302; 383/3

[56] **References Cited**

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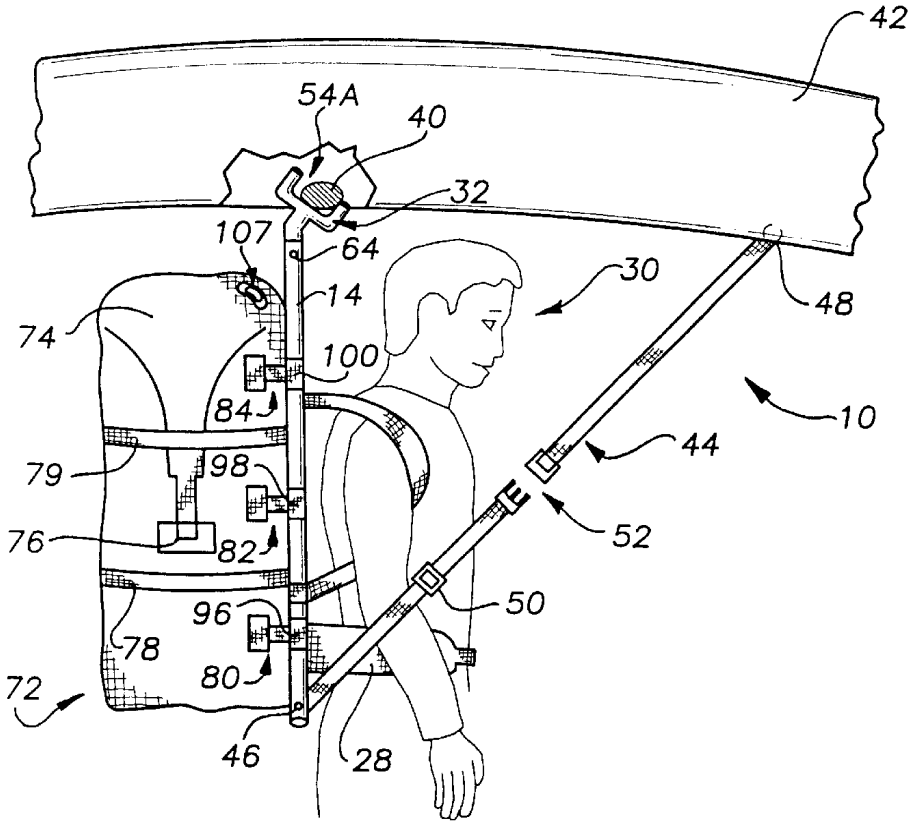
Primary Examiner—Allan N. Shoap
Assistant Examiner—Gregory M. Vidovich
Attorney, Agent, or Firm—Malcolm J. Chisholm, Jr.

[57] **ABSTRACT**

A portage system for supporting light watercraft such as a canoe or kayak includes a frame having opposed first and second upright arms, a plurality of cross-struts interconnecting the arms, a pair of shoulder straps secured to a cross strut and a hip belt secured adjacent bottom ends of the upright members to removably secure the frame to a user. First and second thwart cradles are adjustably secured to top ends of the first and second upright arms so that a center thwart of the watercraft may engage the first and second thwart cradles to support the watercraft at varying heights above the user. A balance strap is adjustably secured between a bottom end of an upright arm and a forward attachment point on the watercraft and tightened at a selected length by a slide buckle to prevent a rear end of the watercraft from descending below a selected height above a surface of the terrain the user is to portage in order to prevent the watercraft from banging into the obstructions on the surface and interrupting balance of the user, while enhancing forward visibility of the user. The thwart cradles can be adjusted to position the watercraft at one of a variety of heights above the user, the height being selected depending on the depth of the center thwart in the watercraft, and/or the length of the craft.

9 Claims, 2 Drawing Sheets



US005853798A

United States Patent [19]

Dubé

[11] Patent Number: 5,853,798

[45] Date of Patent: Dec. 29, 1998

[54] **PROCESS FOR FORMATION OF AN ELECTRODE ON AN ANION EXCHANGE MEMBRANE**

[75] Inventor: **James R. Dubé**, Boston, Mass.

[73] Assignee: **United Technologies Corporation**, Hartford, Conn.

[21] Appl. No.: **928,169**

[22] Filed: **Sep. 12, 1997**

[51] **Int. Cl.**[6] **B05D 3/10**; B05D 5/12

[52] **U.S. Cl.** **427/125**; 427/343

[58] **Field of Search** 427/125, 115, 427/343, 333

[56] **References Cited**

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Primary Examiner—Diana Dudash

Attorney, Agent, or Firm—Malcolm J. Chisholm, Jr.

[57] **ABSTRACT**

The invention is a process for formation of an electrode on a solid polymer anion exchange membrane to increase rates of reaction at a reaction surface of the membrane. The process includes the steps of soaking a polymer anion exchange membrane in a solution containing an anionic entity wherein a desired metal catalyst is contained within the anionic entity so that anions containing the metal catalyst exchange into the membrane by electrostatic attraction, and exposing the membrane to a reducing agent so the metal catalyst is reduced to a metallic form to become physically secured at a reaction surface of the membrane to thereby form the electrode adjacent the reaction surface. In preparation of an electrode on an anion exchange membrane, the process is concluded by rinsing the membrane in distilled water and then the membrane is cycled through the soaking, exposing and rinsing steps until a desired level of catalyst loading is achieved. In a first preferred process, the polymer anion exchange membrane is a tetraflouroethelyene-flourinated ethylene propylene ("TFE-FEP") based membrane; the anionic entity is chloroplatinic acid; and the reducing agent is sodium borohydride. In a second preferred process, the polymer anion exchange membrane is a polyolefin based membrane; the anionic entity is potassium tetrachloroplatinate; and the reducing agent is sodium borohydride.

4 Claims, No Drawings

US005837110A

United States Patent [19]

Dean

[11] Patent Number: 5,837,110

[45] Date of Patent: Nov. 17, 1998

[54] **SPHERICAL SECTION ELECTROCHEMICAL CELL STACK**

[75] Inventor: **W. Clark Dean**, Simsbury, Conn.

[73] Assignee: **United Technologies Corporation**, Hartford, Conn.

[21] Appl. No.: **768,248**

[22] Filed: **Dec. 17, 1996**

[51] **Int. Cl.**[6] **C25B 9/00**; C25B 15/08

[52] **U.S. Cl.** **204/240**; 204/242; 204/256; 204/258; 204/266; 204/267; 204/275; 204/277; 204/278; 204/270

[58] **Field of Search** 204/253–256, 204/257–258, 267–270, 263–266, 240, 242, 275–278

[56] **References Cited**

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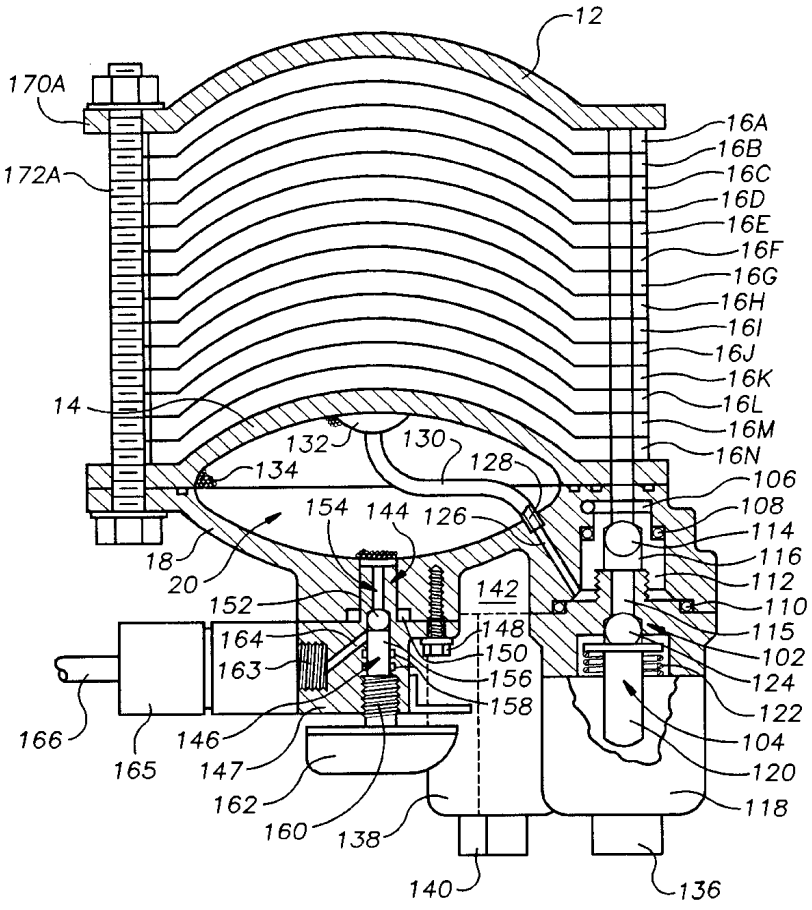
Primary Examiner—Donald R. Valentine

Attorney, Agent, or Firm—Malcolm J. Chisholm, Jr.

[57] **ABSTRACT**

A spherical section electrochemical cell stack is disclosed for generating a product gas such as oxygen from a supply fluid such as water. In a preferred embodiment, the invention includes a spherical section top end plate; a spherical section bottom end plate; one or more spherical section electrochemical cells secured between the top and bottom end plates so that curvature dimensions of the top and bottom end plates and cell are in parallel alignment to thereby minimize any distances between the end plates and cell; and a spherical section pressure header secured to the bottom end plate so that curvature dimensions of the bottom end plate and pressure header are in opposed alignment to thereby define an integral high pressure chamber between the bottom end plate and pressure header. The integral high pressure chamber may be filled with a drying and/or filtering agent so that the product gas may pass through the chamber before leaving the cell. By combining the spherical section bottom end plate with the spherical section pressure header to define the high pressure chamber, a savings of more than half the weight and volume of prior art high pressure filtering-drying chambers is achieved. The spherical section electrochemical cell stack also includes by-pass pressure channels for safety, and integral valve cavity components.

20 Claims, 5 Drawing Sheets



US005733736A

United States Patent [19]

Wun et al.

[11] Patent Number: 5,733,736

[45] Date of Patent: Mar. 31, 1998

[54] **MOTILITY CHANNEL PATHOGEN DETECTOR AND METHOD OF USE**

[75] Inventors: **Chun Kwun Wun**, Palmer; **Frank J. Torre**, Springfield, both of Mass.

[73] Assignee: **Springfield College**, Springfield, Mass.

[21] Appl. No.: **767,165**

[22] Filed: **Dec. 16, 1996**

[51] **Int. Cl.**[6] **G01N 33/567**

[52] **U.S. Cl.** **435/7.21**; 435/30; 435/515

[58] **Field of Search** 435/7.21, 30; 436/515

[56] **References Cited**

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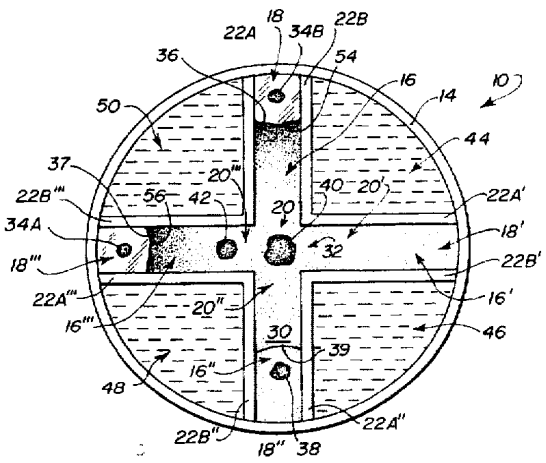
Primary Examiner—James C. Housel
Assistant Examiner—Ginny Allen Portner
Attorney, Agent, or Firm—Malcolm J. Chisholm, Jr.

[57] **ABSTRACT**

A motility channel pathogen detector and method of use of the detector are disclosed for detecting a target motile pathogen in a test sample of potential pathogens. The motility channel pathogen detector includes: a dish having a base and walls arising from the base to define a motility channel; an anti-serum end of the motility channel; an inoculation end of the motility channel opposed to the anti-serum end; and opposed channel walls that cooperate to define the motility channel between the anti-serum and inoculation ends of the channel. A growth medium is positioned in the motility channel and an anti-serum that biologically interacts with the target motile pathogen is positioned in the growth medium in the anti-serum end so that the anti-serum diffuses in the growth medium to form an anti-serum front between the channel walls. The sample of potential pathogens is inoculated in the growth medium adjacent the inoculation end so that any target motile pathogen moves towards, contacts and accumulates at the anti-serum front to form a visible detection line adjacent the anti-serum front. In one embodiment the target motile pathogen is a serotype of *Escherichia coli* bacteria generally known as "*E. coli* 0157:H7", and the anti-serum is *E. coli* H7 anti-serum which restricts motility of the pathogen.

(List continued on next page.)

21 Claims, 1 Drawing Sheet



US005716503A

United States Patent [19]

Dean et al.

[11] Patent Number: 5,716,503

[45] Date of Patent: Feb. 10, 1998

[54] **CENTER POST ELECTROCHEMICAL CELL STACK**

[75] Inventors: **W. Clark Dean**, Simsbury; **David L. Faye**, East Hartland, both of Conn.

[73] Assignee: **United Technologies Corporation**, Hartford, Conn.

[21] Appl. No.: **688,894**

[22] Filed: **Jul. 31, 1996**

[51] **Int. Cl.**[6] **C25B 9/00**

[52] **U.S. Cl.** **204/270**; 204/277; 204/278; 204/279

[58] **Field of Search** 204/267, 268, 204/269, 270, 277, 278, 242, 279

[56] **References Cited**

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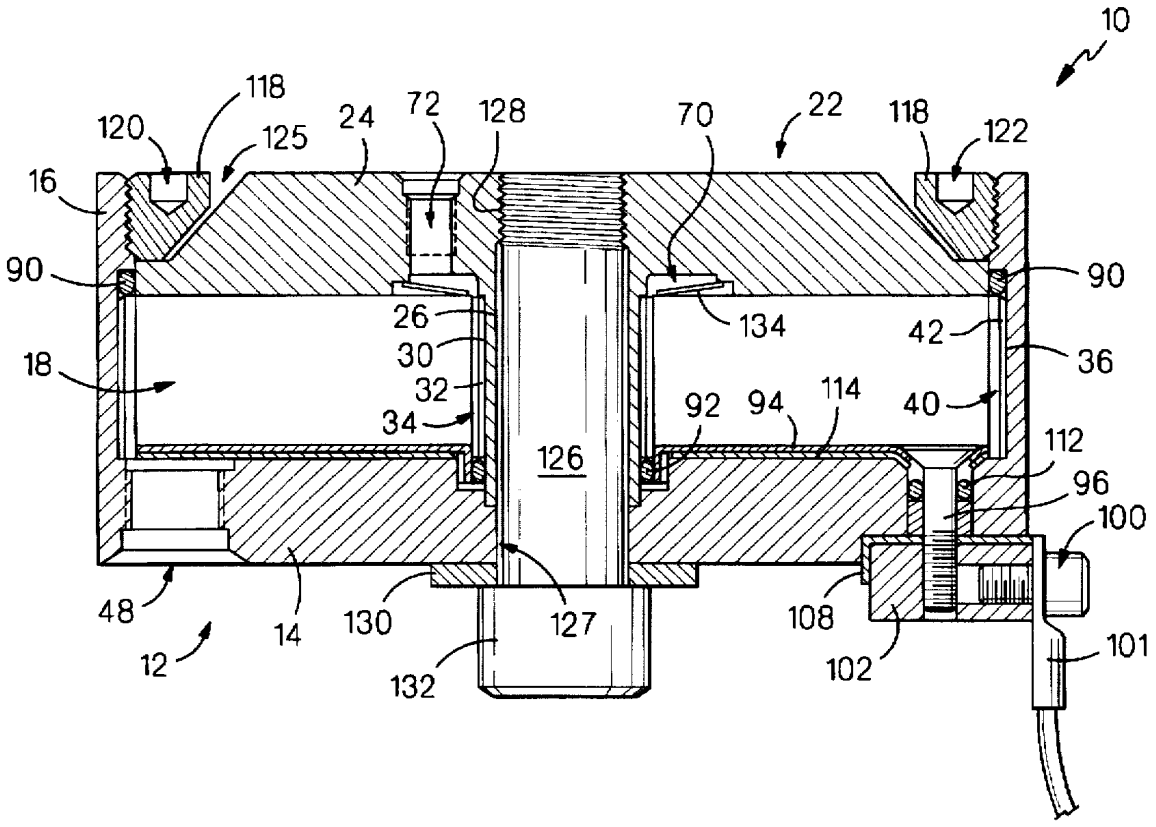
Primary Examiner—Donald R. Valentine
Attorney, Agent, or Firm—Malcolm J. Chisholm, Jr.

[57] **ABSTRACT**

A center post electrochemical cell stack is disclosed for generating a product gas such as oxygen gas from a supply fluid such as water. The invention could be used to generate oxygen on board a space or aircraft and includes: a frame having a base plate and a wall affixed to the base plate so that the wall and base plate define a cell chamber for housing at least one electrochemical cell; and a T-cap having a top plate and a center post affixed to and projecting away from the top plate, wherein the top plate is secured to the wall of the frame to close the cell chamber and the center post passes through a central throughbore in an electrochemical cell within the chamber and is adjustably secured to the base plate of the frame. Consequently, the T-cap and frame cooperate to contain pressure generated by operation of the electrochemical cell. In a specific embodiment of the center post electrochemical cell stack, an exterior surface of the center post of the T-cap cooperates with a central throughbore vented electrochemical cell to define a high pressure manifold for venting of the product gas out of the cell, and an interior surface of the wall of the frame cooperates with the vented central throughbore cell to define a low pressure manifold for transmission of the supply fluid into and out of the cell.

20 Claims, 5 Drawing Sheets



US005704218A

United States Patent [19]

Christians et al.

[11] Patent Number: 5,704,218

[45] Date of Patent: Jan. 6, 1998

[54] INTEGRATED ENVIRONMENTAL CONTROL SYSTEM

[75] Inventors: **Douglas L. Christians**, Vernon; **Diane G. Drew**, Suffield, both of Conn.; **Mark L. Harris**, Agawam, Mass.; **Erin G. Kline**, Vernon; **Michael Zager**, Windsor, both of Conn.

[73] Assignee: **United Technologies Corporation**, Hartford, Conn.

[21] Appl. No.: **629,984**

[22] Filed: **Apr. 8, 1996**

[51] **Int. Cl.**[6] **F25D 9/00**

[52] **U.S. Cl.** **62/172**; 62/402

[58] **Field of Search** 62/87, 172, 401, 62/402, 510; 454/71

[56] **References Cited**

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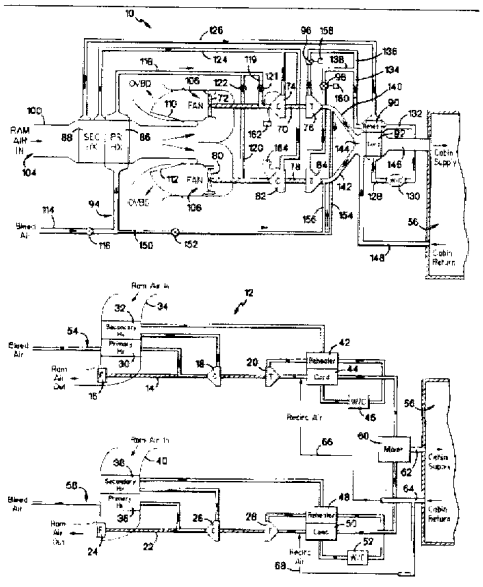
Primary Examiner—Henry A. Bennett
Assistant Examiner—Susanne C. Tinker
Attorney, Agent, or Firm—Malcolm J. Chisholm, Jr.

[57] **ABSTRACT**

An integrated environmental control system is disclosed for providing conditioned supply air to loads such as a passenger cabin of an aircraft. The system comprises at least two shafts, each shaft having a fan, compressor, and turbine mechanically secured to the shaft; common heat transfer components including primary and secondary heat exchangers, a reheater, and a condenser with a water collector; lines that deliver the supply air separately through the compressors and turbines of each shaft and deliver the supply air in common through the common heat transfer components to the load; and shutoff valves secured in fluid communication with each turbine. Upon interruption in the flow of cooled supply air out of a particular turbine secured to any of the shafts, a shutoff valve shuts off transfer of the supply air to that particular turbine on that interrupted shaft and the remaining shafts and their respective fans, compressors, turbines, and the common heat transfer components continue to receive, condition and deliver the supply air to the load in a redundant operating mode. Because the total heat exchange capacity of the integrated, common heat transfer components is large enough to satisfy conditioned air requirements of the load, and in the redundant operating mode the supply air is exposed to that total heat exchange capacity, the system provides enhanced redundant operating mode performance and offers decreased weight, size, and cost over known systems having mechanical components of a comparable size, weight and work capacity.

18 Claims, 2 Drawing Sheets



US005693125A

United States Patent [19]

Dean

[11] Patent Number: 5,693,125

[45] Date of Patent: Dec. 2, 1997

[54] **LIQUID-GAS SEPARATOR**

[75] Inventor: **W. Clark Dean**, Simsbury, Conn.

[73] Assignee: **United Technologies Corporation**, Hartford, Conn.

[21] Appl. No.: **577,998**

[22] Filed: **Dec. 22, 1995**

[51] **Int. Cl.**[6] **B01D 19/00**

[52] **U.S. Cl.** **96/157**; 55/218; 55/317; 55/318; 55/402; 55/409; 55/417; 96/174; 96/177; 96/210; 96/214

[58] **Field of Search** 55/210, 218, 317, 55/318, 402, 409, 417; 96/157, 174, 177, 187, 188, 207, 210, 213, 214, 215, 217

[56] **References Cited**

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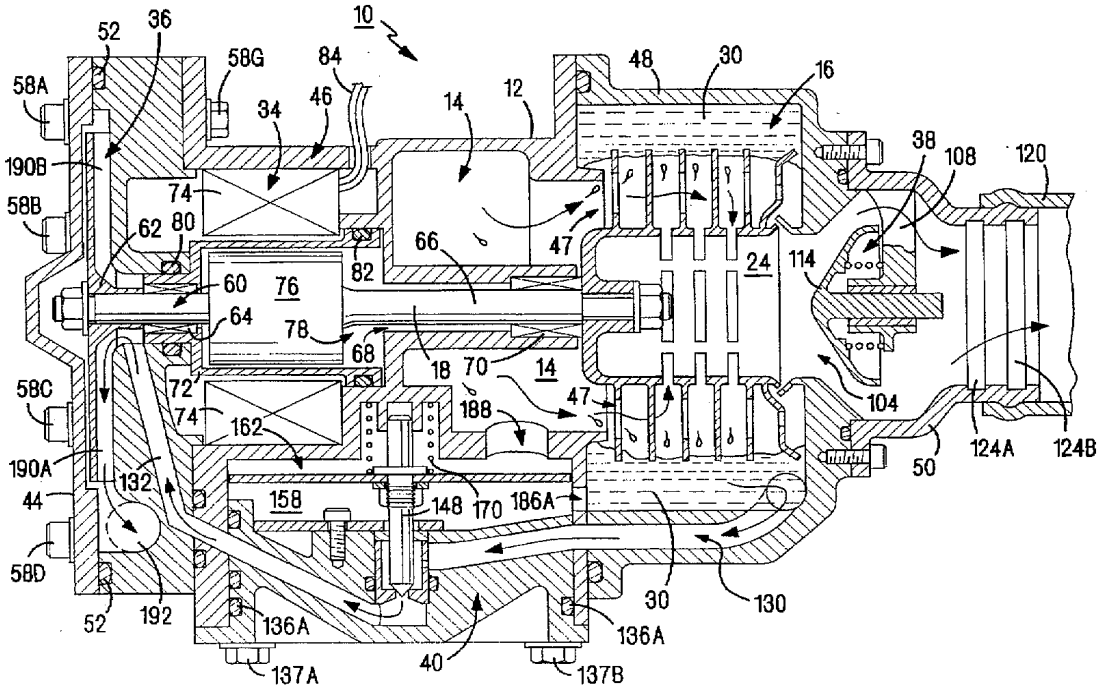
Primary Examiner—C. Scott Bushey

Attorney, Agent, or Firm—Malcolm J. Chisholm, Jr.

[57] **ABSTRACT**

An improved liquid/gas separator is disclosed for separating liquid and gas from a mixture that is mostly gas, within a zero gravity or variable gravity working environment. The separator includes a main housing that defines a pre-swirl chamber for receiving a liquid/gas mixture and an adjacent cylindrical separator chamber for containing liquid and gas separated from the mixture. A main shaft is rotationally secured along an interior longitudinal axis of the main housing and includes a hub portion defining exhaust slots in fluid communication with an exhaust duct within the hub for passing gas out of the separator chamber. A plurality of apertured coalescing disks are secured to the hub portion of the main shaft within the separator chamber for rotationally impacting liquid droplets and directing any droplets, bubbles or sheets of liquid formed on the disks away from the shaft toward and into a rotating liquid ring formed adjacent an interior circumference of the separator chamber. A level control system automatically maintains optimal separation of the liquid and gas by controlling a depth of the liquid ring and includes a level control valve in fluid communication with opposed inner and outer surfaces of the liquid ring so that the valve senses changes in a pressure differential between pressures adjacent the opposed surfaces of the liquid ring and variably discharges the liquid out of the liquid/gas separator in response to those sensed changes to control the depth of the liquid ring.

20 Claims, 5 Drawing Sheets



US005678360A

United States Patent [19]

Fort et al.

[11] Patent Number: 5,678,360

[45] Date of Patent: Oct. 21, 1997

[54] **GUTTER LIQUID SEPARATOR**

[76] Inventors: **James H. Fort**, 94 Quarry Rd., Granby, Conn. 06035; **George C. Rannenberg**, 27 Robin Dr., Collinsville, Conn. 06022

[21] Appl. No.: **466,350**

[22] Filed: **Jun. 6, 1995**

[51] **Int. Cl.**[6] **E04D 13/076**

[52] **U.S. Cl.** **52/14**; 52/12; 52/13; 52/16; 210/474

[58] **Field of Search** 52/12, 13, 14, 52/16; 210/474

[56] **References Cited**

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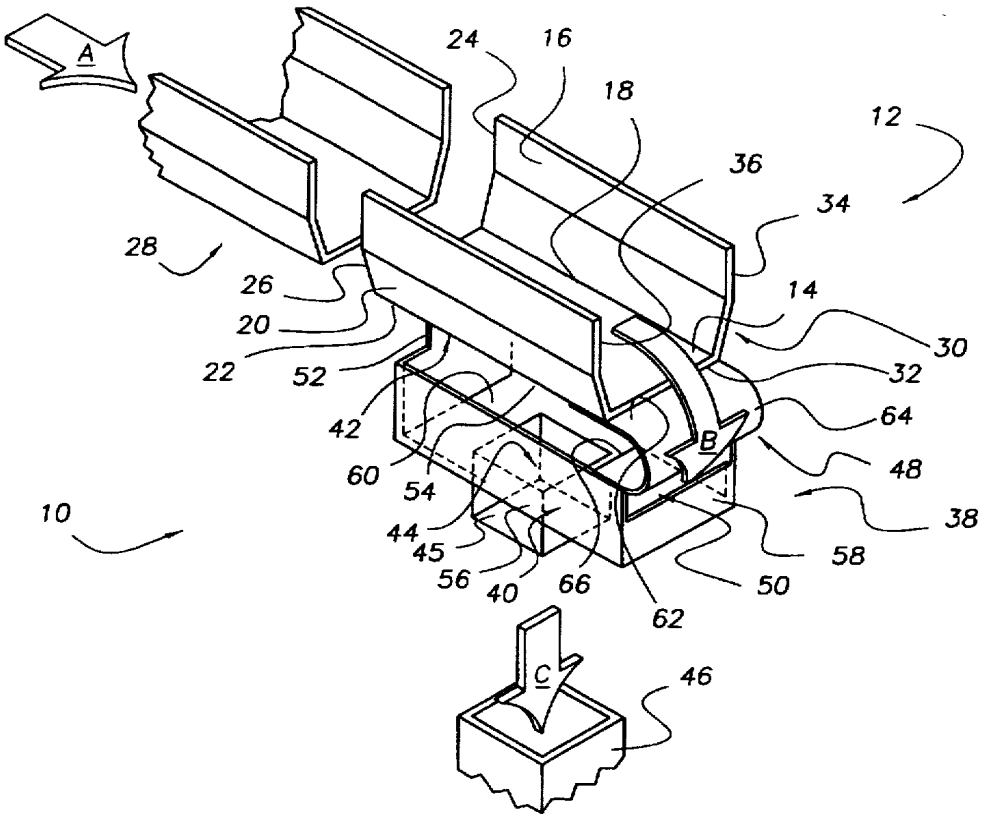
Primary Examiner—Carl D. Friedman
Assistant Examiner—W. Glenn Edwards
Attorney, Agent, or Firm—Malcolm J. Chisholm, Jr.

[57] **ABSTRACT**

A gutter liquid separator is shown for separating liquid from non-liquid debris and for removing debris from a rain water gutter system secured to a roof of a structure. In a particular embodiment, the gutter liquid separator includes two main components; a debris discharge outlet and a liquid separator. The debris discharge outlet includes a flow surface, an inner and an outer wall extending up from the flow surface so that upstream edges of the flow surface, inner and outer walls are secured to a U-shaped gutter of the system. The debris discharge outlet also includes a debris drop-off edge that defines a drop-off plane passing through downstream edges of the flow surface, inner and outer walls. The liquid separator is secured to the debris discharge outlet and includes a liquid collection box secured to a bottom surface of the flow surface under the debris discharge outlet, and a liquid directing surface secured between the debris drop-off edge adjacent the downstream edge of the flow surface and a liquid inlet of the liquid collection box that directs liquid from the flow surface to the liquid collection box. The liquid collection box defines a liquid discharge outlet dimensioned to receive a downspout of the rain water gutter system. Liquid adheres to the liquid directing surface and flows into the liquid collection box, while debris flowing with the liquid drops off the debris drop-off edge out of the system.

8 Claims, 5 Drawing Sheets



US005670727A

United States Patent [19]

Xiao

[11] Patent Number: 5,670,727

[45] Date of Patent: Sep. 23, 1997

[54] **STRINGED INSTRUMENT PRACTICE BOW GUIDE**

[76] Inventor: **Xiaoda Xiao**, 135 Belchertown Rd., Amherst, Mass. 01002

[21] Appl. No.: **647,709**

[22] Filed: **May 14, 1996**

[51] **Int. Cl.**[6] **G01D 1/02**

[52] **U.S. Cl.** **84/283**

[58] **Field of Search** 84/281, 282, 283, 84/325, 465

[56] **References Cited**

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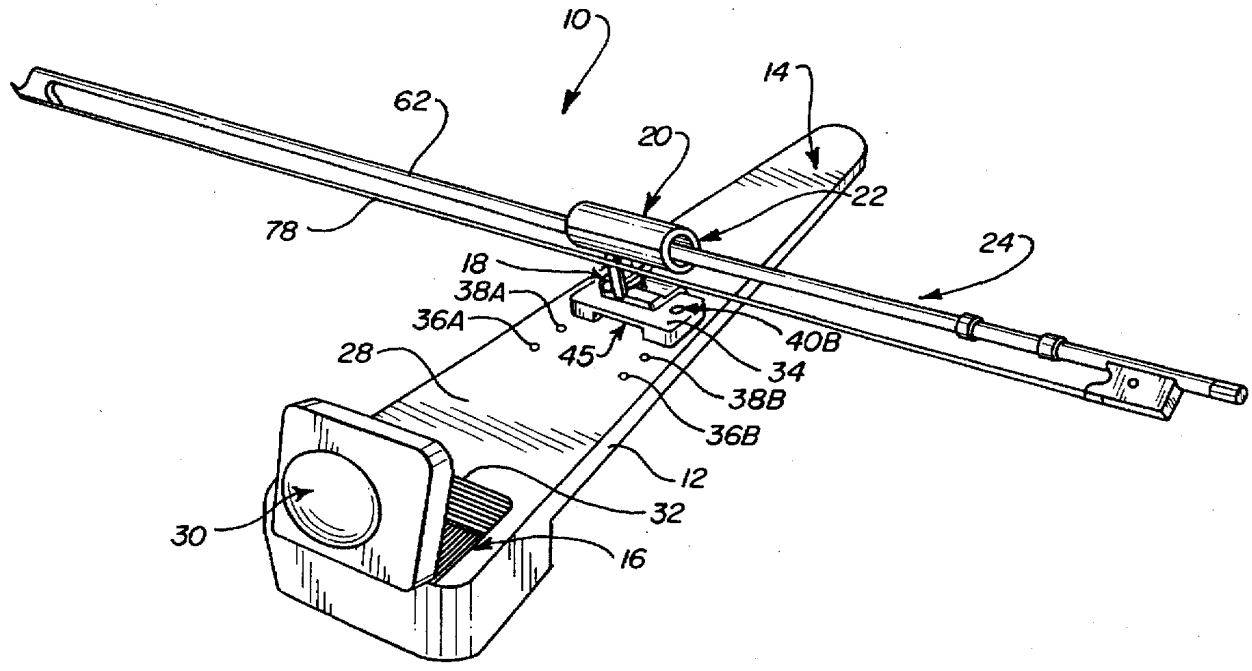
Primary Examiner—Michael L. Gellner
Assistant Examiner—Shih-yung Hsieh
Attorney, Agent, or Firm—Malcolm J. Chisholm, Jr.

[57] **ABSTRACT**

A stringed instrument practice bow guide is disclosed for assisting a student of stringed instruments in learning proper movement of a bow of the stringed instrument without aggravating noise caused by improper string crossings. In a particular embodiment the stringed instrument practice bow guide includes a board having a finger end and an opposed brace end; a frame removably affixed to the board; and, a bow track defining a bow passage for slidably securing the bow. The bow track is pivotally secured to the frame so that the bow passage is in a fixed, right-angle relationship with respect to a longitudinal axis of the board and adjustably pivots with respect to a transverse axis of the board. A pivot arm extends between the bow track and the frame to secure the bow track in a plurality of fixed positions relative to the transverse axis of the board. In a preferred embodiment, the bow track further includes a support housing that supports the bow and an enclosure housing pivotally secured to the support housing that cooperates with the support housing to define the bow passage, and the pivot arm includes a plurality of positioning notches that separately engage a frame strut to secure the bow track in one of the fixed positions. In use of the practice bow guide, the movement of the bow within the bow passage is constrained by the bow track depending upon the position of the bow track selected by the student.

19 Claims, 2 Drawing Sheets



US005632584A

United States Patent [19]

Acevedo

[11] Patent Number: 5,632,584

[45] Date of Patent: May 27, 1997

[54] **BLIND SNAP MOUNTED CLIP FASTENER**

[76] Inventor: **Martin Acevedo**, 77 Warrenr Rd., Ashland, Mass. 01721

[21] Appl. No.: **628,846**

[22] Filed: **Apr. 5, 1996**

[51] **Int. Cl.**[6] **F16B 19/00**; F16B 37/04

[52] **U.S. Cl.** **411/182**; 411/508; 411/913

[58] **Field of Search** 411/111, 112, 182, 411/508, 509, 510, 913

[56] **References Cited**

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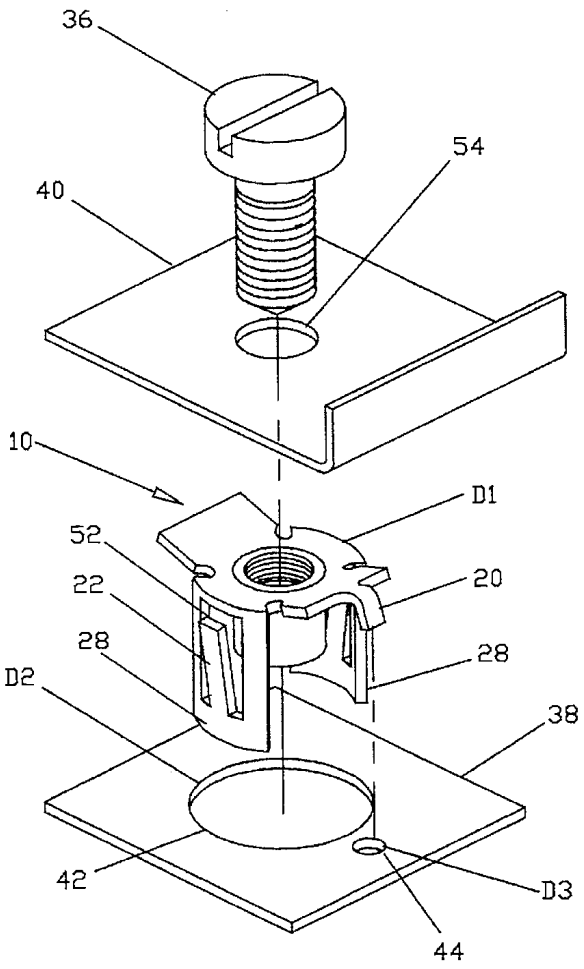
Primary Examiner—Neill R. Wilson

Attorney, Agent, or Firm—Malcolm J. Chisholm, Jr.

[57] **ABSTRACT**

A blind snap mounted clip fastener for anchoring into a round hole pattern stamped from a single sheet metal piece with a base portion (**50**) that is substantially flat, from which a cylindrical sleeve (**24**) is drawn and internally threaded. A pair of locking arms (**26***a*) and (**26***b*) projecting outwardly from the base portion, with an anti-rotate tab (**20**) projecting outwardly from a locking arm (**26***a*) and bent downwardly and perpendicularly to the locking arm. A pair of spaced apart cylindrical shaped segments (**28**) projecting outwardly from base portion (**50**) and bent downwardly generally perpendicular and concentric to the sleeve. Along the vertical surface of each cylinder segment, a locking pawl (**22**) is sheared, shaped and bent outwardly away from the segment with its top edge placed at a predetermined distance from the top surface of the base portion and concentric to the segment perimeter. The blind snap mounted fastener is simple to manufacture and provided With a multiplicity of features such as: anti-rotate, anti-vibration, self-locking, multiple engaging threads, able to accommodate tolerance accumulation, able to tolerate dimensional variations in mounting panel material thickness and with a prevailing locking torque feature. The fastener can be used and installed by anyone possessing simple home tools, such as a drill.

13 Claims, 2 Drawing Sheets



US005620165A

United States Patent [19]

Dean

[11] Patent Number: 5,620,165

[45] Date of Patent: Apr. 15, 1997

[54] **RETRACTING RING SEAL VALVE**

[75] Inventor: **W. Clark Dean**, Simsbury, Conn.

[73] Assignee: **United Technologies Corporation**, Hartford, Conn.

[21] Appl. No.: **543,951**

[22] Filed: **Oct. 17, 1995**

[51] **Int. Cl.**[6] **F16K 25/00**

[52] **U.S. Cl.** **251/158**; 251/177; 251/187

[58] **Field of Search** 251/158, 177, 251/187, 179, 301, 193

[56] **References Cited**

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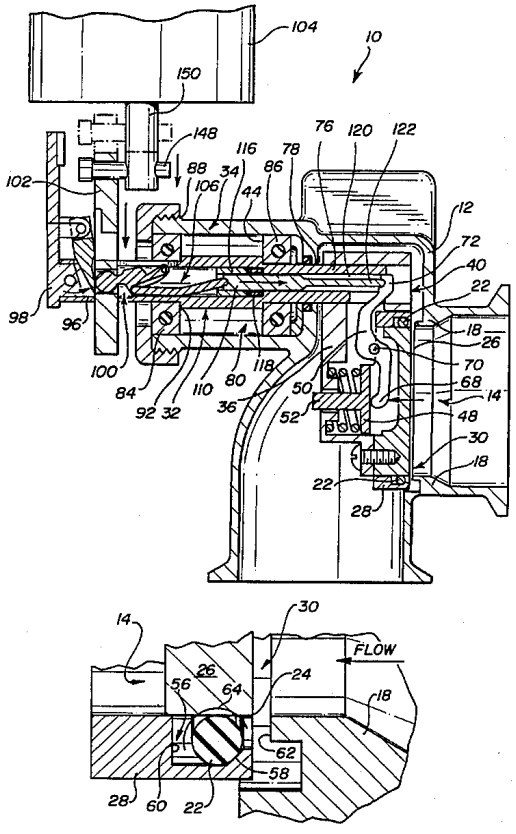
Primary Examiner—Denise L. Ferensic
Assistant Examiner—Joanne Y. Kim
Attorney, Agent, or Firm—Malcolm J. Chisholm, Jr.

[57] **ABSTRACT**

A retracting ring seal valve is disclosed for adjustably restricting and permitting fluid flow in a two-direction fluid control system. In a particular embodiment the invention comprises a valve body that defines a central passage through which the fluid passes, a side chamber adjacent the central passage, and a sealing shoulder around a circumference of the passage. A gate assembly adjustably moveable between the central passage and the side chamber includes a ring seal surrounding a peripheral edge of a sealing surface of the gate assembly so that a retainer moves the ring seal to seal a flow gap defined between the sealing surface and the sealing shoulder of the valve body to restrict flow of fluid through the central passage. An actuating assembly secured between the gate assembly and the valve body both positions the gate assembly to restrict or permit flow of fluid through the passage and also moves the ring seal into and out of the flow gap. To open the retracting ring seal valve and thereby permit flow of fluid through the central passage, the actuating assembly first retracts the ring seal from simultaneous, sealing contact with the sealing shoulder and peripheral edge of the sealing surface so that any friction resulting from contact between the gate assembly and sealing shoulder is eliminated. The actuating assembly next pivots the gate assembly in a direction perpendicular to the flow of the fluids out of the central chamber into the adjacent side chamber.

15 Claims, 7 Drawing Sheets



US005608383A

United States Patent [19]

Neil

[11] Patent Number: 5,608,383

[45] Date of Patent: Mar. 4, 1997

[54] **AUTOMATIC TEMPERATURE ALARM SYSTEM**

[76] Inventor: **Clifford R. Neil**, 39 Ora St., Pittsfield, Mass. 01201

[21] Appl. No.: **412,998**

[22] Filed: **Mar. 29, 1995**

[51] **Int. Cl.**[6] **G08B 17/00**

[52] **U.S. Cl.** **340/588**; 99/344; 374/102

[58] **Field of Search** 340/584, 588, 340/529, 309.15, 522; 374/102; 99/342, 344, 325; 219/627, 449, 494, 506, 510; 431/13

[56] **References Cited**

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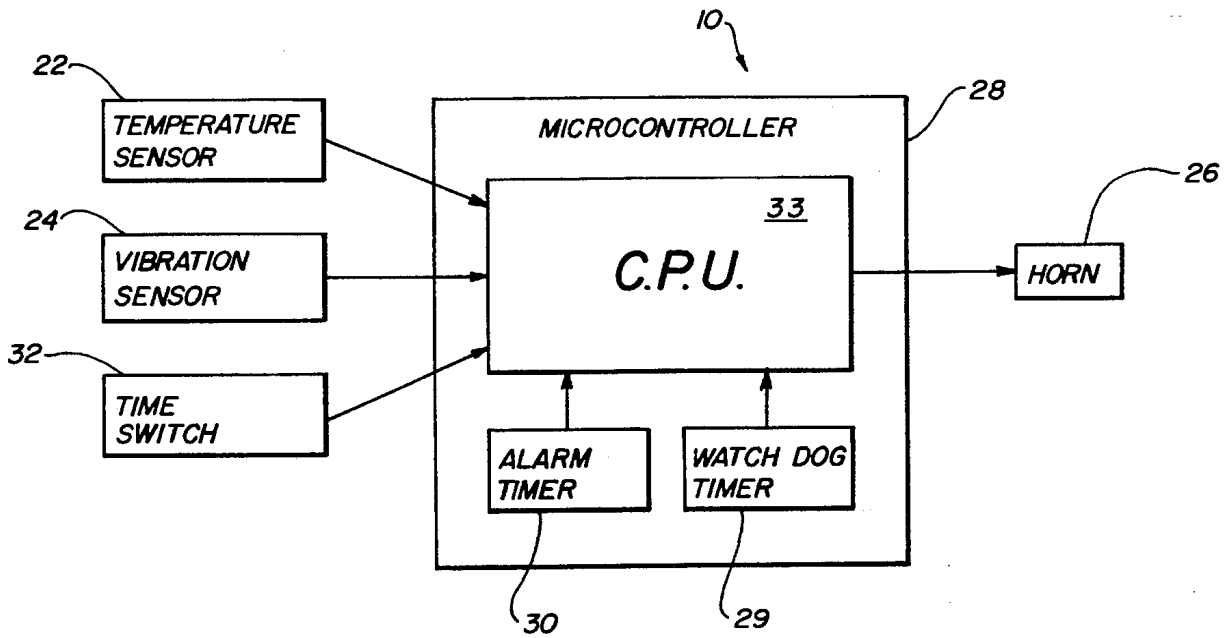
Primary Examiner—Thomas Mullen

Attorney, Agent, or Firm—Malcolm J. Chisholm, Jr.

[57] **ABSTRACT**

An automatic temperature alarm system is disclosed for alerting an operator of a heated apparatus that the apparatus has been heated and untouched for an excessive period of time. In a particular embodiment, the invention comprises a temperature sensor affixed to the heated apparatus that senses its temperature; a vibration sensor that senses motion of the apparatus; a horn to alert the operator; and a system control intelligence in communication with the temperature and vibration sensors and horn for setting an alarm timer to measure an alarm period in response to sensed temperatures and motions and for activating the horn upon expiration of the alarm period. In use of the automatic temperature alarm system, the system control intelligence is operated so that whenever the temperature sensor senses an increase beyond a specific high or trigger temperature, such as a heating temperature of an outdoor barbecue, the system control intelligence sets its alarm timer to commence measurement of the alarm period of time, and upon the expiration of the alarm period of time, for example twenty minutes, the system control intelligence activates the horn. If the system control intelligence senses a motion of the apparatus from the vibration sensor during the alarm period of time, however, it re-sets its alarm timer to re-commence measurement of the alarm period of time. If the horn has been activated, the system control intelligence inactivates it upon sensing any apparatus motion from the vibration sensor.

10 Claims, 4 Drawing Sheets



US005592687A

United States Patent [19]

Lajeunesse

[11] **Patent Number: 5,592,687**

[45] **Date of Patent: Jan. 14, 1997**

[54] **FACIAL INSULATOR**

[76] Inventor: **Alan L. Lajeunesse**, 11 Ellerton St., Chicopee, Mass. 01020

[21] Appl. No.: **535,647**

[22] Filed: **Sep. 28, 1995**

[51] **Int. Cl.**[6] **A41D 13/00**

[52] **U.S. Cl.** **2/9**; 2/206; 2/455

[58] **Field of Search** 2/9, 206, 2, 7, 2/8, 243.1, 267; 602/54, 57, 43, 58, 61, 74; 128/857, 858, 888

[56] **References Cited**

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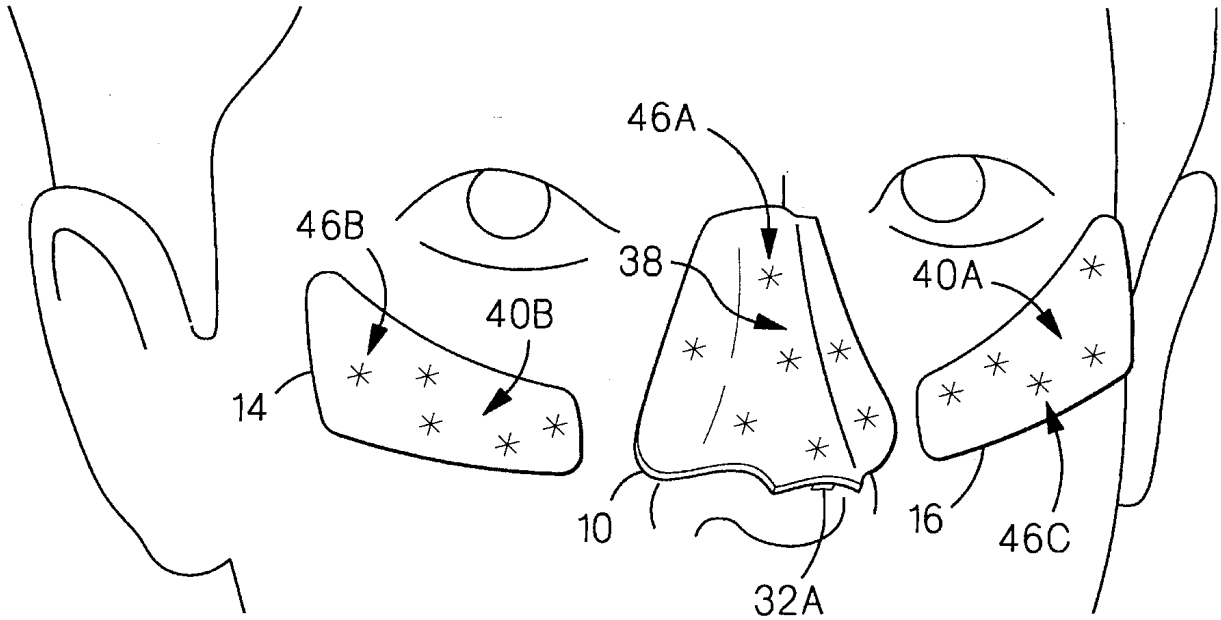
Primary Examiner—Amy B. Vanatta
Attorney, Agent, or Firm—Malcolm J. Chisholm, Jr.

[57] **ABSTRACT**

An improved facial insulator is disclosed for restricting heat loss from exposed skin surfaces. In a general embodiment, the facial insulator comprises a support pad having a design surface for displaying a design and an opposed adhesive surface having an edge strip along a perimeter edge of the pad and an insulating area defined by the edge strip as a circumference of the insulating area. A pressure-sensitive adhesive covers the edge strip, and an insulating material is affixed to the insulating area of the adhesive surface of the insulating pad. At least one downstream vent break and at least one upstream vent break are in generally opposed locations on the edge strip for permitting air to flow through the insulating material to remove any perspiration or moisture. A release layer is affixed to and covers the adhesive surface of the support pad. In a further embodiment, the facial insulator of the present invention may comprise a facial insulator set including insulators dimensioned in the shape of thin-flesh facial areas such as a nose bridge facial insulator and a pair of upper cheek bone facial insulators, so that only those thin-flesh areas are covered; and the vent breaks of the nose bridge and upper cheek bone facial insulators are positioned along their edge strips to facilitate movement of ordinary air currents through the insulating material, such as air currents passing over exposed facial skin surfaces of a down hill skier.

14 Claims, 3 Drawing Sheets



US005576492A

United States Patent [19]

Phalin

[11] **Patent Number: 5,576,492**

[45] **Date of Patent: Nov. 19, 1996**

[54] **MECHANICAL CONTOUR FOLLOWER**

[75] Inventor: **Mark C. Phalin**, Enfield, Conn.

[73] Assignee: **United Technologies Corporation**, Hartford, Conn.

[21] Appl. No.: **378,702**

[22] Filed: **Jan. 26, 1995**

[51] **Int. Cl.**[6] **G01N 29/26**; G01N 29/24

[52] **U.S. Cl.** **73/634**; 73/618; 73/629; 73/640

[58] **Field of Search** 73/632, 633, 634, 73/640, 618, 629, 620, 622, 627, 619

[56] **References Cited**

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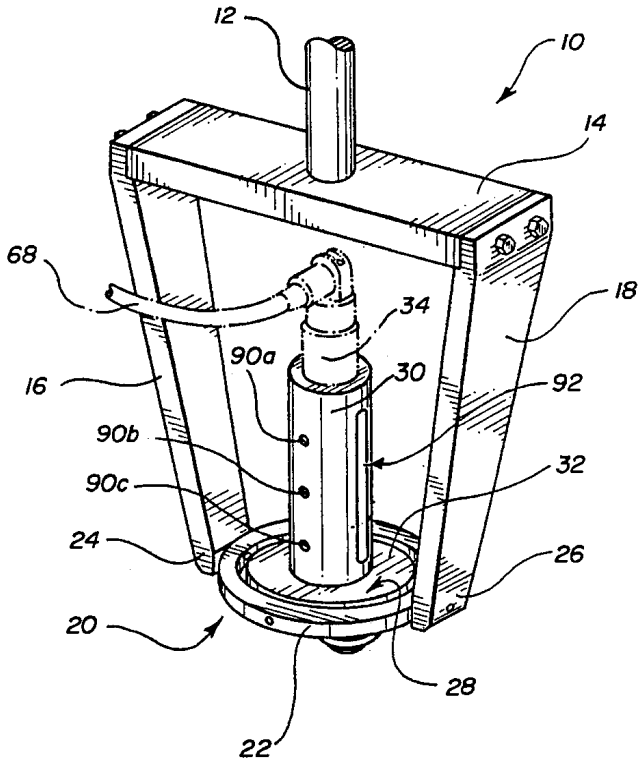
Primary Examiner—Hezron E. Williams
Assistant Examiner—Rose M. Finley
Attorney, Agent, or Firm—Malcolm J. Chisholm, Jr.

[57] **ABSTRACT**

A mechanical contour follower is disclosed for maintaining a transducer ninety degrees to a workpiece surface, with respect to longitudinal and transverse axes of the workpiece surface, and for keeping the transducer at a constant distance from the workpiece surface during an ultrasound inspection of the workpiece (these conditions being referred to as keeping the transducer normal to the workpiece surface). In a particular embodiment, the mechanical contour follower comprises a plunger post slideably secured to a bridge assembly of an ultrasound inspection apparatus; a support frame affixed to the plunger post, having opposed first and second pivot arms; a gimballed mounting means, having an outer ring pivotally secured to opposed pivot ends of the first and second pivot arms, and having an inner disk pivotally secured within the outer ring to produce a gimbal effect; a transducer barrel affixed to a support surface of the inner disk; and a tracking surface of the inner disk opposed to the support surface of the inner disk. The gimbal effect allows a transducer secured within the transducer barrel to remain at ninety degrees to the workpiece surface with respect to the longitudinal and transverse axes of the workpiece surface, and the slidable plunger post enables the transducer to float in a vertical axis, and thereby remain a constant distance from the workpiece surface, so that the transducer automatically remains normal to the workpiece surface throughout an inspection of the workpiece.

6 Claims, 7 Drawing Sheets



US005512081A

United States Patent [19]

DelGrosso et al.

[11] Patent Number: 5,512,081

[45] Date of Patent: Apr. 30, 1996

[54] **HYBRID BRAZE ALLOY**

[75] Inventors: **Eugene J. DelGrosso**, Wallingford, Conn.; **Michael R. Coles**, Corpus Christi, Tex.

[73] Assignee: **United Technologies Corporation**, Hartford, Conn.

[21] Appl. No.: **390,013**

[22] Filed: **Feb. 17, 1995**

[51] **Int. Cl.**[6] **C22C 21/12**

[52] **U.S. Cl.** **75/255**

[58] **Field of Search** 75/255

[56] **References Cited**

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Primary Examiner—Sam Silverberg
Attorney, Agent, or Firm—Malcolm J. Chisholm, Jr.

[57] **ABSTRACT**

A hybrid braze alloy is disclosed that includes an aluminum alloy and a magnesium alloy mixed together. In use of the hybrid braze alloy, the ratio by weight of aluminum alloy to magnesium alloy making up the mixture may be altered within a working braze ratio range of about forty nine to one (49/1) to about four point eight to one (4.8/1), so that the braze melting temperature of the hybrid braze alloy is a function of the ratio. By altering the ratio of the alloys within the working braze ratio range, a braze melting temperature may be achieved that is most appropriate for brazing a specific component to a specific apparatus.

8 Claims, No Drawings

US005507309A

United States Patent [19]

Dean

[11] Patent Number: 5,507,309

[45] Date of Patent: Apr. 16, 1996

[54] **PRESSURE DIFFERENTIAL REGULATOR**

[75] Inventor: **W. Clark Dean**, Simsbury, Conn.

[73] Assignee: **United Technologies Corporation**, Hartford, Conn.

[21] Appl. No.: **498,098**

[22] Filed: **Jul. 5, 1995**

[51] **Int. Cl.**[6] **G05D 11/03**

[52] **U.S. Cl.** **137/87**; 137/312

[58] **Field of Search** 137/87, 312

[56] **References Cited**

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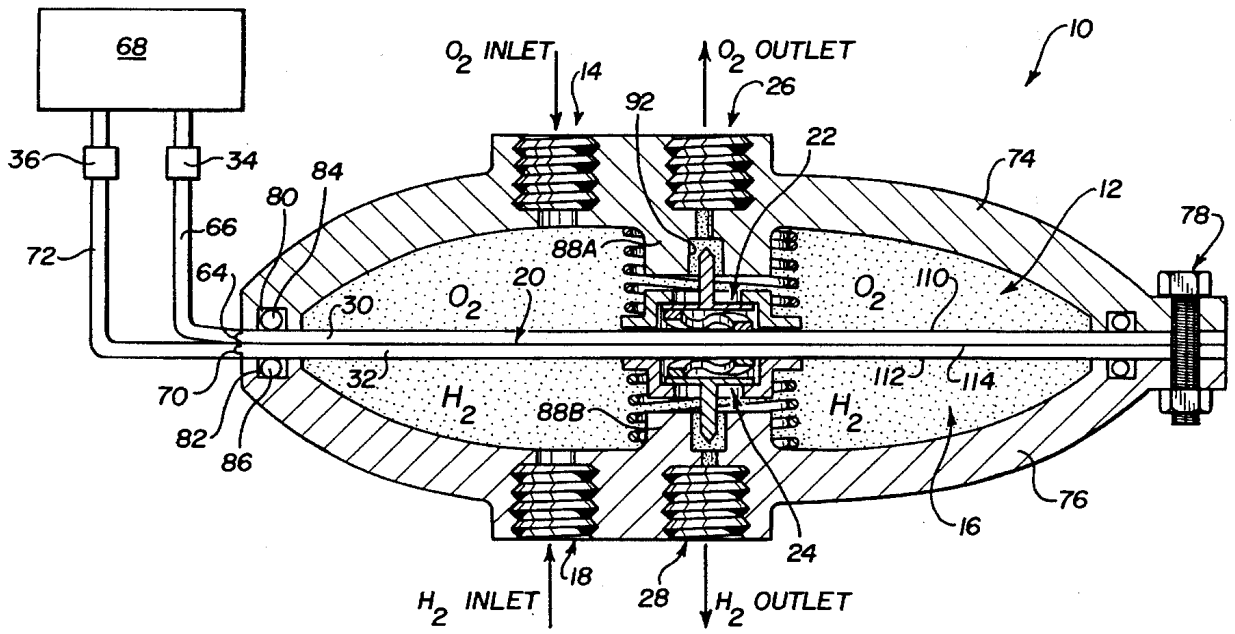
Primary Examiner—Robert G. Nilson

Attorney, Agent, or Firm—Malcolm J. Chisholm, Jr.

[57] **ABSTRACT**

An improved pressure differential regulator is disclosed for controlling pressure differentials within a supply source such as an electrolytic cell stack. The regulator is positioned downstream of the supply source and basically includes a first sensing chamber that receives a first fluid from the source; a second sensing chamber that receives a second fluid from the source; a multi-layered diaphragm secured between the first and second sensing chambers; a first contracted sensing chamber outflow restriction valve secured within the first sensing chamber between the diaphragm and a first fluid outlet; and, a second contracted sensing chamber outflow restriction valve secured within the second sensing chamber between the diaphragm and a second fluid outlet. In operation, if a sudden demand of first fluid downstream of the regulator decreases pressure within the first sensing chamber, the relatively higher pressure within the second sensing chamber will cause the multi-layered diaphragm to expand into and therefore contract the first sensing chamber. That causes the first contracted sensing chamber outflow restriction valve to restrict flow of the first fluid out of the first sensing chamber and supply source, thereby regulating the pressure differential between the first and second fluids within the supply source. The multi-layered diaphragm defines first and second leakage cavities to direct leaked fluids out of the regulator without unsafe mixing of the leaked fluids.

19 Claims, 4 Drawing Sheets



US005505824A

United States Patent [19]

McElroy

[11] Patent Number: 5,505,824

[45] Date of Patent: Apr. 9, 1996

[54] **PROPELLANT GENERATOR AND METHOD OF GENERATING PROPELLANTS**

[75] Inventor: **James F. McElroy**, Suffield, Conn.

[73] Assignee: **United Technologies Corporation**, Hartford, Conn.

[21] Appl. No.: **369,246**

[22] Filed: **Jan. 6, 1995**

[51] **Int. Cl.**[6] **C25B 1/04**; C25B 9/00; C25B 15/02; C25B 15/08

[52] **U.S. Cl.** **205/337**; 204/262; 204/266; 204/258; 204/257; 205/628

[58] **Field of Search** 204/129, 262–266, 204/257–258; 422/189, 234–235, 305

[56] **References Cited**

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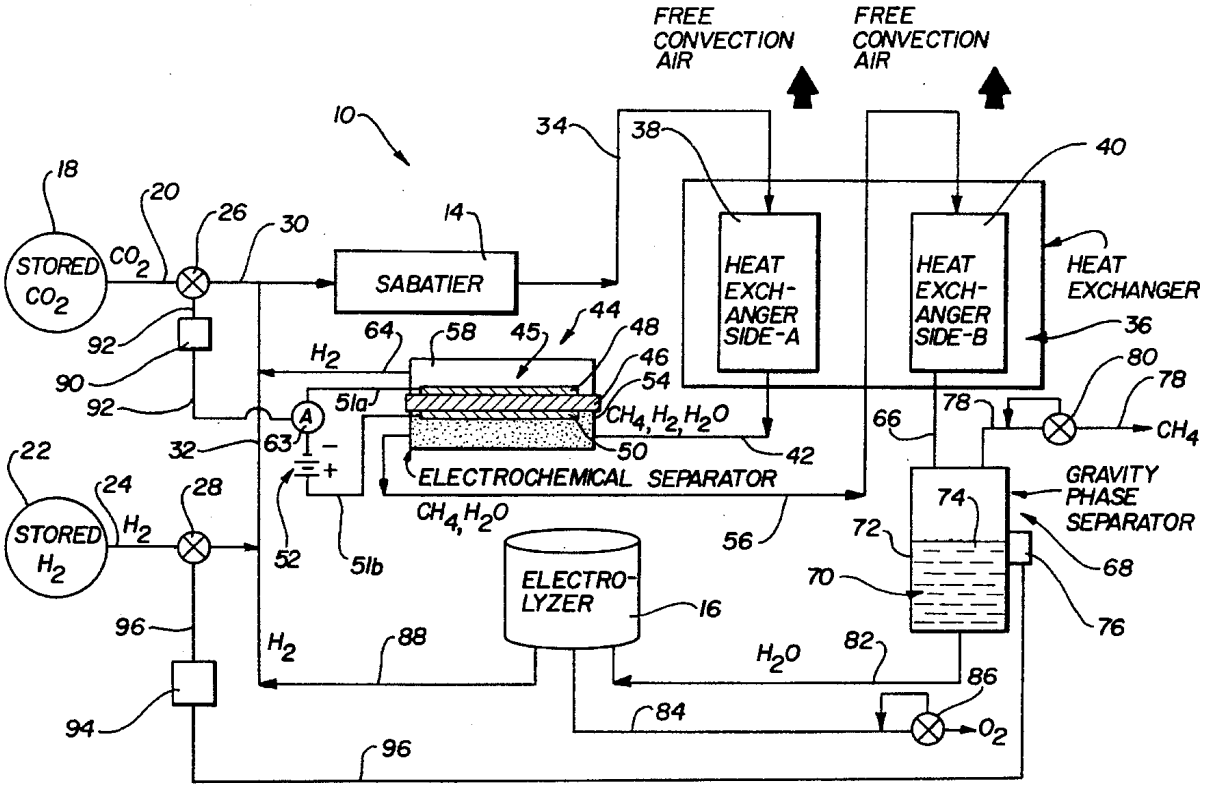
Primary Examiner—Donald R. Valentine
Attorney, Agent, or Firm—Malcolm J. Chisholm, Jr.

[57] **ABSTRACT**

A propellant generator is disclosed that automatically adjusts rates of input of lean and excess reactants to compensate for changes in rates of reactions in the generator. In a particular embodiment, the invention generates propellants methane (CH_4) and oxygen gas (O_2) from a lean reactant carbon dioxide (CO_2) and an excess reactant hydrogen gas (H_2) utilizing stored hydrogen gas transported to a remote site such as the surface of the planet Mars where carbon dioxide is accumulated and stored. A lean reactant flow controller measures the level of excess reactant passing through a sabatier by measuring a current consumed by an electrochemical separator that separates and pressurizes the excess reactant from a mixture of first propellant, water and excess reactant produced by the sabatier. In response to those measurements, the controller adjusts a flow rate of the lean reactant into the sabatier, thereby automatically controlling proportions of the mixture components so that so that unreacted lean reactants are not stored with the propellants and compensation can be made for unforeseen generator interruptions. A stored excess reactant flow controller measures a level of water separated from the mixture by a gravity phase separator and adjusts a flow rate of stored excess reactant into the sabatier to automatically match a flow rate of diatomic hydrogen (H_2) into the sabatier generated by electrolyzing the water separated from the mixture, thereby preventing flooding or emptying of the condensed water in the gravity phase separator.

20 Claims, 2 Drawing Sheets



US005466354A

United States Patent [19]

Leonida et al.

[11] Patent Number: 5,466,354

[45] Date of Patent: * Nov. 14, 1995

[54] **METAL COMPRESSION PAD FOR AN ELECTROLYSIS CELL**

[75] Inventors: **Andrei Leonida**, West Hartford; **Lawrence C. Moulthrop**, Windsor; **Kurt M. Critz**, Enfield, all of Conn.

[73] Assignee: **United Technologies Corporation**, Hartford, Conn.

[*] Notice: The portion of the term of this patent subsequent to Jun. 28, 2011, has been disclaimed.

[21] Appl. No.: **309,258**

[22] Filed: **Sep. 20, 1994**

Related U.S. Application Data

[63] Continuation of Ser. No. 991,906, Dec. 17, 1992, Pat. No. 5,366,823.

[51] **Int. Cl.**[6] **H01M 2/00**

[52] **U.S. Cl.** **204/252**; 204/279; 204/296; 428/131; 428/195; 428/209; 428/323; 428/328; 428/427; 429/34; 429/66

[58] **Field of Search** 429/34, 66; 428/131, 428/195, 209, 323, 328, 457; 204/252, 296, 279

[56] **References Cited**

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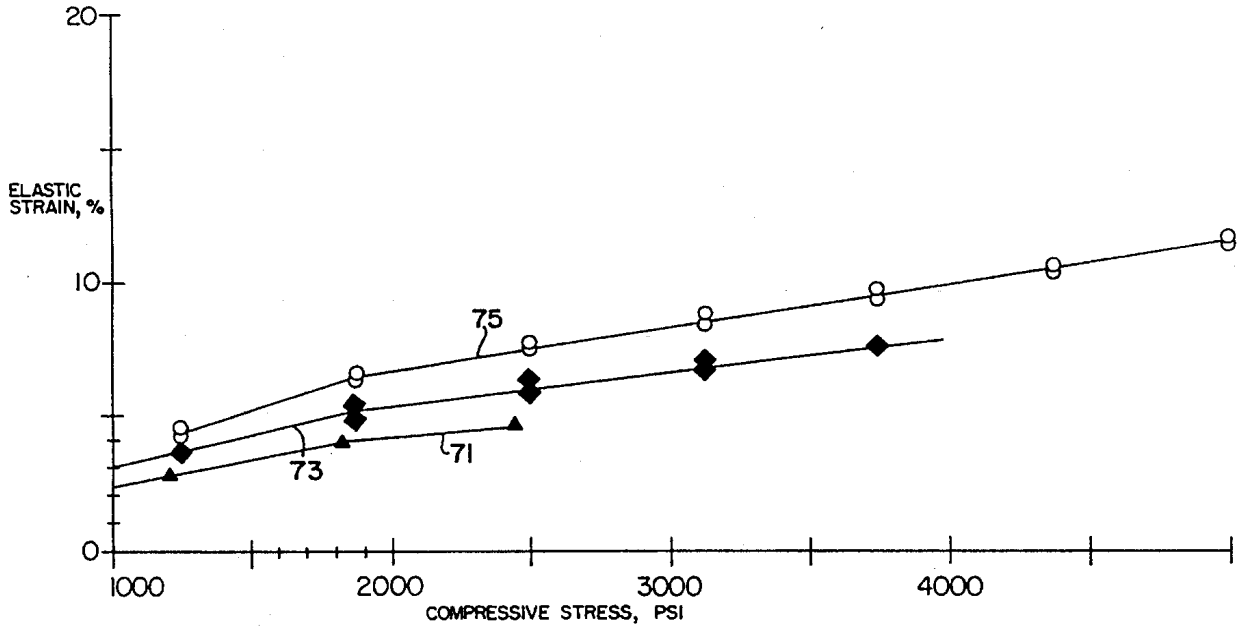
Primary Examiner—Prince Willis, Jr.
Assistant Examiner—M. Nuzzolillo
Attorney, Agent, or Firm—Malcolm J. Chisholm, Jr.

[57] **ABSTRACT**

Accumulated dimensional variations in fuel cells and electrolysis cell assemblies can reduce the efficiency of the assembly and provide leakage paths for fuel and oxidant. A metal compression pad comprised of a metal having an elastic strain of about 3% to about 40% at about 2,500 psig can compensate for component dimensional variations and improve inter-cell conductivity at pressures up to and exceeding about 10,000 psig.

18 Claims, 2 Drawing Sheets



US005444861A

United States Patent [19]

Adamec et al.

[11] Patent Number: 5,444,861

[45] Date of Patent: Aug. 22, 1995

[54] **SYSTEM FOR DOWNLOADING SOFTWARE**

[75] Inventors: **William B. Adamec; Robert E. Cox,** both of Enfield; **Scott A. Gigandet,** East Granby, all of Conn.

[73] Assignee: **United Technologies Corporation,** Hartford, Conn.

[21] Appl. No.: **317,984**

[22] Filed: **Oct. 4, 1994**

Related U.S. Application Data

[63] Continuation of Ser. No. 890,776, Jun. 1, 1992, abandoned.

[51] **Int. Cl.**[6] **G06F 15/16;** G06F 9/06; G06F 9/24

[52] **U.S. Cl.** **395/700;** 364/975.1; 364/975.2; 364/DIG. 2

[58] **Field of Search** 395/650, 700

[56] **References Cited**

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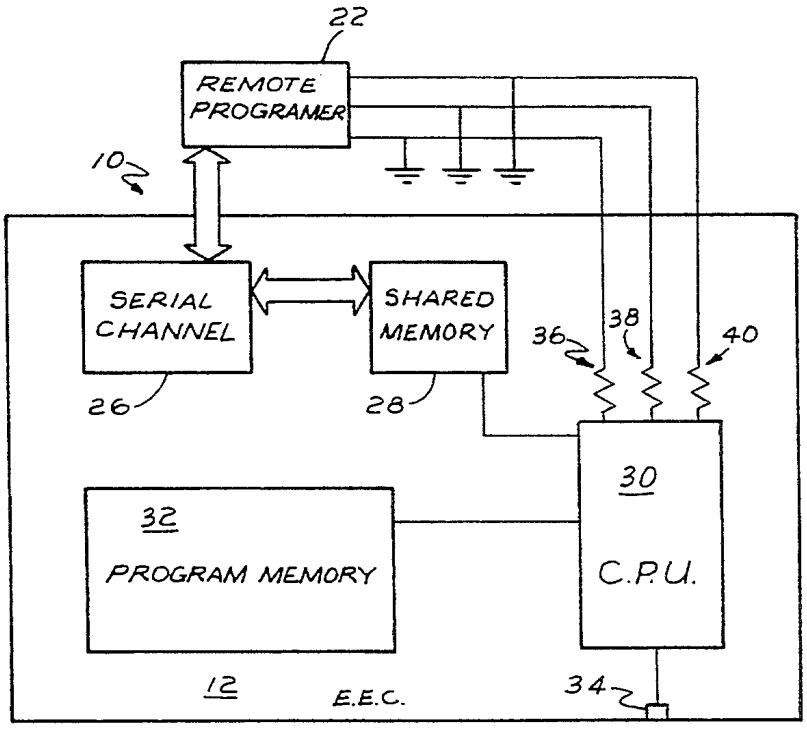
Primary Examiner—Kevin A. Kriess
Assistant Examiner—Michael T. Richey
Attorney, Agent, or Firm—Malcolm J. Chisholm, Jr.

[57] **ABSTRACT**

An improved system is disclosed for downloading, verifying, and/or testing software from a remote programmer to an Electronic Engine Control ("E.E.C.") unit on a gas turbine engine. The invention includes a remote programmer that communicates with the E.E.C. unit through a serial communications link. The E.E.C. unit receives the communications through a serial memory that transmits them to a shared memory and on through a central processing unit ("C.P.U.") to a program memory. A redundant control circuit is controlled by the remote programmer and directs the E.E.C. unit through three operational modes. In a first, or download/verify, mode of operation, the E.E.C. unit may receive and store a boot program. In a second, or program memory, mode, the C.P.U. executes the boot program to allow the C.P.U. to read from and/or write to the program memory in response to communications from the serial channel. In a third, or normal, mode of operation, the C.P.U. can only read from the program memory and an on-board or host computer may replace the remote programmer, so that the C.P.U. executes software stored in the program memory in response to communications received from the host computer to control multiple actuators on the engines, but the host computer cannot access the E.E.C. unit's program memory.

17 Claims, 2 Drawing Sheets



US005441621A

United States Patent [19]

Molter et al.

[11] Patent Number: 5,441,621

[45] Date of Patent: Aug. 15, 1995

[54] **ELECTROCHEMICAL CELL HAVING CROSSED-RIDGE SEALING SURFACE**

[75] Inventors: **Trent M. Molter**, Enfield; **David L. Faye**, East Hartford; **Wilford J. Armstrong**, Bolton, all of Conn.

[73] Assignee: **United Technologies Corporation**, Hartford, Conn.

[21] Appl. No.: **171,730**

[22] Filed: **Dec. 22, 1993**

[51] **Int. Cl.**[6] **C25B 9/00**; C25B 13/02

[52] **U.S. Cl.** **204/252**; 204/279; 429/35

[58] **Field of Search** 204/279, 252–258, 204/263–266; 429/34–39

[56] **References Cited**

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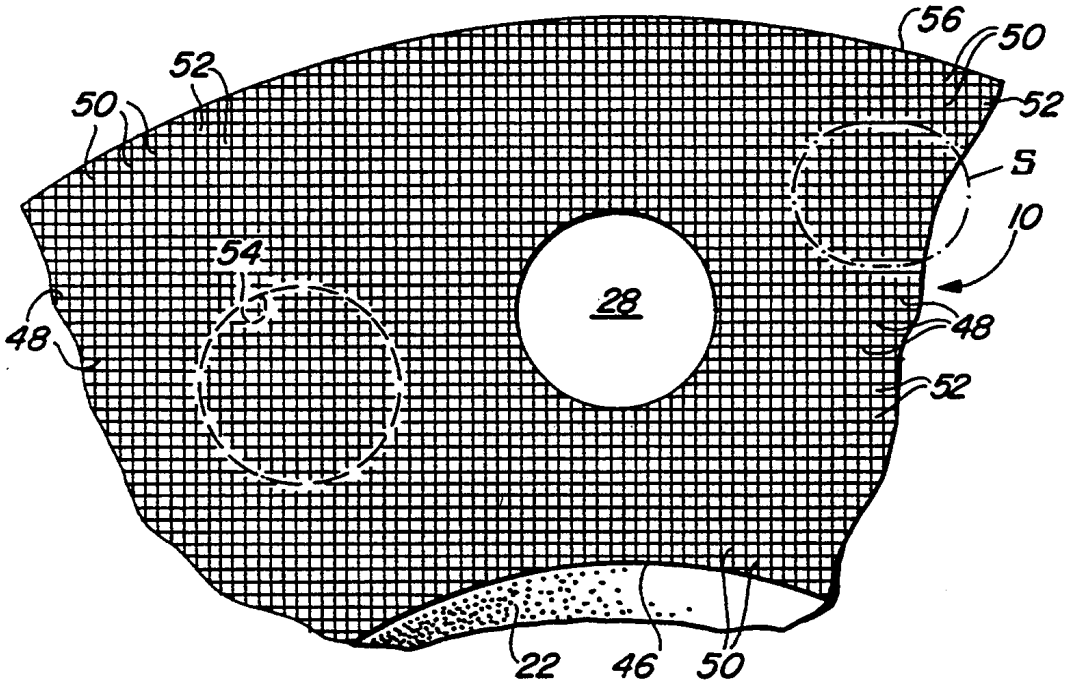
Primary Examiner—Donald R. Valentine
Attorney, Agent, or Firm—Malcolm J. Chisholm, Jr.

[57] **ABSTRACT**

Fluid leakage restriction in multi-layered systems that contain fluids such as electrochemical cell devices with sealing surfaces defining patterns of ridges forming concentric rings surrounding through apertures within the surfaces require a new surface design for use of a potential through aperture site. A crossed-ridge sealing surface is comprised of a first plurality of aligned ridges and a second plurality of aligned ridges that crosses the first plurality of aligned ridges to define sealing cells that surround the existing through apertures and potential through aperture sites, so that one sealing surface design may enhance fluid leakage restriction for a variety of actual and potential through apertures.

10 Claims, 2 Drawing Sheets



US005435125A

United States Patent [19]

Telakowski

[11] Patent Number: 5,435,125

[45] Date of Patent: Jul. 25, 1995

[54] **REDUNDANT ENGINE STARTING SYSTEM**

[75] Inventor: **Robert Telakowski**, Fairlawn, N.J.

[73] Assignee: **United Technologies Corporation**, Hartford, Conn.

[21] Appl. No.: **260,966**

[22] Filed: **Jun. 15, 1994**

[51] **Int. Cl.**[6] **F02C 7/275**

[52] **U.S. Cl.** **60/39.142**; 60/625; 74/6; 74/661

[58] **Field of Search** 60/39.142, 625, 630, 60/698, 700, 701, 702, 716, 718; 74/6, 661

[56] **References Cited**

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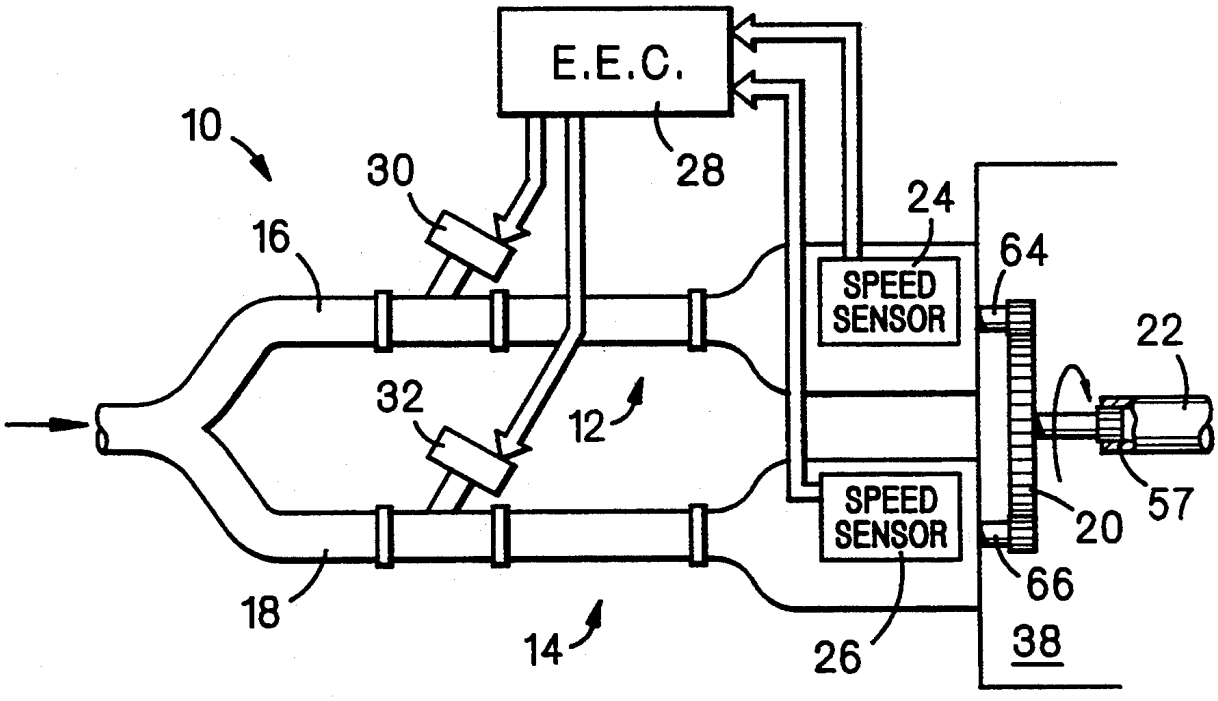
4,899,534	2/1990	Sorenson	60/39.142

Primary Examiner—Lois J. Casaregola
Attorney, Agent, or Firm—Malcolm J. Chisholm, Jr.

[57] **ABSTRACT**

A redundant engine starting system is disclosed that includes at least first and second sub-starters that rotate corresponding sub-starter output shafts affixed by a joining gear to rotate an engine starter shaft to start the engine. Each sub-starter includes a speed sensor for detecting rotational speed of the sub-starter, and a control valve to control rotational speed of the sub-starter. A system control intelligence interprets sensed rotational speeds of the sub-starters and commands the control valves, so that the control valve of an operative sub-starter is commanded to allow increased rotational speed of the sub-starter and therefore its corresponding output shaft whenever the system control intelligence interprets the sensed rotational speed of an inoperative sub-starter. In a preferred embodiment, the system is employed to start a gas turbine engine; the sub-starters are powered by compressed air supplied by sub-starter air ducts; the control valves are operatively disposed within the ducts; and the system control intelligence is an electronic engine control system affixed to the engine.

13 Claims, 4 Drawing Sheets



US005316644A

United States Patent [19]

Titterington et al.

[11] Patent Number: 5,316,644

[45] Date of Patent: May 31, 1994

[54] **HIGH PRESSURE ELECTROCHEMICAL CELL STRUCTURE**

[75] Inventors: **William A. Titterington**, Stratham, N.H.; **Andrei Leonida**, West Hartford, Conn.

[73] Assignee: **United Technologies Corporation**, Hartford, Conn.

[21] Appl. No.: **900,998**

[22] Filed: **Jun. 19, 1992**

[51] **Int. Cl.**[5] **C25B 11/03**

[52] **U.S. Cl.** **204/284**; 204/280; 204/283; 429/134

[58] **Field of Search** ..... 204/280, 284, 290 R, 204/242, 275, 252, 253, 263, 257, 254, 285; 429/34; C25B 11/02, 11/04

[56] **References Cited**

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4,432,858	2/1984	Schmitt et al.	204/284

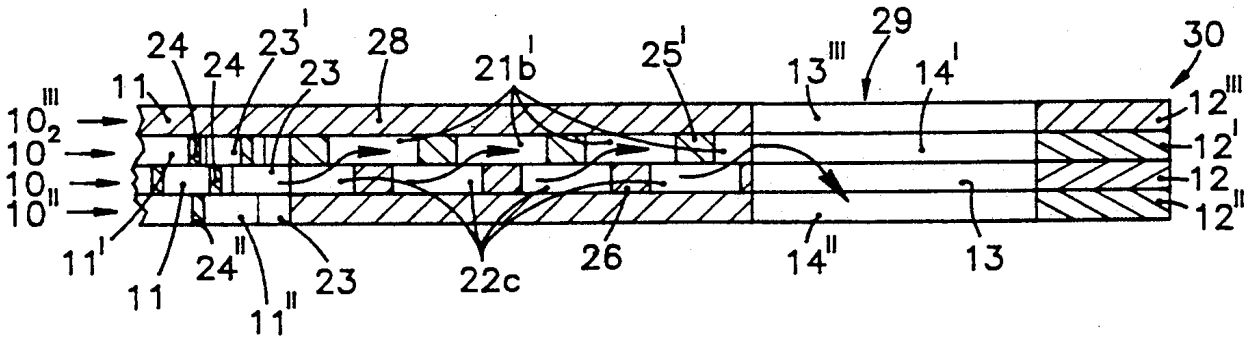
Primary Examiner—Kathryn Gorgos

Attorney, Agent, or Firm—Malcolm J. Chisholm, Jr.

[57] **ABSTRACT**

An electrochemical cell electrode plate includes a laminar and preferably laminated assembly of at least two substantially identically configured plate-shaped components of an electrically conductive high-strength material, each including a fluid-pervious central portion and a solid frame portion integral with and surrounding the central portion. At least one through aperture is provided in the frame portion and forms a continuous fluid-flow conduit with the corresponding aperture of the other component. The frame portion of each of the components has at least one channel therein that is situated between the aperture and the central portion and opens onto the first major surface. The channels of the two components may be constituted by interrupted rows of mutually staggered slots that complement each other into a continuous passage that establishes communication between the aperture and at least one of the spaces of the central portion of one of the components.

8 Claims, 2 Drawing Sheets



US005160443A

United States Patent [19]

Mesheau

[11] Patent Number: 5,160,443

[45] Date of Patent: * Nov. 3, 1992

[54] LIQUID RECYCLING SYSTEM

[75] Inventor: **John S. Mesheau**, Granby, Mass.

[73] Assignee: **Butler Associates**, Ludlow, Mass.

[*] Notice: The portion of the term of this patent subsequent to Jun. 25, 2008 has been disclaimed.

[21] Appl. No.: **686,984**

[22] Filed: **Apr. 18, 1991**

Related U.S. Application Data

[63] Continuation of Ser. No. 482,342, Feb. 20, 1990, Pat. No. 5,026,488.

[51] **Int. Cl.**[5] **B01D 17/02**

[52] **U.S. Cl.** **210/799**; 210/245

[58] **Field of Search** 210/774, 787, 789, 171, 210/195.1, 201, 241, 258, 322, 799

[56] **References Cited**

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5,026,488	6/1991	Mesheau	210/799

Primary Examiner—Bernard Nozick

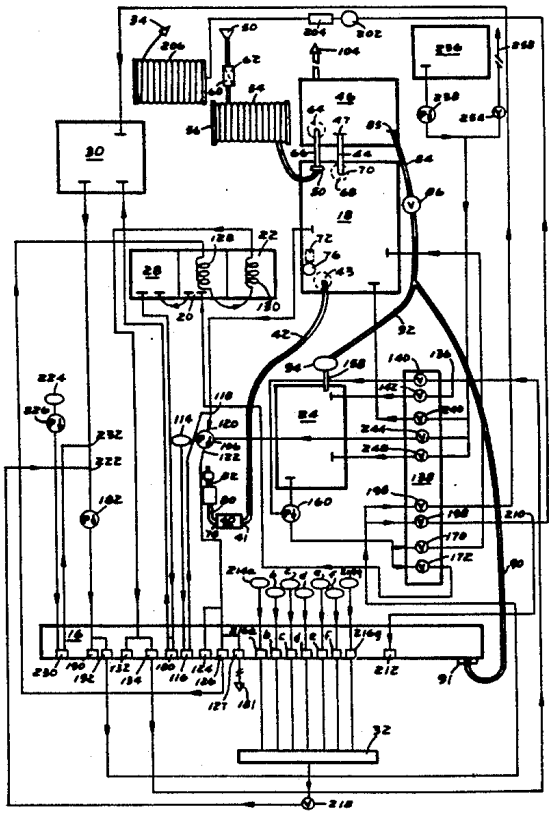
Attorney, Agent, or Firm—Malcolm J. Chisholm, Jr.

[57] **ABSTRACT**

An apparatus and method is disclosed for recycling contaminated industrial liquids. In the preferred embodiment, a conventional, medium-sized "van" type of truck houses, transports and powers a dual-loop assembly. A filter-loop assembly receives and stores recycling liquid in a waste liquid holding tank. The liquid is pumped through a pasteurizing heater and a separating centrifuge and back to the tank. Filter-test valves in the filter-loop enable testing to determine desired heating and separation.

When flow-rate adjustments produce satisfactory heating and separation, the recycling liquid is directed through a cooler, out of the filter-loop and into an additive-loop assembly where the liquid is pumped from a clean liquid holding tank, by additive compound injections, and back to the clean tank. Additive-test valves in the additive-loop enable testing to determine required quantities of specific additive compounds. When tests indicate satisfactory levels of the compounds, the recycling liquid is directed out of the additive-loop assembly and out of the system. The filter and additive test valves enable periodic testing during recycling to insure consistency. If the recycling becomes inadequate, the filter-loop and/or additive-loop is closed until changes in the flow-rate or additive injection rates again produce satisfactory recycling.

13 Claims, 8 Drawing Sheets



US005151096A

United States Patent [19]

Khoury

[11] Patent Number: 5,151,096

[45] Date of Patent: Sep. 29, 1992

[54] LASER CATHETER DIFFUSER

[75] Inventor: Adib I. Khoury, Bellows Falls, Vt.

[73] Assignee: Angiolaz, Incorporated, Rockingham, Vt.

[21] Appl. No.: 676,307

[22] Filed: Mar. 28, 1991

[51] Int. Cl.[5] A61B 17/36

[52] U.S. Cl. 606/15; 606/17; 606/7; 128/398

[58] Field of Search 606/7, 15–19; 128/397, 398

[56] References Cited

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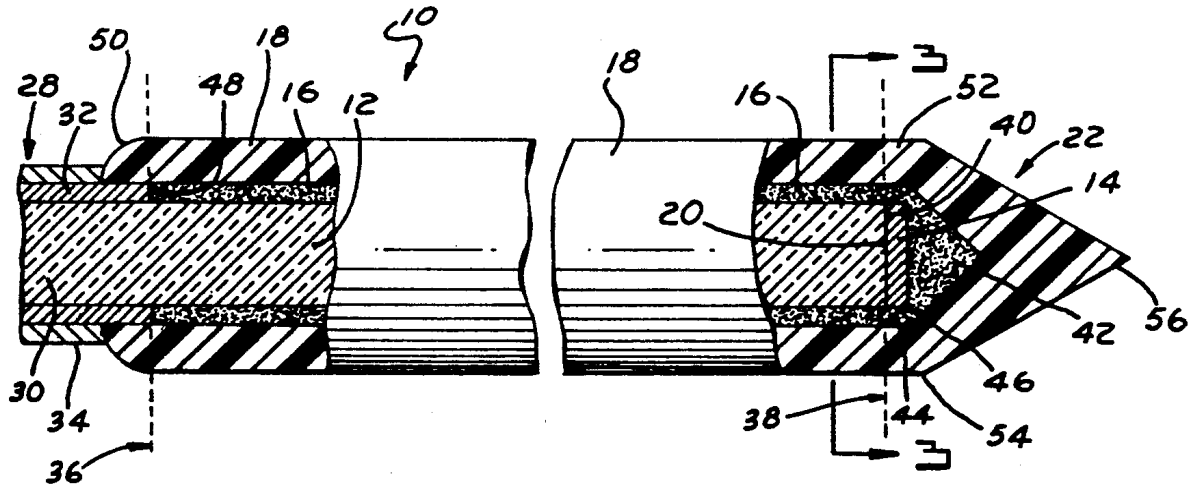
Primary Examiner—Peter A. Aschenbrenner
Attorney, Agent, or Firm—Malcolm J. Chisholm, Jr.

[57] ABSTRACT

A light transmitting and diffusing apparatus is disclosed for activating photodynamic therapy in soft cancerous tumors. In the preferred embodiment, the apparatus is affixed to a standard medical laser that transmits light through an optical fiber to a point adjacent to or within a cancerous tumor. The apparatus includes an unclad fiber-optic core with a reflective cap at a terminal end of the core. A diffuser matrix coats the unclad fiber-optic core and a transparent tubular sleeve encases the matrix and core. The transparent tubular sleeve includes a conical tip adjacent to the terminal end of the core for easy penetration of the cancerous tumors. In use, light leaves the medical laser, travels along the optical fiber into the unclad fiber-optic core. There, some light passes directly out of the core through the diffuser matrix, and the remaining light is reflected, by this reflective cap, back into and around the core, away from its terminal end. The resulting pattern of diffuse light is roughly shaped like a "butternut-squash", producing a decreased risk of damage to blood vessels, nerves, etc., that may be just beyond the terminal end of the core, along its longitudinal axis.

10 Claims, 2 Drawing Sheets



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[54] ACCUSET MICROMETER LATHE

[75] Inventor: David B. Grimes, Greenfield, Mass.

[73] Assignee: Montague Industries, Inc., Turners Falls, Mass.

[21] Appl. No.: 396,657

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[52] U.S. Cl. ..... 51/5 D; 51/165.8; 125/11.03; 125/11.21

[58] Field of Search ..... 51/5 D, 165.8, 165.87, 51/165.77; 125/11.03, 11.18, 11.21, 11.02, 11.01

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Primary Examiner—Robert A. Rose

Attorney, Agent, or Firm—Malcolm J. Chisholm, Jr.

[57] ABSTRACT

An apparatus is described that converts a manual adjustment procedure of a lathe on an existing pulp-grinding machine into an automated electronic procedure. The pre-existing lathe has a sharpening burr affixed to a movable plunger. The plunger is manually lowered by a hand crank until the burr contacts a surface of a pulp-grinding stone. The present invention replaces the hand crank with a reversible, variable speed motor. A transducer is affixed to the plunger wherein electric signals are produced in response to vibrations resulting from contact between the burr and the grinding stone. The signals are processed by a standard programmable controller to control the motor. An electronic encoder electrically measures the position of the plunger and communicates the position to the programmable controller. When the burr on the plunger contacts the grinding stone, the motor is programmed to automatically stop. The controller can then direct the motor to move the plunger the precise depth required for a specific burr, prior to the lathe making a horizontal pass along the stone. The controller records the contact position of the plunger for the next sharpening procedure.

5 Claims, 5 Drawing Sheets