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Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

[Continued on next page]

- (54) Title: SCREEN AND METHOD OF MAKING THE SAME

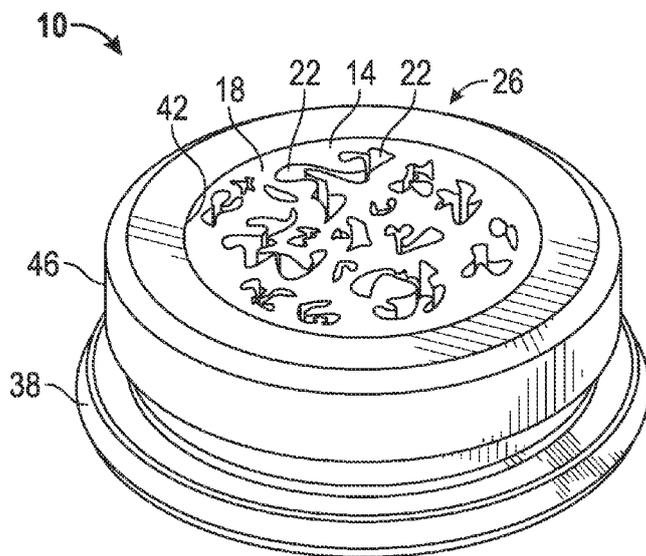


FIG. 1

(57) Abstract: A screen includes a framework of a first material having one or more openings therethrough defining a fluidic filter, and a substance of a second material positioned within the one or more openings in the framework and configured to be removable from the framework during an electrochemical reaction.

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— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

Published:

— *with international search report (Art. 21(3))*

SCREEN AND METHOD OF MAKING THE SAME

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Application No. 13/692,526, filed on December 3, 2012, which is incorporated herein by reference in its entirety.

BACKGROUND

[0002] Screens for filtering fluid flowable therethrough are common, and are made by a wide variety of methods. Some screens are initially plugged and are opened to flow after a selected time period. Such a configuration is sometimes desirable since it allows an operator to perform certain operations while the screen is plugged and then other operations later when the screen is open to flow therethrough. Although screens that perform in this manner serve the purpose for which they are employed. New screen configurations that are initially plugged and subsequently open to flow are always of interest to those in the art.

BRIEF DESCRIPTION

[0003] Disclosed herein is a screen. The screen includes a framework of a first material having one or more openings therethrough defining a fluidic filter, and a substance of a second material positioned within the one or more openings in the framework and configured to be removable from the framework during an electrochemical reaction.

[0004] Further disclosed herein is a method of making a screen. The method includes brazing particles within a bore of a plug with a filler metal of a first material, wherein the particles are made of a second material and the plug of a third material, and exposing the particles, the plug and the filler metal to a fluid, allowing an electrochemical reaction to occur, and removing the particles. Additionally, the second material is more anodic than either of the first material or the third material.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] The following descriptions should not be considered limiting in any way. With reference to the accompanying drawings, like elements are numbered alike:

[0006] FIG. 1 depicts a perspective view of a screen disclosed herein with a substance removed from a framework;

[0007] FIG. 2 depicts a perspective view of the screen of FIG. 1 with particles of a second material shown and the framework removed;

[0008] FIG. 3; depicts a reproduction of a galvanic chart of common materials

[0009] FIG. 4 depicts a cross sectional view of an alternate embodiment of a screen disclosed herein; and

[0010] FIG. 5 depicts a cross sectional view of a plurality of the screens of FIG. 1 positioned in a tubular in an earth formation borehole.

DETAILED DESCRIPTION

[0011] A detailed description of one or more embodiments of the disclosed apparatus and method are presented herein by way of exemplification and not limitation with reference to the Figures.

[0012] Referring to Figures 1 and 2, an embodiment of a screen disclosed herein is illustrated at 10. The screen 10 includes a framework 14 (Figure 1 only) of a first material 18 having one or more openings 22, with a plurality of the openings 22 being illustrated in this embodiment, that define a fluidic filter 26 and a substance 30 of a second material 34 (Figure 2 only) that will define the openings 22 as will be discussed in detail hereunder. The substance 30 is configured to be removable from the framework 14 during an electrochemical reaction. The second material 34 is selected to be more anodic than the first material 18 to assure that the second material 34 is removed instead of the first material 18 during an electrochemical reaction as occurs when the screen 10 is exposed to a fluid including an electrolyte. The substance 30 when present in the openings 22 blocks flow of fluid through the openings 22 while once removed allows fluid to flow through a tortuous path defined by the openings 22 to thereby filter fluid flowing therethrough in the process.

[0013] The screen 10 of the embodiment illustrated also includes a body 38 having a bore 42 therethrough within which the framework 14 and the substance 30 are positioned. The body 38 is made of a third material 46 that like the first material 18 is more anodic than the second material 34 such that the substance 30 is removed before the body 38 in an electrochemical reaction. In some embodiments, the third material 46 may actually be the same material as the first material 18. Good choices for the materials 18, 34 and 46 are based upon their locations on a galvanic chart of common materials shown in Figure 3. The first material 18 and the third material 46 should be selected from more noble, or more cathodic, materials on the galvanic chart such as nickel, copper or steels, while the second material 34 should be selected from the less noble, or more anodic, materials such as alloys including one or more of zinc, beryllium and magnesium, for example. Assuring that the second material 34 is far from the first material 18 and third material 46 assures that the second material 34 is

removed while not removing much if any of the first material 18 and the third material 46 when electrochemically reacted in an electrolyte. These electrolytes include fluids that may be anticipated to be in an environment where the screen 10 will be deployed, such as, in an earth borehole in a hydrocarbon recovery or a carbon dioxide sequestration application, for example. The electrolyte may be a naturally occurring fluid, such as salt-water brine, for example, or may be pumped to the desired location by an operator when needed.

[0014] Referring to Figure 4, an alternate embodiment of a screen disclosed herein is illustrated at 11. The screen 11 differs from the screen 10 in that the framework 15 is not random but instead has a regular and repeating pattern that defines regular and repeating openings 23 that are of consistent size and shape. The framework 15 may be made by filling spaces defined between a plurality of lattices that are stacked together (not shown) with the first material 18. After the framework 15 is made the lattices (fabricated of the second material 34) are dissolved and removed from the framework 15, thereby leaving only the framework 15 to serve as the screen 11 for filtering fluid flowable therethrough.

[0015] Referring to Figure 5, the screen 10 is illustrated in an application for which the screen 10, including the body 38, is well suited, the downhole completion industry. A plurality of the screens 10 are fixedly positioned within holes 47 in a tubular 48 positioned within a borehole 49 in an earth formation 51. In this application the tubular 48 can be positioned within the borehole 49 while the screens 10 are blocked to fluid flow therethrough by the substance 30. When desired, the screen 10 is exposed to an electrolyte to initiate the electrochemical reaction. Once the second material 34 is disintegrated the substance 30 can be removed from the screens 10 thereby leaving a plurality of filtered flow passageways (defined by the framework 14) through a wall 52 of the tubular 48.

[0016] One embodiment of the screen 10 disclosed herein is made with a brazing process. A plurality of particles 50, such as pellets or beads, for example, of the second material 34 are packed within the bore 42 and brazed together and to the body 38 with a filler metal 54. The filler metal 54 while molten fills the interstices 58 defined between the particles 50 before solidifying. Once the filler metal 54 is solidified it forms the framework 14. The filler metal 54 is made of the first material 28 while the particles 50 are made of the second material 34. The particles 50 are removed during an electrochemical reaction when the screen 10 is exposed to an electrolyte leaving just the framework 14 with the openings 22 therethrough. The foregoing construction leaves the framework 14 with the openings 22 of various sizes and shapes that are somewhat random and form a torturous path for fluid to flow therethrough.

[0017] While the invention has been described with reference to an exemplary embodiment or embodiments, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted for elements thereof without departing from the scope of the invention. In addition, many modifications may be made to adapt a particular situation or material to the teachings of the invention without departing from the essential scope thereof. Therefore, it is intended that the invention not be limited to the particular embodiment disclosed as the best mode contemplated for carrying out this invention, but that the invention will include all embodiments falling within the scope of the claims. Also, in the drawings and the description, there have been disclosed exemplary embodiments of the invention and, although specific terms may have been employed, they are unless otherwise stated used in a generic and descriptive sense only and not for purposes of limitation, the scope of the invention therefore not being so limited. Moreover, the use of the terms first, second, etc. do not denote any order or importance, but rather the terms first, second, etc. are used to distinguish one element from another. Furthermore, the use of the terms a, an, etc. do not denote a limitation of quantity, but rather denote the presence of at least one of the referenced item.

CLAIMS

What is claimed is:

1. A screen comprising:
a framework of a first material having one or more openings therethrough defining a fluidic filter; and
a substance of a second material positioned within the one or more openings in the framework and configured to be removable from the framework during an electrochemical reaction.
2. The screen of claim 1, wherein the second material is more anodic than the first material.
3. The screen of claim 1, wherein the screen is configured electrochemically react when exposed to an electrolyte.
4. The screen of claim 1, wherein sizes of the one or more openings vary.
5. The screen of claim 1, wherein shapes of the one or more openings vary.
6. The screen of claim 1, wherein the one or more openings create a tortuous path to fluid flowing therethrough.
7. The screen of claim 1, wherein sizes and shapes of the one or more openings are regular and repeating.
8. The screen of claim 1, wherein the framework is defined by interstices between particles of the substance.
9. The screen of claim 1, wherein the second material is selected from the group consisting of one or more of zinc, beryllium and magnesium and combinations including one or more of the foregoing.
10. The screen of claim 1, further comprising a body defining a bore within which the framework and the substance are positioned.
11. The screen of claim 10, wherein the body is made of a third material that is nearer to the first material on the galvanic chart than to the second material.
12. The screen of claim 11, wherein the first material and the third material are substantially the same.
13. The screen of claim 10, wherein the body is tubular.
14. The screen of claim 1, wherein the substance prevents flow through at least one of the one or more openings prior to its removal from the framework.
15. The screen of claim 1, wherein the screen is employable downhole and the electrochemical reaction occurs in fluid anticipated to be downhole.

16. A method of making a screen comprising;
brazing particles within a bore of a plug with a filler metal of a first material, the particles being of a second material and the plug of a third material, the second material being more anodic than either of the first material or the third material;
exposing the particles, the plug and the filler metal to a fluid;
allowing an electrochemical reaction to occur; and
removing the particles.
17. The method of making a screen of claim 16, further comprising filling interstices defined between the particles with the filler metal.
18. The method of making a screen of claim 16, wherein the fluid includes an electrolyte.
19. The method of making a screen of claim 16, further comprising selecting the second material to be more anodic than either the first material or the third material.

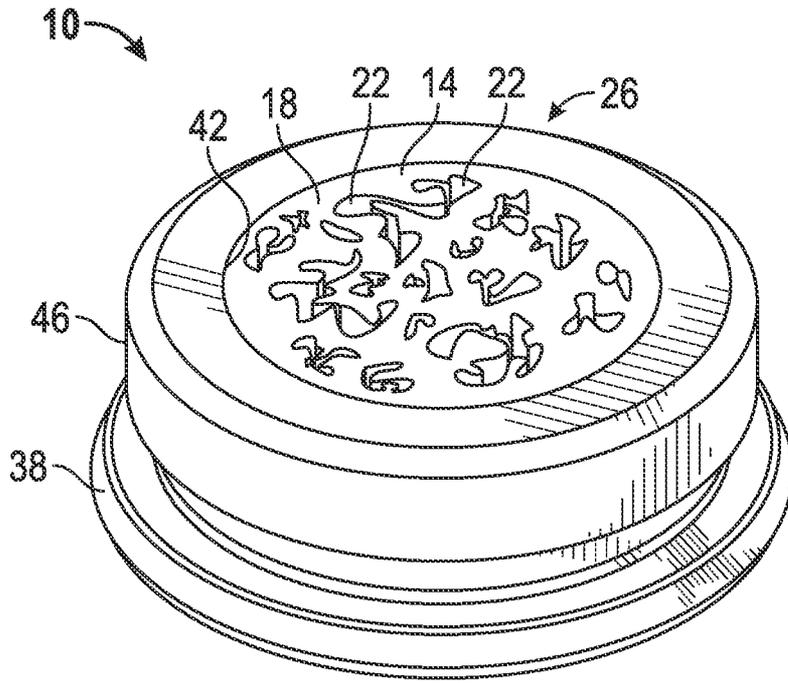


FIG. 1

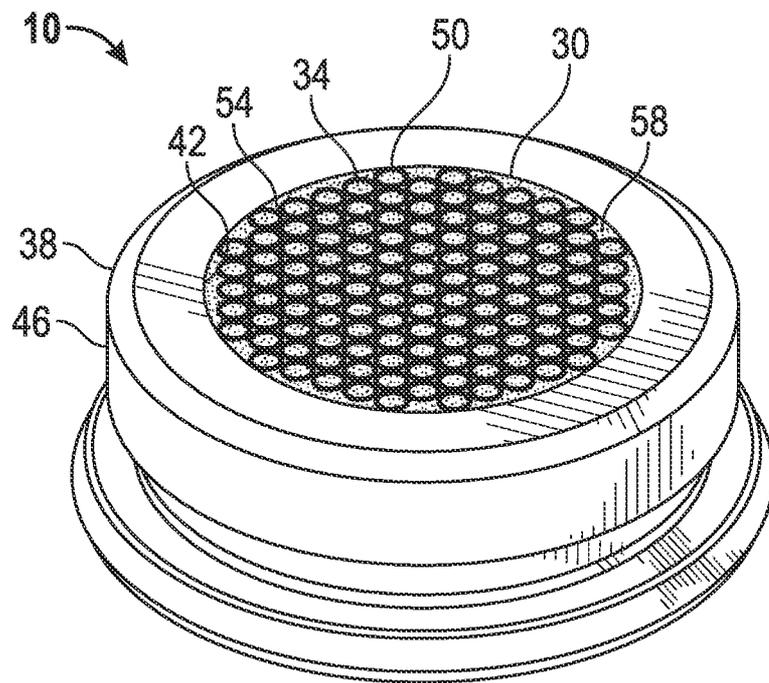


FIG. 2

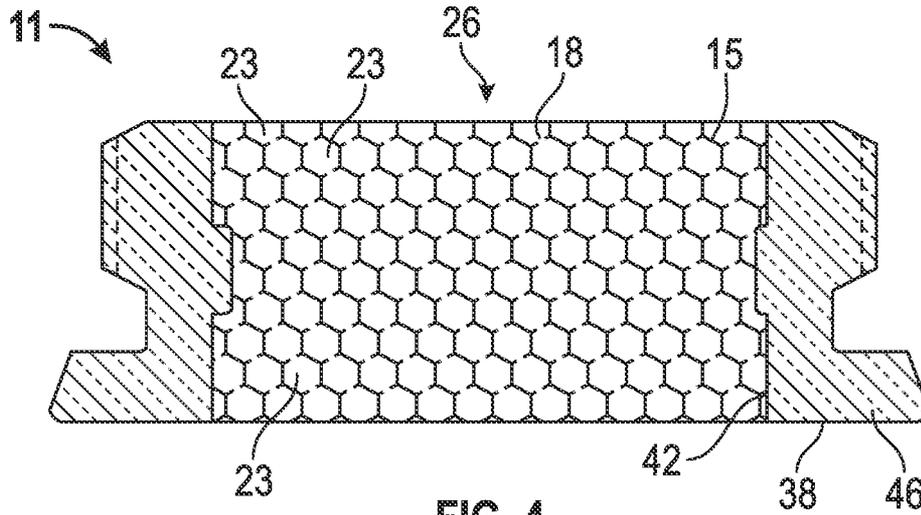


FIG. 4

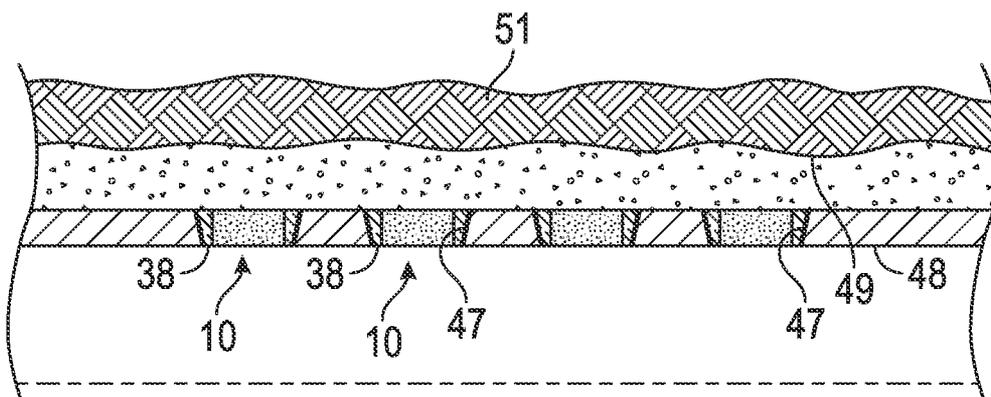


FIG. 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2013/067253**A. CLASSIFICATION OF SUBJECT MATTER****B01D 35/30(2006.01)i, B01D 39/14(2006.01)i, B01D 29/01(2006.01)i**

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B01D 35/30; B01D 53/22; G01N 7/00; B01D 53/86; B01D 59/12; B01D 53/26; B01J 23/89; B01J 35/02; B01D 39/14; B01D 29/01

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS(KIPO internal) & Keywords: screen, framework, filler, particle, electrochemical, removable

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6649559 B2 (DROST, E. et al.) 18 November 2003 See abstract; claims 1, 12.	1-19
A	US 5734092 A (WANG, T. K. et al.) 31 March 1998 See abstract; claims 1-11; and figures 1-4.	1-19
A	JP 09-155157 A (OPT D D KK. MELCO LAB.) 17 June 1997 See abstract; claims 1, 2.	1-19
A	JP 2010-240568 A (SUMITOMO ELECTRIC IND. LTD.) 28 October 2010 See abstract; claims 1-12.	1-19



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2013/067253

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