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14/303,109 12 June 2014 (12.06.2014) US(71) Applicant: **HAVEN TECHNOLOGY SOLUTIONS LLC** [—/US]; 32003 Nichols Sawmill Road, Suite D, Magnolia, Texas 77355 (US).(72) Inventors: **ELMS, David J.**; 20603 Sapphire Circle, Magnolia, Texas 77355 (US). **HUDSPETH, Gregory A.**; 5050 Buffalo Springs Trail, Amarillo, Texas 79119 (US).(74) Agents: **TIDWELL, Mark** et al.; Haynes and Boone, LLP, 2323 Victory Avenue, Suite 700, Dallas, Texas 75219 (US).

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(54) Title: APPARATUS AND METHOD FOR FLUID CONTROL

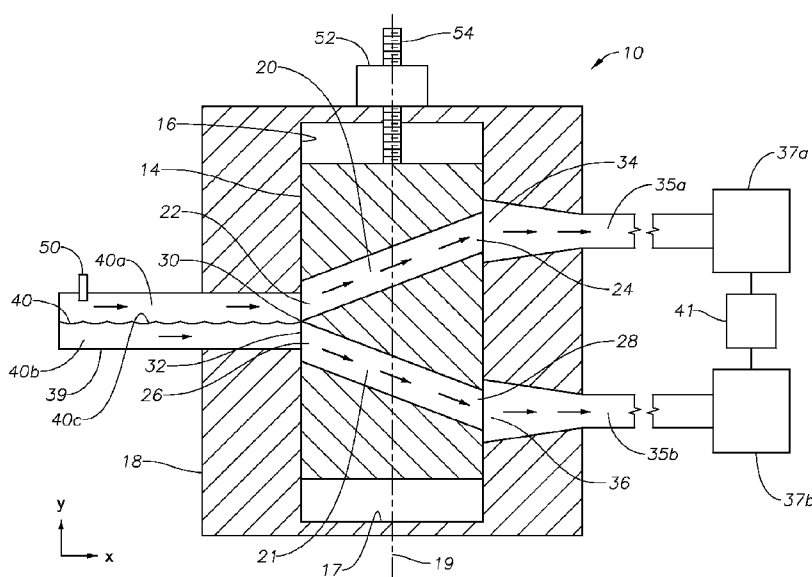


FIG. 1a

(57) Abstract: A multi-phase separation flow management system includes a housing with an inlet, a first outlet and a second outlet and in which a movable element is mounted. The movable element has a first passageway with an inlet and an outlet and a second passageway having an inlet and an outlet, and are disposed in the element so that the inlets of the first and second passageways are adjacent one another and the outlets of the first and second passageways are spaced apart from one another. The inlets are disposed adjacent a housing inlet, the first passageway outlet is disposed adjacent a first housing outlet and the second passageway outlet is disposed adjacent a second housing outlet.



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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US14/42139

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - F16K 11/085 (2014.01)

CPC - F16K 11/085

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)

IPC(8) Classification(s): A61M 39/22; F16K 11/02, 11/085 (2014.01)

CPC Classification(s): A61M 39/223; F16K 11/085, 11/0853; USPC Classification(s): 137/110, 625.41, 207; 210/96.1

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

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

MicroPatent (US Granted, US Applications, EP-A, EP-B, WO, JP, DE-G, DE-A, DE-T, DE-U, GB-A, FR-A); Google; Google Scholar; ProQuest; IP.com; keywords: pump, motor, sensor, pressure, liquid, oil, water, valve, rotate, seperate, split, fluid

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2,335,085 A (ROBERTS A) November 23, 1943; figures 2, 9; page 1, column 2, lines 1-5;	1-8, 11, 36
---	column 2, lines 1-5, 42-45, 55-58	---
Y		9, 10, 12-14, 35
Y	US 6,880,798 B2 (MEYER RW et al.) April 19, 2005; column 1, lines 20-25, 55-58; column 3, lines 9-13; column 4, lines 10-20	9, 10, 35
Y	US 2006/0174885 A1 (AYLSWORTH AC et al.) August 10, 2006; figure 1; paragraphs [0004], [0033], [0039]	12-14
A	EP 0 961 060 A1 (THIERRY B) December 1, 1999; entire document	1-15, 36
A	US 8,062,269 B2 (KEELEY) November 22, 2011; entire document	1-15, 36
A	US 7,766,883 B2 (RELLY DM et al.) August 3, 2010; entire document	1-15, 36
A	US 3,957,082 A (FUSON RL et al.) May 18, 1976; entire document	1-15, 36
A	US 3,586,049 A (ADAMSON RA) June 22, 1971; entire document	1-15, 36
A	US 2,820,438 A (ANDREWS LV et al.) January 21, 1958; entire document	1-15, 36
A	US 2,591,102 A (SNYDER JR) April 1, 1952; entire document	1-15, 36
A	US 2011/0319836 A1 (LEE YG) December 29, 2011; entire document	1-15, 36

☐ Further documents are listed in the continuation of Box C.

* Special categories of cited documents:	"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
"A" document defining the general state of the art which is not considered to be of particular relevance	"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
"E" earlier application or patent but published on or after the international filing date	"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
"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)	"&" document member of the same patent family
"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	

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US14/42139

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

----Please See Supplemental Page----

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
1-15, 35-36

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

-Continued from Box No. III: Observations where unity of invention is lacking-

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I: claims 1-15, 35-36 are directed toward a valve wherein the inlets of the first and second passageways are adjacent one another and the outlets of the first and second passageways are spaced apart from one another.

Group II: claims 16-34 are directed toward a valve wherein the first and second passageways intersect at their respective first and third ports.

Group III: claims 37-48 are directed toward a method for splitting phase components of a fluid.

The inventions listed as Groups I-III do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons.

The special technical features of Group I include a housing having a horizontal inlet, a first outlet and a second outlet; and a rotatable element rotatably mounted in the housing, the rotatable element rotatable about an axis and having a first passageway with an inlet and an outlet and a wall defining the first passageway; and a second passageway having an inlet and an outlet and a wall defining the second passageway (which is not present in Group III), wherein the inlets of the first and second passageways are adjacent one another and the outlets of the first and second passageways are spaced apart from one another, the inlets disposed adjacent housing inlet, the first passageway outlet disposed adjacent the first housing outlet and the second passageway outlet disposed adjacent the second housing outlet, wherein the first and second passageway walls converge at their respective inlets to form an edge adjacent the housing inlet, wherein the edge is substantially parallel with the axis of the rotatable element; a cut sensor disposed along the horizontal flow passage and disposed to measure the cut of fluid flowing within the flow passage; and a motor disposed to rotate the valve element based on the cut sensor measurements (which is not present in Groups II, III).

The special technical features of Group II include a valve housing having a first port formed by a horizontal flow passage, a second port and a third port; and a valve element moveably mounted in the housing, the valve element rotatable about an axis and having a first passageway (which is not present in Group III) extending between first and second ports of the valve element; and a second passageway extending between third and fourth ports of the valve element, wherein the first and third ports of the first and second passageways, respectively, are adjacent one another and the second and fourth ports of the first and second passageways, respectively, are spaced apart from one another, the first and third ports disposed adjacent the first housing port, the second port of the first passageway disposed adjacent the second housing port and the fourth port of the second passageway disposed adjacent the third housing port, wherein the first and second passageways intersect at their respective first and third ports to form an edge adjacent the first housing port (which is not present in Groups I, III).

The special technical features of Group II include stabilizing the fluid so as to have a first fluid portion substantially separate from a second fluid portion with a fluid boundary formed therebetween; positioning the leading edge of a valve element so as to be substantially aligned with the fluid boundary; and simultaneously directing the first fluid portion to a first passageway within the valve element and the second fluid portion to a second passageway within the valve element (which is not present in Groups I, II).

The common technical features of Groups I-III include a housing having a horizontal inlet, a first outlet and a second outlet; and a rotatable element rotatably mounted in the housing, the rotatable element rotatable about an axis and having a first passageway with an inlet and an outlet and a wall defining the first passageway; and a second passageway having an inlet and an outlet and a wall defining the second passageway.

These common technical features are disclosed by US 2,335,085 A (ROBERTS): a housing (10; figure 2) having a horizontal inlet (14), a first outlet (16) and a second outlet (17); and a rotatable element (plug 11 may be rotated; page 1, column 2, lines 1-5) rotatably mounted in the housing (10), the rotatable element (11) rotatable about an axis and having a first passageway (34) with an inlet and an outlet (radially inner and outer ends of passage 34; figure 2) and a wall defining the first passageway (34); and a second passageway (35) having an inlet and an outlet (radially inner and outer ends of passage 35; figure 2) and a wall defining the second passageway (35).

Because the common technical features are disclosed by Roberts, the inventions are not so linked as to form a single general inventive concept. Therefore, Groups I-III lack unity.