(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
27 June 2019 (27.06.2019)

WIPO | PCT

(10) International Publication Number
WO 2019/123308 A1

(51) International Patent Classification:
F24D 3/10 (2006.01)

(21) International Application Number:
PCT/IB2018/060328

(22) International Filing Date:
19 December 2018 (19.12.2018)

(25) Filing Language: Italian

(26) Publication Language: English

(30) Priority Data:
202017000147600 20 December 2017 (20.12.2017) IT

(71) Applicant: **RBM IBOX S.R.L.** [IT/IT]; Via Industriale snc, 25075 Nave (BS) (IT).

(72) Inventor: **BOSSINI, Guido**; Via Costantino Quaranta 14, 25123 Brescia (BS) (IT).

(74) Agent: **CAMOLESE, Marco** et al.; c/o Metroconsult SRL, Via Sestriere 100, 10060 None (TO) (IT).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(54) Title: COLLECTOR FOR DISTRIBUTING A HEAT TRANSFER FLUID IN A HEATING AND/OR COOLING AND/OR CONDITIONING NETWORK, IN PARTICULAR OF HOUSEHOLD AND/OR INDUSTRIAL TYPE

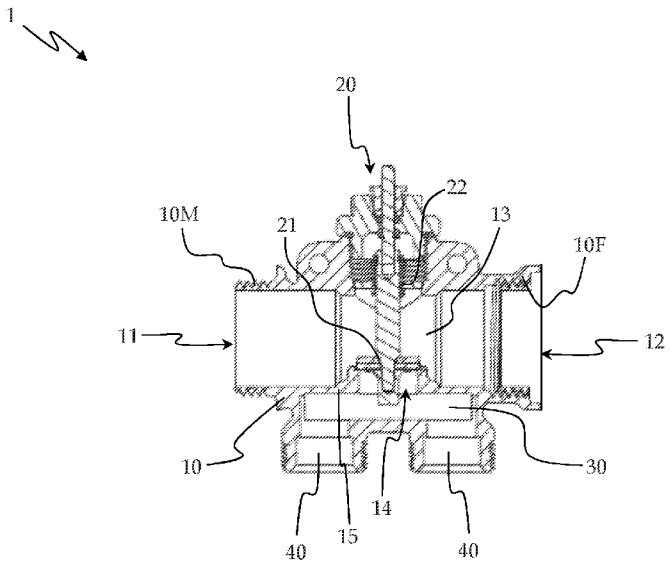


Fig. 1

(57) Abstract: The present invention relates to a collector (1) for distributing a heat transfer fluid in a heating and/or cooling and/or conditioning network, in particular of household and/or industrial type, said collector (1) comprising a housing (10) comprising: - a first terminal portion (11), open for the entry of the fluid into the collector (1); - a second terminal portion (12), open for the exit of the fluid from the collector (1); - a duct (13), which extends from said first terminal portion (11) to said second terminal portion (12) for the passage of the fluid in the housing (10) of the collector (1), wherein the collector (1) comprises a shut-off valve (20) positioned at least partly in the duct (13) and comprising a movable obstructor (21) for adjusting the opening and/or closing of a passage (14) in said duct (13). The peculiar feature of the present invention lies in the fact that said collector (1) comprises: - a chamber (30) that

[Continued on next page]

WO 2019/123308 A1

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

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

— *in black and white; the international application as filed contained color or greyscale and is available for download from PATENTSCOPE*

communicates with the duct (13) through said passage (14), in particular when the shut-off valve (20) is in a condition in which it opens said passage (14), and - a plurality of ports (40) that communicate with said chamber (30), in particular each port (40) being adapted to be associated with a respective branching pipe.

COLLECTOR FOR DISTRIBUTING A HEAT TRANSFER FLUID IN A HEATING AND/OR COOLING AND/OR CONDITIONING NETWORK, IN PARTICULAR OF HOUSEHOLD AND/OR INDUSTRIAL TYPE

DESCRIPTION

The present invention relates to a collector for distributing a heat transfer fluid in a heating and/or cooling and/or conditioning network, in particular of household and/or industrial type, according to the preamble of claim 1.

A collector for distributing a heat transfer fluid in a heating and/or cooling and/or conditioning network, in particular of household and/or industrial type, is known in the art, wherein the collector comprises a housing, usually made of plastic or metallic material, which is provided with:

- a first terminal portion, open for the entry of the fluid into the collector;
- a second terminal portion, open for the exit of the fluid from the collector;
- a duct, in particular having a circular cross-section, which extends from said first terminal portion to said second terminal portion for the passage of the fluid.

The collector of the type known in the art further comprises a port for a branching pipe, in particular said port being hydraulically connected to the duct and being usually arranged radially relative thereto.

The collectors known in the art also include a shut-off valve that allows controlling the opening and/or closing of said passage in order to either allow or prevent the fluid to flow from said duct into said at least one port.

In relatively recent times a need as arisen to distribute the heat transfer fluid in a diversified manner to different “thermal zones” of a heating and/or cooling and/or conditioning network, in particular of domestic and/or industrial type; this requisite derives from the different possible heating/cooling power requirements of each environment and also from legal regulations, which require that the different “thermal zones” of the network can be independently controlled. In this regard, note that “thermal zone” refers to any portion of a building which has uniform characteristics of utilization and exposure.

In order to meet this requirement, it is therefore known in the art to construct the collector in such a way that it comprises:

- a plurality of ports, wherein each port is adapted to be coupled to a respective

branching pipe;

- a shut-off valve associated with each individual port of said plurality of ports, so that it is possible to regulate the flow of fluid from the collector duct to each individual single port.

It is therefore apparent that the collectors known in the art suffer from numerous drawbacks.

In fact, the shut-off valves known in the art, while they may be constructed for manual operation, usually operate automatically, since they comprise a servocontrol (which may be, for example, of electrothermal or electromechanical type) which is appropriately driven by a thermoregulation device installed in the served environment.

In such circumstances, it is clear that the provision of a shut-off valve for each port of the collector necessarily implies much installed electric power and high power consumption, also considering that the servomotor of each shut-off valve remains powered throughout the opening time of the valve itself. Besides, the collectors known in the art necessarily involve significant and considerable operating and maintenance costs.

It is also apparent that a collector so designed as to comprise a shut-off valve associated with each individual port results in a very complex installation of the collector for the whole circuit, also because such a construction necessarily requires an increase in the number of electric wires required for the collector to work properly.

In this frame, it is the main object of the present invention to provide a collector for distributing a heat transfer fluid in a heating and/or cooling and/or conditioning network, in particular of household and/or industrial type, which is so constructed as to overcome the drawbacks suffered by the distribution devices known in the art.

In particular, it is one object of the present invention to provide a distribution collector so conceived as to considerably reduce both the installed electric power and the electric energy consumption.

It is another object of the present invention to provide a distribution collector so conceived as to reduce the purchase cost and the operating and maintenance costs thereof.

In particular, it is one object of the present invention to provide a distribution collector so constructed as to allow for a considerable simplification of the processes to be carried out in order to install the collector itself and the whole circuit it belongs to.

Further objects, features and advantages of the present invention will become apparent from the following detailed description and from the annexed drawings, which are

supplied by way of non-limiting explanatory example, wherein:

- Figure 1 shows a longitudinal sectional view of a first embodiment of a collector for distributing a heat transfer fluid in a heating and/or cooling and/or conditioning network, in particular of household and/or industrial type, according to the present invention;
- Figure 2 shows a longitudinal sectional view of a second embodiment of a distribution collector according to the present invention;
- Figure 3 shows a longitudinal sectional view of the collectors of Figures 1 and 2 joined together.

Referring now to the annexed drawings, Figures 1 and 2 show two different embodiments of a collector (designated as a whole by reference numeral 1) for distributing a heat transfer fluid in a heating and/or cooling and/or conditioning network, in particular of household and/or industrial type, according to the present invention.

In both of the embodiments shown in Figures 1 and 2, the collector 1 is provided with a housing 10 equipped with:

- a first terminal portion 11, open for the entry of the fluid into the collector 1;
- a second terminal portion 12, open for the exit of the fluid from the collector 1;
- a duct 13, which extends from said first terminal portion 11 to said second terminal portion 12 for the passage of the fluid in the housing 10 of the collector 1.

It is clear that the housing 10 of the collector 1 may be made of any material suitable to allow a heat transfer fluid for a heating and/or cooling and/or conditioning network to flow through the first terminal portion 11, the duct 13 and the second terminal portion 12.

Moreover, the duct 13 is preferably so constructed as to have a substantially circular cross-section, in particular said cross-section being the one through which a fluid can flow.

The collector 1 is also equipped with a shut-off valve (designated as a whole by reference numeral 20) positioned at least partly in the duct 13 and comprising a movable obstructor 21 for adjusting the opening and/or closing of a passage 14 in said duct 13.

Preferably, the passage 14 starts from a wall 15 that delimits the duct 13, in particular substantially perpendicularly to the development of the duct 13. Furthermore, the passage 14 may be obtained on an intermediate portion of the duct 13; as a consequence, also said shut-off valve 20 may be substantially associated with an intermediate portion of the duct 13.

Preferably, said shut-off valve 20 is so constructed that the movable obstructor 21 can be operated either manually, e.g. by means of a suitable control wheel (not shown in the drawings), or by means of an electrothermal or electromechanical actuator, which will tend to hold the movable obstructor 21 in the opening condition. When operated manually or by a powered electrothermal or electromechanical actuator, the movable obstructor 21 is pushed and overcomes the countering force of a spring 22, thus moving into the position in which it closes the passage 14 (as shown in the annexed drawings).

In accordance with the present invention, the collector 1 comprises:

- a chamber 30 that communicates with the duct 13 through said passage 14, in particular when the shut-off valve 20 is in a condition in which it opens the passage 14,
- a plurality of ports 40 that communicate with said chamber 30, in particular each port 40 being adapted to be associated with a respective branching pipe (said branching pipes not being shown in the annexed drawings).

In the annexed drawings it can be noticed that said chamber 30 is interposed between the passage 14 of the duct 13 and said plurality of ports 40; as a consequence, the chamber 30 allows putting the ducts 13 in fluidic communication with the plurality of ports 40 through said passage 14, in particular in the situation (not shown in the annexed drawings) in which no thrust action is being exerted on the movable obstructor 21 by the actuator and/or by the manual control that holds it in the closed condition, so that the countering force of the spring 22 brings it back into the position in which it opens the passage 14.

As can be seen in the annexed drawings, the chamber 30 defines a conduit that develops substantially parallel to the duct 13.

It must be pointed out that the chamber 30 is preferably obtained directly in said housing 10 of the collector 1, e.g. during the manufacturing stages (e.g. melting, moulding and/or subsequent processing); in this embodiment (shown in the annexed drawings), the chamber 30 is separated from said duct 13 by the wall 15, in particular the passage 14 being formed on said wall 15.

Preferably, each port 40 of said plurality of ports 40 extends radially from said chamber 30.

As can be seen in Figures 1 and 2, the collector 1 may be so constructed as to comprise a variable number of ports 40 communicating with the chamber 30. In fact, Figure 1 shows a collector 1 provided with two ports 40, so that it can distribute the heat transfer fluid to a pair of branching pipes directed towards the same “thermal zone”; Figure 2 shows a

collector 1 provided with three ports 40, so that it can distribute the heat transfer fluid to three different branching pipes directed towards the same "thermal zone". Therefore, the collector 1 according to the present invention may preferably be designed to comprise a number of ports 40 in the range of two to five. It is however clear that the principles of the present invention may also find application in cases wherein the collector 1 is so designed as to comprise a number of ports 40 greater than five.

It is therefore evident that the collector 1 according to the present invention may be so constructed as to comprise a plurality of ports 40 communicating with the chamber 30, wherein the ports 40 of one collector 1 are typically connected to respective branching pipes in order to distribute the heat transfer fluid homogeneously to the same "thermal zone" of a heating and/or cooling and/or conditioning network.

The peculiar provisions of the present invention thus allow providing a distribution collector 1 so conceived as to considerably reduce the purchase cost and the operating and maintenance costs thereof.

In fact, the provision of the chamber 30 interposed between the duct 13 of the housing 10 and the plurality of ports 40 allows the use of one and only one shut-off valve 20 in the collector 1, since said one shut-off valve 20 allows obtaining the opening or the closing of the passage 14 and, consequently, a diversified distribution of the heat transfer fluid to the different "thermal zones" of a heating and/or cooling and/or conditioning network.

It is therefore apparent that the provision of the chamber 30, which allows the use of only one shut-off valve 20 in the collector 1 to cause the heat transfer fluid to flow from the duct 13 to a plurality of ports 40 at the same time, inevitably leads to a considerable reduction in the consumption of electric energy that was required by the greater number of actuators that needed to be employed in the prior art.

The fact that the collector 1 is so constructed as to comprise only one shut-off valve 20 also allows for a significant simplification of the processes to be carried out in order to install the collector 1 and the whole circuit it belongs to.

In a preferred embodiment, shown in Figures 1 to 3, the first terminal portion 11 and the second terminal portion 12 comprise coupling means, in particular so realized as to extend in a direction substantially coaxial to said duct 13.

Said coupling means comprise:

- a male connection portion 10M, in particular located at said first terminal portion 11, and

- a female connection portion 10F, in particular located at the second terminal portion 12.

It is clear that, in accordance with the present invention, the male connection portion 10M and the female connection portion 10F may be reversed, in that the male connection portion 10M may be located at the second terminal portion 12 and the female connection portion 10F may be located at the first terminal portion 11.

The size and shape of the female connection portion 10F are complementary to those of the male connection portion 10M; as a consequence, the female connection portion 10F of one collector 1 can receive the male connection portion 10M of a contiguous collector 1 (as can be seen in Fig. 3), so as to create a cylindrical tightening surface between said collectors 1.

The female connection portion 10F and the male connection portion 10M may be so constructed as to comprise respective threads (as shown in the annexed drawings) to facilitate the coupling between contiguous collectors 1.

The female connection portion 10F and the male connection portion 10M may then be each equipped with a seat (not shown) suitable for receiving a sealing element, e.g. a toroidal gasket (also not shown); said connection means 10F, 10M and said sealing element thus allow providing a modular collector 1, which can be easily and quickly assembled, and which is so constructed as to prevent any undesired leaking of heat transfer fluid flowing through a plurality of collectors 1.

It should be noted that said female connection portion 10F and/or said male connection portion 10M may also be associated with a closing element (e.g. a cap or a cover, not shown in the annexed drawings) for closing the first terminal portion 11 and/or the second terminal portion 12 and, as a result, for closing the duct 13.

It should also be noted that said coupling means may be constructed differently from those shown in the annexed drawings.

As previously pointed out, the collector 1 may be so constructed as to comprise a variable number of ports 40 communicating with the chamber 30, and two or more collectors 1 can be assembled together in order to form a modular collector 1.

In this respect, in Fig. 3 one can see that, in accordance with the present invention, it is possible to assemble together two or more collectors 1 provided with a different number of ports 40, so as to be able to adequately distribute the heat transfer fluid in a diversified manner to the different “thermal zones” of a heating and/or cooling and/or conditioning

network.

In fact, in the embodiment shown in Fig. 3 a first collector 1 with two ports 40 and a second collector 1 with three ports 40 are assembled together; it is therefore apparent that the first collector 1 with two ports 40 will be able to distribute the fluid evenly to a "thermal zone" with two points of utilization (such points of utilization being, for example, radiators), while in its turn the second collector 1 with three ports 40 will be able to distribute the fluid evenly to another "thermal zone" with three points of utilization. It must be pointed out that fluid distribution from the ports 40 to the respective points of utilization occurs through respective branching pipes (not shown in the annexed drawings). It must also be pointed out that, in the embodiment shown in Figure 3, when the shut-off valve of the first collector 1 is closing the passage 14, thus closing the associated "thermal zone", the heat transfer fluid will be able to flow into the second collector 1 and be then distributed to the next "thermal zone" associated with said second collector 1, in a condition in which the passage 14 of the second collector 1 is open.

The features of the collector 1 according to the present invention, as well as the advantages thereof, are apparent from the above description.

In particular, the peculiar features of the present invention allow constructing the collector 1 in such a way as to considerably reduce the purchase cost and the operating and maintenance costs thereof.

In fact, the provision of the chamber 30 interposed between the duct 13 of the housing 10 and the plurality of ports 40 allows the use of one and only one shut-off valve 20 in the collector 1, since said one shut-off valve 20 allows obtaining the opening or closing of the passage 14 and, consequently, a uniform distribution of the heat transfer fluid, through said ports 40, to the points of utilization of a given "thermal zone" connected to the ports 40 of the same collector 1, and a diversified distribution to the different "thermal zones" of a heating and/or cooling and/or conditioning network which are connected to ports 40 of different collectors 1.

It is therefore apparent that the provision of the chamber 30, which allows the use of one and only one shut-off valve 20 in each collector 1 to cause the heat transfer fluid to flow from the duct 13 to a plurality of ports 40 at the same time, inevitably results in a considerable reduction of the installed electric power and electric energy consumption.

The fact that the collector 1 is so constructed as to comprise only one shut-off valve 20 also allows for a significant simplification of the processes to be carried out in order to

install the collector 1 and the whole circuit it belongs to.

Since it is possible to assemble together two or more collectors 1, even when they have a different number of ports 40, the provisions of the present invention allow for an adequate distribution of the heat transfer fluid in a diversified manner to the different "thermal zones" of a heating and/or cooling and/or conditioning network.

The collector 1 described herein by way of example may be subject to many possible variations without departing from the novelty spirit of the inventive idea; it is also clear that in the practical implementation of the invention the illustrated details may have different shapes or be replaced with other technically equivalent elements.

It can therefore be easily understood that the present invention is not limited to the above-described collector 1, but may be subject to many modifications, improvements or replacements of equivalent parts and elements without departing from the inventive idea, as clearly specified in the following claims.

CLAIMS

1. Collector (1) for distributing a heat transfer fluid in a heating and/or cooling and/or conditioning network, in particular of household and/or industrial type, said collector (1) comprising a housing (10) comprising:

- a first terminal portion (11), open for the entry of the fluid into the collector (1);
- a second terminal portion (12), open for the exit of the fluid from the collector (1);
- a duct (13), which extends from said first terminal portion (11) to said second terminal portion (12) for the passage of the fluid in the housing (10) of the collector (1),

wherein the collector (1) comprises a shut-off valve (20) positioned at least partly in the duct (13) and comprising a movable obstructor (21) for adjusting the opening and/or closing of a passage (14) in said duct (13),

said collector (1) being characterized in that it comprises:

- a chamber (30) that communicates with the duct (13) through said passage (14), in particular when the shut-off valve (20) is in a condition in which it opens said passage (14), and
- a plurality of ports (40) that communicate with said chamber (30), in particular each port (40) being adapted to be associated with a respective branching pipe.

2. Collector (1) according to claim 1, characterized in that said chamber (30) defines a conduit developing substantially parallel to the duct (13).

3. Collector (1) according to one or more of the preceding claims, characterized in that said chamber (30) is obtained directly in said housing (10) of the collector (1).

4. Collector (1) according to claim 3, characterized in that said chamber (30) is separated from said duct (13) by a wall (15) whereon the passage (14) is formed.

5. Collector (1) according to claim 4, characterized in that the passage (14) extends from said wall (15) that delimits the duct (13), in particular in a way substantially perpendicular to said duct (13).

6. Collector (1) according to one or more of the preceding claims, characterized in that each port (40) of said plurality of ports (40) extends radially from said chamber (30).

7. Collector (1) according to one or more of the preceding claims, characterized in that said first terminal portion (11) and second terminal portion (12) comprise coupling means, in particular so constructed as to develop in a direction substantially coaxial to said duct (13).

8. Collector (1) according to claim 7, characterized in that said coupling means

comprise:

- a male connection portion (10M), in particular located at said first terminal portion (11), and
- a female connection portion (10F), in particular located at the second terminal portion (12).

9. Collector (1) according to claim 8, characterized in that the size and shape of the female connection portion (10F) are complementary to those of the male connection portion (10M).

10. Collector (1) according to one or more of claims 8 and 9, characterized in that the female connection portion (10F) and the male connection portion (10M) are so constructed as to comprise respective threads.

11. Collector (1) according to one or more of the preceding claims, characterized in that it comprises a closing element for closing the first terminal portion (11) and/or the second terminal portion (12).

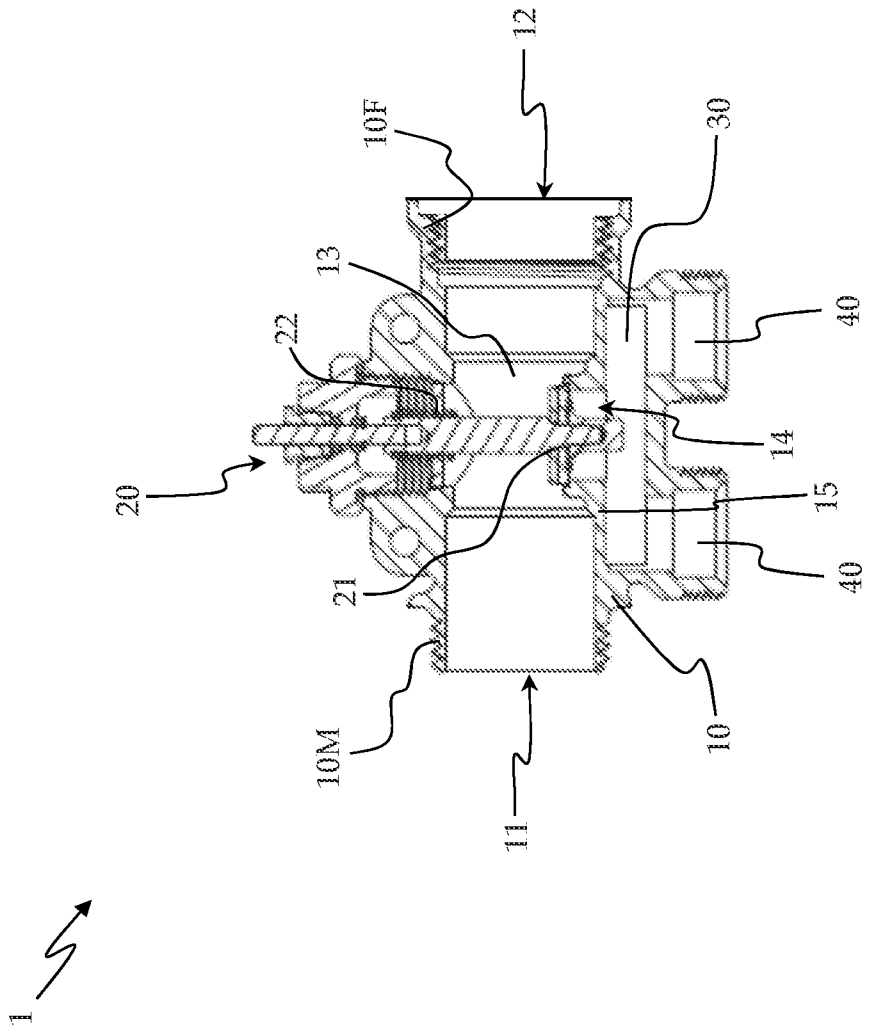


Fig. 1

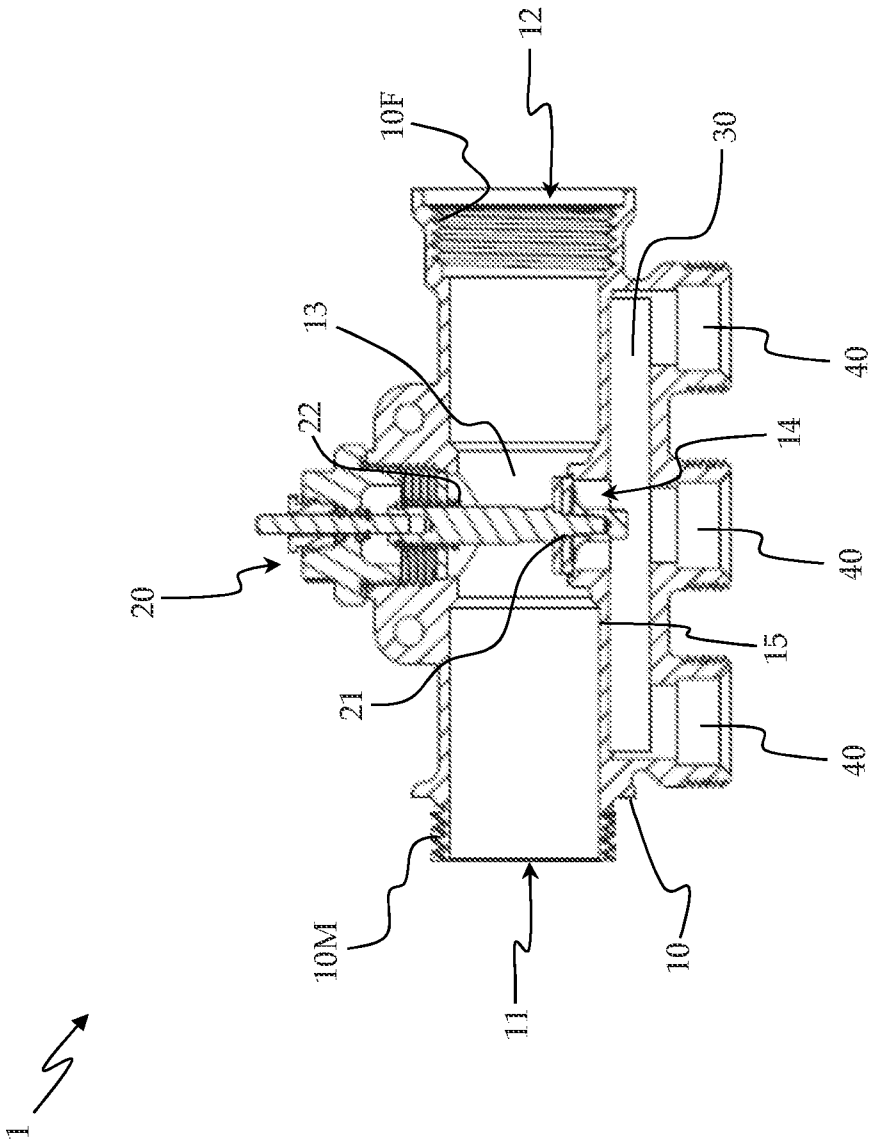


Fig. 2

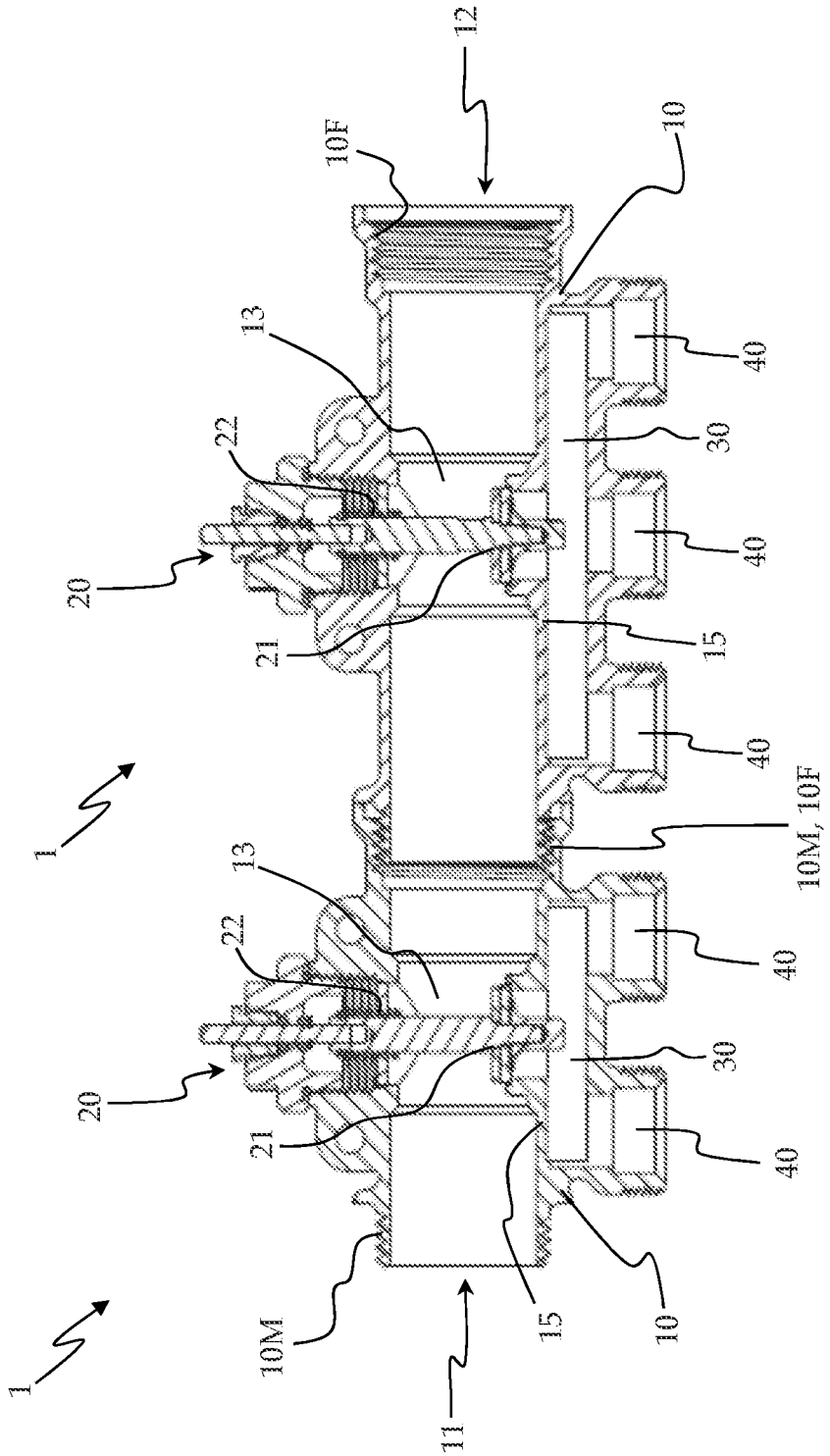

12
10F
10
13
40
22
30
20
40
21
15
40
1
10M, 10F
13
40
22
30
20
21
40
10M
15
10
1
11

Fig. 3

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2018/060328

A. CLASSIFICATION OF SUBJECT MATTER
INV. F24D3/10
ADD.

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)
F24D

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)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 196 42 721 A1 (GUILLOT IND SA [FR]) 24 April 1997 (1997-04-24)	1-7,11
A	column 3, line 58 - column 7, line 14; figures 3,2	8-10

X	DE 10 2011 111771 A1 (ELKUEN NEVZAT [DE]) 28 February 2013 (2013-02-28) page 3, paragraph 26 - page 4, paragraph 39; figures 1,2	1-4,7,11

A	EP 0 109 032 A2 (GRAMMER MEINRAD [DE]) 23 May 1984 (1984-05-23) page 6, line 29 - page 7, line 21; figures 1-2	1

A	EP 0 082 888 A1 (PROBST DIETRICH) 6 July 1983 (1983-07-06) the whole document	7-10

☐ 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	Date of mailing of the international search report
3 April 2019	11/04/2019

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Hoffmann, Stéphanie

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2018/060328

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 19642721 A1	24-04-1997	BE 1009706 A3	01-07-1997
		DE 19642721 A1	24-04-1997
		FR 2740204 A1	25-04-1997
		IT FI960242 A1	16-04-1998
DE 102011111771 A1	28-02-2013	DE 102011111771 A1	28-02-2013
		EP 2589893 A2	08-05-2013
EP 0109032 A2	23-05-1984	DE 3241536 A1	10-05-1984
		EP 0109032 A2	23-05-1984
EP 0082888 A1	06-07-1983	NONE	