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(54) **Title:** RECIPROCATING COMPRESSOR INCLUDING SUCTION ACOUSTIC FILTER

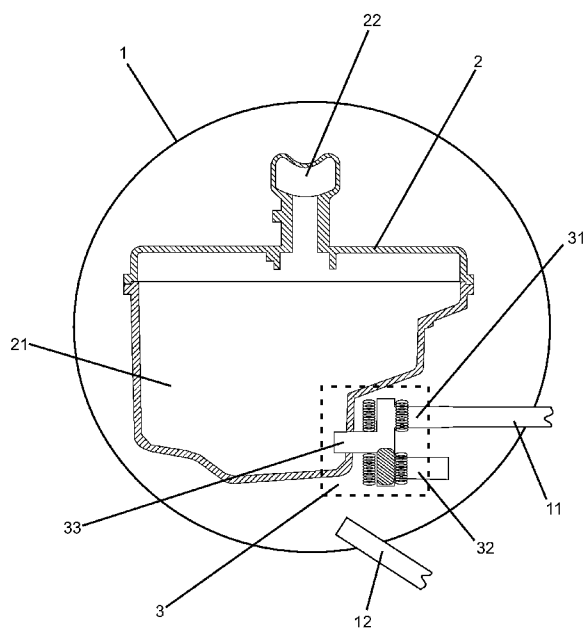


FIG. 2

(57) **Abstract:** A hermetic reciprocating compressor for a dual-evaporation refrigerating system has two suction passages (11,12) for receiving refrigerant from two independent evaporators, and includes a suction acoustic filter (2) disposed inside the hermetic housing (1) fluidly coupled to the compression reciprocating mechanism. Said suction acoustic filter (2) comprises: a pulsation attenuation chamber (21), outlet means (22) and inlet means in the form of a fluid selector device (3), which includes two inlet paths (31,32) and one outlet path (33). Said fluid selector device (3) is disposed between the at least two suction passages (11, 12) of the hermetic housing (1) and the suction acoustic filter (2). One inlet path (31) of the fluid selector device (3) is hermetically fluidly connected to the suction passage (11) of the hermetic housing (1) and the other inlet path (32) of the fluid selector device (3) is opened to the inside of the hermetic housing (1). Refrigerant entering the compressor through the suction passages (11,12) is preliminary selected by the fluid selector device (3) and then, directed to the pulsation attenuation chamber (21) of the suction acoustic filter (2).

“RECIPROCATING COMPRESSOR INCLUDING SUCTION ACOUSTIC FILTER”

Field of the invention

[001] The present invention relates to a reciprocating compressor including an acoustic suction filter, and more particularly a reciprocating compressor of multiple suctions particularly applied to refrigeration systems having at least two separate suction lines.

[002] In general, the said acoustic filter has the main objective to maintain independence between at least two suction lines and optimize the acoustic noise attenuation of suction lines.

Background of the Invention

[003] As is known to the skilled technicians in the subject, the current state of the art is integrated by the Brazilian patent application BRPI11019727, which describes a suction system for reciprocating compressor having a straight fluid selection device connected to the inlet suction of said compressor. Said fluid screening device is designed to receive two suction lines (or two evaporation lines) of the refrigeration system, and selecting by selectively switching fluid from only one of said two suction lines to the suction inlet of the reciprocating compressor. According to said patent application BRPI11019727, fluid selection device comprises an electromechanical valve having at least two inlet paths and one outlet path.

[004] The current state of the art is also integrated by the application of Brazilian patent BR1020140072543, which presents technical characteristics related to fluid selection device priority mentioned in the patent application BRPI11019727, in addition to providing not restricted possibility of using said device selection of fluids within the acoustic filter of the reciprocating compressor suction.

[005] Thus, said patent application BR1020140072543 describes a fluid selector device for reciprocating compressor essentially comprising a valve body composed of at least two inlet paths and at least one outlet path, a displaceable plunger disposed inside the valve body and composed of a communication channel, a sealing area and interaction means cooperatively with the electromagnetic field generating element, in addition to the own electromagnetic field generator element, which is preferably an electric coil. The said

electromagnetic field generator member is capable of stimulating, by means of cooperative interaction, selective and oriented moving of the displaceable actuator inside the valve body, and such selective and guided movement of the displaceable actuator inside the valve body is able to control or seal fluid communication between the input path and output path of said valve body.

[006] In general, the implementation of the fluid selector device disclosed on patent application BR1020140072543 comprises the best constructive and functional option related to the concept of "fluid selector device for selecting only one of two suction lines (or evaporation) for the suction inlet of the reciprocating compressor".

[007] The aforementioned patent application BR1020140072543 also describes the possibility of using such a fluid selection device inside the acoustic filter suction, for which it is only necessary that the acoustic filter comprises a camera having a first track admission and a second track admission hermetically isolated of this chamber.

[008] According to this possibility, which is illustrated in Figure 1 of the patent in question, it is noted that said acoustic filter comprises two suction inlets, whereas the compressor housing comprises two suction passers.

[009] The inlet of the acoustic filter is hermetically connected to the suction passer A1. The inlet B of the acoustic filter is simply directed to the inside of the compressor housing C, is thus equalized to the fluid coming from the suction passer B1, which fills the entire interior of said compressor housing C.

[010] In this embodiment, only the fluid coming from the suction passer B1 which fills the entire interior of said compressor housing C is directed to the pulse equalization chamber D of the acoustic filter, while the fluid coming from the suction passer A1 is directly led to the outlet path E of said acoustic filter.

[011] Although the embodiments disclosed on patent application BR1020140072543, and summarized above, fully achieve the objectives that are proposed, it is inevitable to note certain aspects amenable to optimization and constructive and functional improvement.

[012] The first of these features capable of optimization refers to the accumulation of lubricating oil (unintentionally flowing through the suction lines) in the hermetic suction line.

[013] As is known to those skilled in the art, it is known that part of the

lubricating oil - stored on the bottom of the compressor housing and used for lubrication of the moving metal components - is involuntarily sucked into the compression mechanism. Accordingly, this oil fraction is sent to the refrigeration system components, and finally returns to the compressor. In the case of the suction line related to the suction passer B1, it is apparent that this oil fraction tends to return to its original location, the compressor housing bottom. Eventually, part of the lubricating oil fraction is even led to the acoustic filter, which is not a big problem, ultimately, the interior of the compressor housing C is equalized with the pulse equalization chamber D, that can be used drainage conventional means, such as a through hole provided in the "lower" area of the acoustic filter.

[014] The same does not occur with the suction line connected to the suction passer A1, which suffer the penalty of not being able to have the lubricant oil circulating there drained into the compressor housing C, after all, both said suction passer A1 and the entrance A of the acoustic filter are hermetically isolated from the inside of the compressor housing C, which seeks to prevent any lubricant oil return flowing through this suction line. It is also known to the skilled in the art that the accumulation of this lubricating oil can compromise the overall operation of the compressor.

[015] The second of these aspects capable of optimization refers to the complexity of manufacturing and assembling the acoustic filter described in the patent application BR1020140072543. In general, these difficulties are related to the fact that the fluid disposed slider is fixed inside of the acoustic filter, which limits the possible ways of manufacturing the whole assembly.

[016] In this sense, it is based on the teachings and aspects for improvement of the acoustic filter described on patent application BR1020140072543 that comes the invention in question.

Invention Objectives

[017] It is therefore the primary object of the present invention in question a new alternative to the suction filter disclosed in the application for patent BR1020140072543 beyond optimizing its aspects amenable to improvement.

[018] It is therefore one objective of the subject invention that the suction acoustic filter for reciprocating compressor disclosed herein presents an optimization with respect to the lubricating oil drain, with respect to the acoustic filter described in Patent BR1020140072543.

[019] It is also one of the objectives of the subject invention that the acoustic filter suction to reciprocating compressor disclosed herein is substantially simpler than the acoustic filter described in the patent application BR1020140072543.

Summary of the Invention

[020] The objectives of the subject invention are fully achieved by the reciprocating compressor including the suction acoustic filter, which comprises at least one reciprocating compression mechanism and at least one hermetic housing including at least two suction passers.

[021] The said compressor further includes at least one suction acoustic filter disposed within the hermetic housing, which is fluidly associated with the reciprocating mechanism for fluid compression. This suction acoustic filter comprises at least one pulse attenuation chamber and at least one outlet path.

[022] The said compressor further includes at least one fluid switch device including at least two inlet paths and at least one outlet. According to the invention in question, said fluid selector device is arranged between the at least two suction strainers of the hermetic housing and the suction acoustic filter.

[023] In general, the inlet path of the fluid selector device is hermetically connected to the suction passer of the hermetic housing and the inlet path of the fluid selector device is equalized to the interior of the hermetic housing. This allows the working fluid coming from at least one of the at least two suction strainers are preliminarily selected by the selector fluid device and then directed to attenuating pulses chamber suction acoustic filter.

Brief Description of the Drawings

[024] The invention in question is detailed based on the figures listed below, including:

[025] Figure 1 illustrates the acoustic filter disclosed in Patent BR1020140072543 (prior art);

[026] Figure 2 illustrates, schematically, a preferred embodiment of the object of the subject invention; and

[027] Figure 3 illustrates schematically an alternative embodiment of the invention the object in question.

Detailed Description of the Invention

[028] Based on the general objectives of the invention in question is revealed double suction reciprocating compressor (whose concept is already part of the

current state of the art) including acoustic filter arranged suction between the compression mechanism of the reciprocating compressor double suction and a fluid selector device (whose concept and certain buildings also already part of the current state of the art).

[029] Thus, for all practical purposes, the reciprocating compressor - object of the subject invention - is essentially composed of:

[030] I) A reciprocating engine compression fluid (not shown and belonging to the current state of the art). Said reciprocating mechanism for fluid compression, although necessary when the compressor does not comprise the inventive scope of the subject invention.

[031] II) A hermetic housing 1 including at least two suction strainers 11 and 12. Said hermetic housing 1 is already belonging to the current state of the art and therefore even required to the compressor does not comprise the inventive scope of the invention question.

[032] III) a suction acoustic filter 2 disposed within the hermetic housing 1 and fluidly associated with the alternative mechanism for fluid compression. In this regard, it is noteworthy that the physical embodiment of the acoustic filter can be different, and is usually based on the principles of sound attenuation known to those skilled in the art. The key according to the invention in question is that said suction acoustic filter 2 comprises at least one pulses attenuating chamber 21 and at least one outlet means 22.

[033] IV) A fluid selector device 3 including at least two inlet paths 31 and 32 and at least one outlet path 33. In general, said fluid selector device 3 it is a valve, such as, for example, the valve described in patent application BR1020140072543.

[034] In view of the sum of these four elements/components, the great merit of the invention in question refers to the fact that said third fluid selector device is disposed between the two suction passers 11 and 12 of hermetic housing 1 and suction acoustic filter 2.

[035] This causes the working fluid coming from at least one of the at least two suction passers 11 and 12 is preliminarily selected by the third fluid selector device and then directed to the pulse attenuation chamber 21 of suction acoustic filter 2. Thus, unlike what happens on patent application BR1020140072543, working fluid from any of the suction passers 11 and 12, is subjected to acoustic

attenuation effects of the acoustic filter 2 before be sucked by the reciprocating engine compression of fluid compressor.

[036] Therefore, and from constructive point of view, it is observed that the inlet path 31 of the fluid selector device 3 is hermetically connected to suction passer 11 of the hermetic housing 1 and the inlet path 32 of the fluid selector device 32 is equalized inside the hermetic housing 1.

[037] In more, as illustrated in Figure 2, the fluid selector device 3 may comprise a single outlet path 33 and the suction acoustic filter 2 may comprise a single pulse attenuation chamber 21. In this case, said only outlet path 33 of the fluid selector device 3 is fluidly connected to the single pulse attenuation chamber 21 of the acoustic filter suction 2.

[038] Alternatively, the fluid selector device 3 may comprise at least two outlet paths 33 and 33' and the suction acoustic filter 2 may comprise a single pulse attenuation chamber 21. In this case, both two outlet paths 33 and 33' of the fluid selector device 3 are fluidly connected to the single pulse attenuation chamber 21 of the suction acoustic filter 2. Optionally, and as illustrated in figure 3, the fluid selector device 3 may comprise at least two outlet paths 33 and 33' and the suction acoustic filter 2 may comprise two pulse attenuation chambers 21 and 21' connected together. In this case, each of the two outlet paths 33 and 33' of the fluid selector device 3 are fluidly connected to one among the two pulses attenuation chambers 21 and 21' of the suction acoustic filter 2

[039] Although the constructive point of view, it is preferred that the outlet path 33 (or outlet paths 33 and 33') of the fluid selector device 3 is arranged at the lowest point of the suction acoustic filter 2. This enables and/or facilitates the lubricating oil drain that can be enclosed on the hermetic suction line of the suction passer 11.

[040] For this feature and technical effect to be achieved, the fluid selector device 3 can be partly arranged inside the suction acoustic filter 2, or even disposed outside the suction acoustic filter 2. It is worth mentioning that the means of mounting, fixing and sealing used in the embodiments explained above include techniques and/or have conventional means and known to those skilled in the art. This means that no detailed description of obvious aspects of these embodiments does not prevent and/or hinder the understanding of the subject invention.

CLAIMS

1. Reciprocating compressor including suction acoustic filter, where:
the reciprocating compressor comprises at least one fluid compression reciprocating mechanism;

at least one hermetic housing (1) including at least two suction passers (11, 12);

at least one suction acoustic filter (2) disposed inside the hermetic housing (1) and fluidly coupled to the fluid compression reciprocating mechanism;
said suction acoustic filter (2) comprises at least one pulsing attenuation chamber (21) and at least one outlet path (22);

at least one fluid selector device (3) including at least two inlet paths (31, 32) and at least one outlet path (33);

the reciprocating compressor including suction acoustic filter being specially **characterize** by:

said fluid selector device (3) is disposed between the at least two suction passers (11, 12) of the hermetic housing (1) and the suction acoustic filter (2);

the inlet path (31) of the fluid selector device (3) is hermetically connected to the suction passer (11) of the hermetic housing (1) and the inlet path (32) of the fluid selector device (3) is equalized to the inside of the hermetic housing (1);

the work fluid coming from at least one among the at least two suction passers (11, 12) is preliminary selected by the fluid selector device (3) and, then, directed to the pulsing attenuation chamber (21) of the suction acoustic filter (2).

2. Reciprocating compressor, including suction acoustic filter, according to claim 1, **characterized** by:

the fluid selector device (3) comprises a single outlet path (33);

the suction acoustic filter (2) comprises a single pulses attenuation chamber (21); and

said single outlet path (33) of fluid selector device (3) is fluidly connected to the single pulses attenuation chamber (21) of the suction acoustic filter (2).

3. Reciprocating compressor, including suction acoustic filter, according to claim 1, **characterized** by:

the fluid selector device (3) comprises at least two outlet paths (33, 33');

the suction acoustic filter (2) comprises one single pulses attenuation chamber (21); and

both the at least two outlet paths (33, 33') of the fluid selector device (3) are fluidly connected to the single pulses attenuation chamber (21) of the suction acoustic filter (2).

4. Reciprocating compressor, including suction acoustic filter, according to claim 1, **characterized** by:

the fluid selector device (3) comprises at least two outlet paths (33, 33');

the suction acoustic filter (2) comprises at least two pulses attenuation chambers (21, 21') connected to each other

each one of the at least two outlet paths (33, 33') of the fluid selector device (3) being fluidly connected to the at least one among the at least two pulses attenuation chambers (21, 21') of the suction acoustic filter (2).

5. Reciprocating compressor, including suction acoustic filter, according to claim 1, **characterized** by the work fluid from all suction passers (11, 12) are preliminary selected by the fluid selector device (3) and, then, directed to the pulses attenuation chamber (21) of the suction acoustic filter (2).

6. Reciprocating compressor, including suction acoustic filter, according to claim 1, **characterized** by the at least one outlet path (33) of the fluid selector device (3) is disposed on the lower point of the suction acoustic filter (2).

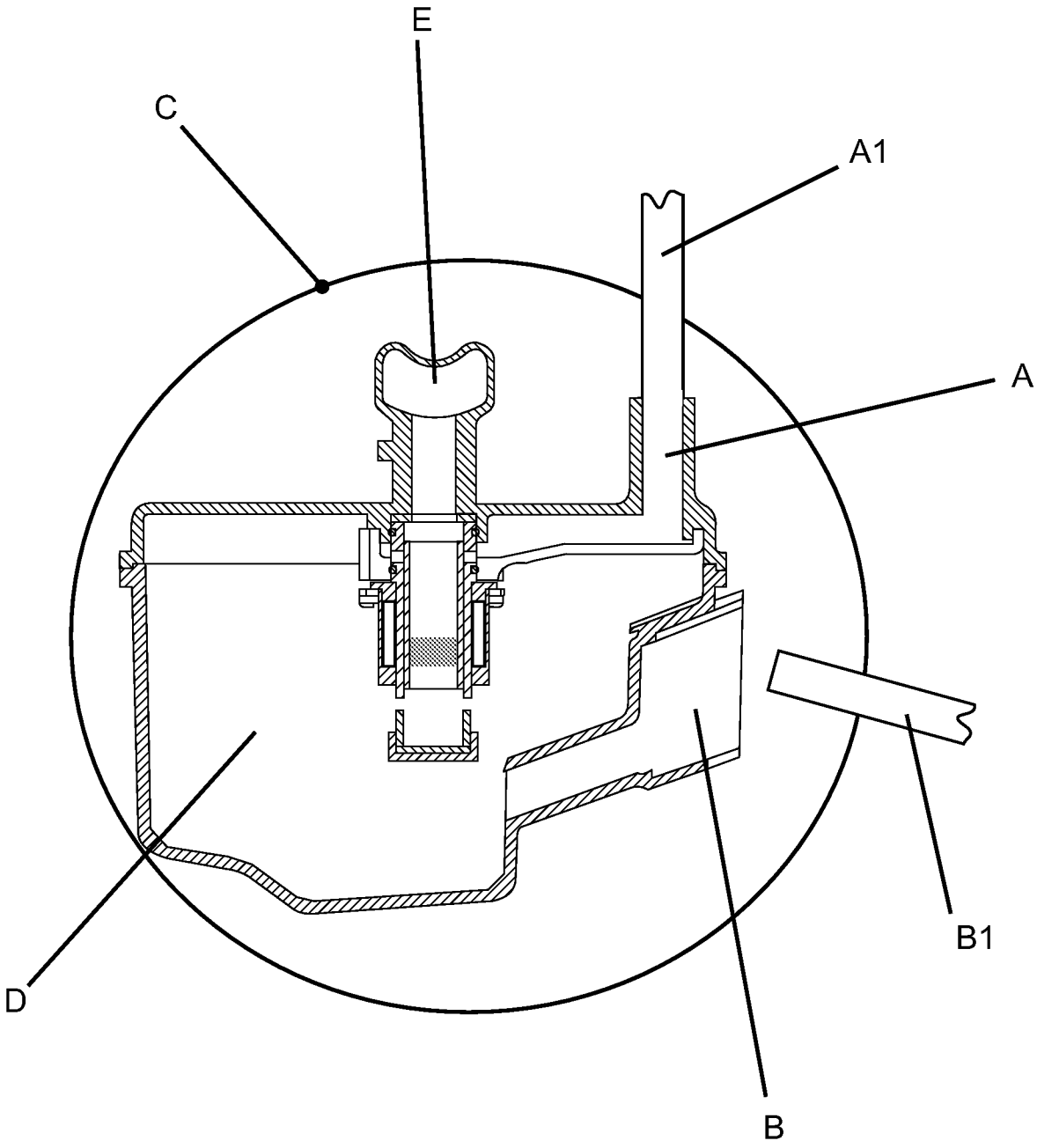


FIG. 1
PRIOR ART

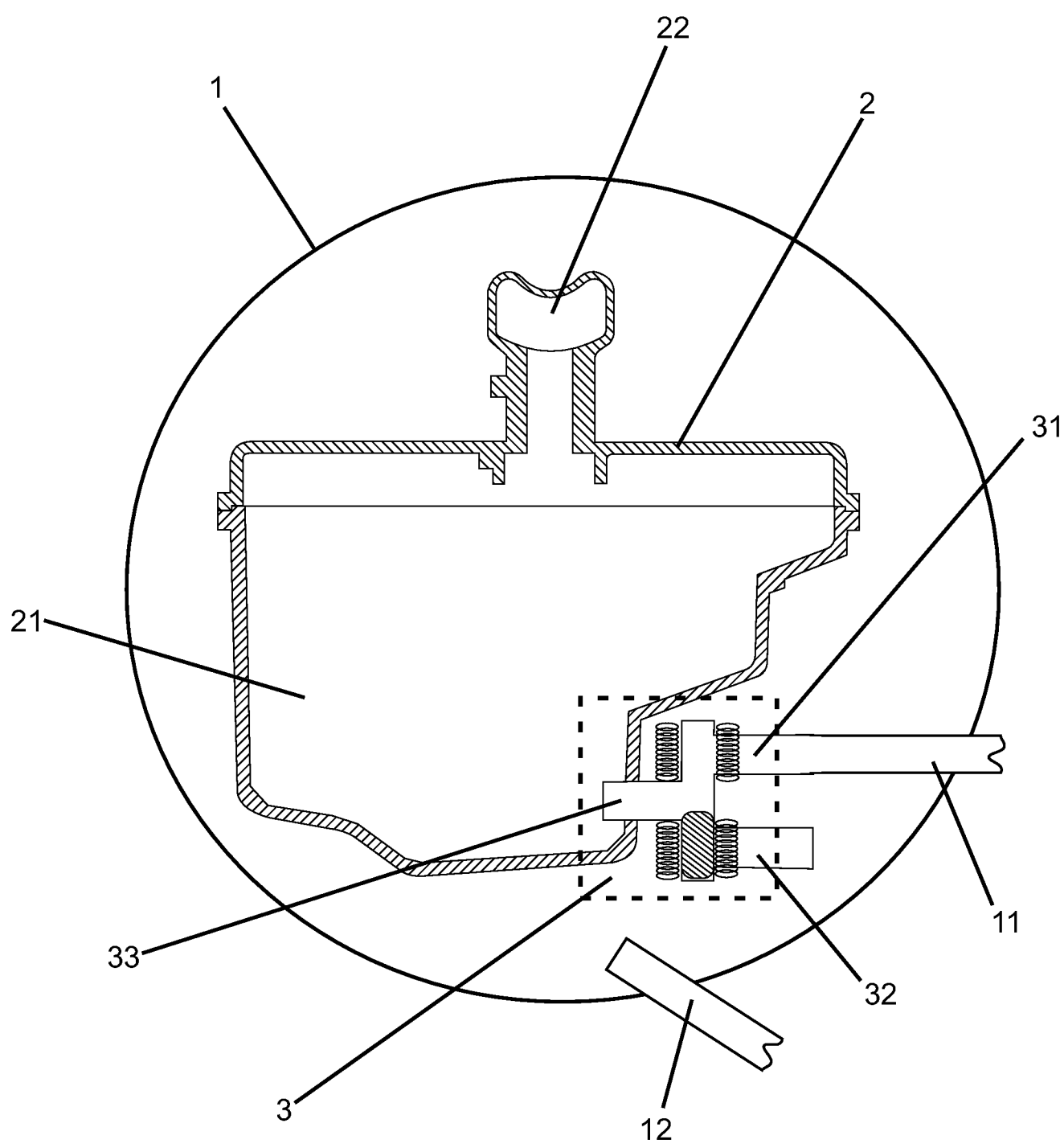


FIG. 2

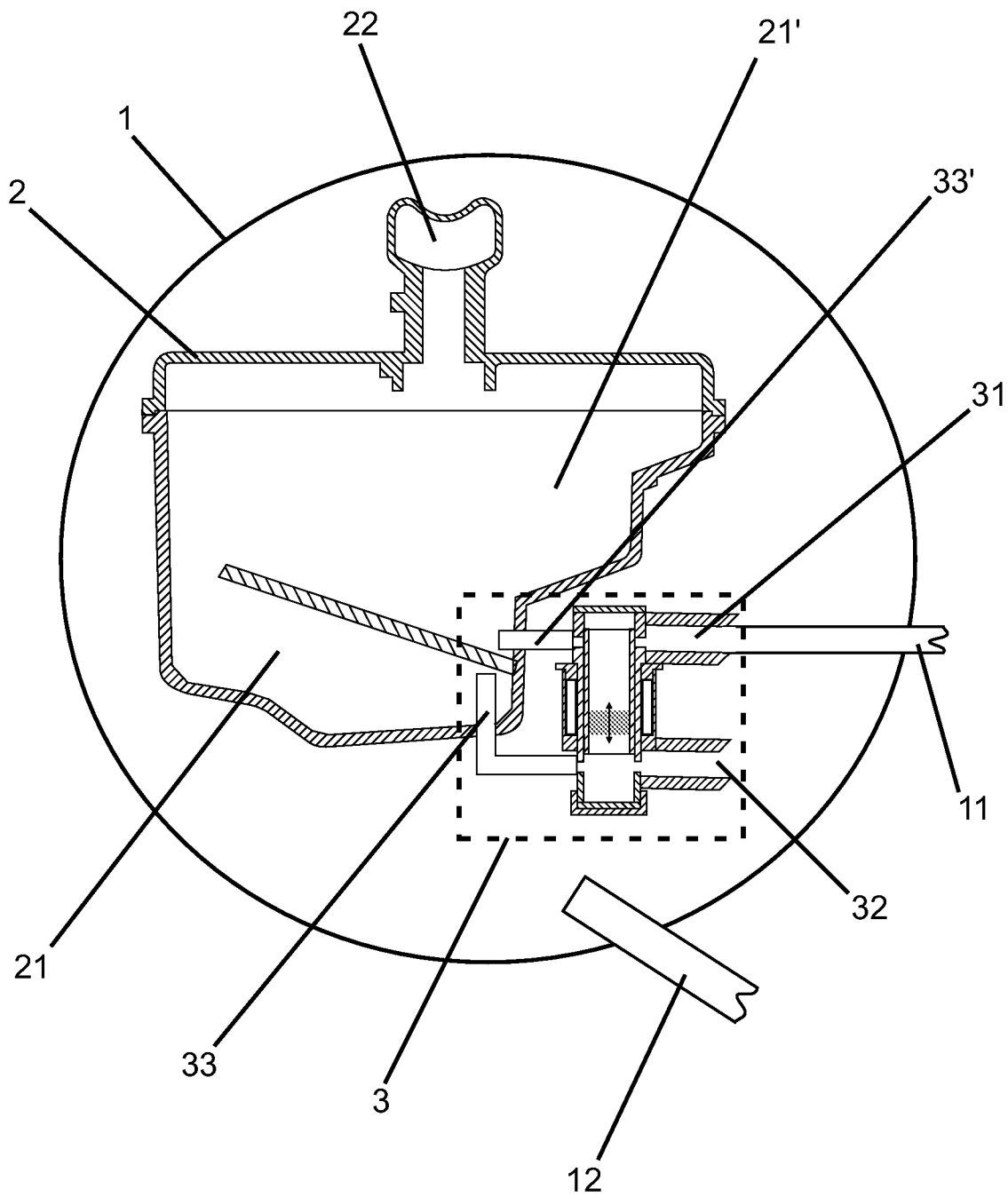


FIG. 3

INTERNATIONAL SEARCH REPORT

International application No
PCT/BR2016/050060

A. CLASSIFICATION OF SUBJECT MATTER
INV. F04B39/00 F25B5/02 F25B31/02
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)
F04B F25B

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

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X	BR PI1 101 972 A2 (WHIRLPOOL SA [BR]) 18 June 2013 (2013-06-18) cited in the application figure 2 -----	1-6
Y	US 2014/238059 A1 (WU GUOLIAN [US] ET AL) 28 August 2014 (2014-08-28) figures 8a,8b,9 -----	1-6
Y	US 2004/170506 A1 (LILIE DIETMAR ERICH BERNHARD [BR] ET AL) 2 September 2004 (2004-09-02) paragraph [0002]; figures 1,2 ----- -/-	1-6



Further documents are listed in the continuation of Box C.



See patent family annex.

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"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

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INTERNATIONAL SEARCH REPORT

International application No
PCT/BR2016/050060

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
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Information on patent family members

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