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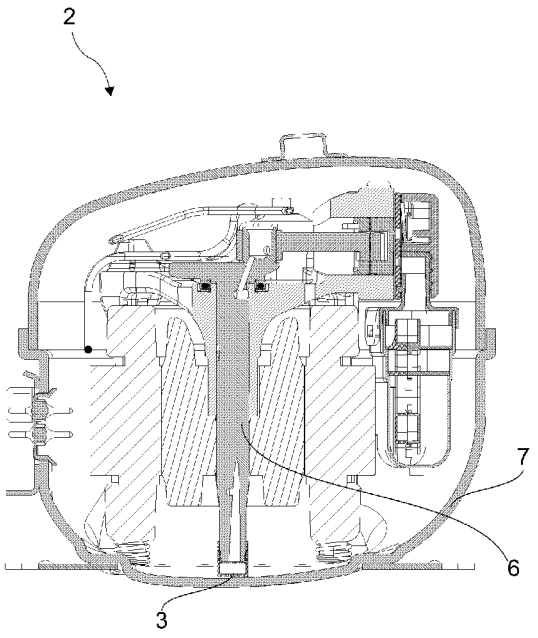
(54) Title: REFRIGERATION APPLIANCE PROVIDED WITH A COMPRESSOR HAVING AN OIL FILTER

Fig. 4



(57) Abstract: Refrigeration appliance (1) comprising a compressor (2) effectuating circulation of a refrigerant to heat exchange units through a fluid circulation circuit, said compressor (2) further having a crankshaft (6) in fluid communication with lubricating oil at a distal end thereof in the manner that lubricating oil is transferrable through said crankshaft (6) by centrifugal force imparted by rotation of said crankshaft (6). An oil filter (3) is fixed to and fully covers the distal end of the crankshaft (6).

[Continued on next page]

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Description

REFRIGERATION APPLIANCE PROVIDED WITH A COMPRESSOR HAVING AN OIL FILTER

[0001] The present invention relates to a refrigeration appliance having a compressor with an oil filter for filtering oil through the crankshaft.

[0002] It is well-known that in the refrigerant cycle effected in refrigeration appliances, the thermal energy absorbed from the inner cabin of the appliance is discharged by means of a condenser. The refrigerant fluid is accordingly circulated by a compressor between a condenser, a tube expander and an evaporator. The refrigerant fluid undergoes a phase transition from the liquid phase into the gas phase by way of absorbing the ambient heat of the foodstuff preserved within the cabin while passing through the evaporator. The evaporator serves for reducing the temperature of circulating air within the cooling device.

[0003] Hermetic reciprocating compressors are intended to reduce friction losses of moving parts and reduce the temperature of compressor parts by means of lubrication. In the lubrication system inside the compressor, oil at the bottom of the housing is transferred to bearings which need to be lubricated and to parts of the compressor to be cooled. In compressors, centrifugal force acts such that oil being displaced outwards moves upwards to provide lubrication. In the existing lubrication systems of conventional compressors, an oil flow path is formed through the crankshaft in the manner that oil is sucked into an oil flow path by a sucking end member soaked in oil filled at the lower portion of the hermetic housing.

[0004] There is a constant quantity of oil in the compressor. The oil in the compressor volume is trapped in the hermetic housing when the compressor operation is terminated, and the oil is sucked up when the compressor starts operating. During normal operation of the refrigerator, all unwanted particles in the refrigeration system are carried along with the refrigerant and if reaching to the compressor, these particles are trapped in the lower housing.

[0005] The tolerances in the oil path of the compressor are in the order of

microns. It is noted that undesired particles that are sucked from the lower portion of the hermetic housing can prevent the crankshaft from rotating, can cause overheating and wear and can ultimately prevent the compressor from operating.

[0006] To this end, the present invention is devised under the recognition that an improved system preventing circulation of unwanted particles within the compressor remains a need.

[0007] Among others, a prior art publication relevant to the technical field of the present invention can be referred to as US2003010573, disclosing an oil pickup apparatus for a hermetic compressor connected with a crank shaft in order to pickup an oil filled up in a lower part of a shell, comprising an oil pickup tube having one end immersed in the oil and being connected with the crank shaft to be rotated together, and the oil pickup tube having an impeller portion integrally formed at the oil pickup tube in order to pickup the oil by a fictitious centrifugal force when the crank shaft rotates and supply the oil to an upper part of the compressor.

[0008] The present invention, on the other hand, proposes a refrigeration appliance compressor having an oil filter preventing presence of extraneous material in the oil as provided by the characterizing features defined in Claim 1.

[0009] Primary object of the present invention is to provide a compressor for a refrigeration appliance, having a filter ensuring filtering of particles.

[0010] The invention proposes a refrigeration appliance with a compressor having a crankshaft onto the end of which a filter is attached in a position at least partially immersed in lubricating oil to filter oil before reaching to said crankshaft. The filter mounted has lower and lateral filter grates allowing flow of oil into the same. The filter receives distal end of the crankshaft at a partial longitudinal distance while the distal end of the crankshaft is still immersed in oil in mounted state of the filter. The lateral filter grate only extends along a longitudinal portion of the filter corresponding to the level until which the distal end is received into the filter.

[0011] Accompanying drawings are given solely for the purpose of exemplifying a compressor whose advantages over prior art were outlined above and will

be explained in brief hereinafter.

[0012] The drawings are not meant to delimit the scope of protection as identified in the claims nor should they be referred to alone in an effort to interpret the scope identified in said claims without recourse to the technical disclosure in the description of the present invention. The drawings are only exemplary in the sense that they do not necessarily reflect the actual dimensions and relative proportions of the respective components of the system.

[0013] Fig. 1 demonstrates a perspective view of a compressor in a refrigeration appliance according to the present invention.

[0014] Fig. 2 demonstrates an upper view of the compressor in the refrigeration appliance according to the present invention.

[0015] Fig. 3 demonstrates a perspective view of the compressor in the refrigeration appliance according to the present invention.

[0016] Fig. 4 demonstrates a cross-sectional view along lines H-H as indicated in Fig. 2 according to the present invention.

[0017] Fig. 5 demonstrates a front perspective view and a lower side perspective view of a filter in the compressor according to the present invention.

[0018] Fig. 6 demonstrates a side view of the crankshaft for the compressor and alternative filter mounting embodiments according to the present invention.

[0019] Fig. 7 demonstrates a cross-sectional view along lines B-B as indicated in Fig. 6 and an enlarged view of section D shown in Fig. 7 according to the present invention.

[0020] Fig. 8 demonstrates a cross-sectional view along lines C-C as indicated in Fig. 6 and an enlarged view of section E shown in Fig. 8 according to the present invention.

[0021] The following numerals are assigned to different parts demonstrated in the drawings:

[0022] 1) Refrigeration appliance

[0023] 2) Compressor

[0024] 3) Filter

[0025] 4) Lower filter grate

[0026] 5) Lateral filter grate

[0027] 6) Crankshaft

[0028] 7) Crankcase

[0029] 8) Pin

[0030] 9) Hole

[0031] 10) First annular flange

[0032] 11) Second annular flange

[0033] 12) Filter protrusion recess

[0034] 13) Filter protrusion

[0035] The present invention proposes a compressor (2) for a refrigeration appliance (1), said refrigeration appliance (1) having a cooling or refrigeration compartment for preserving foodstuff. Said compressor (2) conventionally circulates a refrigerant fluid to a condenser providing the refrigerant fluid to be condensed and an evaporator placed in an evaporator interspace effects refrigeration by absorbing the ambient thermal energy in the refrigeration compartment. The compressor (2) of the refrigeration appliance (1) is illustrated generally in Figure 1, Figure 2 and Figure 3.

[0036] Figure 4 depicts the hermetic compressor (2) of the invention with the crankshaft (6) as a detailed cross-sectional view. Lubricating oil is received from the bottom of a compressor (2) housing (crankcase (7)) to be transferred to various parts and bearings. Centrifugal force imparted by the rotor of the motor to the oil provides that it is conventionally displaced upwardly through a flow path (not shown) through the crankshaft (6). A filter (3) immersed in oil at the lower portion of the hermetic housing is disposed on the flow path of the oil at the lowermost portion of the crankshaft (6) captures particles in oil. Extraneous material oil is therefore filtered by means of the filter (3) mounted to the crankshaft's (6) distal end proximate the base of the crankcase (7).

[0037] Accordingly, unwanted particles in the refrigeration system carried along with the refrigerant and making their way to the compressor (2) are prevented from circulating into the system to block and stop operation of the compressor (2), which is typically linked to the risk of insufficient compressor (2) lubrication and which can also lead in the worst case to

total failure of this component by preventing the crankshaft (6) from rotating.

[0038] According to the present invention, the filter (3) can be mounted to the crankshaft (6) in various configurations as will be explained in detail hereinafter. In reference to Figure 5, the filter (3) includes a lateral filter grate (5), a lower filter grate (4), and a solid portion thereinbetween.

[0039] In Figure 6, different embodiments for mounting of the filter (3) on the crankshaft (6) are shown. In the first embodiment, interengagement of the respective components is performed thanks to the flexible structure of the filter (3). An annular filter protrusion (13) passes over a filter protrusion recess (12) and latches with crankshaft (6) to lock the filter (3) into the crankshaft (6).

[0040] According to an alternative embodiment of the present invention, a first annular flange (10) integral with the crankshaft (6) and a second annular flange (11) integral with the filter (3) are fixedly attached to each other by means of pins (8) through respective holes (9). Therefore, the annular flange of the filter (3) secures the filter (3) to the crankshaft (6) at its lower extremity in operational filtering condition.

[0041] In Figure 7 and 8, respective embodiments of Fig. 6 are shown in a more detailed manner.

[0042] In a nutshell, the present invention proposes a refrigeration appliance (1) comprising a compressor (2) effectuating circulation of a refrigerant to heat exchange units through a fluid circulation circuit, said compressor (2) further having a crankshaft (6) in fluid communication with lubricating oil at a distal end thereof in the manner that lubricating oil is transferrable through said crankshaft (6) by centrifugal force imparted by rotation of said crankshaft (6).

[0043] In one embodiment of the present invention, said compressor (1) further comprises a filter (3) at least partially immersed in said lubricating oil to cover said distal end of the crankshaft (6) on the flow path of the oil during transfer thereof in response to centrifugal force.

[0044] In a further embodiment of the present invention, the filter (3) mounted to the crankshaft's (6) distal end is a cylindrical body having lower and lateral

filter grates (4, 5).

[0045] In a further embodiment of the present invention, said filter (3) comprises an annular filter protrusion (13) passing over a filter protrusion recess (12) of the crankshaft (6) latching said filter (3) with said crankshaft (6).

[0046] In a further embodiment of the present invention, said crankshaft (6) comprises a first annular flange (10) and said filter (3) comprises a second annular flange (11) in the manner that said first annular flange (10) integral with the crankshaft (6) and said second annular flange (11) integral with the filter (3) are fixedly attached to each other.

[0047] In a further embodiment of the present invention, said filter (3) receives said distal end of the crankshaft (6) in a position immersed into oil in the interengaged position of said filter (3) with said crankshaft (6).

[0048] This arrangement ensures improved lubrication effect as the crankshaft (6) is in direct contact with oil starting from its non-operational state.

[0049] In a further embodiment of the present invention, lateral filter grate (5) of the filter (3) longitudinally extend along a longitudinal portion of the filter (3) along which said crankshaft (6) is received in the interengaged position of said filter (3) with said crankshaft (6). This arrangement ensures further improved lubrication effect as oil received into the filter (3) directly communicates with the crankshaft (6) itself.

[0050] In a further embodiment of the present invention, said filter (3) receives the distal end of the crankshaft (6) at a partial longitudinal distance while the distal end of the crankshaft (6) remains immersed in oil in mounted state of the filter (3).

[0051] In a further embodiment of the present invention, said lateral filter grate (5) only extends along a longitudinal span of the filter (3) corresponding to the level until which the distal end is received into the filter (3).

[0052] In a further embodiment of the present invention, a compressor (2) for a refrigeration appliance (1) is proposed, the compressor (2) comprising a crankshaft (6) in fluid communication with lubricating oil at a distal end thereof in the manner that lubricating oil is transferrable through said crankshaft (6) by centrifugal force imparted by rotation of said crankshaft (6), said compressor (2) further having a filter (3) at least partially

immersed in the lubricating oil to cover said distal end portion of the crankshaft (6) on the flow path of the oil during transfer thereof in response to centrifugal force.

[0053] The present invention proposes a compressor (2) for a refrigeration appliance (1), said compressor (2) minimizing risks occurring in the case of inadequate hydrodynamic lubrication conditions.

[0054] The crank-mounted filter (3) ensures that the refrigeration appliance (1) operates safely and that undesired particles in the cooling system are not carried with the coolant. In the case of undesired particulate reaching to the compressor (2), these particles are retained in the compressor oil and trapped in the crankcase (7). Therefore, situations such as prevention of the crank rotation, wear and consequent distortion of the crankshaft (6) operation by undesired particles are eliminated.

Claims

1. A refrigeration appliance (1) comprising a compressor (2) effectuating circulation of a refrigerant to heat exchange units through a fluid circulation circuit, said compressor (2) further having a crankshaft (6) in fluid communication with lubricating oil at a distal end thereof in the manner that lubricating oil is transferrable through said crankshaft (6) by centrifugal force imparted by rotation of said crankshaft (6) **characterized in that**;
said compressor (1) further comprises a filter (3) at least partially immersed in said lubricating oil to fully cover said distal end of the crankshaft (6) on the flow path of the oil during transfer thereof in response to centrifugal force.
2. A refrigeration appliance (1) as in Claim 1 **characterized in that** the filter (3) mounted to the crankshaft's (6) distal end is a cylindrical body having lower and lateral filter grates (4, 5).
3. A refrigeration appliance (1) as in Claim 1 or 2 **characterized in that** said filter (3) comprises an annular filter protrusion (13) passing over a filter protrusion recess (12) of the crankshaft (6) latching said filter (3) with said crankshaft (6).
4. A refrigeration appliance (1) as in Claim 1 or 2 **characterized in that** said crankshaft (6) comprises a first annular flange (10) and said filter (3) comprises a second annular flange (11) in the manner that said first annular flange (10) integral with the crankshaft (6) and said second annular flange (11) integral with the filter (3) are fixedly attached to each other.
5. A refrigeration appliance (1) as in Claim 3 or 4 **characterized in that** said filter (3) receives said distal end of the crankshaft (6) in a position immersed into oil in the interengaged position of said filter (3) with said crankshaft (6).
6. A refrigeration appliance (1) as in Claim 5 **characterized in that** said lateral filter grate (5) of the filter (3) longitudinally extend along a longitudinal portion of the filter (3) along which said crankshaft (6) is received in the interengaged position of said filter (3) with said crankshaft (6).
7. A refrigeration appliance (1) as in Claim 2 **characterized in that** said filter (3) receives the distal end of the crankshaft (6) at a partial longitudinal distance while the distal end of the crankshaft (6) remains immersed in oil in mounted state of the filter (3).
8. A refrigeration appliance (1) as in Claim 2 or 7 **characterized in that** said lateral

filter grate (5) only extends along a longitudinal span of the filter (3) corresponding to the level until which the distal end is received into the filter (3).

9. A compressor (2) for a refrigeration appliance (1), the compressor (2) comprising a crankshaft (6) in fluid communication with lubricating oil at a distal end thereof in the manner that lubricating oil is transferrable through said crankshaft (6) by centrifugal force imparted by rotation of said crankshaft (6), said compressor (2) further having a filter (3) at least partially immersed in the lubricating oil to fully cover said distal end portion of the crankshaft (6) on the flow path of the oil during transfer thereof in response to centrifugal force.

Fig. 1

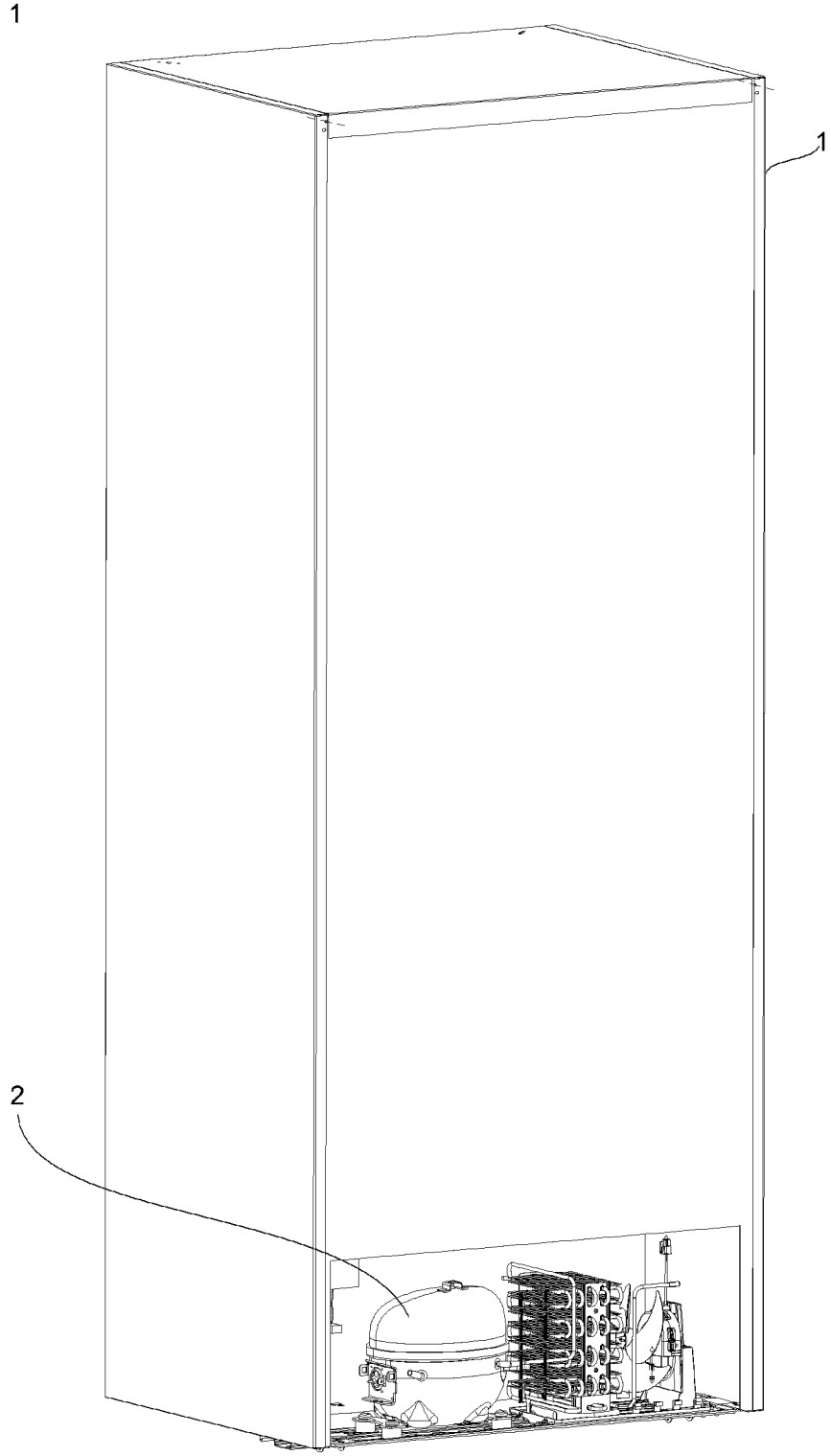


Fig. 2

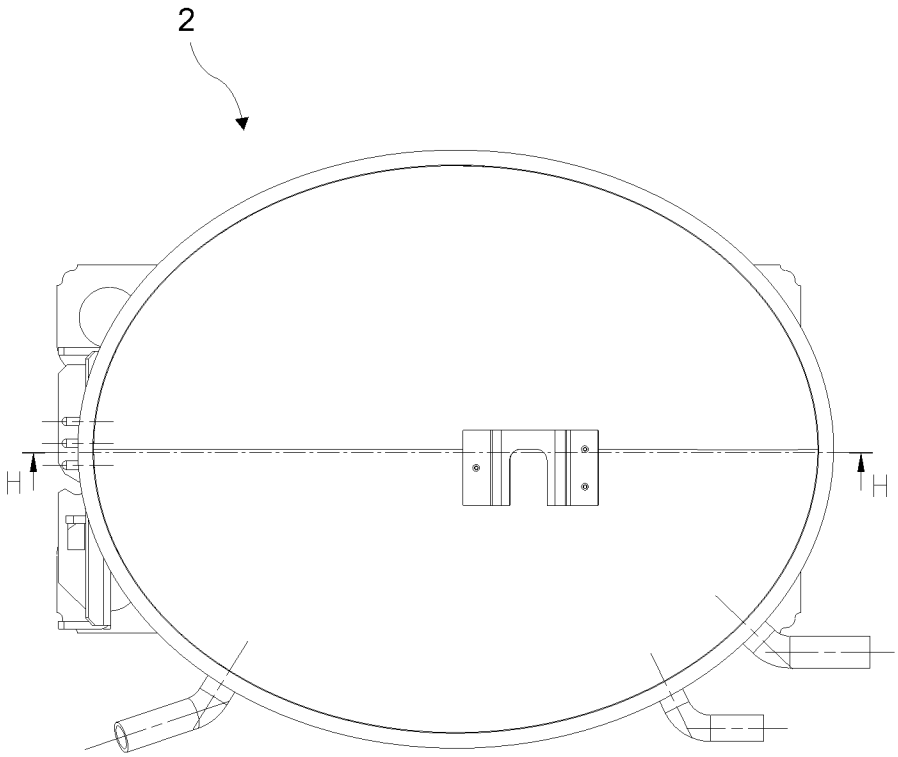


Fig. 3

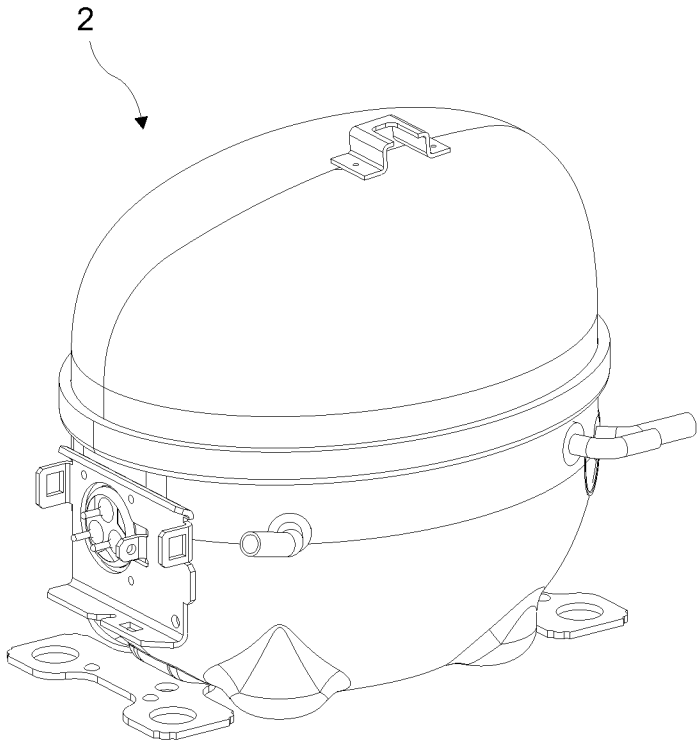


Fig. 4

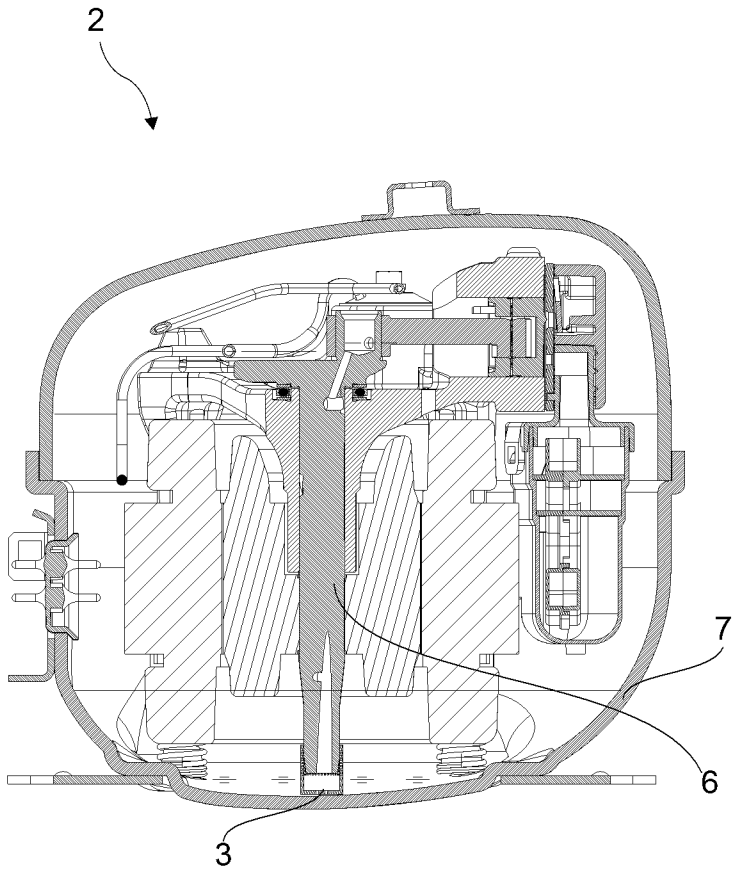


Fig. 5

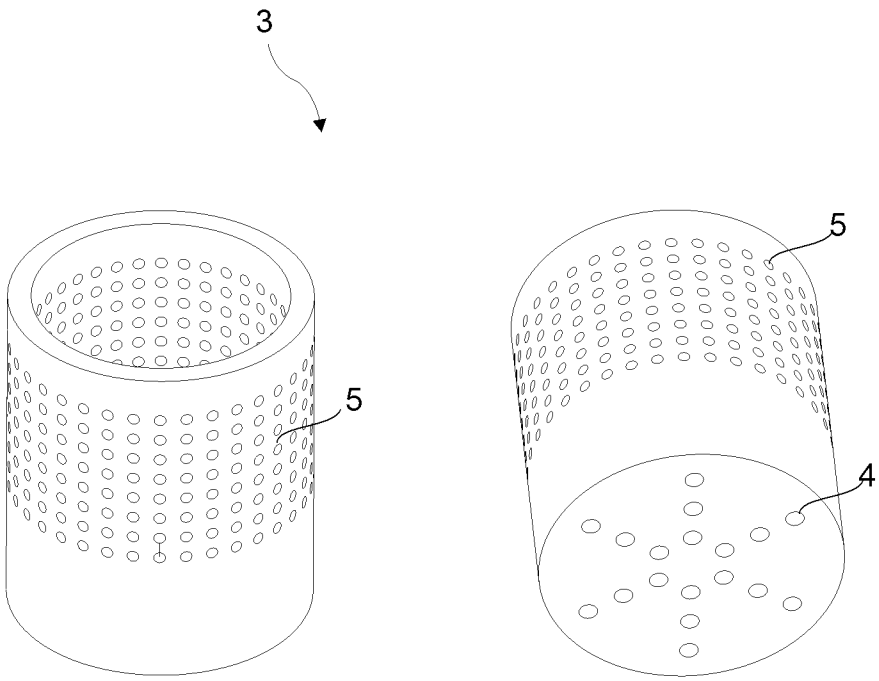
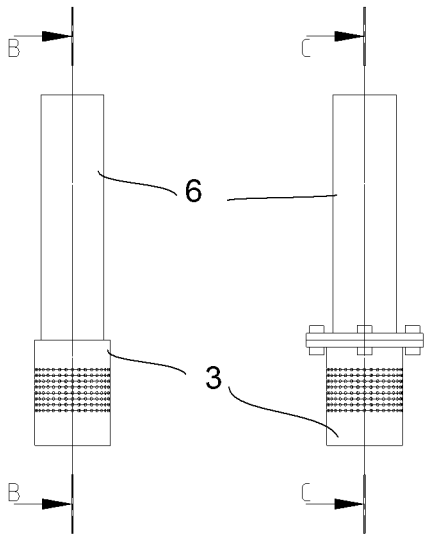


Fig. 6



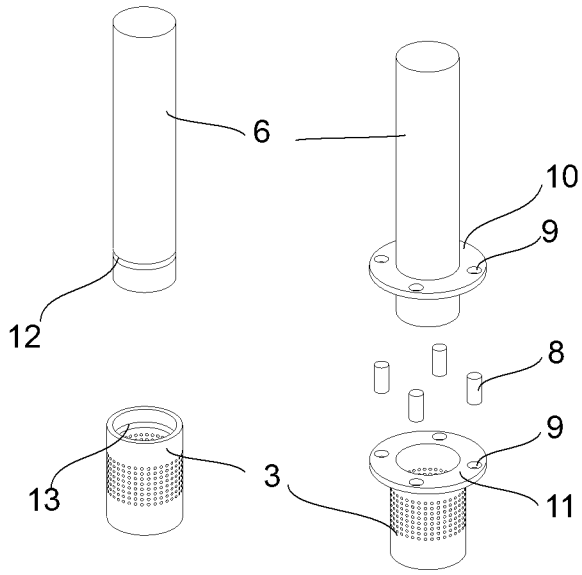


Fig. 7

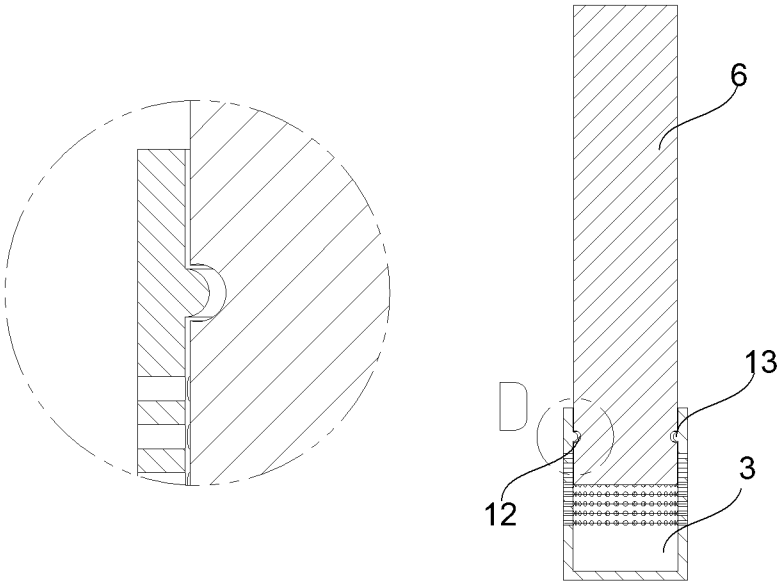
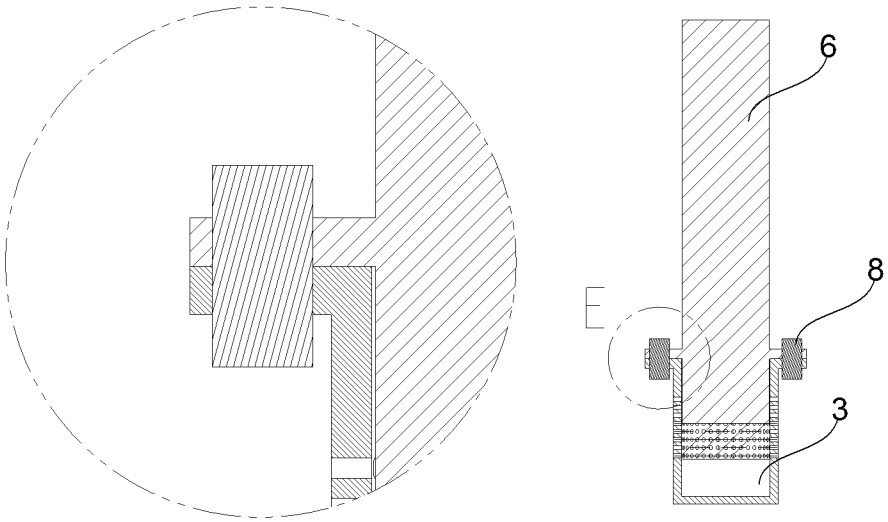


Fig. 8



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2016/082735

A. CLASSIFICATION OF SUBJECT MATTER
INV. F04C23/00 F04B39/02 F04C29/02 F04B39/16
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)
F04C F04B

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

[X] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
25 September 2017	10/10/2017

Name and mailing address of the ISA/	Authorized officer
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2016/082735

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