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(54) **Thermostatic valve and oil filter unit for compressors.**

(57) A device for the cooling and circulation of oil between the oil chamber (11) and the stator chamber (13) of a rotary type compressor, the device comprises a thermostatic valve (15) directly connected to an oil filter (16) and respectively to a heat exchanger (18), the thermostatic valve (15) and the oil filter (16) being coaxially aligned in a casing (14) positioned underneath and in contact with the oil chamber (11) of the compressor.

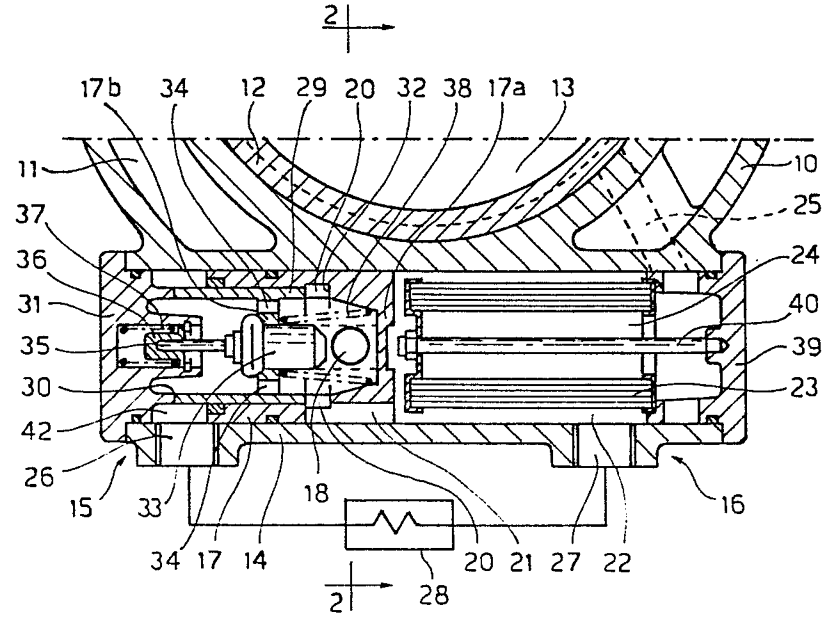

Fig. 1

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Thermostatic valve and oil filter unit for compressors

This invention refers to a device for the circulation of the oil for lubrication and for cooling the air in compressors of the rotary type and, in particular, is directed to a special arrangement of a thermostatic valve and recycling filter for the lubrication and cooling oil to considerably simplify the construction of the compressor and improve lubrication in operating conditions of particularly low temperatures; besides this, it allows easy inspection and/or substitution of both the filter and the thermostatic valve.

This is obtained, according to the innovative principles of this invention, by coaxially arranging the thermostatic valve and the oil filter in a single cylindrical casing underneath and in direct contact with the oil chamber of the compressor, so as to reduce the space occupied and, at the same time, simplify construction and maintenance.

In particular, the thermostatic valve comprises a hollow cylindrical body sealingly housed inside the above-mentioned casing, and a closing cylindrical member operated by a thermostatic control element; the cylindrical member slides between two extreme operative positions in which it opens or closes some exit ports for the oil towards a passage for the direct recycling of the oil from the compressor oil chamber to the stator chamber, and respectively for connecting a cooling circuit towards the above mentioned recycling filter. Preferably, the oil filter and the thermostatic valve are made accessible by removing a closure cover of said cylindrical casing so as to be easily removable for maintenance or substitution.

These and further characteristics of the device according to the present invention will be shown in the description that follows with reference to the attached drawings in which:

Fig. 1 is a cross-sectional view of the lower part of a generic rotary air compressor, at the point in corrrespondence with the longitudinal axis of the casing housing the filter and the thermostatic valve;

Fig. 2 is a section according to the line 2-2 of figure 1.

A rotary air compressor of the type with radial blades, as per se known, comprises an external cylindrical body defining an annular chamber 11, only partially shown, in which a suitable quantity of oil necessary for the operation of the compressor is contained, and an internal cylindrical body 12, also referred to as stator, which defines a chamber 13 in which, as per se known, a blade rotor rotates (not shown). The whole compressor, with all its relative automatic control devices, is not shown completely here, with the exception of the oil circulation device, since it does not constitute an innovative part of the present invention and is realizable in any of several ways.

In a position underneath the body 10 of the compressor and placed in direct contact with the lower part of the oil chamber 11 is a cylindrical casing 14 in which a thermostatic valve 15 and a filter 16 are housed or coaxially arranged in alignment with each other.

In particular, the thermostatic valve 15 comprises a hollow cylindrical body 17 in the form of a cup-shaped element, the closed bottom 17a of which is facing towards the filter 16. The inside of the hollow body 17 is in communication with the oil chamber 11 of the compressor by means of a lateral inlet hole 18 aligned with a hole 19 which opens towards the bottom of the oil chamber 11.

Near the bottom 17a of the valve body 17 a first set of exit ports 20 has been provided which ports communicate, through longitudinal passages or channels 21 with the space 22 in which the filtering cartridge 23 is housed, said space 22 for the filter being a continuation of the space in which the valve 15 is housed. The inside 24 of the filter cartridge in its turn communicates on one side with a conduit 25 which rectckes the oil directly or through suitable distributors (not shown) inside the chamber 13 of the stator.

The other open end of the valve body 17 terminates in correspondence with a second exit port 26 in the casing 14 which is connected to an inlet port 27 of the filter space 22 by means of a branched off circuit for cooling the oil, comprising a heat exchanger 28.

Inside the valve body 17 is an axially hollow cylinder or closing member 29 which sealingly slides between a first end position, shown in Fig. 1, against an annular edge 30 of a closure cover 31, in which position the closing member completely closes the oil passage towards the second exit port 26, and a second operative position opposite the preceding one, in which the closing member 29 closes the radial ports 20 of direct communication with the filter 16 against an annular seat 32 on the bottom of the cup-shaped element mentioned above.

The cylindrical closing member 29 is moved between its two end positions by means of a thermostatic control element 33 for example of the wax type, or equivalent element, which, through changes of the temperature of the oil coming from the chamber 11 is extended or retracted thus moving the closing member mentioned above. According to the example shown, the bulb of the thermostatic element 33 is fastened to a supporting member inside the cylinder 29 surrounded by a set of holes 34 for the passage of the oil, while the rod 35 of the thermostatic element is fastened to the cover 31 in any suitable way; for example, by means of a cup member 36 housed in a seat in the cover 31 and pushed towards the above-mentioned shaft by a spring 37. A second spring 38 is disposed between the bottom 17a of the valve body 17 and the perforated support member 17b for the thermostatic element 33 in the closing cylinder 29 to push the cylinder towards the above mentioned first operative position, thus opposing the action of the thermostatic element 33.

It must be explained also that the cartridge 23 of the filter, like the thermostatic valve, can be withdrowen and removed simply by removing the end closure cover 39 of the housing 14 since the cartridge 23 of the filter is fixed to the cover 39 by means of a tie rod 40 as shown.

The working of the device is as follows: the cylinder 29 of the thermostatic valve 15, operated by the element 33 sensitive to temperature moves gradually from one position, where the passage 26 towards the conduit leading to the heat exchanger 28 is completely closed and the direct passages 20 and 21 to the oil filter 16 are completely open, to the opposite position, where the condition of the above-mentioned passages is reversed.

Therefore, when the oil entering the body of the thermostatic valve from the chamber 11 through the hole 18 has a temperature below a certain determined value, it passes through the ports 20 left uncovered by the hollow cylinder 29 and from these, by means of the slots 21 on the external wall of the valve body 17 it directly reaches the adjacent space 22 where the cartridge 29 of the oil filter is housed and, passing through the filter, it goes into the stator-rotor unit of the compressor by means of a conduit 25.

Gradually as the oil heats up, the thermostatic bulb 33 with which it comes in contact pushes out the rod 35 and forces the closing cylinder 29 to move towards the right, partially closing the passage ports 20 leading to the oil filter and uncovering contemporaneously part of the port 42 towards the opening 26 connected to the conduit towards the cooler 28. Therefore, part of the oil will begin to flow through the appropriate holes 34 in the closing cylinder, and from these towards the exit 26 connected to the cooler 28.

When the maximum calibration temperature is reached, the cylinder 29 will have completely closed the direct passage towards the filter 16 and all the oil will have to circulate through the cooler 28 to return to the filter 16 by an appropriate return conduit connected to the inlet port 27 of the filter housing.

When the temperature of the oil decreases, the thermostat bulb 33 cools as a consequence, causing the rod 35 to retract into the same bulb consequently moving towards the left the cylinder 29 which, passing through intermediate positions, will move to the above mentioned first operative positon.

From what has been said and shown, it is evident that a device is supplied for the circulation and cooling of the oil passing from the oil chamber of a rotary compressor to the stator chamber, which makes use of a particular arrangement of a unit comprising a thermostatic valve and an oil circulation filter, housed and aligned in a single casing positioned underneath and in direct contact with the oil chamber of the compressor. In this was, not only is the whole device simplified constructionally, making its parts easily accessible for maintenance or control, but also at the same time heat losses are reduced by maintaining the circulation of oil at an adequate temperature for a good working of the compressor even in particularly difficult conditions, with very cold or very low ambient temperatures.

Claims

1. A device for the cooling and circulation of oil between the oil chamber (11) and the stator chamber (13) of a rotary type compressor, the device comprising a thermostatic valve (15) directly connected to an oil filter (16) and respectively through a branched off circuit comprising a heat exchanger (18) characterized by the fact that the thermostatic value (15) and the oil filter (16) are coaxially aligned in a casing (14) positioned underneath and in contact with the oil chamber (11) of the compressor.

2. A device as claimed in claim 1, characterized by the fact that the thermostatic valve (15) comprises a cup-shaped hollow cylindrical body (17), the bottom (17a) of which is facing towards the oil filter (16), said valve body (17) presenting, near the bottom, a set (20) of first oil exit ports, connected to the oil filter (16) through direct channels (21), said value body (17) terminating at its other open end in correspondence with a second oil exit (26) connected to a cooling branched off circuit (28) and by the fact that the thermostatic valve (16) comprises a hollow closing cylinder (29), defining an axial passage between an oil inlet (18) into the body (17) of the value (15) and the exit port (26) at one end of the valve body (17), and an axially extensible and retractable thermostatic control element (33), operatively connected between the closing cylinder (29) and a connecting portion (31) fixed to or integral with the casing (14) of the valve (15).

3. A device as claimed in claim 2, characterized by the fact that said thermostatic element (33) comprises a bulb sensitive to temperature, seated inside the closing cylinder (29), and a sliding rod operatively connected to the end closure cover (31) of the casing (14) for the thermostatic valve (15).

4. A device as claimed in claim 3, characterized by the fact that the thermostatic valve (15) can be withdrawn through the end of the casing (14), which is closed by the above mentioned end cover (31).

5. A device as claimed in claim 1, characterized by the fact that the said first set of oil exit ports (20) in the valve body (17), communicate with the oil filter space (22) through longitudinal conduits (21) on the external surface of the valve body (17).

6. A device as claimed in claim 1, characterized by the fact that the oil filter cartridge (24) is carried directly by a closure cover (39) of the space (22) housing the filter (16).

7. A device as claimed in claim 1, characterized by comprising a single casing (14) containing both the thermostatic valve (15) and the oil filter (16), said casing (14) being integral with the compressor body (10) and in correspondence with the bottom of the oil chamber (11) of same.

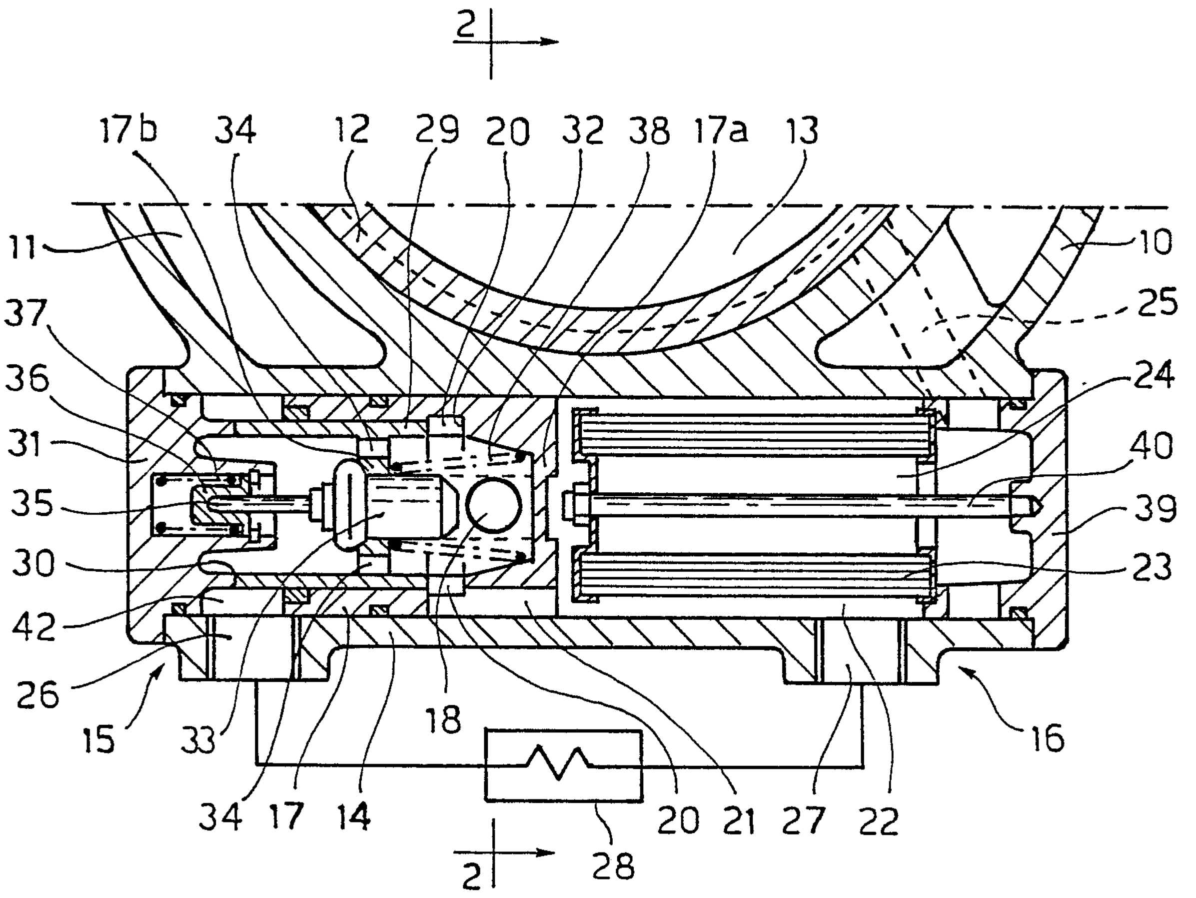

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Fig. 1

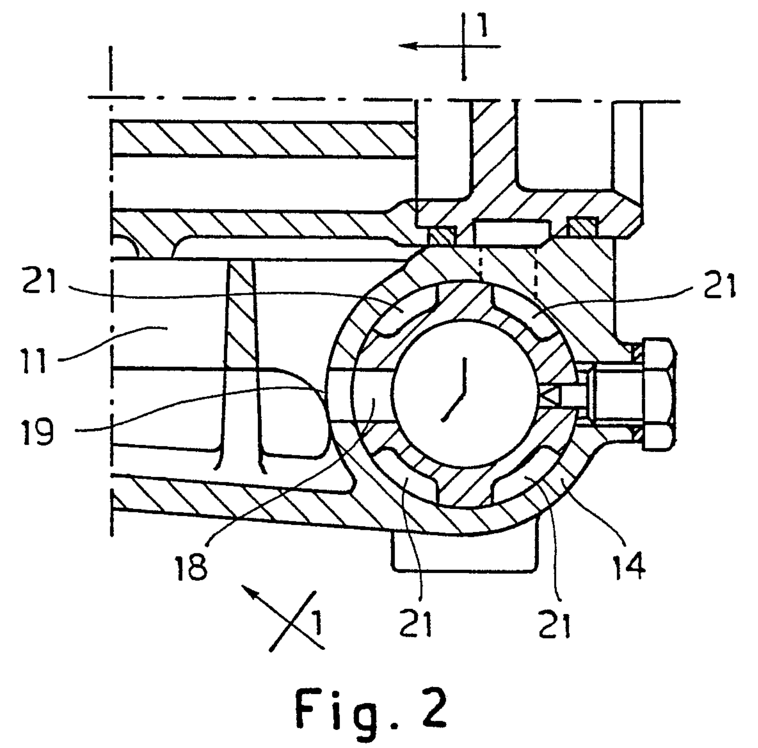

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Fig. 2