

[54] **CIRCULATION PUMP FOR REFRIGERATION PLANT**

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[56]

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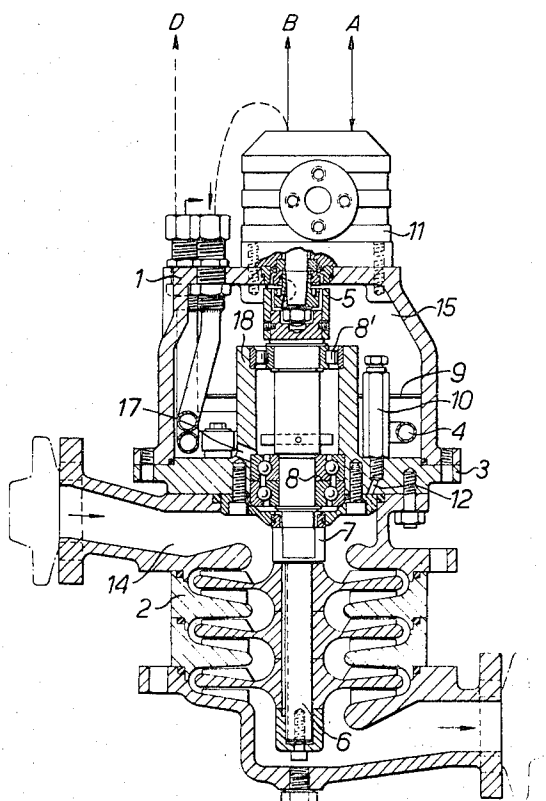
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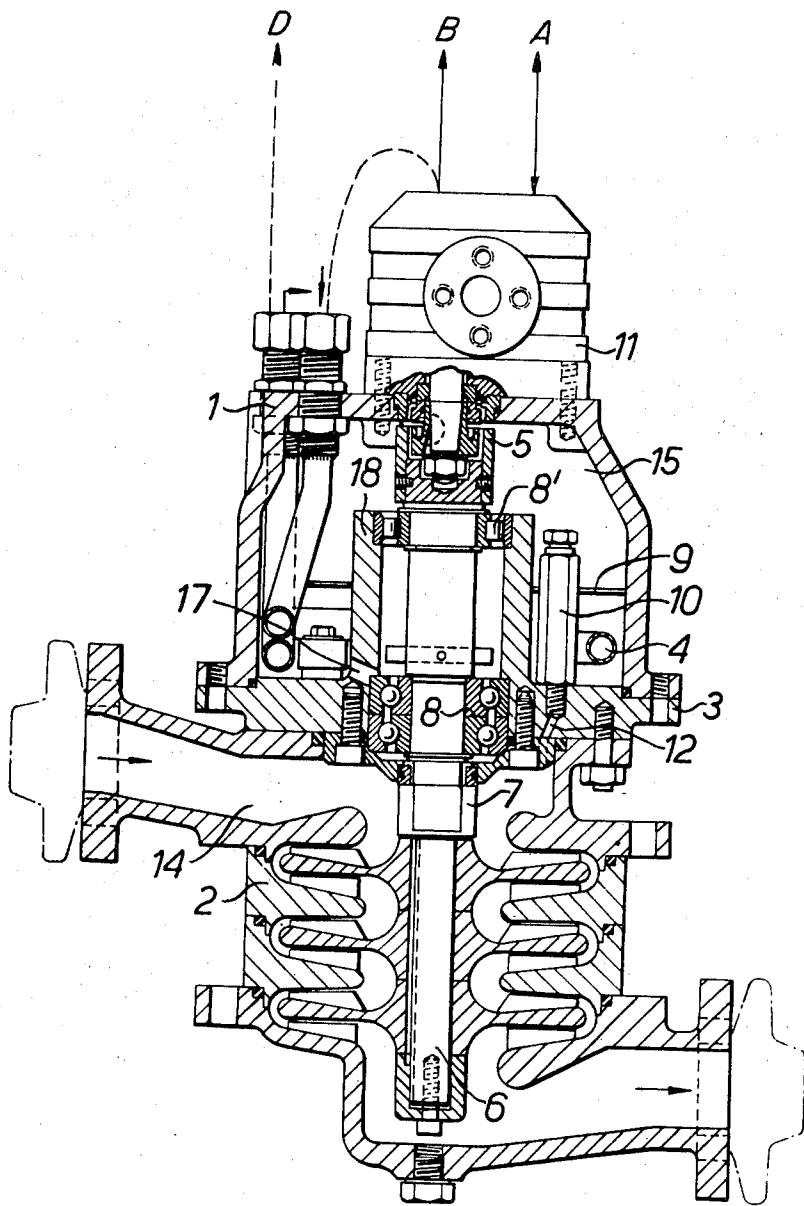
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ABSTRACT

A hydraulic or pneumatic motor for driving a pump in a refrigeration plant has the outlet conduit arranged in a loop in an oil chamber where the pump and motor is placed the loop giving off heat sufficient to evaporate cooling fluid which may leak into said chamber.

5 Claims, 1 Drawing Figure





CIRCULATION PUMP FOR REFRIGERATION PLANT

The present invention relates to an improvement in circulation pumps for refrigeration plants, and particularly circulation pumps which are to be used in environments where there is risk of explosion since electric motors cannot be used and are replaced by pneumatic or hydraulic power sources.

In the chemical industry and in cooling technique the problem of leakage in the fluid circuit arises and one of the most difficult points is the gland box of the pump. In refrigeration plants, pumps with low pressure circulation systems are most frequently used where, in addition to the damaging effect of leaking cooling medium, leakages can entail great economic loss. In order to avoid such leakage, totally enclosed pumps are used where the motor or rotor of the pump is enclosed from the environment in the same chamber as the mechanical parts of the pump whether this is a multiple rotor, a rotor for centrifugal pumps or displacement rotor. The fluid to be transported by the pump when required serves to cool the motor and to lubricate the bearing. Bearings of this type are generally shortlived since the circulating fluid has poor lubricating properties and supply of other lubricant such as oil and grease leads to a harmful and undesirable mixture in the circulating fluid.

In circulation pumps of this type, the problem is thus to provide a bearing which is lubricated with oil and to avoid mixing of the oil with the fluid pumped in the system. The oil is located in a chamber in the interior of a housing and, with through passage of the shaft from the said chamber to the pump, it is impossible to avoid penetration of the pumped fluid, instead of taking expensive and unsatisfactory measures to prevent penetration, a different method is proposed in the present invention and measures are taken to remove the oil from the fluid the penetration of which is impossible to prevent.

Both hydraulic and pneumatic operating media are heated when the media operates a motor, and the heat energy stored in the operating medium by the said heating is, in accordance with the invention, utilized to separate the lubricating oil from the fluid to be transported by the pump. This is achieved in that an outlet conduit for the operating medium from the motor is laid in one or more loops which are immersed in oil in the oil chamber. Evaporation of the said fluid from the lubricating oil leads to a pressure rise in the oil chamber and this is provided with a gas outlet having a spring-loaded valve which opens for release of gas when the pressure in the oil chamber is in excess of a determined value. The gas outlet leads from the oil chamber down into the pump chamber so that the gas is returned into the path to which it pertains.

The invention thus relates to an improvement in circulation pumps for refrigeration plants, where pump and motor are constructed as a closed unit, and the motor is a hydraulic or pneumatic motor which is located in an oil chamber, and the invention is essentially characterized in that the outlet conduit for the hydraulic or pneumatic operating medium is laid in one or more pipe loops in the oil chamber.

A preferred embodiment example of the invention is characterized in that the oil chamber has an outlet which is higher than the maximum oil level in the

chamber and has a valve which opens at a predetermined pressure.

This embodiment example is further characterized in that the gas outlet leads down to the pump chamber.

In the present invention, the oil in the oil chamber is sufficiently free from fluid to ensure good lubrication of the bearings and, by reason of the excess pressure in the oil chamber, it is difficult for the fluid to penetrate. When mounting or overhauling, the excess pressure can be provided by means of an inert gas.

In order that the invention may be more readily understood, it is further explained in the following with reference to an embodiment example illustrated on the drawing.

The drawing shows an axial section through a totally enclosed centrifugal pump wherein the invention is utilized. On the drawing, 1 is the bearing housing for a totally enclosed centrifugal pump for utilization, for example, in a refrigeration plant. The said bearing housing is connected to the pump housing 2, a sealed partition wall 3 being provided between the two housings. The said partition wall 3 has a central through passage for the vertically extending shaft 6, a coupling 5 being mounted in the upper end of said shaft.

In the bottom of the bearing house, that is to say the partition wall 3, a bearing 8 is arranged for the shaft 6, and a further bearing 8' for said shaft is arranged at the upper end of a sleeve-shaped extension upwardly of the said partition wall 3.

Beneath the lower bearing 8 is a gland box 7 or other suitable sealing which, as effectively as possible, is to prevent fluid from penetrating along the shaft from the interior 14 of the pump housing and up into the interior 15 of the bearing housing. The lower portion of said bearing housing is filled with a suitable lubricating oil which, through openings 17 in the sleeve-shaped extension 18, can run down to the bearings 8 and lubricate these. Simultaneously, the oil within the said extension will be supplied, on rotation of the shaft, to the upper mounting 8', accelerated possibly by means of a member not shown.

A hydraulically operated motor 11 is located on top of the housing 2 and hydraulic medium is supplied to the motor in the usual way by means of pipes or conduits of sufficient strength. When the motor is in operation the hydraulic medium becomes heated to an elevated temperature and in accordance with the invention this heat energy is utilized to evaporate cooling medium which may have leaked into the lubricating oil (below the level 9 in the housing 2). To this end the first part of the return pipe or conduit for hydraulic medium leading from the motor, is arranged in a loop 4 in the housing, submerged in the lubricating oil and the loop will give off sufficient heat to evaporate cooling medium which have leaked into the lubricating oil.

In the partition wall 3, a through channel 12 is provided in the upper end of which a valve means in the form of pipe-shaped valve housing 10 is sealingly arranged, for example, by screw means, a spherical valve being arranged in said valve housing. The said spherical valve opens on excess pressure in the bearing space and is spring-loaded, for example, to open at about 0.5 kg excess pressure. If the pressure in the fluid system of the pump is 8 kg, therefore, the said valve will open at a pressure in the bearing housing of 8.5 kg. This excess pressure in the bearing housing will arise during operation of the centrifugal pump unit due to the heat devel-

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oped thereby, the bearing housing being entirely sealed from the environment.

A plug is disposed on the top of the bearing housing for filling of oil.

The level of the oil 9 in the bearing housing is somewhat below the top or inlet of the valve means 10. Thus, when the means is in operation, gas from the bearing housing from the pressure therein will be forced out through the valve 10 and returned to the chamber 14 of the pump. Loss of expensive cooling fluid is thereby wholly eliminated, and an effective and lasting lubrication of the bearings 8 of the common shaft 6 of the pump-motor of the system is achieved. The gland-box 7 prevents oil from penetrating into the pump housing and thus being mixed with the cooling system's fluid.

The example illustrated serves merely to explain the present invention and forms no limitation of the scope afforded by the patent, since other embodiment examples of the invention may well be envisaged; thus, the gas outlet from the interior of the bearing housing, that is to say the oil chamber, may be led to other locations rather than being returned to the circulation pump.

I claim:

1. In a circulation system for refrigeration plants, the combination comprising: a closed housing having sealing partition means defining first and second chambers; pump means in said first chamber for pumping a cooling medium through said system; fluid-driven motor means mounted on said second chamber; rotatable shaft means extending through said chambers and op-

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eratively interconnecting said pump means and motor means; bearing means mounted in said sealing partition means so as to sealingly engage said shaft means and said partition means; a quantity of lubricating fluid in said second chamber adapted to lubricate said bearing means; fluid conduit means connected to the fluid outlet side of said motor means and extending into said second chamber so as to form loop means immersed in and conveying heated motor drive fluid through said lubricating fluid, said heated motor drive fluid in said loop means being adapted to elevate the temperature of said lubricating fluid so as to vaporize cooling medium contained in said lubricating fluid due to leakage of the latter past said sealing partition means from said first chamber into said second chamber.

2. A system as claimed in claim 1, comprising outlet means in said second chamber located above the level of said lubricating fluid; and pressure-actuated valve means being positioned in said outlet means facilitating egress of said vaporized cooling medium from said second chamber.

3. A system as claimed in claim 2, said outlet means communicating with said first chamber so as to return said vaporized fluid medium to the fluid medium being pumped through said system.

4. A system as claimed in claim 1, said motor means comprising a hydraulic motor.

5. A system as claimed in claim 1, said motor means comprising a pneumatic motor.

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