Aug. 10, 1965 K. ROELSGAARD 3,199,459

ROTARY PUMP

Filed April 1, 1963

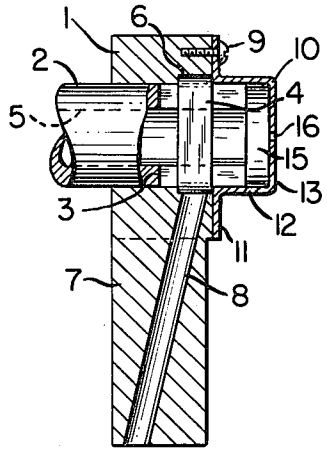

FIG. 1

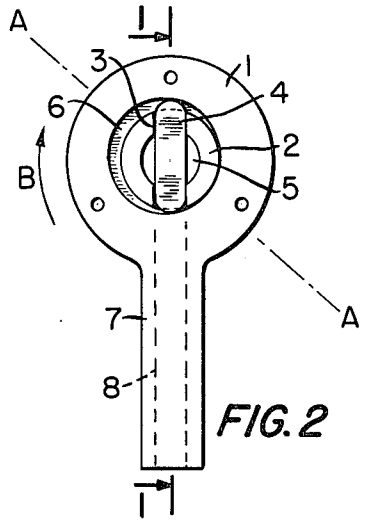

FIG. 2

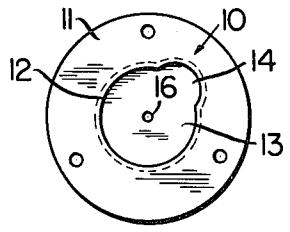

FIG. 3

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ROTARY PUMP

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6 Claims. (Cl. 103—137)

This invention relates to a rotary pump, and is more particularly concerned with a rotary pump of the type having at least one radial blade which is slidable in a slot within the pump casing and rotates inside an eccentric pump chamber, the rotor being formed with an axial bore.

Rotary pumps of the character indicated are known for many applications. They can be manufactured with comparatively small dimensions and can be used for purposes and in locations where other types of pumps tend to fail. In spite of their relatively simple construction, however, known pumps of this type unfortunately require a large number of time-consuming steps for their manufacture in order to provide within the pump body desired channels or passages.

It is accordingly an object of this invention to provide a rotary pump of a construction which can be manufactured more easily and without the large number of time-consuming steps which have characterized the manufacture of prior constructions.

In accordance with this invention, a rotary pump is provided which has a pump body, or casing, which receives the hollow rotor and defines the pump chamber and has an open face at one side, and a cover member which can readily be formed by molding or stamping and which includes a fastening flange portion and an adjoining portion which cooperates with the flange portion to close the open face of the casing and to provide the desired channels or passages. This last-named portion includes a cylindrical wall portion which fits axially over the free end of the rotor, a facing plate portion which extends transversely of the axis of the cylindrical wall portion and is spaced from the end of the rotor when the cover member is connected to the housing, the cylindrical wall portion being formed with an enlargement which is positioned to cooperate with the compression side of the pump chamber.

By reason of this construction, the casing needs only to be machined or drilled to provide the bearing for the rotor and the eccentric pump chamber, all other machining and cutting operations which are customary in the manufacture of this type of pump being eliminated because the cover member provides, in cooperation with the casing, all of the remaining structure to provide the desired channels or passages, and this cover member can be formed in one single pressing or stamping operation. The cover plate, having the form described above, will serve as a cover for the casing, will close the pump chamber, will act as an abutment for the impeller blade on the rotor, will form a reservoir into which the bore in the rotor will open and, most importantly, provides a deflection channel by means of the enlargement in the cylindrical wall portion.

Most advantageously, the circumferential width of the enlargement is greater than the circumferential width of the impeller blade. In this case, the enlargement will serve as a release channel for the back pressure which builds up ahead of the impeller blade inside the pump chamber, which has a crescent or sickle-shaped cross-section around the rotor.

It is also highly advantageous from the standpoint of good sealing between pump chamber and the reservoir

defined in the cover plate, if the diameters of the cylindrical wall portion and the rotor are substantially the same so that they interengage with a close slip fit, viz. the internal diameter of the cylindrical wall portion is substantially equal to the external diameter of the rotor. This construction also permits the slot in the rotor to have a greater axial dimension than the blade, so that the rotor, which can be constructed as an extension of the driving shaft of the pump, can be axially positioned in the casing independently of all other parts of the pump.

When a rotary pump in accordance with the invention is to be employed as a lubrication pump for a refrigeration machine, there is suitably provided a small opening in the center of the facing plate of the cover member. Since oil will enter the reservoir with a certain amount of rotational movement, gaseous refrigerant which it may contain will be separated and can escape through the opening.

Other objects and features of this invention will be readily apparent from the following detailed description of an illustrative embodiment thereof taken in combination with the accompanying drawing, wherein:

FIG. 1 is a vertical sectional view, partly in elevation, of a rotary pump embodying features of this invention, as seen along the line 1—1 of FIG. 2 but including the pump cover;

FIG. 2 is a front elevational view of the pump of FIG. 1, but with the cover removed; and

FIG. 3 is a front elevational view of the cover.

Referring to the drawing, and particularly to FIGS. 1 and 2, a casing 1 is formed with a bore in which is rotatably received a hollow shaft 2 which comprises the pump rotor. Shaft 2 is formed with a longitudinal slot 3 within which a radial impeller blade 4 is movable. The shaft 2 is also formed with a longitudinal bore 5 which opens at the free end of the shaft as seen at the right in FIG. 1. Within the casing there is formed an annular pump chamber 6 which is eccentric in relation to the rotor, so that the centers of both the rotor and of the pump chamber are located in line A—A, as seen in FIG. 2. An extension 7 on the casing contains a bore 8 which serves as a suction channel leading into the pump chamber 6. By means of three stud-bolts 9 the cover member 10 is fastened to the open face of the pump casing. The cover member 10 consists of a fastening flange 11 which serves to close the pump chamber 6 as seen in FIG. 1, a cylindrical wall 12 having the same diameter as the rotor and overlying the free end of the rotor, and a face plate 13 with an enlargement 14 being formed in the cylinder wall 12. This enlargement is positioned in such manner that when the rotor rotates in the direction B, the small portion of the pump chamber on the compression side will be uncovered in order that liquid propelled by the blade 4 will flow via the enlargement 14 into the reservoir 15 defined between the plate 13 and the open end of the rotor, where it can flow into the bore 5 in the rotor. The enlargement 14 is wider than the blade 4 and therefore, a shunt or leakage channel is provided at this end of the pump chamber between the liquid in front of the blade and the liquid behind the blade.

The axial length of the slot 3 is greater than the axial dimension of blade 4. As a result of the construction of the cover member 10, the rotor, which is an extension of the driving shaft, can be positioned axially independently of all other parts of the pump and without changing any tolerances important for the operation of the pump. The reservoir 15 can be enlarged or reduced in size although the relationships illustrated have been found to be particularly satisfactory. The vent or aperture 16 in the center of the plate 13 is provided in the event oil from a refrigeration machine is being pumped. Such oil contains gaseous refrigerant dissolved in it which

should be separated from the oil as much as possible before the oil warms up during the process of lubrication. Such degasification automatically takes place in the pump of this invention. The oil enters the reservoir 15 via the enlargement 14 with a certain amount of rotational movement. This rotational movement is maintained in the reservoir because the end face of the rotor 2 serves as a friction impelling surface. Within the bore 5, a similar rotational driving action takes place. Thus, the lighter refrigerant will tend to flow toward the center of the liquid mass and can escape through the vent 16.

There is thus provided a rotary pump construction which is fully effective and highly efficient yet can be manufactured easily and efficiently without requiring the numerous metal-working operations heretofore considered necessary in the manufacture of this type of pump.

It will be understood that various changes and modifications may be made in the embodiment described above and illustrated in the drawing without departing from the scope of the invention as defined in the appended claims.

It is intended, therefore, that all matter contained in the foregoing description and in the drawing shall be interpreted as illustrative only and not as limitative of the invention.

I claim:

1. A rotary pump comprising a casing having a cylindrical pump chamber formed in one face of the casing, a smaller cylindrical bore opening eccentrically into said pump chamber, and an inlet passage opening into a suction portion of said pump chamber, a hollow shaft rotatable in said bore and having an end portion projecting outwardly beyond said face of said casing, said shaft having an axially and diametrically extending slot in the portion of said shaft extending through said pump chamber, a single diametrically extending blade slidably received in said slot and having a length equal to the diameter of said pump chamber and a width in a direction axial of said bore equal to the axial dimension of said pump chamber, and a cup-shaped cover member for closing the open end of said pump chamber, said cover member being a single integral unit having a cylindrical portion snugly receiving said projecting end portion of said shaft and extending beyond the end of said shaft, an end portion closing the outer end of said cylindrical portion and spaced from the end of said shaft and a flange portion engaging and secured to a portion of said face of said casing surrounding said pump chamber, said cylindrical portion having a radial enlargement at a location in its circumference providing communication between the compression portion of said pump chamber and the space between the end portion of said cover member and the end of said shaft.

2. A rotary pump according to claim 1, in which said enlargement has a circumferential dimension greater than the thickness of said blade in a circumferential direction.

3. A rotary pump according to claim 1, in which the axial length of said slot in said shaft is greater than the width of said blade in an axial direction.

4. A rotary pump according to claim 1, in which a small central aperture is provided in said end portion of said cover member for venting gaseous components of fluid being pumped.

5. A rotary pump according to claim 1, in which said casing has an elongated extension extending generally radially of said shaft and in which said inlet passage comprises a single straight bore extending generally lengthwise of said extension and opening into said pump chamber.

6. A rotary pump comprising a casing having a bore extending therethrough and comprising a smaller cylindrical portion and an enlarged eccentric portion opening in one face of said casing and constituting a pump chamber, and an inlet passage opening into a suction portion of said pump chamber, a hollow shaft of uniform diameter rotatable in said cylindrical bore portion and having an end portion projecting outwardly beyond said face of the casing, said shaft having an axially and diametrically extending slot in the portion of said shaft extending through said pump chamber, a diametrically extending blade slidably received in said slot and having a length equal to the diameter of said pump chamber and a width in a direction axial of said shaft equal to the axial dimension of said pump chamber, said slot having a greater axial extent than said blade, and a cup-shaped cover member for closing the open end of said pump chamber, said cover member being a single integral unit having a cylindrical portion snugly receiving said projecting end portion of said shaft and extending beyond the end of said shaft, an end portion closing the outer end of said cylindrical portion and spaced from the end of said shaft and a flange portion engaging and secured to a portion of said face of said casing surrounding said pump chamber, said end portion having a small central aperture therein and said cylindrical portion having a radial enlargement at a location in its circumference providing communication between the compression portion of said pump chamber and the space between the end portion of said cover member and the end of said shaft, said enlargement having a circumferential extent slightly greater than the thickness of said blade in a circumferential direction.

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