United States Patent

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[72] Inventors Hans Ulrik Leffers;
Bendt Wegge Romer, Sonderborg, Denmark

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[73] Assignee Danfoss A/S
Nordborg, Denmark
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[54] **ENCASED MOTOR COMPRESSOR**
5 Claims, 5 Drawing Figs.

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[50] Field of Search 230/206, 207, 58, 139; 417/372; 184/6

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Primary Examiner—Robert M. Walker
Attorney—Wayne B. Easton

ABSTRACT: The invention relates to a lubricating system for a motor-compressor assembly of the type used for small refrigerating machines. The assembly has a vertical shaft arrangement with a centrifuging disc attached to the top of the shaft for flinging lubricating oil to the internal wall of the casing by centrifugal force. The shaft has a shoulder or flange which forms a part of an axial thrust bearing arrangement and the centrifuging disc has outwardly inclined wall means which extends from a level below to a level above the shoulder of the shaft.

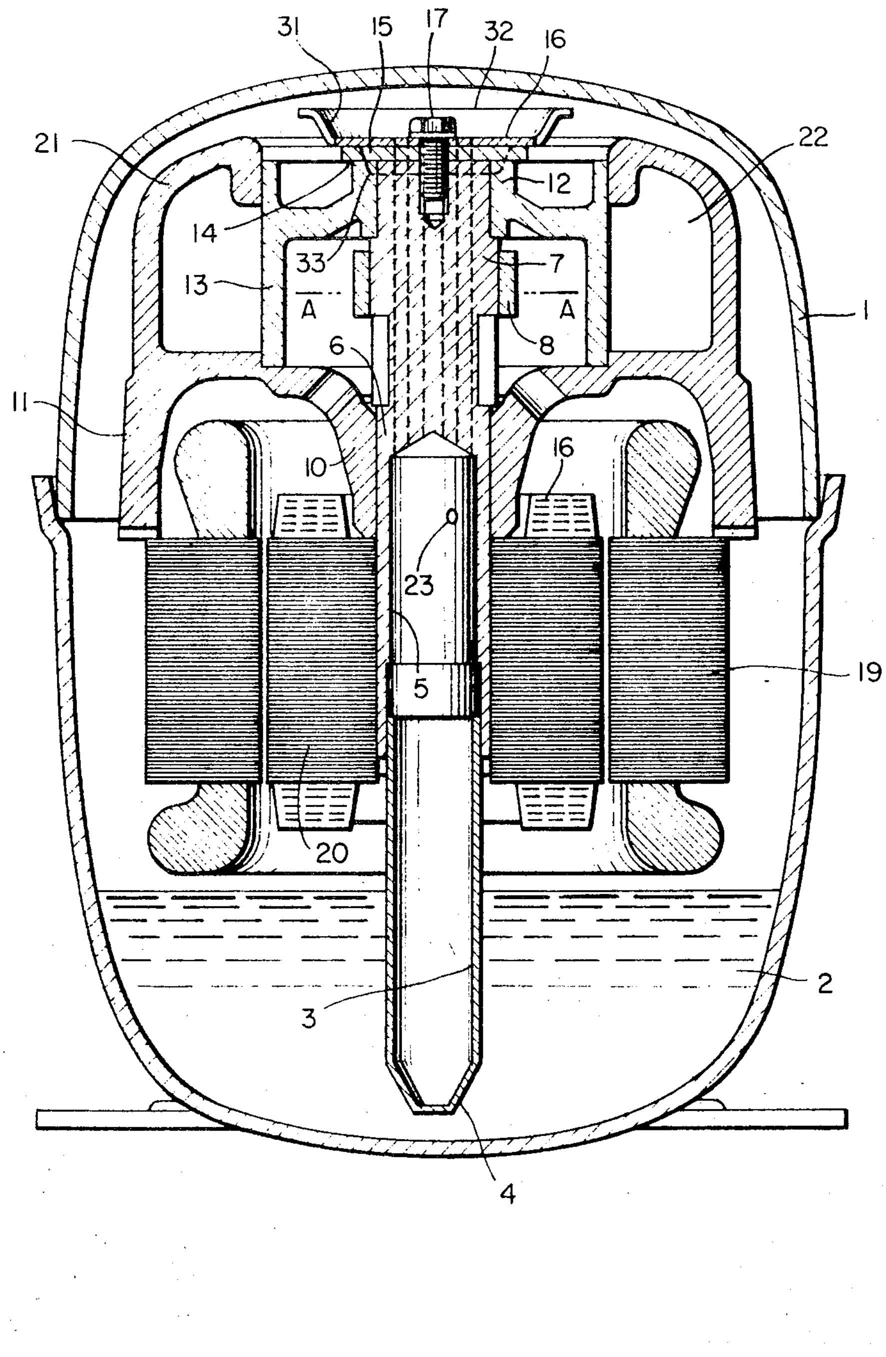


FIG 1

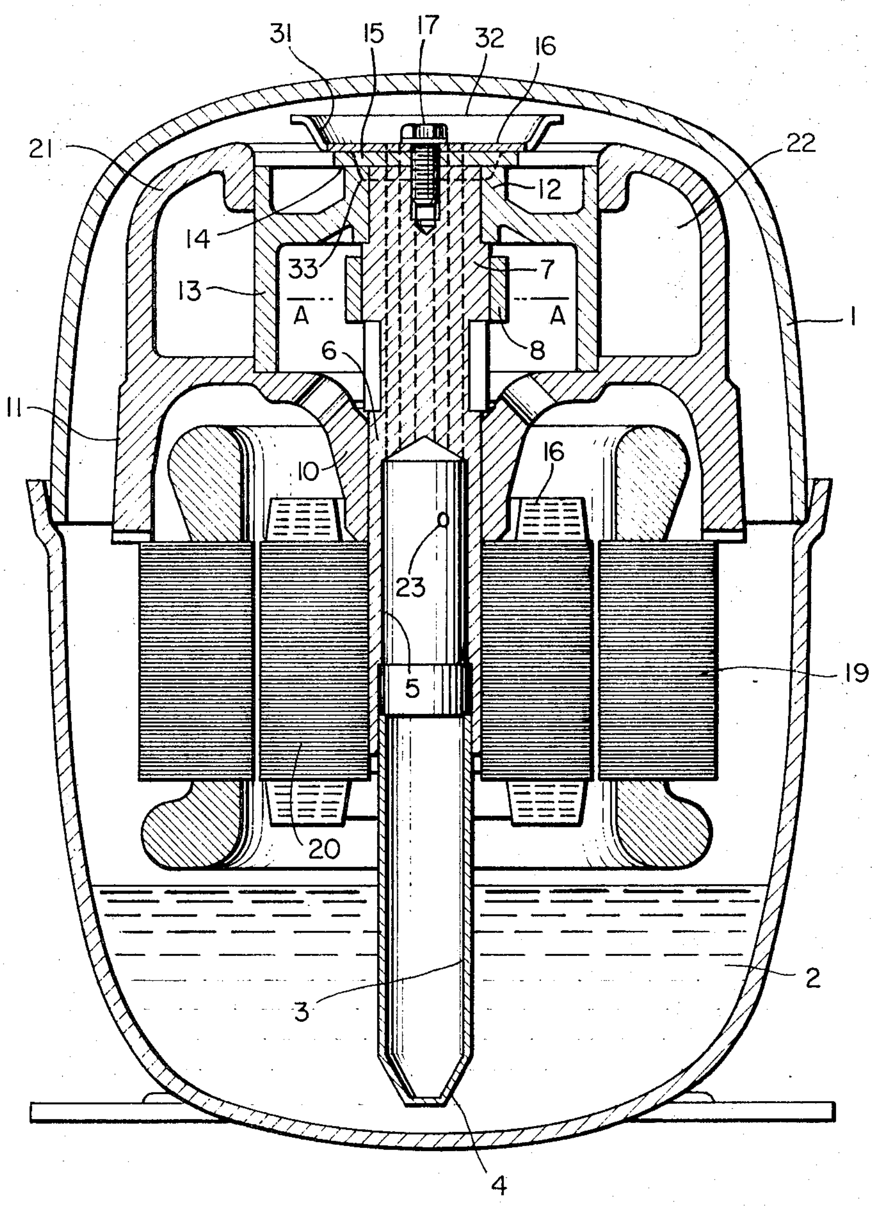


FIG 2

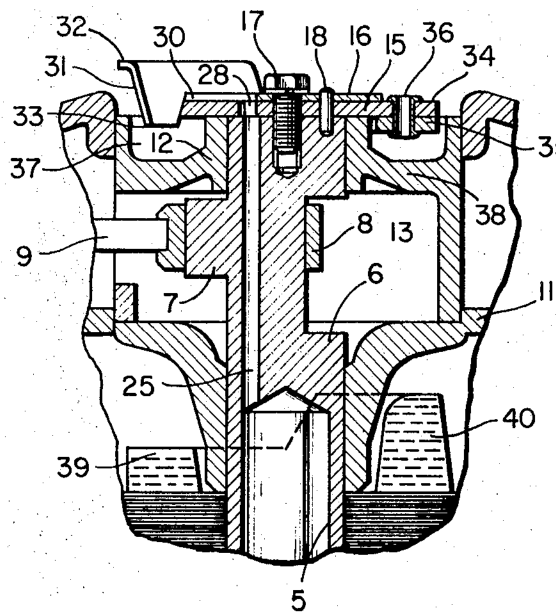


FIG 5

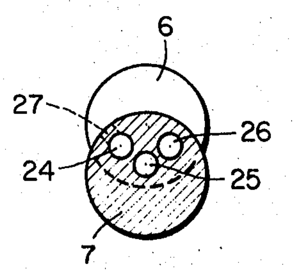


FIG 3

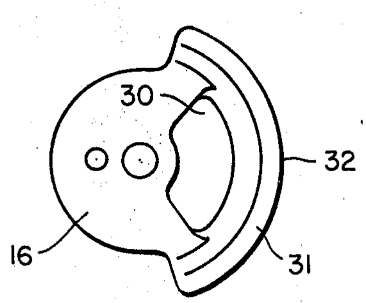
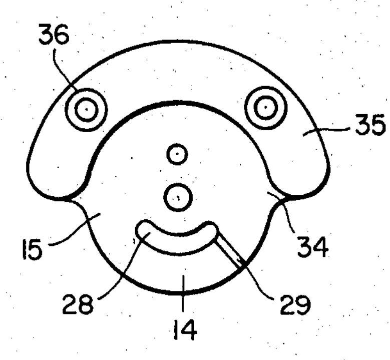


FIG 4



ENCASED MOTOR COMPRESSOR

The invention relates to an encased motor-compressor, particularly for small refrigerating machines and comprising a vertical shaft arrangement having an axial bearing and at least one oil-outlet orifice at the upper end-face, from which orifice the oil is flung on to the wall of the case by centrifugal force.

This oil runs along the wall of the case back into the sump and is cooled in so doing. In order to keep the temperature of the oil as low as possible, it is desirable to pass the greatest quantity of oil over the wall of the case. Only a limited quantity of oil is available for this purpose, however, i.e. the difference between the supply capacity of the oil pump and the quantity of oil required for lubricating purposes.

These conditions apply for example in the case of a known motor compressor having a vertical shaft arrangement and a cylinder positioned at the top, the axial bearing being located below the crank and an inclined bore extending through the crank in such manner that the mouth of the outlet is disposed outside the axis of rotation of the shaft.

It is also known to employ centrifuging discs in motor compressors for distributing the oil.

The object of the invention is to provide a motor compressor of the initially described kind and of simple construction, in which the quantity of oil cooled on the wall of the case can be increased.

According to the invention this is done by the shaft arrangement having a shoulder to form the axial bearing at its upper end and carrying a centrifuging disc with an upwardly inclined edge, which extends from a level below the shoulder to a level above the end-face.

In this arrangement, the axial bearing is upwardly extended to such an extent that the lubricating oil emerging therefrom can be caught by the downwardly extending edge of the centrifuging disc. Consequently, the centrifuging disc not only distributes the oil emerging from the orifice at the end-face, but also distributes, on the wall of the casing, the oil passed to the axial bearing for lubricating purposes. A more intensive cooling effect is consequently obtained.

It is not necessary for the edge of the centrifuging disc to extend over the entire circumference. If the oil-outlet orifices are only on one side of the end-face, it suffices if the edge of the centrifuging disc extends only over a portion of the circumference extending on this side.

In a further aspect of the invention, an oil-fed lubricating groove is provided in the shoulder and extends towards the edge extending over the circumferential portion. This lubricating groove imparts a preferential direction to the oil supplied to the axial bearing, so that, in the main, it impinges on the circumferential portion of the edge of the centrifuging disc that is present.

A particularly simple construction is obtained if the shoulder is formed by the underside of a disc which is secured to the end-face of the shaft and which contains an opening for the outlet of oil and a lubricating groove running therefrom on the underside.

In a preferred embodiment, that portion of the circumference not occupied by the edge of the centrifuging disc is occupied by a compensating weight connected to the shaft. This results in good utilization of space. Furthermore, the particular portion of the circumference opposite the crank can be unoccupied by the edge of the centrifuging disc if axially parallel oil passages extend through the shaft and the crank.

Additionally, the axial bearing can be arranged within a recess in the housing of the compressor and the upper rim of the edge of the centrifuging disc can project from the recess. Although a construction that is very short in axial direction can be obtained by this arrangement, the oil flung out from the axial bearing into the recess can be carried to the wall of the case with the help of the edge of the centrifuging disc.

An embodiment of the invention will now be described in greater detail by reference to the drawing, in which:

FIG. 1 shows a longitudinal section through the motor-compressor of the invention,

FIG. 2 is a central partial section through the upper end of the motor-compressor in a plane at right-angles to that of FIG. 1,

FIG. 3 is a view from below of the centrifuging disc employed,

FIG. 4 is a view from below of the axial bearing disc used, and

FIG. 5 is a section through the motor crankshaft, on the line A—A of FIG. 1.

The motor compressor is mounted, on springs (not illustrated), in a case **1**. In the lower part of the case is an oil sump **2**. An oil-supply pipe **3**, the lower end of which is formed as a hollow cone **4**, extends into this sump. The supply pipe **3** is pressed in the bore **5** of a motor shaft **6**, which drives a compressor piston (not illustrated) through a crank **7**, a crank bearing **8** and a connecting rod **9**. The shaft is held in a first radial bearing **10**, which is formed in the carrier member **11** for the motor, and in a second radial bearing **12**, which is formed in an insert **13** contained in the carrier member **11**. An axial bearing is formed by the underside **14** of a disc **15**, secured to the end-face of the shaft **6**, in conjunction with the upper end-face of the radial bearing bush **12**. Above this is located a centrifuging disc **16**. The two discs **15** and **16** are detachably secured to the shaft **6** by means of a screwbolt **17** and are held against rotation with the help of a pin **18**. The motor consists of a stator **19**, connected to the carrier member **11**, and a rotor **20**, connected to the shaft. The upwardly extending wall **21** of the carrier member **11**, together with the insert **13**, forms noise-reducing chambers **22**.

The oil delivered by the pipe **3** rises in the bore **5** of the shaft **6**; part of it is deflected through a bore **23** for lubricating the radial bearing **10**. The rest continues upwards through three axially parallel bores **24**, **25** and **26**, the position of which can be seen from FIG. **5**. Oil is deflected through a transverse bore **27** for lubricating the crank bearing **8**. The oil emerging from the three bores **24**, **25** and **26** passes into an opening **28** in the disc **15**. From there the oil can be distributed, through a radially extending groove **29**, over the surface of the axial bearing on the underside **14** of the disc. The remaining oil passes through a cutaway portion **30** in the edge of the centrifuging disc to reach the edge **31** thereof, and is thence flung on to the wall of the case by the rim **32**.

As FIG. **3** shows, the centrifuging disc **16** has, only over somewhat less than half of its periphery, an upwardly inclined edge **31**, this edge in fact being on the same side as that where the three bores **24**, **25** and **26** run out from the end-face of the shaft **6**. The lower rim **33** of the edge **31** is located below the underside **14** of the disc **15**. The rim **32** is above the end-face of the shaft arrangement, i.e. above the cutaway portion **30** in the centrifuging disc **16** and is also above the upper end-face of the carrier member **11**. Consequently the oil emerging in the zone of the axial bearing is also caught, although this point is located below the end-face of the carrier member, and the oil is passed to the wall of the casing.

On the side opposite the crank **7**, the disc **15** is provided with an additional part ring **34** to which is also fitted, by means of rivets **36**, a further ring portion **35**. For the sake of clarity, one of the rivets **36** is shown in section in FIG. **2**. In this way, there is created a compensating weight whereby the out-of-balance caused by the crank **7** can be compensated. Around the upper radial bearing bush **12** is an annular chamber **37**, in which is set back a part **38** of the end-face of the insert **13**. Not only can the one illustrated further ring portion **35** be accommodated in this annular chamber, but, if required, a second one. It will be clearly seen that these ring portions are positioned precisely opposite the centrifuging disc, so that the two parts cannot collide with each other.

For the purpose of achieving further weight-compensation, the upper short-circuiting ring **39** of the rotor **20** has an enlargement **40** over that half of its circumference on the side opposite the crank. In this way a compensating weight is provided above and below the crank **7**, so that the arrangement is subject to extremely little imbalance.

The disc **15** can be fitted after the motor compressor has been assembled. There is no difficulty in obtaining optimum balancing by introducing additional weights or by substituting another disc.

We claim:

1. A motor-compressor assembly comprising a casing, a carrier frame disposed internally of said casing, said frame defining a radial bearing and an upper axial bearing, a shaft rotatably journaled in said radial bearing and having flange means engaging said axial bearing, and a centrifuging disc attached to said flange means having outwardly inclined wall means extending above and below said flange means, said shaft having vertically extending oil passages with upper orifices opening on only one diametric side thereof, said centrifuging disc wall means being only on said diametric side of said shaft.

2. A motor-compressor assembly according to claim **1** wherein said flange means has an opening on said diametric side of said shaft in surrounding relation to said orifices, and a groove in the lower side of said flange means extending in a radially outwardly direction from said opening for lubricating said axial bearing.

3. A motor-compressor assembly according to claim **2** wherein said flange means is a separate disc member attached to said shaft.

4. A motor-compressor assembly according to claim **2** including counterweight means attached to said flange means on the diametric side thereof opposite said one diametric side.

5. A motor-compressor assembly according to claim **1** wherein said carrier frame defines an annularly shaped recess surrounding said axial bearing, said centrifuging disc wall means having a lower portion thereof within the confines of said recess.