Nov. 12, 1935. J. SOUTHERN 2,020,525

ROTARY PUMP, COMPRESSOR AND THE LIKE

Filed May 10, 1934

Fig. 1.

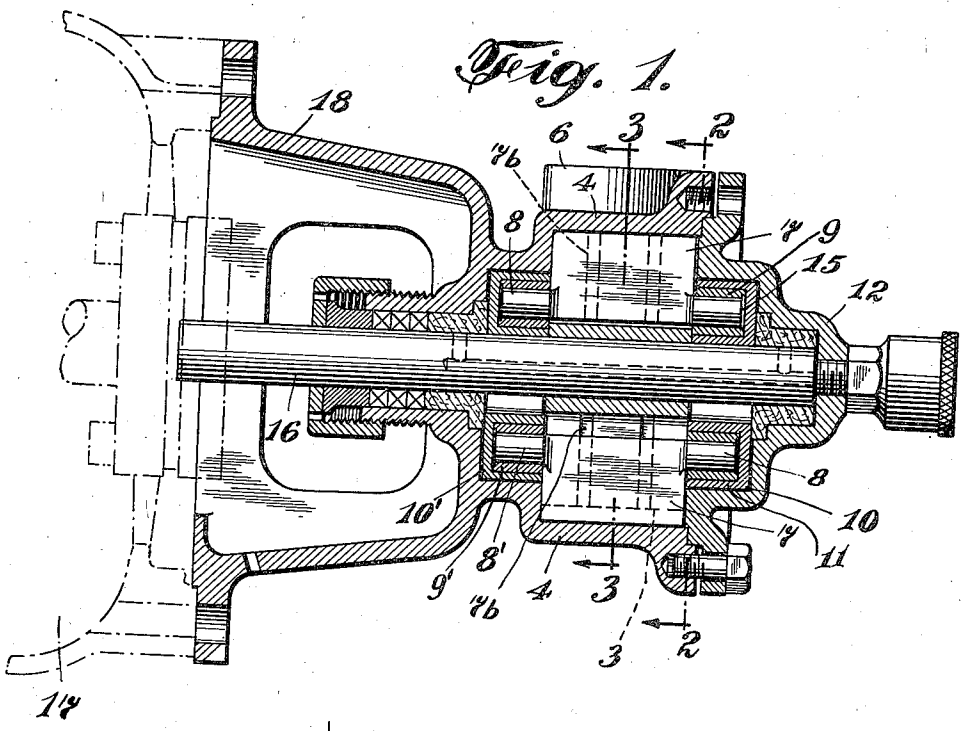


Fig. 2.

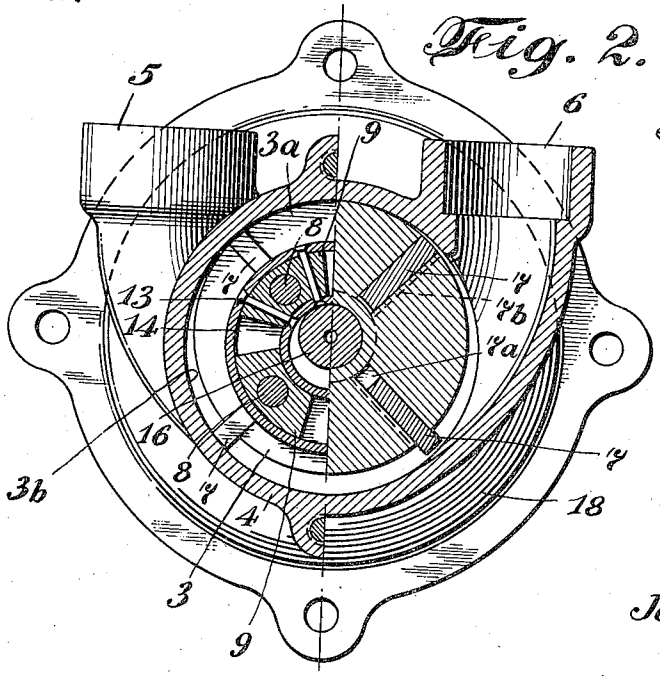
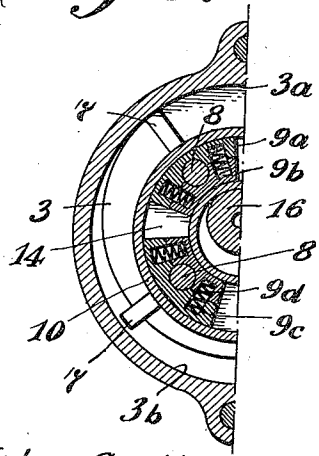


Fig. 3.



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ROTARY PUMP, COMPRESSOR, AND THE LIKE

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6 Claims. (Cl. 103—136)

This invention relates to rotary displacement pumps, compressors and the like, of the type comprising a rotary drum carrying sliding vanes, plates or pistons mounted eccentrically within a stationary casing, the vanes reciprocating within guides or slots in the drum as the latter revolves.

In such pumps, in order to reduce friction losses, the vanes have been guided so that they rotate with their tips just clear of the casing wall by the provision of floating rings rotatably located in annular grooves in the casing end walls and with which trunnions on the vanes are engaged.

An object of the present invention is to provide a pump of the type indicated having increased efficiency and in which in particular frictional losses are still further reduced.

According to the invention floating rings of channel shape in section are provided and driven by the drum or rotor of the pump through shoes associated with the vane trunnions either by positive connection of one vane shoe or by resiliently loaded friction means.

The sliding vanes may be provided with end trunnions seated within curved shoes or blocks which are mounted within the channel rings, the blocks associated with one of the vanes being fastened to the floating rings.

According to another form one or more (pairs) of the shoes or blocks are divided and the parts frictionally engaged with the sides of the channel rings by resilient means such as springs so that the blocks while being firmly engaged with the rings are free enough to accommodate themselves in working or to give or slide under overload or undue strain.

A further feature of the invention lies in the provision of a cavity or arcuate recess in the casing wall but coaxial with the drum or rotor to afford an extended sealing area between the suction and discharge sides of the pump.

It will be appreciated that the outer ends of the vanes tend to revolve on a circle the center of which is that of the floating rings but as the vanes are constrained by their radial mounting in the drum which is eccentric to the casing and floating rings, the vanes do not follow a truly circular path. With this condition in view the invention also consists in making the inner peripheral wall of the casing or pump chamber slightly elliptical in accordance with the displacement of the axes of the drum or rotor and the floating rings.

Another feature of the invention comprises the provision of vents or ducts leading from the compartments in the slots or guides in the rotor behind the vanes to the pump chamber to afford a free passage for entrapped fluid.

With these and other objects in view as may appear from the accompanying specification, the invention consists of various features of construction and combination of parts, which will be first described in connection with the accompanying drawing, showing rotary pumps, compressors and the like of the preferred form, and the features forming the invention will be specifically pointed out in the claims.

In the drawing:

Fig. 1 is a longitudinal section through a pump constructed in accordance with the invention.

Fig. 2 is an end view partly in section of the pump shown in Fig. 1, the left half being a section on the line 2—2 and the right half being a section on the line 3—3 of Fig. 1.

Fig. 3 is a fragmentary section similar to Fig. 2 illustrating a modified form of the pump.

In carrying the invention into effect according to one convenient mode by way of example, a rotary drum 3 is mounted eccentrically within a stationary casing or pump chamber 4 having inlet and discharge ports 5 and 6 respectively. The drum 3 is driven by a shaft 16 coupled to a motor 17 upon which the casing 4 may be carried by the housing 18. The drum is provided with a plurality of radially arranged sliding vanes 7 (four in the example illustrated) which are projected outwardly by centrifugal force as the drum rotates.

Each vane is provided with end trunnions 8 which seat within curved blocks 9. The blocks 9 have a sliding fit within an annular channel-shaped member or ring 10 (see Fig. 1) which is located within a circular recess 11 in the end wall 12 of the stationary pump casing, such recess being eccentric to the drum shaft. A slight clearance is provided between the outer surface of the ring 10 and the recess 11. The trunnions 8' on the ends of the vanes opposite to the trunnions 8 seat within the curved shoes or blocks 9' which in turn have a sliding fit in the ring 10'. The ring 10' is carried by the housing 18.

The rings 10 are adapted to rotate with the drum 3 for which purpose the end curved blocks 9 of one of the vanes are fastened to the rings as by rivets 13. It will be appreciated that only one vane may be connected to the rings owing to the eccentric mounting between the drum 3 and the rings which causes the blocks to approach and recede from one another in accommodating themselves as the drum rotates.

During the period when a pair of blocks 9 is

approaching one another the space therebetween (such as 14, Fig. 2) will decrease in volume and in order to prevent breakage in the event of a liquid being present in such space the curved blocks 9 are grooved, as at 15, Fig. 1, to provide communication between the spaces 14 between the blocks.

The inner peripheral wall of the casing forms an arcuate recess 3a the arc of which is struck from the axis of the rotor. This recess affords an extended area for sliding contact with the rotor so that an effective seal is provided between the suction and delivery sides of the pump, as contrasted with the usual line sealing contact.

For the reason already explained the inner peripheral wall of the casing is slightly elliptical, the portions in the region of the reference 3b being a slightly flatter curve than the rest of the wall.

In order to liberate any fluid entrapped in the pockets or compartments 7a behind the vanes, vent grooves or ducts such as 7b may be provided in the rotor against the face of the vanes.

During the operation of the pump, as the drum revolves the ring members 10 will be carried round by the trunnions 8 associated with the blocks 9 which are fixed to the rings. During the part of the revolution when the eccentricity increases the free blocks 9 will have a slightly backward movement relatively to the rings while during the part of the revolution when the eccentricity decreases, these blocks will have a slight forward movement relatively to the rings.

According to another mode of carrying part of the invention into effect as shown in the modified form of the pump illustrated in Fig. 3, one or more of the vane shoes or blocks 9 may be slip-frictionally coupled to the floating channel rings 10. In one form a shoe (or shoes) may be divided and the two parts 9a and 9b cavitated, see 9c in Fig. 3. In the cavities are seated helical springs 9d which constantly tend to separate the parts 9a and 9b and thrust the outer surfaces against the sides of the channel ring and afford a frictional engagement which is sufficient to cause the rings to be driven with the rotor but will allow the blocks to accommodate themselves circumferentially or give or slide under any undue strain. The trunnions of the vanes may be located between the divided parts 9a and 9b or they may be located entirely in one part or the other, the part independent of the trunnion operating simply as a thrust block under the resilient pressure of the springs.

The inner wall of the pump casing may be shaped to a working fit with the drum at the upper part.

In all other respects the pump shown in Fig. 3 is similar to that shown in Figs. 1 and 2.

The pump illustrated is suitable for delivering water or other liquid and operates effectively without priming.

The improvement according to the invention may also be applied with any necessary modification to rotary vane air compressors.

It will be understood that the invention is not to be limited to the specific construction or arrangement of parts shown, but that these may be modified widely within the invention as defined by the claims.

What is claimed is:

1. In a rotary pump, compressor or the like, a casing, a rotor in said casing, floating rings of channel shape in cross-section carried by said rotor, vanes slidably carried by said rotor, trunnions on said vanes, shoes in said rings and connected to said trunnions, said shoes being spaced one from the other and provided with grooves to permit communication between the spaces between the shoes.

2. In a rotary pump, compressor or the like, a casing, a rotor in said casing, floating rings of channel shape in cross section carried by said rotor, vanes slidably carried by said rotor, trunnions on said vanes, shoes in said rings and connected to said trunnions, means for urging said shoes into frictional driving engagement with said floating rings, said shoes being spaced one from the other and provided with grooves to permit communication between the spaces between the shoes.

3. In a rotary pump, compressor or the like, a casing, a rotor in said casing, floating rings of channel shape in cross-section carried by said rotor, vanes slidably carried by said rotor, trunnions on said vanes, shoes in said rings and connected to said trunnions, and resilient means carried by said shoes for urging the shoes into frictional driving engagement with said floating rings.

4. In a rotary pump, compressor or the like, a casing, a rotor in said casing, floating rings of channel shape in cross-section carried by said rotor, vanes slidably carried by said rotor, trunnions on said vanes, shoes in said rings and connected to said trunnions, and resilient means carried by said shoes for urging the shoes into frictional driving engagement with said floating rings, said vanes being provided with ducts to permit escape of fluid from behind the inner ends of the vanes.

5. In a rotary pump, compressor or the like, a casing, a rotor in said casing, floating rings of channel shape in cross-section carried by said rotor, vanes slidably carried by said rotor, trunnions on said vanes, shoes in said rings and connected to said trunnions, and resilient means carried by said shoes for urging the shoes into frictional driving engagement with said floating rings, said shoes being spaced one from the other and provided with grooves to permit communication between the spaces between the shoes.

6. In a rotary pump, compressor or the like, a casing, a rotor in said casing, floating rings of channel shape in cross-section carried by said rotor, vanes slidably carried by said rotor, trunnions on said vanes, shoes in said rings and connected to said trunnions, one of said shoes being riveted to said floating rings for driving the rings, said shoes being spaced one from the other, said shoes being provided with grooves to permit communication between the spaces between said shoes.

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