

Oct. 5, 1937.

F. BURGHAUSER

2,095,168

AXIAL PUMP

Filed March 18, 1936

Fig.1

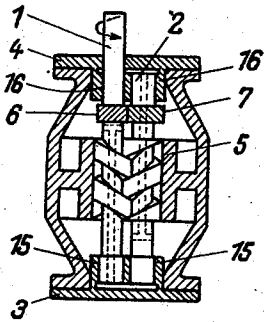


Fig.2

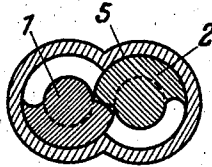


Fig.3

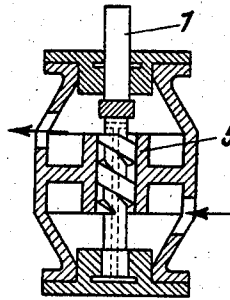


Fig.4

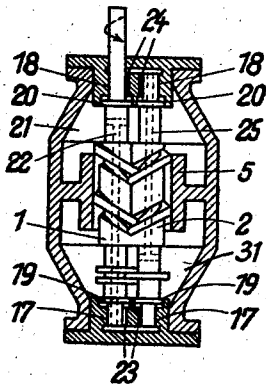


Fig.5

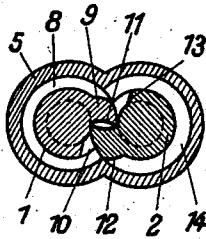
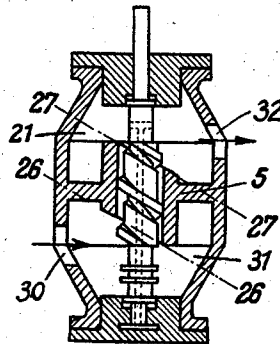


Fig.6



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UNITED STATES PATENT OFFICE

2,095,168

AXIAL PUMP

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Application March 18, 1936, Serial No. 69,552

In Germany March 14, 1935

3 Claims. (Cl. 103—128)

The axial or screw pumps known hitherto are not of highest efficiency due to the fact, that the friction losses are too great.

The object of the present invention is to reduce the friction losses in screw or axial pumps. To obtain this end, a novel screw profile is used which on the one hand warrants a perfect tightening and on the other hand allows the friction to be reduced as desired at the casing surrounding the screw spindles. Moreover, means are also provided to prevent further frictions.

In the accompanying drawing Figs. 1-3 show a screw or axial pump of known construction. Fig. 1 is a longitudinal section through the pump, Fig. 2 is a cross section, on an enlarged scale, through the screw profile and a portion of the casing surrounding the screw spindles, and Fig. 3 shows a longitudinal section through the pump in a plane at a right angle to that of Fig. 1. The main spindle 1 and the auxiliary spindle 2 are guided in the two bearing covers 3 and 4 and surrounded by the casing 5. The two spindles 1 and 2 are positively and rotatably connected together by the two gear wheels 6 and 7.

Figs. 4-6 of the drawing show a screw pump having reduced friction losses according to the invention. First of all the profile of the screw thread according to the known construction and shown in Fig. 2 is to be compared with that of the present invention and shown in Fig. 5, whereas according to the construction shown in Fig. 2 the portions of the peripheries of the spindles 1 and 2 which slide upon the casing 5 together correspond about to the periphery of one spindle. According to the present invention and as shown in Fig. 5 portions of the peripheries of the spindles are reduced in diameter as desired to permit but small portions of the peripheries of the spindles to slide upon the casing 5, whereby the surface friction between the spindles and the casing may be reduced as far as desired.

The novel screw profile according to Fig. 5 consists of a cylinder 8, carrying a thread comb 9 near which a thread notch 10 is provided. The width of the circumference of the thread comb 9 and of the thread notch 10 may be equal or different from each other, depending upon the desired distribution of the work upon the main and the auxiliary spindle.

Two turns of the thread of the spindles are sufficient for a complete tightening if the flank 11 of the thread is backed off. The flanks 12 and 13 of the thread may be of any shape and may be so formed also, that they may serve for transmitting power from the main spindle upon

the auxiliary spindle, for instance according to an evolvent. Also the diameter of the cylinder 8 of the main spindle may be different from that of the cylinder 14 of the auxiliary spindle, to obtain a ratio of gearing for the purpose of adapting the auxiliary spindle to a certain number of revolutions of the main spindle.

The spindles 1 and 2 may also be provided with a plurality of thread combs 9 and thread notches 10 and also a plurality of auxiliary spindles 2 may be arranged around the main spindle 1.

A further reduction of the surface friction is obtained according to the present invention by a particular construction of the bearings which serve to compensate for the axial thrust of the liquid upon the spindles.

To compensate for this axial thrust of the liquid on the front faces of the bearings 15, 15 and 16, 16 in the construction shown in Fig. 1, a certain diameter of the bearings was required hitherto and owing to the fact that these bearings simultaneously were designed to serve as supports, a certain length also was required which could not be neglected. Due to this fact, in most cases unsufficiently loaded bearings of great surface friction resulted.

According to the construction of the invention shown in Fig. 5, the diameter and the length of the bearings 17, 17 and 18, 18 are reduced to such an extent as to obtain normally loaded bearings, whereby the surface friction also is correspondingly reduced. For the purpose of axial compensation of the thrust of the liquid upon the spindles, each bearing 17, 17 and 18, 18 is provided with a correspondingly dimensioned thrust compensating piston 19, 19 and 20, 20 which together with the front faces of the bearing pivots compensate the axial thrust of liquid. The lower bearings 17, 17 and the compensating pistons 19, 19 are loaded by the liquid pressure prevailing in the pressure chamber 21 of the pump by way of the port 22 of the spindle 1 and by way of notches 23, 23 provided in the bearings 17, 17 respectively.

One face of each of the upper release pistons 20, 20 is subjected to the liquid pressure prevailing in the pressure chamber 21 and the other face is subjected to atmospheric pressure and, by way of the notches 24 in the bearings 18, 18 and the port 25 of the spindle 2, to the pressure of the suction chamber respectively. By providing separated bearings and compensating pistons on each spindle, a substantial reduction of the bearing friction is obtained, because with a reduc-

tion of the diameters of the bearings, the friction is reduced by the square of the diameters.

A further reduction of the surface friction between the outer peripheries of the spindles and the casing is, according to the present invention, obtained by the fact, that portions of the casing, directly surrounding the spindles and not required for tightening purposes, are cut away, so that, as shown in Fig. 6, the casing is cut away along helical lines 26, 26 and 27, 27 at the ends at which the spindles enter and leave the casing respectively. For the sake of simplicity the casing may also be cut away along planes 26, 26 and 27, 27.

In operation, fluid is drawn into the pump through the port 30, is received in the suction chamber 31, is drawn into the pockets formed by the interengaging thread combs 9 and forced by the rotation of the spindles upwardly into the pressure chamber 21 from which it is discharged through the outlet port 32.

Not only is dead surface friction prevented hereby, but also the flow of the liquid into the screw spindles is substantially facilitated.

What I claim is:—

1. An axial or screw pump, comprising a casing, bearings mounted in said casing, interengaging screw spindles of cylindrical cross section journaled in said bearings, a thread comb provided on the cylindrical portion of said spindles near which a thread notch is cut into said portion, a compensating piston mounted adjacent each bearing of each of said spindles, a casing

portion surrounding said spindles, means for supplying compensating fluid pressure to said pistons, and said pistons together with said bearings compensating for the thrust of the liquid upon said spindles.

2. An axial or screw pump, comprising a casing, bearings mounted in said casing, interengaging screw spindles of cylindrical cross section journaled in said bearings, at least one thread comb provided upon each of the cylindrical portions of said spindles near each of which a thread notch is cut into said portions, a compensating piston mounted adjacent each bearing of each of said spindles, means for supplying compensating fluid pressure to said pistons, a casing portion surrounding said spindles, and said pistons together with said bearings compensating for the thrust of the liquid upon said spindles.

3. An axial or screw pump comprising a casing, at least two interengaging screw spindles rotatably mounted therein, bearings formed in each end of said casing and providing mounts for said spindles, individual and intercommunicating pressure chambers for each end of each spindle formed in the ends of said casing adjacent said bearings, said spindles being formed to provide means for supplying fluid pressure to said chambers, and compensating pistons formed on said spindles adjacent both ends thereof and working in said pressure chambers to provide a pressure balance for said spindles.

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