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C. O. J. MONTELIUS

ROTARY PUMP, MOTOR, METER, OR THE LIKE

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Fig. 1

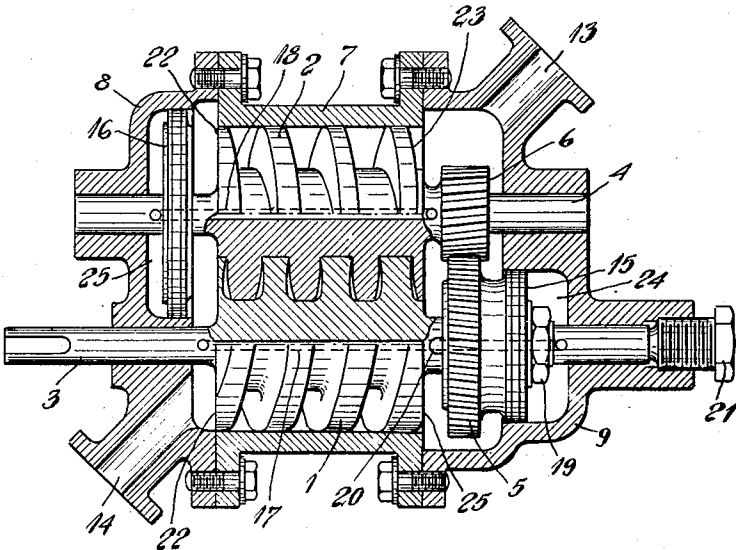
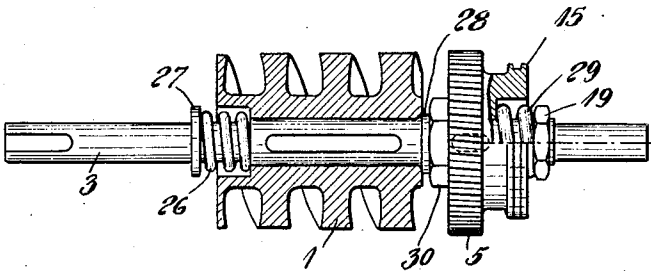


Fig. 2



C. O. J. Montelius
inventor

By: Marks & Clerk
Attys

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CARL OSCAR JOSEF MONTELIUS, OF STOCKHOLM, SWEDEN.

ROTARY PUMP, MOTOR, METER, OR THE LIKE.

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This invention relates to rotary pumps, motors, meters or the like, comprising intermeshing screws rotatably mounted in a housing tightly enclosing said screws, a fluid, such as for instance water, oil or gas, being supplied at the one end of the screws and passing, when rotating the screws, through the grooves of the screws to the opposite end thereof.

In order to prevent leakage it is of importance that the screws bear tightly against each other and also against the surrounding housing. At the same time it is of importance to reduce the friction between the cooperating screws and also between the screws and the housing to a minimum and, consequently, a certain small play must always exist between the cooperating surfaces of the relatively movable members.

When operating under high pressures and also at a low number of revolutions it is desirable, in order to obtain a high efficiency, to make the said play very small, whereas when operating under low pressures said also at a high number of revolutions said play ought to be somewhat greater, so as to further reduce the friction. Further, attention is to be had to the wearing off of the cooperating surfaces causing an increase of the play.

As a consequence, the said play ought to be adjustable, so as to suit to different running conditions and also to compensate for wear.

The present invention has for its object to render such adjustment or varying of the play possible.

With this object in view the invention consists essentially in this that the cooperating screws and the surrounding housing are so shaped that the play between said screws or between the screws and the housing or both can be adjusted by means of displacing one or more of the screws axially.

In the annexed drawing two forms of embodiment of the invention are shown. Fig. 1 is an axial section of a screw pump according to the one form of embodiment, showing also a partial axial section of the intermeshing screws. Fig. 2 is a detail view of one of the cooperating screws according to the second form of embodiment.

Referring to Fig. 1, 1 designates a left-hand thread and simultaneously double-thread screw mounted on a shaft 3 and meshing with a right-hand thread and single-

thread screw 2 mounted on a second shaft 4. Mounted on the two shafts are further spur wheels 5 and 6 meshing with one another and having a gear ratio 1:2. The two screws 1 and 2 are enclosed by a housing 7 having end plates 8 and 9, in which the shafts 3 and 4 are journaled. The one end of the shaft 3 projects through the end plate 8 and is adapted to be connected to a suitable driving appliance. The inside peripheral surfaces of the housing bear tightly against the outer surfaces of the screws and simultaneously the threads of the screws bear tightly against each other. Also the end plates 8 and 9 bear tightly against the housing 7, offering a free entrance for the fluid to the ends of the screws. The fluid is supplied through an inlet 13 in the end plate 9 and is discharged through an outlet 14 in the end plate 8 after having passed through the open parts of the screw grooves, when turning the screws.

If a certain difference of pressure exists at the opposite ends of the screws, a pressure should arise on the screws in the axial direction. In order to compensate for such axial pressure there are mounted on the shafts 3 and 4 compensating pistons 15 and 16 having such dimensions as to balance the pressure. The said pistons 15 and 16 fit into two chambers 24 and 25 made in the end plates 9 and 8, said chambers being in communication with the fluid at the opposite end of the screws through central channels 17 and 18 bored in the shafts 3 and 4.

Particularly at high pressures and low numbers of revolutions it is necessary that the screws fit exactly against each other and also against the housing, while maintaining a very small play permitting the screws to work with the smallest possible friction.

In order to render it possible to exactly adjust the said play and also to correct the same with respect to wearing, the circumferential surface of the screws is not exactly cylindrical as usual, but the said surface is according to the invention slightly conical, the outer diameter being slightly greater at the end 23 of the screws than at the opposite end 22, and the interior surface of the housing 7 corresponds exactly to the taper of the screws. By means of an adjusting screw 21, screwed into the end plate 9 and locking the end of the shaft 3, the said shaft may be displaced axially, whereby

the other shaft 4 and the screws 1 and 2 secured to the shafts will be moved correspondingly. By such means the play between the outer surface of the screws and the interior surface of the housing 7 will obviously be adjusted as desired.

The play between the screw threads, on the other hand, is adjusted by means of an adjusting nut 19 screwed on the shaft 3 and securing the piston 15 and the gear wheel 5 rigidly connected to said piston. The said gear wheel 5 is capable of sliding along a key 20 secured in the shaft 3. The gear wheels 5 and 6 are skew-cut, and consequently, an axial displacement of the one wheel 5, while the other wheel 6 is rigidly secured to its shaft 4 and cannot be displaced thereon, causes a relative turning of the meshing position of the gear wheels. Thus also the screws will be turned relatively to each other, which may be performed by this that the screw 2 is freely movable in the axial direction and may adjust itself in a suitable position.

The threads of the screw 1 are cut in such way that their thickness increases gradually from the end 22 towards the end 23 and, on the other hand, the thickness of the threads of the screw 2 decreases gradually in the same direction. Thus, a relative turning and a corresponding relative axial displacement of the screws cause a change of the play between the screws, and it is, consequently, possible to adjust the said play by means of the adjusting screw 19.

The higher the pressure is, the less ought the play to be. On the other hand, the fluid friction is decreased through a greater play, and, consequently, when using low pressures, the play ought to be relatively great. Thus, the best efficiency will be gained when using varying plays. A device for automatically varying the play is shown in Fig. 2.

The said figure shows the shaft 3 with the screw 1, the gear wheel 5, the piston 15 and the adjusting nut 19. In this case, however, the screw 1 as well as the piston 15 with the gear wheel 5 is displaceably mounted on the shaft 3. The screw 1 is pressed against a collar 28 by means of a spring 26 bearing against another collar 27 on the shaft 3. Similarly, the piston 15 with the gear wheel 5 is pressed against an abutting nut 30 by means of a spring 29 bearing against the adjusting nut 19.

When the pressure at the right-hand side of the screw 1 obtains a certain value it will overcome the pressure of the spring 26, and the screw 1, as also the screw 2 with its shaft 4 and the gear wheel 6, Fig. 1, will be displaced towards the left, whereby the play between the screws and the housing is decreased. Simultaneously the gear wheel 6 is displaced relatively to the gear wheel 5,

and due to the skew teeth of the said wheels a relative turning movement of the screws 1 and 2 takes place thus decreasing the play between the intermeshing screw threads. In the same manner the piston 15 is, due to the overpressure, pressed towards the right against the action of the spring 29, by which the gear wheels 5 and 6 are moved further relatively to each other, thus causing a further turning of the screws relatively to each other and a further decreasing of the play. By suitably choosing the tension of the springs the conicality of the outer surfaces of the screws and the gradually decreasing thickness of the screw threads the play between the screws relatively to each other and also between the screws and the housing may be caused to vary in a suitable degree.

In certain cases the screws may, if desired, be made cylindrical, fitting into the housing with a certain predetermined play, which cannot be adjusted, whereas the screw threads only may be shaped as mentioned permitting of an adjustment of the play, as described.

What I claim is:—

1. A rotary pump, motor, meter or the like, comprising a housing and at least two intermeshing screws rotatably mounted in said housing, the latter fitting tightly to the tops of the screw threads, the threads of the intermeshing screws being cut in such a way that the thickness of the threads of the one screw increases gradually from one end of the screw towards the opposite end, whereas the thickness of the threads of the cooperating screw decreases in the same direction, adjusting means being provided for axially displacing and simultaneously turning the one screw relatively to the other screw.

2. A rotary pump, motor, meter or the like, comprising a housing and at least two intermeshing screws rotatably mounted in said housing, the latter fitting tightly to the tops of the screw threads, the threads of the intermeshing screws being cut in such a way that the thickness of the threads of the one screw increases gradually from one end of the screw towards the opposite end, whereas the thickness of the threads of the cooperating screw decreases in the same direction, adjusting means being provided for axially displacing and simultaneously turning the one screw relatively to the other screw, said screws being connected to each other by means of toothed wheels capable of being adjusted relatively to each other.

3. A rotary pump, motor, meter or the like, comprising a housing and at least two intermeshing screws rotatably mounted in said housing, the latter fitting tightly to the tops of the screw threads, the circumferential surface of the screws being slightly conical and the inside surface of the hous-

ing having a corresponding shape, adjusting means being provided for axially displacing the screws.

5 4. A rotary pump, motor, meter or the like, comprising a housing and at least two intermeshing screws rotatably mounted in said housing, the latter fitting tightly to the tops of the screw threads, the threads of the intermeshing screws being cut in such a
10 way that the thickness of the threads of the one screw increases gradually from one end of the screw towards the opposite end, whereas the thickness of the threads of the cooperating screw decreases in the same di-
15 rection, and means for automatically adjusting the screws relatively to each other.

5. A rotary pump, motor, meter or the like, comprising a housing and at least two intermeshing screws rotatably mounted in
20 said housing, the latter fitting tightly to the tops of the screw threads, the circumferential surface of the screws being slightly conical and the inside surface of the hous-

ing having a corresponding shape, and means for automatically adjusting the screws
25 relatively to each other and to the housing.

6. A rotary pump, motor, meter or the like, including a housing and at least two intermeshing screws rotatably mounted in
30 said housing, the latter fitting tightly to the tops of the screw threads, the thickness of the threads of one screw of the intermeshing screws increasing gradually from one end of the screw towards the opposite end, and
35 the thickness of the threads of the cooperating screw decreasing in the same direction, the circumferential surface of the screws being slightly conical and the inside surface of the housing having a corresponding
40 shape, and adjusting means for axially displacing the screws and simultaneously turning one screw relatively to the other.

In testimony whereof I affix my signature.

CARL OSCAR JOSEF MONTELIUS.