March 25, 1952 C. O. T. MONTELIUS 2,590,560

SCREW PUMP

Filed Sept. 25, 1948

Fig. 2.

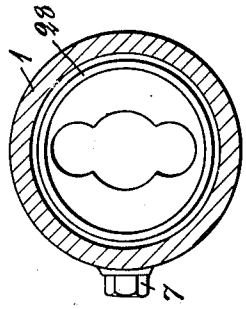


Fig. 4.

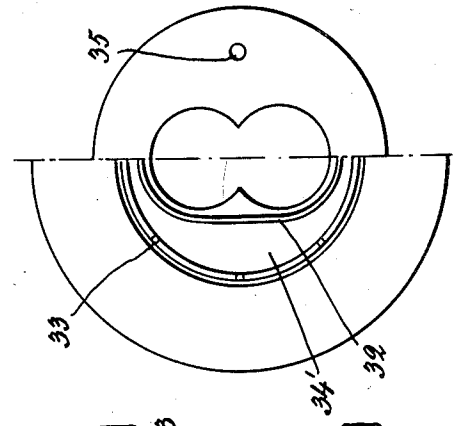


Fig. 1.

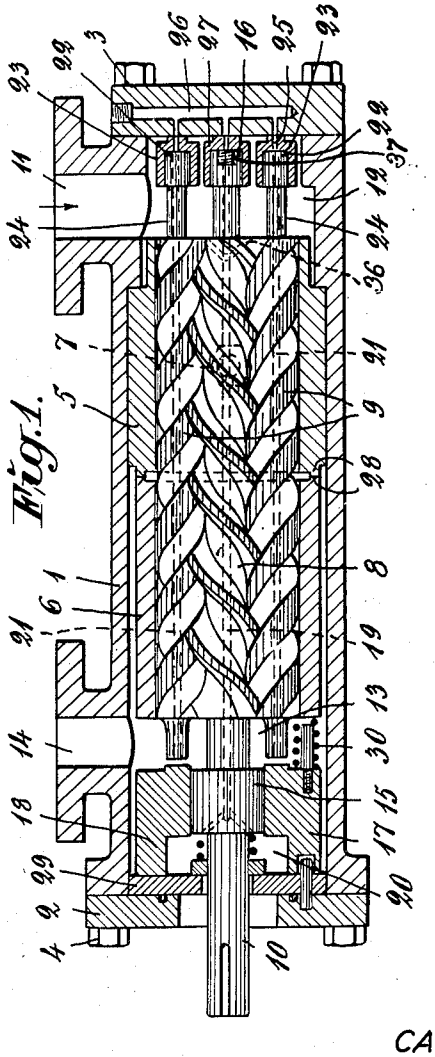
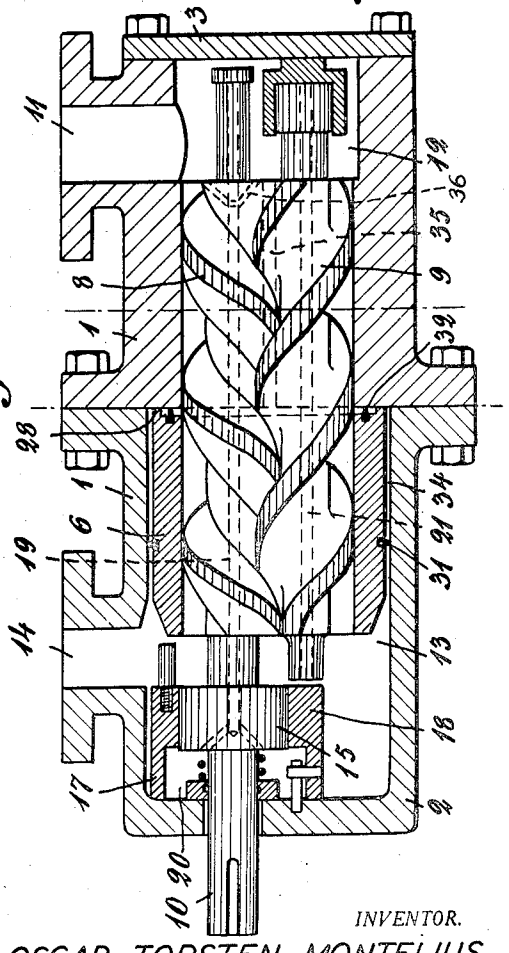


Fig. 3.



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Patented Mar. 25, 1952 2,590,560

UNITED STATES PATENT OFFICE

2,590,560

SCREW PUMP

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Application September 25, 1948, Serial No. 51,135
In Sweden May 10, 1948

5 Claims. (Cl. 103—128)

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The present invention relates to screw-pumps and motors comprising two or more intermeshing screw-rotors enclosed in a closely fitting sleeve having intersecting bores. In order to obtain high pump pressure it is important to maintain a tight fit between the threads of the screws as well as between the screws and the bores in the sleeve, the screws rotating in the bores in the same manner as shafts in bearings.

The necessity of using long screws and bores makes it difficult to obtain an exactly uniform bearing for the screws in the bores of the sleeve, as these cannot be bored or turned to an exactly uniform diameter throughout, without special precautions. But even if the bores should have an exact shape, they might be slightly deformed through the mounting of the sleeve in its casing, or by the stresses from the pipes attached to the casing.

In order to avoid these disadvantages the present invention suggests that the sleeve is made in two or more parts independent of each other, which are freely adjustable in relation to one another but act as a single unit by the working pressure of the pump. The different parts are allowed to adjust themselves on the screw-rotors, whereby the disadvantages caused by using one long, single sleeve are eliminated.

Preferably the part of the sleeve adjacent to the low-pressure side of the pump is rigidly connected to or integral with the pump casing, the other part or parts of the sleeve at the high-pressure side of the pump adjusting themselves to the screws. A clearance between said part or parts and the pump casing is desirable in order to allow a proper alignment. When the pump is started, these movable parts of the sleeve are pressed against the fixed part of the sleeve by the liquid pressure acting on the end surfaces.

In order better to hold and locate the parts of the sleeve by the pump pressure, the engaging end surfaces should be shaped to contact each other near their largest diameters only.

In order to obtain the greatest possible thrust force between the movable and fixed parts of the sleeve, and between the different movable parts if a plurality of such parts are used, not only the engaging surfaces should be located near the periphery of the end surfaces as mentioned above but also the counter-pressure on the main part of the end surfaces of the sleeve facing each other should be eliminated by a drainage passage and a suitable seal.

The general objects of the present invention relate to the attainment of the advantages just described. These and other objects relating particularly to details of construction and operation

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will become apparent from the following description read in conjunction with the accompanying drawing, in which:

Fig. 1 shows a longitudinal section of a pump operating with three screws, while Fig. 2 is a cross section of the same.

Figs. 3 and 4 illustrate corresponding sections of a double-screw pump.

In both embodiments the screws are provided with balancing pistons operating in self-adjusting sleeves.

In the embodiment illustrated by Figs. 1 and 2 the pump casing is at each end provided with covers 2 and 3 attached to the pump casing by screws 4. In a central and preferably cylindrical bore in the casing 1 is inserted a sleeve consisting of two parts 5 and 6. The part 5 is accurately fitted to the casing and kept in place by a locking bolt 7, while the part 6 is mounted with clearance. Each of the parts 5 and 6 is provided with three parallel, cylindrical and intersecting bores. A screw-rotor is mounted in each of these bores, the central rotor 8 having left-hand threads and the side rotors 9 having right-hand threads.

The central rotor 8 is provided with a driving shaft 10 projecting with clearance through the cover 2. Liquid entering through an inlet 11 to a chamber 12 is trapped between the threads of the screws and forced into a pressure chamber 13 arranged at the opposite end of the casing 1 whence it is discharged through the outlet 14.

In order to balance the axial thrust acting on the screw 8 caused by the difference of pressure of the liquid in the chambers 13 and 12 the screw 8 at one end has a piston 15 and at the other end a smaller piston 16. The piston 15 runs with a small clearance in a bore in the sleeve 17, which by the working pressure is held with the annular part 18 pressed against the cover 2. The central screw-rotor is provided with an axial passage 19, through which the low pressure end of the screw-rotor communicates with the chamber 12 through branch passages 36, thus connecting the chamber 20 enclosed between the sleeve 17 and the cover 2 with the chamber 12. At the right hand end the draining passage 19 is closed by means of a screw plug 37 inserted from the end of the piston 16. The side screws 9 are also provided with axial passages 21 extending through the shaft ends 24 to the end surfaces of the pistons 22 running in cylindrical sleeves 23. Bores 25 in these sleeves 23 face corresponding bores in the cover 3 and communicate with a passage 26 in the cover 3. The piston 16 runs in another cylindrical sleeve 27, the inside of which is connected with the passage 26 in the same way.

By means of this arrangement not only are the side screws 9 balanced by their postons 22, but the central screw-rotor 8 is also balanced by means of its piston 16, the piston 16 being subjected to the delivery pressure of the pump through bores 21 and 25 and passage 26.

When the pump is not working and there is no pressure in the pump, the screws 8 and 9 are carried only by the relatively short part 5 of the sleeve, this being the sole part which is rigidly fitted to the casing, all the other parts being carried by the screws.

When the pump is started the pressure in the chamber 13 will exceed that in the chamber 12 as well as that in the space between the parts of the sleeve.

As a result the free part 6 of the sleeve is pressed against the fixed part 5. In order to obtain a safe grip between the parts 5 and 6 their end surfaces facing each other are provided with annular extensions 28. Further the pressure of the liquid in the chamber 13 forces the sleeve 17 against the inside cover 29, which is supported by the cover 2 and at the same time the cylindrical sleeves 23 and 27 are pressed against the cover 3. A spring 30 is placed between the sleeves 6 and 17 in order to ensure contact between the parts 5 and 6 as well as between the sleeve 17 and the inside cover 29 from the start of the pump.

In the embodiment according to Figs. 3 and 4 only two screws are used and the casing 1 itself is divided. The right part of the casing 1 in Fig. 3 is integral with the sleeve, the bores for the screws being executed in the casing itself. The left part encloses a separate sleeve 6 fitted as previously shown in Fig. 1. An elastic O-ring 31 prevents entry of pressure between the sleeve 6 and the casing 1. Another O-ring 32 is placed in a groove in the end surface of the sleeve 6 just outside the bores for the screws 8, 9. A bore 35 ending in the chamber 12 drains the space between the O-rings 31 and 32. The fluid pressure on the sleeve 6 is carried by the annular extension 28 along its circumference. To drain the space outside the sleeve a number of grooves 33 across the annular extension 28 are provided.

The invention may be varied within a wide scope and the tightening devices 31, 32 with the draining passage 35 may if desired also be utilized in the embodiment illustrated in Figs. 1–2.

The balancing pistons of the screws shown in the figures are not essential for the present invention, but they are of some consequence for the avoiding of any misalignment of the parts.

To those skilled in the art it is evident that the details of the invention are not limited by the combinations described.

What is claimed as new and desired to be secured by Letters Patent is:

1. A rotary pump having a housing with an inlet and an outlet, a plurality of intermeshing, parallel, rotary screws, and a sleeve with intersecting, parallel bores, closely fitting the outside perimeters of said screws, the sleeve being divided perpendicularly to the axes of the bores into parts freely movable in relation to each other, one of the parts of the sleeve being fixed in the housing, and the other part being exposed at its outer end to said outlet and in clearance relationship to the housing for freedom to properly align itself with the first mentioned part when it is urged towards the first mentioned part by the working pressure of the pump.

2. A rotary pump having a housing with an inlet and an outlet, a plurality of intermeshing, parallel, rotary screws, and a sleeve with intersecting, parallel bores, closely fitting the outside perimeters of said screws, the sleeve being divided perpendicularly to the axes of the bores into parts freely movable in relation to each other, one of the parts of the sleeve being fixed in the housing, and the other part being exposed at its outer end to said outlet and in clearance relationship to the housing for freedom to properly align itself with the first mentioned part when it is urged towards the first mentioned part by the working pressure of the pump, the adjacent ends of said parts having annular fitting surfaces.

3. A rotary pump having a housing with an inlet and an outlet, a plurality of intermeshing, parallel, rotary screws, and a sleeve with intersecting, parallel bores, closely fitting the outside perimeters of said screws, the sleeve being divided perpendicularly to the axes of the bores into parts freely movable in relation to each other, one of the parts of the sleeve being fixed in the housing, and the other part being exposed at its outer end to said outlet and in clearance relationship to the housing for freedom to properly align itself with the first mentioned part when it is urged towards the first mentioned part by the working pressure of the pump, the first mentioned part being integral with the housing.

4. A rotary pump having a housing with an inlet and an outlet, a plurality of intermeshing, parallel, rotary screws, and a sleeve with intersecting, parallel bores, closely fitting the outside perimeters of said screws, the sleeve being divided perpendicularly to the axes of the bores into parts freely movable in relation to each other, one of the parts of the sleeve being fixed in the housing, and the other part being exposed at its outer end to said outlet and in clearance relationship to the housing for freedom to properly align itself with the first mentioned part when it is urged towards the first mentioned part by the working pressure of the pump, the adjacent ends of said parts having annular fitting surfaces, the first mentioned part being integral with the housing.

5. A rotary pump having a housing with an inlet and an outlet, a plurality of intermeshing, parallel, rotary screws, and a sleeve with intersecting, parallel bores, closely fitting the outside perimeters of said screws, the sleeve being divided perpendicularly to the axes of the bores into parts freely movable in relation to each other, one of the parts of the sleeve being fixed in the housing, and the other part being exposed at its outer end to said outlet and in clearance relationship to the housing for freedom to properly align itself with the first mentioned part when it is urged towards the first mentioned part by the working pressure of the pump, and a resilient ring surrounding the second mentioned part and engaging the housing.

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