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HELICAL GEAR PUMP WITH STATOR COMPRESSION

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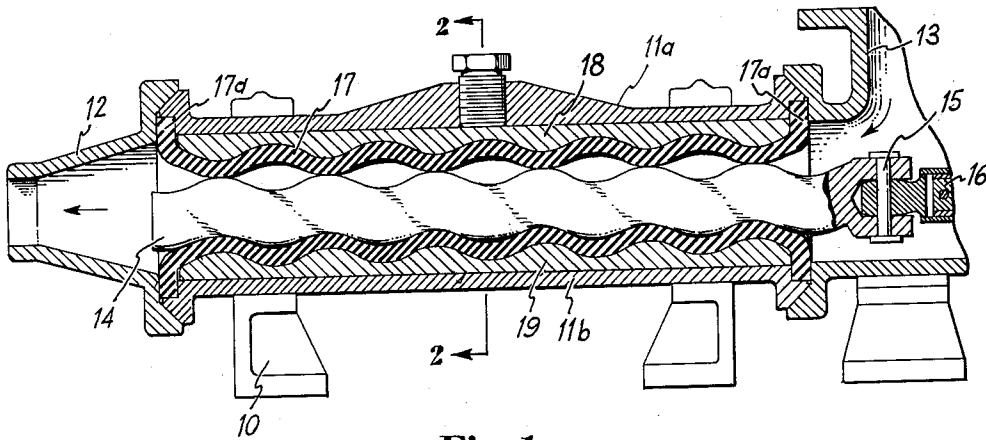


Fig. 1

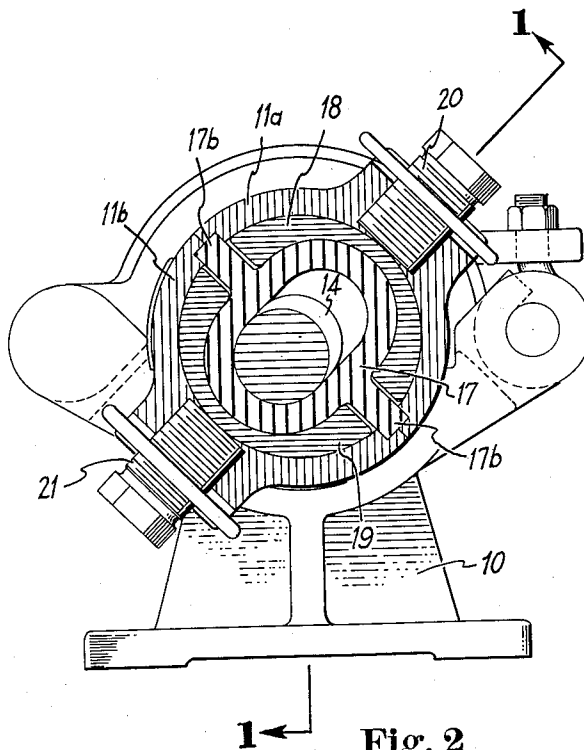


Fig. 2

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1

3,084,631 HELICAL GEAR PUMP WITH STATOR COMPRESSION

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This invention relates to helical gear pumps of the type invented by R. J. L. Moineau wherein a helically externally threaded rotor coacts with an internally helically threaded stator, said stator having one more thread than said rotor. Pumps of this general type are now generally built with a metallic rotor which is rigid and a stator which is of flexible or resilient material such as rubber. Pumps of this type are particularly advantageous in the handling of abrasive materials but such materials produce wear and this wear is usually greatest toward the discharge end of the pump.

In my earlier patent, No. 2,796,029, dated June 18, 1957, I disclosed and claimed a pump wherein a metallic semi-cylindrical element was interposed between the stator and the casing in which the stator was disposed and wherein an adjusting screw was provided whereby the stator could be compressed to a desired degree. An object of that invention was to provide such adjusting means which would be self-aligning so that the adjustment would compensate for increased wear toward one end of the pump or the other. It was also an object of the invention to make it possible to increase the capacity of such a pump at higher pressures and to provide a pump where the maximum efficiency would occur at higher pressures.

In another of my earlier patents, No. 2,874,643, dated February 24, 1959, I disclosed and claimed an improvement over the first mentioned patent, whereby the stator was compressed by fluid pressure and in which means were provided whereby the stator was subjected to the discharge pressure of the pump so that as the discharge pressure increased, the stator was more greatly compressed.

In both of said earlier patents, I made use of a more or less conventional stator which was cylindrical on the exterior and was internally helically threaded as is required of such stators. The exterior cylindrical surface of the stator was acted upon by a part cylindrical shim against which pressure could be brought to bear either by means of an adjusting screw or by suitable pressure means.

It is an object of the present invention to improve upon the structure of my earlier patents by providing a stator of constant wall thickness whereby the external surface of the stator will also be helically threaded. The shim or shims acting upon the stator externally according to my present invention will be part cylindrical externally but will have a configuration on their inner surfaces which will be complementary to the external threads of the stator so that a more uniform pressure may be brought to bear over the entire surface of the stator.

One of the objects of my present invention, therefore, is to provide for adjustable stator compression such that the shim which produces the pressure acts at all points upon the same thickness of rubber so that there is less opportunity for lateral or axial displacement of the rubber than in prior constructions.

These and other objects of the invention which will be described in more detail hereinafter or which will be apparent to one skilled in the art upon reading these specifications, I accomplish by that certain construction and arrangement of parts of which the following is an exemplary embodiment.

2

Reference is made to the drawings forming a part hereof and in which:

FIG. 1 is a cross-sectional view through a typical pump embodying the present invention, taken on the line 1—1 of FIG. 2.

FIG. 2 is a cross-sectional view on an enlarged scale taken on the line 2—2 of FIG. 1.

Briefly, in the practice of the invention as already mentioned above, I provide a stator of rubber or other resilient material having a constant wall thickness. This means that the stator would exhibit not only the internal helical threads required in pumps of this nature, but that the outer surface of the stator will also have threaded apertures. I then cause to act upon the external surface of the stator two or more shims which have cylindrical external surfaces but whose internal surfaces are configured so as to be, together, complementary to the external threaded configuration of the stator.

Referring now in more detail to the drawings, the pump may be mounted in conventional manner on a base 10 and it comprises a rigid casing element 11. As a matter of convenience in manufacture the casing 11 may be made in two parts 11a and 11b. The casing is provided with an outlet fitting at 12 and is secured at its entrance end to an inlet fitting 13 (shown fragmentarily). The conventional pump rotor is indicated at 14 and is secured by a universal joint generally indicated at 15 to one end of a connecting rod 16 which at its other end is connected similarly but with the pin at right angles to the drive shaft of a motor or the like, as is conventional and not shown. By virtue of the well known double universal joint connection, the on-center rotation of the motor shaft is converted to a rotational and orbital motion of the rotor 14 as is required in pumps of this nature.

The stator is indicated at 17 and as best seen in FIG. 1 it is of constant wall thickness so that its external surface is convoluted much as the external surface of the rotor except that there are two threads instead of one. The stator, as is conventional, may be provided with the end flanges 17a for clamping respectively between the casing 11 and the inlet fitting 13 and outlet fitting 12.

In order to prevent a twisting action or rotating action of the stator, it may be provided with the laterally extending locating members 17b, as best seen in FIG. 2, may be clamped between the portions 11a and 11b of the casing member 11.

Within the casing 11, I provide the shims or casing liner elements 18 and 19. These shims occupy the space between the casing members 11a and 11b respectively and the stator 17. Their outer surfaces are cylindrical so as to fit within the cylindrical casing and their inner surfaces are configured as best seen in FIG. 1 to conform to the external configuration. From a consideration of FIG. 2, it will be clear that there is clearance between the shims 18 and 19, respectively, and the locating members 17b, so that the shims 18 and 19 may be urged toward each other.

It will now be clear that as pressure is exerted on the shims 18 and 19, they bear against the stator 17 and cause it to embrace the rotor 14 more tightly, thus accomplishing the objects of the invention. It will also be clear that the pressure of the shims 18 and 19 is uniformly transmitted to every part of the stator since the stator has a uniform wall thickness.

In the particular embodiment illustrated, the pressure upon the stator is accomplished by the adjusting screws 20 and 21, threaded through bosses in the casing portions 11a and 11b respectively. It will be clear that while I have shown two such adjusting screws the objects of the invention could in part at least be accomplished by a single adjusting screw urged toward a fixed shim on the other side of the casing. It is preferable, however, to have two adjusting screws and to adjust the two screws in

3

equal amounts for best results. It will also be understood that the shim structure 18—19 could be made in three or more parts with a corresponding number of adjusting screws. It is also of course within the scope of the invention to provide for each shim more than one adjusting screw distributed over the length of the casing. Similarly, it will be understood that hydraulic or pneumatic pressure may be used to apply pressure to the shims instead of the screws 20 and 21, in which case fluid pressure from any suitable source, which may include the outlet of the pump, may be applied as taught in my said Patent No. 2,874,643.

It will also be clear that the principles of the present invention are applicable where the pump is used as a motor by the forcing of fluid between the rotor and stator to produce rotation of the rotor. The invention is also, of course, applicable where the device is used as a compressor with a tapered rotor and stator.

Numerous modifications may be made without departing from the spirit of the invention and I therefore do not intend to limit myself except as set forth in the claims which follow.

Having now fully described the invention, what I claim as new and desire to secure by Letters Patent is:

1. A helical gear pump having a rigid casing, an externally threaded rigid rotor, and an internally and externally threaded resilient stator of substantially constant wall thickness and having one thread more than said rotor, said rotor and stator being disposed within said casing and coacting to form pumping pockets which progress axially through said pump, a plurality of casing liner elements lining the major portion of the interior of said casing with a circumferential clearance between said casing liner elements, said liner elements together having an internally helically threaded configuration complementing

4

the externally threaded configuration of said stator, and means for urging at least one of said liner elements radially inward to compress said stator against said rotor.

2. A structure according to claim 1, wherein means are provided by urging all of said liner elements radially inward to compress said stator against said rotor.

3. A structure according to claim 1, wherein said stator is provided with diametrically opposed locating members extending radially outward from its exterior surface, wherein said casing element is formed in two halves clamping said locating members between them, and wherein there are two liner elements having circumferential clearance between them and said locating elements.

4. A structure according to claim 1, wherein an adjusting screw passes threadedly through said casing and engages said one of said liner elements, whereby the pressure of said one liner element against said stator may be adjusted.

5. A structure according to claim 1, wherein an adjusting screw passes threadedly through said casing substantially centrally of each of said liner elements and engages the respective liner element, whereby the pressure of said liner elements against said stator may be adjusted.

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