April 17, 1934. H. F. VICKERS 1,954,853

ROTARY MECHANISM

Filed Feb. 25, 1929 2 Sheets-Sheet 1

Fig. 1.

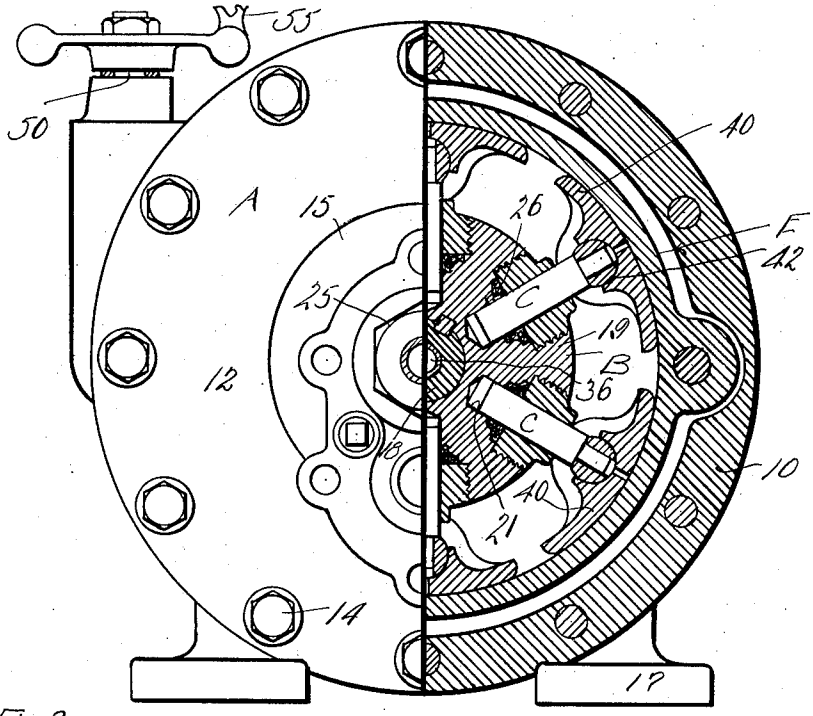
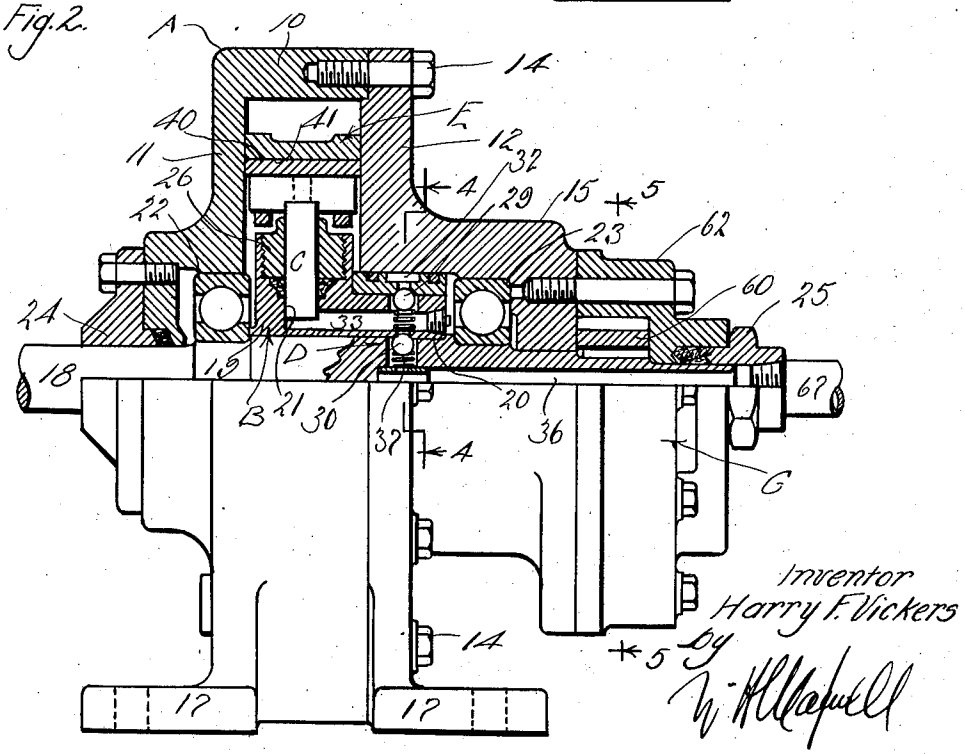


Fig. 2.



Inventor
Harry F. Vickers
by
His Attorney

April 17, 1934. H. F. VICKERS 1,954,853

ROTARY MECHANISM

Filed Feb. 25, 1929 2 Sheets-Sheet 2

Fig. 3.

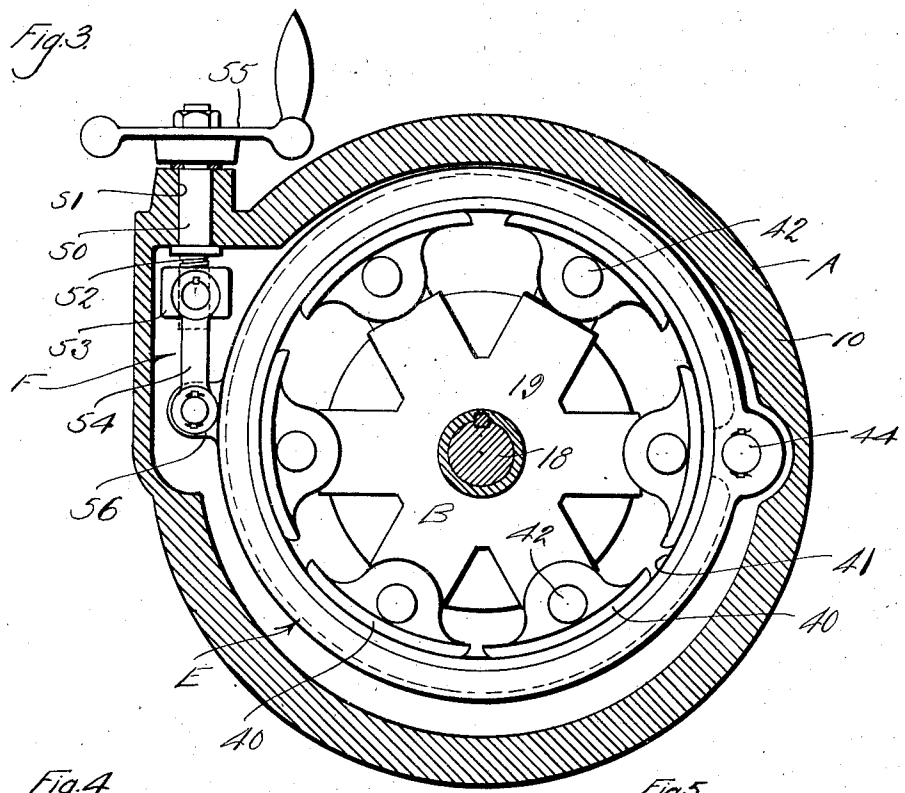


Fig. 4.

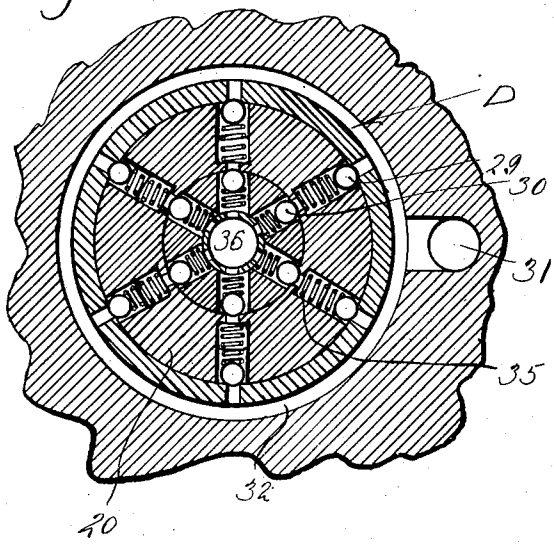
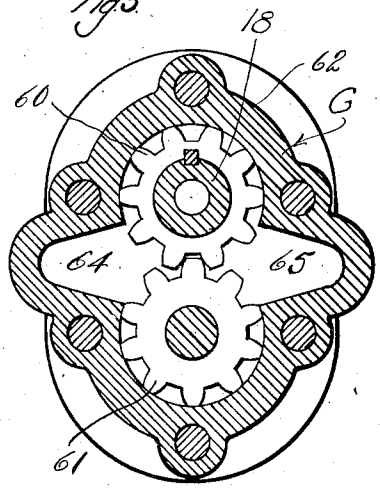


Fig. 5.



Inventor
Harry F. Vickers
by W. H. Maxwell
his Attorney

Patented Apr. 17, 1934

1,954,853

UNITED STATES PATENT OFFICE

1,954,853

ROTARY MECHANISM

Harry F. Vickers, Los Angeles, Calif.

Application February 25, 1929, Serial No. 342,606

1 Claim. (Cl. 103—161)

This invention has to do with a rotary mechanism and it is a general object of the invention to provide a mechanism particularly useful for handling or pumping fluid.

The present invention relates to a plunger type of rotary mechanism for handling fluid. The mechanism of the invention is capable of operating either as a pump or as a motor. The mechanism is especially useful as a variable capacity pump, and therefore I will describe it in detail as a pump, it being understood that the term pump is not to be construed as a limitation upon the use of the invention, as it is equally capable of operation as a motor.

It is a general object of the present invention to provide a simplified, improved, and commercially practical construction and arrangement of parts in a mechanism of the character mentioned.

A further object of the invention is to provide an improved, effective, and inexpensive construction for effecting control or regulation of the capacity of the mechanism.

Another object of the invention is to provide improvements in the relationing of the valve mechanism to the cylinder and piston mechanisms whereby the fluid is handled in an efficient, dependable manner.

It is another object of the invention to provide improvements in the mounting and arrangement of the rotor or rotating element within the housing.

A further object of the invention is to provide various improved features of construction whereby the mechanism is made inexpensive of manufacture, efficient in operation, and suitable for commercial use.

The various objects and features of the invention will be best and more fully understood from the following detailed description of a typical form and application of the invention, throughout which description reference will be had to the accompanying drawings, in which:

Fig. 1 is an end view of the device provided by this invention showing the parts at one side of the vertical center line broken away so that the parts of the cylinders and plungers appear in section. Fig. 2 is a side view of the mechanism showing the parts above the horizontal center line of the mechanism in the central section. Fig. 3 is a detailed transverse sectional view showing the general arrangement of the cylinders and pistons and the control mechanism. Fig. 4 is a detailed sectional view taken through the valve mechanism, being a view taken as indicated by line 4—4 on Fig. 2, and Fig. 5 is a detailed transverse sectional view taken through the fluid feed mechanism being a view taken as indicated by line 5—5 on Fig. 2.

The mechanism provided by this invention includes, generally, a housing A, a rotor B operable in the housing and including a plurality of cylinders, plungers C operable in the cylinders of the rotor and adapted to be carried around with the rotor, valve means D for controlling the flow of fluid to and from the cylinders of the rotor, an adjustable operating member E for actuating the plungers, and control means F for the operating member E.

The housing A, which is the stationary or fixed element of the mechanism, forms a carrier and casing for the various other parts of the mechanism. The housing includes, generally, an annular body 10 within which the rotor operates, and end plates 11 and 12 which close the ends of the body.

In the construction illustrated the end plate 11 is formed integral with one end of the body while the end plate 12 is detachably connected to the other end of the body by means of cap screws 14. The end 12 of the body has a central or hub extension 15 which carries the valve means D and various other parts as will be hereinafter described. Further, in the mechanism shown there is an auxiliary fluid feeding means G carried by the hub extension 15 of the end 12. In practice the housing is usually mounted stationary on a suitable support and therefore its exterior is provided with suitable mounting brackets 17.

The rotor B is a revolving element carried in the housing A on a shaft 18. The rotor is fixed on the shaft 18 and includes a cylinder block 19 operating within the body 10 of the housing, and an extension 20 on one end of the cylinder block extending into the hub part 15 of the end 12. The cylinder block 19 is provided with a plurality of radially disposed openings or cylinders 21. The cylinders are arranged symmetrically around the central axis of the rotor as shown throughout the drawings. The extension 20 of the rotor joins one end of the cylinder block 19 and extends into the hub extension 15 where it carries the valve means D.

The shaft 18, which carries the rotor, is supported by the end plates 11 and 12 of the housing through bearings 22 and 23 in the end plates 11 and 12, respectively. The bearing 22 in the end plate 11 is arranged adjacent the cylinder block 19 while the bearing 23 in the end plate 12 is arranged adjacent the outer end of the extension

20. In the preferred construction I use ball bearings in mounting the shaft in the housing. The shaft 18 extends into the housing through the end 11 and projects through the end 12 into the fluid feed means G. A suitable packing gland 24 is provided around the shaft 18 at the end plate 11 and a suitable packing gland 25 is provided around the extension of the shaft at the means G.

The plungers C are slidably carried in the cylinders 21 of the block 19. In the preferred construction the cylinders 21 are provided with packing means 26 to make fluid tight connections between the plungers and cylinders.

The valve means D provided for controlling the flow of fluid to and from the cylinders 21 includes, generally, an inlet valve 29 and an outlet valve 30 in connection with each cylinder. In the arrangement shown an annular groove 32 is provided in the exterior of the rotor extension 20 to be in constant register with a supply port 31 formed in the hub extension 15. A port 33 extends from each cylinder into the extension 20 where it is connected with the groove 32. Intake valves 29 are arranged in the connections between the ports 33 and grooves 32 and seat outwardly so that they are normally held closed by the action of centrifugal force. In practice springs 35 may be arranged behind the valves 29, as illustrated in the drawings. The outlet valves 30 are arranged in openings which connect the ports 33 with an opening 36 extending longitudinally through the shaft 18. The valves 30 preferably seat outwardly so that they are seated by centrifugal force. In practice springs 37 may be arranged back of the valves, as shown in the drawings.

The operating member E, in accordance with this invention, is an annular member arranged within the body 10 of the housing around the cylinder block 19. The operating member fits loosely or freely in the body 10 and is sufficiently large to be spaced a substantial distance from the cylinder block. The plungers C carry bearing shoes 40 which slidably engage the inner face 41 of the member E. The shoes 40 are mounted on the outer ends of the plungers through pivotal connections 42 and are shaped and proportioned so that lubricating oil within the housing wedges under them during operation, forming an oil wedge or film. In order that the shoes may have this action, their forward or leading ends are longer than their rear or trailing ends.

The member E is mounted in the housing so that it is normally held stationary during operation of the mechanism and is adjustable or shiftable from a position where it is concentric with the rotor and a position where it is eccentric to the rotor. In accordance with the present invention the member E is held at diametrically opposite sides so that it is movable about an axis offset from that of the rotor. In the arrangement shown in the drawings the member E is held at one side by a pivot pin 44 which extends between the end plates 11 and 12 of the housing and is engaged and held at the diametrically opposite side by the control means F. The control means F is operable to move said last-mentioned side of the member E so that the member swings or tilts about the pivot pin 44. The parts are arranged and proportioned so that the member E can be arranged concentric with the rotor, as shown in Fig. 1, and can be arranged in various positions eccentric to the rotor. When the member E is concentric with the rotor the mechanism operates without the reciprocation of the plungers in the cylinders, and therefore without pumping action, whereas when the member E is eccentric to the rotor, as shown in Fig. 3, the plungers are caused to reciprocate in the cylinders of the rotor, causing positive pumping action.

The control means F, provided for adjusting the position of the member E and for holding the member E in adjusted position, may comprise a suitable connection between the member E of the housing and a means for actuating or varying such connection from the exterior of the housing. In the drawings I have illustrated a screw means for adjusting the member F. In the arrangement shown an operating stem 50 extends into the housing through an opening 51 in the body of the housing, a screw 52 is provided on the inner end of the stem to operate in a block 53, and a link connection 54 is provided between the block 53 and the member E. The stem 50 is rotatably carried in the opening 51 and is adapted to be rotated from the exterior of the housing by a hand crank 55 or any other suitable means. The screw 52 is threaded in the block 53 so that rotation of the screw causes movement of the block. The link connection 54 is pivotally connected to the block 53 and to a lug 56 projecting outwardly from the member E at a point diametrically opposite the pivotal connection between the member E and housing. The construction just described is clearly shown in Fig. 3 of the drawings.

The fluid feeding means G is provided to feed fluid, say, for instance, oil, to the supply port 31, above described, under pressure so that the fluid will properly feed to the cylinders when the mechanism is operated at high speed. This means may be of various constructions and may be arranged in the mechanism in various manners. In the form of the invention shown this means is in the nature of a gear pump including two gears 60 and 61 carried in a gear case 62 applied to the outer end of the hub extension 15. The shaft 18 projects from the hub extension 15 into the gear case 62 to drive the gear 60. The gear case is provided with an inlet port 64 through which fluid is delivered to the gears 60 and 61 and is provided with outlet port 65 which communicates with the port 31 in the hub extension 15. With this arrangement, the gear pump operates whenever the shaft 18 is rotated. The gear pump operates to deliver fluid under pressure to the valve mechanism so that the fluid will effectively follow the action of the mechanism even at high speeds.

The portion of the shaft 18 that extends into the gear case 62 is surrounded by the packing means 25 carried by the casing 62. In the preferred arrangement the opening 36 in the shaft, to which the fluid is delivered by the pumping action of the plungers in the cylinders, extends to the end of the shaft carried in the case 62. A delivery pipe 67 may be arranged in communication with the opening 36, as shown in Fig. 2 of the drawings.

From the foregoing description it is believed that the operation of the device will be fully understood. When the mechanism is operated, that is when the shaft 18 is rotated and the member E is set eccentric to the rotor, fluid, say, for instance, oil, admitted to the port 64 is delivered to the port 65 under pressure so that it enters the cylinders through the intake valves 29 and is distributed from the cylinders through the outlet valves 30. This flow of fluid is caused by the reciprocation of the plungers in the cylinders

the reciprocation being due to the operation of the bearing shoes 40 in the member E. Pumped fluid passes out of the mechanism through the opening 36 in the shaft 18. It will be apparent that the extent of movement of the plungers in the cylinders will depend upon the eccentricity of the member E with reference to the rotor, this being under control through the means F.

The present invention is concerned with the general arrangement and combination of parts above set forth and not with improved constructions or features embodied in specific parts. For example, the valve mechanism set forth is fully set forth and claimed in my U. S. Patent No. 1,910,581, entitled Valve means for pump, or the like, of May 23, 1933.

The shoes 40 operating in the member E are fully set forth and claimed in my co-pending application entitled Construction for rotary compressor, or the like, filed Feb. 25, 1929, Serial No. 342,604, while other subject matter that I have mentioned is set forth and claimed in my U. S. Patent No. 1,878,736, entitled High speed pump, of Sept. 20, 1932.

Having described only a typical, preferred form of my invention, I do not wish to limit myself to the specific details set forth, but wish to reserve to myself any changes or variations that may appear to those skilled in the art or fall within the scope of the following claim.

Having described my invention, I claim:

In a rotary pump, a casing including two sections each including an end plate and a central tubular extension forming a bearing carrier, there being an annular part projecting from the peripheral portion of one of the end plates, said annular part being joined to the other end plate, and one of the central tubular extensions having a chamber to accommodate a valve mechanism and having a fluid passage communicating with the chamber, a shaft extending through the casing and having a fluid passage in it, bearings in the tubular extensions supporting the shaft, a block on the shaft to operate between the end plates and having radially disposed cylinder openings and having an axial extension entering said chamber and having fluid passages communicating with the cylinder openings, valve means carried by the extension of the block controlling communication between the passage therein and the passage in the shaft and the passage communicating with the chamber, plungers operable in the cylinder openings, a ring surrounding the block and located between the end plates and within the said annular part, means pivotally connecting the ring and the casing at a point adjacent said annular part and on an axis parallel with that of the shaft, means engaging the ring at a point removed from the pivotal connection and extending to the exterior of the casing operable from the exterior of the casing to control the position of the ring within the casing, and bearing shoes on the plungers slidably operating on the interior of the ring.

HARRY F. VICKERS.