May 23, 1933. H. F. VICKERS 1,910,581

VALVE MEANS FOR PUMPS OR THE LIKE

Filed Feb. 26, 1929

Fig. 1.

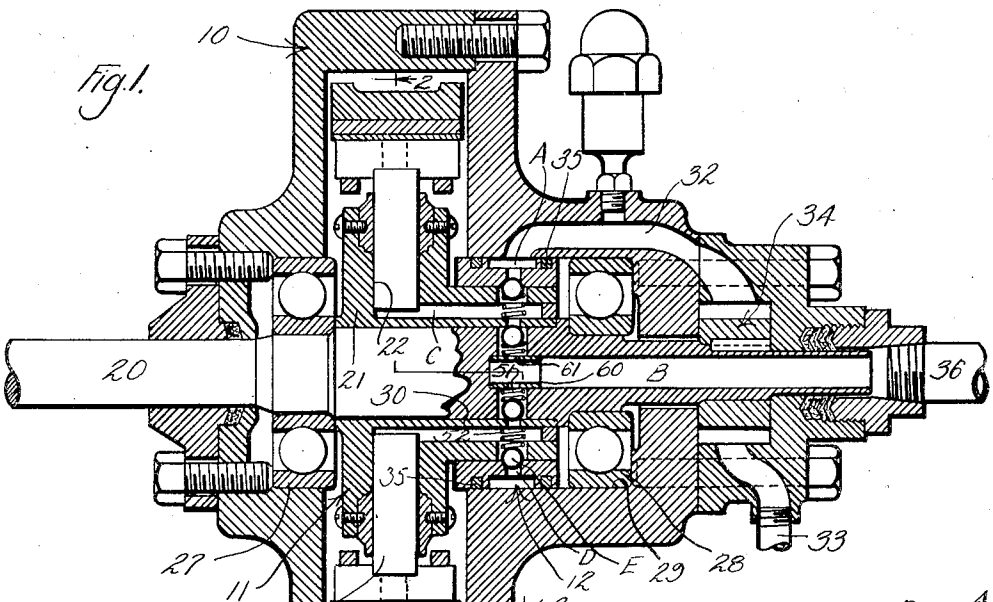


Fig. 2.

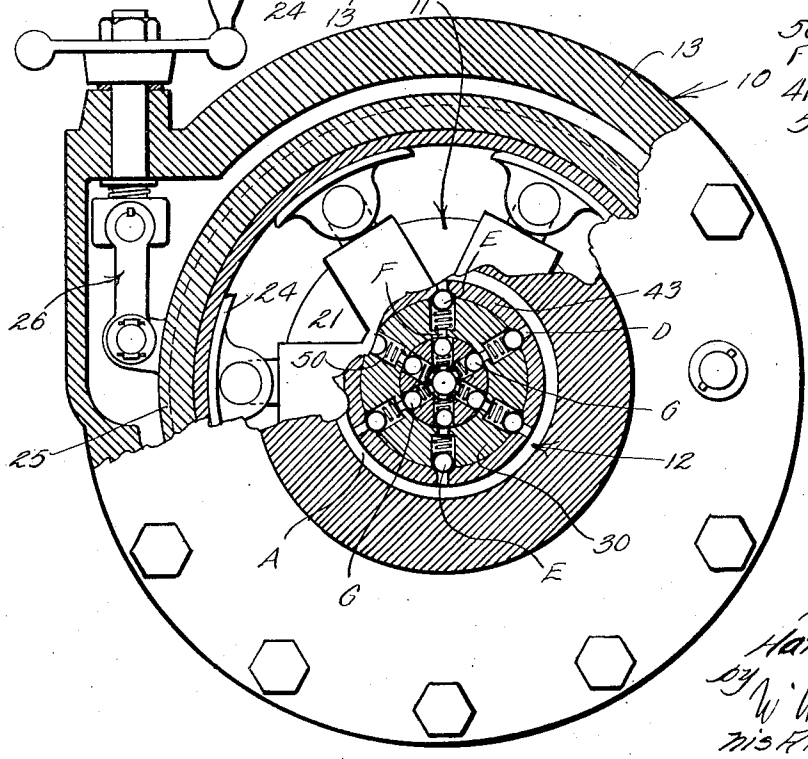
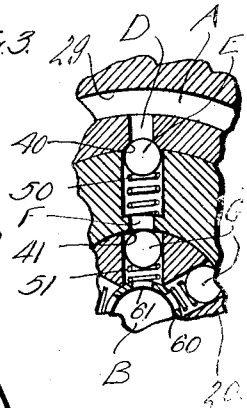


Fig. 3.



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

Patented May 23, 1933 1,910,581

UNITED STATES PATENT OFFICE

HARRY F. VICKERS, OF LOS ANGELES, CALIFORNIA

VALVE MEANS FOR PUMPS OR THE LIKE

Application filed February 26, 1929. Serial No. 342,704.

This invention has to do with valve means for a compressor or pump of the rotary type and it is a general object of the invention to provide a simple, practical and dependable valve means for controlling the flow of fluid in a mechanism of the type mentioned.

The present invention is particularly applicable to rotary machines, that is, machines wherein the principal working parts revolve. To facilitate an understanding of the principles of the invention, I will describe it as applied to a pump of the rotary type wherein an assembly of cylinders and pistons revolve about a common or central axis.

Numerous arrangements and constructions have been proposed for controlling the flow of fluid in rotary machines such as I have referred to. The most common of these is the sliding or rotary valve type wherein two or more ported members are arranged for relative rotation and have their ports related to cooperate for the desired control of the fluid. This type of valve means has certain recognized limitations and is particularly inefficient in handling high pressures.

It is a general object of the present invention to provide valve means for a rotary machine of the type mentioned having centrifugally actuated valve members.

A further object of the invention is to provide a valve means for a rotary machine of the type mentioned in which both the inlet and outlet valve are centrifugally actuated.

It is a further object of the invention to provide a valve means of the character mentioned in which the various parts are arranged in a simple, compact manner and in a manner to allow flow of fluid with a minimum of resistance or friction.

It is a further object of the invention to provide various improved features of formation and arrangement of parts in a valve means of the character mentioned. The invention provides a structural arrangement which is compact, effective and inexpensive of manufacture.

The various objects and features of my invention will be best understood from the following detailed description of a typical form and application of the invention, throughout which description I refer to the accompanying drawing, in which:

Fig. 1 is a longitudinal detailed sectional view of a rotary pump embodying the valve means provided by this invention, and Fig. 2 is a transverse sectional view of the mechanism being a view taken substantially as indicated by line 2—2 on Fig. 1, and Fig. 3 is an enlarged view of the valve.

For the purpose of setting forth a typical application of the present invention, I have disclosed it as applied to a rotary compressor which is fully set forth and claimed in my co-pending application entitled Rotary mechanism, filed February 25, 1929, Serial Number 342,606. Further, in the drawing I have illustrated features of construction and combination of elements which are set forth and claimed in my prior patent entitled High speed pump, dated Sept. 20, 1932, Number 1,878,736, and in my co-pending application entitled Construction for rotary compressor, or the like, filed February 25, 1929, Serial Number 342,604.

The rotary mechanism or pump illustrated in the drawing includes, generally, a body or housing 10, a rotating assembly 11 mounted within the housing, and control or valve means 12 associated with the other parts. The housing 10 is a stationary part or element of the machine and comprises, generally, an outer cylindrical wall 13 and ends 14 and 15. In the particular case shown the end 14 and cylindrical wall 13 are formed integrally while the end 15 is detachable being secured to the part 13 by a plurality of cap screws 16.

The rotating assembly 11 includes, generally, a central drive member or shaft 20 mounted centrally in the housing, a cylinder block 21 carried on the shaft and having a plurality of radially disposed cylinders 22, and plungers 23 operating in the cylinders 22. In the particular type of mechanism illustrated, reciprocation of the plungers 23 in the cylinders 22 is obtained through the co-operation of shoes, on the outer ends of the plungers, with a bearing ring 25 mounted in the housing.

The bearing ring 25 is mounted in the housing to surround the assembly 11 and is nor-

mally held stationary in the housing. The construction is provided with means 26 for shifting the position of the bearing ring 25 in the housing to shift the position of its axis with reference to that of the shaft 20. The shoes 24 provided on the outer ends of the plungers 23 bear in the ring 25 and when the axis of the ring is removed from that of the shaft 20 the plungers are caused to reciprocate or slide in the cylinders as the assembly 11 rotates relative to the ring 25.

The assembly 11 is rotatably mounted in the housing 10 so that the cylinder block 21 is carried between the ends 14 and 15 of the housing. The shaft 20 extends axially through the housing and has one end supported by the end 14 through a suitable bearing 27 and has the other end extending through the end 15 and supported in the end 15 by a bearing 28. The bearing 28 is carried in a deep axially disposed recess 29 formed in the inner side of the end 15 around the shaft 20.

The valve means 12 provided by the present invention is carried by or formed with the assembly 11 so that it revolves. In the form of the invention illustrated the cylinder block 21 is provided at one end or side with a central axial projection or hub 30 which extends into the recess 29. The hub 30 with the portion of the shaft 20 extending through the recess 29 forms a revolving element that may be termed a central revolving part carrying the valve means. The cylinder block 21 is fixed or made tight on the shaft 20 so that the hub 30 of the cylinder block and the shaft form a solid and substantially continuous structure for supporting the valve means.

In accordance with my invention the valve means includes an intake chamber A in the revolving part formed by the hub 30 and shaft 20; an outlet passage B in said part, cylinder ports C (one communicating with each cylinder); inlet valve ports D (one connecting each cylinder port C with the intake chamber A); intake valves E for controlling flow through the ports D; outlet ports F (one connecting each cylinder port C with the outlet passage B); and outlet valves G controlling flow through the ports F.

The intake chamber A is adapted to be supplied with fluid forming a suitable source of supply so that the chamber A is normally filled with fluid ready to pass through the ports D. In the arrangement shown the chamber A is an annular chamber formed in the outer portion of the said revolving part to have continuous communication with a supply port 32 connected with a supply line 33. In the particular arrangement illustrated a force or pressure feed means 34 is connected between the supply pipe 33 and port 32 so that fluid is supplied to the port 32 under pressure. In practice annular packing rings 35 are provided at either side of the annular chamber A to prevent leakage of fluid between the revolving part and the wall of the chamber 29. The outlet passage B, in accordance with the preferred form of the invention, is a centrally located opening extending into the shaft 20 from one end. In the case illustrated the passage B is shown extending into the shaft 20 from the end which projects through the end 15 of the housing. A suitable packed connection is provided with the said end of the shaft and a discharge conduit 36.

There is one cylinder port C communicating with the inner end of each cylinder 22 in the block 21, and in the arrangement illustrated the several ports C extend from the inner ends of the cylinders parallel with the axis of the assembly 11 into the hub 30. An intake port D connects each cylinder port C with the chamber A and an outlet port F connects each cylinder port C with the outlet passage B. The ports C are located between the chamber A and the passage B so that the intake ports D extend radially between the chamber A and the ports C, while the outlet ports likewise extend radially between the passage B to the ports C. Each intake port D is provided with a seat 40 to receive an intake valve E while each outlet port is provided with a seat 41 to receive an outlet valve G. In the preferred form of the invention the hub 30 has an outer section 43 formed separate from the other parts, which section is preferably formed of high-grade material and carries the chamber A and the portions of the intake ports in which the seats 40 are located or formed. In practice this section 43 is pressed or otherwise fitted tightly on the part of the hub 30 which is integral with the cylinder block 21.

In the particular form of the invention shown the intake valves E are ball valves, that is, they are spherical in form, arranged to seat outwardly on the seats 40 in the ports D. During operation of the mechanism the centrifugal force exerted on the valves E, due to rotation of the assembly 11, causes the valves to normally bear outwardly to engage the seats 40. In practice I provide a light valve spring 50 back of each valve E to normally yieldingly hold it on the seat 40, the springs being provided mainly to hold the valves seated when the mechanism is not in use or before it has reached its proper speed of operation. In the particular case illustrated the valves E are arranged in the ports in the integral portion of the hub 30 before the detachable section of the hub is arranged in place.

The outlet valves G are also shown as ball, or spherical, valves arranged to seat outwardly against the seats 41. The seats 41 are formed in the portions of the ports F extending through the hub part 30, as clearly shown throughout the drawing. The valves G, being arranged to bear outwardly against their

seats, are normally held seated by centrifugal force in the same manner as the valves E. In practice, however, I provide light helical springs 51 under or back of the valves G to function the same as the springs 50 do with the valves E. In the form of construction illustrated the valves G may be arranged in place through the outlet passage B. In the construction shown a cage member 60 is arranged in the passage B after the valves G and springs 51 are in place to hold the springs and valves in place, as shown throughout the drawing. The cage 60 has openings 61 which allow passage of fluid from the ports F into the passage B.

From the foregoing description it will be apparent that my invention provides an arrangement of valves such that centrifugal force acts to operate or close the valves when the mechanism is in operation. This is a significant feature as it provides a mechanism not dependent upon springs or other means liable to fail. Further, it is to be noted that the invention provides a reciprocating type of valve in which the pressure being held by the valve acts to hold it seated, thus making the construction suitable for high pressures such as cannot be effectively handled by sliding valves. Again, it is to be noted that the invention provides a construction and arrangement of parts which is simple of manufacture, compact, and easily assembled or taken apart.

Having described only a typical preferred form and application 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 claims:

Having described my invention, I claim:

1. In a rotary pump, means for causing circulation of fluid and including a rotor having an axially projecting hub, fluid control means carried by the hub and including a radially outward seating intake valve connecting an intake chamber in the hub with a port in the hub, and a radially outward seating outlet valve connecting said port and an outlet passage located centrally in the hub.

2. In a rotary pump, means for causing circulation of fluid and including a rotor having an axially projecting hub, fluid control means carried by the hub and including a radially outward seating intake valve connecting an intake chamber in the outer portion of the hub with a port in the hub, and a radially outward seating outlet valve connecting said port and a central outlet passage in the hub.

3. In a rotary pump, means for causing circulation of fluid and including a rotor having an axially projecting hub with a detachable part, fluid control means in connection with said part and including a radially outward seating intake valve connecting an intake chamber in said part with a port in said part, and a radially outward seating outlet valve connecting said port and an outlet passage in the hub.

4. In a rotary pump, means for causing circulation of fluid including a revolving unit having a shaft, a body fitting around the shaft and having an axially projecting hub, and a detachable part over the hub, and valve means carried by said part including an outwardly seating outlet valve in a port formed radially in the shaft and body, the seat for the outlet valve being in the body and an outwardly seating inlet valve in a port formed radially in the body and said part, the seat for the inlet valve being in said part.

5. In a rotary pump, means for causing circulation of fluid and including a rotor having an axially projecting hub with a detachable part, fluid control means in connection with said part and including a radially outwardly seating intake valve connecting an intake chamber in said part with a port in said part, and a radially outwardly seating outlet valve connecting said port and an outlet passage in the hub, the intake valve cooperating with a seat in said part.

In witness that I claim the foregoing I have hereunto subscribed my name this 7th day of November, 1928.

HARRY F. VICKERS.