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S. SCHNELL

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2 Sheets-Sheet 2

FIG. 3.

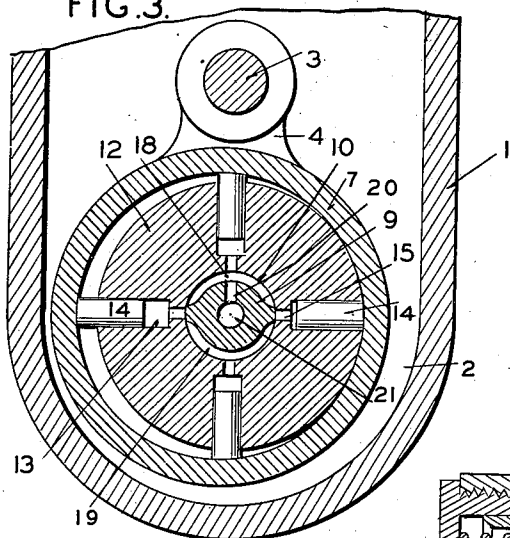


FIG. 6.

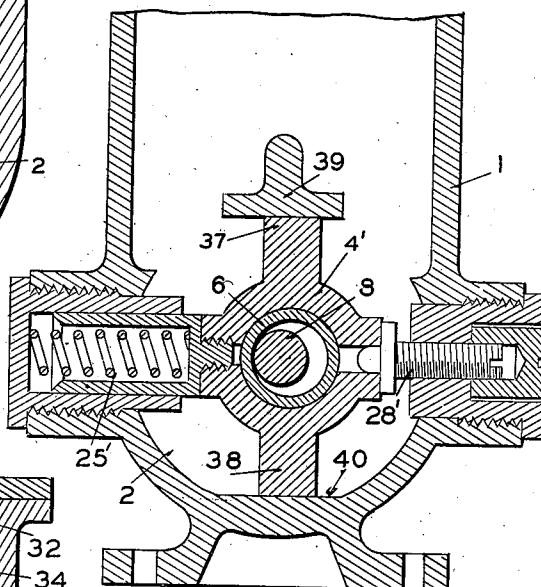
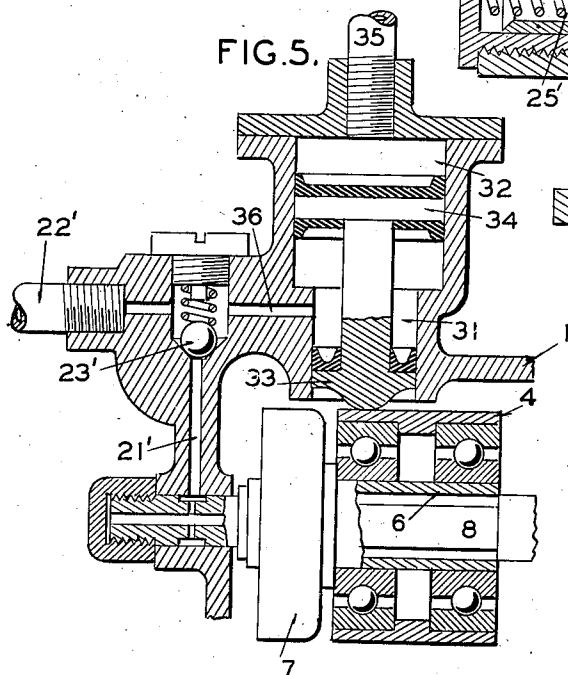


FIG. 5.



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4 Claims. (Cl. 103—161)

My invention relates to pumps and more particularly to a rotary type of pump which is caused to be operated by an eccentric positioning of certain parts thereof.

One of the objects of my invention is to produce an improved rotary type of pump for producing fluid pressures.

Another object of my invention is to produce a simple and efficient pump which can be small in size, economical to manufacture and capable of long life due to an arrangement that will result in minimum wear between cooperating parts.

Still another object of my invention is to produce an improved pump which will automatically cease pumping when a predetermined fluid pressure has been developed and without the necessity of stopping the driving member or controlling either the inlet or the outlet passages.

Other objects of my invention will become apparent from the following description taken in connection with the accompanying drawings in which Figure 1 is a longitudinal sectional view of a pump embodying my invention; Figures 2 and 3 are sectional views taken on the lines 2—2 and 3—3 of Figure 1; Figure 4 is a view showing a spring-biased piston that may be employed in the pump; Figure 5 is a sectional view showing a modified control arrangement; and Figure 6 is a sectional view of a pump having a slidable support for the pump ring.

Referring in detail to the drawings and first to Figures 1, 2, and 3, the pump disclosed is embodied in a casing 1 providing a reservoir 2 for containing the fluid to be compressed. Extending across the casing is a pin 3 upon which is pivotally mounted a support 4 hanging in the lower part of the casing. Journaled in this support by means of ball-bearings 5 is a sleeve 6 provided at one end with an integral pump ring 7 having its axis coinciding with the axis of the sleeve. The sleeve 6 and ring 7 surround a shaft 8 of smaller external diameter than the internal diameter of the sleeve, said shaft being journaled at one end in one wall of the casing and at the other end on a stationary pin 9 which is received in an end bore 10 of said shaft. The shaft 8 is parallel with pin 3 and is adapted to be driven from the exterior of the casing by a pulley 11.

The end of shaft 8 adjacent pin 9 is provided with an enlargement 12 having a cylindrical external surface of smaller size than ring 7. Said enlargement is positioned in the ring and has radially extending bores 13 (four being shown)

and arranged so that the axis of one is at right angles to the axes of adjacent bores. Within each bore is a piston 14, the outer end of which is adapted to cooperate with the internal surface of the pump ring 7. The inner ends of the bores are connected by passages 15 to bore 10 which receives the pin 9.

The pin 9 is held stationary by being clamped by a nut 16 to the closure plate 17 carried by the casing. The end of this pin which is positioned in bore 10 is provided with opposed non-communicating curved grooves 18 and 19 in its surface. Groove 18 is connected by a radial passage 20 to an outlet passage 21 extending axially through pin 9, which passage constitutes the outlet of the pump. A conduit 22 leads from passage 21 to any suitable device to be actuated or to a pressure tank and has a check valve 23 associated therewith. The other groove 19 in pin 9 communicates with an axially extending groove 24 in the surface of the pin, which groove opens into casing 1 and constitutes the inlet of the pump.

Acting on one side of the pump ring support 4 is a spring 25 of predetermined strength, said spring normally biasing the support 4 so that the axis of sleeve 6 and the pump ring is at one side of the axis of the driving shaft 8 and the enlargement 12. The spring 25 is held in position between a boss 26 on the support 4 and the inner end of a plug 27 screwed into the wall of the casing. On the side of the support diametrically opposite spring 25 there is provided an adjustable stop 28 in the form of a screw threaded into a plug 29 carried by the casing. Thus by adjusting the screw, the distance the spring may bias the axis of the sleeve and pump to one side of the axis of shaft 8, is predetermined but can be varied at will.

Referring now to the operation of the pump just described, shaft 8 may be continuously driven by a suitable source of power connected to pulley 11. As the shaft rotates, centrifugal force will throw the pistons 14 outwardly and they will engage with the pump ring 7. Since the pump ring is journaled in ball-bearings in the support, it is very easily rotated and the pump ring will, therefore, be rotated with shaft 8 by the engagement of the outer ends of the pistons with the ring 7. Since spring 25 causes the axis of the pump ring to be at one side of the axis of the shaft, then as shaft 8 and the pump ring rotate, pistons 14 will be successively actuated by the relative movement between the adjacent points on the enlargement of the shaft

and the pump ring as they simultaneously rotate about their different axes.

As the shaft rotates, passages 15 from the bores in which the pistons are mounted will be automatically connected with grooves 18 and 19 as will be apparent from Figure 3. During the time interval that a bore is in communication with groove 18, the piston therein will be moved from substantially its extreme outer position in the bore to substantially its extreme inner position. The fluid which is in the bore will thus be compressed and forced out through groove 18 and the outlet passage 21. During the time that a piston is in communication with groove 18, it will move from substantially its extreme inner end of the bore to its extreme outer position in the bore and consequently will draw in fluid to the bore during this period since groove 19 is in communication with the reservoir formed by the lower part of the casing. It is thus seen that as the shaft and ring make a revolution, a piston will be so actuated that it will draw in fluid from the reservoir and then force it out the outlet under pressure.

As fluid pressure is developed by the pumping operation, a time will be reached when the force exerted by spring 25 can no longer hold the pump ring in a position where its axis is at one side of the axis of the rotating shaft 8. When this occurs, the position of the axis of the pump ring will be changed to coincide with the axis of the shaft and, therefore, the pistons will no longer be reciprocated and pumping will stop. When pumping stops, however, the shaft and pump ring will continue to rotate as long as the shaft is driven. There will be no wear on any of the pumping parts during the non-pumping period because there is no relative movement between the ring and the enlargement on the shaft and the pistons are not reciprocated. Little wear will take place by continued rotation of the ring as this is mounted in ball-bearings.

Pumping will again take place whenever the pressure at the outlet drops below the predetermined value at which the pump ceases to function. When this occurs spring 25 will again become effective to cause the axis of the pump ring to be placed at one side of the axis of the shaft. The stroke of the pistons can be increased or decreased as desired by adjusting the stop 28 which determines the distance the axis of the pump ring can be moved to one side of the axis of the shaft 8.

In the particular construction shown pumping will not take place until the pistons are moved out into contact with the pump ring by centrifugal force. If it is desired to have the pump become operative at speeds lower than that necessary to produce the centrifugal force to move the pistons 14 outwardly, this can be accomplished by placing light springs between the pistons and the bottoms of their bores. Such arrangement is shown in Figure 4 wherein piston 14' is made hollow and a spring 30 is interposed between the head of the piston and the bottom of bore 13.

In Figures 1, 2, and 3, I have shown a spring for biasing the axis of the pump ring to one side of the axis of the driving shaft. In place of the spring, however, other means may be employed. In Figure 5 I have shown a fluid pressure means for performing this function. The wall of casing 1 carries axially aligned communicating cylinders 31 and 32, the former being

smaller than the latter. Positioned within these cylinders are interconnected pistons 33 and 34, the former being adapted to engage support 4. Cylinder 32 may be connected by a conduit 35 to any suitable source of fluid pressure at a remote point. The small cylinder 31 is connected by a passage 36 to be in communication with the outlet passage 21' which has associated therewith a check valve 23' interposed between it and the conduit 22' leading to the device to be actuated or the pressure tank. It is seen that by means of this arrangement if fluid under pressure is forced into cylinder 32 and pistons 33 and 34 moved inwardly, the axis of the pump ring will be shifted to one side of the axis of shaft 8 and pumping will take place and fluid under pressure will be forced out through the outlet port 21' and conduit 22'. This compressed fluid pressure will also be effective in cylinder 31 and when the fluid pressure in said cylinder reaches such a value that it can move piston 34 to the left against the pressure from conduit 35, pumping will cease. By varying the relationship of the pressure areas of the rear side of piston 34' and piston 33 it is seen that the fluid pressure necessary to cause the pump to operate can be of any desired value. A very small pressure through conduit 35 can cause the pump to develop a much greater pressure before it stops pumping.

It is not necessary that the support for the sleeve and pump ring be pivotally mounted as such may be slidably mounted in the casing if desired. Such mounting is shown in Figure 6. The support 4' is provided with diametrically positioned lugs 37 and 38, the former cooperating with a surface on a cross-bar 39 in the casing and the latter cooperating with a surface 40 on the bottom of the casing. A spring 25' acts on one side of support 4' and an adjustable stop in the form of a screw 28' cooperates with the diametrically opposite side of support 4'. The operation of this pump will be the same as that shown in Figures 1 to 3 except that the positioning of the axis of the pump ring to one side of the shaft is obtained by a sliding of the ring support instead of a swinging movement of the ring support.

Being aware of the possibility of modifications in the particular structure herein described without departing from the fundamental principles of my invention, I do not intend that its scope be limited except as set forth by the appended claims.

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

1. In a pump, a housing having a fluid reservoir, a support in said housing having an opening for a bearing, a first rotatable member comprising a sleeve journaled in the bearing opening of the support and provided at one end with a cylindrical element having an internal cylindrical surface outside the bearing opening and of a larger diameter than the sleeve, a second rotatable member positioned within the cylindrical member provided with a radially positioned bore, means for rotating one of said members, plug means concentrically arranged in said second rotatable member fixed in said housing, said plug having a bore therein connectable with the bore in said second rotatable member constituting the exhaust for the pump, a piston in the bore of said second rotatable member whose outer end is directly engageable with the inner cylindrical surface of

said element, said plug having a duct formed therein originating in the reservoir in said housing terminating in the radial bore in said rotatable member constituting the inlet for said pump, means for alternately connecting the outlet and the inlet to the bore by rotation of the second member, and yieldable means for biasing one of said rotatable members to a position where its axis is at one side of the axis of the other member so that when one member is rotated the piston will so cooperate with both members that said members will simultaneously rotate about their respective axes causing the piston to be reciprocated to produce a pumping action without any substantial relative movement between the piston and the cylindrical member.

2. In a pump, a housing having a fluid reservoir, a support in said housing having an opening for a bearing, a first rotatable member comprising a sleeve journaled in the bearing opening of the support and provided at one end with a cylindrical element having an internal cylindrical surface outside the bearing opening and of a larger diameter than the sleeve, a second rotatable member positioned within the cylindrical member provided with a radially positioned bore, means for rotating one of said members, plug means concentrically arranged in said second rotatable member fixed in said housing, said plug having a bore therein connectable with the bore in said second rotatable member constituting the exhaust for the pump, a piston in the bore of said second rotatable member whose outer end is directly engageable with the inner cylindrical surface of said element, said plug having a duct formed therein originating in the reservoir in said housing terminating in the radial bore in said rotatable member constituting the inlet for said pump, means for alternately connecting the outlet and the inlet to the bore by rotation of the second member, and fluid pressure operated means operable by pressure independent of that produced by the pump for moving one of said members to a position where its axis is at one side of the axis of the other member so that when the one member is rotated the piston will so cooperate with both members that said members will simultaneously rotate about their respective axes causing the piston to be reciprocated to produce a pumping action without any substantial relative movement between the piston and the cylindrical member.

3. In a pump, a housing having a fluid reservoir, a support in said housing having an opening for a bearing, a first rotatable member comprising a sleeve journaled in the bearing opening of the support and provided at one end with a cylindrical element having an internal cylindrical surface outside the bearing opening and of a larger diameter than the sleeve, a second rotatable member positioned within the cylindrical member provided with a radially positioned bore, means for rotating one of said members, plug means concentrically arranged in said second rotatable member fixed in said housing, said plug having a bore therein connectable with the bore

in said second rotatable member constituting the exhaust for the pump, a piston in the bore of said second rotatable member whose outer end is directly engageable with the inner cylindrical surface of said element, said plug having a duct formed therein originating in the reservoir in said housing terminating in the radial bore in said rotatable member constituting the inlet for said pump, means for alternately connecting the outlet and the inlet to the bore by rotation of the second member, fluid pressure operated means operable independently of pressure developed by the pump for moving one of said members to a position where its axis is at one side of the axis of the other member so that when one member is rotated the piston will so cooperate with both members that said members will simultaneously rotate about their respective axes causing the piston to be reciprocated to produce a pumping action without relative movement between the piston and the cylindrical member, and means operated by a predetermined pressure developed by the pumping action of the piston for so acting on the fluid pressure operated means as to cause it to permit the member moved thereby to return to a position where its axis coincides with the axis of the other member.

4. In a pump, a housing having a fluid reservoir, a support in said housing having an opening for a bearing, a first rotatable member comprising a sleeve journaled in the bearing opening of the support and provided at one end with a cylindrical element having an internal cylindrical surface outside the bearing opening and of a larger diameter than the sleeve, a second rotatable member positioned within the cylindrical member provided with a radially positioned bore, means for rotating one of said members, plug means concentrically arranged in said second rotatable member fixed in said housing, said plug having a bore therein connectable with the bore in said second rotatable member constituting the exhaust for the pump, a piston in the bore of said second rotatable member whose outer end is directly engageable with the inner cylindrical surface of said element, said plug having a duct formed therein originating in the reservoir in said housing terminating in the radial bore in said rotatable member constituting the inlet for said pump, means for alternately connecting the outlet and the inlet to said bore by rotation of the second member, fluid pressure operated means operable by fluid pressure independent of that developed by the pump for swinging the support for the cylindrical member on its pivot and to a position where the axis of said cylindrical member is parallel with the axis of the second rotatable member so that when the second member is rotated the piston will be reciprocated in its bore to produce a pumping action, and pump developed fluid pressure means for causing the cylindrical member to assume a position where its axis coincides with the axis of the second member when a predetermined pressure is developed by the operation of the pistons.

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