Aug. 6, 1935. J. HAZLINGER 2,010,761

ROTARY PUMP

Filed May 15, 1934 2 Sheets-Sheet 1

Fig. 1

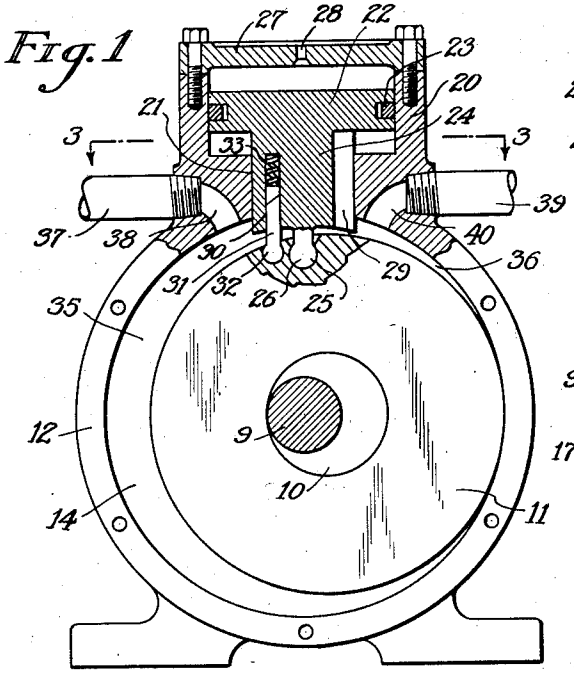


Fig. 2

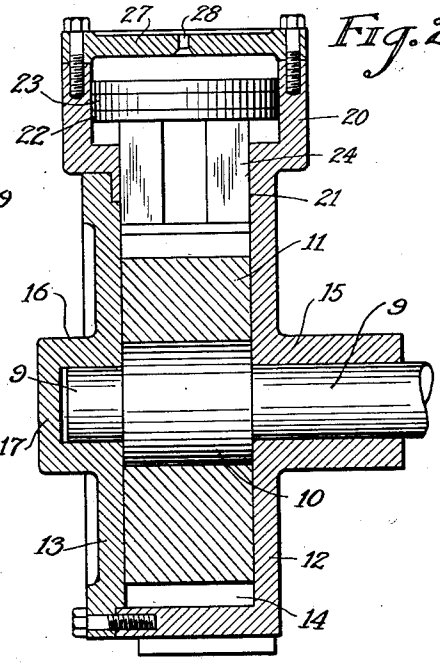


Fig. 4

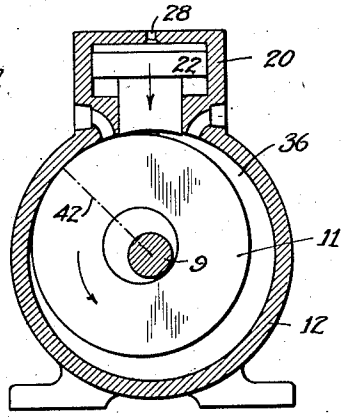


Fig. 6

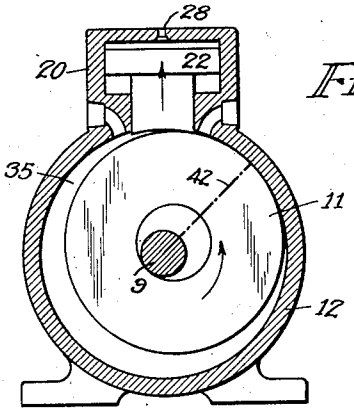
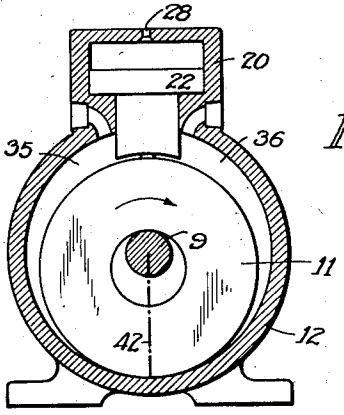


Fig. 5



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Filed May 15, 1934 2 Sheets-Sheet 2

Fig. 3

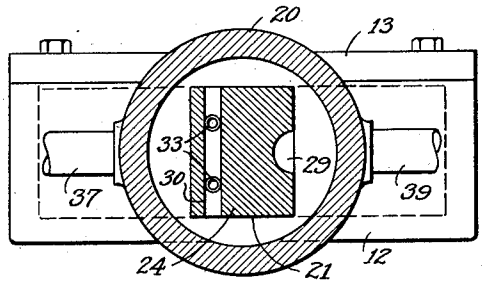
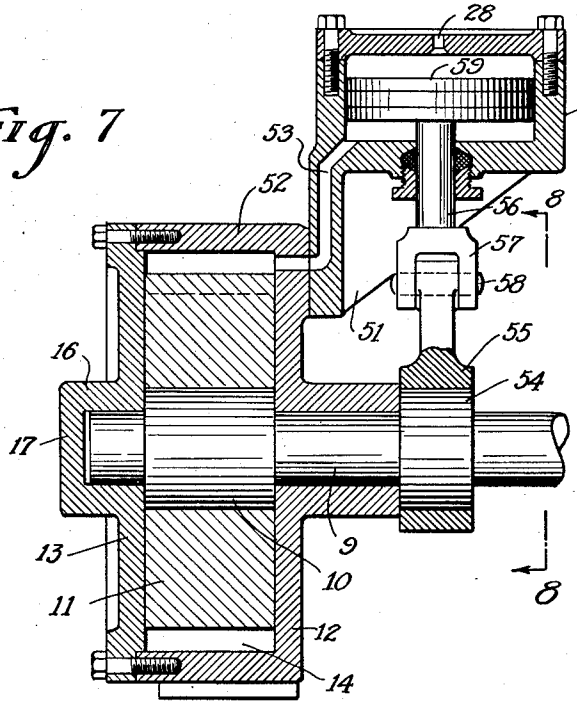


Fig. 7



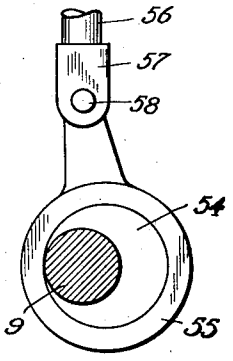


Fig. 8

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UNITED STATES PATENT OFFICE

2,010,761

ROTARY PUMP

John Hazlinger, Middlesex Boro, N. J.

Application May 15, 1934, Serial No. 725,784

1 Claim. (Cl. 103—132)

This invention relates to rotary pumps wherein an eccentrically mounted rotor is revolved within a cylindrical chamber to effect a pumping action.

In the operation of the form of rotary pump heretofore employed the delivered pressure of the pump had a characteristic fluctuation which in many engineering applications is highly objectionable. This pressure fluctuation results from the principle of operation upon which this pump is based.

It is the primary object of my invention to overcome these objections by providing a pump wherein the graphic curve of the resultant pressure delivered by the pump would be substantially a straight line. It is obvious that this improvement would effect certain economies in power consumption in that a pump of this type will require a more even torque.

The invention will be fully and comprehensively understood from a consideration of the following detailed description when read in connection with the accompanying drawings which form part of the application, with the understanding, however, that the improvement is capable of extended application and is not confined to the exact showing of the drawings nor to the precise construction described and, therefore, such changes and modifications may be made therein as do not affect the spirit of the invention nor exceed the scope thereof as expressed in the appended claim.

In describing the invention in detail and the particular physical embodiment illustrating the invention, reference is had to the accompanying drawings wherein like characters of reference designate corresponding parts thruout the several views.

In the drawings:

Fig. 1 is a side elevational view of my device with cover removed and certain parts in section.

Fig. 2 is a central sectional view of Fig. 1.

Fig. 3 is a plan sectional view taken on the line 3—3 of Fig. 1.

Figs. 4, 5 and 6 are diagrammatic views similar to Fig. 1 but illustrating various stages in the cycle of operation.

Fig. 7 is a central sectional view of an alternate arrangement of my device; and

Fig. 8 is a detail view of the piston operating mechanism taken on line 8—8 of Fig. 7.

Referring to Figs. 1 and 2, numeral 9 indicates a pump shaft upon which is formed an eccentric collar 10 which carries an annular piston 11, the collar 10 being rotatable within the piston 11. A casing 12 in conjunction with an end plate 13 forms a cylindrical chamber 14, the interior ends of which are contacted by the circular ends of the piston 11. The most eccentric peripheral point of the piston 11 contacts with the interior cylindrical wall of the chamber 14 to effect a seal between the spaces at either side of the contact line. The casing 12 and the end plate 13 have at their axial centers journals 15 and 16 respectively which rotatably support the shaft 9. The journal 16 is provided with a closure wall 17 at its outer end.

A cylinder 20 is disposed radially from the chamber 14 and beyond the periphery of same. The interior of cylinder 20 and chamber 14 are connected by a rectangular guideway 21. A piston 22, provided with a piston ring 23 to insure the piston's sliding fit in the cylinder 20, transforms into a rectangular sectioned guide 24 at its lower end, said guide being adapted to slide in the guideway 21. The lower end of the guide 24 is provided with a three-quarter circular lateral bead 25 which fits into a like circular sectioned groove 26 proximal to the periphery of the annular piston 11 and in axial alignment to same. The groove 26 and bead 25 provide an operative mechanical connection between annular piston 11 and piston 22 and are adapted to transmit the radial motion of the piston 11 to a reciprocatory motion of the piston 22. The cylinder 20 is provided with a removable cylinder head 27 thru which is formed a breather hole 28 which provides communication between the upper portion of cylinder 20 and the atmosphere so that the upper side of piston 22 is subjected only to atmospheric pressure. Into one side of the guide 24 is formed a vertical groove 29 to provide unrestricted communication between chamber 14 and the lower portion of cylinder 20. A vertical slot 30 is provided in the body of the guide 24 to slidably retain an abutment 31, the lower end of which is arcuately formed to fit into a circular groove 32 cut axially in the periphery of the piston 11. The springs 33 pressing against the abutment 31 hold its lower end in contact. By this construction the chambers on either side of the abutment are isolated from each other.

These chambers are designated by numerals 35 and 36. The chamber 35 is the inlet side of the pump to which is connected an inlet pipe 37 thru the port 38. Chamber 36 is the compression side of the pump to which is connected a delivery pipe 39 thru a port 40.

With reference now to the operation of the pump, attention is directed to Figs. 4, 5 and 6 illustrating the cycle of operation. The pump

shaft 9 is rotated in the clockwise direction indicated by the arrow. The eccentricity of the collar 10 causes the annular piston 11 to revolve in the chamber 14. The piston 11 is prevented from rotating with the eccentric collar 10 by its mechanical connection to the guide 24. This arrangement results in a rolling contact of the periphery of piston 11 against the cylindrical wall of the chamber 14. In describing the detailed operation of the pump a theoretical line 42 is used, which line is projected radially from the axial center of shaft 9 to the contact point of the periphery of piston 11 hereinbefore mentioned. It is to be noted here that because of the resultant rolling action of the piston 11, this contact point moves about the periphery of the piston 11 resulting in an effective seal at this point between the chambers 35 and 36. In Fig. 4 is illustrated the beginning of the cycle, line 42 being at approximately 45° from the dead center. At this stage the piston 22 has just begun to move downwardly, as indicated by its arrow. This motion of the piston 22 continues until the line 42 is on the vertical center line or at dead center. At this point the pump has completed half its cycle and the piston 22 has been moved to its lowermost position. As the piston 11 continues around to complete the latter half of its cycle the piston 22 is being raised to its uppermost position. The revolution of the piston 11 from the position in Fig. 4 to that shown in Fig. 6 constitutes the complete intake or suction operation. The effect of the reciprocatory motion of piston 22 during intake is negligible because of the relative position of abutment 31 and the resultant isolation of chamber 35 from the operation of piston 22.

With reference now to the operation of the pump during its compression stroke, which it will be observed occurs simultaneously with the intake stroke, the chamber 36 has been filled with liquid during the intake stroke. Fig. 4 illustrates the beginning of the compression wherein line 42 is at approximately 45° from the vertical and piston 22 is at its uppermost position. As piston 11 is revolved until line 42 is on lower dead center, Fig. 5, piston 22 is being pulled downwardly. This constitutes half the compression stroke, during which time the chamber 36 is of greater volume than during the remainder of the stroke. The piston 22 moving downwardly accelerates the compression of the liquid by displacing same from cylinder 20. The piston 11 now moves around from dead center to position in Fig. 6 to complete the compression stroke. During this arc of the cycle the piston 22 is being raised, which motion results in the increase of the volume of chamber 36 in that, some of the liquid, being compressed, is pushed into cylinder 20 thru the groove 29. Thus the cooperation of piston 22 with piston 11 effects an acceleration of compression during the first half of the stroke by more rapidly confining the liquid in the compression chamber and further effects a deceleration of the compression during the latter half of the stroke by gradually increasing the volume of chamber 36. By the cooperation of the revolving annular piston 11 with the reciprocating piston 22 it will be found that the fluctuation of the resultant delivered pressure will be at a minimum and that therefore the torsional power required to operate the pump will be substantially uniform thruout the entire cycle.

Referring now to Figs. 7 and 8, a modified arrangement of the reciprocating piston in conjunction with the rotary pump is shown. In this arrangement the rotary pump unit is constructed essentially the same as that illustrated in the first form, Figs. 1 and 2, except that the reciprocating pump unit is remote therefrom. The cylinder 50 of the reciprocating pump is supported on a bracket 51 attached to a casing 52 of the rotary pump. A port 53 formed in the base of bracket 51 provides communication between the lower portion of cylinder 50 and the compression side of the rotary pump. It is to be noted here that this port 53 has the same function in the operation of the entire pump as does groove 29 in the first arrangement. A piston 59 is slidable within cylinder 50 and is affixed to a connecting rod 56, the end of which is formed in a yoke 57. The shaft 9 upon which is integrally formed a collar 10, as described for the first arrangement, has also a similar eccentric collar 54 formed on it. A connecting rod 55 is rotatably mounted on collar 54 and pivotally mounted to the yoke 57 by means of the pin 58 so that a reciprocatory motion of cylinder 59 is imparted thru the connecting rod 55 as generated by the rotation of eccentric collar 54. The detailed operation of this arrangement is identical to that described for the first and more preferred arrangement.

What is claimed as new is:

In a rotary pump, a casing having an inlet and an outlet, an annular piston eccentrically revolvable within said casing, a fluid chamber between said annular piston and said casing, a cylinder the interior of which communicates with the interior of said fluid chamber, and a second piston within said cylinder adapted to be reciprocated by the movement of said annular piston, said reciprocable piston on its upward stroke assisting the upward movement of the annular piston in the last half of the latter's cycle, there being a passageway between a wall of said cylinder and part of said reciprocable piston whereby the latter may force fluid from said cylinder toward said outlet on its compression stroke.

JOHN HAZLINGER.