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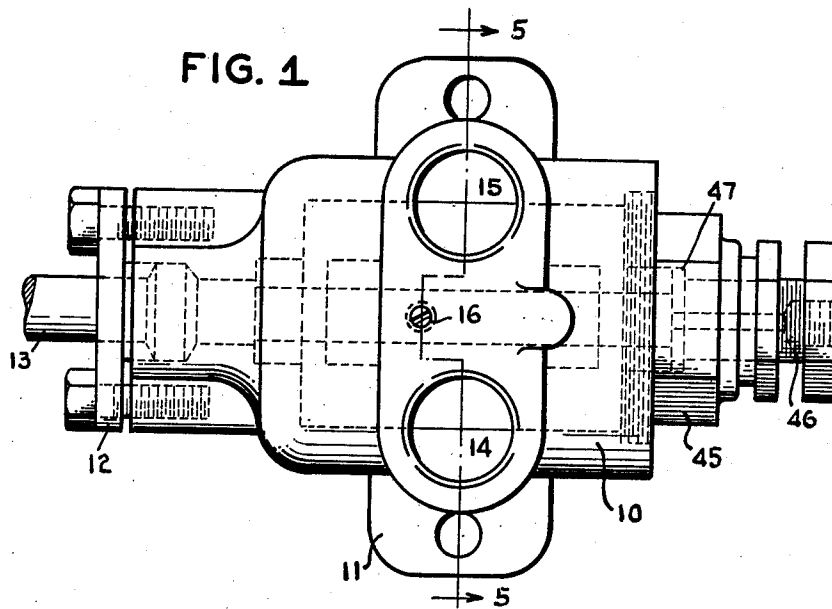
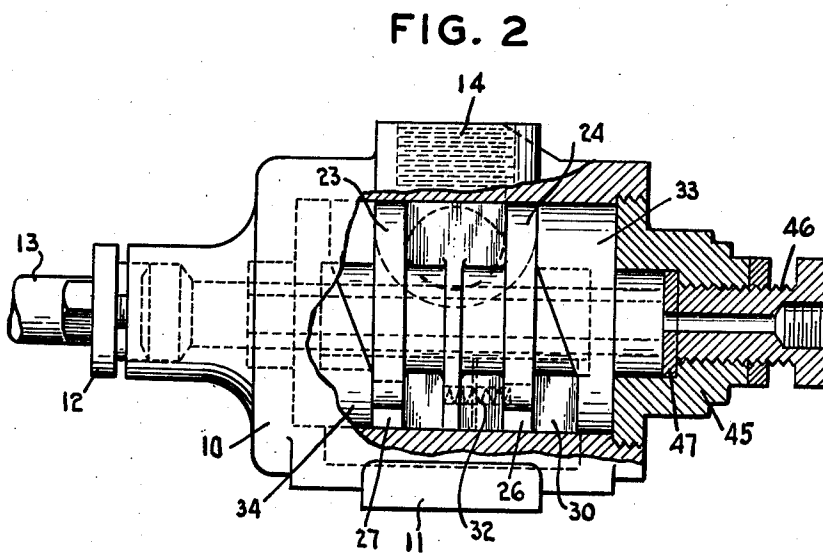
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2,142,867

ROTARY PUMPING APPARATUS

Filed Sept. 3, 1937

2 Sheets-Sheet 1



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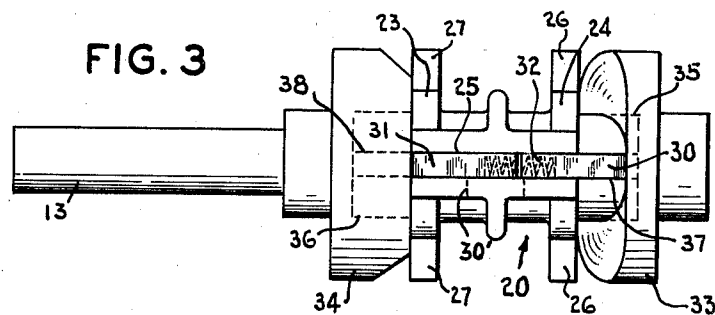
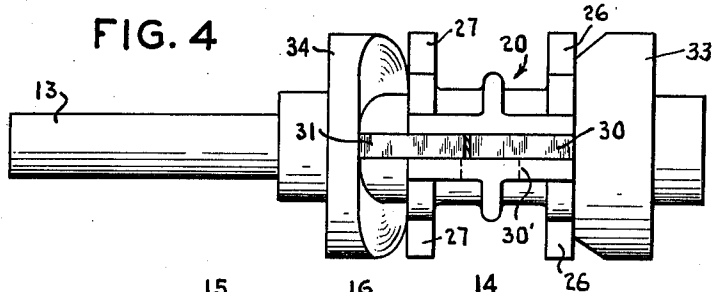
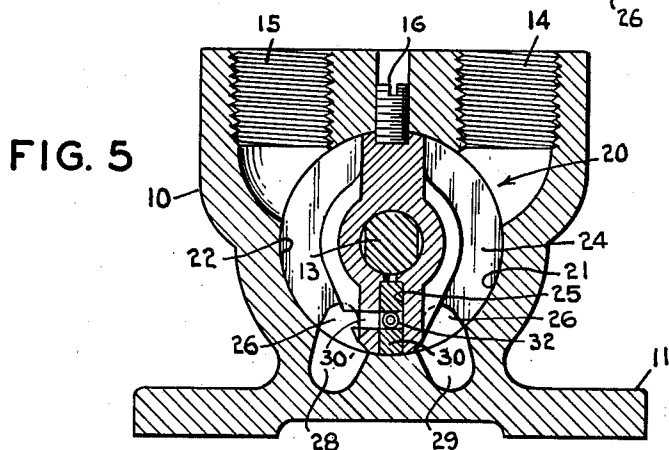
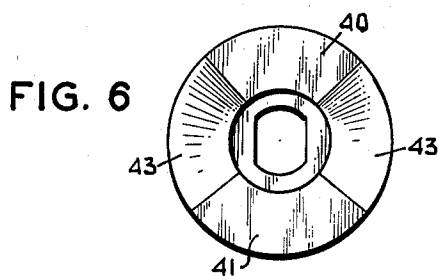
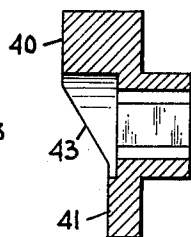
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ROTARY PUMPING APPARATUS

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2 Sheets-Sheet 2



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2,142,867

ROTARY PUMPING APPARATUS

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ton, N. J.

Application September 3, 1937, Serial No. 162,282

5 Claims. (Cl. 103—123)

The invention relates to fluid pressure apparatus for withdrawing and delivering fluids, and more especially to pumping apparatus of the so-called rotary type suitable either for liquids or gases and as a vacuum- or pressure-producing apparatus therefor.

The invention has for an object a novel and simple arrangement of the parts of which the apparatus is composed, whereby exceptionally efficient operation is attained, and whereby also the apparatus may be secured against leakage.

A further object of the invention resides in the provision of means for readily adjusting the parts in the event of any wear thereof.

Still another object of the invention is to provide a simple and readily constructed rotary fluid engine in which the fluid flow may be in either direction; and an apparatus which may be driven at relatively high speed, allowing of connecting the same directly, for example, with an electric motor.

In carrying out the invention, there is fixedly mounted within a suitable casing a hub member having end walls closing a pair of oppositely disposed longitudinal chambers provided in said hub, which chambers communicate with a suitable intake and an outlet respectively provided through the wall of the said casing. The end walls of the hub are provided with pairs of ports, the ports of a pair being disposed upon opposite sides of a longitudinal peripheral way or groove in which is adapted to reciprocate abutment means.

This means is engaged at its opposite ends by rotor members embodying barrel or face cams having a flat portion or lobe in width exceeding the distance between a pair of ports and designed during a period of a cycle to seal off momentarily both of a pair of such ports.

The said cams are rotatably mounted upon bearings projecting axially from opposite ends of the hub, which hub and the bearing are bored through axially to receive a drive shaft upon which the said cams are mounted for rotation thereby. The cams or rotor members, moreover, are arranged with their flat portions disposed 180° apart.

Provision is made, also, suitably to seal the hub and cam elements within the casing and to provide for an axial adjustment thereof as well as of the hub member.

The nature of the invention, however, will best be understood when described in connection with the accompanying drawings, in which:

Fig. 1 is a plan view of the novel apparatus.

Fig. 2 is a side elevation thereof partly in longitudinal section.

Figs. 3 and 4 are underneath views of the hub member and cooperating cams or rotor elements, together with the drive shaft therefor, the respective figures showing the cam elements in two different positions and 180° apart.

Fig. 5 is a transverse section through the apparatus taken on the line 5—5, of Fig. 1 of the drawings, and looking in the direction of the 10 arrows.

Fig. 6 is an end elevation of one of the cams or rotor elements; and Fig. 7 is a longitudinal section thereof.

Referring to the drawings, 10 designates a cylindrical casing integral with or mounted upon a supporting base 11, and sealed at one end by a suitable stuffing box or the like 12 through which enters axially of the casing the drive shaft 13. The opposite end of the casing is sealed in manner hereinafter set forth, and the top of the casing is provided with an inlet 14 and an outlet 15 for respectively receiving and discharging fluid to and from the apparatus, or vice versa.

Fitting tightly within the casing and adjustably secured thereto, as by means of a set screw 16, is a cylindrical hub member 20 having upon opposite sides of its longitudinal axis fluid chambers 21 and 22, respectively, and sealed off by respective end walls 23 and 24 integral with said hub. At the bottom of these walls and upon opposite sides of a peripheral groove or way 25 are respective pairs of ports 26 and 27 which afford outlets or inlets, as the case may be, from a said chamber externally of the hub. To provide for the disposal of any foreign matter passing through the apparatus, as well as to afford a greater cross-sectional area for the ports, grooves 28 and 29 are located in the casing longitudinally thereof and juxtaposed respectively to the ports 26 and 27, connecting the ports at a corresponding side of way 25.

The said groove or way 25 passes also through the end walls 23 and 24 and is designed to receive abutment means comprising preferably a pair of blocks 30 and 31 slidable in the said way and maintained in extended position in being urged longitudinally apart by means of a spring 32 seated in the blocks 30 and 31, and/or by introducing fluid under pressure between said blocks. This may be effected through a slot 30' disposed adjacent the way and communicating therewith in the space between the blocks and also with the pressure chamber of the two fluid 55

chambers, in the present embodiment the chamber 22.

By this expedient, not only will wear be taken up but the two blocks will constantly be urged outwardly beyond the end walls 23 and 24 to engage respective face cams or rotor members 33 and 34, which are rotatably mounted on bearings 35 and 36, respectively, and extending axially from the said hub member. These bearings are bored through axially, as well as the hub member, to receive the drive shaft 13 to which the cams or rotor members are fixed for rotation thereby, as by squaring the inner portion of said shaft or otherwise keying the said members thereto. Moreover, they may be peripherally grooved longitudinally as at 37 and 38 to seat and steady the respective blocks 30 and 31.

As shown more particularly in Figs. 6 and 7, these cams or rotor members comprise a flat rise or lobe 40 of uniform pitch and of a width somewhat greater than the distance between the two ports of a pair, so that when said lobe 40 passes over this portion of an end wall, both ports will momentarily be completely sealed from the chambers 21 and 22.

Disposed substantially 180° from this portion 40 is a similar portion 41 of width equal to said portion 40 plus the width of the abutment, but displaced axially from portion 40 and connected with the former by a wall 43 of the desired pitch for the volume required.

By substituting differently pitched cams, various volumes or pump capacities are attainable with a given casing and hub.

The respective blocks of the abutment means at their corresponding outer ends are adapted to engage with the faces of the two cams or rotor members as these are rotated; and the said blocks will thus be reciprocated back and forth parallel to the axis of rotation of the drive shaft and will seal one chamber with its port connection from the other with its port connection, a sub-chamber being afforded by a cam element at one side of the abutment means and increasing in volume by the retreating lobe for drawing in fluid and a further sub-chamber upon the opposite side of decreasing volume for compressing the same for delivery into the other chamber through its corresponding port. A similar operation occurs at the opposite end of the hub, but with the cycle lagging 180° behind that of the former. This double action materially reduces pulsations in the delivered fluid.

In mounting the various parts in the casing, the one end of the hub, or rather its bearing 36, shoulders more or less in the said casing while at the other end the casing is closed by means of a nut 45 threaded therein, preferably with a left-hand thread; and into this nut is threaded, preferably with a right-hand thread, a take-up plug 46. This plug at its inner end is adapted to engage the corresponding cam 33 at that end, or rather an intermediate thrust washer 47, so that by taking up on the said plug any wear of the moving parts may readily be accommodated.

As hereinbefore set forth, the other end of the casing is sealed by means of the stuffing box 12.

By introducing fluid under pressure to the apparatus hereinbefore described, it will be apparent that the same may be operated as a motor, rather than as a motor-driven pump.

I claim:

1. Rotary apparatus of the class described, comprising a casing provided with an inlet and an outlet, a hub member fixed therein and having

end walls closing a pair of oppositely disposed longitudinal chambers of said hub, the chambers communicating respectively with said inlet and said outlet, means to seal the ends of said casing, a drive shaft mounted in said hub, a peripheral way extending longitudinally of the hub and end walls, abutment means slidably mounted therein and adapted to extend alternatively beyond the corresponding end walls, peripheral ports being provided through said end walls upon opposite sides of said abutment means and a pair of longitudinal grooves in the inner wall of the casing upon opposite sides of the said abutment means with the ends of a groove juxtaposed to the corresponding ports, and face cams mounted to rotate with said shaft, the respective faces of the cams being adapted to engage with said abutment means and having a sealing portion abutting the corresponding end walls of the hub member and of a width sufficient to cover both of the ports of a said end wall.

2. Rotary apparatus of the class described, comprising a casing provided with an inlet and an outlet, a hub member fixed therein and having end walls closing a pair of oppositely disposed longitudinal chambers of said hub, the chambers communicating respectively with said inlet and said outlet, a drive shaft mounted in said hub, a peripheral way extending longitudinally of the hub and end walls, abutment means slidably mounted therein and adapted to extend alternatively beyond the corresponding end walls, ports being provided through said end walls upon opposite sides of said abutment means, face cams mounted to rotate with said shaft, the respective faces of the cams being adapted to engage with said abutment means and having a sealing portion abutting the corresponding end walls of the hub member and of a width sufficient to cover both of the ports of a said end wall, and means sealing the ends of the casing, and including an axially adjustable element adapted to abut one of the cams and extending externally of the casing at one end, the face of the other cam opposite its cam face abutting the other end of the casing.

3. Rotary apparatus of the class described, comprising a casing provided with an inlet and an outlet, a hub member fixed therein having a bearing surface extending longitudinally at each end thereof and having end walls closing a pair of oppositely disposed longitudinal chambers of said hub, the chambers communicating respectively with said inlet and said outlet, a drive shaft mounted in said hub, a peripheral way extending longitudinally of the hub and end walls, abutment means slidably mounted therein and adapted to extend alternatively beyond the corresponding end walls, ports being provided through said end walls upon opposite sides of said abutment means, and face cams mounted to rotate with said shaft on the said bearing surfaces, the respective faces of the cams being adapted to engage with said abutment means and having a sealing portion abutting the corresponding end walls of the hub member and of a width sufficient to cover both of the ports of a said end wall, a nut threaded in one direction into the casing axially thereof at one end, and a take-up plug threaded into the nut in the opposite direction, its inner end adapted to abut the corresponding cam the face of the other cam opposite its cam face abutting the end of the casing.

4. Rotary apparatus of the class described, comprising a casing provided with an inlet and an outlet, a hub member fixed therein having a bear-

ing surface extending longitudinally at each end thereof and having end walls closing a pair of oppositely disposed longitudinal chambers of said hub, the chambers communicating respectively
5 with said inlet and said outlet, a drive shaft mounted in said hub, a peripheral way extending longitudinally of the hub and end walls, abutment means slidably mounted therein and adapted to extend alternatively beyond the corresponding
10 end walls, ports being provided through said end walls upon opposite sides of said abutment means, and face cams mounted to rotate with said shaft on the said bearing surfaces, the respective
15 faces of the cams being adapted to engage with said abutment means and having a sealing portion abutting the corresponding end walls of the hub member and of a width sufficient to cover both of the ports of a said end wall, a nut threaded
20 in one direction into the casing axially thereof at one end, a take-up plug threaded into the nut in the opposite direction, and a thrust washer intermediate the cam and the inner end of the

take-up plug the face of the other cam opposite its cam face abutting the end of the casing.

5. Rotary apparatus of the class described, comprising a casing provided with an inlet and an outlet, a hub member fixed therein having an
5 end wall and affording oppositely disposed longitudinal chambers communicating respectively with said inlet and said outlet, means to seal the ends of said casing, a drive shaft mounted in said
10 hub, a peripheral way extending longitudinally of the hub and end wall, abutment means slidably mounted therein, peripheral ports being provided in the end wall upon opposite sides of said abutment
15 and a pair of grooves in the inner wall of the casing upon opposite sides of the said abutment means with the ends of a groove juxtaposed to the corresponding ports, and a face cam
20 mounted to rotate with said shaft to engage with said abutment and having a sealing portion abutting the end wall of the hub member and of a width sufficient to cover both of the ports of said end wall.

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