Jan. 10, 1961 A. F. GRAF VON SODEN 2,967,490

ROTARY PUMP AND THE LIKE

Filed Oct. 29, 1957 2 Sheets-Sheet 1

Fig. 1.

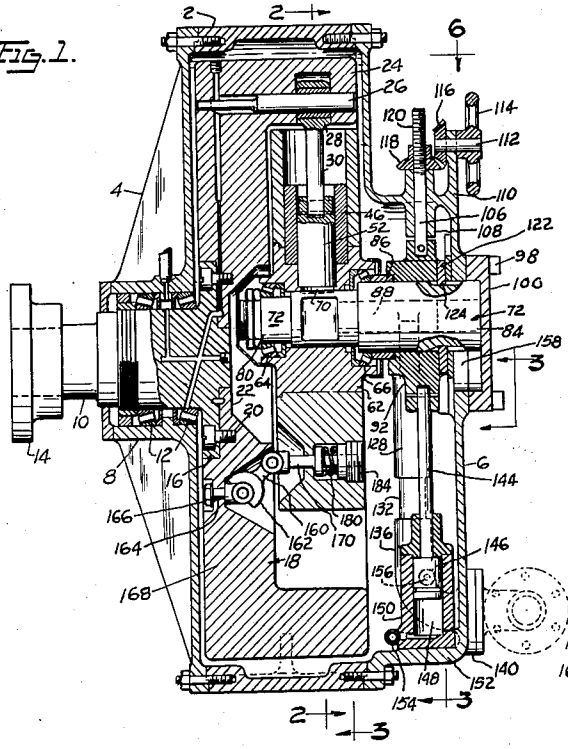


Fig. 6.

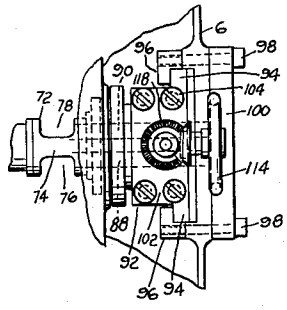


Fig. 5.

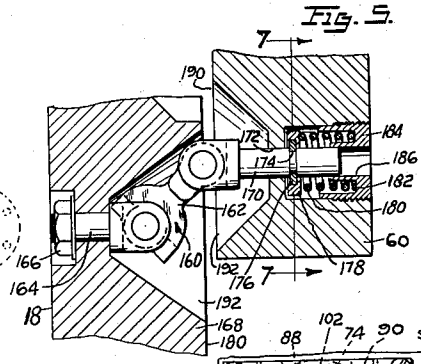


Fig. 3.

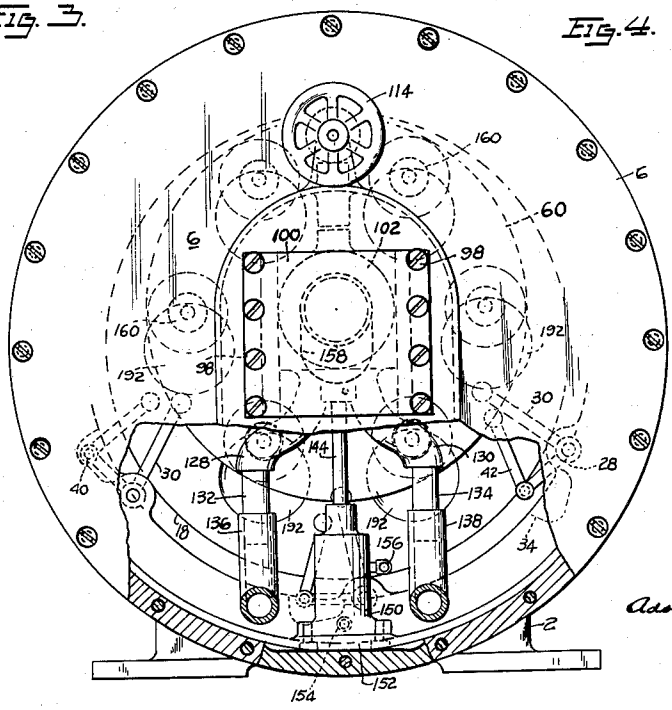
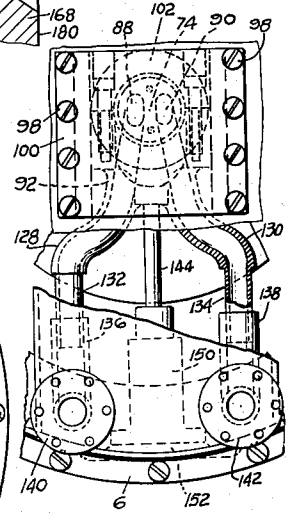


Fig. 4.



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Adolph F. Graf von Soden

Jan. 10, 1961 A. F. GRAF VON SODEN 2,967,490

ROTARY PUMP AND THE LIKE

Filed Oct. 29, 1957 2 Sheets-Sheet 2

Fig. 2.

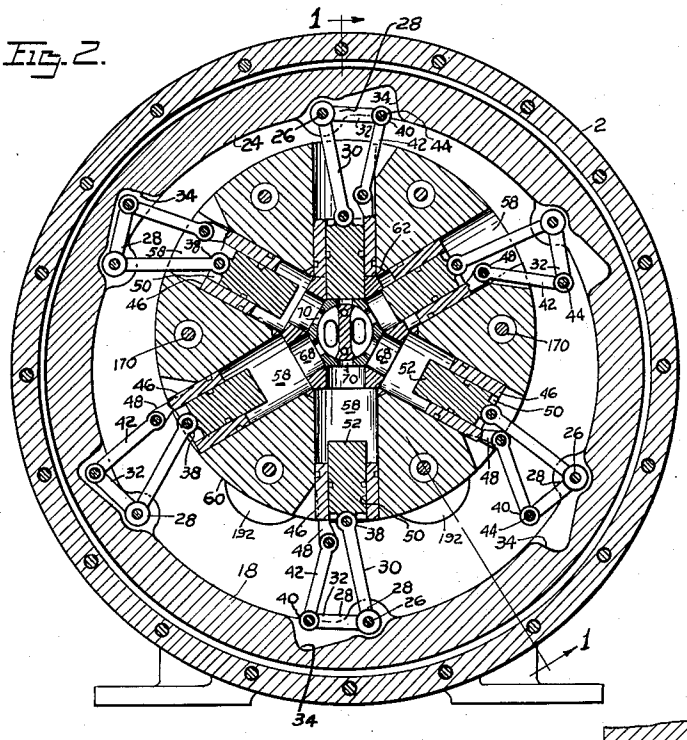


Fig. 7.

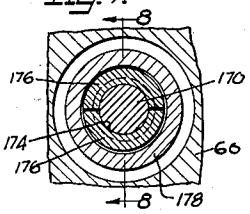


Fig. 8.

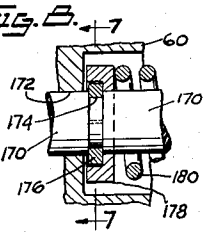


Fig. 9.

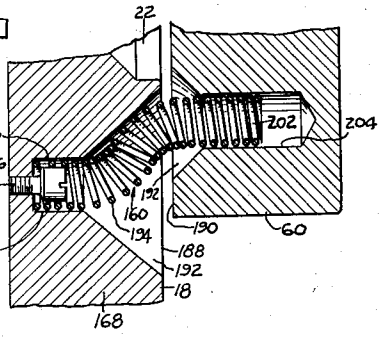


Fig. 10.

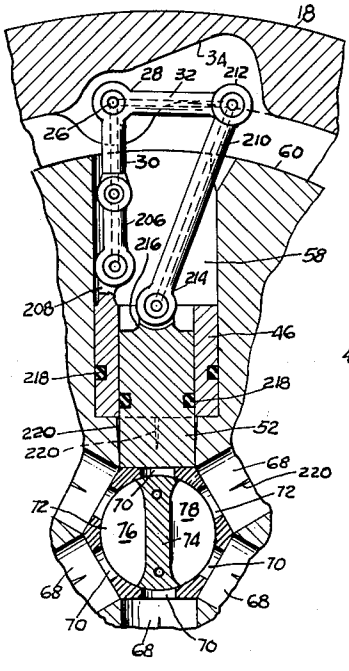
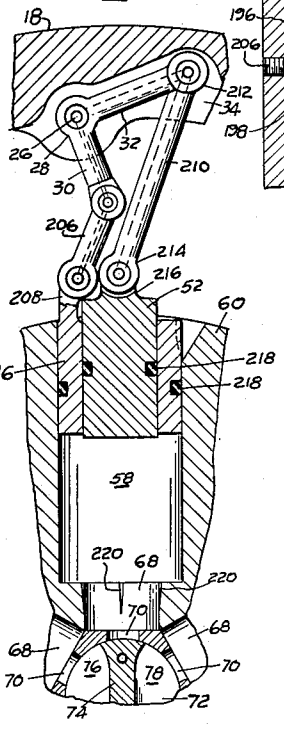


Fig. 11.



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2,967,490

# ROTARY PUMP AND THE LIKE

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Filed Oct. 29, 1957, Ser. No. 693,078

6 Claims. (Cl. 103—161)

My invention relates to rotary pumps, such as fluid compression and discharge units and vacuum producing units, and more particularly to rotary devices for providing high vacuum and high fluid pressures.

An object of my invention is to provide said rotary unit with a cylinder block and a fly wheel, each being rotatably and independently mounted of the other, said cylinder block having off-center controlling means for adjusting and for holding same in an off center position with respect to the center position of said fly wheel, also having a set of suitably arranged and specially constructed connecting rods, each of which being provided with a piston and a plunger, which are slidably mounted in their respective cylinders of said cylinder block, for securing high vacuum and high fluid pressures, when said unit is in operation.

Another object of my invention is to provide said rotary unit with a reaction stabilizing means for maintaining relative rotation of the cylinder block with respect to the fly wheel, said means being self-aligned and self-adjustable in relation to any variable off center position of said cylinder block.

A further object of my invention is to provide means in said self-aligning and self-adjustable reaction stabilizing units which will allow an easy and a readily access for servicing of the parts involved, also assuring high accuracy of the alignment of said reaction stabilizing units with respect to the fly wheel, when said rotary unit is in operation and under variable vacuum or fluid pressure producing condition.

A further object of my invention is to provide said rotary unit with a pair of adjustable passages for the fluid intake and discharge, each having a fixed intake and outlet position, so that conventional and standard pipe connections may be employed, when in use.

My invention also has for its objects to provide such means that are positive in operation, convenient in use, easily installed in a working position and easily disconnected therefrom, economical in manufacture, relatively simple, and of general superiority and serviceability.

Other and further objects and advantages of my invention as will hereinafter more fully appear, I attain by the construction herein shown on the drawings and described in the specification, forming a part of my application.

Reference is had to the accompanying drawings, in which the similar characters denote the same parts.

In the drawings;

Fig. 1 shows a vertically sectional view of the rotary unit or apparatus, taken on the line 1—1 of the Fig. 2.

Fig. 2 shows a vertically sectional view of the rotary unit, taken on the line 2—2 of the Fig. 1.

Fig. 3 shows a partly elevational and partly sectional view of the apparatus, taken in the direction of the arrows 3—3 of Fig. 1.

Fig. 4 shows a fragmentary elevational and partly fragmentary view of the intake and discharge passages of the apparatus.



Fig. 5 shows a reaction stabilizing unit in an enlarged form, taken in the same position as disclosed in Fig. 1.

Fig. 6 shows a top view of the off-center position adjusting apparatus, taken from the top of Fig. 1, and in the direction of the arrow 6.

Fig. 7 shows a fragmentary sectional view of the pin assembly, a part of the reaction stabilizing unit, taken in the direction of arrows 7—7 of Fig. 5.

Fig. 8 shows a fragmentary sectional view of the pin assembly, taken on the line 8—8 of Fig. 7.

Fig. 9 shows a sectional view of the reaction stabilizing unit, in modified form.

Fig. 10 shows a fragmentary sectional view of the piston rod, crank lever and plunger member in relation to the piston, disposed in cylinder of the cylinder block, showing same when in downward position, the structure being shown in modified form.

Fig. 11 shows a fragmentary sectional view of the component parts disclosed in Fig. 10, showing the piston and the relative position of the plunger, when in their uppermost position within the cylinder of said cylinder block.

Describing my invention more in detail, in its broader aspects, said invention comprises a housing 2 having a back plate member 4 and also having a suitable front cover member 6.

Said back plate 4 is provided with a suitable bearing housing 8 wherein a suitable shaft 10 is mounted and held in rotatable position by means of bearings 12, the outermost end of said shaft having a flanged coupling 14 mounted thereon, while the inwardly extending end thereof is provided with a mounting flange 16, upon which the fly wheel 18 is mounted and held in place by means of bolts or screws 20.

The center section of said fly wheel 18 is provided with a recess 22, while the fly wheel rim section 24 is provided with a set of crank pins 26, each of which is adapted for holding suitable crank members 28 in a pivotable position. Each of said crank members 28 is provided with a downwardly extending crank rod 30 including an outwardly extending lever member 32, see Fig. 2. Suitable recess sections 34 are provided in said rim section 24 of said fly wheel for receiving therein said crank members 28 and said extended lever member 32, as shown.

It may be noted, that said crank rod 30 and said lever member 32 are disposed at a suitable positional angle, so that a desired crank action may be had between the crank rod end 38 and the crank rod lever end 40, when in motion and operation.

The extended end of said lever member 32 is connected to a suitable link rod member 42 by means of a suitable pin 44, while the extended end of said link rod member 42 is connected to a piston member 46 which is provided with a yoke 48 extending upwardly, as shown. The center section of said piston member 46 is provided with a suitable cylindrical passage 50 adapted for receiving therein a plunger member 52, the upper end of which is pivotally connected by means of a suitable pin to said crank rod end section 38 of said crank rod member 30, as shown.

As shown in the drawings, there are six pistons and six plungers in the apparatus, however, it may be noted that any number of pistons with plungers, or pistons alone or in an alternate position may be used.

Said pistons 46 are each slidably mounted within their respective cylinders 58 which are disposed in a cylinder block 60, said cylinders converging toward the center and terminating at a bearing block member 62, wherein a set of suitable bearings 64 and 66 are positioned, see Fig. 1, while each piston cylinder 52 is provided with a fluid communicating passage 68, and each leading into a

centrally positioned passage or entrance **70**, as shown, in Figs. 2 and 10.

Within a close proximity of said entrances **70** a suitable shaft member **72** is mounted, which is supported by said bearings **64** and **66**, said shaft having a central divisional section **74** adapted for forming side passages **76** and **78**, as shown in Figs. 2, 6 and 10, the inwardly extending shaft end **80** being provided with lock nuts for holding said shaft and the respective bearings in place, see Fig. 1, while the outwardly extending shaft end **84** is provided with a collar member **86** adapted for holding bearing **66** in place and position.

Said extending end **84** of said shaft member **72** is provided with a pair of passages **88** and **90**, which extend longitudinally and connect said side passages **76** and **78** respectively, as shown in Figs. 4 and 6.

At the extended shaft end **84** and over said passages **88** and **90** is positioned a suitable bearing block member **92**, said block having a pair of side slide bars **94** adapted for slidably mounting said block member **92** upon the inner slideway of said front cover **6**, said block being held in place and in said slideway by means of a pair of clamps **96**, which are held in place by means of screws **98**. Said screws **98** extend outwardly, passing through and to the outer side of said front cover member **6**, the outer surface being provided with a suitable enclosure or plate **100**, which is held in place and position by means of said screws **98** and which are also holding said clamps **96** in place, as shown.

The bearing block member **92** is provided with a cap member **102** which is held in place by means of screws **104**, said cap member having a position controlling rod **106** extending upwardly and the extended end of which being slidably mounted in a suitable boss **108** disposed upon the upper section of said front cover **6**. Said upper section of said cover member **6** having a suitable bracket **110** adapted for mounting therein a pinion shaft **112**, the outer end of which being provided with a control hand wheel **114**, while the inner end of said shaft **112** having a mitre gear **116** is held in mesh with a companion mitre gear **118** and secured upon the threaded end **120** of said extended rod **106**.

In order to hold said extended end **84** of said shaft member **72** in position and for preventing same from turning, a suitable plate **122** is provided between said bearing block member **92** and said inner slideway section of said cover **6**, said plate having a pair of keys **124** extending into said shaft member **72**, as shown in Fig. 1.

The lower section of said bearing block member **92** is provided with a pair of outwardly and downwardly extending tubular passages **128** and **130** adapted for interconnecting side passages **88** and **90** in said shaft member **72**, each tubular passage being provided with pipe ends **132** and **134** each being slidably disposed within their respective pipe extensions **136** and **138** and terminating with an outwardly positioned pipe mounting flanges **140** and **142**, respectively.

The lower-most center portion of said bearing block member **92** is provided with a downwardly extending stabilizing rod **144**, having its end connected to a suitable piston **146**, said piston being slidably disposed within a cylinder **148** of the hydraulic housing **150**, and which is mounted upon the bottom plate **152** of said cover member **6**.

Said cylinder **148** is provided with suitable hydraulic pipe connections **154** and **156**, so that the actuation of said piston **146** may be facilitated.

The extended end **84** of said shaft **72** is slidably mounted in a longitudinally positioned slot or passage **158**, which is disposed in said cover member **6**, said slot extending into said enclosure or plate **100**, so that the upward and downward movement of said shaft member **72** including said cylinder block member **60** may be had.

It may then be noted, that said stabilizing rod **144** supported by said hydraulic piston within said cylinder member **148** may be used for controlling the upward and the downward position of said shaft member **72**, including said cylinder block member **60**, with respect to the central position of said fly wheel **18**, by supplying said cylinder member **148** with suitable hydraulic fluid under pressure, and, as an alternate condition, said hand wheel **114** may be used effectively for lowering and elevating said shaft member **72** together with said cylinder block member **60**, and thereby either extending or shortening the stroke of the piston members **46** including said plunger members **52**, when the apparatus is at rest or when said fly wheel **18** and said cylinder block member **60** are in rotation and operation.

A power, such as an electric motor (not shown) may be applied to the apparatus through said shaft member **10**, so that pumping of fluid or desired vacuum may be had, or, a fluid under pressure may be supplied through one of said pipe extensions **136** or **138**, then passing to the cylinders **58** for actuating said pistons and said plungers, thus causing said shaft member **10** to turn, and thereby providing a desired motive power by means of said apparatus.

It may also be noted, that by reversing the fluid flow through said pipe extensions **136** or **138** and the respective passages **88** and **90**, said cylinder block member **60** and said fly wheel **18** together with said shaft member **10**, will turn in a desired direction, and that the fluid flow, while directed into said cylinders **58**, may be reversed from one to the other of said passages **88** and **90**, and almost instantaneously and with equal effect said fly wheel **18** and the shaft member **10** will reverse the rotation of the apparatus, as required.

A set of reaction stabilizing units **160** are provided in the apparatus for maintaining relative rotation of said cylinder block member **60** with respect to said fly wheel **18**, said stabilizing units being in form of suitably constructed pivotal members or unit connections **162**, having one end thereof firmly mounted and in a fixed position as at **164**, being held in place by means of a suitable fastening member **166**.

The mounting of said units **160** may, if so desired, be at the fly wheel flange section **168** of said fly wheel **18**, as shown in Figs. 1, 5 and 9, or, be mounted in the body of said cylinder block member **60**, or, said stabilizing units **160** may be slidably mounted in the respective members, if so desired, for providing the required result.

The pin end **170** of said unit connection **162** is extended into and slidably positioned within a bearing hole **172**, disposed in said cylinder block member **60**, said pin end **170** being provided with a circular groove **174** wherein a split washer or collar **176** is placed, see Figs. 7 and 8, and which is held in place by means of a suitable retaining washer **178**, having a recess section for retaining therein said split collar **176**, as shown. For maintaining said retaining washer **178** in place and position, a compression spring **180** is provided over said pin end **170**, one end of said spring bearing against said retaining washer **178** while the other end of said spring is disposed within suitable recess **182** of a mounting member or plug **184**, having a central hole or aperture **186** for receiving therein said extended pin end **170**, as shown in Fig. 5.

Whenever said cylinder block member **60** is adjusted or placed into an off-center position with respect to the central position of said fly wheel **18**, each of said unit connections **162** will also adjust themselves to a required off-center position or distance, thus supporting said cylinder block member **60** in a stabilized and a relative rotatable position, during the operation of said apparatus.

In order to provide free rotation of said connections **162** and around the fixed position as shown at **164**, the adjacent surfaces area **188** and **190** of the fly wheel flange section and said cylinder block **60** respectively, are each provided with a conically or suitably shaped clearance

openings 192, so that when said cylinder block and fly wheel are in an off-center position, a sufficient clearance for said unit connections 162 may be had, as shown in Fig. 5.

In Fig. 9 a modified structure of the stabilizing unit 160 is shown, wherein a suitable resilient member 194, such as a suitably coiled spring, nylon or rubberized plug or tubular member or the like, may be used, of which the end section 196 is held within a socket 198 by means of a screw 200, for preventing said resilient member from slipping out of its place.

It may be noted however, that when the end section 196 of said resilient member 194 is free to twist in said socket 198, it does not prevent the operation of the stabilizing unit, excepting that when one end of said resilient member is fastened and firmly held in place, the friction and binding of the free end thereof is eliminated.

The free end 202 of said resilient member 194 is freely disposed within a suitable socket 204 of said cylinder block 60, so that said free end may slide and twist freely therein, when said fly wheel and said cylinder block are in rotation.

In Figs. 10 and 11, the operative position of said piston and the plunger members are shown in modified form, disclosing said piston member 46 and said plunger member 52 in their extreme downwardly depressed position, as shown in Fig. 10, while the Fig. 11 shows said piston member 46 and said plunger 52 in their extreme uppermost positions, exposing the cylinder chamber 58 and the communicating passage 68 with said fluid entrance 70, which is disposed in close proximity to the shaft member 72 and the respective fluid passages 76 and 78.

Unlike the design and construction shown in Fig. 1 and Fig. 2, the crank member 28, as shown in Figs. 10 and 11, is provided with a short crank rod 30, having a suitable link member 206 pivotally connected thereto, while the end of said link member being connected to a yoke extension 208, which extends from said piston member 46.

The lever member 32 of said crank member 28 is provided with a suitable plunger lever 210, one end of which connects with the extended end 212 of said lever member 32, while the downwardly extending end 214 connects with the plunger yoke 216 of the plunger member 52.

Said pistons 46 and said plunger members 52 are each provided with a set of suitable compression retaining rings 218, also, said fluid entrances 70 of the cylinder chamber and said passages associated therewith, are each provided with a set of downwardly extending grooves 220, which are for preventing fluid back pressures, when said piston members 46 and said plunger members 52 are reaching their maximum downward stroke.

While I have thus described my invention with great particularity, it will be clear that the same may be modified throughout a wide range.

I accordingly do not propose to be limited to the exact details of construction herein shown on the drawings and described in the specification, but reserve the rights in practice to make the necessary changes and modifications therein, which may come within the scope of the appended claims.

I claim as my invention:

1. In the apparatus of the class described comprising in combination with a rotary pump unit, a housing having a back plate member and a front cover member, a fly wheel and a cylinder block rotatably mounted in said housing and each mounted independently of the other, a rim section in said fly wheel, a plurality of crank pins mounted in an equidistant position in said fly wheel rim section, a crank member pivotally mounted on each crank pin, said crank member having a crank rod extending toward the center of said fly wheel and terminating with a crank rod end and also having a lever member extending angularly therefrom and terminating with a crank rod lever end, a link rod member pivotally connected to each crank rod lever end, a plurality of cylinders centripetally positioned in said cylinder block, a piston member in each cylinder having a yoke for pivotally connecting the extended end of each link rod member, a cylindrical passage longitudinally extending through said piston member, a plunger member in said cylindrical passage of each piston member and slidably positioned therein and pivotally connecting said crank rod end of each crank rod, a shaft connected to said fly wheel extending outwardly therefrom and rotatably mounted in a bearing housing of said back plate member, an independent shaft member for holding said cylinder block in rotatable position and having an outwardly extending end passing through said front cover member, an adjusting means in said front cover member of said housing for holding said outwardly extending end of said shaft member including said cylinder block in an off-center position with respect to the center of said fly wheel, a set of stabilizing means in said fly wheel and extending into said cylinder block for providing a stabilized rotatable position therebetween and for providing a relative rotation action of said cylinder block with respect to said fly wheel, during the operation of said apparatus.

2. In a stabilizer of the class described and connected to the fly wheel and the cylinder block of the apparatus, comprising, a set of sockets disposed in equidistance and diametrically opposite position in the web of said fly wheel, a set of passages disposed in equidistance in the cylinder block and in diametrically opposite positions with relation to said set of sockets, and resilient means disposed in each of said set of sockets and passages, combination of said fly wheel and cylinder block for stabilizing their rotative positions and for preventing relative rotation of said cylinder block with respect to said fly wheel of the apparatus.

3. In the apparatus of the class described comprising the combination with a rotary pump unit, a housing having a back plate member and a front cover member, a fly wheel rotatably mounted in said housing, a cylinder block independently mounted in close proximity to said fly wheel and rotatably positioned within said housing, a plurality of crank pins mounted in an equidistant position at the rim section of said fly wheel, a crank member pivotally mounted on each crank pin and having a crank rod extending toward the center of said fly wheel, a lever member extending angularly from said crank member, a link member pivotally connected to the extended end of said lever member, a plurality of piston members each having a cylindrical passage extending therethrough and each being connected to the respective connecting link rod member, a plurality of plunger members each slidably mounted in the respective cylindrical passage of said piston members and each connecting the respective extended end of said crank rod, a cylinder block shaft member adjustably secured to said front cover member of said housing and having the inwardly extending shaft end terminating in close proximity to said fly wheel and for holding said cylinder block member in a rotatable position therein, a pair of side passage openings at the inwardly extending shaft end disposed in an adjacent position to the respective entrances of each cylinder in said cylinder block member, a longitudinally extending inlet and outlet passages communicating with the respective side passage openings in said cylinder block shaft member, a slidable inlet and outlet tubular passages disposed inwardly of said front cover member and communicating with the respective inlet and outlet passages in said shaft and also terminating with the respective pipe mounting flanges at the outward side of said front cover member, a bearing block member secured on said outwardly extended shaft end of said cylinder block shaft

member and having passages for interconnecting said longitudinally extending inlet and outlet passages in said shaft including said inlet and outlet tubular passages in said front cover member, an off-center adjustable means connecting said bearing block member of said extended shaft end and slidably mounted at the inner side of said front cover member for providing a variably adjustable stroke for said piston members including said plunger members in said cylinder block member, and stabilizing means in said fly wheel and connecting said cylinder block member thereby providing a stabilized and a relative rotation action for said cylinder block member with respect to said fly wheel and when said rotary pump unit is in motion.

4. In the apparatus of the class described comprising, a housing having a front cover member and a back plate member, a rotatably mounted shaft in said back plate member, a fly wheel mounted on said shaft and disposed within said housing, a rim in said fly wheel having a plurality of recess sections, a crank pin mounted in each of said recessed sections and spaced in equidistant positions in said rim of said fly wheel, a crank member pivotally mounted on each of said crank pins, each crank member having a crank rod extending downwardly and a lever member extending angularly therefrom, a link rod member pivotally connected to each extended end of said lever member, a piston member connected to the extended end of each link rod member, a cylindrical passage in each of said piston members, a plunger member connected to each extended end of said crank rod and slidably mounted in the respective cylindrical passage of said piston, a cylinder block member rotatably disposed and in close proximity to said fly wheel, a plurality of cylinders centripetally positioned in said cylinder block member for receiving therein each piston and plunger members, a cylinder block shaft member having an outwardly extended end adjustably mounted at said front cover member and also extending into said housing for holding said cylinder block member in a rotatable position, a pair of side passages at the inwardly extending shaft end for interconnecting each of said cylinders, a bearing block member slidably mounted at the internal side of said front cover member for holding said cylinder block shaft member in a slidably adjustable position, a longitudinally positioned inlet and outlet passages in said cylinder block shaft member for communicating with said pair of side passages, a pair of pipe ends connected to and slidably mounted in the respective pipe extensions of said bearing block member for interconnecting said longitudinal inlet and outlet passages and terminating at the pipe mounting flanges outwardly of said front cover member, an elevating and depressing means connected to said bearing block member and mounted on said front cover member for holding said cylinder block member in an off-center position and with respect to the center position of said fly wheel and thereby controlling the stroke length of said piston and plunger members, and stabilizing means disposed in said fly wheel and extending into said cylinder block member for stabilizing and for providing a relative rotation action of said cylinder block member with respect to said fly wheel during the rotation thereof.

5. In the apparatus of the class described, in combination with a rotary pump unit comprising, a housing having a back plate member and a front cover member, a fly wheel having a shaft extending into said back plate member and rotatably mounted therein, a sidewardly extending rim section in said fly wheel and disposed within said housing, a cylinder block member disposed within said rim section of said fly wheel, a plurality of cylinders in said cylinder block member, a bearing block in said cylinder block member having a plurality of passages interconnecting said cylinders therein, a piston member slidably mounted in each cylinder and each piston member having a cylindrical passage therein, a plunger member slidably mounted in said cylindrical passage of each piston member, a plurality of recessed sections in said rim section of said fly wheel disposed at the rim internal side and in juxtaposition to the peripheral outer surface of said cylinder block member, a crank pin in each recessed section positioned transversely of said recessed section and extending through said rim, a crank member mounted on said crank pin and having a downwardly extending crank rod connected to said plunger member, a lever member angularly extending from said crank rod and extending into said recessed section of said rim section, a link rod member pivotally mounted at one end to said lever member and the other end thereof connecting said piston member, a shaft member rotatably mounted in said bearing block of said cylinder block member and adjustably positioned in said front cover member with respect to said fly wheel for providing a reciprocal action for each piston member including each plunger member and for providing each plunger member with a longer stroke which is supported by the pivotal action of said lever member, and means in said front cover member for holding said shaft member including said cylinder block member in a variably adjustable off-center position when said apparatus is in rotatable motion.

6. The combination of elements as disclosed in claim 5, including a pair of side passages in said cylinder block shaft member for interconnecting said passages in said bearing block including said cylinders in said cylinder block member, inlet and outlet passages extending longitudinally through said shaft member for connecting at one end with said pair of side passages and the other end of said longitudinal passages terminating at the outwardly extending end thereof, a pair of tubular passages communicating with said longitudinal passages at said extended end of said shaft member extending downwardly therefrom and terminating with a pair of pipe ends, a pair of pipe extensions slidably mounted and connecting said pipe ends and terminating with pipe mounting flanges at the outside section of said front cover member for connecting the fluid intake and discharge connections leading into and out of said rotary pump unit.

**References Cited** in the file of this patent

UNITED STATES PATENTS

| | | |
|---|---|---|
| 1,321,249 | Shepherd | Nov. 11, 1919 |
| 1,763,565 | Parker | June 10, 1930 |
| 1,889,352 | Corbin | Nov. 29, 1932 |
| 2,083,808 | Andrews | June 15, 1937 |
| 2,284,139 | Fitzpatrick | May 26, 1942 |
| 2,343,244 | Rose | Mar. 7, 1944 |
| 2,349,280 | Joy | May 23, 1944 |
| 2,392,754 | Mercier | Jan. 8, 1946 |
| 2,485,753 | Lefler et al. | Oct. 25, 1949 |

FOREIGN PATENTS

| | | |
|---|---|---|
| 652,092 | Great Britain | Apr. 18, 1951 |
| 745,741 | Great Britain | Jan. 22, 1953 |