

Jan. 16, 1962

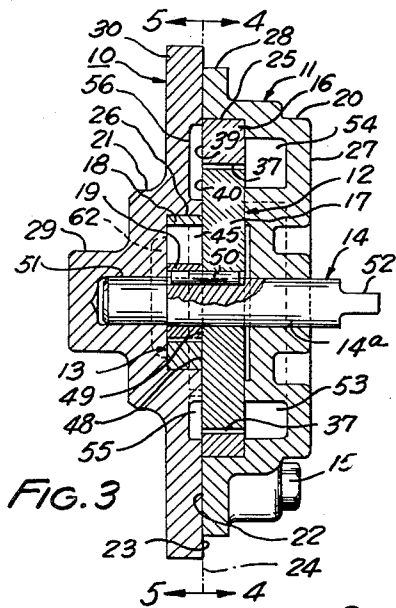
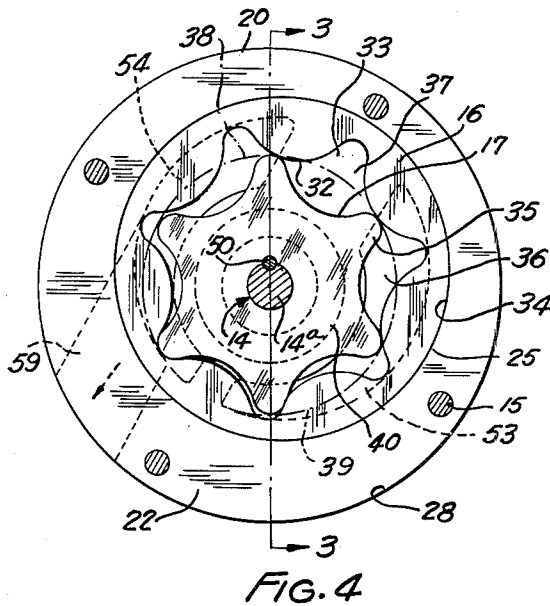
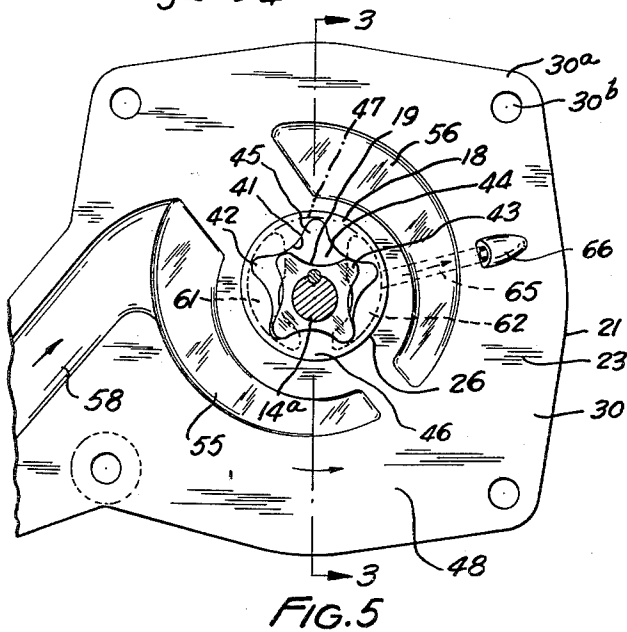
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ROTARY PUMPS

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3 Sheets-Sheet 2



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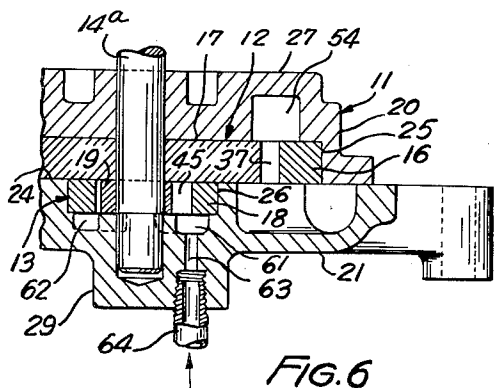
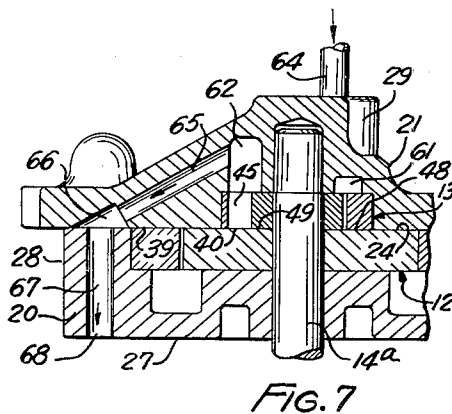
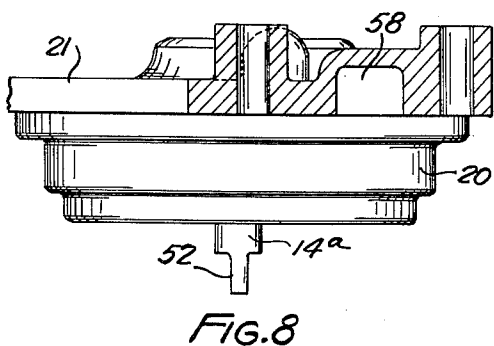
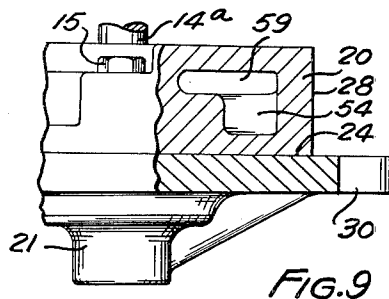
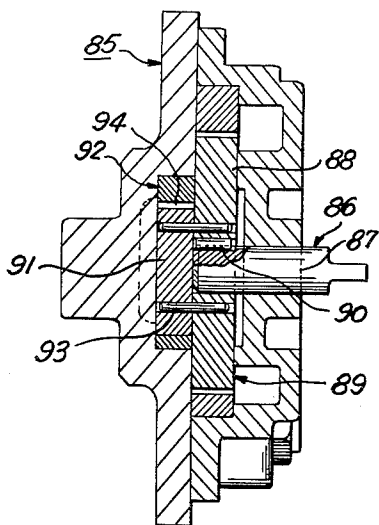
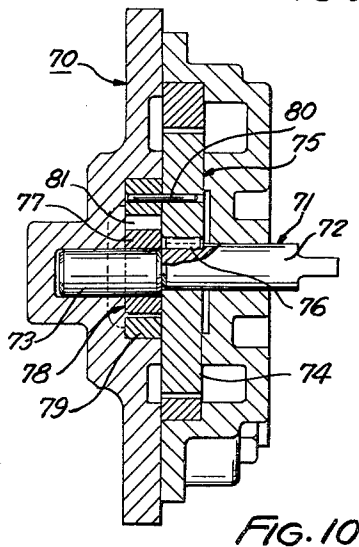


FIG. 11

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ROTARY PUMPS

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This invention has to do with rotary pumps and provides a novel pump unit of the plural pump type.

An object of this invention is to provide a novel pump unit of the plural pump type which is of a simplified construction and relatively more compact than the pumps of this type heretofore available.

Another object is to provide a plural pump assembly comprising a plurality of rotary pumps in a short-coupled relation in a common housing with rotor means of one pump forming a side wall for pumping chambers of an adjacent pump, such that the overall axial length of the unit is reduced to a minimum.

Still another object is to provide such a plural pump assembly in which the axially adjacent pumps are of the gear type with side portions of the rotor means of adjacent pumps in running contact and in which a gear member of one pump has a position and size to overlies and form the side wall of, pumping chambers of an adjacent pump.

This invention likewise provides a plural pump assembly comprising a common housing having two axially adjacent gear-type pumps therein of large and small pitch diameter respectively and in which intake and discharge ports serving the larger pump lie outside of the periphery of the cylinder of the smaller pump.

Additionally, this invention provides a dual pump assembly having pump cylinders extending into complementary housing sections from a common parting plane and in which the rotor means of the pumps have their adjacent side faces in running contact and lying substantially in the parting plane.

Other objects and advantages of this invention will be apparent in the following detailed description, and in the accompanying sheets of drawings forming a part of this specification and in which,

FIG. 1 is an end elevation of a plural pump assembly embodying this invention;

FIG. 2 is an end elevation of the plural pump assembly from the other end thereof and with portions of the pump housing shown in section;

FIG. 3 is a sectional view taken through the pump assembly axially thereof and substantially as indicated by section line 3—3 of FIGS. 1, 4 and 5;

FIG. 4 is a transverse section taken on section line 4—4 of FIG. 3;

FIG. 5 is another transverse section taken on section line 5—5 of FIG. 3;

FIGS. 6, 7 and 8 are fragmentary sections taken respectively on section lines 6—6, 7—7 and 8—8 of FIG. 1;

FIG. 9 is a fragmentary section taken on section line 9—9 of FIG. 2;

FIG. 10 is an axial section similar to that of FIG. 3 but showing a modified construction for such a plural pump assembly; and

FIG. 11 is an axial section similar to FIG. 3 but representing another modified construction.

As one of the preferred embodiments of the present invention, FIGS. 1 to 4 inclusive show a plural pump assembly 10 which comprises, in general, a common housing 11 containing axially adjacent pump units, in this instance two such pump units 12 and 13, and a shaft means 14 rotatable in the housing for supplying driving torque to the pump units. The pumps 12 and 13 are

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rotary pumps and are here shown as being of the gear type and each comprising two coaxially disposed cooperating outer and inner gear-type rotors. The pumps 12 and 13 are of two sizes; the pump 12 being the larger pump and comprising outer and inner cooperating rotors 16 and 17, and the pump 13 being the smaller pump and comprising outer and inner cooperating rotors 18 and 19.

The housing 11 comprises two complementary housing sections 20 and 21 secured together as by suitable bolts 15 and having their adjacent side faces 22 and 23 lying in a common transverse parting plane 24. The housing section 20 is provided with a circular pump cylinder 25 which extends thereinto from the side face 22 thereof and in which the rotors 16 and 17 of the larger pump 12 are located. The housing section 21 is provided with a circular pump cylinder 26 extending thereinto from the face 23 thereof and in which the rotors 18 and 19 of the smaller pump 13 are located.

The housing section 20 is provided with a flat external end face 27 and with a circular peripheral edge 28. The housing section 21 is provided with a central axial external boss 29, and with a radial flange 30 of a generally quadrangular shape and of such size that its corner portions 30a project beyond the peripheral edge 28 of the housing section 20 as shown in FIGS. 1 and 2. The projecting corner portions 30a are provided with bolt holes 30b. The housing section 21 also has a projecting leg portion 31 formed as an extension of the boss and flange portions 29 and 30.

The plural pump assembly 10 can be applied to various uses but, when the housing 11 thereof is of the form and construction above described, the assembly can be mounted on the motor housing or engine block of an internal combustion engine by attaching the flange 30 of the housing section 21 to the engine block by means of studs or the like extending through the bolt holes 30b. When the pump assembly 10 is mounted in this manner, the housing section 20 projects into a bored opening of the engine block. The pumps 12 and 13 can be used for auxiliary purposes of the engine such as lubrication and scavenging pumps, or for any other desired purposes.

The outer or driven rotor 16 of the pump 12 is in the form of an internal gear having tooth projections or lobes 32 thereon and pockets or tooth spaces 33 between the pairs of adjacent teeth. This outer rotor 16 has a circular outer periphery 34 which is rotatably slidable in the cylinder 25. The inner or driving rotor 17 is in the form of an external gear having teeth 35 thereon and tooth spaces 36 between the pairs of adjacent teeth.

The teeth 35 of the inner rotor 17 are fewer in number than the tooth spaces 33 of the outer rotor 16, such that during rotation of the inner rotor in mesh with the outer rotor, the teeth and tooth spaces of the two rotors will cooperate to form pumping chambers 37 therebetween of variable size. The bottoms of the tooth spaces 36 of the inner rotor all lie on a common circle 38 representing the minor diameter of this rotor. The outer and inner rotors 16 and 17 are of an axial thickness substantially equal to the axial depth of the cylinder 25, such that their side faces 39 and 40 lie in the common parting plane 24.

The outer or driven rotor 18 of the pump 13 is in the form of an internal gear having tooth projections or lobes 41 and intervening pockets or tooth spaces 42 between the pairs of adjacent lobes. The inner or driving rotor 19 is in the form of an external gear having teeth 43 and intervening tooth spaces 44 between the pairs of adjacent teeth. The teeth 43 of the inner rotor 19 are fewer in number than the tooth spaces 42 of

the outer rotor, such that during rotation of the inner rotor in mesh with the outer rotor, the cooperating teeth and tooth spaces will form pumping chambers 45 therebetween of variable size.

The outer rotor 18 of the pump 13 is provided with a circular periphery 46 which is rotatably slidable in the cylinder 26. The tooth spaces 42 of the outer rotor 18 all have their tops lying on a common circle 47 which represents the major diameter of the pumping chambers 45 of the smaller pump 13. The rotors 18 and 19 are of an axial thickness substantially equal to the axial depth of the cylinder 26, such that their side faces 48 and 49 lie in the common parting plane 24.

The shaft means 14 is common to all of the pumps of the plural pump assembly 10 and is here shown as comprising a single shaft member 14a rotatable in the housing sections 20 and 21 and extending transversely of the pump cylinders 25 and 26. The shaft member 14a extends through these pump cylinders in an eccentric relation thereto, as shown in FIGS. 3, 4 and 5, and the inner rotors 17 and 19 of the pumps 12 and 13 are secured to this shaft member as by means of the key 50, such that the inner rotors are located in a corresponding eccentric relation and meshed engagement with respect to their associated outer rotors 16 and 18.

The inner end of the shaft member 14a is rotatable in a bearing socket 51 provided in the boss 29 of the housing section 21. The opposite end of the shaft member 14a projects from the housing section 20 and is provided with a flat extension portion or tongue 52 to be drivingly engaged by an available shaft or rotatable part of the engine on which the pump assembly 10 is mounted.

The housing section 20 is further provided with a pair of crescent-shaped partial intake and discharge ports 53 and 54 on diametrically opposite sides of the shaft member 14a and the housing section 21 is further provided with a pair of such diametrically located crescent-shaped partial intake and discharge ports 55 and 56. The partial intake ports 53 and 55 lie on opposite sides of the cooperating rotors of the pump 12 and communicate with the pumping chambers 37, as shown in FIG. 3, for supplying intake fluid thereto. The partial discharge ports 54 and 56 lie on opposite sides of the cooperating rotors of the pump 12 and likewise communicate with the pumping chambers 37 for receiving delivery fluid therefrom under pressure.

For supplying intake fluid to the partial intake ports 53 and 55 of the pump 12, the housing section 21 is provided with an intake passage 58 which communicates with one of the partial intake ports, in this instance, the partial intake port 55. The pumped fluid delivered by the pump 12 is discharged therefrom through a discharge passage 59 which is provided in the housing section 20 and communicates with one of the partial discharge ports, in this case, the partial discharge port 54.

The intake and discharge passages 58 and 59 thus provided in the housing 11 for the pump 12 can be at any desired location in the housing but, when the pump 10 is intended for mounting on an engine block in the manner explained above, the intake passage 58 is preferably formed in the housing section 21 so as to be in the form of a groove recessed into the face 23 and the extension leg 31 of this housing section, and the discharge passage 59 of the housing section 20 is a substantially radially extending passage opening through the peripheral edge 28 of this housing section as shown in FIGS. 1, 2 and 4. With the intake and discharge passages 58 and 59 of the pump 12 disposed in this relation, they will cooperate with suitably located corresponding fluid passages of the engine block when the pump assembly is mounted on the latter.

The smaller pump 13 is provided with a pair of crescent-shaped intake and discharge ports 61 and 62 which are formed in the housing section 21 and located on diametrically opposite sides of the shaft member 14a.

The intake port 61 communicates with the pumping chambers 45 of the pump 13 for supplying fluid thereto and the discharge port 62 communicates with the pumping chambers 45 for receiving the pumped fluid therefrom under pressure.

For supplying intake fluid to the intake port 61 of the pump 13, the housing section 21 is provided with an intake passage 63 communicating with this port and with which a supply pipe or suitable pipe fitting 64 can be connected. The pumped fluid being delivered by the pump 13 is delivered from the discharge port 62 through a delivery passage 65 of the housing section 21. In this instance, the delivery passage 65 is disposed in an angular relation to the axis of the shaft member 14a and has its outer end in communication with a delivery pocket 66 recessed into the face 23 of this housing section as shown in FIGS. 5 and 7.

An extension delivery passages 67 is provided in the housing section 20 and extends therethrough in an axial direction, as shown in FIG. 7, with one end of this extension passage in communication with the delivery pocket 66 and its other end opening through the external end face 27 of this housing section as a delivery port 68. When the pump unit 10 is mounted on the engine block in the relation already explained above, the delivery port 68 will be in communication with a space or passage of the engine block to which the pumped fluid being delivered by the pump 13 is to be supplied.

By reason of the fact that the rotor means of the axially adjacent pumps 12 and 13 of the pump assembly 10 have their adjacent sides lying in the common plane 24, as explained above, portions of the adjacent sides are in a face-to-face running contact. The rotors of the pumps 12 and 13 are of such sizes and pitch diameters that the above-mentioned circle 38 representing the minor diameter for the inner rotor 17 of the larger pump 12 will always be greater than the circle 47 representing the major diameter for the pumping chambers 45 of the smaller pump 13. It will thus be seen that the inner rotor 17 of the larger pump 12 will always be in an overlying relation to the pumping chambers 45 of the smaller pump and will form the side wall or cover for these pumping chambers. It will also be seen that when the rotors of the axially adjacent pumps 12 and 13 are in this running and covering relation, no spacer or intermediate cover plate will be needed between the two pumps and the rotor means of the two pumps will be in a short-coupled relation such that the overall axial length of the pump assembly 10 can be of a minimum dimension.

FIG. 10 of the drawings shows a plural pump assembly 70 which is similar to the pump assembly 10 above described but in which the shaft means 71 comprises two shaft members 72 and 73. The shaft member 72 has the inner rotor 74 of the larger pump 75 secured thereto by means of the key 76 and the shaft member 73 has the inner rotor 77 of the smaller pump 78 freely rotatable thereon. In this modified form of plural pump assembly 70, the outer rotor 79 of the smaller pump 78 is connected with the inner rotor 74 of the larger pump 75 so as to be driven thereby through the transverse connecting pin 80.

In all other respects the modified pump assembly 70 is similar to the above-described pump assembly 10 and functions in substantially the same manner with the adjacent surface of the rotor 74 forming a cover means for the pumping chambers 81 of the smaller pump 78.

FIG. 11 of the drawings shows another modified construction embodied in a plural pump assembly 85 wherein the shaft means 86 comprises a single shaft member 87 having the inner rotor 88 of the larger pump 89 secured thereto by means of the key 90. In this modified pump assembly 85, the inner rotor 91 of the smaller pump 92 is

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connected with the inner rotor 88 of the larger pump 89 by means of the transverse pins 93.

In all other respects the modified pump assembly 85 is similar to the above-described pump assemblies 10 and 70 and functions in a similar manner with the adjacent surface of the inner rotor 88 of the larger pump 89 forming a cover means for the pumping chambers 94 of the smaller pump 92.

From the accompanying drawings and the foregoing detailed description, it will now be readily understood that this invention provides a plural pump assembly in which axially adjacent pumps located in a common housing have the rotor means thereof in running contact, such that a side portion of the rotor means of one pump forms a cover means for pumping chambers of the adjacent pump. It will accordingly be seen that in a plural pump assembly, as provided by this invention, the axially adjacent pumps are in a close-coupled relation such that the pump assembly will have a minimum axial length and will operate in a successful and efficient manner without need for a partition plate or intermediate cover between the axially adjacent pumps.

Although the novel plural pump assembly of this invention has been illustrated and described herein to a somewhat detailed extent, it will be understood, of course, that the invention is not to be regarded as being limited correspondingly in scope but includes all changes and modifications coming within the terms of the claims hereof.

Having described our invention, we claim:

1. In a dual pump assembly comprising axially adjacent pumps, a common housing having axially adjacent pump cylinders therein, said housing also having a pair of intake and discharge ports therein for each of said cylinders, rotor means operable in the cylinders with the axially adjacent side faces of the rotor means of adjacent pumps in a coplanar running relation, the rotor means of each pump comprising a pair of cooperating rotatable driving and driven gear members defining variable pumping chambers in communication with the intake and discharge ports of such pump, the gear members comprising the rotor means of one of said pumps being of larger pitch diameter than the gear members comprising the rotor means of the other pump such that the rotor means of said one pump forms an axial side wall of the pumping chambers formed by the rotor means of said other pump, transversely extending shaft means comprising a drive shaft having the driving gear of only one of said pumps secured thereto, and means connecting the driving gear of the last-mentioned one pump to the driving gear of the other pump.

2. In a dual pump assembly comprising axially adjacent pumps, a common housing having axially adjacent pump cylinders therein, said housing also having a pair

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of intake and discharge ports therein for each of said cylinders, rotor means operable in the cylinders with the axially adjacent side faces of the rotor means of adjacent pumps in a coplanar running relation, the rotor means of each pump comprising a pair of cooperating rotatable outer and inner gear-type rotors defining variable pumping chambers in communication with the intake and discharge ports of such pump, the gear members comprising the rotor means of one of said pumps being of larger pitch diameter than the gear members comprising the rotor means of the other pump such that the rotor means of said one pump forms an axial side wall of the pumping chambers formed by the rotor means of said other pump, transversely extending shaft means comprising a drive shaft having the inner rotor of one of said pumps secured thereto, and means securing the inner rotor of the other pump to the inner rotor of the last-mentioned one pump.

3. In a dual pump assembly comprising axially adjacent pumps, a common housing having axially adjacent pump cylinders therein, said housing also having a pair of intake and discharge ports therein for each of said cylinders, rotor means operable in the cylinders with the axially adjacent side faces of the rotor means of adjacent pumps in a coplanar running relation, the rotor means of each pump comprising a pair of cooperating rotatable outer and inner gear-type rotors defining variable pumping chambers in communication with the intake and discharge ports of such pump, the gear members comprising the rotor means of one of said pumps being of larger pitch diameter than the gear members comprising the rotor means of the other pump such that the rotor means of said one pump forms an axial side wall of the pumping chambers formed by the rotor means of said other pump, transversely extending shaft means comprising a drive shaft having the inner rotor of one of said pumps secured thereto, an idler shaft rotatably supporting the inner rotor of the other pump, and means securing the outer rotor of the last-mentioned other pump with the inner rotor of the last-mentioned one pump.

References Cited in the file of this patent

UNITED STATES PATENTS

698,539	McBride	Apr. 29, 1902
1,795,040	Renfrew	Mar. 3, 1931
1,927,799	Mann	Sept. 19, 1933
2,358,275	Hess	Sept. 12, 1944
2,490,115	Clarke	Dec. 6, 1949
2,531,808	Eames	Nov. 28, 1950
2,859,698	Buehler	Nov. 11, 1958

FOREIGN PATENTS

819,195	Germany	Oct. 31, 1951
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