April 5, 1960 G. S. DLUGOS 2,931,303

PUMP

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Fig. 1

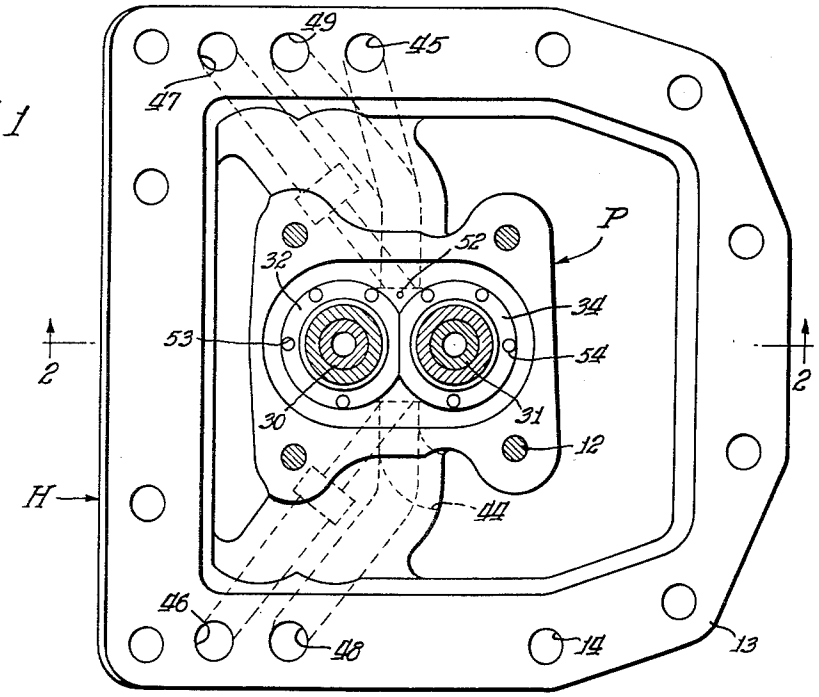
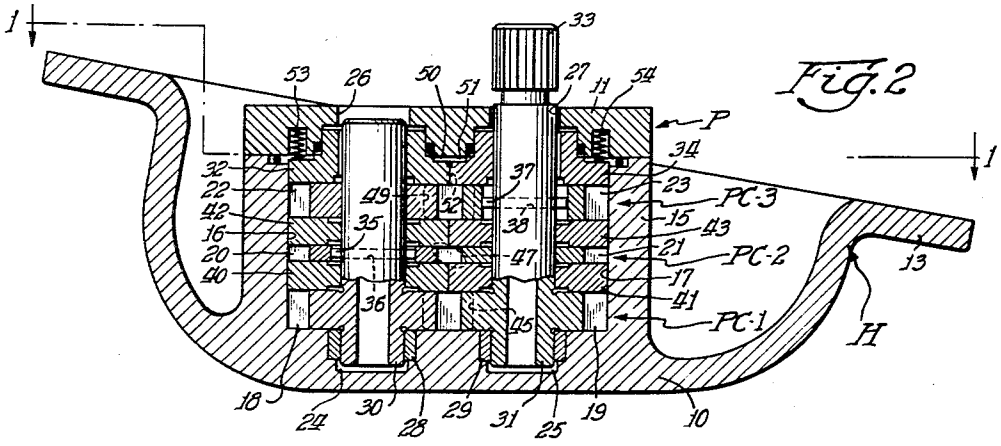


Fig. 2



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3 Claims. (Cl. 103—4)

This invention relates to gear pump assemblies, and more particularly to assemblies incorporating gear pumps of the pressure loaded variety.

More specifically, this invention relates to a pump assembly having a plurality of separate pumping elements with a common pressure loading bushing or end plate means and which is especially adapted for use as a lubricating pump assembly. Such an assembly is so constructed to be extremely compact, and is further provided with a particular housing forming a sump from which one of the pumping elements obtains its supply of fluid.

Therefore, the principal object of this invention is the provision of an improved, compact lubricating pump assembly.

Another object of this invention is the provision of an improved, compact lubricating pump assembly of the pressure loaded variety wherein the plurality of pumping means therein is so constructed and arranged to utilize a common pressure loaded bushing or end plate means, and wherein the assembly housing is so constructed to provide a sump for one of the pumping means of the assembly.

These and other objects and features of this invention will become apparent from the following description when taken with the accompanying drawing in which:

Figure 1 is a view taken of line 1—1 of Figure 2 and looking in the direction of the arrows; and

Figure 2 is a section view taken on line 2—2 of Figure 1 looking in the direction of the arrows.

Referring now to the drawing, and in particular to Figure 2, the pump assembly, generally indicated by P, comprises a housing H including a body 10 and a cover 11, suitably secured together by bolt means or the like, indicated at 12.

The body 10 is of a generally cup-shape and terminates in an outwardly directed continuous flanged portion 13 having suitable bored openings 14 therethrough to receive bolt means by which the assembly P is retained in its proper operating position, and the body further comprises a substantially centrally disposed upstanding, substantially cylindrical portion 15. The upstanding portion 15 is bored to provide overlapping or intersecting, parallel, cylindrical cavities 16 and 17 to receive, in spaced relation, pairs of gears 18 and 19, and 20 and 21, and 22 and 23, each pair meshing in the overlapping area of the cavities. The pairs of gears may be of different widths, thereby providing different capacities, or may be of the same width, thereby providing equal capacities, without departing from the spirit of this invention.

The body 10 is also provided with cavities 24 and 25 of a smaller diameter but intersecting and communicating with the cavities 16 and 17, respectively, and the cover 11 is provided with stepped bores 26 and 27, each portion of which is smaller in diameter but intersecting and communicating with the cavities 16 and 17, respectively, when the body and cover are assembled.

The cavities 24 and 25 receive cylindrical bearing means 28 and 29 in which are journaled one of the terminal

ends of shafts 30 and 31, respectively. The opposite terminal end of the shaft 30 is journaled in a journal portion of an axially movable bushing or end plate means 32 disposed within the cavity 16 and having one face in contact with the adjacent side face of the gear 22, the journal portion being slidably received in the bore 26 and being of a complementary shape relative thereto. The shaft 31 is provided with a splined portion 33 disposed outside the housing H to receive a driving connection from a source of power (not shown), and has an intermediate portion journaled in a journal portion of an axially movable bushing or end plate means 34 disposed within the cavity 17 and having one face in contact with the adjacent side face of the gear 23, the journal portion being slidably received in the bore 27 and being of a complementary shape relative thereto.

The gears 18 and 19 are, as illustrated, made integral with the shafts 30 and 31, respectively, but could be suitably affixed thereto in other ways without departing from the spirit of this invention. The gear 20 is drivingly connected with the shaft 30 by means of a pin 35 passing through a hole 36 formed in the shaft 30 and having its terminal ends disposed within a slot formed through the hub portion of the gear 20, the gear thereby being capable of axial movement relative to the shaft while retaining its driving connection therewith. The gear 21 is disposed on the shaft 31 and is capable of axial movement with regard thereto. It is thus obvious that the pumping means comprised by the gears 20 and 21 derives its drive from the gear 20 and the shaft 30.

The gear 22 is disposed on the shaft 30 and is capable of axial movement with regard thereto. The gear 23 is drivingly connected to the shaft 31 by means of a pin 37 passing through a hole 38 formed in the shaft 31 and having its terminal ends disposed within a slot formed through the hub portion of the gear 23, the gear thereby being capable of axial movement relative to the shaft while retaining its driving connection therewith.

The pumping elements are separated by means of spaced bearing spacer means 40, 41, 42 and 43; the means 40 being disposed between the gears 18 and 20 and in contact with the adjacent side faces thereof, the means 41 being disposed between the gears 19 and 21 and in contact with the adjacent side faces thereof; the means 42 being disposed between the gears 20 and 22 and in contact with the adjacent side faces thereof; and, the means 43 being disposed between the gears 21 and 24 and in contact with the adjacent side faces thereof. These bearing spacer means are constructed to be axially movable within the respective housing cavities and are provided with substantially centrally positioned bores for rotatable reception of the shafts 30 and 31.

As is obvious, the bearing spacer means, together with the axially movable bushing or end plate means, separate the housing cavities into a plurality of pumping chambers each of which is provided with a pumping means comprising a pair of intermeshing gears. It should be noted at this time that the gears 18 and 19 are in contact with the terminal walls of the bores 16 and 17, respectively, which walls provide end plate means for the pump means 18 and 19.

Each of the bearing spacer means and the axially movable bushing or end plates means may be provided with relief recesses similar to those shown and described in Lauck et al. Patent No. 2,420,622, and for the same purpose. Note also that the shafts 30 and 31 are hollow for the passage of leakage fluid therethrough.

Each of the pumping chambers, generally identified as PC–1, PC–2 and PC–3, is provided with an inlet and an outlet for the flow of fluid to and from the chambers. Thus, the chamber PC–1 is provided with an inlet 44 (see Figure 1) opening into the cup-shaped housing which

forms a sump for this pump, and is provided with an outlet 45 terminating in the flange 13 of the housing H.

The chamber PC–2 is provided with an inlet 46 and an outlet 47 both of which terminate in the flange 13 of the housing H. The chamber PC–3 is provided with an inlet 48 and an outlet 49 both of which terminate in the flange 13 of the housing H.

Thus proper connections for the inlets 46 and 48 and all the outlets are made when the device is attached in its proper operating position to its utilization device.

The axially movable bushing or end plate means 32, 34 are provided with pressure motive surfaces spaced from the gears 22 and 23, respectively, which define with the walls of the housing H annular, intersecting, pressure motive chambers 50 and 51, respectively, which chambers are adapted to receive fluid under pressure to act against the motive surfaces and urge the bushing or end plate means, together with the gears 22, 23, 20, 21 and the bearing spacer means 42, 43, 40, 41 downwardly, as viewed in the drawing. Such urging will provide pumping seals between the adjacent gear side faces and the end plate, bushing or bearing means, as the case may be, and will prevent or substantially reduce the leakage or fluid under pressure from outlet to inlet across the gear side faces, thereby improving the efficiency of the assembly and each of its pumping means.

Fluid for the purpose of providing the motive force against the bushing or end plate means 32 and 34 is derived from the outlet of the pump comprising the gears 22 and 23, and is provided by a communication or passage 52 between the chambers 50, 51 and the chamber PC–3. The passage 52 may be formed in the manner shown and described in the aforementioned Lauck et al patent. Since the pressure is derived from output pressure, it will be obvious that as the pressure output increases, the force, known as a pressure loading force, will increase.

To provide an initial loading force for the pump assembly, there are provided compression springs 53 and 54 received in open-ended cavities in the cover 11, which act against the bushing or end plate means 32 and 34, respectively.

Thus there has been described a compact pump assembly having a plurality of pumps, each of which is of the pressure loaded variety, yet employ common pressure loaded bushing or end plate means, and wherein the pressure source to accomplish the loading is derived from one of the pumps. Further, the pump assembly is housed in a housing which forms a sump for one of the pumps. The housing is flanged and employs the flange for the terminal ends for at least some of the pump inlets and outlets, whereby when connected in its operating environment, proper connection with the inlets and outlets will be made.

While this invention has been described with reference to one embodiment, it is to be understood that this is by way of illustration and not by way of limitation, and the appended claims should be construed as broadly as the prior art will permit.

I claim:

1. In a pump assembly, the combination of a housing having substantially cupped-shaped walls terminating in an outwardly directed flange and a substantially centrally disposed upstanding portion removed from said walls, said upstanding portion having a pair of spaced wall means, means defining a cavity in said upstanding portion between said wall means, said walls and upstanding portion defining a sump means therebetween, means defining a plurality of pumping chambers in said cavity, said pumping chambers being in substantially aligned relation between said wall means, an inlet and an outlet in each pumping chamber, one of said inlets communicating with said sump means, the remainder of said inlets and said outlets terminating in said flange, pumping elements in each pumping chamber, said defining means including axially movable bearing spacer means disposed between adjacent pumping elements and axially movable bushing means disposed between one of said wall means and the pumping elements adjacent thereto, and means to pressure load said bushing means to axially move said bushing means, said pumping elements, said spacer means in packed relation against the other of said wall means to thereby provide pumping seals between said chamber defining means and the adjacent side faces of said pumping elements.

2. In a pump assembly, the combination of a housing having substantially cupped-shaped walls terminating in an outwardly directed flange and a substantially centrally disposed upstanding portion removed from said walls, said upstanding portion having a pair of spaced wall means, means defining a cavity in said upstanding portion between said wall means, said walls and upstanding portion defining a sump means therebetween, means defining a plurality of pumping chambers in said cavity, said pumping chambers being in substantially aligned relation between said wall means, an inlet and an outlet in each pumping chamber, one of said inlets communicating with said sump means, the remainder of said inlets and said outlets terminating in said flange, pumping elements in each pumping chamber, said defining means including axially movable bearing spacer means disposed between adjacent pumping elements and axially movable bushing means disposed between one of said wall means and the pumping elements adjacent thereto, and means to pressure load said bushing means to axially move said bushing means, said pumping elements, and said spacer means in packed relation against the other of said wall means to thereby provide pumping seals between said chamber defining means and the adjacent side faces of said pumping elements, said means to pressure load said bushing means comprising means communicating fluid output pressure of one of said pumping chambers to said bushing means.

3. In a pump assembly, the combination of a housing having substantially cupped-shaped walls terminating in an outwardly directed flange and a substantially centrally disposed upstanding portion, said walls and said upstanding portion defining a sump means therebetween, said upstanding portion having a pair of spaced wall means, means defining a cavity in said upstanding portion between said wall means, means defining a plurality of pumping chambers in said cavity, said pumping chambers being in substantially aligned relation between said wall means, an inlet and an outlet for each pumping chamber, one of said inlets communicating with said sump means and the remainder of said inlets and all of said outlets terminating in said flange, pairs of pumping elements in each pumping chamber, a shaft means, means drivingly connecting at least one of each pair of pumping elements with said shaft means, at least one of said drivingly connected pumping elements being connected for axial movement relative to said shaft means, said defining means including axially movable bearing spacer means disposed between adjacent pumping elements and axially movable bushing means disposed between one of said wall means and the pumping elements adjacent thereto, means defining a pressure motive chamber including a portion of said axially movable bushing means, and means to communicate high pressure fluid to said motive chamber to urge said bushing means and said spacer means and said pumping elements in packed relation against the other of said wall means to provide pressure seals between said chamber defining means and the adjacent side faces of said pumping elements.

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