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2,885,965

PRESSURE LOADED PUMP LUBRICATING MEANS

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2 Sheets-Sheet 1

Fig. 1

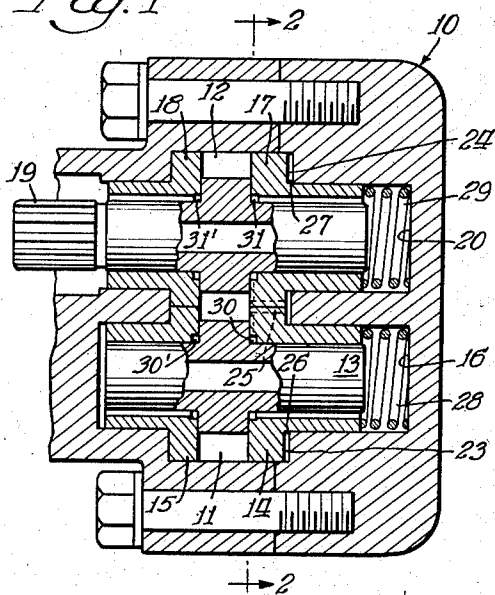


Fig. 2

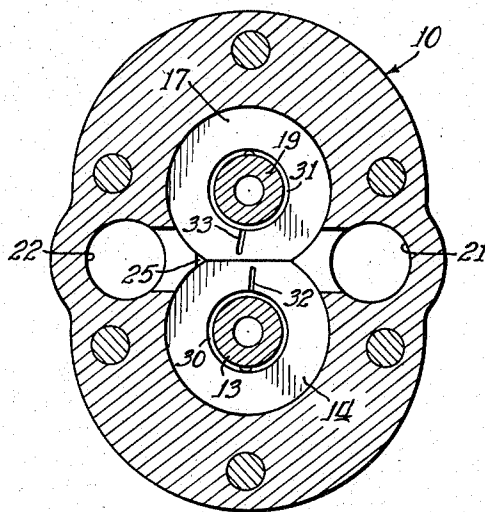
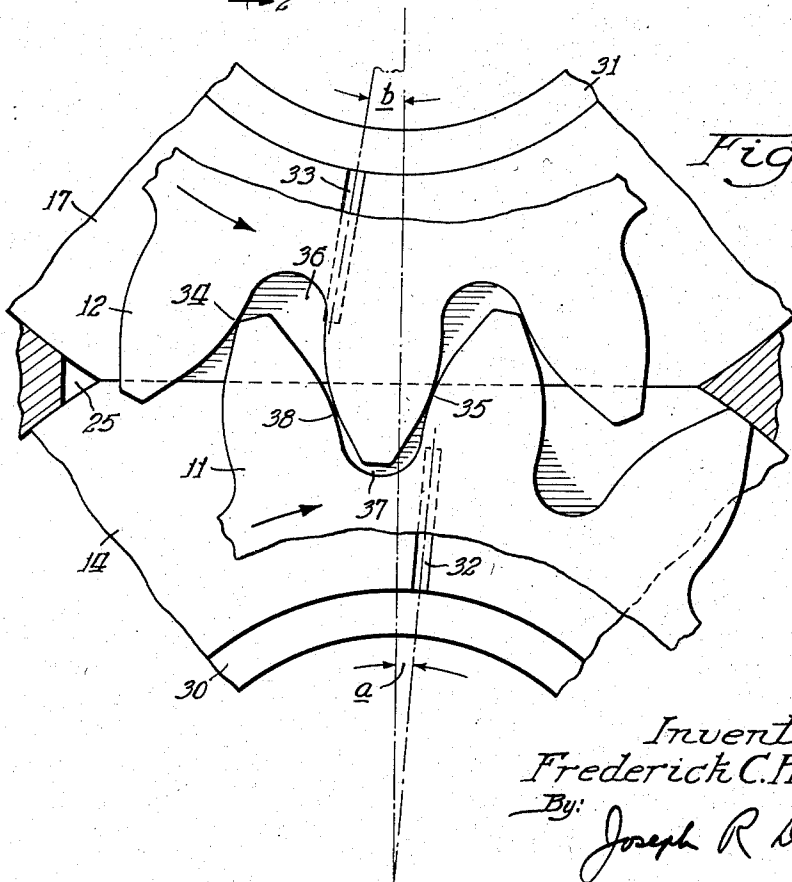


Fig. 3



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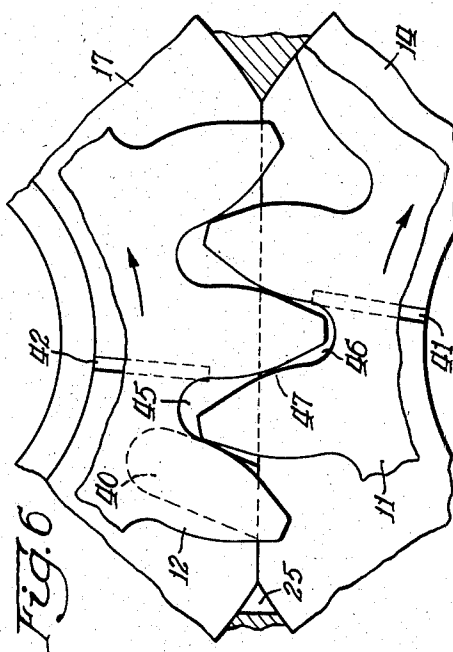
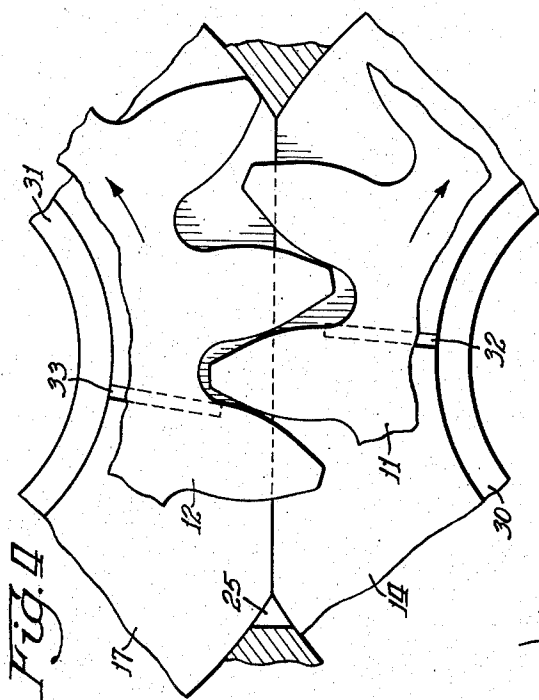
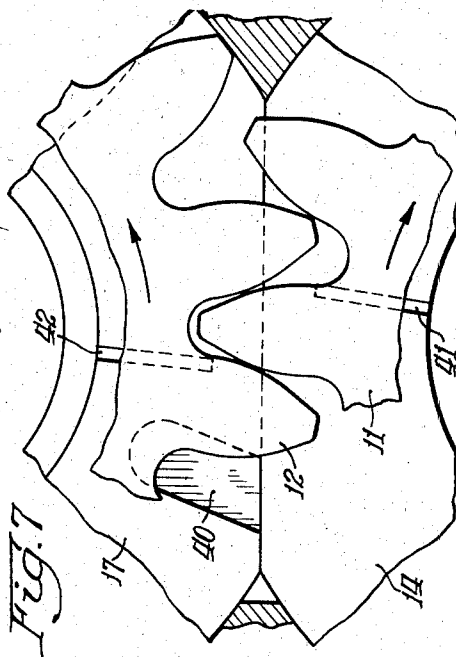
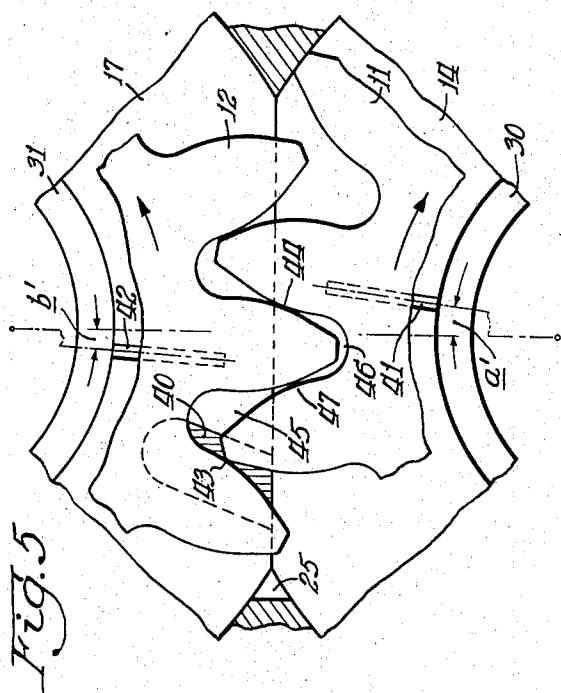
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PRESSURE LOADED PUMP LUBRICATING MEANS

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2 Sheets-Sheet 2



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PRESSURE LOADED PUMP LUBRICATING MEANS

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17 Claims. (Cl. 103-126)

This invention relates to a gear pump and more particularly to a gear pump of the type employing pressure loaded bushings or end plates, such pumps sometimes being referred to as pressure loaded pumps.

In pressure loaded pumps of the type including a set of axially movable, pressure loadable bushings or end plates, a part of the discharge pressure generated by the pump is communicated to the rear or motive pressure surface of the axially movable bushings to urge the bushings into sealing relationship with their associated gears. As described in United States Patent No. 2,420,622 to John A. Lauck et al., by carefully selecting the relative areas of the forward surfaces and the rear or motive surfaces of the bushings, it is possible to control within very close limits the actual sealing pressure established during operation of the pump. Gear pumps so constructed are capable of delivering fluid at an extremely high pressure with considerable volume.

Pumps of this type generally include a pair of intermeshing gears, each gear having an axially extending shaft journaled in bores formed in the bushing, and because of the high rotational speeds of the gears, such journals require a continuous flow of lubricant, so as to overcome frictional forces and prevent the scoring and burning out of the shafts and the bushings. Usually, the shafts are fitted into the bushing bores so that some of the fluid under pressure developed in the pump flows to the journals along the length of the shafts. However, it has been found desirable to construct the pump in such a manner that fluid under pressure will be forced along the length of the shafts within the bushing bores, so as to insure the proper lubrication of the journals and more effectively overcome the frictional forces, and, positively prevent the scoring and burning out of the shafts and the bushings. Therefore, it is the principle object of this invention to provide a pump constructed in a manner whereby fluid under pressure is forced along the gear shafts within the bushing bores.

Another object of the invention is to provide a pump with means defining a communication between the pump chamber and the gear shaft journals whereby fluid under pressure is forced along the length of the gear shafts, so as to provide lubrication therefor.

A still further object of this invention is to provide an intermeshing gear type pump having bushings associated therewith and including means formed in the gear engaging faces of the bushings cooperative with the intermeshing gears functioning to provide a forced flow of fluid under pressure to and along the gear shafts within the bushing bores, so as to provide a supply of a lubricating medium for the shaft journals.

Another object of the invention is to provide pump bushings with grooves formed therein cooperating with the intermeshing pump gears and functioning to direct a flow of fluid under pressure to the gear shaft journals, thereby providing a positive lubricating system for the journals.

A more specific object of the invention is to provide

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bushings associated with a pressure loaded gear type pump with grooves formed therein cooperating with the gears to direct fluid trapped by said gears to the journals of the gear shafts, so as to provide a forced lubrication for the journals.

These and other objects, features and advantages of the invention will become apparent from the following detailed description and drawings, in which:

Figure 1 is a longitudinal sectional view of a pump constructed in accordance with the principles of this invention;

Figure 2 is a cross sectional view taken on line 2-2 of Figure 1 and showing to advantage pump bushings constructed in accordance with the principles of this invention;

Figure 3 is a greatly enlarged partial view showing the intermeshing gear teeth of a pump constructed in accordance with this invention, said gear teeth being shown in one pumping position, and illustrating one embodiment of the pump bushings;

Figure 4 is a greatly enlarged partial view similar to Figure 3 showing the intermeshing gears in another pumping position;

Figure 5 is a greatly enlarged partial view similar to Figure 3 showing the intermeshing pump gears in one pumping position and illustrating another embodiment of the pump bushings; and

Figures 6 and 7 are greatly enlarged partial views similar to Figure 5 showing the intermeshing gears in a second and a third pumping position, respectively.

The same reference characters are employed to refer to the same part in the various views of the drawing.

Referring now to the drawings; 10 denotes a suitably chambered pump housing in which are rotatably mounted a driven gear 11 and an intermeshing driving gear 12. Driven gear 11 is supported on a shaft 13 journaled on its right end, through a flanged, pressure responsive, axially movable bushing or end plate 14 and on its left side through a fixed, flanged, body bushing or end plate 15. The gear 11 and bushings 14 and 15 are arranged in a first chamber 16 formed in the pump housing 10 with sufficient clearance between the right end of the bushing 14 and the adjacent wall of the housing to permit axial movement of the bushing 14. In a similar manner, driving gear 12 has disposed on its right side a flanged, pressure responsive, axially movable bushing 17 and on its left a fixed, flanged, body bushing 18. Driving shaft 19, upon which gear 12 is mounted, is journaled through bushings 17 and 18 and may be suitably connected to any suitable driving means (not shown). Gear 12 and associated bushings 17 and 18 are located in a second chamber 20 formed in the housing intersecting and parallel to chamber 16. Sufficient clearance is provided between the right end of the bushing 17 and the adjacent wall of the housing to permit axial movement of the bushing 17.

As will be observed, the bushings are illustrated as formed with a flat chordal meeting surface thereby forming a juncture between corresponding ones of the bushings. However, one piece fixed, and one piece axially movable bushings may be employed without departing from the scope of the invention.

As shown in Figure 2 of the drawings, the housing has an inlet port or conduit 21 formed on its right side and an outlet port or conduit 22 formed on its left side. Low pressure fluid is introduced in the pump housing at the inlet 21 and high pressure fluid is discharged from the housing through outlet 22, the inlet and outlet ports communicating with the inlet and discharge areas of the pump gears. The pressure loadable bushings are normally fitted into the bores with sufficient clearance to permit slight axial movement of the bushing with re-

spect to the bore to establish the delivering operation of the pump.

In the operation of a pump of this type, discharge pressure generated by the intermeshing gears is communicated from the outlet or discharge side thereof to the annular pressure loaded areas at the back of the bushings 14 and 17, designated respectively at 23 and 24 in the drawings, through an axially extending passage 25 formed in the peripheries of those bushings on the discharge side of the pump at the point of convergence of the bushings. Areas 23 and 24 cooperate with the adjacent walls of the housing bores 16 and 20, respectively, and with the peripheries of the associated bushings to define pressure loading chambers 26 and 27, respectively. The passage 25 extends from the discharge side of the gears to the right, as viewed in Figure 1, through the inner communicating portions of the pressure loading chambers 26 and 27 at their point of juncture. Escape of pressure rearwardly from the pressure loading chambers is substantially prevented by means of a suitable O-ring seal (not shown) disposed about the periphery of the rear or barrel portion of each bushing in a suitably formed groove in the periphery of the bushing or in the adjacent bore wall. Pressure leaking past the O-ring seal may be vented to inlet pressure or to a zone of intermediate pressure in line with conventional pressure loaded pump practice. Further details of the O-ring seals are found in the aforementioned Lauck et al. patent. While the bushings have heretofore been described as being flanged bushings it is obvious that bushings having a uniform outer diameter may be employed. To provide an initial sealing relationship between the bushings and gear side faces, coiled compression springs 28 and 29 are disposed within the right end of the chambers 16 and 20, respectively, so as to seat against the terminal end of the barrel or tubular portions to urge the forward surfaces of the bushings into engagement with the gear side faces.

As in the usual pressure loaded pump, constructed in accordance with the teachings of the aforementioned Lauck et al. patent, recesses 30 and 31 are formed in the radially inner portion of the forward or gear engaging surfaces of the pressure loading bushings 14 and 17, or in the gear side faces, and these recesses are placed in communication with a pressure lower than discharge pressure generated to the pump through the clearance between the gear journals and the bushing bores, or by specific grooves or channels extending axially of the inner cylindrical surfaces of the tubular part or bore of the bushings. These recesses control the effective pressure area of the pressure loading bushings, the area or size of these relief recesses being determined in any particular pump, so as to control the effective pressure areas of the bushing in such a manner that axial forces resulting from the pressure generated by the pump acting against the gear side face engaging surfaces of the bushings 14 and 17 tending to produce axial movement of the bushings away from the gear side faces, are effectively controlled and overcome by oppositely directing the loading forces communicated to the rear or motive surfaces of the bushing which latter axial forces are made to slightly exceed the first-mentioned axial forces and thereby maintain proper sealing engagement. Also the bushings 15 and 18 are formed with recesses 30' and 31', respectively, corresponding to the recesses 30 and 31 of the bushings 14 and 17, respectively. Such recesses may be likewise provided in the gear side faces.

Reference is now made to Figures 2, 3 and 4 of the drawings, Figure 2 showing the pump bushing constructed in accordance with one embodiment of this invention and Figures 3 and 4 showing enlarged portions of the intermeshing gears in different pumping positions and the bushings constructed in accordance with this one embodiment. The axially movable bushings 14 and 17 are shown with grooves 32 and 33, respectively, formed in their gear engaging faces. These grooves 32 and 33 effectively

direct fluid under pressure to the recesses 30 and 31, respectively (if such recesses are formed in the bushings) and thereby to the gear shaft journals for positive lubrication thereof. Each groove intersects its associated recess at one end and at the other end extends to a position short of the juncture of the bushings wherein it opens into a pocket formed between the intermeshing gear teeth in certain pumping positions thereof. Groove 32, formed in the bushing 14 associated with the driven gear 11, is directed at an angle a with respect to a line perpendicular to the axes of the gears, and as groove 32 progresses inwardly of the pump, i.e., from left to right as illustrated, it slopes toward the inlet side thereof. Groove 33, formed in the bushing 17 associated with the driving gear 12, is directed at an angle b with respect to the aforementioned line perpendicular to the axes of the gears, and as groove 33 progresses inwardly of the pump, i.e., from right to left as illustrated, it slopes oppositely to that of the groove 32; that is, toward the outlet side thereof. As is obvious from the drawings, the angle a is smaller than the angle b , the purpose of which will be described.

Figure 3 shows the intermeshing gear teeth in one pumping position wherein the gear teeth initially contact each other at the pitch point 34 and the driving point 35, these points lying on the pressure angle line of the gears; and thereby sealing off from discharge a certain amount of fluid trapped between the points of contact comprising what will be referred to as pockets 36 and 37 with a slight opening between the gear teeth at 38, so that a fluid communication will exist between the pockets 36 and 37. As the gears rotate, the fluid so trapped is squeezed between the gear teeth because of the decrease in the space as the teeth approach full meshing position, resulting in the trapped fluid being placed under pressure. As the gear teeth approach full meshing position, the pocket 36 and the groove 33 will communicate with one another and a part of the fluid under pressure thus trapped in the pocket 36 will be forced into the groove 33, to the recess 31 in the face of the bushing 17 and thereby to the associated shaft journal. Continued rotation of the gears toward their full meshing position will cause the groove 32 and the pocket 37 to communicate with one another and the remaining fluid thus trapped will be forced into the groove 32, to the recess 30 in the face of the bushing 14 and the associated shaft journal.

In this embodiment, the angle a is smaller than the angle b . These angles being so chosen that fluid is forced to the groove 33 in advance of that to the groove 32. If the angles were not so chosen, extremely high pressures would build up in the communicating pockets as the gears approach full meshing position and the result would be a forcing of the greater amount of fluid to the groove 32. The opening of one in advance of the other as the gears approach their full meshing position, results in a substantially even flow of fluid to the gear journals. Further, large pressures being build up in the space between the gear teeth results the driven gear 11 to be thrown against the drive gear 12 since the resulting high pressures would be larger than discharge pressure causing a severe backlash of the gears.

As the gears continue to rotate in the directions indicated by the arrows there will be succeeding communicating pockets existing between the intermeshing gears, corresponding to the pocket identified on the drawings as 36 and 37, and as each of the corresponding pockets communicate with its corresponding groove, the trapped fluid will be forced into the groove and thereby to its associated recess and gear journal. As the gears further continue to rotate both of the grooves will be sealed off and Figure 4 shows the gear teeth in such position. It should be obvious that the forced lubrication of the gear journals by their corresponding grooves will be intermittent but because of the high rotational speed of

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the gears in pump applications the resulting flow of fluid will be substantially continuous.

In pumps of this type wherein there is developed a very high fluid pressure, a serious problem arises because of fluid trapped by the gear teeth adjacent the outlet side of the pump, since such trapped fluid results in a noisy pump operation. In such pumps, it has been found advisable and desirable to reduce the noise caused by the trapped fluid, this being accomplished by providing at least one of the bushings with a groove formed in the gear engaging face thereof for the relief of the trapped fluid. Such a groove is formed in the bushing adjacent the outlet side of the pump and is commonly known as an anti-trapping groove.

Figures 5, 6 and 7 of the drawings illustrate a pump incorporating an anti-trapping groove in one of the bushings, and as herein illustrated, the axially movable bushing associated with the drive gear is so formed with an anti-trapping groove 40. In this embodiment the anti-trapping groove 40 is so formed and disposed to be effective to relieve only a portion of the fluid trapped between the intermeshing gear teeth as they approach their full meshing position. The groove 40, as illustrated, is shallow in depth and is similar in outline to a finger. It is inclined from the outlet toward the inlet side of the pump, and so disposed as to be closed off from the space between the gear teeth hereinafter described before the lubricating grooves communicate with the space.

Lubricating grooves 41 and 42 are formed in the gear engaging face of the bushings 14 and 17, respectively, and are disposed in a similar fashion to the corresponding grooves 32 and 33 of the Figure 3 embodiment. The groove 41 is disposed at an angle a' to the axis of the gear 11 and the groove 42 is disposed at an angle b' with respect to the axis of the gear 12. In a similar manner to the Figure 3 embodiment, the grooves are so disposed with respect to the gear teeth so that they communicate with a space between the gear teeth, to be hereinafter described, when the trapped fluid is under pressure.

As illustrated, the intermeshing gear teeth are in contact at the pitch point 43 and the driving point 44, these points lying on the pressure angle line of the gears thereby sealing off from discharge a certain amount of trapped fluid between the points of contact in what will be referred to as pockets 45 and 46 adjacent the output side of the pump, with a slight opening between the pockets at 47, so that a fluid communication will exist between the pockets. As the gears rotate, the fluid so trapped is squeezed between the gear teeth because of the decrease in the space as the gears approach full meshing position, resulting in the trapped fluid being placed under pressure. As the gears approach full meshing position, the groove 42 will communicate with the pocket 45 and slightly thereafter, or at the same moment, the groove 41 will communicate with the pocket 46, so that each of the associated gear shaft journals will be lubricated in a manner similar to that described with reference to the Figure 3 embodiment.

In this embodiment the angle a' is larger than the angle b' ; however, the upper groove 42 will communicate with its associated pocket in advance of the lower groove 41, for the same reasons as set forth in the Figure 3 embodiment. The difference in the angles of this embodiment from the angles in the Figure 3 embodiment is necessary because of the anti-trapping groove 40 formed in one of the pump bushings; and even with the addition of the anti-trapping groove there will be a sufficient quantity of fluid trapped in the pockets to properly lubricate the shaft journals. As the gears continue to rotate the grooves will be no longer in communication with their respective pockets as illustrated in Figures 6 and 7.

In this embodiment, as in the Figure 3 embodiment, the fluid forcing action will be intermittent, but because of the high rotational speeds of the pump gears, it will be substantially continuous.

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It is to be expressly understood that lubricating grooves as thus described may be and usually are similarly disposed in the fixed bushings to insure proper lubrication of the gear shaft journals associated therewith. Lubricating grooves as taught by this invention are equally applicable in bushings of fixed bushing pumps as well as in pumps wherein part of the pump housing constitutes the pump bushings.

Thus there has been described an improved gear pump having means whereby the gear shaft journals are positively and effectively lubricated during the pumping operation, the invention being one which effectively solves a problem prevalent in gear pumps yet is relatively simple, efficient and inexpensive.

Wherein the various parts of this invention have been referred to as located in the right or left positions, it will be understood that this is done solely for the purpose of facilitating description and that such references relate only to the relative position of such parts as shown in the accompanying drawings.

While certain preferred embodiments of the invention have been specifically disclosed, it is understood that the invention is not limited thereto, as many variations will be readily apparent to those skilled in the art and the invention is to be given its broadest possible interpretation within the terms of the following claims.

What is claimed is:

1. In a liquid pump; an inlet to and an outlet from said pump; a pair of intermeshing gears for forcing liquid from said inlet through said outlet, each of said gears being provided with an axially extending shaft; an end plate having a front face cooperable with the adjacent side faces of said gears to provide a pumping seal therewith and being provided with a pair of spaced bores for receiving said shafts thus forming gear shaft journals; and means so constructed and arranged to direct only liquid which has become completely trapped by the spaces between successive pairs of intermeshing gear teeth and squeezed therein by said gear teeth as they approach full meshing relation to said bores to provide lubrication of said journals including means defining a first groove in said end plate front face extending radially from one of said bores angularly toward said outlet relative to a plane passing through the rotational axes of said shafts, and means defining a second groove in said end plate front face extending radially from the other of said bores angularly toward said inlet relative to said plane, said means defining said grooves being in intermittent communication with said spaces between the gear teeth as said gears approach full meshing position.

2. A pump as recited in claim 1, wherein said angularity of said means defining said first groove is greater than that of said means defining said second groove.

3. A pump as recited in claim 1, wherein said angularity of said means defining said first groove is smaller than that of said means defining said second groove, and wherein said end plate has means defining an anti-trapping groove therein adjacent said outlet so as to prevent a portion of said liquid from being trapped in said space.

4. In a pressure loaded liquid pump; an inlet to and an outlet from said pump; a pair of intermeshing gears for forcing liquid from said inlet through said outlet, each of said gears being provided with an axially extending shaft; a fixed bushing having a front face cooperable with the adjacent side faces of said gears to provide a pumping seal therewith; an axially movable bushing having a front face; means for pressure loading said axially movable bushing to provide a pumping seal between said front face thereof and the adjacent side faces of said gears; a pair of spaced bores in each of said bushings to receive said shafts thus forming gear shaft journals; and means so constructed and arranged to direct only liquid which has become completely trapped by the spaces between successive pairs of intermeshing gear teeth and squeezed therein by said gear teeth as

they approach full meshing relation to said bores to provide lubrication of said journals including means defining a first groove in said front face of each bushing extending radially from corresponding ones of said bores angularly toward said outlet relative to a plane passing through the rotational axes of said shafts, and means defining a second groove in said front face of each bushing extending radially from the other corresponding ones of said bores angularly toward said inlet relative to said plane, said means defining said grooves being in intermittent communication with said spaces between the gear teeth as said gears approach full meshing position.

5. A pressure loaded pump as recited in claim 4, wherein said angularity of said means defining said first groove is greater than that of said means defining said second groove.

6. A pressure loaded pump as recited in claim 4, wherein said angularity of said means defining said first groove is smaller than that of said means defining said second groove, and wherein at least one of said bushings has means defining an anti-trapping groove therein adjacent said outlet so as to prevent a portion of said liquid from being trapped in said space.

7. In a pressure loaded liquid pump; an inlet to and an outlet from said pump; a pair of intermeshing gears for forcing liquid from said inlet through said outlet, each of said gears being provided with an axially extending shaft; a pair of fixed bushings each radially co-extensive with said gears and having front faces co-operable with the adjacent side faces of said gears to provide pumping seals therewith; a pair of axially movable bushings each radially co-extensive with said gears and having front faces; means for pressure loading said axially movable bushings to provide pumping seals between said front faces thereof and the adjacent side faces of said gears; each of said bushings having a flat chordal meeting surface thus forming a juncture between each pair and each being provided with a bore for receiving a shaft thus forming gear shaft journals; and means so constructed and arranged to direct only liquid which has become completely trapped by the spaces between successive pairs of intermeshing gear teeth and squeezed therein by said gear teeth as they approach full meshing relation to said bores to provide lubrication of said journals including means defining a first groove in said front faces of one fixed and one axially movable bushing extending radially from said bores therein to a position spaced from said junctures and angularly toward said outlet relative to a plane passing through the rotational axes of said gears, and means defining a second groove in said front faces of the other fixed and the other axially movable bushing extending radially from said bores therein to a position spaced from said junctures and angularly toward said inlet relative to said plane, said means defining said grooves being in intermittent communication with said spaces between the gear teeth as said gears approach full meshing position.

8. A pressure loaded pump as recited in claim 7, wherein said angularity of said means defining said first groove is greater than that of said means defining said second groove.

9. A pressure loaded pump as recited in claim 7, wherein said angularity of said means defining said first groove is smaller than that of said means defining said second groove, and wherein at least one of said bushings has means defining an anti-trapping groove therein adjacent said outlet so as to prevent a portion of said liquid from being trapped in said space.

10. In a gear pump of the type including a pair of intermeshing gears each being provided with an axially extending shaft, end plate defining means radially co-extensive with the gear teeth and engaging the terminal side faces of the gears in sealing relation and being provided with bores for receiving said shafts thus forming journals for said shafts, an inlet leading to and an outlet

leading from said pump, and means to provide lubrication of said journals comprising, means defining a first groove in said end plate defining means extending angularly from a position on one side of a plane passing through the rotational axes of said shafts to one of said bores, and means defining a second groove in said end plate defining means extending angularly from a position on the other side of said plane to another of said bores, said means defining said first and second grooves being effective to allow only fluid completely trapped between successive pairs of gear teeth as they approach fully meshing relation to be forced into said means defining said grooves and thereby to the respective bores to thereby provide said lubrication of said journals.

11. In a gear pump of the type including a pair of intermeshing gears each being provided with an axially extending shaft, a pair of end plate defining means radially co-extensive with the gear teeth each engaging the terminal side faces of the gears in sealing relation and each being provided with a pair of spaced bores for receiving said shafts thus forming journals for said shafts, an inlet leading to and an outlet leading from said pump, and means to provide lubrication of said journals comprising, means defining a first groove in each of said end plate defining means extending angularly from a position on one side of a plane passing through the rotational axes of said shafts to corresponding ones of said bores, and means defining a second groove in each of said end plate defining means extending angularly from a position on the other side of said plane to the other corresponding bores, said means defining said first and second grooves being effective to allow only fluid completely trapped between successive pairs of gear teeth as they approach fully meshing relation to be forced therein and thereby to said bores to thereby provide said lubrication of said journals.

12. In a gear pump of the type including a pair of intermeshing gears each being provided with an axially extending shaft; pairs of end plates radially co-extensive with the gear teeth of each gear each having a face engaging the terminal side faces of the gears in sealing relation, each end plate being provided with a bore for receiving one of said shafts thus forming journals for said shafts and each having a flat chordal meeting surface thus forming a juncture between corresponding ones of each pair; an inlet leading to and an outlet leading from said pump; and means to provide forced lubrication of said journals comprising, means defining a first groove in the faces of one pair of end plates extending angularly from a position on one side of a plane passing through the rotational axes of said shafts to the bores of said one pair, and means defining a second groove in the faces of the other pair of end plates extending angularly from a position on the other side of said plane to the bores of said other pair, said means defining said grooves intersecting said bores and extending to a position short of said junctures, and being effective to allow only fluid completely trapped between successive pairs of gear teeth as they approach fully meshing relation to be forced into said means defining said grooves and thereby to the associated bores for providing said forced lubrication of said journals.

13. In a pressure loaded gear pump of the type including a pair of intermeshing gears each being provided with an axially extending shaft; a fixed end plate and an axially movable end plate, each of which is radially co-extensive with the gear teeth; means to pressure load said axially movable end plate; each of said end plates engaging the terminal side faces of the gears in sealing relation and being provided with spaced bores for receiving said shafts thus forming journals for said shafts; an inlet leading to and an outlet leading from said pump; and means for providing lubrication of said journals including, means defining a first groove in each of said end plates extending angularly from a position on one

side of a plane passing through the rotational axes of said shafts to corresponding ones of said bores, and means defining a second groove in each of said end plates extending angularly from a position on the other side of said plane to the other corresponding bores, said means defining said first and said second grooves being effective to allow only fluid completely trapped between successive pairs of gear teeth as they approach fully meshing relation to be forced into said means defining said grooves and thereby to said bores for providing said lubrication of said journals.

14. In a pressure loaded gear pump of the type including a pair of intermeshing gears each being provided with an axially extending shaft; a pair of fixed bushings; a pair of axially movable bushings; means to pressure load said axially movable bushings; each of said bushings being coextensive with the gear teeth of one of said gears and engaging the terminal side faces thereof in sealing relation, each of said bushings having a bore therein for receiving one of said shafts thus forming journals for said shafts and having a flat chordal meeting surface thus forming a juncture between each pair; an inlet to and an outlet from said pump; and means for providing lubrication of said journals including, means defining a first groove in one fixed and one axially movable bushing extending angularly from a position spaced from said junctures and on one side of a plane passing through the rotational axes of said shafts to and intersecting said bores in said bushings, and means defining a second groove in the other fixed and other axially movable bushing extending angularly from a position spaced from said junctures and on the other side of said plane to and intersecting said bores in said last-named bushings, said means defining said grooves being effective to allow only fluid completely trapped between successive pairs of gear teeth as they approach full meshing relation to be forced into said means defining said grooves to said bores for providing said lubrication of said journals.

15. A pressure loaded pump as recited in claim 14, wherein said angularity of said means defining said first groove is greater than that of said means defining said second groove.

16. A pressure loaded pump as recited in claim 14, wherein said angularity of said means defining said first groove is smaller than that of said means defining said second groove, and wherein at least one of said bushings has means defining an anti-trapping groove therein adjacent said outlet so as to prevent a portion of said liquid from being trapped in said space.

17. Means for providing forced lubrication for the parallel shaft journals of a gear type fluid pump having a pair of intermeshing gears, comprising a first and a second passage defining means each radially extending from one of said journals to a position closely adjacent the full meshing position of said gears effective to direct fluid trapped and sealed off from discharge in pockets between the gear teeth and placed under pressure therein by said gear teeth as they approach full meshing relation to said journals, said first passage defining means defining an angle with a plane passing through the rotational axes of said gears on one side thereof and said second passage defining means defining an angle with said plane on the other side thereof.

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