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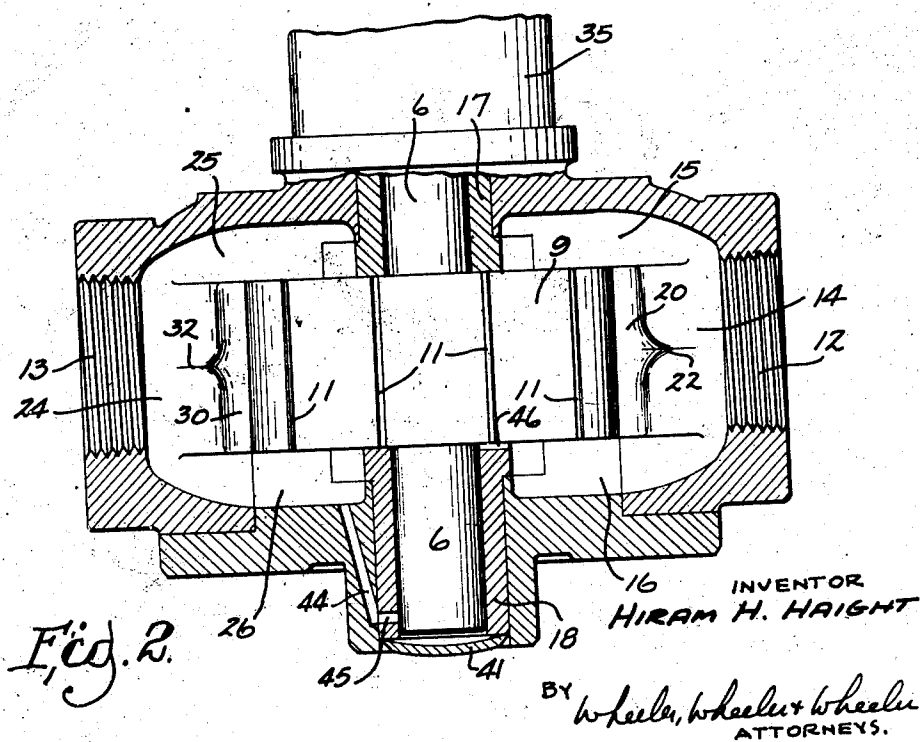
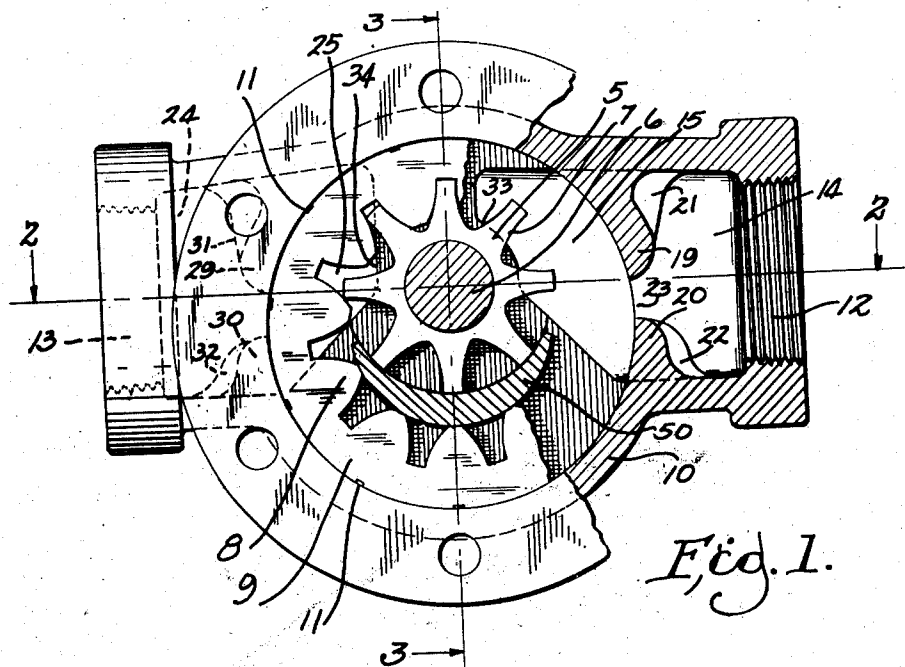
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2,433,360

GEAR PUMP

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2 Sheets-Sheet 1



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2 Sheets-Sheet 2

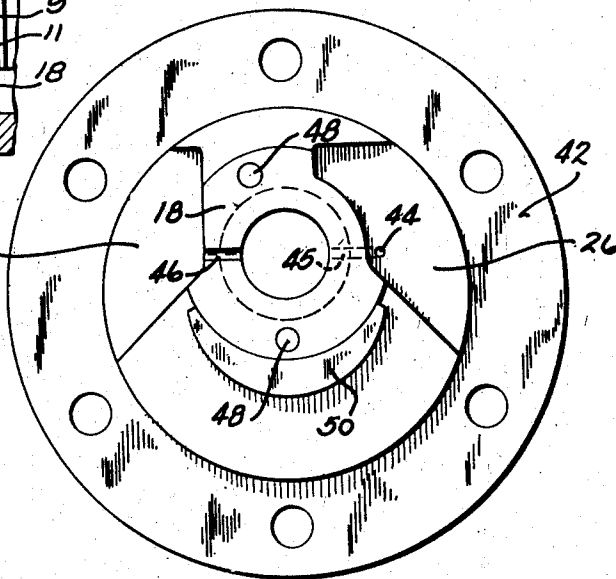
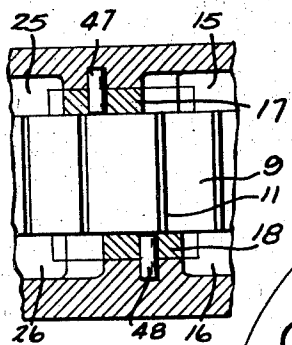
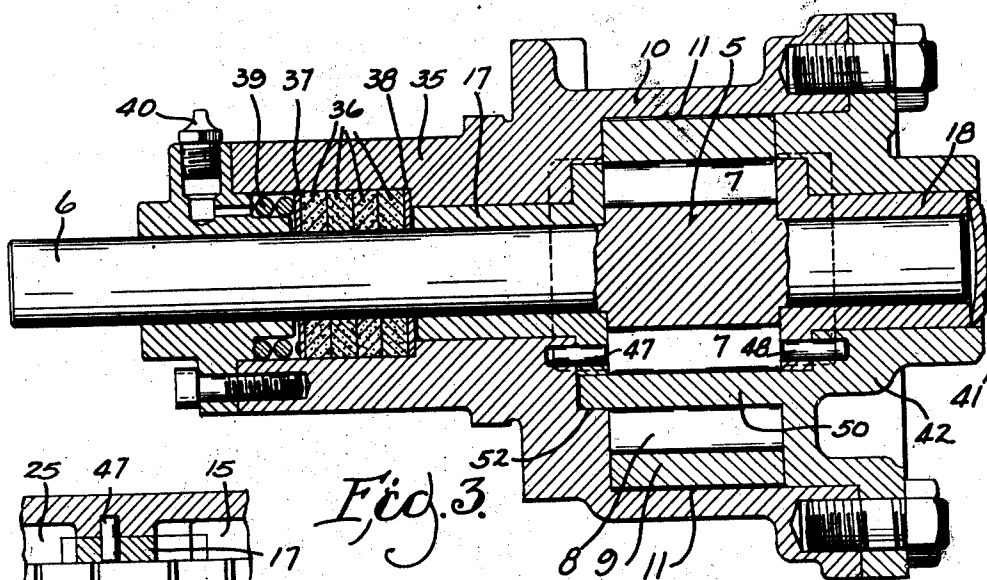


Fig. 4.

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GEAR PUMP

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8 Claims. (Cl. 103—126)

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This invention relates to improvements in gear pumps of the pinion and ring gear type.

It is an object of the invention to provide an improved form of manifolding with aligned inlet and outlet ports; to provide branch manifolds with staggered ends affording an adequate seal at each end of the rotor while still affording escape for liquid under compression regardless of the direction of pump operation; to protect the bearing surface of the ring gear from being scratched by grit entrained with the liquid pumped; to provide novel and improved means for lubricating at least one of the bushings with a portion of the material pumped; and otherwise to improve the strength and prolong the life of the apparatus as will more fully appear from the following disclosure of the invention.

In the drawings:

Fig. 1 is a side elevational view of the body as it appears when exposed by the partial removal of the cover, portions of the body and cover being shown in section.

Fig. 2 is a view of the pump in transverse section on the line 2—2 of Fig. 1.

Fig. 3 is a view of the pump in longitudinal section on the line 3—3 of Fig. 1.

Fig. 4 is a view showing the inner face of the cover in elevation.

Fig. 5 is a diagrammatic section through the manifold.

Like parts are identified by the same reference characters throughout the several views.

The pinion 5 is mounted on shaft 6 and is provided with teeth 7 meshing with the teeth 8 of a ring gear 9 peripherally journaled in the casing 10 to rotate on an axis eccentric to that of shaft 6. These parts are of generally conventional construction except that the outer periphery of the ring gear 9 has its bearing surface interrupted at intervals by transverse grooves 11 of generally axial extent. The marginal edges of the ring gear at each side of the grooves 11 are sharp and are constantly wiping the bearing surface in the interior casing 10 to tend to pick up in the grooves any grit which may enter the bearing. Means is provided for flushing the grooves 11 as will hereinafter be disclosed to carry such grit through the pump with a minimum of damage to the bearing surfaces.

The inlet and outlet points 12 and 13 of casing 10 are aligned axially, this being frequently of great advantage in making installations. These ports open into manifolds of peculiar form best shown in Figs. 1 and 2.

The manifold 14 divides into branches 15, 16,

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which extend about the sides of the ring gear 9 actually intersecting to some extent the flanges of the bushings 17, 18 for shaft 6. Thus the flow of the liquid pumped enters and leaves the interdenal spaces between the teeth 8 of the ring gear to the ends of such spaces. The flow from the port to the manifold branches 15 and 16 is divided and guided by tongues 19 and 20 projecting downwardly and upwardly from the top and bottom of the manifold 14, as shown in Fig. 1, said tongues having relatively sharp flow dividing webs 21, 22 as best shown in Fig. 2.

There is a gap between the tongues 19 and 20 at or near the center of port 12, as indicated at 23 in Fig. 1. At this gap, the outer peripheral bearing surface of the ring gear 9 is exposed to the jetting action of flow entering or leaving port 12. At this gap the flow is not divided, but directly impacts and/or washes the outer peripheral surface of the ring gear, thereby tending to wash from the grooves 11 successively exposed at the gap, any grit which may have been picked up by such grooves from the inner bearing surface of the casing 10 in the course of ring gear rotation.

As indicated in Fig. 2, the port 13 communicates with a manifold 24 similar to that already described and having branches 25 and 26 from which liquid entering or leaving the interdenal spaces between the teeth 8 of ring gear 9 is guided by downwardly projecting tongue 29 and, upwardly projecting tongue 30, the respective tongues having sharpened dividing fins 31, 32, as shown in Fig. 2.

In the elevation shown in Fig. 1, the respective manifolds 25 and 15 may have some difference in form, as indicated in Fig. 1. The manifold branch 15 extends materially closer to the vertical plane through the axis of shaft 6 than does the manifold branch 25. Manifold 15 has an arcuate surface 33 at substantially constant radius from the axis of shaft 6, while the manifold branch 25 terminates at an end wall 34 which extends vertically from its point of nearest approach to the axis of shaft 6.

At the opposite or near side of the pump, the manifolding arrangement is reversed. It is the manifold 26 which extends closest to the vertical center line while the manifold 16 is shorter.

At each end of the ring gear, there is a peripherally elongated bearing surface providing an adequate seal between the inlet and outlet manifolds. However, this seal is elongated toward port 13 as between manifold branches 15 and 25 and is elongated toward port 12 as between

manifold branches 26 and 16. (See Fig. 5.) This tends to provide continuity and smoothness of pumping action without hammer, regardless of the direction in which the pump is operated and regardless of whether port 12 or port 13 comprises the inlet and which comprises the outlet. In each direction of operation, there is one of the manifold branches available close to the vertical center line to receive the last liquid expressed from the interdental spaces of the ring gear. Yet both ends of the ring gear have an adequate seal which could not be provided but for the staggered arrangement of the manifold branches as described.

The pump casing 10 has an axial extension at 35 which provides a packed bearing for the driving end of shaft 6. Beyond the end of bushing 17, I provide a set of packing gaskets 36 between washers 37 and 38, the whole assembly being subjected to the pressure of a compression spring 39. Into the spring chamber, there is a lubricating connection from fitting 40.

Bushing 18, on the other hand, is wholly closed about the end of shaft 6 by the key 41. Bushing 18 is located within the removable cover plate 42 of the casing. The liquid pumped may be used for the lubrication of the bearing provided by bushing 18. To this end, a duct 44 leads from manifold branch 26 through the metal of the cover plate 42 to a point near the outer end of bushing 18 where it communicates with a radial duct 45 provided in the bushing and leading to the outer end of the bearing surface.

From the inner end of the bearing surface, a radial groove 46 leads through the surface of the bushing flange to a point of communication with the branch manifold 16. Thus, regardless of the direction of operation of the pump, one of the ducts 44 or 46 will communicate with the high pressure side and the other with the low pressure side to establish a pressure differential and to provide means whereby some of the liquid pumped may be led to and from the respective ends of the bearing surface provided by bushing 18. Both bushings 18 and 17 may be secured against rotation with the shaft by means of pins 47, 48, if desired.

The crescent-shaped baffle 50, commonly used in pumps of this character, is desirably made a part of the removable closure 42 and projects therefrom into a counter bore at 52 in the pump casing whereby its inner or free end is rigidly anchored.

A pump manufactured as herein disclosed has strength, long life, relative freedom from bearing trouble, relatively high efficiency in pumping and relative freedom from noise.

I claim:

1. In a pump of the pinion and ring gear type, a casing having aligned ports and manifold branches leading from the respective ports and extending about the ends of the ring gear, diagonally opposite branches approaching close to the point of maximum compression and other diagonally opposite manifold branches terminating materially less close to the point of maximum compression, said casing providing bearing surfaces for each end of the ring gear which are rotatively staggered with respect to each other between the manifold branches at the respective ring gear ends.

2. In a pump, the combination with a ring gear and internal pinion gear meshing with the ring gear, said ring gear having teeth and interdental spaces from the ends of which said pinion is

adapted to displace liquid at the point of fullest mesh between the pinion and ring gear, of a casing within which the pinion and ring gear are operatively mounted for rotation, and means for driving one of said gears, said casing having bearing surfaces engaging the ends of the ring gear adjacent said point of fullest mesh and being provided with inlet and outlet ports having branch passages extending about both faces of the ring gear toward said point, the branch passages communicating with one of said ports being spaced from the branch passages communicating with the other of said ports by said bearing surfaces of the casing, the bearing surfaces of the casing at opposite faces of the ring gear being angularly offset peripherally of the ring gear, a branch passage from one port leading close to the point of maximum mesh between said gears at one face of the ring gear, and a branch passage of the opposite port leading close to such point of maximum mesh at the opposite face of the ring gear.

3. In a pump, the combination with a ring gear and internal pinion gear meshing with the ring gear, said ring gear having teeth and interdental spaces from the ends of which said pinion is adapted to displace liquid at the point of fullest mesh between the pinion and ring gear, of a casing within which the pinion and ring gear are operatively mounted for rotation, and means for driving one of said gears, said casing having bearing surfaces engaging the ends of the ring gear adjacent said point of fullest mesh and being provided with inlet and outlet ports having branch passages extending about both faces of the ring gear toward said point, the branch passages communicating with one of said ports being spaced from the branch passages communicating with the other of said ports by said bearing surfaces of the casing, said casing being provided internally with deflecting means before the respective ports having wedge-shaped fins for guiding liquid between the respective ports and the respective branch manifold passages communicating therewith.

4. In a pump of the character described, the combination with a ring gear having interdental spaces opening only to the end faces of the gear, of a pinion meshing with the ring gear and provided with teeth adapted at the point of fullest mesh to displace liquid from said spaces, and means operatively mounting the ring gear and pinion for rotation and comprising a casing having an interior bearing surface for the ring gear, substantially aligned inlet and outlet ports, branch manifolds leading from said ports about the respective ends of the ring gear by communication with said spaces at the end faces of the ring gear, means projecting into said manifolds comprising sharp edge dividers for guiding flow between the ports and the respective manifold branches, said means terminating opposite said ports to expose peripheral portions of the ring gear, and said ring gear portions being provided with channels of generally axial extent for collecting grit from the interior bearing surface of said casing, the flow through said ports being adapted to wash said channels at the points opposite said ports where the periphery of the ring gear and said channels are successively exposed.

5. The pump set forth in claim 4 in which diagonally opposite branch manifolds extend along opposite faces of the ring gear closer to the point of fullest mesh of the pinion with the ring gear than do the intervening manifold branches, said

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casing having sealing surfaces abutting the end faces of the ring gear between the respective manifold branches and said surfaces being offset angularly at opposite faces of the ring gear.

6. In a pump, the combination with an operatively meshing ring gear and pinion gear, of a casing operatively confining said gears and providing for the rotation thereof, said casing including a body portion having a gear cavity and a crescent-shaped recess opening toward said cavity together with a closure portion closing said cavity and provided with a crescent-shaped baffle spanning said cavity and having its end portions seated in said recess, said baffle intervening between a portion of the pinion and an internal portion of the ring gear.

7. In a pump of the character described, the combination with a ring gear and pinion gear in operative mesh, of means providing bearings and manifold therefor including a casing having inlet and outlet ports, manifolds leading from said ports into operative communication with the interdental spaces of the ring gear, a shaft upon which the pinion gear is mounted, a bushing for said shaft carried by a portion of the casing, said bushing having an end face abutting the pinion gear, a groove in said face affording communication between one of said manifolds and the surface of said shaft adjacent said pinion, a duct leading from an opposite manifold toward the outer end of the shaft, and a duct leading through said bushing from the first mentioned duct and to the outer end of the shaft whereby to subject spaced points of said bushing to differential pressures of the respective manifolds and to induce circulation through said bushing along said shaft.

8. In a pump, the combination with a ring gear and a pinion gear in operative mesh, and a shaft upon which the pinion is mounted, of a casing providing bearings for the shaft and ring gear and having inlet and outlet ports and branch

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passages leading from each of said ports about the ring gear toward the point of mesh of the pinion therewith, said ring gear having interdental spaces opening endwise to said passages, partition means within the casing in bearing contact with the ring gear substantially at the point of mesh of the pinion therewith, said partition means separating the passages branching from one of said ports from the passages branching from the other, and baffle means within the casing before each of said ports provided with deflecting surfaces for guiding flow between the ports and the respective branch passages, the said baffle means having apertures opening through the casing bearing for the ring gear, and the ring gear having a peripheral bearing surface provided with sharp-edged pocket means for picking up grit from the complementary bearing surface of the casing, the said sharp-edged pocket means being exposed through the apertures of the baffle means to flow through said ports whereby hydraulically to remove grit from said pockets.

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