May 31, 1949. A. B. THACHER 2,471,915

GEAR PUMP

Filed Dec. 24, 1946

2 Sheets-Sheet 1

Fig. 1.

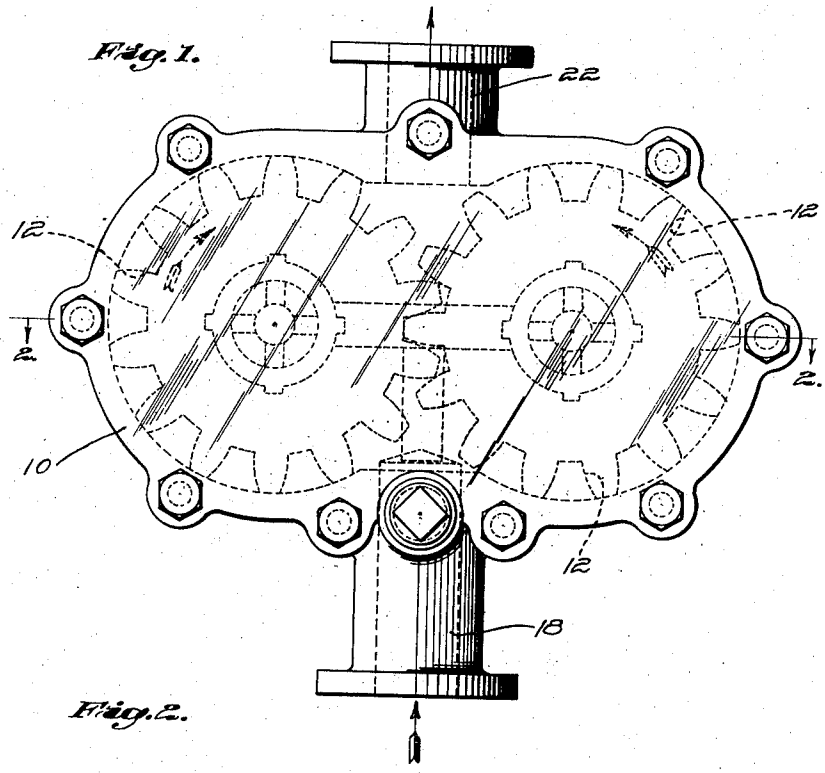
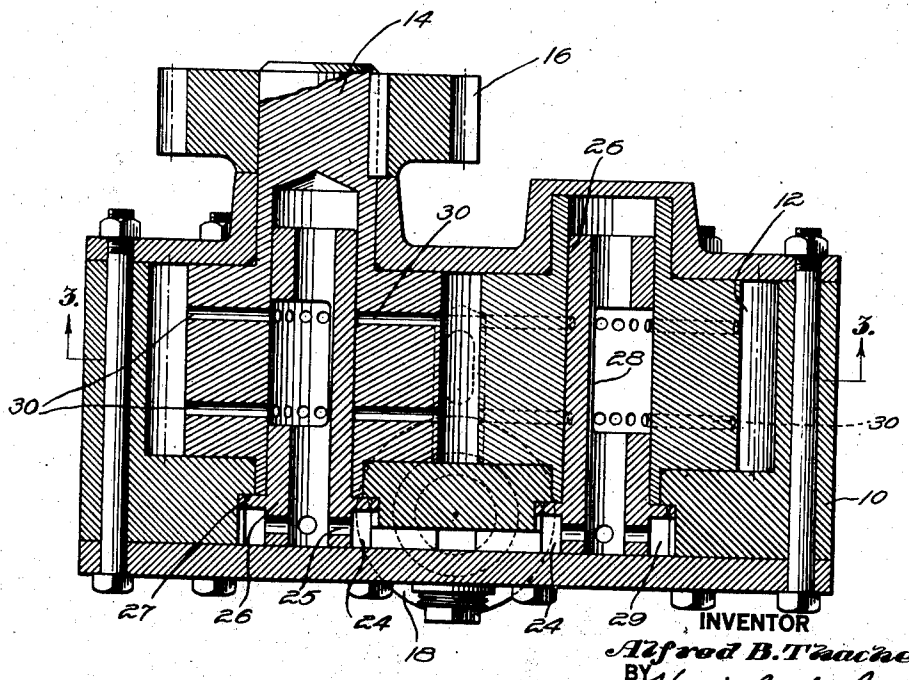


Fig. 2.



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Fig. 3.

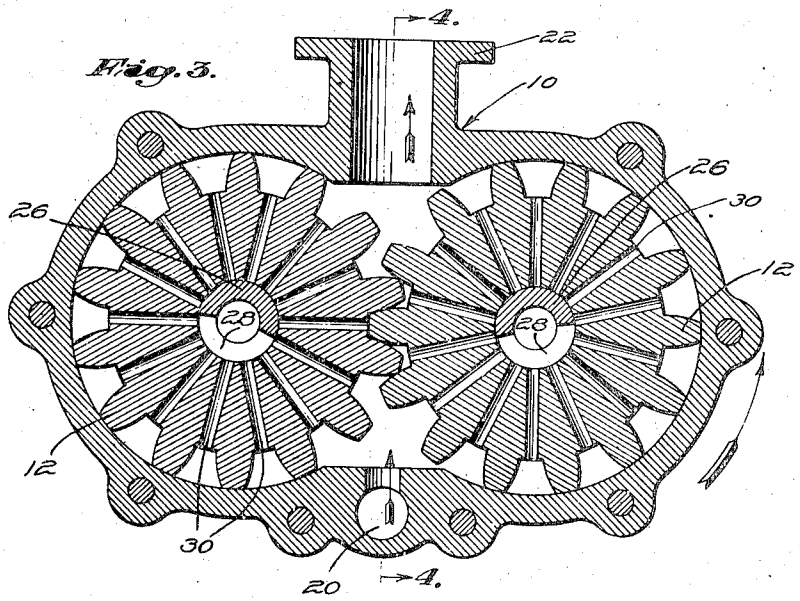
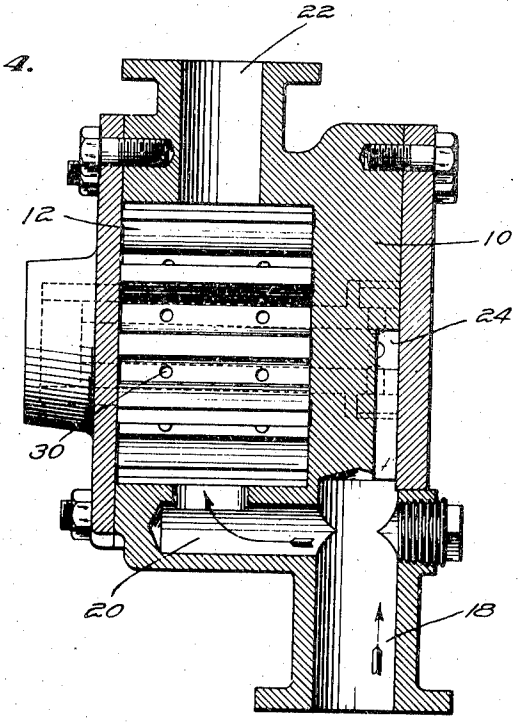


Fig. 4.



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GEAR PUMP

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11 Claims. (Cl. 103—2)

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This invention relates to pumps and particularly to a gear pump adapted for circulating lubricating oil or pumping a liquid under pressure.

A primary object of the invention is to increase the volume of delivery and efficiency of gear pumps for circulating lubricants or delivering liquid fuels etc. under pressure by increasing the flow of the liquid into the intake passages and into the interdental spaces on the intake side of the pump.

Another object of the invention is to completely fill the intake passages and interdental spaces on the intake side of the pump and prevent a vacuum being formed in these passages and to increase the flow of liquid delivered by the pump to a maximum.

And finally it is an object to provide intake passages leading from the main intake passage through radial holes provided within the pump gears and open only to the intake side of the pump casing to permit maximum flow of liquid to the interdental spaces.

The novel features characteristic of this invention are set forth more in detail in the claims appendant hereto but the nature and scope of the invention will be better understood by referring to the following description taken in connection with the accompanying drawings forming a part thereof, in which a specific and preferred embodiment of the invention has been set forth in detail for the purposes of illustration.

In the drawings:

Figure 1 is a side elevation of a pump made in accordance with the present invention.

Fig. 2 is a horizontal sectional view of the pump shown in Fig. 1 taken on the plane of line 2—2 in Fig. 1.

Fig. 3 is a side elevation in section of the pump shown in Figs. 1 and 2, the section being taken on the plane of line 3—3 in Fig. 2, and

Fig. 4 is a transverse vertical sectional view taken on the plane of line 4—4 in Fig. 3.

In the following description certain specific terms are used for convenience in referring to the various constructional details of the illustrated form of the invention; these terms, however, are to be interpreted broadly and limited only as the state of the art requires.

The invention in detail preferably includes the following principal parts. First, a casing; second, a pair of intermeshing gears rotatably mounted therein and driven by any suitable means; third, intake and discharge passages formed in the casing of conventional or usual type; fourth, sleeves extending centrally through the gears

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and having a lateral opening in their walls adjacent their inner ends; fifth, radial passages formed in said gears extending from their central openings to their interdental spaces, and sixth, intake passages leading from the main intake passage to said centrally mounted sleeves.

Gear pumps have been used to a limited extent only at high speeds, particularly under conditions in which intake pressures are low for the reason that the efficiency under these conditions is unsatisfactory. Under these conditions the flow into the interdental cavities, due to this low pressure, is insufficient to completely fill them at high rotative speeds and therefore the volume delivered by the pump is reduced. The primary purpose therefore of the invention is to augment the flow of liquid into the interdental cavities and thus increase the volume delivered by the pump.

Referring more in detail to the figures of the drawing, there is shown a pump of the rotating intermeshing gear type, having a casing 10 suitably recessed for receiving the intermeshing spur gears 12. One of these gears 12 may have a shaft 14 preferably formed integrally therewith and on which may be mounted a driving gear 16 outside the casing 10 by means of which the pumping gears 12 may be rotated at any desired speed. Gears 12 are mounted for rotation within the casing on shafts extending laterally from the gears and journaled in suitable bearings formed in the casing.

The casing 10 is formed in separable parts, as shown in the figures of the drawings, suitably secured together and provided with an intake passage 18 having a branch 20 extending to the intake space within the casing occupied by the gears 12. On the opposite side of the intermeshing portion of the gears 12 is a discharge passage 22 connecting to this space within the casing. The above-described construction is that usually found in intermeshing gear pumps of conventional form and it is to increase the capacity of the intake passages of such a conventional pump that the present construction has been provided.

In addition to the intake passage 20 above described or in lieu thereof are branch passages 24 leading to centrally mounted sleeves 26 maintained against rotation and about which the gears rotate. To accommodate these sleeves 26 the pumping gears 12 are centrally bored and the sleeves 26 fit freely in a substantially oil tight relation within the bored openings in the gears. These sleeves are supported at one end in casing

10 and are held against rotation by projecting lugs. The sleeves also are provided with lateral openings 28 in their walls extending for a portion only of their periphery at an intermediate point along their length as shown in Fig. 3. These openings or slots 28 permit liquid which has entered the sleeves from the intakes 24, through radial openings 25, to be admitted to radial passages 30 within the gears 12, connecting the bored openings within the gears with the interdental spaces. The slots 28 are wide enough, as shown in Fig. 3, to permit flow of fluid from the intakes 24 simultaneously through radial passages 30 formed within the gears when the outer ends of these radial passages enter the intake side of the gear space within the casing 10.

It will be seen by an inspection of Fig. 2 that the sleeves 26 are fixed relative to the casing by projections or lugs 27 on the sleeves 26 entering slots 29 formed within the casing 10. The inner ends of radial passages 30 in the gears 12 are brought into communication with the space within the sleeves 26 as the outer ends of the passages approach the intake side of the pump casing. When the inner end of the radial passage 30 passes beyond the edge of opening 28 in the sleeve 26 this radial passage 30 is closed until it again approaches the intake side of the casing. Under some conditions it may be desirable to close the inner end of passage 30 when the outer end of radial passage 30 has advanced beyond the intake space of the pump casing to a point where the gear teeth contact the cylindrical wall of the casing, however in the now preferred form the inner end of passage 30 is allowed to remain open for approximately 180° as shown in Fig. 3. The solid portion of sleeve 26 acts as a valve to prevent the liquid under pressure in the discharge portion of the casing from returning through passages 30 to the bored openings in the gears and hence to the intake portion of the pump.

As shown in Fig. 2 the gears 12 are supported at their opposite ends by appropriate bearing surfaces of any preferred type provided in the casing 10. The sleeves 26 are free within the gears 12 and do not take any lateral loads.

In operation and with the gears 12 suitably rotated, the liquid being pumped will enter the intake passage 20 and pass directly into the intake space within the casing. Also by means of the centrally mounted sleeves 26 and the radial extending passages 30 within the gears 12, additional fluid simultaneously enters the pump by way of the intakes 24, the sleeves 26 and radial passages 30. The intake space within the casing 10 therefore will be amply supplied with the fluid being pumped through the conventional intake and the intake supply conduits leading to the radial passages 30. The gears 12 may therefore be rotated at higher speeds than in the conventional types of gear pumps while ample supply of fluid is assured at all speeds to deliver maximum volume.

In the event the interdental spaces of the gears are not completely filled with liquid while the spaces are in the intake portion of the pump casing, the flow of liquid through passages 30 as the gear rotates will fill or tend to fill such spaces during this rotation as the interdental spaces approach the discharge side of the pump. Such a construction allows a much longer time in which the spaces may be filled over the time allowed in the ordinary gear pump. When the interdental spaces at the ends of the passages 30 are on the discharge side of the pump they are blocked by the solid portion of the sleeves 26.

As the fluid in passages 30 flows radially outward, its velocity is increased by centrifugal force and the mass flow through these passages and through the usual intake passages will maintain the flow into the pump at a maximum at high rotative speeds.

While the passages 30 extending radially within the gears 12 have been described as being used in conjunction with the conventional intake passage 20 it will be understood that these passages 30 may, if desired, be used as the principal intake passage for the pump.

It is to be further understood that the invention is not limited to the specific embodiment herein illustrated and described but may be used in other ways without departure from the spirit of the invention as defined by the following claims.

I claim:

1. A pump comprising a casing, a pair of intermeshing gears rotatably mounted therein, a main intake passage and supplementary intake passages on one side of said casing, an outlet passage on the opposite side of said casing, said supplementary intake passages extending from said main intake passage centrally within said gears and then radially therethrough to the interdental spaces of said gears, said radially extending passages being open to the intake side of said casing for only a portion of the gear circumference extending in the direction of gear rotation from adjacent the point of gear separation.

2. A pump comprising a casing, a pair of intermeshing gears rotatably mounted therein, a discharge passage for said casing, a main intake passage and supplementary intake passages for said casing, said supplementary intake passages extending from said main intake passage centrally within said gears and being open as successive angularly spaced radially extending passages within said gears have their outer ends in communication with the intake side of said casing.

3. A pump comprising a pair of intermeshing gears, driving means therefor, a casing enclosing said gears, intake and discharge passages formed in said casing, said passages entering opposite sides of the space occupied by said gears, sleeves about which said gears rotate having flow connections to said intake passage and lateral openings intermediate their lengths, and said gears having radial holes therein leading from said sleeves to the spaces between the teeth thereof, whereby supplemental intake passages are provided through said sleeves and radial holes to the interdental space of said gears.

4. A pump comprising a pair of intermeshing gears, driving means therefor, a casing enclosing said gears, intake and discharge passages formed in said casing on opposite sides of the space occupied by said gears, a supplemental intake passage, central sleeves extending transversely within the casing and about which said gears rotate having lateral openings intermediate their lengths, a flow connection between said supplemental passage and said sleeves, said gears having radially extending holes therein leading from said sleeves to spaces between the teeth thereof, said holes being open to the space within the sleeves when the outer ends of said holes are disposed within the intake space, whereby a supplemental intake is provided through said sleeves and radial holes to the space occupied by said gears.

5. A pump comprising a pair of intermeshing gears, driving means therefor, a casing enclosing said gears, intake and discharge passages formed in said casing on opposite sides of the space occupied by said gears, central sleeves about which said gears rotate, flow connections to said sleeves from the pump intake passage, said sleeves having lateral openings intermediate their lengths, and said gears having radially extending holes therein leading from said sleeves to the spaces between the gear teeth, whereby a supplemental intake is provided through said sleeves and radial holes to the space occupied by said gears.

6. A pump comprising a casing, intermeshing gears mounted for rotation in a gear cavity therein, intake and discharge passages within said casing and communicating with separate portions of said gear cavity, a supplementary intake passage leading from outside said gear cavity and including passages extending radially from within at least one of said gears to the interdental spaces of said gear, and means for continuously blocking the radially extending passages leading to an interdental space in fluid communication with said discharge passage.

7. A pump comprising a casing, intermeshing gears rotatably mounted therein, a discharge passage within said casing and outside of and communicating with interdental spaces of said gears, an intake including passages extending radially outward from within at least one of said gears to interdental spaces of said gear, said intake passages being open to unmeshed portions of said gear, and means for blocking the radially extending passages leading to interdental spaces in fluid communication with said discharge passage and preventing inward flow in said radially extending intake passages.

8. A pump comprising a casing, intermeshing gears rotatably mounted therein, a discharge passage within said casing and outside of and communicating with interdental spaces of said gears, an intake including passages extending radially from within said gears to the interdental spaces of said gears, said intake passages being open to unmeshed portions of said gears, and means for blocking the radially extending passages leading to interdental spaces in fluid communication with said discharge passage.

9. A pump comprising a casing, a pair of intermeshing gears rotatably mounted in a gear receiving recess therein, main intake and discharge passages within said casing and continuously connected with said gear receiving recess, and a supplemental intake passage leading from a portion of said main intake passage outside said gear receiving recess to passages within one of said gears extending radially from within said one gear to the exterior thereof, means connecting said radially extending passages to said supplemental passage for only a portion of the gear

circumference, said portion extending in the direction of gear rotation from adjacent the point of gear separation.

10. A pump comprising a pair of intermeshing gears, driving means therefor, a casing enclosing said gears in a gear space, intake and discharge passages formed in said casing on opposite sides of said gear space, a supplementary intake passage, a central hollow sleeve about which one of said gears rotates having lateral openings formed therein intermediate its length, a flow connection between said supplementary passage and said hollow sleeve, said one gear having radially extending holes formed therein leading from said sleeve to the spaces between the teeth thereof, whereby a supplemental intake is provided through said hollow sleeve and out said lateral openings and said radial holes to said gear space.

11. A pump comprising a pair of intermeshing gears, driving means therefor, a casing enclosing said gears in a gear space, main intake and discharge passages formed in said casing on opposite sides of said gear space and including a portion of said gear space, a supplemental intake passage, a central hollow sleeve extending transversely within said casing and about which one of said gears rotates, said sleeve having a lateral opening extending throughout approximately one half of the circumference of said sleeve and located intermediate the length of said sleeve, a flow connection between said supplemental intake passage and said hollow sleeve, said one gear having radially extending holes therein leading from said hollow sleeve to spaces between the gear teeth, said holes being opened to the space within said hollow sleeve when the outer ends of said holes enter said main intake passage and closed to the space within said hollow sleeve before the outer ends of said holes enter said main discharge passage, whereby a supplemental intake is provided through said sleeve and radial holes to said gear space.

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