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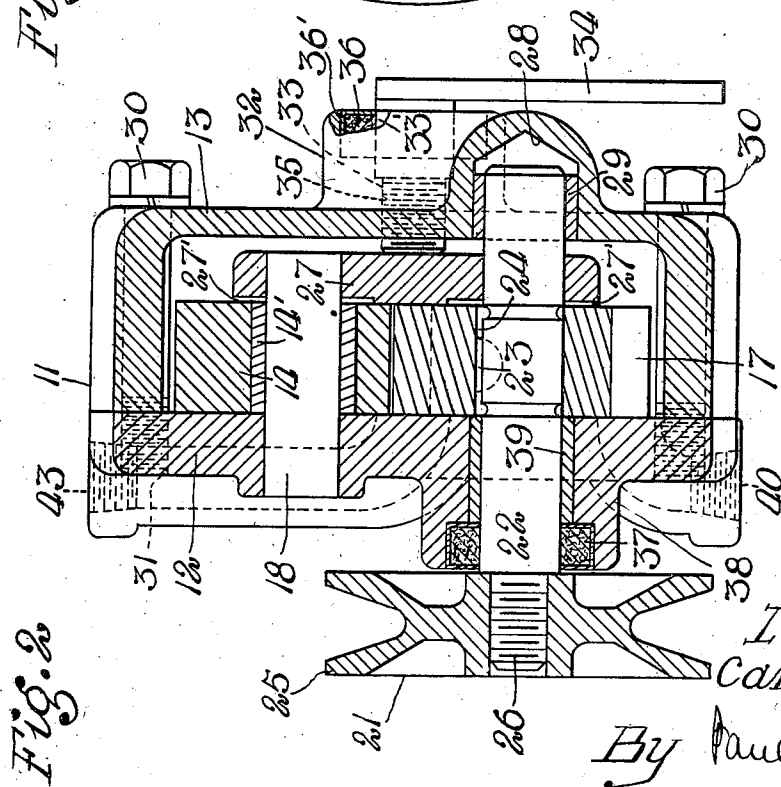
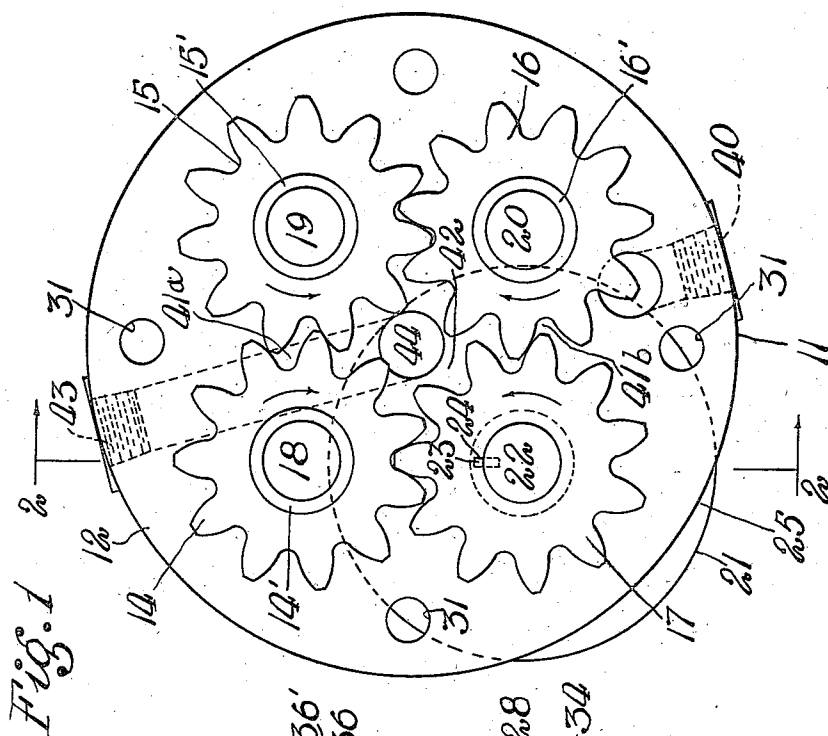
C. W. MOTT

2,272,309

GEAR PUMP

Filed March 6, 1939

2 Sheets-Sheet 1



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Fig. 3

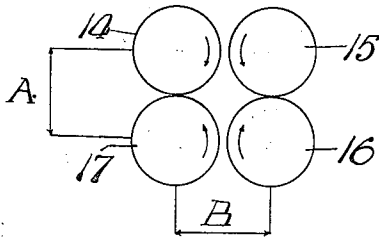


Fig. 4

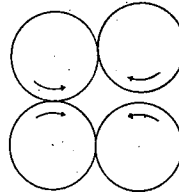


Fig. 5

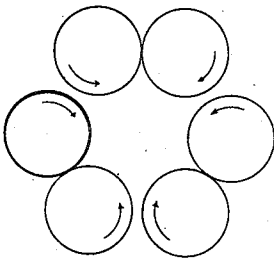


Fig. 6

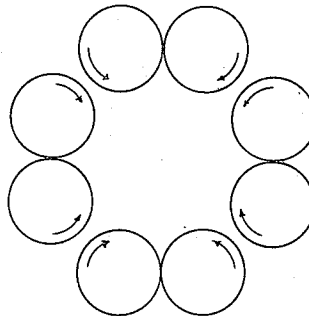


Fig. 7

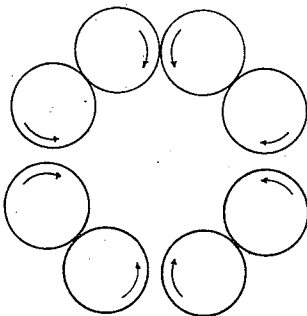
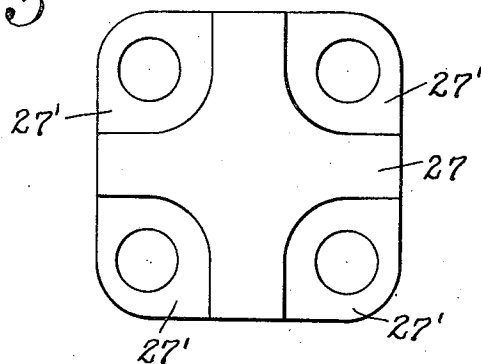


Fig. 8



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UNITED STATES PATENT OFFICE

2,272,309

GEAR PUMP

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5 Claims. (Cl. 103—126)

This invention relates to fluid gear pumps and more particularly to the arrangement of the fluid gears therefor.

With the usual fluid gear pumps, the fluid is delivered from one side of the pump to the other by the same being taken between the gear teeth and a closely fitting casing and delivered circumferentially to the other side of the pump. Perfection in the operation of the pump is dependent upon there being a well machined casing which is costly to form.

The object of the present invention is to provide a gear pump which is simple in construction and cheap to make, in that it is not necessary to have the gears exactly fit the casing and thus wherein machining of the same is eliminated.

Another object of the invention is to provide a pump which includes a controllable means independent of the drive mechanism for effecting or stopping the pump action.

The present invention takes the form of a plurality of even number of gears of standard gear shape arranged in a cluster to drive one another and to provide a central space within the same. While all of the gears are in driving relationship, some of them are slightly out of normal mesh with an adjacent gear. Those slightly out of normal mesh will leave a space by which fluid can be transferred. With this slight space being provided between those portions of the gears moving toward the central space from a fluid body provided about the entire cluster of gears, the fluid will be taken inwardly through this slight space and delivered to the central space within the entire cluster of gears. From this central space there is a communication by which fluid may be delivered for use to any desired point where fluid pressure is to be desired. Those portions of the gears which are not slightly out of mesh but are in normal mesh will act as positive seals to the central space. No fluid is permitted to pass outwardly from the space as with regard to these normal mesh portions. In order to provide an effective means for controlling operation of the pump, wall and plate portions are used to effect closing of the central space, one of these portions being movable toward and from the flat faces of the gears, so that pump action can be controlled. As the portion is moved to close the central space, pumping action will be effected, and, as it is moved away to open the central space, pumping action will cease, the gears merely churning in the fluid body.

It was found, in the making of the usual pumps

where the pumping action was dependent upon the casing fitting tightly with the gears in order that fluid was moved between the gear teeth and wall of the casing, that there was considerable expense involved in the cutting and machining of this space in which the gear was to run. This expense even ran into a cost more than the cost of the making of the pump gears themselves. It has been found that the gears, though they are more in number than what is used in the ordinary pump, can be made much more cheaply and with less expense than the cost of the machining necessary in the manufacture of the usual form of pump.

For other objects and for a better understanding of the invention, reference may be had to the following detailed description taken in connection with the accompanying drawings, in which:
Figure 1 is a plan view of the pump in its preferred form with the cover removed, showing the arrangement of the gears;

Figure 2 is a cross sectional view taken on the line 2—2 of Figure 1 and illustrating the driving means and control means;

Figures 3 to 7, inclusive, are diagrammatic showings of various arrangements of the gears, by which pumping action can be effected, including in Figure 3 the preferred form shown in Figures 1 and 2; and,

Figure 8 is a plan view of the inside surface of the closure plate.

In Figures 1 and 2, there is shown a fluid containing casing designated generally at 11 and comprising a wall portion 12 and a cover portion 13. On the wall portion 12 there is drivingly mounted a cluster of four gears 14, 15, 16 and 17, each of which having a standard gear shape. The gears 14, 15 and 16 each has bushings 14', 15', and 16', respectively, for the journaling of the same on axle spindles 18, 19 and 20, respectively, retained in the wall portion 12. The gear 17 may be designated as the driving gear inasmuch as it is the gear to which power is delivered from the driving means designated generally at 21, which includes an axle spindle 22 extending through the wall portion 12, to which the gear 17 is drivingly fixed by a key means 23 engaging with a slot 24 in the gear. On the outer end of the spindle 22 and externally of the casing 11 is a drive pulley 25 fixed to the axle spindle by means of a threaded portion 26 thereof.

All four of the axle spindles extend inwardly from the wall portion 12 sufficiently beyond the face of the gears so as to provide guiding of a closure plate portion 27 carried thereby. This

closure plate is movable toward and from the gear faces. Since it is not necessary for all of the plate to engage the entire portion of the faces of the gears to effect closing of the central space, the contacting face of the closure plate has relieved or recessed portions 27'. Movement of the plate portion 27 into engagement with the faces of the gears closes the central space and effects pump action. Opening of the space by disengagement of the plate 27 with the face will effect cessation of or relieve pump action. Upon opening the space, the gears merely churn in the fluid. The driving axle spindle 22 extends from the wall portion 12 a greater distance than the other spindles in order to have the same seat in a recessed portion 28 of the cover 13 and in journaled engagement with a bushing 29 seated in the recess 28.

The cover 13 is adapted to be removed from the wall portion 12 and can be coupled therewith by bolts 30 adapted to thread in threaded holes 31 in the wall portion 12. This cover, in addition to the recess 28, also has an extended portion 32 for receiving a threaded screw 33 having a laterally extending handle 34 associated with it. The portion 32 has a threaded hole 35 for receiving the threaded screw 33, which extends into the space within the casing and into engagement with the forward face of the closure plate 27 to control its position with relation to the face of the gears. In order to provide a sealing engagement of this screw 33 with the cover, the screw 33 has a cylindrical portion 33' with which a packing gland 36 in a recess 36' in the projected portion 32 cooperates.

In order to provide for sealing of the axle spindle 22 in the wall portion 12, there is provided a packing gland 37 in a projected portion 38 on the outer face of the wall portion 12. There is also a bushing 39 in the wall portion and extending into the portion 38 for providing the journal engagement of the spindle 22 therewith.

In wall portion 12, there is provided, near its lower edge, an inlet passage means 40 for delivering fluid into the casing to provide a body of fluid about the entire cluster of gears. The casing 11, therefore, functions to obtain means to provide a body of fluid about the cluster of gears.

In this form shown in Figures 1, 2 and 3, the axle spindles are so arranged that a pair of gears 14—17 are slightly out of normal mesh with a pair of gears 15—16, but the individual gears in each of these respective pairs is in normal mesh with their other gear of the pair. As illustrated in Figure 3, the pairs of gears are spaced apart a distance equal to the difference between the measured distances between gear centers A and B. This arrangement of the gears provides for spaces 41a and 41b between the pairs of gears which are continuously forming as the same are driven to take fluid from the fluid body surrounding the cluster of gears into a central space 42 within the gears. The rotation of the gears is such that the flow of fluid is inwardly relative to the portions of the gears which form the spaces 41a and 41b, although it should be seen that a reversal of rotation could take place and fluid could be moved from the central space outwardly. Also, in the form shown, the gears which are used have an uneven or odd number of teeth. This changes the operation of the arrangement in that one of the spaces is formed at a different time from the other space. Hence, fluid is brought into the central spaces, respec-

tively, with different unions of the gears at different times. With the use of gears having an even number of teeth, fluid is brought in between the slightly out of mesh gears at the same time. The union between the gears 14—17 and 15—16, being in normal mesh, acts to seal the central space, hence the fluid is only being taken in by the spaces 41a and 41b.

In order to take off the fluid brought into the central space 42, there is provided an outlet passageway means in the wall portion 12 having an entrance 44 on the gear-engaging face of the wall portion. From this passage means 43, the fluid may be delivered to any location where it is desired to have work performed.

While the form shown in Figures 1, 2 and 3 relates only to where four gears or two pairs of gears are used, it should be appreciated that other arrangements, such as shown in Figures 4 to 7, inclusive, might be used, all of the arrangements operating generally on the same principle, in that an even number of gears is always used, and also in that they might be arranged so that they lie in pairs. In considering these diagrammatic forms, it should be understood that, while the gears are designated by circles and those gears which are slightly out of mesh are shown by the circles being out of contact, it is intended by these forms and in accordance with the spirit of the invention that all of the gears are in driving relationship, except that the unions between some of the gears are in slightly out of normal meshing engagement.

The form shown in Figure 5 merely adds an additional pair to the form shown in Figure 3, while the form shown in Figure 6 merely adds an additional pair to the form shown in Figure 5. This adding of pairs of gears could be made indefinitely.

In the forms shown in Figures 4 and 7, there is shown less entrances of the fluid than would be possible for the particular number of gears being used. For instance, in Figure 4, there is only one entrance by which fluid is taken into the central space as distinguished from Figure 3 wherein there are two entrances. In Figure 7 there are only three entrances of fluid into the central space whereas there could be four entrances as shown in Figure 6, both having the same number of gears. However, it should be noted that all of the forms include an even number of gears. This is because an uneven number of gears would give a locked condition to the arrangement and would not operate.

It should now be seen that there has been provided by the present invention a fluid pump wherein the gears themselves do not need to cooperate with the wall portions of the casing to effect pumping action. Since they do not need to cooperate with the wall portions, the elimination of machining, which was necessary for the usual pumps, is no longer necessary.

While various changes may be made in the detailed construction of the structure shown herein, it should be understood that such changes shall be made within the spirit and scope of the present invention as defined in the appended claims.

What is claimed is:

1. In a gear pump, a cluster of gears of standard gear shape drivingly arranged in pairs and forming a central space, the individual gears of each pair being in normal mesh with each other but at least one of said pairs being slightly out of normal mesh with an adjacent pair so

as to permit flow of fluid therebetween, controllable means for effecting closing and opening of the central space within the center of the cluster of gears to regulate pump action, the closing of said space effecting pump action while the opening of the same effects cessation of the pump action, means for providing a body of fluid completely about the gears, a portion of the periphery of each gear being in communication with said body of fluid, means for driving the gears whereby when said central space is closed a fluid will be caused to flow from the body of the fluid and between slightly out of mesh gears to the central space, and an outlet means for taking off the fluid from the central space.

2. In a gear pump, a fluid-containing casing including a flat wall portion and a removable cover adapted to be fixed to the wall portion, a cluster of an even number of gears of standard gear shape drivingly arranged on said wall portion with one of their faces sealingly engaging therewith, any one of said gears in normal and sealing mesh with one adjacent gear and slightly out of normal mesh with the other adjacent gear, a controllable closure plate arranged to be slidable toward and away from the faces of the gears to close and open the central space within the cluster of gears, means carried by the cover and extending therethrough to be accessible from the outside of the casing for effecting movement of the plate toward and away from the gears, said casing providing for the locating of a body of fluid completely about the gears, a portion of the periphery of each gear being in communication with said body of fluid, means for driving said gears extending through the wall portion, whereby when said plate effects closing of the central space by said means carried by the cover pumping action takes place and fluid passes from the fluid body and between the slightly out of mesh gears and the central space, and outlet means in the wall portion for taking off the fluid from the central space.

3. In a gear pump, two pairs of gears of standard gear shape, the individual gears of each pair being in normal and sealing mesh but said pairs being drivingly arranged together though slightly out of normal mesh such a distance as to effect flow of fluid between the gears, said gears forming a central space, control means for

closing the central space, means for providing a complete body of fluid about the gears, a portion of the periphery of each gear being in communication with said body of fluid, means for driving the gears, whereby fluid is caused to flow from the body of fluid and between the slightly out of mesh gears to the central space, and outlet means for taking off fluid from the central space.

4. In a fluid gear pump, four pump gears of standard gear shape arranged in driving relationship with each other but the alternate union of the gears being slightly out of normal mesh to provide a slight space for effecting movement of fluid, said gears in their arrangement forming a central space, controllable means for effecting closing and opening of said central space, the closing of the central space effecting pump action while the opening of the same will relieve action of the pump, means for providing a complete body of fluid about the gears, a portion of the periphery of each gear being in communication with said body of fluid, means for driving the gears whereby when said central space is closed fluid will be caused to flow from the body of the fluid and between the slightly out of mesh gears to the central space, and outlet means for taking off the fluid from the central space.

5. In a fluid gear pump, a fluid-containing casing including a flat wall portion, four pump gears of standard gear shape arranged in driving relationship with each other on the flat wall portion and within the casing but the alternate union of the gears being slightly out of normal mesh to provide a slight space for effecting movement of fluid, said gears in their arrangement forming a central space, said casing being of sufficient size to provide a complete body of fluid about the gears, a portion of the periphery of each gear being in communication with said body of fluid, controllable means for closing the central space opposite the flat wall portion to effect pumping action, outlet means in the wall portion communicating with the central space for taking off fluid therefrom, and means for driving the gears, whereby fluid in the casing near to the portion of the periphery of each of the gears is taken into the central space and delivered to the outlet means.

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