Feb. 9, 1937. D. GREGG 2,070,203

OIL PUMP

Filed Nov. 5, 1934

Fig. 1

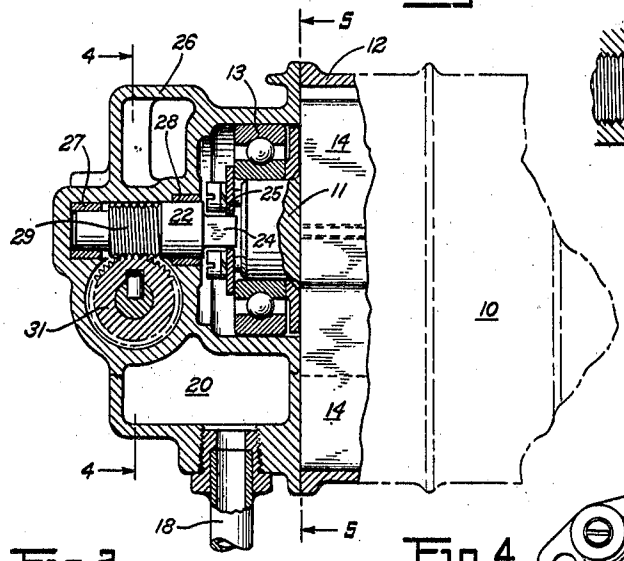


Fig. 6

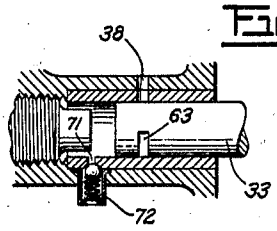


Fig. 7

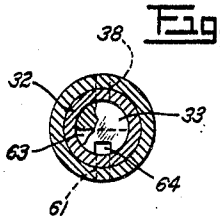


Fig. 2

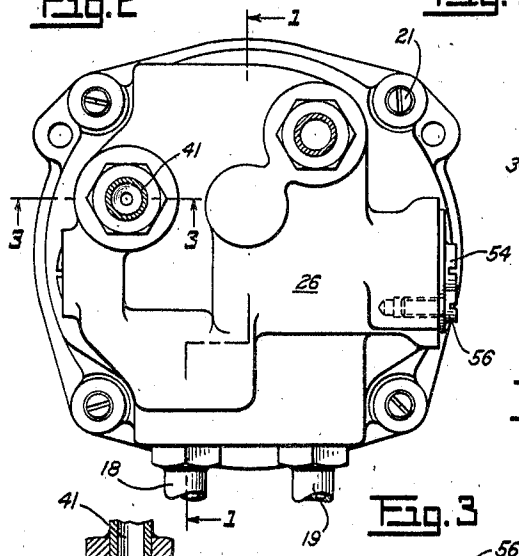


Fig. 4

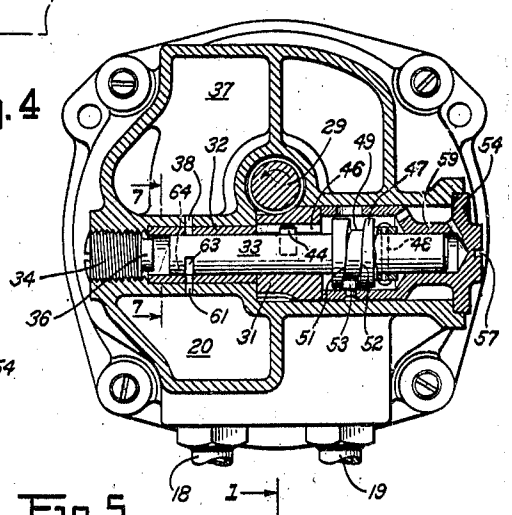


Fig. 3

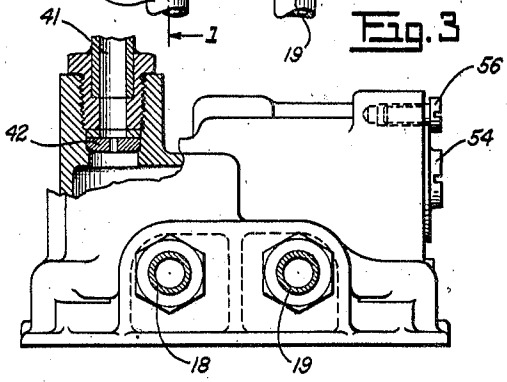
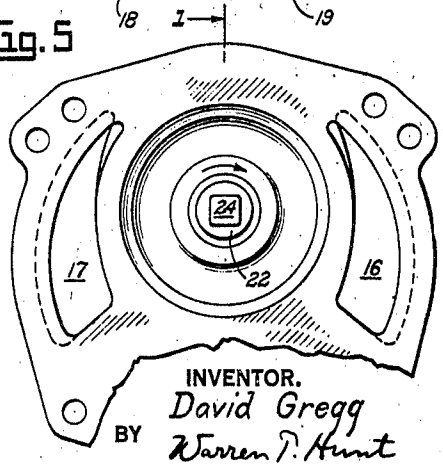


Fig. 5



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OIL PUMP

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Application November 5, 1934, Serial No. 751,604

8 Claims. (Cl. 103—157)

This invention relates to pumps and more particularly to reciprocating pumps that are suitable for pumping small quantities of liquid.

An object of the invention is to provide a fluid pump which will supply small quantities of fluid in a predetermined amount at each stroke of the piston.

Another object of the invention is to provide a reciprocating fluid pump in which the amount of fluid that is pumped may be readily varied.

Another object of the invention is to provide a reciprocating fluid pump in which the amount of fluid pumped may be varied without changing the pump speed.

Another object of the invention is to provide a reciprocating fluid pump in which the pumping capacity may be varied by changing the angular position of the piston with respect to its reciprocal position.

Other objects of the invention will be apparent from the following description in connection with which certain embodiments of the invention have been shown in the accompanying drawing in which:

Fig. 1 is a side elevation partly in section of a vane type air pump having an oil pump constructed in accordance with the invention;

Fig. 2 is an end view of the oil pump shown in Fig. 1;

Fig. 3 is a view partly in section, the sectional portion being taken on line 3—3 of Fig. 2;

Fig. 4 is a sectional view taken on line 4—4 of Fig. 1;

Fig. 5 is a sectional view taken on line 5—5 of Fig. 1;

Fig. 6 is an enlarged view showing a modified form of cylinder construction; and

Fig. 7 is an enlarged end view of the oil pump piston, taken along line 7—7 of Fig. 4.

Referring to the drawing, the air pump upon which the improved oil pump is mounted is indicated generally at 10 and is of well known construction, having a rotor 11 eccentrically mounted in casing 12 by bearing 13. Slidable vanes 14 are mounted in the rotor, and the inlet and outlet ports to the air pump are shown at 16 and 17, respectively, (Fig. 5). Inlet port 16 is connected to the atmosphere through a cored passageway 20 that is formed in the oiler head by means of pipe 18, and the outlet is connected through a similar passage, not shown, to discharge pipe 19.

In air pumps for certain purposes it is desirable to supply lubricant thereto in measured quantities so that the minimum amount of lubricant is supplied to adequately lubricate the same. An over-supply may allow some of the oil to enter the outlet pipe and be detrimental to the functioning of devices that are operated by the air pump. For example, if the air pump be used to inflate rubber articles it is very desirable to reduce the oil supply to a minimum and thus prevent deterioration of the rubber from the excess oil that is passed through the outlet line.

The oil pump embodying the present invention is secured to the casing 12 by screws 21 and is driven by shaft 22 having a squared end 24 which is mounted within a squared opening 25 formed in the rotor 11. Shaft 22 is rotatably mounted in the oil pump housing 26 by bearings 27 and 28 and is provided with a worm 29 in mesh with the worm wheel 31. A bushing 32 forming the oil pump cylinder is pressed within the casing 26 within which is mounted the reciprocating piston 33, the outer end of the cylinder being closed by a threaded plug 34 having a cylindrical projection 36 projecting within the cylinder to determine the clearance volume of the pump, it being apparent that plug 34 can be readily changed and another one substituted to provide any clearance that is desired. Cylinder 32 is preferably positioned horizontally and connected with compartment 37 by an oil inlet port 38, oil being supplied to the compartment 37 by any suitable means, such as a separate pump (not shown) by means of oil supply pipe 41. A metering disc 42 is provided in the oil supply line for regulation of the quantity of oil delivered, but this is not essential. It is desirable, however, to keep an adequate supply of oil in the reservoir 37 so that inlet 38 may be covered at all times. The piston 33 is provided with a pin 44 which is slidably mounted in a groove 46 formed in the interior of worm wheel 31. A member 47 is secured to piston 33 by any desired means, such as rivet 48, and contains a groove 49 formed by two parallel cam surfaces 51 and 52. A pin 53 is secured to sleeve 54 and projects within the groove 49. Sleeve 54 is rotatable in the housing and secured in any desired angular position by screw 56. Screw slot 57 is provided for angular adjustment of the sleeve by any suitable tool. Sleeve 54 surrounds the cam groove 49 and is provided with a reduced portion 59 forming a bearing for the piston 33. The outlet port 61 of the cylinder is in communication with the air inlet compartment 20 which communicates with the air pump 10. The pump inlet port 38 and outlet port 61 are controlled by a slot 63 formed in piston 33 which is in communication with the cylinder by an end slot 64.

In the operation of the pump, compartment 37

is supplied with oil from any suitable source and inlet port 38 is submerged. Rotation of shaft 22 causes piston 33 to rotate and during the rotation thereof, the piston is also reciprocated by means of the pin 53 and the cam slot 49. It will be apparent that the piston is shown in its extreme position toward the right and further rotation will cause it to move toward the left, as viewed in Fig. 4. It is assumed that a charge of oil has been drawn into the cylinder during a previous portion of the cycle, and it is apparent that the movement of the piston toward the left will force oil from the cylinder through the slots 64 and 63 into the air inlet chamber 20 from which it will be delivered to the air pump by port 16 for lubrication thereof.

In the embodiment shown in Fig. 4 the stroke is substantially equal to the width of the ports 61 and 38 and the slot 63 extends over substantially one-half of the piston circumference. The sleeve 54 is shown in an adjusted position to deliver one-half the cylinder displacement during one pump cycle. Rotation of sleeve 54 through 90 degrees in either direction from the position shown will cause the pump to deliver its full cylinder displacement during each cycle, and rotation of the sleeve through 180 degrees will reduce the delivery to substantialy one-half the cylinder displacement.

The cycle of operation of the pump with the sleeve 54 in the position shown is as follows:

The first quarter of revolution moves the piston one-half stroke toward the left and discharges one-half the cylinder displacement to air chamber 20.

The second quarter of revolution moves the piston to its extreme position toward the left, but during this portion of the stroke the inlet port 38 is uncovered by slot 63 and the exhaust port 61 is closed, therefore any oil remaining in the cylinder is returned to chamber 37.

The third quarter of revolution moves the piston one-half stroke toward the right and draws oil into the cylinder from the inlet chamber 37 through port 38.

The fourth quarter revolution moves the piston to its extreme right position and suction is applied to the exhaust port 61, but no oil is drawn into the cylinder as chamber 20 is the air intake chamber of the air pump and is much larger than the displacement space of the oil pump, therefore there is no oil adjacent the port 61 and the piston draws air into the oil pump cylinder during the last half of the intake stroke, and no oil is removed from the chamber.

Maximum delivery

Rotation of the sleeve 54 through 90 degrees in either direction from the position of Fig. 4 moves the piston one-half its stroke toward the left and the operation is as follows:

The first quarter revolution discharges one-half the cylinder displacement to chamber 20.

The second and third quarter revolutions draw oil from the chamber 37.

The fourth quarter revolution discharges one-half the cylinder displacement to chamber 20, making a total discharge for the cycle equal to the entire cylinder displacement.

Minimum delivery

Rotation of sleeve 54 through 180 degrees from the position of Fig. 4 moves the piston its full stroke toward the left and the operation is as follows:

The first quarter revolution applies suction to the exhaust port 61, and only air is drawn into the cylinder for the first half of the suction stroke.

The second quarter revolution applies suction to the inlet port 38, and the remaining half of the suction stroke draws oil from chamber 37, with the result that the cylinder contains half oil and half air at the end of the suction stroke.

The third quarter revolution applies pressure to inlet port 38, but the greater portion of the oil has reached the lower side of the cylinder, therefore the first half of the piston delivery stroke returns the air and possibly some of the oil to chamber 37.

The fourth quarter revolution applies pressure to the exhaust port 61 and the oil remaining in the cylinder, which is substantially one-half of the cylinder displacement, is delivered to chamber 20.

In the modification illustrated in Fig. 6, the outlet port 71 is not controlled by piston movement but is placed somewhat beyond the end of the stroke and is provided with a check valve 72 for preventing the return of oil to the cylinder.

In this form of the invention the operation is quite similar to the form previously described, except that regulation of the quantity of oil pumped is controlled entirely by adjusting the position of slot 63 with reference to the inlet port 38.

While certain embodiments of the invention have been illustrated and described, it is understood that this showing and description are illustrative only and the invention is not regarded as limited to the form shown and described, or otherwise, except by the terms of the following claims.

What is claimed is:

1. In a pump the combination of a housing, a cylinder therein having inlet and outlet ports, a piston in said cylinder having a port arranged to periodically coincide with said inlet and outlet ports for connecting the same with the compression space of the cylinder, said piston port extending substantially half way around the piston surface, means for rotating said piston, a member secured to the piston having a cam groove, a sleeve providing a bearing for said piston, means secured to the sleeve and projecting within said groove for causing reciprocation of said piston during rotation thereof, and means for manually rotating the sleeve from the exterior of the housing to adjust the delivery of the pump.

2. In a pump the combination of a housing, a cylinder therein having inlet and outlet ports, a piston in said cylinder controlling said ports, a gear surrounding said piston and having a feathered connection with said piston for rotating the same, a cam on said piston, a sleeve providing a bearing for said piston, means secured to the sleeve and coacting with the cam for reciprocating said piston, and means for manually rotating the sleeve from the exterior of the housing.

3. In a pump the combination of a housing, a cylinder therein having aligned inlet and outlet ports, a piston in said cylinder having a slot for controlling said ports, a gear concentric with the piston and having a feathered connection with said piston for rotating the same, a sleeve abutting said gear and providing a bearing for said piston, a cam on said piston, means secured to said sleeve and coacting with the cam for reciprocating said piston, means for manually rotating the sleeve from the exterior of the housing, and means for restraining the sleeve against rotation.

4. In a pump the combination of a housing, a cylinder therein having inlet and outlet ports, a rotatable worm, a worm gear meshing therewith, a piston having a slidable driving connec-

tion with said worm gear and arranged to control said ports, spaced cam means on said piston forming a groove therebetween, a sleeve concentric with said piston rotatably mounted in said housing, means on said sleeve projecting into said groove, and means for restraining rotation of said sleeve.

5. In a pump the combination of a housing, a cylinder therein having inlet and outlet ports, a rotatable worm, a worm gear meshing therewith, a piston having a slidable driving connection with said worm gear and arranged to control said ports, spaced cam means on said piston forming a groove therebetween, a sleeve concentric with said piston rotatably mounted in said housing, said sleeve having a reduced portion forming a bearing for said piston, means on said sleeve projecting into said groove, and means for restraining rotation of said sleeve.

6. In a pump the combination of a housing, a cylinder therein having inlet and outlet ports, a rotatable worm, a worm gear meshing therewith, a piston having a slidable driving connection with said worm gear and arranged to control said ports, spaced cam means on said piston forming a parallel sided groove therebetween, a sleeve concentric with said piston rotatably mounted in said housing, a pin secured to said sleeve projecting into said groove and substantially filling the same, and means for restraining rotation of said sleeve.

7. In a pump the combination of a housing, a cylinder therein having inlet and outlet ports, a rotatable worm, a worm gear meshing therewith, a piston having a slidable driving connection with said worm gear and arranged to control said ports, spaced cam means on said piston forming a groove therebetween, a sleeve concentric with said piston rotatably mounted in said housing and abutting said worm gear, said sleeve having a reduced portion forming a bearing for said piston, a pin secured to said sleeve projecting into said groove, and means for restraining rotation of said sleeve.

8. In a pump the combination of a housing, a horizontal cylinder therein having vertically arranged inlet and exhaust ports, said inlet port being arranged above said exhaust port, a liquid reservoir above said inlet port and in communication therewith, an air chamber below and in communication with said exhaust port having a volume greater than the cylinder displacement of the pump, a piston in said cylinder controlling said ports, means for rotating said piston during the reciprocation thereof, cam means secured to the piston for reciprocating the same, a sleeve providing a bearing for said piston, a cam follower secured to the sleeve and coacting with said cam means for reciprocating the piston, said sleeve being adjustably rotatable from the exterior of the housing for changing the relative position of the cam follower with respect to the cam means, and means restraining rotation of said sleeve.

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