

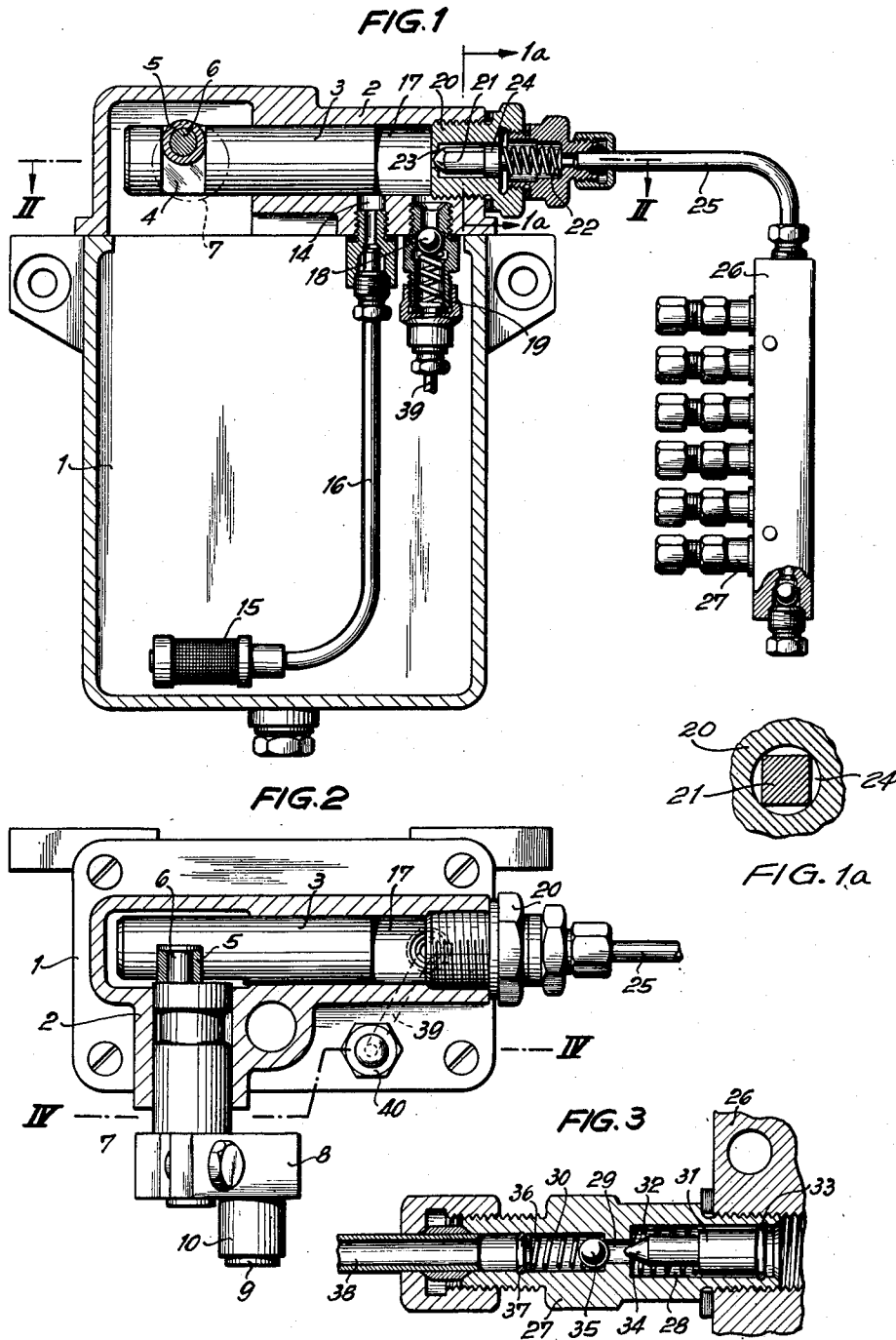
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FLUID DISTRIBUTING APPARATUS

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2 Sheets-Sheet 1



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2 Sheets-Sheet 2

FIG. 4

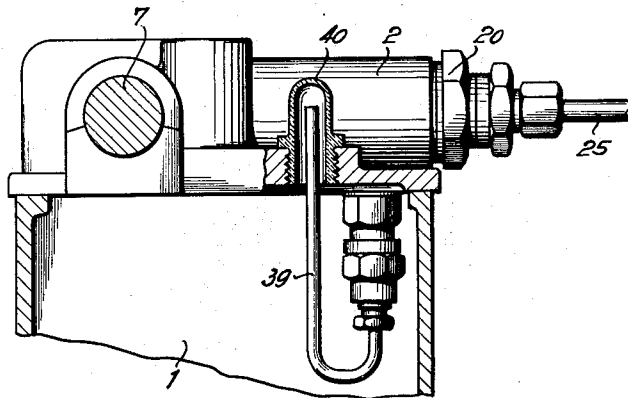
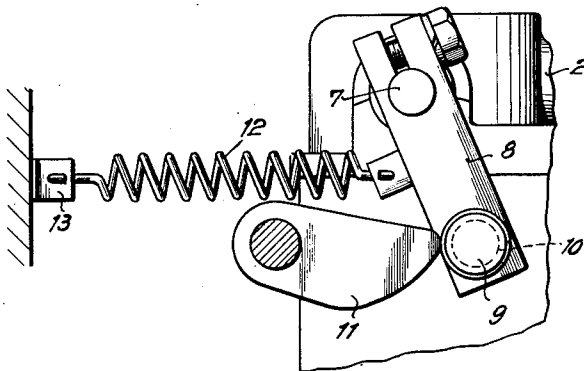


FIG. 5



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FLUID DISTRIBUTING APPARATUS

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2 Claims. (Cl. 184-7)

The present invention relates to a fluid distributing apparatus.

More particularly, the present invention relates to that type of fluid distributing apparatus which is adapted to simultaneously deliver predetermined amounts of fluid to a plurality of stations. Such devices are used, for example, in lubricating systems for delivering predetermined amounts of oil simultaneously to a plurality of stations.

Known devices of this type include reciprocating pistons which deliver a measured amount of fluid, and a particular disadvantage of these known devices resides in the fact that the fluid pressure is used to move these pistons back to their rest position, so that the apparatus is required to pump and supply more fluid than the amount which actually passes to the several stations. Furthermore, pumps of such known devices are required to operate at a pressure which is substantially higher than the highest pressure required at the several stations to which fluid is delivered. Furthermore, great inconvenience and complications as well as faulty operation are associated with these known devices because they require stuffing boxes or other sealing glands to be used with the fluid measuring pistons.

One of the objects of the present invention is to overcome these drawbacks by providing fluid measuring pistons which are moved back to their rest position by a means other than the fluid pressure.

Another object of the present invention is to provide an apparatus which does not require any sealing glands such as stuffing boxes or the like to be associated with the fluid measuring pistons.

A further object of the present invention is to provide a means for relieving the fluid pressure at the measuring devices after the pressure stroke of the fluid supplying pump.

An additional object of the present invention is to provide a means for guaranteeing that a supply of fluid will always be on hand at the several fluid measuring devices to be moved therefrom to the several stations.

Still another object of the present invention is to provide a means for automatically returning to a supply tank excess fluid which cannot pass through the apparatus during operation of the fluid supplying pump.

A still further object of the present invention is to provide a means for rendering a part of the moving fluid visible.

Yet another object of the present invention is to derive at least a part of the movement of the piston of the fluid supplying pump from a spring.

The objects of the present invention also include the provision of an apparatus capable of accomplishing all of the above objects while at the same time being made up of simply and ruggedly constructed parts which are small in number and which are very reliable in operation.

With the above objects in view, the present invention mainly consists of an apparatus for supplying a predetermined amount of fluid, such as lubricant or the like, to a

predetermined station, this apparatus including a conduit means leading to the station for conveying a fluid thereto and having in its interior a transverse wall portion formed with an opening passing therethrough. A non-return valve means is located in the conduit means on the downstream side of the wall portion thereof and engages the latter to permit fluid to flow only downstream through said opening. A piston means is mounted in the conduit means on the upstream side of the wall portion thereof for movement toward and away from the latter, this piston means having a free end portion of a smaller size than the interior of the conduit means located adjacent the wall portion for engaging the latter and closing the opening thereof upon movement of the piston means in a downstream direction toward this opening. A spring means is operatively connected to the piston means for urging the latter in an upstream direction away from the opening, and a stop means is located in the conduit means upstream of the piston means and adjacent thereto for limiting the movement of the piston means away from the opening under the influence of the spring means. A pump means is operatively connected to the conduit means for periodically moving a fluid under pressure in a downstream direction through the conduit means so that the fluid engages the piston means to move the latter against the action of the spring means toward the opening until the free end portion of the piston means closes the latter. A passage means communicates with the space in the conduit means between the non-return valve means and the piston means for conveying fluid to this space so that the fluid in this space is moved through the non-return valve means during movement of the piston means toward the opening until the free end portion of the piston means closes the opening.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

Fig. 1 is a partly sectional, elevational view of one possible apparatus constructed in accordance with the present invention;

Fig. 1a is a fragmentary sectional view taken along lines 1a-1a of Fig. 1 in the direction of the arrows;

Fig. 2 is a partly sectional view taken along line II-II of Fig. 1 in the direction of the arrows;

Fig. 3 is a fragmentary sectional view through one of the several fluid measuring devices of the present invention;

Fig. 4 is a partly sectional view taken along line IV-IV of Fig. 2; and

Fig. 5 is a fragmentary elevational front view of a part of the structure shown in Figs. 1 and 2.

Referring now to the drawings, a tank means 1 is shown in Fig. 1, and this tank means is adapted to hold a fluid such as a lubricating oil or the like to supply the same to a pump means mounted on top of the tank means and including the single cylinder 2 and the single piston 3 which is mounted in the cylinder 2 for reciprocation therein. The cylinder 2 has its outlet end portion located at its right-hand end, as viewed in Fig. 1, and the space in the cylinder 2 between the outlet end thereof and the piston 3 forms a pressure chamber 17.

The piston 3 is formed with a transverse groove 4 in one side thereof (Figs. 1 and 2), and a roller 5 is located in this groove 4 for sliding up and down the length thereof while moving to the right and left to reciprocate the piston 2. The roller 5 is turnably mounted on a pin

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6 which is fixed eccentrically to a shaft 7 rotatable in a bearing forming an integral extension of the cylinder 2, as is shown in Fig. 2.

This shaft 7 is fixed at its outer end to a lever 8 (Figs. 2 and 5) to which a pin 9 is fixed. A roller 10 is rotatably carried by the pin 9 and is maintained in engagement with a cam means 11 (Fig. 5) which is fixed to a rotating shaft of a motor or the like (not shown). A spring 12 (Fig. 5) is fixed at one end to a stationary bracket 13 and is connected at its other end to the lever 8 so as to urge the latter in a clockwise direction about the axis of shaft 7, as viewed in Fig. 5.

Thus, the spring 12 serves to maintain the roller 10 in engagement with the cam 11 so that the turning cam 11 moves the piston 3 in its pressure stroke toward the outlet end of cylinder 2 to reduce the volume of pressure chamber 17, while the spring 12 moves the piston 3 in the reverse direction in its suction stroke to increase the volume of pressure chamber 17.

The tank means 1 includes a suction duct means which takes the form of a tube 16 having an inlet covered by a filter 15 and communicating with an opening 14 formed in the wall of cylinder 2 at chamber 17 thereof. As is evident from Fig. 1, the suction opening 14 is closed and opened by the reciprocating piston 3 so that during the suction stroke of the piston the suction opening 14 will be uncovered and fluid will flow through the suction duct means into the pressure chamber 17.

An overflow valve means 18 communicates with the pressure chamber 17 and with the tank means 1. This overflow valve means is in the form of a non-return valve provided with a spring 19 which is strong enough to prevent the overflow valve means from opening before all of the several fluid measuring means, described below, are closed. In other words, the pressure of spring 19 is greater than the highest pressure at the stations to which the fluid is delivered.

A housing 20 is located at the outlet end portion of the cylinder 2, and this housing 20 includes a transverse wall portion 23 formed with an opening communicating with chamber 17 and adapted to be closed by the valve member 21. The spring 22 urges the valve member 21 to the closed position thereof, shown in Fig. 1, and a plunger means 24 is located between the spring 22 and valve member 21 and slidably engages the cylindrical opening of housing 20 located about valve member 21 with a very small amount of play, this plunger means 24 having a close sliding fit in the cylindrical opening of housing 20.

As is apparent from Fig. 1a, the valve member 21 is of square cross section and its edges slidably engage the opening surface of housing 20 which is engaged by the plunger means 24 so that even though this plunger means moves to the right, as viewed in Fig. 1, beyond the cylindrical opening of housing 20, it will always be accurately guided back into this opening by the edges formed by the intersecting flat sides of the valve member 21.

A conduit means leading from the pump means 2, 3 to the several stations is formed by the parts 20—24 together with the tube 25 communicating with the housing 20, the header 26 communicating with the tube 25, and the several tubular members 27 communicating with the header 26 and each being connected to a line 38 leading to one of the stations (Fig. 3). The several tubular members 27 are all formed in one piece and form part of this conduit means, each of the tubular members 27 and its associated parts having the construction which is shown in detail in Fig. 3.

As is apparent from Fig. 3, each tubular member 27 is provided with a transverse wall portion in its interior, and this wall portion is formed with an opening 29 passing therethrough. As is evident from Fig. 3, the interior portion 28 of tubular member 27 on the upstream side of opening 29 is larger than the interior portion 30 of the tubular member 27 located on the downstream side of

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opening 29. A fluid measuring piston means 31 is located in the interior portion 28 of tubular member 27 and this piston means 31 has a free end portion 34 of a smaller size than the interior portion 28 and located adjacent to the opening 29 to close the latter when the piston means 31 moves in a downstream direction toward the opening 29.

A stop means in the form of a snap ring 33 is located in the tubular member 27 upstream of and adjacent to the piston means 31 to limit movement thereof away from the opening 29, and a spring 32 abuts against the piston means 31 and the upstream face of the transverse wall portion of member 27 so as to form a spring means operatively connected to the piston means 31 for urging the latter in an upstream direction away from the opening 29 until the piston means 31 engages the stop means in the form of snap ring 33 located in an annular groove of the member 27.

A non-return valve means is located in the tubular member 27 on the downstream side of opening 29 for permitting fluid to flow only in a downstream direction through the opening 29 and along the line 38, and this non-return valve means includes a ball valve member 35 engaging the transverse wall portion of member 27 to close opening 29 and being urged to its closed position by a spring 36 abutting against a snap ring 37, all of these parts 35—37 being located within the inner portion 30 of the tubular member 27.

A passage means is provided to convey fluid to the space between the non-return valve means on the downstream side of opening 29 and the piston means 31 on the upstream side of opening 29, and in the particular example illustrated this passage means is formed by the outer surface portion of piston means 31 and the inner surface portion of the tubular member 27 which is located about the piston means 31 with a clearance of approximately 0.1 mm. so that this clearance forms a passage along which fluid flows to the space between the non-return valve means 35—37 and piston means 31.

The tank means 1 is provided with a transparent wall portion which takes the form, for example, of a transparent glass enclosure 40 communicating with the interior of the tank means, as shown in Fig. 4. A tube 39 leads from the overflow valve means 18 toward the transparent wall portion 40 and has a free open end located adjacent the latter so that fluid will fall from this free open end of tube 39 to the interior of the tank means, and the fluid leaving tube 39 will be visible through the transparent wall portion 40 of the tank means 1.

The above described apparatus operates as follows:

The rotating cam means 11 and spring 12 act on the lever 8 to swing the latter back and forth so that the shaft 7 is turned back and forth to reciprocate the piston 3 of the pump means in the cylinder 2 thereof. Upon movement of the piston 3 in its pressure stroke to the right, as viewed in Fig. 1, the suction opening 14 is closed and the fluid in the pressure chamber 17 moves the valve member 21 to open the same and moves the plunger means 24 to the right, as viewed in Fig. 1, against the action of spring 22 until the plunger means 24 leaves the cylindrical opening of housing 20 in which it is guided, so that the fluid, such as lubricating oil, then flows under pressure in a downstream direction through the tube 25 and header 26 to the several tubular members 27.

During this pressure stroke of the piston 3, the fluid under pressure in the header 26 acts on the several piston means 31 to move the latter in the downstream direction against the action of the several springs 32, respectively, so that the fluid then flows in a downstream direction through the several openings 29 and through the several non-return valve means 35—37. The fluid in each tubular member 27 moves in the downstream direction through opening 29 thereof until this opening is closed by the free end portion 34 of the piston means 31, this free end portion 34 being conically shaped so as to extend into the opening 29, as shown in Fig. 3.

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The continued movement of the piston 3 in its pressure stroke toward the outlet end of the cylinder 2, after the closing of the several openings 29 by the free end portions 34 of the several piston means 31, respectively, causes the fluid pressure to increase so as to automatically open the overflow valve means 18 and cause the fluid which cannot pass through the several fluid measuring devices to flow through the overflow valve means 18 and along the tube 39 back into the tank means 1, this overflow fluid being visible through the transparent wall portion 40 of the tank means 1 so that an observer may see that the apparatus is operating properly.

As the end of the pressure stroke of piston 3, the spring 22 urges the valve member 21 back to its closed position and moves the plunger means 24 back into its cylindrical guide so as to lower the pressure of the fluid in the tube 25, header 26 and the several tubular members 27. Thus, the springs 32 can now return the several piston means 31, respectively, to their rest position engaging the several stop means 33, respectively.

The speed of rotation of the cam means 11 is regulated in accordance with the viscosity of the lubricating oil, for example, so that a complete cycle of movement of the piston 3 takes place in a period of from 2 to 5 seconds. This period of time is sufficient to allow the several fluid measuring piston means 31 to move slowly back to their rest position under the influence of the springs 32, respectively. During this return movement of the several piston means 31, the oil in the header 26 moves through the passage means formed by the clearance between each tubular member 27 and the piston means 31 therein so that the space between the non-return valve means 35—37 and the piston means 31 in each tubular member 27 is filled with fluid when the piston means 31 is back in its rest position. Thus, during the next pressure stroke of the piston 3, there will be fluid on the downstream side of the piston means 31 to be moved through the opening 29 and non-return valve means 35—37 in a downstream direction.

It is evident that the amount of fluid delivered to each station during each pressure stroke of piston 3 depends on the distance through which each piston means 31 can move in a downstream direction until it closes the opening 29. Thus, by changing the length of these several piston means 31, it is possible to regulate the amount of fluid delivered to several stations.

As is evident from Fig. 3, the one-piece tubular member 27 of the conduit means forms a unit with the non-return valve means 35—37 and the piston means 31 as well as spring 32 and snap ring 33, and the tubular member 27 is threadedly mounted on the header 26 so as to be very easily removed therefrom. Thus, it is a simple matter to obtain access to the apparatus which measures the amount of fluid delivered to the several stations.

As is evident from Fig. 3, the one-piece tubular member 27 of the conduit means forms a unit with the non-return valve means 35—37 and the piston means 31 as well as spring 32 and snap ring 33, and the tubular member 27 is threadedly mounted on the header 26 so as to be very easily removed therefrom. Thus, it is a simple matter to obtain access to the apparatus which measures the amount of fluid delivered to the several stations.

Instead of operating the lever 8 through the cam means 11 and spring means 12, it is possible to replace these parts with a hand crank connected to the shaft 7 for turning the latter so that the one-cylinder pump can be operated by hand in any desired manner, and of course with such an arrangement a drive mechanism for turning the cam means 11 is unnecessary.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of fluid distributing apparatus differing from the types described above.

While the invention has been illustrated and described

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as embodied in fluid distributing apparatus for delivering predetermined amounts of fluid to several working stations, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. Apparatus for supplying a predetermined amount of fluid, such as a lubricant or the like to at least one predetermined station comprising, in combination, a piston pump for pumping the fluid; conduit means communicating with and extending downstream from said piston pump for receiving fluid under pressure therefrom and guiding the fluid along a desired path; fluid measuring means communicating with said conduit means downstream of said piston pump for delivering a measured amount of fluid from said conduit means, said measured amount being less than the amount delivered by said piston pump at each pressure stroke; overflow valve means communicating with and extending downstream from said piston pump parallel to said conduit means for discharging from said piston pump fluid in excess of said measured amount during each pressure stroke of the piston pump; and non-return valve means located in said conduit means adjacent said piston pump for permitting fluid to flow only from said piston pump to said fluid measuring means and for reducing the pressure of the fluid located in said conduit means between said non-return valve means and said fluid measuring means after termination of the pressure stroke of the pump.

2. Apparatus for supplying a predetermined amount of fluid, such as a lubricant or the like to at least one predetermined station comprising, in combination, a piston pump for pumping the fluid; conduit means communicating with and extending downstream from said piston pump for receiving fluid under pressure therefrom and guiding the fluid along a desired path; fluid measuring means communicating with said conduit means downstream of said piston pump for delivering a measured amount of fluid from said conduit means, said measured amount being less than the amount delivered by said piston pump at each pressure stroke; tank means operatively connected to said piston pump for supplying the fluid thereto to be periodically moved by said pump under pressure downstream to said conduit means, said tank means having a transparent wall portion; overflow valve means communicating with and extending downstream from said piston pump parallel to said conduit means and communicating with said tank means for discharging from said piston pump fluid in excess of said measured amount during each pressure stroke of the piston pump along a path visible through said transparent wall portion to said tank means so that the pressure condition in said conduit means between said piston pump and said fluid measuring means may be observed through said transparent wall portion; and non-return valve means located in said conduit means adjacent said piston pump for permitting fluid to flow only from said piston pump to said fluid measuring means and for reducing the pressure of the fluid located in said conduit means between said non-return valve means and said fluid measuring means after termination of the pressure stroke of the pump.

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