May 6, 1958 G. R. MORTON 2,833,449

LUBRICATING PUMP

Filed Sept. 4, 1956 2 Sheets-Sheet 1

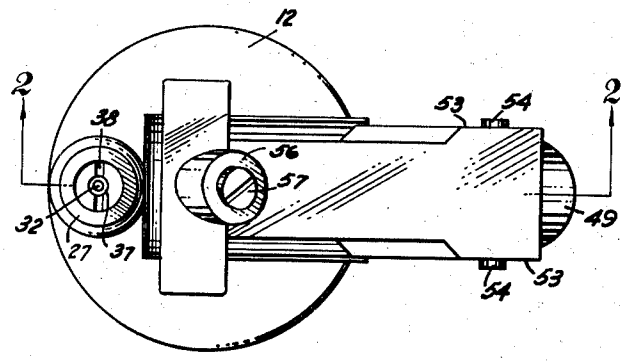


Fig. 1.

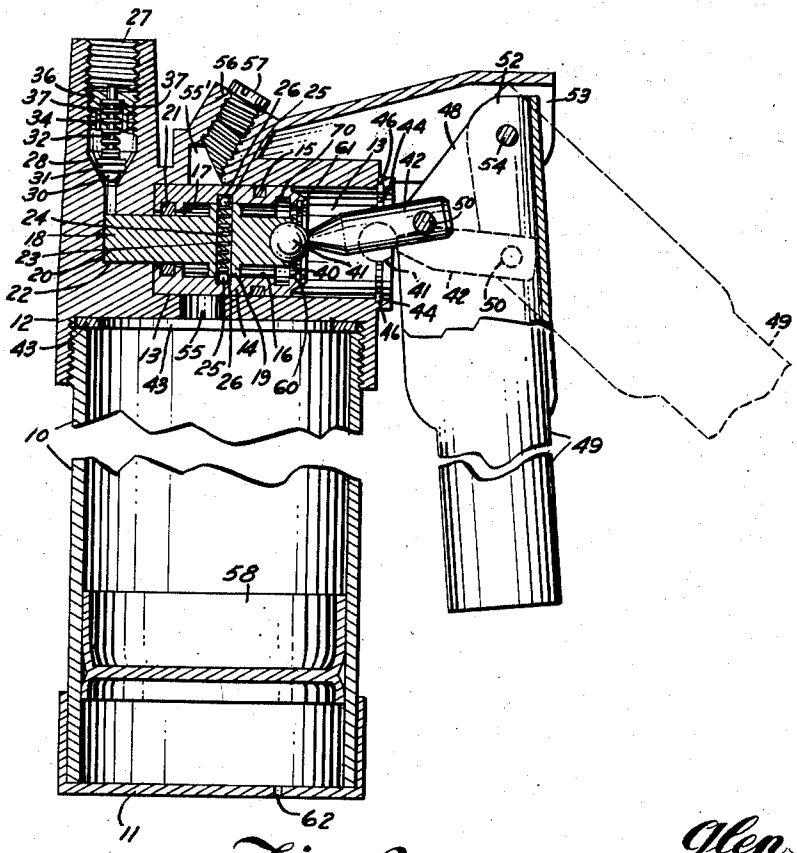


Fig. 2.

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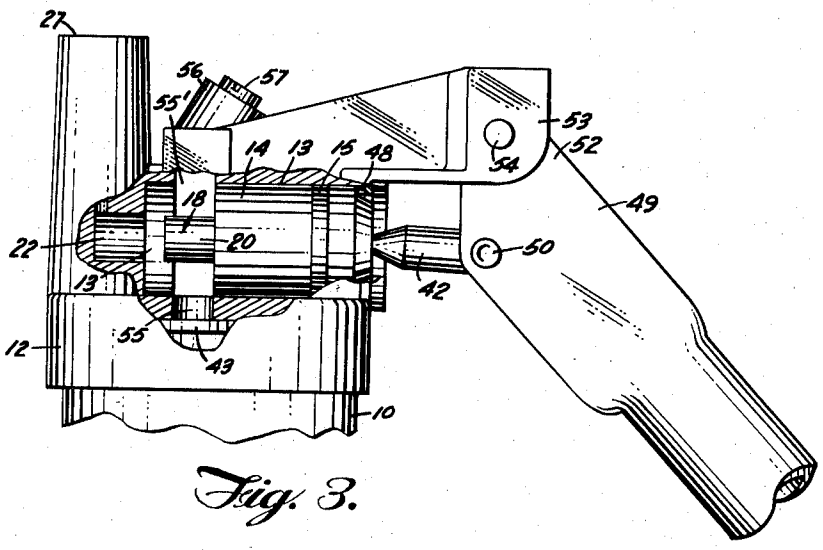


Fig. 3.

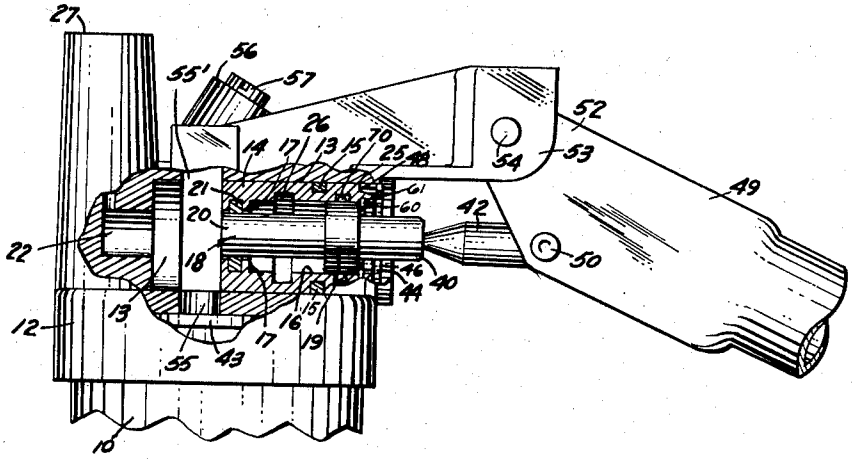


Fig. 4.

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LUBRICATING PUMP

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6 Claims. (Cl. 222—256)

The present inveniton relates to lubricating pumps of the hand operated type.

An object of this invention is to provide a lubricating pump having a preloading cylinder with a piston receptacle in it, making possible a gun operable with only a small movement of the handle, for providing a short-stroke gun usable whenever greases are sufficiently free-flowing to flow through the inlet opening of the pumping chamber even though it is partially restricted by the cylinder, and also providing faster pumping wherever there is sufficient room for a full pumping stroke.

Another object of the present invention is to provide a lubricating pump of the hand operated type which applies high pressure to the charge of lubricant by compound leverage attained in a manner providing the greatest leverage at the end of the pumping stroke leverage is most needed rather than at the beginning of the stroke and diminishing when needed most, as in prior art pumps.

A further object of this invention is to provide a pump which is free of air lock. Air lock is an expression used in the trade for the condition existing at times when air in the pumping chamber expands and contracts with the pumping stroke without any grease being moved. This is the most frustrating disadvantage of grease pumps of the prior art, because at such times much time must be wasted in very slowly evacuating the air with many pumping motions that do not move the grease.

It is my conception that the reason there is air in the pumping chambers of prior art grease guns for causing air lock is because the earlier grease guns leak at the outlet check valve, permitting air to enter the chamber during a return stroke of the plunger. It is an object of this invention to provide a solution for this problem, providing a more efficient outlet check valve.

Yet another object is to provide a pump using a check valve in its grease outlet passage having a resilient seal for more complete closure.

A further object is to provide a hand operated grease gun having greater power for more efficient operation in cold weather, even when using heavy greases because of superior ability to evacuate its chamber for the loading of its chamber with grease.

A further object of the invention is to provide a grease gun capable of greasing efficiently even though air enters the grease reservoir with the grease.

A further object is to provide a pump having a large recess in the pump body which surrounds the chamber and to which grease can flow from the reservoir whereby grease can enter the chamber from all sides to assure a perfect filling of the chamber.

Another object is to provide a lubricating pump of a multiple piston type with an inner piston and an outer hollow pre-loading piston and in which the pistons are releasably connected in a manner permitting use of the gun by means of short strokes at times when grease flows freely and by means of longer strokes when grease flows only with difficulty.

Other and further objects and advantages of the present invention will be apparent from the following detailed description, drawings and claims, the scope of the invention not being limited to the drawings themselves as the drawings are only for the purpose of illustrating a

way in which the principles of this invention can be applied.

Other embodiments of the invention utilizing the same or equivalent principles may be used and structural changes may be made as desired by those skilled in the art without departing from the present invention and the purview of the appended claims.

This application is an improvement on the applicant's co-pending patent application Serial No. 494,145 filed March 14, 1955, which has been forfeited, without prejudice, in view of this application.

In the drawings:

Fig. 1 is a top view of the lubricating pump of the present inveniton;

Fig. 2 is a side view in cross-section taken on lines 2—2 of Fig. 1. A medial portion of the pump is broken away for convenience of illustrating;

Fig. 3 is a side view with a part in cross-section showing piston and plunger in a short-stroke outer position; and

Fig. 4 is a view similar to Fig. 3 but showing piston and plunger in a completely outward position preparatory to a long stroke.

Referring in greater detail to the drawings, in which like numerals indicate like parts throughout the several views, the present invention consists of a lubricating pump formed from a grease reservoir member or hollow cylinder **10** and having a vented cap **11** closing one end of the cylinder **10** and having a pump body **12** closing the other end of the cylinder.

The pump body **12** is threadedly received on the upper end of the hollow grease cylinder **10** and compresses upon an annular sealing gasket **43** disposed between the interior surface of the pump body **12** and the upper edge surface of the cylinder **10**.

The pump body **12** is provided with a transversely arranged chamber **13** in which is reciprocably carried a free hollow piston **14** with a resilient compressible, annular O-ring **15** sealing it within the chamber **13**. The piston **14** is provided with a longitudinally extended hole or bore **16**. The inward end of the hole or bore **16** is of a lesser diameter whereby a shoulder **17** is formed within the interior of the piston **14**. A preferably cylindrical plunger **18**, having a medial portion **19** of a larger diameter to co-act at certain times with the said shoulder **17**, is slidably and reciprocably disposed within the piston **14** and provided with an inward end portion **20**, projecting outwardly therefrom. On the outer periphery of the piston **14** is a circular groove which receives the O-ring **15**.

Another similar O-ring **21**, inset into the shoulder **17**, seals the plunger **18** with respect to the piston **14**.

The projecting end **20** of the plunger **18** is at times entered into a recess pump cylinder **22** or inward end of the chamber **13** which is of a lesser diameter than the said chamber and axially aligned therewith as shown in Fig. 1. The end **20** of the plunger **18** snugly fits the recess **22** and is of a cross-sectional shape complementary to the walls of said recess.

The enlarged medial portion **19** of the plunger **18** is provided with a transversely arranged hole **23**, in which is disposed a spring **24** biasing a pair of detent balls **25** outwardly into engagement at times with an inner annular detent recess **26** formed on the inner wall of the piston **14** as shown in Fig. 4.

The pump body **12** is provided with a vertically disposed dispensing outlet **27**, a lower end of which opens into the described inward end **22** of the chamber **13** and is there shaped to form a conical valve face **28**. A valve head **30**, within the outlet **27**, is encircled by a partially recessed O ring **31** and provided with a stem **32** extended

upwardly, into a coil spring 34 which latter bears against a plug 36 threaded into the upward end of the outlet.

The plug 36 is provided with a vertical hole 37 for the passage of grease and a screw-driven slot 38 for adjusting the pressure of the spring 34 against the valve head 30.

The outward end of the plunger 18 is formed into a socket 40 which retains a ball shaped end 41 of a connecting link 42, the latter is extended outwardly of the chamber 13 and pump body 12.

The outward end of the link 42 extends within a slot 48 formed on one side of a generally vertically disposed handle 49 and is pivotally connected to the latter by a transversely disposed pin 50.

From a position adjacent the pin 50, the handle 49 extends outwardly and upwardly and is positioned at its upward offset end 52 between two spaced apart ears 53 which latter are formed integrally with the pump body 12 and project outwardly from the side thereof. A further pin 54, transversely disposed, pivotally secures the handle 49 to the spaced ears 53.

An inlet passage 55 forming an opening into the chamber 13 from the interior of the cylinder 10 is located spaced away from cylinder 22 of the chamber 13 and provides a passageway for grease to enter from the cylinder 10 to a position in front of the piston 14 and plunger 18.

The passage 55 enters upon a large filling recess 55' which extends completely around the chamber 13 whereby grease thereby enters the chamber 13 from all directions to insure a perfect filling of the chamber 13.

The pump body 12 preferably has a threaded inlet opening 56 receiving a threaded plug 57, and adapted to receive grease, when desired, from a grease gun filler not shown.

A grease follower 58 is disposed within the cylinder 10.

As best shown in Fig. 4, a stop ring 60 engaged in an interior groove 61 at the outer end of the piston bore 16 blocks an over-retraction of the plunger 18 as the enlarged medial portion 19 thereof abuts the stop ring 60.

Similarly, a stop ring 44 is engaged in an interior groove 46 at the outer end of the piston chamber 13 which blocks an over retraction of the piston 14 as the annular shoulder 48 abuts the stop ring 44.

A vent hole 62, through the cap 11, permits the grease follower to move downwardly when loading grease or upwardly by atmospheric pressure when a pressure difference is formed by the piston plunger action.

It will be seen that the sucking of grease upwardly through the inlet passage 55 is made possible because atmospheric pressure entering through the vent hole 62 pushes against the back side of the grease follower 58, forcing it toward the inlet 55, as there is no pressure against the inner side of the grease follower 58 to counteract the atmospheric pressure.

Referring to Fig. 4, it will be seen that chamber 13 is considerably larger than the pump cylinder 22, and upon the retracted movement of the piston 14 and the plunger with the check valve 30 closed, the grease or lubricant enters through the inlet passage 55 to relieve the decrease air pressure formed by the removal of the moving parts and completely fills the chamber 55 and 13. Upon compression or power stroke of the piston 14 and the plunger 18, the piston 14 will force as much grease from chamber 13 into the cylinder 22 as the cylinder 22 can accommodate. The resistance of the lubricant in the cylinder 22 stops the forward movement of the piston 14 forcing the detent balls out of the recess 26 and permitting the inner end of the plunger 18 to enter the pump cylinder 22 to force the grease or lubricant past the valve 30 through the dispensing outlet 27.

Aided by the O ring 31 placed about the check valve head 30, attention is called to the fact that air as well as grease will not be permitted to flow backwardly past the said valve head when the plunger 18 is retracted, and consequently air accidently entrapped in the grease will be pumped from the interior until grease is again forced into the chamber 13 by air entering the vent 62 at atmospheric pressure.

The mechanical advantage provided by the arrangement of parts increases in value as the pivot pin 50 nears an imaginary line drawn through the upper pivot pin 54 and the plunger socket 40, having the greatest leverage at the stroke end where it is most desirable.

In long-stroke or maximum stroke operation, when the lever 49 is in an outer position and is pressed inward the hollow piston 14 and the plunger 20 move together during a first movement period in which the plunger 18 carries the hollow cylinder 14 along with it because of the frictional engagement of the balls 25 against the inner surface of the recess 70.

During this first movement period the inner ends of the hollow piston 14 and the plunger 18 are disposed in the same plane. When the innermost end of the chamber 13 is filled with grease which contains no air, the grease will not compress and the grease prevents the inner end of the hollow piston 14 from moving further inwardly than a position which is approximately at that side of the inlet opening 55 which is nearest the recess 22 whereby the hollow piston 14 ordinarily never reaches the inner end of the chamber 13.

At this point further movement inwardly of the plunger 18 causes the plunger 18 to move forward independently of the hollow cylinder 14 which latter stays in a stationary position. The plunger 18 then proceeds further inward until it strikes or "bottoms" against the inner wall of the recess 22.

When there is air in the inner end of the chamber 13 the action is different, and the plunger 18 and cylinder 14 move inwardly with their inner ends in the same plane until the inner end of the hollow cylinder 14 strikes or "bottoms" against the inner end wall of the chamber 13, thereby supercharging the recess 22 before the plunger 18 enters the recess 22, as makes possible the pumping the air out swiftly, thus ending the first movement period in a high air content situation.

As the hollow cylinder 14 approaches the end wall of the chamber 13 any air in the end of the chamber 13 is thus squeezed and compacted into the recess 22 by the hollow cylinder 14 working in cooperation with the plunger 18. Thereafter begins the second movement period in which further inward movement of the plunger 20 is independent at that time of the stationary hollow cylinder 14. The inward movement of the plunger 18 continues until it reaches the inner end of its own recess 22 pushing the remaining grease and air past the valve head 30.

The large chamber space displaced by the piston 14 insures that the decrease in pressure caused by its removal will be great enough to cause even cold grease to move into the vacated area whereas on the return stroke only grease in the smaller space provided by the plunger cylinder 22 need be moved with each stroke.

It will be seen that the plunger 18 extends completely to the inner end wall of the recess or cylinder 22. I prefer to call this "bottoming" in which the cylinder "bottoms" against the end wall of the recess or pump cylinder 22 squeezing air out of the pump with such efficiency as to make air locking substantially impossible.

When desired, short pumping strokes can be used with less power but more speed as is handy when the grease flows easily.

For example when piston and plunger are as shown in Fig. 3 with the detent balls in the recess 26, then the position of Fig. 3 is an outer position preparatory to a short pumping stroke.

However when a long pumping stroke is desired, as when the grease is more stiff, the piston and plunger can begin their strokes from the position shown in Fig. 4. In these positions the detent balls 25 engage in an outer

detent recess 70 to carry the piston 14 inwardly the more positively for pre-loading of the recess 22 until the detent balls come out of the outer detent recess 70.

From the foregoing description, it is thought to be obvious that a lubricating pump constructed in accordance with my invention is particularly well adapted for use, by reason of the convenience and facility with which it may be assembled and operated, and it will also be obvious that my invention is susceptible of some change and modification without departing from the principles and spirit thereof, and for this reason I do not wish to be understood as limiting myself to the precise arrangement and formation of the several parts herein shown in carrying out my invention in practice, except as claimed.

I claim:

1. A lubricating pump comprising a hollow grease reservoir member, vented means closing one end of said reservoir member, a pump body closing the other end of said reservoir member, said body being provided with a chamber, a hollow piston being provided with a hole extending longitudinally therethrough, said pump body being further provided with a recess arranged at one end of said chamber in communication with said chamber and in alignment with the hole in said piston, a plunger mounted in said hole for reciprocating movement and having one end portion snugly and slidably projecting into said recess at the end of a pumping stroke, said recess having an inner wall, the inner wall of said recess and the inner end of said plunger being complementally shaped, said pump body being provided with an outlet connected in communication with said recess and with an inlet connecting the interior of said hollow grease reservoir member with said chamber, handle means carried exteriorly of said cylinder and connected to said plunger for effecting the sliding movement of the latter, and means carried by said plunger and frictionally engageable with said hollow piston for causing said piston to move with said plunger, said handle means being so constructed as to permit said inner end of said plunger to travel inwardly during a pumping stroke until said inner end of said plunger comes substantially into contact with said inner end wall of said recess to squeeze air out of said cylinder during a pumping stroke to eliminate air-locking of said pump.

2. The pump of claim 1 in which said frictional engagement means is operable to disengage said piston upon movement of said plunger into said pump cylinder closing communication of said recess with said chamber, and a freely slidable follower within said grease reservoir member adapted to force lubricant contained therein toward said inlet in response only to atmospheric pressure on the outer side of said follower.

3. A lubricating pump comprising a hollow grease reservoir member, vented means closing one end of said reservoir member, a pump body closing the other end of said reservoir member, said body being provided with a chamber, a hollow piston reciprocably carried within said chamber, said hollow piston being provided with a hole extending longitudinally therethrough, said pump body being further provided with a recess arranged at one end of said chamber in communication with said chamber and in alignment with the hole in said piston, a plunger mounted in said hole for reciprocating movement and having one end portion snugly and slidably projecting into said recess at the end of a pumping stroke, said pump body being provided with an outlet connected in communication with said recess and with an inlet connecting the interior of said hollow grease reservoir member with said chamber, handle means carried exteriorly of said cylinder and connected to said plunger for effecting the sliding movement of the latter, and means carried by said plunger and frictionally engageable with said hollow piston for causing said piston to move with said plunger.

4. A lubricating pump comprising a hollow grease reservoir member, vented means closing one end of said

reservoir member, a pump body closing the other end of said reservoir member, said body being provided with a chamber, a hollow piston reciprocably carried within said chamber, said hollow piston being provided with a hole extending longitudinally therethrough, said pump body being further provided with a recess arranged at one end of said chamber in communication with said chamber and in alignment with the hole in said piston, a plunger mounted in said hole for reciprocating movement and having one end portion snugly and slidably projecting into said recess at the end of a pumping stroke, said pump body being provided with an outlet connected in communication with said recess and with an inlet connecting the interior of said hollow grease reservoir member with said chamber, handle means carried exteriorly of said cylinder and connected to said plunger for effecting the sliding movement of the latter, spring loaded detent means carried by said plunger and in engagement with the inner wall of said piston, said piston having an annular detent recess on its inner wall to releasably receive said detent means, said detent means and said detent recess being so arranged that said plunger can substantially engage the inner end of said plunger receiving recess at a time when the inner end of said piston is in a position blocking the said inlet to said chamber whereby said pump can be used with short strokes when desired with the inner end of said plunger always projecting beyond said piston and whereby said plunger can be retracted into said piston when a longer stroke is desired.

5. A lubricating pump comprising a hollow grease reservoir member, vented means closing one end of said reservoir member, a pump body closing the other end of said reservoir member, said body being provided with a chamber, a hollow piston being provided with a hole extending longitudinally therethrough, said pump body being further provided with a recess arranged at one end of said chamber in communication with said chamber and in alignment with the hole in said piston, a plunger mounted in said hole for reciprocating movement and having one end portion snugly and slidably projecting into said recess at the end of a pumping stroke, said recess having an inner wall, the inner wall of said recess and the inner end of said plunger being complementally shaped, said pump body being provided with an outlet connected in communication with said recess and with an inlet connecting the interior of said hollow grease reservoir member with said chamber, handle means carried exteriorly of said cylinder and connected to said plunger for effecting the sliding movement of the latter, the inner wall of said piston having recess means therein, said plunger having spring-loaded retractable detent means engaging the wall of said recess means in said piston to cause said piston to move with said plunger, said handle means being so constructed as to permit said inner end of said plunger to travel inwardly during a pumping stroke until said inner end of said plunger comes substantially into contact with said inner end wall of said recess to squeeze air out of said cylinder during a pumping stroke to eliminate air-locking of said pump.

6. The pump of claim 5 in which said piston further has another recess means on the inner wall thereof to receive said plunger detent means to releasably hold said piston in a position with respect to said plunger in which said plunger projects inwardly from said piston for making possible effective use of the pump by applying short pumping strokes thereto without causing the plunger to move outwardly beyond the position of projecting inwardly of said piston.

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