Feb. 24, 1953 F. R. LADD 2,629,328

PUMP

Filed Sept. 26, 1947 2 SHEETS—SHEET 1

Fig. 1.

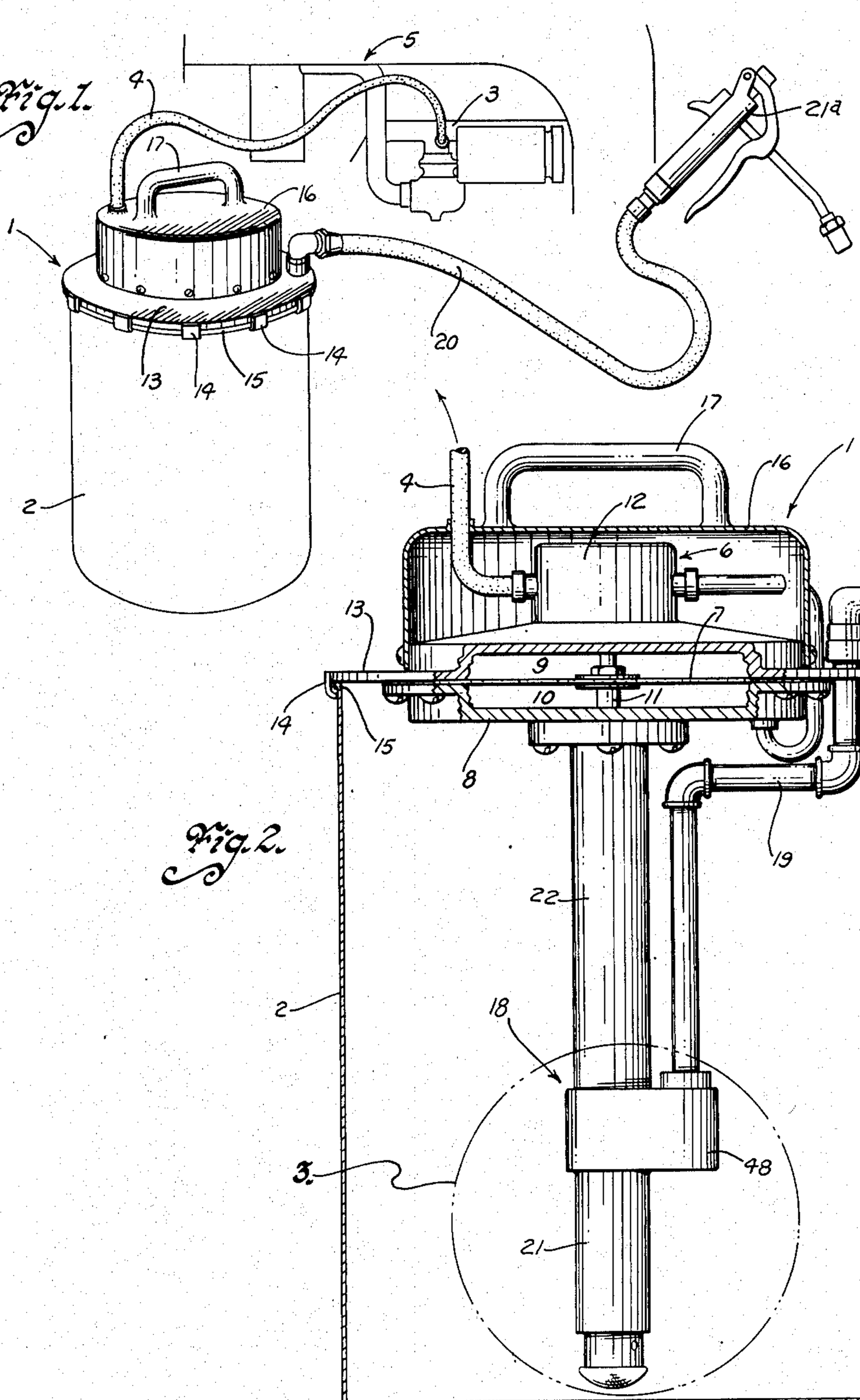

Fig. 2.

Witness
Elwood P. Seeley

Inventor:- Floyd R. Ladd
by Harry L. Finger
Attorney

Feb. 24, 1953 F. R. LADD 2,629,328

PUMP

Filed Sept. 26, 1947 2 SHEETS—SHEET 2

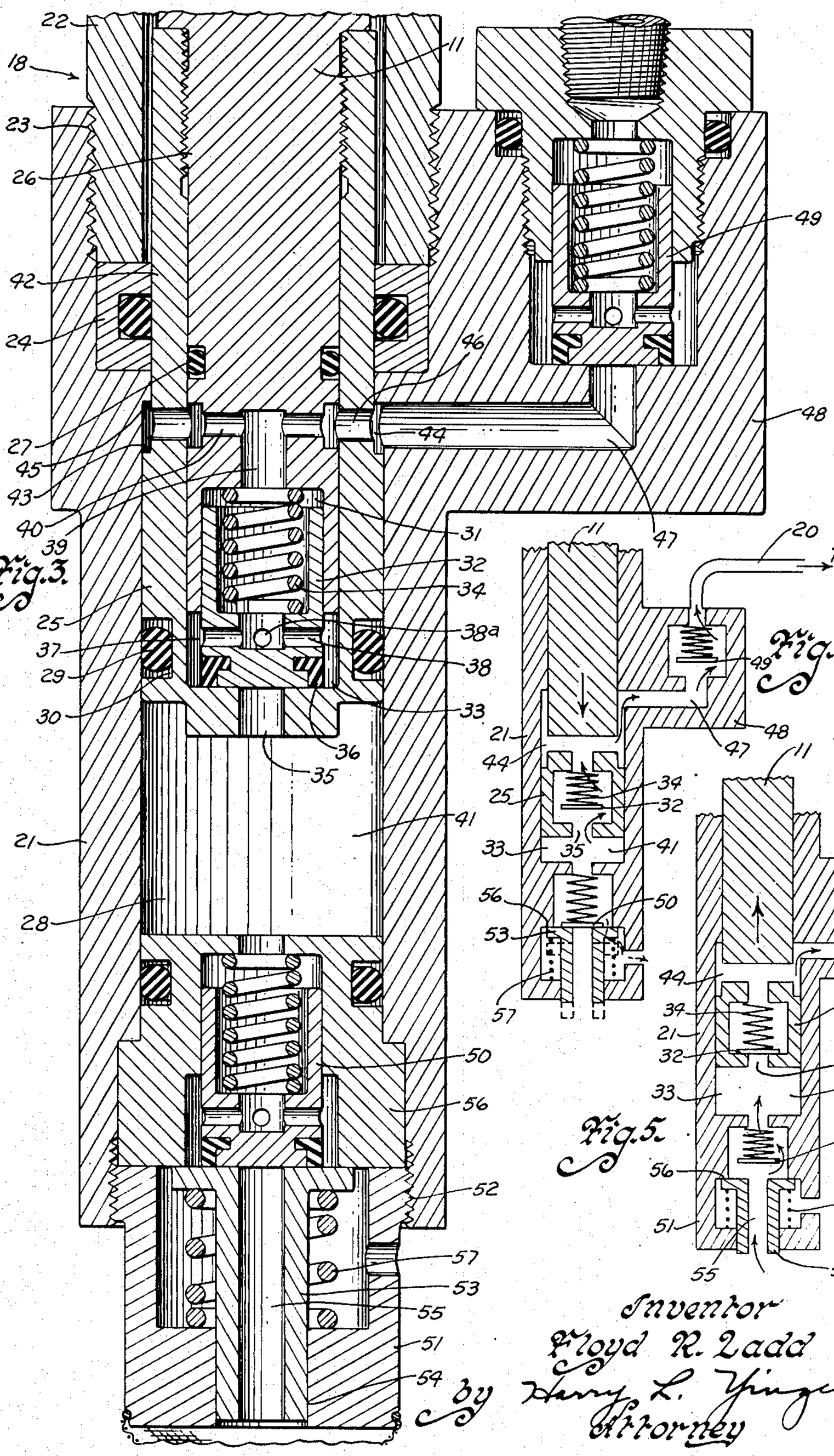

Fig. 3.

Fig. 4.

Fig. 5.

Inventor
Floyd R. Ladd
By Harry L. Yinger.
Attorney

Patented Feb. 24, 1953

2,629,328

UNITED STATES PATENT OFFICE

2,629,328

PUMP

Floyd R. Ladd, Waverly, Iowa

Application September 26, 1947, Serial No. 776,294

6 Claims. (Cl. 103—42)

1

The present invention relates to a portable grease gun and more particularly to a portable grease gun structure having a vacuum motor means operable from the intake manifold of an internal combustion engine.

It is an object of the invention among others to provide a grease gun structure that is compact and of a size easily handled so as to be portable and easily transported from place to place by one person.

It is another object of the invention to provide a portable grease gun structure that is particularly adapted to lubricate farm machinery in the fields by attaching the grease gun structure to an internal combustion engine on a tractor to receive power to operate the grease gun structure.

It is still another object of the invention to provide a portable grease gun structure that is simple in construction and operation, easy to operate and economical both in construction and operation; a portable grease gun structure that is long lasting and durable in operation, requiring few repairs with less time lost in operation; a portable grease gun structure that is easy to operate, simple in design and easy of repair in case of breakdown; and a portable grease gun structure that requires no special skill on the part of an operator to connect to an intake manifold of a tractor and to a fitting.

With the foregoing and other objects in view, the invention will be more fully described herewith and will be particularly pointed out in the claims appended hereto.

In the drawings, wherein like symbols refer to like or corresponding parts throughout the several views:

Figure 1 is an elevational view of the grease gun structure shown attached to a tractor.

Figure 2 is a side elevational view with certain parts of the grease gun structure broken away.

Figure 3 is a sectional view through the center of the lower end of the pump within the grease gun structure with the section cut being through the circular plane 3.

Figure 4 is a schematic view of the lower end of the pump of the grease gun structure showing the piston of the pump moving downward.

Figure 5 is a schematic view of the lower end of the pump of the grease gun structure showing the piston of the pump moving upward.

The grease gun structure is represented generally at 1 and is shown in Figure 1 as mounted on top of a grease receptacle 2. A hose 4 is shown as extending from the grease gun structure 1 to the intake manifold 3 of an internal combustion engine 5.

2

At the top of the grease gun structure 1 is a double acting vacuum motor 6 which has a diaphragm 7 dividing the housing 8 into chambers 9 and 10. A piston rod 11 is attached to and moves with the diaphragm 7. A valve mechanism within the valve housing 12 operates to alternately connect chamber 9 with tube 4 and chamber 10 with the atmosphere and chamber 10 with tube 4 and chamber 9 with the atmosphere. Vacuum motors of this type are old in the art and are well known in the operation of windshield wipers in the automobile art.

The housing 8 of the vacuum motor 6 has a flange 13 extending outwardly around the entire periphery of the housing 8 and has a series of spring fingers 14 around the outer periphery of the flange 13 to fit over a bead 15 on the grease receptacle 2. A cover 16 having handle 17 is attached to the motor housing 8 and serves as a means to transport the grease gun structure 1 from place to place. When the grease gun structure 1 is mounted on the grease receptacle 2 by the spring fingers 14, the grease gun structure 1 and grease receptacle 2 are portable by grasping handle 17.

A pump 18 is attached below the vacuum motor 6 and is immersed in the grease in container 2. As the pump 18 is actuated by the vacuum motor 6, by the motor 6 and pump 18 having the common piston rod 11, grease is forced through pipe 19 to hose 20. The hose 20 has a release nozzle 21*a* to attach to fittings through which grease may enter to bearing parts of machinery. The release nozzle 21*a* and the fittings to which the release nozzle 21*a* attaches, are old and well known in the art and their use and structure are well known.

The pump 18 is included within a pump housing 21 and the piston rod 11, common to both the vacuum motor 6 and pump 18 is reciprocal within a housing 22. The pump housing 21 connects with the housing 22 by screw threads 23 and a packing member 24 is included between the housing members 21 and 22.

The piston rod 11 has a cap housing 25 screw threaded to the piston rod 11 at 26, which cap housing 25 surrounds the lower end of the piston rod 11 to form with the lower end of piston rod 11 the piston of the pump 18. The piston housing 25 contacts packing 24 to seal the space between the piston 25 and the pump housing 21 and the housing 22. The packing 24 is a synthetic rubber packing of O-shape and has been found most

satisfactory in sealing and is resistant to deterioration from the grease. The cap housing 25 and the piston rod 11 have the same type sealing means 27 therebetween and do not depend on the screw threads 26 to seal the joint in view of the pressures developed by the pump 18. The piston 25 reciprocates within the pump housing 21 and seals with the inner cylindrical wall 28 of the pump housing 21 by an O-shaped packing 29 carried in a groove 30 in the piston 25.

The end of the piston rod 11 terminates in a socket 31 into which a valve 32 fits. The cap housing 25 has a seat 33 upon which the valve 32 seats. A spring 34 is within the valve 32 and the end of the socket 31 to keep the valve 32 seated on seat 33 to thus close off passage 35 in the end of the cap housing 25. A sealing member 36 is attached into the bottom of the valve 32 to seal with seat 33 when the valve 32 is seated. A space 37 is formed between the end of piston rod 11, seat 33 of housing 25 and valve 32. The valve 32 has lateral passageways 38 connecting into the space 37 and a central bore 38*a* in valve 32. The piston rod 11 has a central bore 39 which connect into lateral passageways 40. The passage 35, space 37 lateral passageways 38, central bore 38*a*, central bore 39 and lateral passages 40 form a conduit from a cylinder or chamber 41 in the pump housing 21 below the piston through the valve 32.

The upper portion 42 of the housing 25 is reduced in diameter from the lower portion of the housing 25, which lower portion has a close sliding fit with the inner wall 28 of the pump housing 21 and a shoulder 43 is formed between the upper and lower portions of the housing 25. A second chamber 44 is formed between the inner wall 28 of the pump housing 21, shoulder 43, outer wall 42 and a top shoulder 45 in the pump housing member 21. The cap housing 25 has passageways 46 connecting with the passageways 40 in the piston rod 11 and the passageways 46 in turn connects with the second chamber 44.

The second chamber 44 connects into an outlet passage 47 in an extension 48 connected with the pump housing 21. The extension 48 has a check valve 49 therein similar in every respect to the valve 32 in the piston 25 previously described. The passage 47 connects into hose 20 and delivers grease under pressure to the nozzle 21*a*.

A standing valve 50, similar to the valves 32 and 49, is mounted in the bottom of the pump housing 21 and held in place by a thimble 51 screw threaded at 52 into the pump housing 21. The thimble 51 carries a relief valve 53 that can slide through opening 54 in the end of the thimble 51 and the relief valve 53 has a central opening 55 therethrough. The relief valve 53 seats against a housing 56 containing the standing valve 50 and the spring 57 keeps the relief valve 53 seated against the valve housing 56.

On the upstroke of the piston 25, the pressure is reduced in chamber 41 with the atmospheric pressure on the grease in receptacle 2 forcing grease through opening 55 in relief valve 53. The grease lifts standing valve 50 out of contact with relief valve 53 and allows grease to flow through standing valve 50 into chamber 41.

On the downward stroke of piston 25, standing valve 50 is seated again on relief valve 53, thus closing off chamber 41. The valve 32 will now become unseated and grease will flow into the upper chamber 44. On the upward stroke of the piston 25, valve 32 again seats and shoulder

43 lifts the grease in chamber 44 and forces it under pressure into the outlet hose 20 by valve 49.

In the operation of the grease gun, most farms have a tractor available which has an internal combustion engine thereon and the intake manifold can be tapped and a suitable fitting put thereon to receive hose 4 which may also have a fitting in the end thereof to couple with the fitting in the intake manifold. It can be seen that the grease gun 1 can be attached to a tractor where the intake manifold has a fitting anywhere the tractor is found.

The receptacle 2 may be the receptacle in which grease is supplied by a grease distributor. The flange 13 may be made to handle any size receptacle 2 desired. When the grease gun assembly is attached by spring fingers 14 to the receptacle 2, the whole assembled unit may be portable from handle 17. The hose 20 and nozzle 21*a* connect with regular fitting members now employed throughout industry.

The gas from the intake manifold is conducted to the valve mechanism 12 and chambers 9 and 10 are alternately connected with atmosphere and vacuum as previously explained to reciprocate the piston rod 11 which in turn reciprocates piston 25.

Turning now to the schematic view of Figure 5, the piston rod 11 is shown as moving upwardly, hence piston 25 is also moving upwardly. A vacuum is created behind the piston 25 in chamber 41 with atmospheric pressure forcing grease from receptacle 2 through the standing check valve 50 into chamber 41. Also the piston 25 in moving upwardly forces the lubricant from chamber 44, past check valve 49 into hose 20.

On the down stroke of piston 25 as represented schematically in Figure 4, lubricant is forced from the large lower chamber 41, by valve 32 in the piston 25 into the smaller upper chamber 44. Surplus lubricant, represented by the difference in displacement between the lower chamber 41 and the upper chamber 44 is forced out the final check valve 49 into the hose 20 providing the resistance to such flow is not greater than the resistance of the spring 57 holding relief valve 53 against valve housing 56 to close off chamber 41. In case resistance in hose 20 is greater than the tension to which spring 57 has been calibrated, then spring 57 will be compressed allowing relief valve 53 to unseat and the grease to return to the receptacle 2.

It will be noted that; by regulating or calibrating the tension in spring 57 so it is less than the maximum downward thrust of the vacuum motor 6; the downward stroke will always be completed and the upward stroke started, regardless of the resistance or pressure in the outlet grease hose 20; and consequently the vacuum motor 6 will never be stalled or equilibrium reached between downward thrust of the vacuum motor 6 and pressure in the system on the downward stroke of the piston 25.

If the vacuum motor 6 stalls or equilibrium is reached on the downward stroke of piston 25, the whole grease gun system will be charged with a much lower pressure than if the pressure in the grease gun system reached equilibrium on the upstroke. This is due to the fact that a large area piston is operating on the downstroke whereas a small area piston is operating on the upstroke. As an example the following is set forth:

Down stroke

Thrust of the vacuum motor	350 pounds per square inch
Area of piston effective on the down stroke	.800 square inches
Resultant pressure	437 pounds per square inch
Total volume displaced with 1 inch stroke	.100 cubic inches

Upstroke

Thrust of vacuum motor	350 pounds per square inch
Area of piston effective on the upstroke	.100 square inches
Resultant pressure	3500 pounds per square inch
Total volume displaced with 1 inch stroke	.100 cubic inches

Thus the pump **18** will force a large volume of grease (.800 cubic inches) per cycle of operation where only a low pressure is required to force the grease from hose **20** into a grease fitting. When higher pressure is needed to force the grease from hose **20** into a fitting, the pump **18** continues to operate until the upstroke of the pump builds up sufficient pressure which may reach a maximum of 3500 pounds per square inch.

It will be understood that the invention has been described for purposes of illustration and explanation and that changes and variations are possible without departing from the scope of the invention; all such modifications and changes are intended to be included in the appended claims.

I claim:

1. In combination, a conduit having an inlet and outlet, a valved piston reciprocable within said conduit, said piston provided with a passageway communicating at one end with said valve and at the other end with said outlet, means for reciprocating said piston, a second valve means in said conduit adapted to open and close said inlet and forming a chamber in said conduit between said piston and said second valve, a thimble detachably secured over said inlet; said thimble provided with a first and second passageway each connecting with said inlet, a relief valve in said thimble, said relief valve having a bore concentric with said first passageway in said thimble and said inlet, said second valve means adapted to close the bore in said relief valve at times, said relief valve capable of closing communication between said second passageway in said thimble and said inlet and capable of opening communication between the same while the bore in said relief valve means is closed by said second valve means to provide a relief outlet for material in said chamber.

2. In combination, a conduit having a receiving opening and a discharge opening, a valved piston reciprocal within said conduit, said piston provided with a passageway connecting said piston valve and said discharge opening, means for reciprocating said piston, a check valve in said receiving opening and forming a chamber within said conduit intermediate said valved piston and said check valve, a thimble over said receiving opening, said thimble provided with an inlet and an outlet each of which communicate with said receiving opening, a relief valve in said thimble having a bore concentric with said inlet and communicating with said receiving opening, said

check valve capable of closing said bore, and said relief valve normally closing said outlet and capable of opening the same while said bore is closed by said check valve.

3. In combination, a conduit having a receiving opening and a discharge opening, a valved piston reciprocal within said conduit, said piston provided with a passageway connecting said piston valve and said discharge opening, means for reciprocating said piston, a check valve in said receiving opening and forming a chamber within said conduit intermediate said valved piston and said check valve, a thimble over said receiving opening, said thimble provided with an inlet and an outlet each of which communicate with said receiving opening, a spring controlled relief valve in said thimble having a bore concentric with said inlet and communicating with said receiving opening, said check valve capable of closing said bore, said relief valve normally closing said outlet and the spring on the same calibrated to be compressed when a predetermined pressure is reached in said chamber whereby said outlet is opened to provide a relief outlet for material in said chamber.

4. In combination, a conduit having a receiving opening and a discharge opening and adapted to receive and discharge heavy viscous material, a valved piston reciprocal within said conduit, said piston provided with a passageway connecting said piston valve and said discharge opening, means for reciprocating said piston, a check valve in said receiving opening and forcing a pressure chamber within said conduit intermediate said valved piston and said check valve so that on each upward stroke of said piston the material passing through said conduit is drawn into said pressure chamber, on the downward stroke a portion of the material is forced from the pressure chamber to said discharge opening and on the next upward stroke the material is ejected through said discharge opening, said pressure chamber having a maximum working capacity several times greater than said discharge opening so as to receive a quantity of material in excess of the maximum working capabilities of said discharge opening whereby the material is ejected at said discharge opening at a greater pressure than that at which it entered the pressure chamber, and a relief valve means for releasing excess material from said pressure chamber when resistance at said discharge opening is greater than pressure in said chamber, said relief valve means comprising, a thimble over said receiving opening, said thimble provided with an inlet and an outlet each of which communicate with said receiving opening, a relief valve in said thimble having a bore concentric with said inlet and communicating with said receiving opening, said check valve capable of closing said bore, and said relief valve normally closing said outlet and capable of opening the same while said bore is closed by said check valve.

5. In combination, a conduit having a receiving opening and a discharge opening and adapted to receive and discharge heavy viscous material, a valved piston reciprocal within said conduit, said piston provided with a passageway connecting said piston valve and said discharge opening, means for reciprocating said piston, a check valve in said receiving opening and forming a pressure chamber within said conduit intermediate said valved piston and said check valve so that on each upward stroke of said piston the

material passing through said conduit is drawn into said pressure chamber, on the downward stroke a portion of the material is forced from the pressure chamber to said discharge opening and on the next upward stroke the material is ejected through said discharge opening, said pressure chamber having a maximum working capacity several times greater than said discharge opening so as to receive a quantity of material in excess of the maximum working capabilities of said discharge opening whereby the material is ejected at said discharge opening at a greater pressure than that at which it entered the pressure chamber, and a relief valve means for releasing excess material from said pressure chamber when resistance at said discharge opening is greater than pressure in said chamber, said relief valve means comprising, a thimble over said receiving opening, said thimble provided with an inlet and an outlet each of which communicate with said receiving opening, a spring controlled relief valve in said thimble having a bore concentric with said inlet and communicating with said receiving opening, said check valve capable of closing said bore, said relief valve normally closing said outlet and the spring on the same calibrated to be compressed when a predetermined pressure is reached in said chamber whereby said outlet is opened to provide a relief outlet for material in said chamber.

6. In combination, a conduit having a receiving opening and a discharge opening, a valved piston reciprocal within said conduit, said piston provided with a passageway connecting said piston valve and said discharge opening, means for

reciprocating said piston, a check valve in said receiving opening and forming a chamber within said conduit intermediate said valved piston and said check valve, a thimble over said receiving opening, said thimble provided with an inlet and an outlet each of which communicate at a common point with said receiving opening, a relief valve in said thimble having a bore concentric with said inlet and communicating with said receiving opening, said check valve capable of closing said bore, and said relief valve normally closing said outlet and capable of opening the same while said bore is closed by said check valve.

FLOYD R. LADD.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
310,459	Nicholson, et al.	Jan. 6, 1885
1,147,286	Welch	July 20, 1915
1,764,926	Bennett	June 17, 1930
1,781,374	Deutsch	Nov. 11, 1930
1,930,293	Valentine	Oct. 10, 1933
1,943,102	Woodruff	Jan. 9, 1934
2,136,636	Rotter	Nov. 15, 1938
2,235,544	Wold	Mar. 18, 1941
2,277,824	Franson	Mar. 31, 1942
2,336,457	Augensen	Dec. 14, 1943
2,340,020	Roose, et al.	Jan. 25, 1944
2,387,233	Clapp	Oct. 23, 1945
2,404,502	Kehle	July 23, 1946
2,404,547	Strid	July 23, 1946