Sept. 28, 1948. J. D. MORGAN ET AL 2,450,248

GREASE DISPENSING UNIT

Filed Oct. 7, 1944 2 Sheets-Sheet 1

Fig. 1.

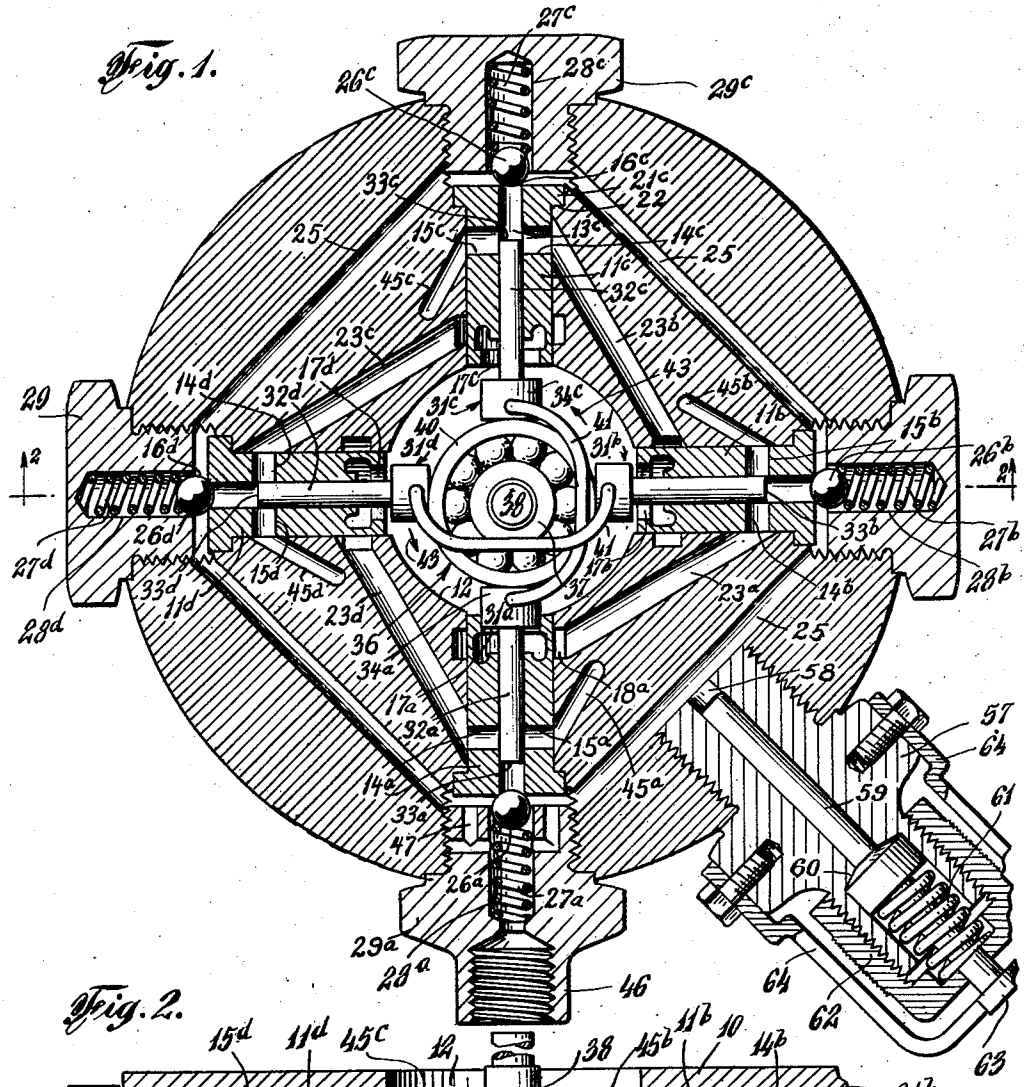
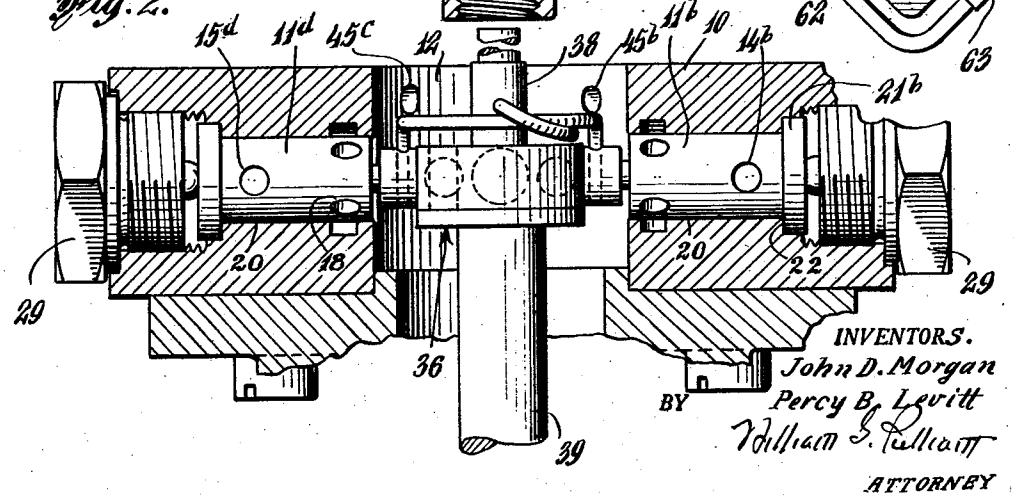


Fig. 2.



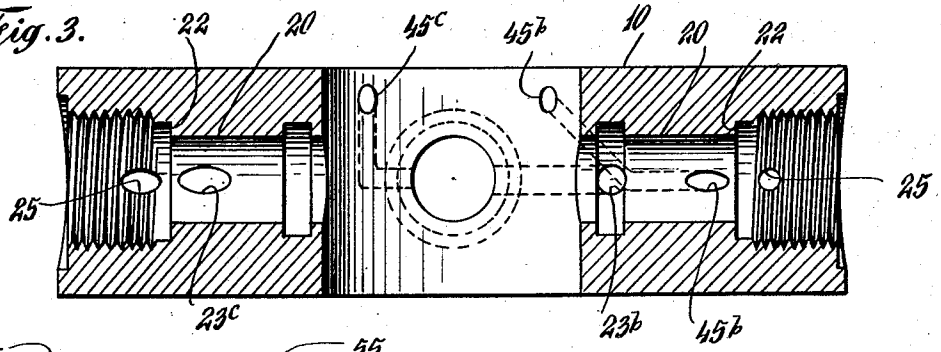
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GREASE DISPENSING UNIT

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Fig. 3.



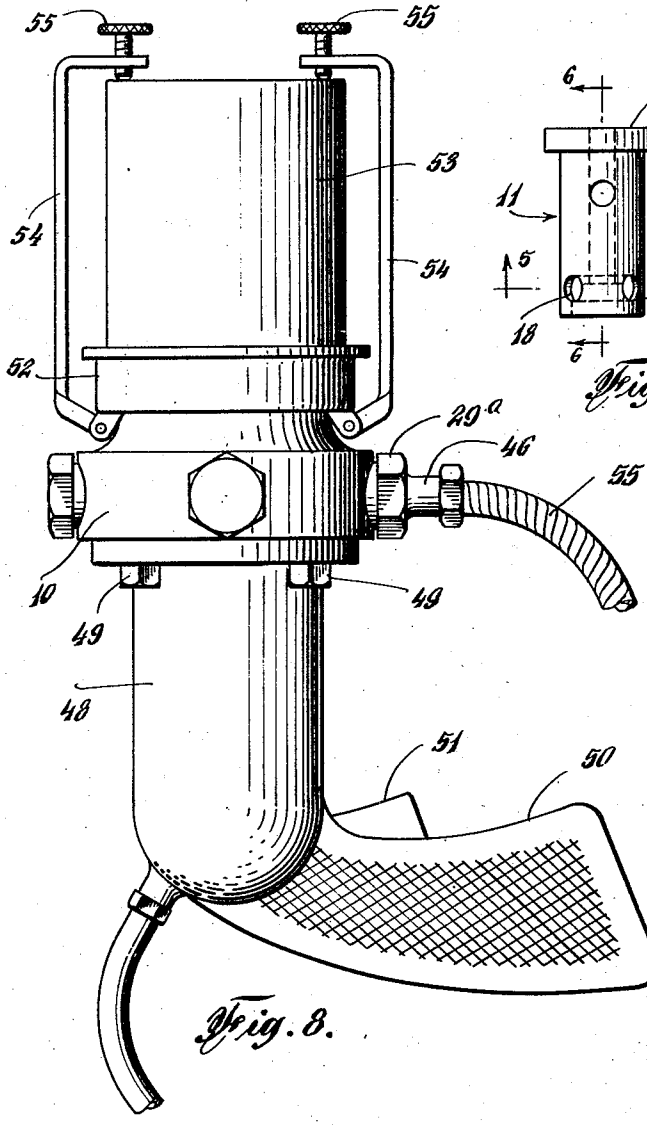
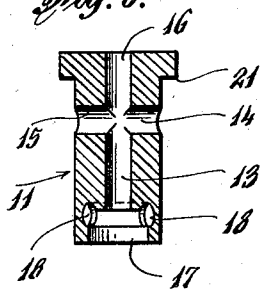


Fig. 8.

Fig. 4.

Fig. 6.



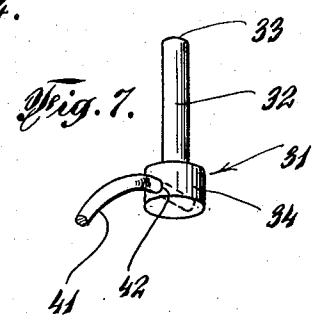
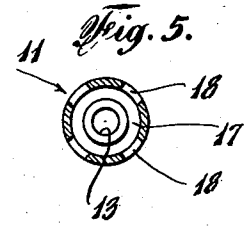


Fig. 7.

Fig. 5.



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GREASE DISPENSING UNIT

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Application October 7, 1944, Serial No. 557,664

11 Claims. (Cl. 222—232)

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This invention relates to pumps for handling fluids of high and varying viscosity, and more particularly to an improved apparatus for dispensing lubricating greases in the servicing of the bearings of automotive and similar equipment.

The principal object of the invention is to provide a pump which is adapted positively to withdraw grease or a similar viscous fluid from a reservoir and to discharge it at high pressure, and at a substantially uniform rate, regardless of the viscosity of the entering grease and of the temperature at which the pump is operated; and specifically to provide a grease pump which functions as well in the winter time when the entering grease has gelled and is stiff, as during the summer periods when the grease has been softened by hot weather almost to the consistency of a liquid.

Another object of the invention is to provide a multi-cylindered pump having a crankcase which serves as a reservoir for grease, and an eccentric which, in addition to performing its normal function of reciprocating pistons in said cylinders, acts also to churn grease in the crankcase wherefor to render it more fluid, and to displace that grease from the crankcase into the inlets of the several cylinders.

It is a further object of the invention to provide a multi-cylindered pump in which the piston of each cylinder projects into the crankcase of the device during its return stroke, and in the course of its next advance stroke, withdraws grease from the crankcase and feeds it under some slight pressure to the inlet of an associated cylinder, thus assuring uniform feeding of grease from the reservoir-crankcase to the several cylinders under even the most unfavorable conditions, as for example when the grease is set to a hard, gel-like character.

It is yet another object of the invention to provide a grease dispensing unit which is adapted to remove grease directly from a can in which it is packaged, and to discharge that grease at a sufficiently high pressure to enable it to penetrate into the innermost recesses of conventional high pressure bearings, thus lessening the work of a filling station attendant, for example, by relieving him of the duty of filling the reservoir of the dispensing unit, and further insuring the delivery of clean and uncontaminated grease in exactly the condition in which it was supplied by the grease manufacturer.

The invention has for a further object the provision of a dispensing unit including a multi-

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cylinder pump which is adapted to discharge grease at almost any pressure and that may be required for lubrication work, and which with its integral driving motor and flexible delivery line, is hardly larger than the conventional manually operated grease gun so that it is readily portable, and accordingly, lends itself to the servicing of the many inaccessibly located pressure fittings of the bearings of modern automotive and similar equipment.

Fig. 1 is a plan view, in section, of one form of pump embodying the invention;

Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1;

Fig. 3 is a sectional view similar to that of Fig. 2 with certain parts of the pump omitted better to show underlying details of the device;

Fig. 4 is an elevational view of one of the cylinders of the pump of Figs. 1 to 3;

Fig. 5 is a sectional view taken on the line 5—5 of Fig. 4;

Fig. 6 is a sectional view taken on the line 6—6 of Fig. 4;

Fig. 7 is a perspective view of one of the pistons of the pump of Figs. 1 to 3; and

Fig. 8 is an elevational view of a grease dispensing unit including the pump of Figs. 1 to 3, in accordance with the invention.

In the drawings, and referring to Figs. 1 to 3, numeral 10 represents a cylinder block containing four cylinders 11 disposed at approximately 90° intervals about the central opening 12 which, as will be evident later, serves both as a reservoir for grease or the like and as a crankcase for the complete pump. The several cylinders of the illustrated device are formed separately from the block to facilitate their manufacture from hardened steel, and to allow for the making of the block of aluminum or other light material. All of the cylinders are of identical construction so that the description of one of them will suffice. Thus, and referring to Figs. 4 to 6, each cylinder comprises a hardened steel shell having a central bore 13 of comparatively small cross section to which grease may be supplied through inlet port 14, and from which excess grease may overflow through port 15, and having its outer end open to serve as a port 16 for the discharge of grease at high pressure. It is particularly to be noted that the bore terminates at its inner end in an enlarged feed chamber 17 which at times receives grease from reservoir 12, and which has one or more feed ports 18 from which grease may flow to an adjacent cylinder in a manner which will later be made clear.

These cylinders are of such size as to fit readily within the recesses **20** in block **10**, with the flange **21** of each cylinder resting upon the shoulder **22** of the block (Fig. 3), with its inner end approximately aligned with the wall of reservoir **12**, with its inlet port **14** registering with one end of one of the feed passages **23**, and the ports **18** of its feed chamber registering with the other end of another of the feed passages **23**.

In the assembled device, the port **16** of each cylinder discharges into a common discharge passage **25**, and is provided with a discharge valve which governs the flow of grease from the port into that passage. The illustrated valve comprises nothing more than a ball **26** which is yieldingly seated in the discharge port **16** by spring **27**, the spring being conveniently confined in a recess **28** of cap **29** which is threaded into the block **10** and serves, of course, to seal the end of recess **20**.

The pistons **31** in the several cylinders are of identical construction. Thus, and referring to Figs. 1 and 7, each piston comprises a shaft **32** which makes a lapped fit with the bore **13** of its associated cylinder so that its outer end **33** may discharge grease therefrom, and an enlarged head **34** which is adapted to fit within the chamber **17** of its associated cylinder, and to force grease therefrom through one of the feed passages **23** to the inlet **14** of an adjacent cylinder.

In the operation of the pump, the several pistons are preferably driven by an eccentric **36** which is mounted to rotate in reservoir **12**. As here illustrated, the eccentric comprises a caged ball bearing unit having its inner race **37** mounted upon a crank arm **38** of a drive shaft **39**, and having its outer race **40** engaging the ends of piston heads **34**. In order to hold these heads in engagement with the race, the pistons in opposite cylinders are connected by spring links **41**, which may be nothing more than pieces of wire bent to generally arcuate shape and having their ends turned downwardly to fit within suitable holes **42** in the piston heads. Accordingly when shaft **39** is rotated in the direction indicated by the arrows **43**, the outer race acts successively upon each piston to drive it outwardly. It is of particular importance to note that with this arrangement there is substantially no rubbing between race **40** and the piston heads, and frictional wear is thus minimized. The return of each piston is, of course, effected by its connection through spring link **41** with an advancing piston in an opposing cylinder.

Other constructional details of the pump can best be understood by a consideration of its complete cycle of operation. For this purpose it will be assumed that the reservoir **12** has been filled with grease, and that the several parts are in the positions shown in Fig. 1. Referring to that figure, it will be noted that the piston in cylinder **11***a* has been driven by eccentric **36** to its outermost position. In advancing to that position, the end **33***a* of its shaft has first closed inlet port **14***a*, and thereafter has discharged grease at high pressure through discharge port **16***a*, and ball valve **26***a* into the common discharge passage **25**. Simultaneously its head **34***a* has carried grease from reservoir **12** into chamber **17***a*, and has forced that grease under some slight pressure through feed ports **18***a* and feed passage **23***a* to the inlet port **14***b* of the next adjacent cylinder **11***b*.

As stated above, the eccentric rotating in the direction indicated by arrows **43**, acts successively

upon the head of each piston **31**. It follows therefore that the piston in cylinder **11***b* has been advanced through half of its forward stroke so that its outer end **33***b* has all but closed inlet port **14***b* to shut off the flow of grease from the preceding cylinder **11***a*. Piston **31***b* is accordingly just about ready to start discharging grease under high pressure through its discharge valve **26***b* into the common discharge passage. In the course of this half-stroke, head **34***b* has trapped grease under its shoulders and has forced it into chamber **17***b*, and at this juncture the head has just about closed the end of the feed chamber so that its further advance will force grease from that chamber through passage **23***b* to the inlet **14***c* and into the bore **13***c* of the next adjacent cylinder **11***c*.

The piston in this last-mentioned cylinder has been drawn to its most retracted position by spring link **41**. Its outer end **33***c* has therefore uncovered inlet port **14***c* as much as it ever will to allow for free flow of grease through feed passage **23***b* into the bore **15***c*. In this connection it may be noted that the inlet ports are of circular cross section and have been purposely drilled oversize to obtain a maximum port area. If the ports were of rectangular cross section, then at this stage of operation the end of the piston shaft and the lower edge of the port would be aligned.

During the course of the retraction of piston **31***c*, its head **34***c* has projected into reservoir **12** to such an extent as to uncover the end of chamber **17***c*. The grease which has been churned and swirled in reservoir **12** by the rotation of the eccentric, accordingly flows under the shoulders of this piston head so that when that element advances it will trap the grease and force it into the chamber for discharge through passage **23***c* into cylinder **11***d*.

At the particular stage of the complete cycle of operation of the pump which is illustrated in Fig. 1, piston **31***d* in cylinder **11***d* is on its return stroke, having been half withdrawn by its connection through link **41** with the advancing piston **31***b* in cylinder **11***b*. During the next quarter revolution of the eccentric, this piston will of course be withdrawn to its fully retracted position, comparable to that of piston **31***c* in cylinder **11***c*. Still further rotation will start the advance of this piston to trap grease in its chamber **17***d*, to feed that grease through passage **23***d* to the inlet port **14***a* of the next adjacent cylinder **11***a*, and of course, to discharge grease at high pressure from its outlet port **16***d* into common discharge passage **25**.

It will be readily evident from the drawings that the volumetric capacity of each chamber **17** greatly exceeds that of the delivery portion of the bore **13** with which it is connected. Thus the advance of head **34***a* into chamber **17***a* results in the feeding of a far greater quantity of grease to the bore of cylinder **11***b* than can be discharged by the piston in that cylinder. It is for this reason that each cylinder is provided with the previously mentioned overflow port **15** which registers with an overflow passage **45** leading to the reservoir **12**. Accordingly when the bore of **11***b* has been completely filled with grease, any excess will flow through port **15***b* and return directly to the reservoir through passage **45***b*. This arrangement for feeding excessive quantities of grease to the several cylinders is highly advantageous in that it assures the complete filling of the cylinders under almost any conceivable operating condition. Thus, in the wintertime, when the grease

in the reservoir tends to gell, and to have almost no capacity for flowing, the oversize heads projecting into a crankcase still act to trap a sufficient quantity of this stiff material to fill the very much smaller cylinder bores. Under these conditions, the quantity of grease fed through the passages 23 may be just sufficient to fill the high pressure portions of the cylinders with little or no overflow back to the reservoir. When, however, the grease is thin and free-flowing, a much greater quantity may be handled, but since any excess is returned immediately to the reservoir, the excess feeding will not result in any waste. The arrangement has the further advantage of assuring quick priming of the pump when it is first started up, so that the delivery of grease at high pressure may start promptly.

In the operation of the pump, the rotation of the eccentric produces a thorough churning and swirling of the grease and a constant and considerable displacement of it towards the ends of the chambers 17 as they are successively opened. Both of these factors tend, of course, to make the grease flow into the chambers 17 and thence to the several cylinders. This action is particularly useful in the wintertime when the mechanical working of the stiffened grease renders it more fluid and free-flowing so that a continuous feed from the reservoir to the cylinders is made easier. Under test, the pump was allowed to stand idle in the cold until the grease in the reservoir had gelled to a very stiff consistency. Almost immediately upon starting the pump under these conditions, grease was fed under pressure to the several cylinders, and was discharged therefrom at full line pressure, which at times, reached a value of 8000 pounds per square inch.

Any suitable means may be provided for the delivery of grease from discharge passage 25 to a point of usage. In the illustrated structure, this is very simply accomplished by providing one of the caps 29 with an extended head 46 which is internally threaded to receive a conventionaal connecting fitting; and by extending chamber 28*a* through the head so that grease may readily flow therethrough. In view of the limited working space between the inner end of cap 29*a*, and the outer end of the cylinder, it is desirable to provide supplementary discharge passages 47 through which grease may flow, for example, when the inner end of passage 28*a* is restricted by the lifting of ball valve 26*a* to permit a discharge of grease from cylinders 11*a*.

Such a pump lends itself to incorporation in a grease gun of the kind shown in Fig. 8. Referring to that figure, it will be seen that the gun includes an electric driven motor 48 secured by bolts 49 to one side of the cylinder block 10, and having a pistol grip 50 which serves as the handle of the completed gun. The shaft of this motor, of course, carries the eccentric 36 as shown in Fig. 2; and a trigger switch 51 serves as a ready means for controlling the operation of the motor. The gun also includes a cup 52 secured to the opposite side of block 10, and which is adapted to receive an opened can of grease 53 in such a position as to feed grease continuously to the reservoir 12. Such a can may be held in leak-tight relation to the cup by any suitable means, arms 54 which are pivoted to the cup and have adjustable set screws 55 in their outer end, serving this purpose in the illustrated device. The flexible hose 55 which is threaded into the head 46 of cap 29*a* serves, of course, to deliver grease at high pressure to a fitting at its outer end (not shown), and from there to a conventional pressure fitting of the Alemite or other type.

The pump of the present invention is capable of delivering grease or the like at extremely high pressures which may at times exceed those that are safe for the operating conditions then existing. In order to prevent the building up of excessive pressures, a safety switch is preferably provided which may, for example, be connected in circuit with the motor 48 and which acts to open the circuit of that motor whenever the pressure in discharge passage 25 exceeds a predetermined value. As here shown, the switch comprises a fitting 57 which is threaded into the block 10, and which has a central bore 58 opening into the discharge passage 25. A piston 59 is mounted in the bore and is adapted to seat against the shoulders 60 of the fitting, and to be held yieldingly in that position by spring 61 which is confined under the head of cap 62 which is threaded upon the fitting. The adjustment of the position of this cap, of course, increases or decreases the tension of spring 61, and accordingly sets the pressure which must be generated in discharge passage 25 to unseat the piston. Whenever that occurs, the piston acts upon a switch 63 (indicated diagrammatically) which is secured to fitting 57 by brackets 64 to open an electrical circuit including motor 48, thus bringing the motor and the pump to a stop.

It is preferred that one of the micro-acting types of switches be employed which will respond to a very minute movement of the piston. It will be apparent, however, that any suitable switch arrangement can be utilized to accomplish the desired result, or that a relief valve may be substituted for the switch, which valve will respond to the building up of an undesirably high pressure in passage 25 to open that passage, and allow an overflow of grease.

The illustrated and described gun is of a size comparable to that of a standard hand-operated grease gun so that it is readily portable. It will be evident, however, that unlike such a conventional gun it does not require a manual filling of the reservoir. All that is required of a filling station attendant, for example, is that he shall open a sealed can of grease and apply it to the cup 52. Thereafter the pump acts to withdraw grease from the can and to deliver it in the clean and uncontaminated condition in which it was supplied by the grease manufacturer.

It will be apparent that the pump is not limited to the small size here shown, nor to use in a hand gun of the illustrated type. It may be made of any appropriate capacity and may be incorporated in a stationary grease dispenser or in one of the semi-portable types of dispensers, or it may be employed in any suitable way for acting upon a viscous fluid to raise the pressure thereof to a desired value.

Since certain changes may be made in the embodiment of the invention which are well within the skill of the mechanic in the art, it is intended that the foregoing shall be construed in a descriptive rather than in a limited sense.

We claim:

1. A pump for grease and other viscous fluids comprising a crankcase which is adapted to serve as a reservoir for grease or the like; a plurality of oppositely disposed cylinders extending radially from said crankcase, each cylinder having a chamber opening into said crankcase, a bore of smaller diameter extending beyond said chamber, an inlet port to said bore, and a discharge port constituted by the outer end of said bore; a feed

passage between said chamber of each cylinder and said inlet port to the bore of the next adjacent cylinder; a discharge passage connecting all of said discharge ports; a discharge valve seated in each discharge port and controlling the flow of grease therefrom to said discharge passage; a piston disposed for reciprocation in the bore of each of said cylinders; each said piston having an enlarged head at its inner end which is adapted during a part of its stroke to project into said crankcase, and during a further part thereof to force grease from said crankcase into the chamber of its associated cylinder and through said feed passage into the bore of the next adjacent cylinder; and means in said crankcase for reciprocating said piston.

2. A pump for grease and other viscous fluids according to claim 1 characterized in that the head of each piston is adapted to deliver a greater quantity of grease to the bore of the next adjacent cylinder than can be discharged by the piston in that adjacent cylinder, and by an overflow port in each cylinder aligned with the inlet port thereof for returning excess grease to said crankcase.

3. A pump for grease and other viscous fluids according to claim 1 characterized in that said means for reciprocating said pistons outwardly comprises an eccentric which is disposed within said crankcase whereby it may serve in rotating to churn grease therein and to wipe it towards the inner ends of said chambers, and links connecting the pistons in oppositely disposed cylinders and serving to hold the inner ends thereof in operative relation to said eccentric.

4. A pump for grease and other viscous fluids comprising a cylinder block having a centrally located reservoir for grease or the like; a plurality of oppositely disposed cylinders extending radially from said reservoir, each cylinder having a chamber at its inner end which opens into said reservoir, a bore of smaller diameter extending beyond said chamber, an inlet port to said bore, and a discharge port constituted by the outer end of said bore; a feed passage between the chamber of each cylinder and the inlet port to the bore of the next adjacent cylinder; a discharge passage connecting all of said discharge ports; a discharge valve seated in each discharge port and controlling the flow of grease therefrom to said discharge passage; a piston disposed for reciprocation in the bore of each said cylinders; each said piston having an enlarged head at its inner end which is adapted during a part of its stroke to project into said reservoir and during a further part thereof to force grease into the chamber of its cylinder and through said feed passage into the bore of the next adjacent cylinder; an eccentric mounted for rotation in said reservoir said eccentric serving to drive said pistons outwardly and also to churn grease in said reservoir; and links connecting the pistons in oppositely disposed cylinders for holding the heads of such pistons in cooperation to said eccentric.

5. A pump for grease and other viscous fluids according to claim 4 characterized in that the head of each piston is adapted to feed a greater quantity of grease to the bore of the cylinder than can be discharged by the piston in that cylinder, in that each cylinder has an over-flow port aligned with the inlet port to its bore, and by a passage connecting each over-flow port with said reservoir.

6. A pump for grease and other viscous fluid according to claim 4 characterized by a motor secured to one side of said block in operative relation to said eccentric, and by means on the other side of said block for feeding grease or the like to said reservoir.

7. A pump for grease and other viscous fluids according to claim 4, characterized by a motor secured to one side of said block in driving relation to said eccentric, and means on the other side of said block for holding a container of grease or the like in feeding relation to said reservoir.

8. A pump for grease and other viscous fluids comprising a central reservoir; a plurality of cylinders extending radially from said reservoir, each cylinder having a chamber at its inner end opening into said reservoir, and a bore of smaller diameter extending beyond said chamber, an inlet port to said bore and a discharge port from said bore; a feed passage between said chamber of each cylinder and said inlet port to the bore of the next adjacent cylinder; a piston disposed for reciprocation in the bore of each such cylinder; each such piston having an enlarged head at its inner end which is adapted during a portion of its stroke to uncover the inner end of such chamber of its associated cylinder and to project into said reservoir, and during a further portion thereof to force grease from said reservoir into said chamber of its associated cylinder and through said feed passage into the bore of the next adjacent cylinder; and said enlarged head of each piston being adapted to deliver a greater quantity of grease to the bore of the next adjacent cylinder than can be discharged by the piston in that adjacent cylinder; an overflow port in each cylinder aligned with the inlet port thereof for returning excess grease to said reservoir; and means for reciprocating said pistons.

9. A pump for grease and other viscous fluids according to claim 8, characterized in that said means for reciprocating said pistons includes an eccentric mounted for rotation in said reservoir, and in that said eccentric and reservoir are so proportioned that the former serves to churn grease in the latter and to wipe it towards the inner ends of the chambers of said cylinders whereby to assist in feeding grease to the latter.

10. A motor driven grease gun comprising a reservoir for grease, a plurality of cylinders extending radially from said reservoir, each such cylinder having an inlet port and a discharge port, a delivery passage connecting all of said discharge ports, a discharge valve between each discharge port and said delivery passage, a feed passage connecting each inlet port with said grease reservoir, a piston mounted for reciprocation in each cylinder, each such piston having an inner end portion which is adapted during a portion of its stroke to feed grease from said reservoir through one of said passages to the inlet port of an adjacent cylinder, means for reciprocating said pistons including an eccentric mounted for rotation in said reservoir, said eccentric also serving to churn grease in said reservoir whereby to maintain it in condition for flow, a motor for driving said eccentric, and means for holding a container of grease in juxtaposition to said reservoir to feed grease thereto.

11. A motor driven grease gun including a pump comprising a reservoir for grease, a plurality of cylinders extending radially from said reservoir, each such cylinder having an inlet port and a discharge port, a delivery passage connecting all of said discharge ports, a piston in each cylinder having an outer portion which is adapted to force grease from that cylinder into said discharge passage and an inner portion which is

adapted to force grease positively from said reservoir to the inlet port of the next adjacent cylinder, means for reciprocating said pistons including an eccentric mounted for rotation in said reservoir, said eccentric serving to drive said pistons outwardly and simultaneously to churn grease in said reservoir whereby to maintain it in condition for flow; an electric motor secured to said crankcase in driving relation to said eccentric, said motor having a portion which serves as a handle for the gun, and a switch mounted in said handle portion for controlling said motor; and means for holding a container of grease in juxtaposition to said reservoir to feed grease thereto.

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