

Oct. 9, 1962

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HEAVY-GREASE DISPENSER

3,057,521

Filed Sept. 6, 1960

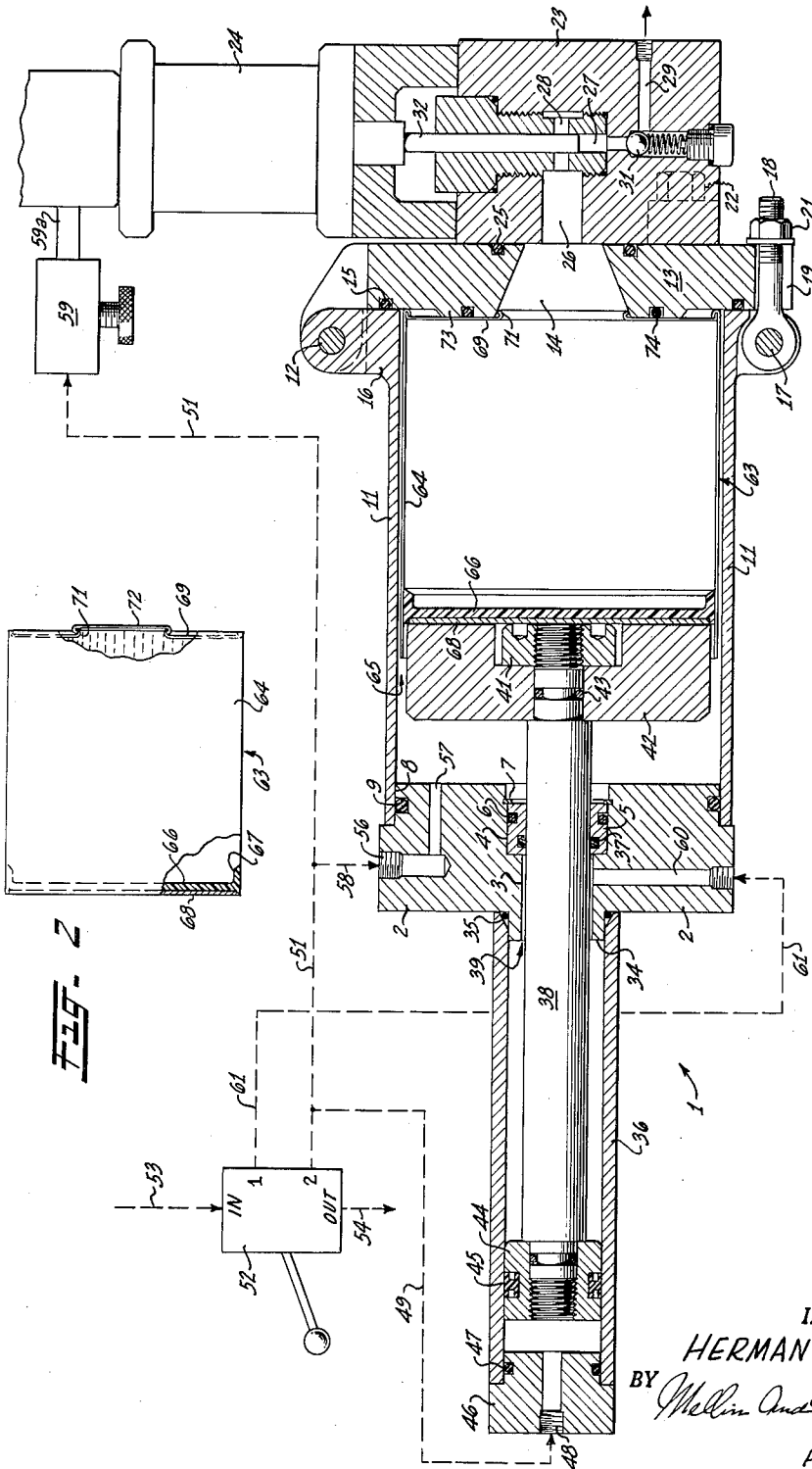


FIG. 1

FIG. 2

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3,057,521  
**HEAVY-GREASE DISPENSER**  
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 Filed Sept. 6, 1960, Ser. No. 54,243  
 5 Claims. (Cl. 222-262)

This invention relates to and in general has for its object the provision of a pneumatic cylinder and associated grease cartridge for dispensing heavy greases.

Presently, heavy greases are marketed in cylindrical cartridges for insertion into a ram or cylinder from which a conventional grease gun takes its feed. The cartridges are in the form of a tin can and as a result of the unequal pressures to which the interior and exterior of the cans are subjected during the operation of the ram, many cans are crushed or otherwise damaged, with the result that air is entrained in the grease and proper dispensing thereof is not attained.

More specifically, one of the objects of this invention is the provision of a grease cartridge and associated ram or cylinder so constructed and arranged that any differential pressure to which the exterior and interior of the cartridge is subjected can be readily withstood by the cartridge without damage thereto.

Another object of this invention is the provision of a ram or cylinder and an associated grease cartridge wherein the diameter of the cartridge is such that it will fit into the cylinder with positive clearance and can therefore be subjected to the cylinder pressure on all of its surfaces and then sealed against the internal head of the cylinder by an additional increment of mechanical pressure applied only to the closed end of the grease cartridge.

A further object of this invention is the provision of a grease cartridge for use in the combination above described, comprising a cylindrical can sealed at its bottom by an axially movable piston disc and provided at its top with a removable lid or cap.

The invention possesses other advantageous features, some of which, with the foregoing, will be set forth at length in the following description where that form of the invention which has been selected for illustration in the drawings accompanying and forming a part of the present specification is outlined in full. In said drawings, one form of the invention is shown, but it is to be understood that it is not limited to such form, since the invention as set forth in the claims may be embodied in other forms.

Referring to the drawings:

FIG. 1 is a mid longitudinal section taken through a ram, grease cartridge, and grease gun embodying the objects of my invention.

FIG. 2 is a side elevation of the grease cartridge shown in section in FIG. 1, with a portion thereof broken away to better illustrate its construction.

The ram illustrated in FIG. 1 and generally designated by the reference numeral 1 includes an outer cylinder head 2 provided with a central bore 3 and a counterbore 4. Mounted in the counterbore 4 is a bearing bushing 5 sealed to the cylinder head 2 by a recessed O ring 6. Holding the bushing 5 is a snap ring 7.

Seated on the undercut inner end 8 of the cylinder head 2 and sealed thereto by a recessed O ring 9 is a cylinder sleeve 11. Although not shown, the sleeve is secured to the head 2 by any suitable means required to withstand the pressures herein involved.

Hinged to the opposite end of the sleeve 11 by a hinge pin 12 is a door 13 formed with a central, outwardly converging grease port 14. Recessed in the door is an O ring 15 arranged to seal against the enlarged end wall 16 of the sleeve when the door 13 is in its closed position. Hinged to the sleeve 11 by a pin 17 paralleling and di-

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ametrically opposite the hinge pin 12 is a locking bolt 18 receivable in a keeper notch 19 formed in the door 13. Threaded on the outer end of the bolt 18 is a nut 21 serving to clamp the door closed and sealed against the open end of the sleeve 11.

Secured to the outer face of the door 13 by bolts 22 or formed integral therewith is a conventional grease gun 23 mounting and operated by a conventional pneumatic pump or motor 24. Sealing the gun 23 to the outer face of the door 13 is an O ring 25 recessed in the door around the grease port 14. The port 14 registers with the intake port 26 of the grease gun which in turn communicates with the piston bore 27 of the gun through a cross bore 28. Extending through the outer face of the grease gun 23 is a grease outlet bore 29 communicating with the piston bore 27 through a downwardly opening spring biased check valve 31. Operating in the piston bore 27 is a piston 32 arranged to be reciprocated in the usual fashion by the pneumatic pump or motor 24.

Fastened to the left end of the cylinder head 2 over an outwardly extending cylinder head flange 34 and sealed thereto by an O ring 35 is a cylinder sleeve 36. Slidable through the bearing bushing 5 and sealed thereto by an O ring 37 is a piston stem 38. Here it should be particularly noted that an annular passageway 39 is defined by the bore 3 and the adjacent cylindrical surface of the piston stem 38.

Mounted on the right-hand end of the stem 38 and secured thereto by a recessed nut 41 is a piston 42 having positive clearance with the sleeve 11. Recessed in the reduced left-hand end of the stem 38 within the confines of the piston 42 is an O ring 43 serving to seal these two members together.

Threaded on the left-hand end of the stem 38 is a small piston 44 and recessed therein is a gasket ring 45 having a running fit with the cylinder sleeve 36. Fixed to and closing the left end of the sleeve 36 is a plug or cap 46 sealed to the sleeve by an O ring 47.

Formed in the plug 46 is a tapped bore 48 arranged to communicate through lines 49 and 51 with a conventional four-way air valve 52. The valve 52 serves to selectively connect the line 51, and therefore the line 49, either with a source 53 of high-pressure air or with an exhaust port or line 54.

Provided in the cylinder head 2 is a tapped bore 56 communicating at its inner end with a passageway 57 leading to the interior of the sleeve 11. Connected to the outer end of the tapped bore 56 is a line 58 communicating with the line 51 and which, by means of the valve 52, can be selectively connected with the source 53 of high-pressure air or with the exhaust line 54.

The line 51 also connects with the air pump or motor 24 through an air-regulating valve 59 and a duct 59a.

Also provided in the cylinder head 2 is a tapped bore 60 communicating at its inner end with the passageway 39 and connected at its outer end with a line 61 leading to the valve 52. In one position of the valve 52 the line 61 is placed in communication with the high-pressure line 53, this occurring when the line 51 is placed in communication with the exhaust line 54.

As illustrated in FIG. 1, the ram above described is arranged to dispense grease from a grease cartridge 63. The cartridge 63 as shown in FIGS. 1 and 2 consists essentially of a cylindrical tinplate shell or casing 64 having an outer diameter substantially less than the inner diameter of the sleeve 11 so as to leave an air passageway 65 between the cartridge casing 64 and the ram sleeve 11.

Closing the bottom end of the cartridge casing 64 and slidable therein, piston fashion, is a plastic disc or piston 66 provided with a bearing flange 67 having a running fit with the interior walls of the casing. Backing the disc

or piston 66 is a metal stiffening disc 68 recessed within the left-hand end of the piston 66.

Secured to the right-hand end of the cartridge casing 64 is an annular metal ring or top 69 formed with an inner peripheral bead 71 of a diameter substantially equal to the diameter of the inner end of the cylinder head outlet port 14.

Crimped over the bead 71 (FIG. 2) is a removable can top or lid 72. As shown in FIG. 1, when the cartridge 64 is in its dispensing or operative position within the ram, its annular top 69 seats on an annular land 73 formed on the inner side of the door 13 and is sealed thereto by an O ring 74 recessed in the door.

Preparatory to charging the ram 1 with a cartridge 63, the door 13 is locked against the open end of the ram sleeve 11 and the control valve is placed in a position wherein the lines 53 and 61 are interconnected and the line 51 is connected with the exhaust line 54. High-pressure air then passes into the cylinder head bore 60 and through the passageway 39 into the sleeve 36 and against the inner end of the small piston 44. The stem 38 and the parts connected thereto are thus moved to the left. In this position of the valve 52 the left end of the sleeve 36 exhausts to atmosphere through the bore 48, the line 49, the line 51, the valve 52 and the exhaust line 54. The piston 42, having thus been moved to the left end of the sleeve 11, the door 13 is opened and the ram is ready to be charged with a cartridge.

The lid or cap 72 of a cartridge 63 is then removed and the opened cartridge is inserted into the sleeve 11, and the door 13 closed and locked. In this condition of the ram and cartridge, the cartridge is completely surrounded by air under atmospheric pressure.

The valve 52 is then turned to its dispensing position whereby the high-pressure line is placed in communication with the line 51. High-pressure air then passes through the line 49 into the left end of the sleeve 36 behind the piston 44. Simultaneously high-pressure air passes through the line 58 into the left end of the sleeve 11 behind the piston 42 and through the regulating valve 59 into the pneumatic pump or motor 24. By reason of the passageway 65, high-pressure air within the sleeve 11 completely surrounds the cartridge 63 and subjects every part of it, including its ends, to the line pressure. Simultaneously the line pressure within the left end of the small sleeve 36 operates on the end of the small piston 44, thus causing the large piston 42 to push the cartridge 63 to the right and to seal its annular end or top 69 against the O ring 74. Although all of the surfaces of the cartridge are subjected to the line pressure, it is to be particularly noted that the cartridge piston 66, in addition to being subjected to the line pressure which is transmitted to it through the piston 42, is simultaneously subjected to a force created on the rear end of the piston 44 and transmitted to the piston 42 through the piston stem 38. However, since the area of the small piston 44 is much smaller than the area of the large piston 42, the supplementary force due to the piston 44 is only a fraction of the force due to the line pressure acting on the large piston 42. It is the force resulting from the small piston 44 that serves to hold the cartridge sealed against the cylinder door 13, and this force is the bursting force to which the can is subjected. The total force to which the cartridge piston 66 is subjected (line pressure on the large piston 42 plus the line pressure on the small piston 44) should be sufficient to force the grease through the cartridge when supplemented by the action of the grease gun 23. When the grease gun piston 32 rises, a partial vacuum is created in the bore 27. The resulting and additional differential pressure imposed on the piston 42 drives the piston 42 to the right and thereby forces grease from the cartridge through the port 14 and the passageway 26 into the pump bore 27 beneath the pump piston 32. On the down stroke of the piston 32 an increment

of grease is cut off by the piston and forced by the check valve 31 out the discharge port 29.

When the cartridge 63 is empty, the door 13 is opened and the valve 52 reversed so as to retract the piston 42 and ready it for another cartridge.

By maintaining all of the surfaces of the cartridge under at least line pressure and subjecting the cartridge piston to this pressure plus the additional but relatively small pressure resulting from the action of the smaller piston 44, the differential pressure to which the inside and outside of the cartridge is subjected can be maintained well below the bursting pressure of the cartridge, particularly along its seam. Grease is thus prevented from leaking from the cartridge into the ram sleeve 11 and bursting of the cartridge into tight engagement with the sleeve 11 is likewise avoided.

In calculating the force exerted by the small piston 44, it should be observed that during its working stroke its right-hand side is under atmospheric pressure by reason of the fact that the bore 60 communicates with the atmosphere through the valve 52. The force on the left-hand side of the piston 44 is equal to the line pressure multiplied by the cross-sectional area of the piston. The force on the opposite side of the piston 44 is equal to the area of the piston less the cross-sectional area of the stem 38 multiplied by atmospheric pressure. The total force exerted by the piston 44 during its working stroke is therefore the difference between these two forces, and it is this differential total force which is applied to the large piston 42 in addition to the force resulting from the line pressure within the sleeve 11.

Although dimensions are not here critical, the controlling factors include the pressure required to move the grease through a cartridge of a given diameter and length, the bursting pressure of the cartridge and the line pressure available.

Although it is possible to locate the seal ring 74 substantially adjacent the periphery of the cartridge capping 64 rather than along the door land 73, this would require greater accuracy in the formation of the casing end so as to insure a proper seal with the O ring.

I claim:

1. A grease-dispensing system comprising: a first cylinder; a first cylinder head fixed and sealed to one end of said first cylinder; a second cylinder head removably secured and sealed to the other end of said first cylinder and provided with a central grease exit port; a second and smaller cylinder secured and sealed to said first cylinder head coaxially therewith and extending outwardly therefrom a cap secured and sealed to the free end of said second cylinder; a piston stem extending through said first cylinder head coaxially therewith; means for slidably sealing said piston stem to said first cylinder head; a first piston secured to said stem within said first cylinder and having positive clearance therewith; a second piston secured to said stem within said second cylinder and having a running fit therewith; means for establishing communication between said first cylinder and a point external thereto; and means for establishing communication between the outer end of said second cylinder and a point external thereto.

2. A grease-dispensing system of the character set forth in claim 1 wherein the outer diameter of said piston stem is less than the inner diameter of said second cylinder and wherein means is provided for establishing communication between the inner end of said second cylinder and a point external thereto.

3. A grease-dispensing system of the character set forth in claim 1 wherein a grease cartridge is contained in said first cylinder forwardly of said first piston, said cartridge including a cylindrical shell loaded with grease and having an outer diameter smaller than the inner diameter of said first cylinder; a piston closing the rear end of said cylindrical shell and slidable therein; and means for sealing the open front end of said cartridge against said sec-

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ond cylinder head when the front end of said cartridge is forced against said second cylinder head.

4. A grease-dispensing system of the character set forth in claim 1 wherein a grease gun is sealed to the outer face of said second cylinder head and arranged to take its feed through the said exit port in said second cylinder head. 5

5. A grease-dispensing system of the character set forth in claim 3 wherein a grease gun is sealed to the outer face of said second cylinder head and arranged to take its feed from said cartridge through the said exit port in said second cylinder head. 10

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