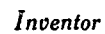


Filed Feb. 12, 1947

LUBRICATION SYSTEM

4 Sheets-Sheet 1



By Hickel, Tutor, Abellberg, Haanmann & Kipper
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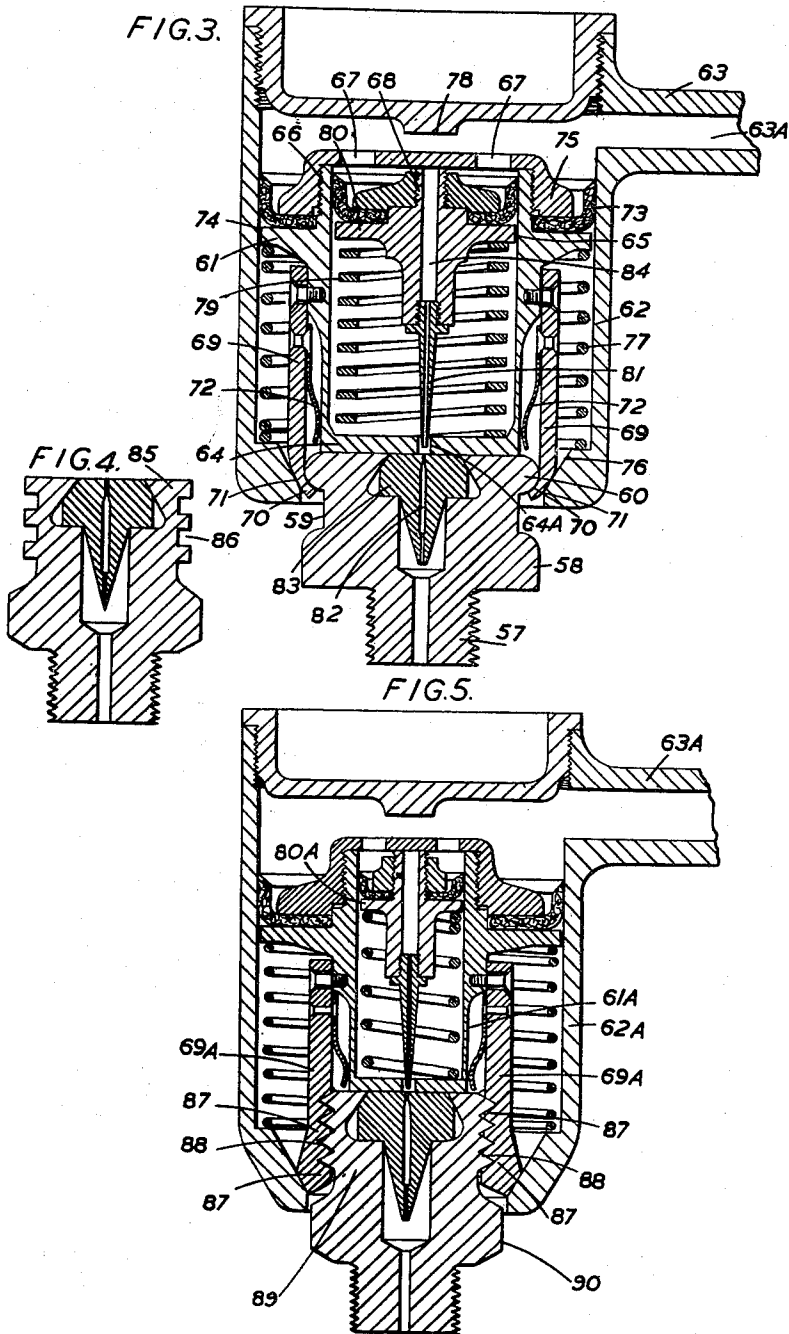
April 29, 1952

C. C. S. LE CLAIR
LUBRICATION SYSTEM

2,594,320

Filed Feb. 12, 1947

4 Sheets-Sheet 2



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2,594,320

Filed Feb. 12, 1947

4 Sheets-Sheet 3

FIG. 6.

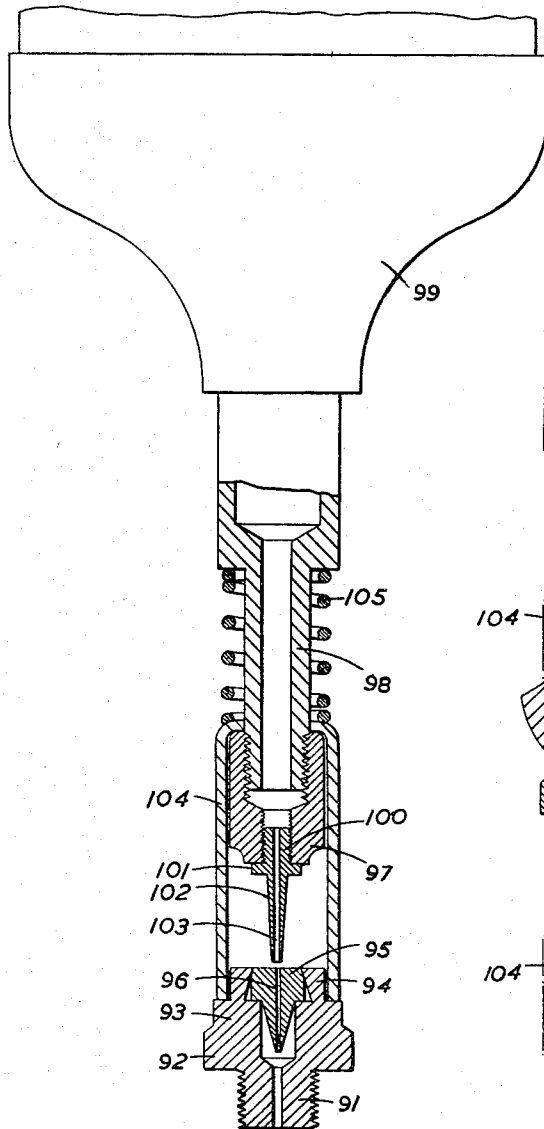


FIG. 1.

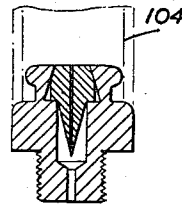


FIG. 8.

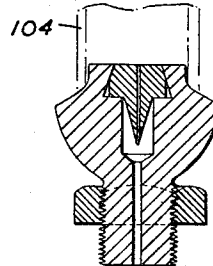
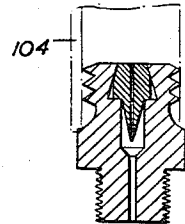


FIG. 9.



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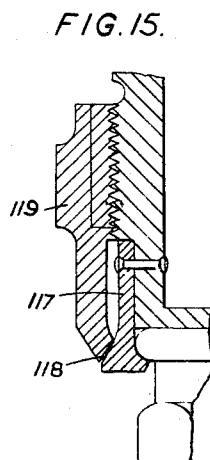
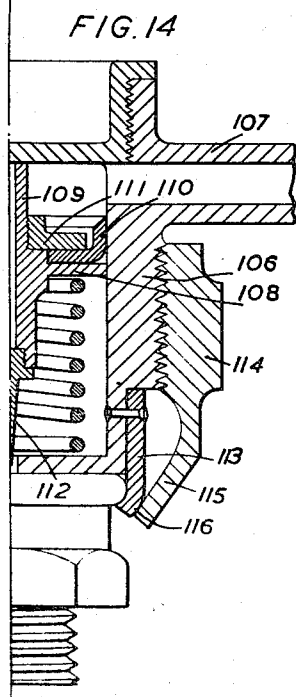
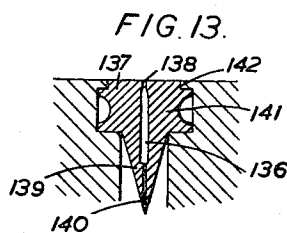
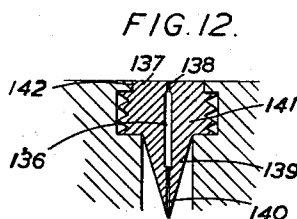
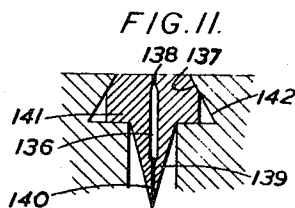
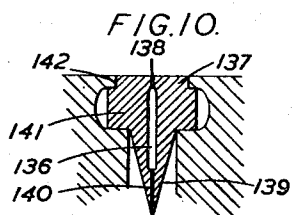
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LUBRICATION SYSTEM

Filed Feb. 12, 1947

4 Sheets-Sheet 4



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2,594,320

LUBRICATION SYSTEM

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Application February 12, 1947, Serial No. 728,082
In Great Britain February 20, 1946

20 Claims. (Cl. 137—69)

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This invention relates to lubrication systems of the kind in which lubricant is discharged at high pressure by means of a grease gun or other high-pressure lubricant-discharging device into a nipple or lubricant-receiving device which is usually attached or connected permanently to the part to be lubricated. The invention also relates to lubrication systems in which the grease gun or equivalent is provided with, or is connected to, a nozzle which is provided with jaws or other device whereby the nozzle may be detachably applied or attached by direct thrust, or by "pull-on," or "lateral" or other method of engagement to the nipple, which latter may be formed with a flange or head or other means adapted to be engaged by the nipple-engaging jaws or other device of the nozzle body.

The invention thus relates for example to lubrication systems in which the nozzle is adapted to form a lubricant-tight joint with the nipple by thrust applied to the nozzle, or in which the nozzle comprises a number of movable jaws which when operated manually, mechanically, or by the pressure of the lubricant forced into the nozzle by the grease gun or equivalent, are adapted to form a detachable connection with the nipple, or in which the nozzle is provided with fixed jaws in the form of a channel adapted to form a detachable connection with a flange on the nipple.

Known nipples used in the above mentioned lubricant systems are frequently provided with non-return valves adapted to close the lubricant passages in the nipples but whether or not they are provided with such valves the inlets of the said passages form lodgements in which dirt can collect.

One object of the present invention is to provide nipples or lubricant receiving devices (hereinafter called "nipples") which are so constructed that dirt cannot collect in the said inlets.

According to the present invention, the inlet end of the lubricant passage in the nipple is provided with a closure member, which is made of flexible lubricant-impervious material and is formed with a lubricant passage of small size, the arrangement being such that either due to the manner in which the member is mounted in the nipple and (or) the manner in which the lubricant passage is formed through the said material, the lubricant passage is normally closed but can be opened to allow lubricant to be forced through it under pressure imposed upon the lubricant by a grease gun or equivalent device. The closure member thus not only acts to prevent the access of dirt to the interior of the nipple, but also, as will be explained later, may act as

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a non-return valve to prevent the back flow and escape of lubricant when the pressure on the latter is relieved and the nozzle is removed from the nipple.

A further object of the invention is to provide a combination of nipples constructed as briefly described above with nozzles which may form part of, or may be attached to, grease guns or equivalent and are provided with hollow conduit means which are adapted to open the lubricant passages in the said closure members and thus allow lubricant to be injected through those passages into the lubricant receiving passages in the nipples and thence to the place of use of the lubricant.

Such a nozzle may, for example, comprise a hollow body, a lubricant inlet conduit through which lubricant from a grease gun or equivalent is forced into the body under pressure, a hollow conduit means which is slidable in the body and which, when the nozzle is in its working position upon the nipple, is forced under the lubricant pressure into, and opens, the lubricant passage in the said closure member and thus allows lubricant to be injected through the said passage into the lubricant receiving passage in the nipple and thence to the place of use.

The said hollow conduit means may form part of a piston assembly which is slidably arranged within the said hollow body, and it may include a needle-like stem which is adapted to be forced forwards towards the nipple into the lubricant passage in the closure member under the pressure of the lubricant acting upon the piston assembly.

As an alternative, however, the nozzle may comprise a hollow body adapted to be connected to the outlet conduit of a grease gun or equivalent, a hollow conduit means which is attached to or forms part of, the hollow body and which, under manual pressure applied to the nozzle, is forced into, and opens, the said lubricant passage in the closure member and thus allows lubricant to be injected through the said passage into the lubricant receiving passage in the nipple and thence to the place of use.

The said closure member conveniently consists of a flexible, lubricant-impervious teat which is formed with a head, adapted to be fitted in a housing formed at the inlet end of the lubricant passage in the nipple, and a shank which is arranged in that passage, and the teat may be formed with an axial lubricant passage which passes right through the teat.

On the other hand, the teat may be formed with an axial lubricant passage which passes partly through the teat and the shank may then

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be provided with one or more slits which provide communication between that passage and lubricant-receiving passage in the nipple. The outer surface of the head of the teat is preferably flush with the outer surface of the nipple, and in certain constructions the said shank is tapered although this is not essential. The lubricant passage in the teat may be formed by merely piercing the teat or by drilling the teat or by moulding the passage in the teat.

The teat may be provided with a tapered head which is fitted in a correspondingly shaped housing at the inlet end of the lubricant passage in the nipple.

On the other hand, the head of the teat may be so shaped that part only of the head is tightly gripped in the housing at the inlet end of the lubricant passage in the nipple to close the inlet end of the lubricant passage in the teat, while an empty space is provided in the housing around the rest of the head of the teat.

The nipples may comprise heads shaped for engagement by the nipple-engaging fixed jaws or parts or by the lubricant pressure or manually or mechanically operated movable jaws or parts of the nozzles, spanner or wrench engaging parts and shanks which are adapted, by threading or otherwise, to be fixed in the bearings or other parts to be lubricated.

The teat may be made of rubber, synthetic rubber or other mouldable material, or lubricant-imperious flexible material.

Various constructional forms of nipples and also of nozzles adapted to be used in association therewith will now be described, by way of example, with reference to the accompanying drawings, and in the descriptions it will be assumed that the nipple and nozzle are both arranged in a vertical position, with the nozzle uppermost delivering downwards into the nipple. On the drawings:

Figure 1 is a sectional view of a nozzle and nipple combination, the nozzle being engaged in its working position on the flanged head of a nipple. In this figure, the nozzle is of the type which comprises fixed jaws for engagement upon and around the flanged head of the nipple by "pull-on" motion and in which the hollow slidable conduit which engages in the lubricant passage in the teat is in the form of a needle-like stem and is carried by a grease-operated piston slidable in the nozzle body;

Figure 2 is a sectional view of a second nozzle and nipple combination, the nozzle being engaged in its working position on the head of the nipple. In this figure, the nozzle comprises movable nipple-engaging jaws which are adapted to engage with a part-spherical portion of the nipple head, the jaws being carried by an outer piston assembly which is slidable in the annular space between outer and inner body parts of the nozzle;

Figure 3 is a sectional view of a third nozzle and nipple combination, the nozzle being engaged in its working position on the head of the nipple. In this figure, the nozzle comprises an outer piston assembly which is formed upon an inner body part of the nozzle and is slidable in the outer body part of the nozzle and which also carries nipple-engaging jaws adapted to engage the circular head or flange of a nipple of the type shown in Figure 1;

Figure 4 is a sectional view of a modified form of nipple which comprises a head formed with a number of annular grooves or serrations with which corresponding projections formed on the

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locking jaws of a nozzle of the type described with reference to Figure 3 are adapted to engage;

Figure 5 is a sectional view of a fourth nozzle and nipple combination, in which the nozzle is of the type shown in Figure 3, but differs therefrom in that its locking jaws are formed with projections adapted to engage in the annular grooves or serrations formed in the head of the modified nipple shown in the figure;

Figure 6 is a sectional view of a fifth nozzle and nipple combination. The nozzle shown in this figure is not adapted to be attached or gripped to the nipple and part of the head of the latter is shaped to provide a guide for a spring-urged sleeve which is slidable upon the nozzle body and is adapted to ensure that the needle-like stem of the nozzle is in correct alignment with the lubricant passage in the nipple teat;

Figures 7, 8 and 9 are all sectional views showing how nipples as illustrated in Figures 1, 2 and 4 and 5, may be used with nozzles as shown in Figure 6;

Figures 10 to 13 are sectional views of modified forms of teats for use in nipple heads;

Figure 14 is a half-sectional view of a nozzle and nipple combination in which the nozzle is provided with manually operated nipple-engaging jaws; and

Figure 15 is a fragmentary sectional view of a modification of the nozzle and nipple combination shown in Figure 14.

Referring first to Figure 1:

In this constructional form of the invention, the nipple comprises a shank 1, which is threaded or otherwise formed for attachment to the place of use of the lubricant, an enlarged intermediate or spanner-engaging part 2, and a circular flange 3 which is separated from the intermediate or spanner-engaging part by an annular recess 4, which thus provides a neck between the latter and the flange 3 around which the jaws of the nozzle may be engaged as described hereinafter.

The nipple is provided with an axial grease outlet passage 5 which extends from the bottom end of the shank to a position spaced slightly above the lower flat face of the spanner-engaging part 2 of the nipple where it joins a coaxial enlarged bore 6. The upper end of the latter is counter-bored so as to provide a shoulder 7 spaced from the upper face of the flange and a tapered side wall 8 which is inclined outwardly from the flat top face of the nipple flange downwardly to the shoulder. The shoulder 7 and the tapered wall thus form a tapered housing for the head 9 of a rubber or like teat, which at its opposite end is formed with a tapered or pointed shank 10 projecting downwards into the enlarged bore 6 when the teat is in position in the nipple. The teat is formed with a straight-through pieced axial passage 11 normally of no measurable diameter.

As described hereinafter, however, the head of the teat may be larger in diameter than the upper and smaller end of the tapered housing, but smaller than the larger and lower end thereof, but being made of rubber or like material it can be distorted sufficiently to allow it to be forced into place without damage to itself. Once in place it will be firmly held in position by the tapered form of the housing.

In a modification the enlarged bore 6 in the upper part of the nipple may, as shown in broken lines, extend right down through the attachment shank 1, if the latter is large enough to permit of it.

One constructional form of nozzle for use with

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the nipple is also shown in Fig. 1. It comprises a hollow body 12, which is integral with, or attached to, a hollow shank 13, the latter being integral with, or adapted to be attached to, the grease outlet conduit of the grease gun or equivalent (not shown). The bottom or nipple engaging end of the nozzle is formed with a recess of known form of T-section comprising a straight portion which extends from the side of the nozzle body nearest to the grease gun or equivalent to the centre of the body where it connects with a semi-circular portion which is spaced from the opposite side of the nozzle body. In known manner, this arrangement provides two jaws 15, between which the nipple neck can be slidably engaged, and a channel 14 above the jaws adapted to receive the nipple flange 3.

The bore 16 of the nozzle body extends from the upper face of the body to a position short of the channel 14, so that the body is provided with a base 17 separating the bore from the channel. A small hole 18 is formed centrally in the base and provides communication between the bore 16 and the channel 14. The grease inlet conduit 19 in the hollow shank 13 of the nozzle body communicates with the bore 16 at a position near the upper face of the nozzle body.

A piston assembly is slidably arranged in the bore of the nozzle body and comprises a central body 20, having a flange 21 and a shank 22 which projects upwards from the upper face of the flange, a coaxial needle-like stem 23 which projects downwards from the lower face of the flange and a flexible sealing washer which is held between the upper face of the flange 21 of the piston body and a nut 26 which is screwed upon a threaded part of the shank, the annular sealing lip of the washer being directed upwards. The piston assembly is constantly urged upwards by a coil spring 27, which reacts between the base 17 of the nozzle body and the flange 21 on the piston body. An axial passage 24 connects the upper end of the shank 22 to the lower end of the needle like stem 23.

The upper end of the bore 16 of the nozzle body is preferably closed by a cover plate 28 arranged in a recess in the nozzle body and held in position by a circlip 29 which is fitted in an annular groove formed in the nozzle body above the cover plate, and a flexible sealing ring or disc 30 is used below the cover to effect a pressure tight joint.

Alternatively, the cover may be attached to the nozzle body by screwing.

The coil spring 27 urges the complete piston assembly upwards and the upward movement is limited by the engagement of the upper end of the shank 22 with the cover. The arrangement is such that normally the lower end of the needle stem 23 of the piston body does not project beyond the lower face of the base 17 of the nozzle body but is either flush with it or is disposed slightly above it. The annular sealing lip of the sealing washer 25 is so disposed that it can never mask the inlet end of the grease conduit 19 in the hollow shank of the nozzle body.

In operation, the nipple-engaging jaws 15 of the nozzle body are hooked upon the neck of the nipple and the nipple flange 3 is engaged in the channel 14, the bottom face of the base 17 then engaging with the upper face of the nipple flange. The nozzle is pulled across the nipple until the nipple flange is fully engaged in the semi-circular end of the channel 14 in the nozzle body. In this position, the needle-like stem 23 of the piston

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assembly and the passage 11 in the rubber teat are in exact axial alignment. When the grease gun or equivalent is operated, grease under pressure is forced through the conduit 19 in the hollow shank 13 of the nozzle body into the bore 16 of the latter, the piston assembly then being forced downwards against the pressure of the coil spring 27 and the needle end of the piston stem 23 being forced into the end of the passage 11 in the rubber teat. This movement of the piston assembly may be limited either by the closing of the coil spring 27 or by a shoulder or other step (not shown) and as soon as the piston assembly has reached the desired limit of its downward travel further discharge of grease by the grease gun or equivalent will force grease through the straight-through passage 24 in the piston body and the needle stem, thence through the passage 11 in the rubber or like teat into the nipple and thence to the place of use. When the operation of the grease gun or equivalent is discontinued the piston assembly is returned upwards to its original position by the action of the spring 27 and the nozzle can then be removed from the nipple.

In a second constructional form shown in Figure 2, the nipple comprises a shank 31 adapted for attachment at a place of use of the lubricant, an intermediate or spanner-engaging part 32, a head comprising an upper cylindrical part 33 and a lower partly-hemispherical part 34 of larger diameter. As in the construction described above, the nipple is hollow being formed with a grease passage of varying diameter and is provided with a teat 35 of flexible, lubricant-imperious material such as rubber or like material formed with a lubricant passage 36. The teat may be made and held in place in any of the ways referred to above and hereinafter.

This nipple is intended for use with a modified form of nozzle, having movable nipple-engaging jaws operated by the pressure of the lubricant and which, under the influence of that pressure, move forward, i. e., downwards, and grip the partly-hemispherical part 34 of the nipple head.

The nozzle comprises two coaxial cylindrical bodies 37 and 38, the outer body 38 being integral with, or attached to, a hollow shank 39 integral with or adapted to be attached to the discharge shank or duct of a grease gun or equivalent (not shown).

The inner cylinder 37 is formed, like the nozzle body of the construction shown in Figure 1, with an apertured base 40 and an open upper end closed by a cover member 41 which in this case is preferably screwed into position. The walls of the cylinder 37 extend below the base, forming a recess 42 which fits over the upper cylindrical part 33 of the nipple, forming a guide for alignment.

Within the inner cylinder is a piston assembly comprising a flange 43, a sealing ring 44, an upwardly projecting shank 45 and a downwardly projecting needle-like stem 46, all spring-urged upwards away from the nipple engaging end of the nozzle, the assembly being formed with an axial straight-through bore 47 all as described in reference to Figure 1.

Between the inner and outer cylinders is an annular space 48 in which are arranged an annular piston 49 and jaws 50.

The lower end of the outer cylinder is provided with an inwardly turning flange 51, and the jaws 50 are loosely hung from the annular piston 49 so that while relative lateral movement of the jaws

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is permitted, positive downward movement is enforced when the annular piston moves downwards.

The annular piston with its depending jaws is urged upwards by a spring 52 away from the nipple-engaging end of the nozzle, but the spring exerts a lower pressure per square inch on the annular piston than the spring 53 of the inner piston exerts upon the inner piston. The upper end of the annular space 48 is closed by a cover 54 which, in the preferred embodiment, is screwed into place, and may conveniently be formed integral with, and as a radial extension of, the cover 41 for the inner cylinder 37. A hole or holes 55 through the inner cylinder wall, arranged close under the cover, afford communication between the inner and outer cylinders.

In operation, the nozzle is first placed in position over the head of the nipple, with the recess 42 within the lower end of the inner cylinder walls registering over the cylindrical part 33 of the nipple. In this position the needle like stem of the inner piston assembly and the passage in the teat are in exact axial alignment. When the grease gun or equivalent is operated, grease under pressure is forced through the duct 56 in the hollow shank 39 of the nozzle body into the bore of the outer cylinder, and also through the hole or holes 55 into the inner cylinder. Since the outer spring 52 exerts a lower pressure upon the outer piston 49 than the inner spring 53 exerts upon the inner piston it follows that the outer piston will move first. As it descends the outer piston forces the depending jaws 50 downwards, and as they encounter the inwardly turning flange 51 of the outer cylinder 38 they are also forced inwardly, thus collectively acting as a clutch to grip the partly-hemispherical part 34 of the nipple head. After this action further discharge of grease by the gun or equivalent results in the inner piston being forced downwards against the pressure of its spring 53 and in the forward end of the needle stem 46 being forced into the end of the passage 36 in the rubber teat. This movement of the piston assembly may be limited either by the closing of the inner coil spring 53 or by a shoulder or other stop (not shown) and as soon as the piston assembly has reached the desired limit of its downward travel further discharge of grease by the grease gun or equivalent will force grease through the straight-through passage 47 in the piston body and needle stem, thence through the passage in the rubber teat into the nipple and thence to the place of use.

When the operation of the grease gun or equivalent is discontinued, the inner piston assembly is returned upwards to its original position by the action of the inner spring 53. Thereafter, the outer piston 49 with its depending jaws 50 will also return under the action of its spring 52. As soon as this has taken place the nozzle can be removed from the nipple.

As will be understood from the foregoing description a nozzle as described with reference to Figure 2 could be used in conjunction with a flanged nipple, as described with reference to Fig. 1, the hooked ends of the jaws 50 being shaped to fit around the nipple flange 3.

In a third constructional form of the invention shown in Figure 3, the nipple may be constructed as previously described in connection with the nipple shown in Figure 1, viz., having a shank 57 for attachment to a place of use, an intermediate or spanner engaging part 58, a neck 59 and

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a flange 60. The nozzle again comprises two coaxial inner and outer cylinder bodies 61 and 62, but in this construction the inner cylinder is slidable within the outer. The hollow shank 63 of the outer body 62 is integral with, or attached to, the shank or duct of a grease gun or equivalent (not shown). The inner cylinder is formed with a base 64 having a central hole 64A and within this inner cylinder is a piston assembly 65, comprising a flange, a sealing ring, an upwardly projecting shank and a downwardly projecting needle-like stem spring urged upwardly away from the nipple engaging end of the nozzle, all as described in reference to Figures 1 and 2. The upper end of the inner cylinder is provided with a cover member 66, but this is formed with holes 67 so that it does not serve as a closure for the cylinder, but only acts as a stop member, the shank 68 of the inner piston abutting against it, when the inner piston is in its uppermost position. The nozzle is also provided with movable jaws 69, but they are loosely attached to the inner cylinder wall instead of to a sliding annular piston as in Figure 2. As in that case they have a limited free lateral movement but in this case they have no endwise movement relative to the inner cylinder. The lower ends of the jaws are formed with hooks 70 on their inner faces, and their outer faces 71 are bevelled for a reason to be explained hereinafter. Leaf springs 72 are arranged between the jaws and the cylinder in order to spread the jaws to their widest capacity.

The inner cylinder 61 is slidably arranged within the outer cylinder 62, and it is provided at the upper end with an outwardly turned flange 74 which in conjunction with a flexible sealing ring which is arranged in the annulus between the inner and outer cylinder walls and is gripped in place between the said flange 74 and a flange 75 formed upon the inner cylinder cover 66 forms a piston assembly by which the inner cylinder is caused to slide as will be explained hereinafter.

At its lower extremity the outer cylinder wall is formed with an inwardly turning flange, the inner upper edge 76 of which is bevelled for engagement with the bevels 71 on the movable jaws 69. Between the bevel on the flange and the outer cylinder wall the upper surface of the flange is flat, and a coil spring 77 is arranged between the flange and the flange 74 on the inner cylinder. The reaction of the spring 77 urges the inner cylinder, with its depending jaws, upwards in relation to the outer cylinder. This motion is limited by the inner cylinder cover 66 abutting against a boss 78 on the outer cylinder cover. In this position the jaws 69 are spaced outwards by their leaf springs 72. The outer coil spring 77 exerts a lower pressure per square inch on the whole area of the outer cylinder than the inner piston spring 79 exerts upon the inner piston.

When the nozzle is placed in its working position on the head of the nipple the jaws 49 are spread outwards by their springs 72, their hooked ends 70 can pass freely over the edge of the nipple flange 60 and the apertured base 64 of the inner cylinder can come into contact with the upper face of the nipple flange. When the grease gun or equivalent is operated, grease under pressure is forced through the duct 63A in the hollow shank 63 of the nozzle into the bore of the outer cylinder, and also through the holes 67 in the cover 66 of the inner cylinder into the latter.

Since the outer spring 77 exerts a lower pressure upon the whole inner cylinder, which acts as a sliding piston, than the inner spring 79 exerts upon the inner piston, it follows that the inner cylinder as a whole will move relative to the outer cylinder before the inner piston moves relative to the inner cylinder. As the inner cylinder and its jaws move downwards, or more correctly, as the outer cylinder moves upwards, the bevelled edge 76 of the inwardly turning flange of the outer cylinder engages the bevelled faces 71 of the jaws causing them to close radially inwards not only gripping the nipple flange but also centralising it so that the lubricant passage in the teat is in correct axial alignment with the needle like stem.

When this action is completed further discharge of grease by the gun or equivalent results in the inner piston assembly 65 being forced downwards against the pressure of its spring 79 and in the forward end of the needle stem 81 being forced through the hole 64A in the base 64 of the inner cylinder into the end of the passage 82 in the rubber teat 83. This movement of the piston assembly may be limited either by the closing of the inner coiled spring 79, or by a shoulder or other stop (not shown). As soon as the inner piston assembly has reached the desired limit of its downward travel further discharge of grease by the grease gun or equivalent will force grease through the straight-through passage 84 in the piston body and needle stem, thence through the passage 82 in the rubber teat into the nipple and thence to the place of use. When the operation of the grease gun or equivalent is discontinued, the inner piston assembly 65 is returned upwards to its original position by the action of its spring 79, the inner cylinder 61 with its depending jaws 69 then also returning under the action of the outer spring 77. As soon as this has taken place the jaws will be freed, and will open outwards under the action of their springs 72, thereby freeing the nipple flange 69 and permitting the nozzle to be removed.

The modified nipple shown in Figure 4 is not provided with a head in the form of a single flange, as previously described with reference to Figures 1 and 3, but may have a cylindrical body 85, upon which are formed a number of circular grooves or serrations 86.

As shown in Figure 5, a nozzle for use with this modified type of nipple may be constructed like that shown in Figure 3 and thus, briefly, may comprise an outer body 82A provided with a hollow shank 63A, an inner body 61A, an inner piston assembly 80A and spring-urged jaws 69A carried by the inner body 61A. In this modified construction of nozzle, however, the jaws are provided with projections or ridges 87 which engage in grooves or serrations 88 formed in the cylindrical body 89 of the nipple 90 when the nozzle is fitted in its working position upon the nipple.

It will be noted that whereas the grooves or serrations in the cylindrical body of the nipple shown in Figure 4 are of square section those in the cylindrical body of the nipple shown in Figure 5 are of V-section. It is to be understood, however, that the grooves or serrations may be any other convenient section.

The body of the nipple may also be of conical instead of cylindrical shape.

It will also be appreciated that a nozzle as described with reference to Figure 1 could be adapted for use in conjunction with the types of nipple described above with reference to Fig-

ures 4 and 5. As in the constructions described above the nipples are provided with teats of flexible, lubricant-impervious material formed with lubricant passages and may be made in any of the ways referred to above or hereinafter.

A fourth constructional form of the invention is shown in Figure 6. The nipple comprises a shank 91 adapted for attachment at a place of use of the lubricant, an intermediate or spanner engaging part 92, a lower cylindrical part 93 and an upper cylindrical part 94 of reduced diameter. As in the constructions described above, the nipple is provided with a teat 95 of flexible, lubricant-impervious material formed with a lubricant passage 96, which teat may be made in any of the ways referred to above or hereinafter.

This nipple is intended for use with a modified form of nozzle shown in Figure 6 which is not adapted to be gripped to the nipple during the lubricating operation. The nozzle comprises a hollow body 97 integral with, or adapted to be attached to, the grease outlet conduit 98 of the grease gun or equivalent 99. The end of the bore of the body 97 which is adjacent to the nipple when the nozzle is in the working position is tapped to receive the threaded shank 100 of a needle-like delivery stem 102 similar to the part 23 in Figure 1, which is also formed with an intermediate flange 101 adapted to abut against the lower end of the body when the delivery nozzle is screwed into position. An axial bore 103 connects the upper end of the shank 100 with the lower end of the said needle-like stem.

In order not only to serve as a guide but also to protect the needle stem 102 against damage and to protect a user against injury by the stem, a sleeve 104 is slidably arranged upon the grease outlet conduit 98 and the body 97. This sleeve is normally pressed downwardly by means of a coil spring 105 surrounding the conduit so that the stem is entirely enclosed in the sleeve.

In order to inject grease into the nipple and thence to the place of use, the lower end of the sleeve 104 is applied to the nipple and fitted around the upper cylindrical part 94, which part thus acting in cooperation with the sleeve and serves to ensure that the needle stem 102 and the lubricant passage 96 in the nipple teat are in correct alignment. Thus, when the grease gun or equivalent is thrust forwards towards the nipple to discharge grease into the nipple, the needle-like stem 102 is first forced into the lubricant passage 96 in the teat. The amount of this motion being limited either by the flange 101 on the delivery nozzle engaging with the upper cylindrical part 94 of the nipple or by an abutment (not shown) in the sleeve, engaging the body 97, the sleeve sliding backwards along the grease outlet conduit 98 and compressing the spring 105. Further thrust on the gun 99 results in grease being forced through the bore of the hollow conduit 98, through the passages in the head 87 and the needle 102 into the passage 96 in the teat and thence to the place of use. When the grease discharging operation is completed and the nozzle is removed from the nipple, the sleeve 104 is forced forwards again into its original position by the spring 105 thus again acting as a protection to the needle stem.

It will be understood that a nozzle of the type shown in Figure 6 can also be used in conjunction with nipples of the type shown in Figures 1, 2, 4 and 5. This is illustrated in Figures 7 to 9 wherein the nipple engaging end of the slidable

sleeve 104 of the nozzle is shown in broken lines fitted over the head or flange of the nipple head.

Figure 14 shows by way of example a modified nozzle having manually operable jaws. The nipple used with this nozzle may be of any of the types mentioned above which are adapted to be gripped by movable jaws, and the nozzle is preferably of the same general type as in the third construction described above with reference to Figure 3, wherein the jaws have lateral movement but do not advance and recede as in the second construction shown in Figure 2.

Thus, the nozzle comprises a cylinder body 106 with a hollow inlet shank 107 and a hollow bore in which slides a piston assembly similar to that described in reference to Figure 1 and comprising a flange 108, an upwardly extending shank 109, a sealing ring 110 and holding nut 111, and a downwardly projecting needle stem 112.

On the outside of the cylinder wall, at or near the nipple-engaging end, a number of jaws 113 are suspended in similar fashion to the jaws 69 described with reference to Figure 3, and above these jaws the wall is formed with an external thread, upon which an internally threaded shell 114 is screwed. The outside of the shell is knurled so that it can be gripped and rotated by hand, and the lower end is made conical at 115 to engage with the bevelled ends 116 of the jaws, so that when the shell is screwed upwards on the thread the jaws are moved radially inwards.

As shown in Figure 15, in a modification of the above construction, the jaws 117 may be formed with a reversed bevel such that the jaws are moved inwards by a downward movement of the threaded hollow shell 119.

In a sixth construction, the nozzle has mechanically operated jaws, and may be constructed internally as in the case of the fifth construction shown in Figure 14, and it may be provided externally with a hollow shell capable of axial movement like the shell 114. Instead of this axial movement being provided by rotating the shell by hand upon a screw thread, however, the shell is mounted slidably upon the cylinder body of the nozzle and is provided externally with two parallel circumferential collars, between which are engaged the jaws of a fork-ended lever.

The nozzle body as a whole is slidably mounted in a housing so that it can be advanced and retracted, for example, by cam action. After the nozzle body has thus been brought forward into contact with the nipple, the jaws can then be automatically closed by moving the said hollow shell axially upon the nozzle body by means of the said fork ended lever which may also be hand or cam operated.

It will be appreciated that the invention is not limited to the constructional forms of nipples described above, but is applicable to nipples of any practicable shape in which a flexible, lubricant-impervious teat can be housed as described, whether or not the nipples are adapted to be detachably held by nipple-engaging jaws.

As previously stated, in any of the nipple constructions the lubricant passage in the teat may be made by merely piercing the material; that is to say, without the removal of any substantial amount of material as would occur if it were drilled with a rotating drill, so that normally the passage will have no measurable diameter and there will be no exposed aperture or space in the teat in which dirt can collect.

On the other hand, the lubricant passage in the teat may be drilled, thus removing material,

or it may be moulded. Referring to Figures 10 to 13, in either of these cases the passage 136 through the teat will have a measureable diameter and will thus offer a lodgement for dirt. To prevent this the upper part of the head 137 is made an interference fit in its housing in the nipple, the material of the teat surrounding the passage being thereby forced radially inwards when the teat is fitted in the housing so that the open inlet end 138 of the passage is closed, and thus no space for the collection of dirt will remain.

In the cases in which the passage is drilled or moulded, however, it is preferred that the drilled or moulded teat passage 136 (Figures 10 to 13) small not pass right through the teat, but shall stop short at, say, three quarters of the depth of the teat, the remainder of the lower tapered shank 139, being formed into two or more flexible lips by a slit or slits 140. This slit, or these slits, may be formed by splitting with a knife, thus removing no material or they may be cut with an exceedingly fine saw or they may be moulded or similarly fine fins. Even although a narrow space is left between the lips, nevertheless, owing to the tapered shape of the shank of the teat, any back flow of the grease will be stopped by the pressure of the grease causing the tapered sides of the shank of the teat to collapse and the lips to close inwardly. The teat therefore acts as a non-return valve, and the inclusion of a ball and spring, or other conventional type of non-return valve, in the nipple, becomes unnecessary.

It will also be appreciated that when the forward end of the nozzle piston needle stem enters the closed lubricant passage in the teat there must be some lateral displacement of rubber. If the head, as shown in Figure 1, of the teat is a fit in the correspondingly shaped housing in the nipple there will be no contiguous lateral space into which the displaced rubber can go and displacement must take place longitudinally. While this is not impossible, it may cause difficulty in operation.

In modifications, therefore, as shown in Figures 10 to 13, space is provided laterally round the head of the teat between the head and the housing in the nipple into which the displaced rubber can readily flow. Thus, the head of the teat may be cylindrical while its housing is conical as shown in Figure 11, the upper edge of the conical housing 142 gripping the head 141 to hold it in place, and also distorting the material radially inwards so that the otherwise open end 138 of the passage is closed.

Again, while the teat head 141 may be cylindrical, its housing may either be of larger diameter and/or barrel shaped as shown in Figure 10, and in either case may have an upper shoulder 142 which grips the upper edge of the head and distorts it radially inwards whether it is formed with an annular recess or not. The upper edge of the head of the teat may have an annular recess into which the shoulder engages.

As shown in Figure 13, the head 141 of the teat may be made "waisted," that is, narrower at the middle than at the ends, and its housing may be cylindrical, having an upper shoulder 142 which grips the head of the teat as previously described. Again, the head of the teat and/or its housing may be formed with circular grooves or serrations for the same purpose, as shown in Figure 12.

As mentioned above in connection with Fig-

ure 1, when the operation of the grease gun or equivalent is discontinued, the nozzle piston assembly returns to its original position under the influence of the coil spring. This return movement of the piston assembly causes a back flow of grease out of the bore of the nozzle body back through the conduit in the hollow shank of the nozzle towards the grease gun or equivalent. It is therefore necessary that the outlet conduit of the grease gun or equivalent shall not have a non-return valve.

Different types of grease guns or other grease dispensers may be used. The grease gun may, for example, be of the known type in which a plunger overruns and closes an inlet port during its discharge stroke. As soon as the inlet port is overrun and closed, further movement of the plunger discharges grease through the conduit in the hollow shank of the nozzle into the bore of the latter, the nozzle piston assembly then being operated as previously described, and some of the grease being discharged through the nipple to the place of use.

When the gun plunger makes its return stroke the grease column in the bore of the nozzle body and the said conduit will follow it until the nozzle piston assembly or assemblies reaches its or their upper stop or stops. Thereafter, the gun plunger, continuing its return motion, will create a void in the gun barrel, which void, when the inlet port is again uncovered, will be equal in volume to the grease discharged. As soon as the inlet port is uncovered, the gun will be recharged by the influx of new grease.

The teat in the nipple, the sealing washer in the nozzle body cover and the sealing rings in the pistons may be made of rubber, synthetic rubber or other mouldable material, or lubricant-impervious flexible material.

The nipple-engaging jaws forming part of the nozzle body in the first construction shown in Figure 1 may be arranged for "push-on" attachment or for lateral attachment instead of for "pull-on" attachment as described above.

The hollow grease inlet shank of the nozzle may be arranged at any desired angle to the axis of the nozzle body. It may also be connected to the latter by means of a hinge joint or a knuckle point or a universal joint and/or it may be connected to the discharge conduit of the grease gun or equivalent by any of such joints.

As shown in Figures 1 to 3, 4, 5 and 14, it is convenient to form the needle-like stem of the nozzle piston as a separate member adapted to be detachably attached to the piston as by screwing. The same arrangement is shown in Figure 6.

It will be understood that the nipples, and nozzles may be used in systems for dispensing grease or thixotropic solids or oil.

I claim:

1. A nipple fitting comprising a rigid, generally tubular body member having a shank adapted to be fixedly secured to a part to be lubricated and an outer end, said body member having a variable diameter bore extending therethrough of less diameter at said outer end than immediately inwardly of the same and including a shoulder intermediate the ends of said bore, and a compressible closure member adapted to be received in said bore and having an opening extending therethrough, said closure member having a diameter adjacent its outer end sufficiently in excess of the diameter of the outer end of said bore to cause said closure member to be compressively maintained in said bore against

removal outwardly and said opening to be maintained resiliently closed, and having a shoulder intermediate its ends adapted to seat upon the shoulder in said bore for maintaining said closure member against axial movement inwardly of said bore.

2. A nipple fitting comprising a rigid, generally tubular body member having a shank adapted to be fixedly secured to a part to be lubricated and an outer end, said body member having a variable diameter bore extending therethrough of less diameter at said outer end than immediately inwardly of the same and including a shoulder intermediate the ends of said bore, and a compressible closure member having an opening extending therethrough and including an end part adapted to be compressively received in the portion of said bore between said shoulder and the outer end of the fitting, said end part being of larger diameter than the outer end of said bore for compressively maintaining said closure member against axial movement and for resiliently maintaining said opening closed.

3. A nipple fitting as claimed in claim 2, wherein the outer end of said tubular body member is of variable diameter to form a shouldered head under which said end part engages.

4. A nipple fitting as claimed in claim 2, wherein the outer end of said tubular body member is formed with one or more annular lips of a diameter greater than the diameter of said bore at its outer end.

5. A nipple fitting comprising a rigid, generally tubular body member having a shank adapted to be fixedly secured to a part to be lubricated and an outer end, said body member having a variable diameter bore extending therethrough of less diameter at said outer end than immediately inwardly of the same and including a shoulder intermediate the ends of said bore, and a compressible closure member adapted to be received in said bore and having an opening extending therethrough, said compressible member having an outer end enlarged relative to the diameter of the outer end of said bore and adapted to be received in the portion of said bore between said shoulder and the outer end of the fitting for compressively maintaining said closure member against axial movement in the bore and resiliently maintaining said opening closed, said head having a flat outer face and being of axial length substantially equal to the distance from said shoulder to the outer end of said bore so that said outer face is maintained substantially flush with the outer end of the tubular body member.

6. A nipple fitting comprising a rigid, generally tubular body member having a shank adapted to be fixedly secured to a part to be lubricated and an outer end, said body member having a variable diameter passageway extending therethrough including a substantially frusto-conical portion forming the outer end thereof, and a compressible closure member adapted to be received in said passageway and having an opening extending axially therethrough and an enlarged head of larger diameter than the small end of the frusto-conical portion of the passageway to cause said closure member to be maintained in said passageway and the opening therein to be maintained resiliently closed by the compressive force exerted thereon adjacent the small end of the frusto-conical portion of the passageway.

7. A nipple fitting comprising a rigid, generally tubular body member having a shank adapted to

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be fixedly secured to a part to be lubricated and an outer end, said body member having a variable diameter passageway extending therethrough including a substantially frusto-conical portion having its minor diameter in the outer end of said body member and a substantially cylindrical portion extending from the end of said frusto-conical portion of major diameter to form a shoulder with said end, and a compressible member for closing said passageway having an opening extending axially therethrough and an enlarged head terminating in a shoulder intermediate the ends of said compressible member, said head being of larger diameter than the minor diameter of said frusto-conical portion to cause said member to be maintained against outward axial movement and said opening to be resiliently closed by the compressive force thereon adjacent said end of minor diameter, and said shoulder on said compressible member and the shoulder in said passageway cooperating to prevent axial movement of said compressible member inwardly.

8. A nipple fitting comprising a rigid, generally tubular body member having a shank adapted to be fixedly secured to a part to be lubricated and an outer end, said body member having a cylindrical bore of variable diameter extending therethrough including a cylindrical portion of enlarged diameter inwardly of the outer end of said body member defining outer and inner shoulders in the bore, and a compressible member for closing said bore having an opening extending therethrough and an enlarged head adapted to be received in the portion of said bore of enlarged diameter and defining a shoulder intermediate the ends of said member cooperating with the inner shoulder in said bore to prevent axial movement of said member inwardly of said bore, said head being of greater diameter than the outer end of said bore, and of axial length substantially equal to the distance from said inner shoulder to the outer end of said bore to cause said member to be held against axial movement outwardly of said bore and the opening therein to be resiliently closed by the compressive engagement of said outer shoulder with the upper end of said head.

9. A nipple fitting comprising a rigid, generally tubular body member having a shank adapted to be fixedly secured to a part to be lubricated and an outer end adapted to be engaged by the coupler of a source of lubricant supply, said body member having a variable diameter bore extending therethrough of less diameter at its outer end than immediately inwardly thereof, and a compressible member having an enlarged outer end with an opening extending therethrough and adapted to be compressively received in the outer end of said bore for maintaining the compressible member against axial movement in the bore and an inner end portion extending inwardly in said bore from said enlarged outer end, said inner end portion being severed along an axial plane to adapt said severed end portions for functioning as a check valve to prevent backflow of lubricant from said fitting.

10. A nipple fitting comprising a rigid, generally tubular body member having a shank adapted to be fixedly secured to a part to be lubricated and an outer end adapted to be engaged by the coupler of a source of lubricant supply, said body member having a variable diameter bore extending therethrough of less diameter at its outer end than immediately inwardly thereof, and a compressible member having an enlarged outer end

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with an opening extending therethrough and adapted to be compressively received in the outer end of said bore for maintaining the compressible member against axial movement in the bore and a tapered inner end portion extending inwardly in said bore from said enlarged outer end, said tapered end being severed along an axial plane to form a one-way flap valve for preventing backflow of lubricant from said fitting.

11. In a lubricating system, the combination with a nipple fitting including a body member having a shank adapted to be fixedly secured to a part to be lubricated, and an outer end forming a head with a seat thereon, which body member has a variable diameter bore extending therethrough of less diameter at its outer end than immediately inwardly of the same with a shoulder intermediate the ends of said bore and which fitting has a compressible closure member in the bore with an opening extending therethrough and including an end part adapted to be compressively received in the portion of said bore between said shoulder and the outer end of the fitting, the said end part being of larger diameter than the outer end of said bore for compressively maintaining said closure member against axial movement and for resiliently maintaining said opening closed; of a nozzle for making detachable fluidtight connection with the fitting, said nozzle including a tubular body member having structure forming an apertured contact surface adapted for cooperative engagement with said seat, means for detachably securing said body member to said head with said contact surface in firm engagement with said seat and the aperture therein in axial alignment with the opening in the closure member, means forming an inlet to said body member adapted to be supplied with fluid under pressure, a hollow injector nozzle in said body member having an inlet adjacent one end and terminating at the other end in a reduced tip adapted to be projected through the aperture in said contact surface and into the opening in said closure member, means operatively connected to said injector nozzle and responsive to the presence of fluid under pressure in said tubular body member for advancing said injector nozzle to lubricant delivering position, resilient means normally urging said injector nozzle to retracted position, and means in said tubular body member limiting movement of said injector nozzle under the influence of said resilient means including a part adapted to close the inlet thereto.

12. A lubrication system as defined in claim 11, wherein the bore in the fitting includes a substantially frusto-conical portion forming the outer end thereof, and the compressible closure member adapted to be received in the bore has a head seated in the said frusto-conical portion, which head is of larger diameter than the small end of the frusto-conical portion so that the opening therein is maintained resiliently closed by the compressive force exerted thereon adjacent the said small end.

13. A lubrication system as defined in claim 11, wherein the bore in the fitting is cylindrical and includes a cylindrical portion of enlarged diameter inwardly of the outer end of the body member defining outer and inner shoulders in the bore, and in which the compressible closure member has an enlarged head adapted to be received in the portion of the bore of enlarged diameter and the closure member is maintained against axial movement with the outer end of the opening maintained resiliently closed by the compressive

sive engagement of the outer shoulder with the upper end of said head.

14. In a lubricating system, the combination with a nipple fitting including a body member having a shank adapted to be fixedly secured to a part to be lubricated, and an outer end forming a head with a seat thereon, which body member has a variable diameter bore extending therethrough of less diameter at its outer end than immediately inwardly of the same with a shoulder intermediate the ends of said bore and which fitting has a compressible closure member in the bore with an opening extending therethrough and including an end part adapted to be compressively received in the portion of said bore between said shoulder and the outer end of the fitting, the said end part being of larger diameter than the outer end of said bore for compressively maintaining said closure member against axial movement and for resiliently maintaining said opening closed; of a nozzle for making detachable fluidtight connection with the fitting, said nozzle including a tubular body member having an apertured contact surface adapted for cooperative engagement with said seat, fixed means on said body member for detachably connecting said nozzle to said fitting and cooperating with said head to hold said seat and contact surface in firm abutting engagement and said aperture and the opening in said closure member in axial alignment, a hollow injector nozzle having a reduced tip adapted to be projected through the aperture in said contact surface and into said opening, piston forming means operatively connected to said injector nozzle, means forming an inlet to said tubular body member adapted to be connected to a source of fluid under pressure for supplying fluid for operating said piston to move said injector nozzle to projected position and for discharge through said injector nozzle into said fitting.

15. A lubrication system, as defined in claim 14, wherein the bore in the fitting includes a substantially frusto-conical portion forming the outer end thereof, and the compressible closure member adapted to be received in the bore has a head seated in the said frusto-conical portion which head is of larger diameter than the small end of the frusto-conical portion so that the opening therein is maintained resiliently closed by the compressive force exerted thereon adjacent the said small end.

16. In a lubricating system, the combination with a nipple fitting including a body member having a shank adapted to be fixedly secured to a part to be lubricated, and an outer end forming a head with a seat thereon, which body member has a variable diameter bore extending therethrough of less diameter at its outer end than immediately inwardly of the same with a shoulder intermediate the ends of said bore and which fitting has a compressible closure member in the bore with an opening extending therethrough and including an end part adapted to be compressively received in the portion of said bore between said shoulder and the outer end of the fitting, the said end part being of larger diameter than the outer end of said bore for compressively maintaining said closure member against axial movement and for resiliently maintaining said opening closed; of a nozzle for making detachable fluidtight connection with the fitting, said nozzle including outer and inner tubular body members, said inner body member having an apertured contact surface adapted for abut-

ting engagement with said seat, a plurality of jaws movably mounted within said outer body member and formed to engage the head of said fitting for holding the aperture in said contact surface and the opening in said fitting in axial alignment, fluid pressure operated means effective to move said jaws to engaged position, resilient means opposing movement of said fluid pressure operated means for effecting return of said jaws to disengaged position, a hollow injector nozzle in said inner body member having a reduced tip adapted to be projected through the aperture in said contact surface and into the opening in said closure member, fluid pressure operated means for moving said injector nozzle to projected position, inlet forming means on the outer tubular body member adapted to be connected to a source of fluid under pressure for supplying fluid for moving said jaws to engaged position and said injector nozzle to projected position, and resilient means effective to inhibit movement of said injector nozzle until said jaws have been moved to engaged position.

17. A lubrication system as defined in claim 16, wherein the bore in the fitting includes a substantially frusto-conical portion forming the outer end thereof, and the compressible closure member adapted to be received in the bore has a head seated in the said frusto-conical portion, which head is of a larger diameter than the small end of the frusto-conical portion so that the opening therein is maintained resiliently closed by the compressive force exerted thereon adjacent the said small end.

18. In a lubricating system, the combination with a nipple fitting including a body member having a shank adapted to be fixedly secured to a part to be lubricated, and an outer end forming a head with a seat thereon, which body member has a variable diameter bore extending therethrough of less diameter at its outer end than immediately inwardly of the same with a shoulder intermediate the ends of said bore and which fitting has a compressible closure member in the bore with an opening extending therethrough and including an end part adapted to be compressively received in the portion of said bore between said shoulder and the outer end of the fitting, the said end part being of larger diameter than the outer end of said bore for compressively maintaining said closure member against axial movement and for resiliently maintaining said opening closed; of a nozzle for making detachable fluidtight connection with the fitting, said nozzle including outer and inner tubular body members relatively movable in response to the presence of fluid under pressure in said outer body member, said inner body member having an apertured contact surface adapted for abutting engagement with said seat, a plurality of jaws hingedly suspended with respect to said inner body member and formed to engage said fitting, said jaws being adapted to be moved to engaged position for holding the aperture in said contact surface and the opening in said closure member in axial alignment upon movement of said body members responsive to the presence of fluid under pressure in the outer body member, a hollow injector nozzle in said inner body member having a reduced tip adapted to be projected through the aperture in said contact surface and into said opening, means operatively connected to said injector nozzle and movable in response to the presence of fluid under pressure in said body members, to advance said injector nozzle to projected position, resilient

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means opposing movement of said body members under the influence of fluid under pressure, and second resilient means effective to inhibit movement of said injector nozzle toward projected position until said jaws have been moved to engaged position.

19. In a lubricating system, the combination with a nipple fitting including a body member having a shank adapted to be fixedly secured to a part to be lubricated, and an outer end forming a head with a seat thereon, which body member has a variable diameter bore extending there-
through of less diameter at its outer end than immediately inwardly of the same with a shoulder intermediate the ends of said bore and which fitting has a compressible closure member in the bore with an opening extending therethrough and including an end part adapted to be compressively received in the portion of said bore between said shoulder and the outer end of the fitting, the said end part being of larger diameter than the outer end of said bore for compressively maintaining said closure member against axial movement and for resiliently maintaining said opening closed; of a nozzle for making detachable fluidtight connection with the fitting, said nozzle including axially aligned tubular body members defining an annular space therebetween, one of said members having a contact surface formed thereon complementary to said seat, a plurality of jaws movably mounted between said body members and formed to engage the head of said fitting for holding said contact surface in firm abutting engagement therewith, fluid pressure operated means for moving said jaws relative to said body members into locking engagement with the head of the fitting, a hollow injector nozzle having a reduced tip projectable through said contact surface and into the opening in said closure member, second fluid pressure operated means operatively connected to said injector nozzle for moving said injector nozzle to projected position, a first resilient means for returning said jaw to disengaged position when the fluid pressure is relieved, and second resilient means for inhibiting movement of said injector nozzle toward projected position until said jaws have been moved to engaged position.

20. In a lubricating system, the combination with a nipple fitting including a body member having a shank adapted to be fixedly secured to a part to be lubricated, and an outer end forming a head with a seat thereon, which body member has a variable diameter bore extending there-

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through of less diameter at its outer end than immediately inwardly of the same with a shoulder intermediate the ends of said bore and which fitting has a compressible closure member in the bore with an opening extending there-
through and including an end part adapted to be compressively received in the portion of said bore between said shoulder and the outer end of the fitting, the said end part being of larger diameter than the outer end of said bore for compressively maintaining said closure member against axial movement and for resiliently maintaining said opening closed; of a nozzle for making detachable fluidtight connection with the fitting, said nozzle including axially aligned tubular body members relatively movable upon the application of fluid pressure thereto, one of said members having a contact surface formed thereon complementary to said seat, a plurality of jaws movably mounted between said body members and formed to engage the head of said fitting for holding said contact surface in firm abutting engagement therewith, fluid pressure operated means effective to move said jaws to engaged position, a first resilient means opposing movement of said jaws to engaged position, a second resilient means opposing movement of said fluid pressure operated means, a hollow injector nozzle having a reduced tip projectable through said contact surface into the opening in said closure member, second fluid pressure operated means operatively connected to said injector nozzle for moving said injector nozzle to projected position, and means for inhibiting movement of said injector nozzle toward projected position until said jaws have been moved to engaged position.

CAMILLE CLARE SPRANKLING
LE CLAIR.

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