Oct. 13, 1936. F. B. FARNSWORTH 2,057,643

MULTIPLE FEED LUBRICATOR

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FIG. 1.

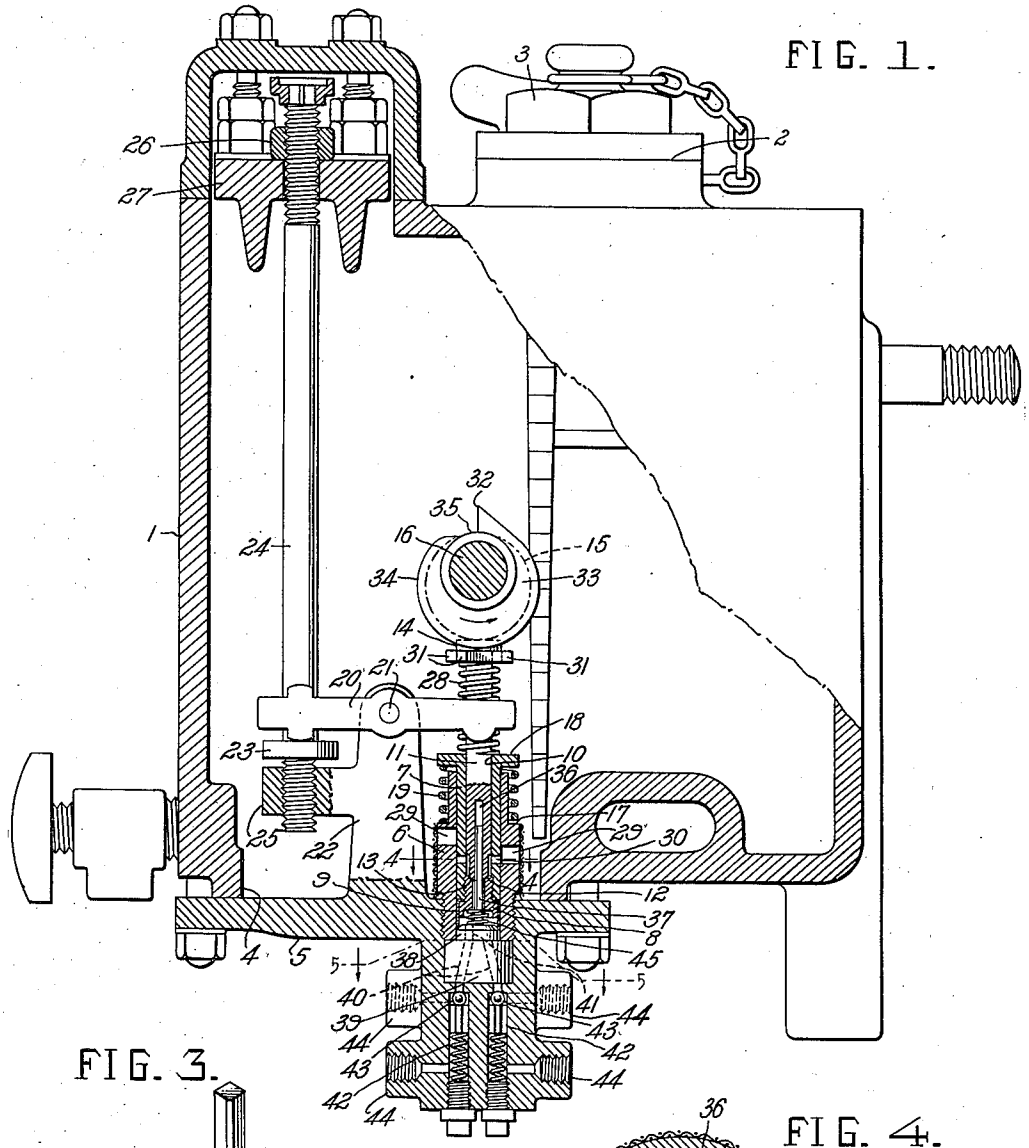


FIG. 3.

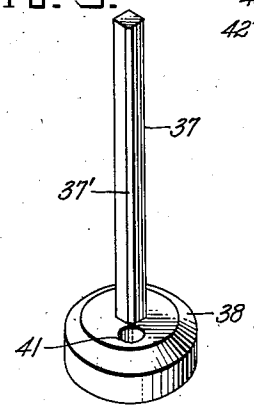
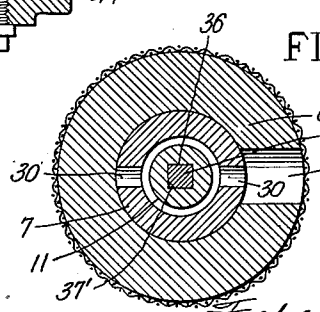


FIG. 4.



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FIG. 2.

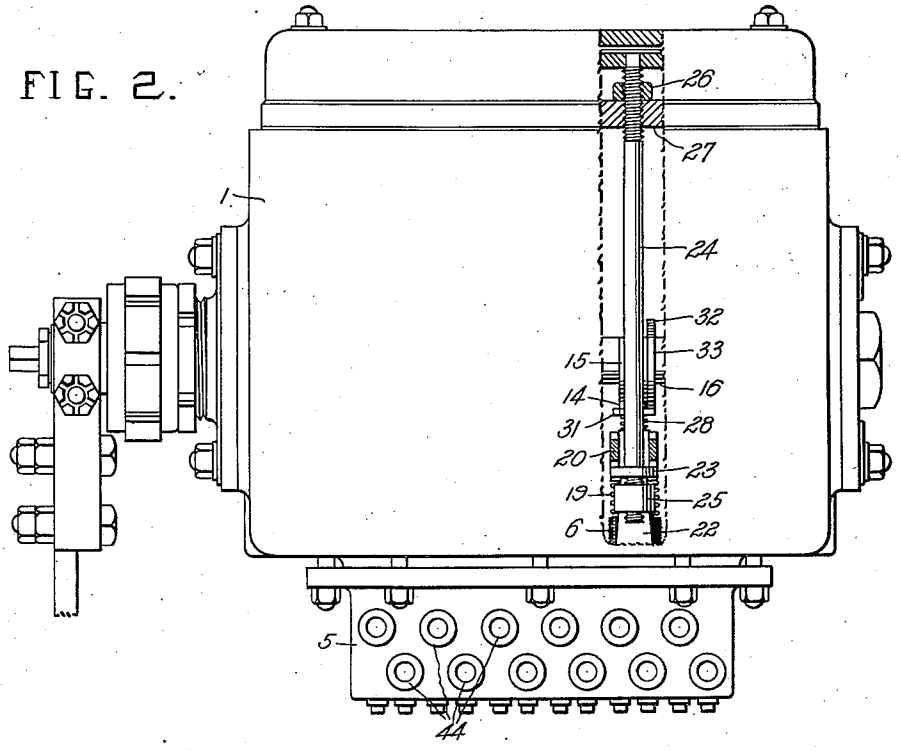


FIG. 6.

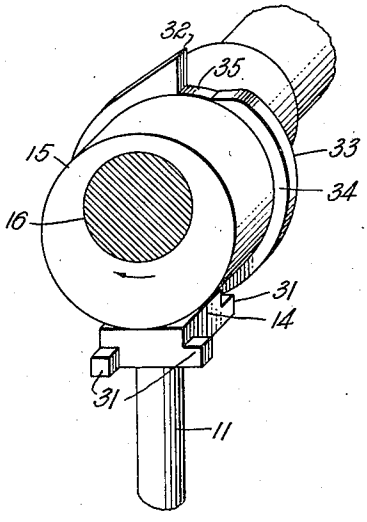
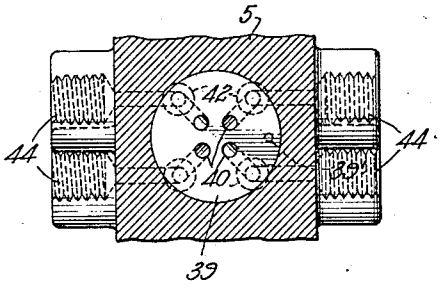


FIG. 5.



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UNITED STATES PATENT OFFICE

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MULTIPLE FEED LUBRICATOR

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Application November 14, 1935, Serial No. 49,850

10 Claims. (Cl. 184—35)

This invention relates to lubricators, and it has particular reference to lubricators of the type disclosed in the patents of Frank W. Edwards and Fordyce B. Farnsworth, No. 1,881,353, dated Oct. 4, 1932 and No. 1,886,659, dated Nov. 8, 1932.

The object of the invention is to provide means whereby a lubricant feeding or forcing unit having a single discharge duct may be so modified that it will be capable of successively supplying lubricant to a plurality of discharge ducts.

In force feed lubricators of the type disclosed in the patents referred to a plurality, preferably six, of lubricant forcing units are provided, each of these units supplying lubricant to a single discharge duct. In accordance with the present invention this plurality of six discharge ducts, or sources of lubricant supply as they may be called, may be multiplied so that a lubricator of the type mentioned, instead of being capable of furnishing six streams of lubricant under pressure, may furnish a multiple of such six streams, as will be pointed out in detail hereinafter.

The invention consists in a multiple feed lubricator, the multiple feed of which is provided by supplying a single lubricant forcing unit including a cylinder and piston, with a rotative feed control member adapted to control the feed of lubricant, supplied under pressure by the forcing unit, successively to a plurality of lubricant discharge ducts in timed relation to the reciprocation of the piston of the forcing unit; and the invention consists, further, in the structure and operative characteristics of the parts of the apparatus whereby this operation may be performed, all as will be explained hereinafter more fully and finally claimed.

In the accompanying drawings illustrating the invention, in the several figures of which like parts are similarly designated,

Figure 1 is a fragmentary sectional end elevation of a lubricator of the type referred to and embodying the parts forming the subject of the present invention.

Fig. 2 is a side elevation of the lubricator, upon a smaller scale, a part of the casing thereof being broken away to disclose one of the forcing units.

Fig. 3 is an enlarged perspective view of the feed control member.

Fig. 4 is an enlarged section taken on the line 4—4 of Fig. 1.

Fig. 5 is an enlarged section taken on the line 5—5 of Fig. 1, and

Fig. 6 is an enlarged perspective view illustrating the piston-operating cam and associated parts.

The lubricator comprises a body 1 which forms the lubricant reservoir and may be filled through a filler opening 2 provided with a removable cap 3. The bottom of the lubricator has a longitudinal opening 4 to which is removably applied a cap 5 providing a means for the assembly and support of the lubricant forcing units (only one of which is shown) each including a cylinder 6, a hollow piston 7 and a centrally bored piston head 8 provided with a cup washer 9. Within the bore 10 of the hollow piston 7 is arranged an operating or push rod 11 provided at its lower end with a valve face 12 seating upon a valve seat 13 formed preferably upon the upper screw-threaded end of the piston head 8, and having at its upper end a cam follower 14 cooperating with a cam 15 mounted upon and rotatable with a suitably rotated cam shaft 16.

The cylinder 6 is shouldered at 17, and the upper end of the hollow piston 7 is provided with a flange 18, and between the shoulder 17 and flange 18 is interposed a spring 19 tending normally to force the piston upwardly. Upward movement of the piston is limited by one end of a rocker arm 20 pivoted at 21 upon a bracket 22 and having its other end bearing against stop member 23 carried by a rod 24 adjustably screw-threaded into a lug 25 on the bracket 22 and provided at its upper end with a lock nut 26 bearing against a plate 27. It will be apparent that by thus adjustably limiting the upward stroke of the piston the quantity of lubricant handled at each stroke may be controlled, as desired.

Between the flange 18 and the cam follower 14 is interposed a spring 28 which normally forces the rod 11 upwardly and maintains the cam follower 14 in contact with the cam 15. Thus the stroke of the push rod 11 is constant, regardless of the stroke of the piston 7.

The cylinder 6 and piston 7 are provided with lubricant inlet passages 29 and 30 respectively.

The parts thus far described are substantially the same in structure and mode of operation as those of the lubricators of the patents hereinabove referred to, as will be described.

Below the cam follower 14 the rod 11 is provided with a head having a plurality of symmetrically arranged lateral extensions 31 (see Fig. 6) adapted to be successively engaged by the tooth 32 of a toothed member 33 rotatable with the cam shaft 16 and mounted in contact with one face of the cam 15. This toothed member 33 has a flange 34 which extends beyond the periphery of the cam

15 and bears against an adjacent face of the squared cam follower 14 for a purpose which will appear later. Furthermore, it will be noted that the flange 34 terminates adjacent to the tooth 32 to provide a recess 35 of a depth coincident with the periphery of the cam 15.

The lower end of the rod 11 is broached to provide a square bore 36 and this bore receives the complemental square stem 37 of a feed control member 38, thus forming between the rod 11 and the feed control member 38 a non-rotative slidable connection. One edge 37' of the stem 37 is flattened, as shown, to prevent any dash-pot action in the bore 36.

The feed control member 38 is in the form of a disk the under operative face of which is preferably ground into a fluid tight, contacting or seating fit with a distributor block 39 mounted in a suitable recess in the cap 5 and held against rotation therein by any suitable means, such as a pin 39' (see Fig. 5). This distributor block is provided with a plurality of lubricant discharge ducts 40 (four in the embodiment shown) with which a feed passage 41 of the feed control member 38 is adapted to successively register in a manner to be later explained. The lubricant discharge ducts 40 communicate with lubricant discharge passages 42 formed in the cap 5 and provided with appropriate check valves 43. Although the distributor block 39 furnishes a good means for providing the desired ground fit with the cooperating seating face of the control member 38, it is not essential as, obviously, the seat for the member 38 may be formed directly in the bore of the cap 5.

As has been indicated, in the embodiment shown there are four lubricant discharge ducts, and four communicating lubricant discharge passages for each of the forcing units of the lubricator. Two of the lubricant discharge passages are provided with outlets 44 on one side of the cap 5 and the other two are provided with similar outlets on the opposite side of the cap 5, these outlets being arranged upon the two sides of the cap in staggered relation as will be clearly apparent from an inspection of Figs. 2 and 5. Thus, in the case of a lubricator having six forcing units, there will be twenty-four discharge outlets, twelve upon each side of the cap 5. Suitable conduits (not shown) for conveying the lubricant from these discharge outlets to the points to be lubricated may be attached to the several outlets.

In order to maintain the feed control member 38 properly seated at all times over the lubricant discharge ducts, regardless of the position of the piston 7, a spring 45 is interposed between its upper face and the lower face of the piston head 8.

From the foregoing, it will be understood that the reservoir 1 is filled with lubricant which completely surrounds all of the forcing units. As the cam shaft 16 rotates, as indicated by the arrows, Figs. 1 and 6, the rod 11 and the piston 7 which, as shown, are in their fully depressed position, will rise under the influence of the springs 19 and 28, the piston 7 being arrested in its upward movement by the rocker arm 20, and the rod 11 continuing to travel upward with its cam follower 14 in engagement with the face of the cam 15. The differential of the upward movement of the piston 7 and rod 11 unseats the valve face 12 from the valve seat 13 and permits lubricant to enter the space in the cylinder below the piston head 8 by way of the inlet passages 29 and 30, and the bore of the piston head.

As the cam shaft 16 continues to rotate, the tooth 32 of the toothed element 33 will engage one of the lateral extensions 31 and will cause the rod 11 to be turned through an angle of 90°, the adjacent corner of the cam follower 14 being permitted to clear the flange 34 of the toothed element by virtue of the recess 35 therein. As soon as the rod 11 has been turned through 90°, another of the faces of the squared cam follower will be engaged by the flange 34 of the toothed element 33 and further rotation of the rod 11 will, for the time being, be prevented.

As the rod 11 is rotated, during its upward stroke, the feed control member 38 will be rotated also and its feed passage 41 will be caused to register with one of the lubricant discharge ducts 40. Continued rotation of the cam 15 will cause the rod 11 to be depressed, and in its downward movement its valve face 12 will contact with the valve seat 13 of the piston 7 and will move the piston downward in the cylinder, thereby causing the oil which entered the cylinder upon the upward stroke of the piston to be forced out through the feed passage 41 the duct 40 with which it registers and the discharge passage communicating therewith.

Upon the next upward stroke of the piston 7 and rod 11 a further rotation of 90° will be imparted to the rod 11 and feed control member 38, in the same manner as just described, and this further rotation will cause the feed passage 41 of the feed control member to register with another one of the lubricant discharge ducts 40, so that when the piston again moves downward on its forcing stroke the oil contained in the cylinder will be forced out through this other lubricant discharge duct and its communicating discharge passage. This intermittent operation will continue as long as the cam shaft 16 is rotated.

Inasmuch as the feed control member 38 is rotated during the upward or suction stroke of the piston 7, its rotation will be facilitated by virtue of the absence of pressure upon it and between it and its seat (except such pressure as is exerted by the spring 45), and hence longer wear of the parts 38 and 39 is assured. Moreover, the pressure of lubricant upon the control member 38 during the forcing or delivery stroke of the piston serves to hold the control member more firmly to a seat upon the block 39, thus helping to maintain a seal between these parts.

It is to be understood that although each of the lubricant forcing units is shown and described as provided with means for discharging oil through four lubricant discharge ducts, the invention is not to be considered as thus limited, as it will be obvious to those skilled in the art that a greater or less number of discharge ducts may be provided, if desired, and the intermittent rotation of the rod 11 may be made through any appropriate angle greater or less than 90°, to accommodate the number of discharge ducts employed, by proper design of the toothed element 33 and by providing a suitable number of lateral extensions 31 for cooperation therewith.

Various changes are considered to be within the spirit of the invention and the scope of the following claims.

What I claim is:—

1. In a multiple feed lubricator, a lubricant forcing unit in communication with a source of lubricant, said unit including a cylinder and piston, a cam, a rod actuated by said cam for imparting reciprocating forcing movement to said

piston, said rod rotatable with respect to the axis of said piston and provided with a plurality of lateral extensions, a toothed element rotatable in synchronism with said cam and adapted to intermittently engage said lateral extensions to impart intermittent rotative movement to said rod is timed relation to its reciprocation, means providing a plurality of lubricant discharge ducts, a feed control member cooperating with said ducts and provided with a feed passage, and means furnishing a connection between said rod and feed control member whereby the latter may be rotated in timed relation to the reciprocation of said piston to cause said feed passage to successively register with said ducts.

2. In a multiple feed lubricator, a lubricant forcing unit in communication with a source of lubricant, said unit including a cylinder and piston, a cam, a rod actuated by said cam for imparting reciprocating forcing movement to said piston, said rod rotatable with respect to the axis of said piston and provided with a cam follower member and a plurality of lateral extensions adjacent thereto, a toothed element rotatable with said cam and adapted to intermittently engage said lateral extensions to impart intermittent rotative movement to said rod in timed relation to its reciprocation, means providing a plurality of lubricant discharge ducts, a feed control member seating over and cooperating with said ducts and provided with a feed passage, and means furnishing a connection between said rod and feed control member whereby the latter may be rotated in timed relation to the reciprocation of said piston to cause said feed passage to successively register with said ducts.

3. In a multiple feed lubricator, a lubricant forcing unit in communication with a source of lubricant, said unit including a cylinder and piston, a cam, a rod actuated by said cam for imparting reciprocating forcing movement to said piston, said rod rotatable with respect to the axis of said piston and provided with a cam follower member and a plurality of lateral extensions adjacent thereto, a toothed element rotatable with said cam and adapted to successively engage said lateral extensions to impart intermittent rotative movement to said rod in timed relation to its reciprocation, means providing a plurality of lubricant discharge ducts equal in number to the number of said lateral extensions, a feed control member cooperating with said ducts and provided with a feed passage, and means furnishing a connection between said rod and feed control member whereby the latter may be rotated in timed relation to the reciprocation of said piston to cause said feed passage to successively register with said ducts.

4. In a multiple feed lubricator, a lubricant forcing unit in communication with a source of lubricant, said unit including a cylinder and piston, a cam, a rod actuated by said cam for imparting reciprocating forcing movement to said piston, said rod rotatable with respect to the axis of said piston and provided with a cam follower member and a plurality of lateral extensions adjacent thereto, a toothed element rotatable with said cam and adapted to successively engage said lateral extensions to impart intermittent rotative movement to said rod in timed relation to its reciprocation, means providing a plurality of lubricant discharge ducts, a feed control member seating over and cooperating with said ducts and provided with a feed passage, means for holding said member to its seat regardless of the position of said piston in said cylinder, and means furnishing an axially sliding non-rotative connection between said rod and feed control member whereby the latter will be rotated in timed relation to the reciprocation of said piston to cause said feed passage to successively register with said ducts.

5. In a multiple feed lubricator, a lubricant forcing unit in communication with a source of lubricant, said unit including a cylinder and piston, a cam, a rod actuated by said cam for imparting reciprocating forcing movement to said piston, said rod rotatable with respect to the axis of said piston and provided with a plurality of lateral extensions and a cam follower adjacent thereto, said cam follower having a plurality of lateral faces equal in number to the number of said lateral extensions, a toothed element rotatable with said cam and adapted to successively engage said lateral extensions to impart intermittent rotative movement to said rod in timed relation to its reciprocation, said toothed element having a flange for successive engagement with the several faces of said cam follower to prevent undesired rotation of same, means providing a plurality of lubricant discharge ducts, a feed control member seating over and cooperating with said ducts and provided with a feed passage, means for holding said member to its seat regardless of the position of said piston in said cylinder, and means furnishing an axially sliding non-rotative connection between said rod and feed control member whereby the latter may be rotated in timed relation to the reciprocation of said piston to cause said feed passage to successively register with said ducts.

6. In a multiple feed lubricator, a lubricant forcing unit in communication with a source of lubricant, said unit including a cylinder and piston, a cam, a rod actuated by said cam for imparting reciprocating forcing movement to said piston, said rod rotatable with respect to the axis of said piston and provided with a plurality of lateral extensions and a cam follower adjacent thereto, said cam follower having a plurality of lateral faces equal in number to the number of said lateral extensions, an element rotatable with said cam and having a tooth adapted to successively engage said lateral extensions to impart intermittent rotative movement to said rod in timed relation to its reciprocation, said toothed element having a flange for successive engagement with the several faces of said cam follower to prevent undesired rotation of same, said flange recessed adjacent to said tooth to clear said cam follower when said rod is rotated by engagement of said tooth with said lateral extensions, means providing a plurality of lubricant discharge ducts, a feed control member seating over and cooperating with said ducts and provided with a feed passage, means for holding said member to its seat regardless of the position of said piston in said cylinder, and means furnishing an axially sliding non-rotative connection between said rod and feed control member whereby the latter may be rotated in timed relation to the reciprocation of said piston to cause said feed passage to successively register with said ducts.

7. In a multiple feed lubricator, a lubricant forcing unit in communication with a source of lubricant, said unit including a cylinder and piston, a rod and means for reciprocating same for imparting reciprocating forcing movement to said piston, said rod rotatable with respect to

said piston and provided with a plurality of lateral extensions, a toothed element rotatable in synchonism with the reciprocation of said rod and adapted to intermittently engage said lateral extensions to impart intermittent rotative movement to said rod in timed relation to its reciprocation, means providing a plurality of lubricant discharge ducts, a feed control member cooperating with said ducts and provided with a feed passage, and means furnishing an axially slidable connection between said rod and feed control member whereby the latter may be rotated in timed relation to the reciprocation of said piston to cause said feed passage to successively register with said ducts.

8. In a multiple feed lubricator, a lubricant forcing unit in communication with a source of lubricant, said unit including a cylinder and piston, means for imparting relative reciprocation between said cylinder and piston to admit lubricant to the cylinder in substantial absence of pressure upon one stroke of reciprocation and to force the thus admitted lubricant from the cylinder at desired pressure upon the return stroke, means for feeding the lubricant thus forced through a plurality of outlets successively, including a feed control member provided with a feed passage and a seat for said feed control member in which said outlets terminate, and means for causing the feed passage of said feed control member to successively register with said outlets in timed relation to said reciprocation, said registering means being operatively effective in the absence of pressure in said cylinder to move said feed control member, and being operatively ineffective to move said feed control member during said forcing stroke to thus permit said feed control member to seat under pressure of said lubricant.

9. In a multiple feed lubricator, a lubricant forcing unit in communication with a source of lubricant, said unit including a cylinder and piston and means for imparting reciprocation to said piston to admit lubricant to the cylinder in substantial absence of pressure upon one stroke and to force the thus admitted lubricant from the cylinder at desired pressure upon the return stroke, means for feeding the lubricant thus forced through a plurality of outlets successively, including a rotatable feed control disk provided with a feed passage and a seat for said disk in which said outlets terminate, and means for causing the feed passage of said feed control disk to successively register with said outlets in timed relation to the reciprocation of said piston, said registering means being operatively effective in the absence of pressure in said cylinder to rotate said disk, and being operatively ineffective to rotate said disk during said forcing stroke to thus permit said disk to seat under pressure of said lubricant.

10. In a multiple feed lubricator, a lubricant forcing unit in communication with a source of lubricant, said unit including a cylinder and piston and means for imparting reciprocation to said piston to admit lubricant to the cylinder in substantial absence of pressure upon one stroke and to force the thus admitted lubricant from the cylinder at desired pressure upon the return stroke, means for feeding the lubricant thus forced through a plurality of outlets successively, including a seat forming the end of said cylinder and in which the said outlets terminate, a rotatable feed control disk seating upon said seat but capable of movement axially of said cylinder with respect to said seat, said disk provided with a feed passage, and means for causing the feed passage of said disks to successively register with the outlets of said seat in timed relation to the reciprocation of said piston, said registering means being operatively effective in the absence of pressure in said cylinder to rotate said disk, and being operatively ineffective to rotate said disk during said forcing stroke to thus permit said disk to seat upon said seat member under pressure of said lubricant.

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