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LUBRICATING UNIT

2,707,657

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2 Sheets-Sheet 1

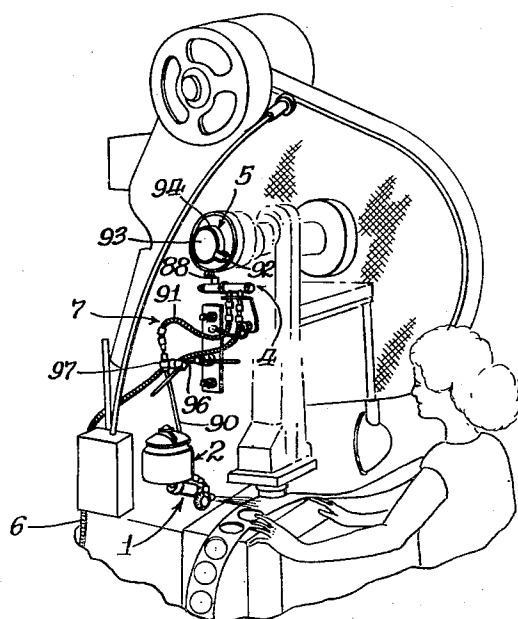


Fig. 1.

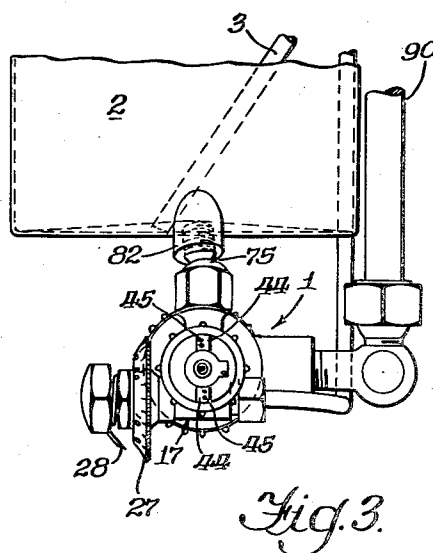


Fig. 3.

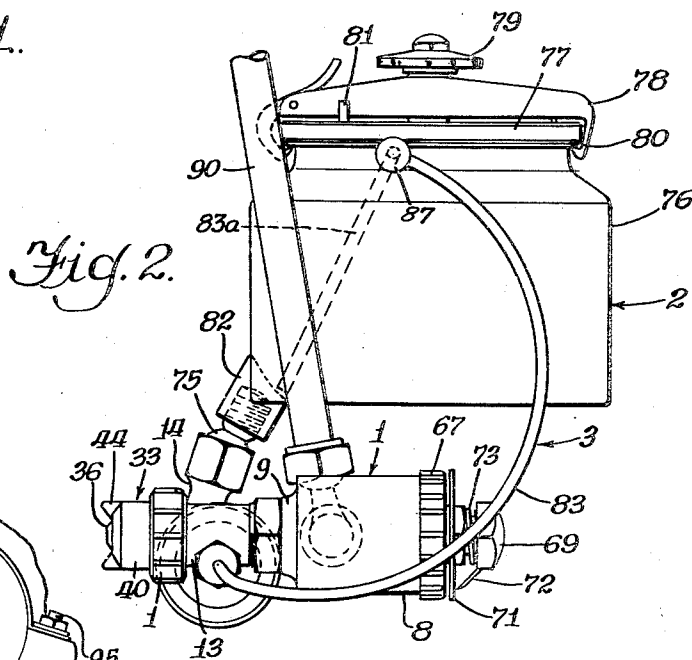


Fig. 2.

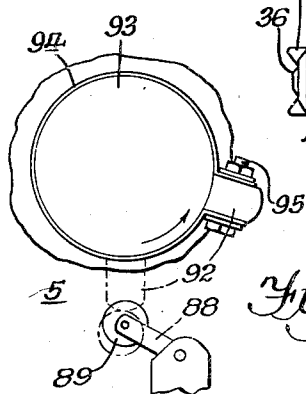


Fig. 4.

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Fig. 6.

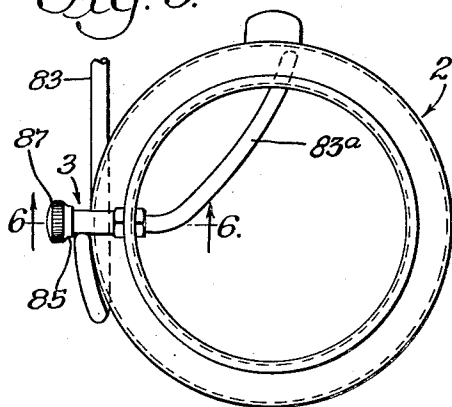
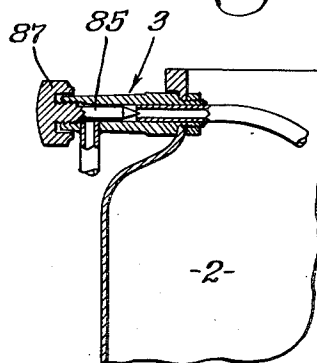
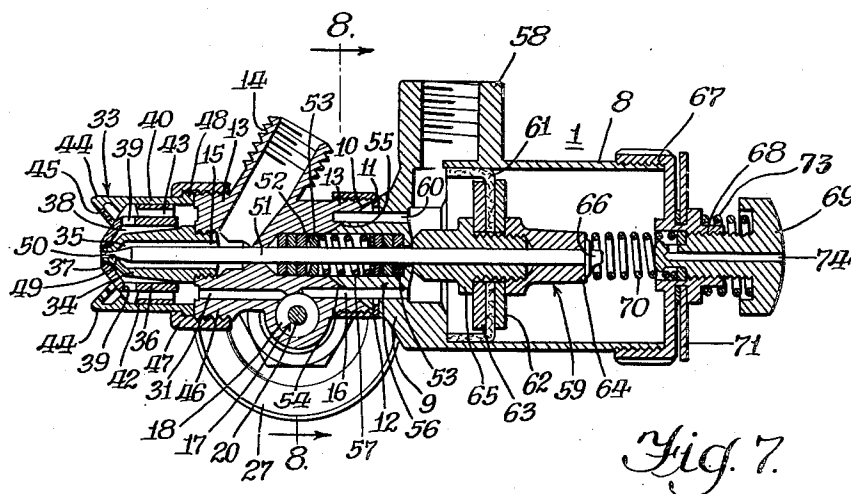


Fig. 7.

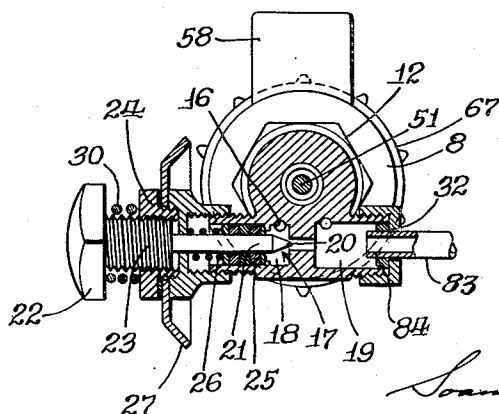


Fig. 8.

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LUBRICATING UNIT

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6 Claims. (Cl. 299—86)

This invention relates to lubricating units, and more particularly to a unit for lubricating dies of punch presses, bearings of conveyors, and the production materials of drawing and forming operations.

When punch presses are operating, it is important that the die be lubricated in order to assure satisfactory operation. It is also important that the bearings of conveyors be adequately lubricated during operation and that the materials of metal forming operations be coated with lubricant. In the past, rather antiquated methods were employed for accomplishing the above mentioned lubricating operations. More particularly, the lubricant was usually applied by swabbing or brushing, which methods are unreliable, inadequate and outmoded, in addition to being expensive and often times wasteful of the lubricant. It would, of course, be desirable to accomplish such lubrication automatically and in synchronization with the operation of the associated apparatus. Of course, it would also be desirable to evenly apply lubricant to the work without any waste of material.

Commercially available lubricants frequently contain small amounts of sediment and contain oils of different characteristics, such as density and viscosity. Therefore, it is desirable to continuously agitate the oil when it is applied to the work to assure uniformity of lubricant and even lubrication.

The main object of the present invention is to provide an improved lubricating unit which will apply an even coat of lubricant to the tool or work without waste of the lubricating material and which will apply lubricant having uniform characteristics. Additional objects and advantages of the invention will become apparent through reference to the accompanying drawings which illustrate a preferred embodiment of the invention.

In the drawings:

Figure 1 is a perspective view showing one of the improved lubricating devices on a punch press;

Figure 2 is an enlarged fragmentary side elevation of the lubricating apparatus shown in Figure 1;

Figure 3 is a fragmentary front elevational view taken from the left of Figure 2;

Figure 4 is a fragmentary elevational view showing a cam attached to the shaft of the punch press and a co-acting cam actuated roller;

Figure 5 is a top view of the reservoir shown in Figure 2, the lid being removed;

Figure 6 is a fragmentary sectional view of the reservoir taken on the line 6—6 in Figure 5;

Figure 7 is an enlarged axial section of the valve mechanism of the device shown in Figure 2; and

Figure 8 is a transverse sectional view of the spraying device taken on line 8—8 of Figure 7.

As illustrated in the drawings, the improved lubricating apparatus is shown in conjunction with a punch press, but it will be understood that the apparatus may be advantageously employed with conveyors for lubricating the bearings thereof, or in association with metal

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forming operations. These uses or the apparatus will become more apparent from the following description of the apparatus.

In the illustrated embodiment, the apparatus comprises a spraying device 1 which is actuated by air pressure, a reservoir 2 which is adapted to supply lubricant to the spraying device, and agitating means 3 which is connected to the spraying device 1 and to the reservoir 2 for mixing the lubricant in the reservoir to prevent any sedimentation and thereby provide most satisfactory lubrication and trouble free operation of the spraying device. The apparatus further includes a control mechanism 4 which is operable to supply air under pressure to the spraying device at selected times, the control mechanism being actuated by cam means 5 (Figure 4) attached to the punch press. The apparatus includes conduits 6 and 7 for supplying air to the control mechanism 4 and to the spraying device 1.

The valve mechanism or spraying device 1 is illustrated in Figures 2, 3, 7 and 8, the device being shown in elevation in Figures 2 and 3, and being illustrated in cross-section in Figures 7 and 8. As illustrated in the drawings, the spraying device 1 comprises a barrel 8 which is preferably generally cylindrical in shape and which has a restricted section 9 at the forward end thereof. The outer end of the restricted section 9 has an annular flange 10 formed thereon which provides an abutment for an intumed shoulder 11 on a gland 12, the gland being thereby rotatable with respect to the barrel 8. The gland 12 is threaded internally in order to engage a complementary thread on a head 13 which is located forwardly of the barrel in axial alignment therewith.

When the spraying device 1 is used, lubricant is supplied to the head 13 through an integrally formed angularly disposed nipple 14. The union between the head 13 and barrel 8 by means of the gland 12 permits the head to be rotatably adjusted about its axis so that the lubricant may be supplied to the head 13 from any angle through the nipple 14. The head 13 is provided with a longitudinally extending liquid passageway 15 which provides communication between the nipple 14 and the forward end of the head 13.

The head 13 is also provided with several air passageways which are adapted to conduct pressurized air from the barrel 8 to the forward end of the head 13 in regulated amounts. For this purpose, the head 13 is provided with an air passageway 16 which extends forwardly to a transversely disposed adjustable valve 17. This valve is shown particularly in Figure 8. The valve is of the needle type and comprises a pair of chambers 18 and 19 which are separated by a needle valve 20. The air passageway 16 communicates with the chamber 18 and air passes to the other chamber 19 through the valve 17.

The needle valve 20 is carried on an adjustable stem 21 which terminates in a manually adjustable knob 22. The knob has a threaded shank 23 so as to permit adjustment of the needle valve 20, the knob being threadedly attached to a coupling 24 which is secured to the head 13. In order to prevent escape of air, the stem 21 is surrounded by suitable packing material 25 which is held under pressure in the valve 17 by a spring 26.

For purposes of measuring the amount of air, a dial 27 is supported about the valve stem 21 on the coupling 24 and a pointer 28 is integrally attached to the knob. The dial 27 may be calibrated by experiment.

The knob 22 is held at the selected position by means of a compression spring 30 which is disposed between the knob and coupling 24. The chamber 19 of the valve communicates with a forwardly extending air passageway 31 which leads to the forward end of the head 13. This chamber 19 also communicates with a threaded opening

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32 which connects to the agitating means 3 in a manner to be hereinafter described.

The forward end of the head 13 is adapted to receive any one of several types of nozzles, which nozzles may be detachably secured to the head as shown in Figure 7 of the drawings. In the illustrated construction, the nozzle, designated 33 in the drawings, comprises a cylindrically shaped, tapering tip 34 having a tapering bore 35 which communicates with the lubricant passageway 15, the tip being threadedly attached to the forward end of the head 13.

The nozzle 28 further includes an intermediate housing 36 having a tapering forward end and a generally cylindrical shank (Figure 7). The housing 36 is concentrically disposed about the tip 34. The tapering end of the intermediate housing 36 is provided with an opening 37 which receives the forward end to the tip 34, the opening being somewhat larger than the end of the tip to permit discharge of air around the tip. The intermediate housing 36 fits on the tip 34 and defines an annular space 38 between this housing and the tip. The annular space 38 communicates with the air passageway 31 of the head 13 through a pair of radially extending passageways 39.

The nozzle 33 also includes a cap 40 which is disposed around the intermediate housing 36 and tip 34. The housing 36 is held in the cap by a compression ring 42. The cap 40 and intermediate housing 36 define an annular air chamber 43 which communicates with the forward air passageway 31 in the head and the radially extending passageways 39 in the housing. The cap is adapted to direct converging air streams across the end of the nozzle 28 so as to achieve increased directivity of the lubricant stream. For this purpose, the forward end of the cap 40 is provided with a pair of diametrically opposed, inwardly converging projections 44 having openings 45 formed therein. These openings direct converging streams of air across the end of the nozzle 33.

Thus, air enters the annular chamber 43 and is conducted to the openings 45 in the projections 44 and to the opening 37 about the tip 34 through the radial passageways 39. As is well known, the discharge of air about the tip 34 draws the liquid from the tip 34 and also sprays it outwardly.

The nozzle 33 is secured to the head 13, which is provided with a threaded section 46 on the forward end, by means of a gland 47 which engages an outturned flange 48 on the nozzle 28 and the threads on the head. As a result of this arrangement, the nozzle 33 shown in the drawings may be rotated to any desired position and secured in that position.

A valve seat 49 is provided within the tip 34, the seat cooperating with a valve 50 which, in the illustrated construction, is of the needle type. The valve 50 is axially movable by means of a valve stem 51 which is integrally formed therewith and extends axially rearwardly through the head 13 to the enlarged portion of the barrel 8. The head is provided with an axially extending bore 52 proportioned to receive packing material 53 which is adapted to prevent communication between the various fluid and air passageways. The packing material may be any of several types of material and is preferably held in place by means which permit easy and rapid replacement of the packing material. To this end, the rear face 54 of the head 13 flares outwardly from the bore 52 and the face bears against a complementary surface 55 formed on the forward end of a packing and bearing member 56 which is integral with the restricted end 9 of the barrel 8. The packing material 53 is also disposed in this member 56 and a helical spring 57 is provided for pressing against the packing material in the member 56 and the material in the bore 52 to assure a fluid tight seal around the valve stem 51. The rear end of the packing and bearing member 56 is formed to permit the stem 51 to extend therethrough into the barrel 8.

The barrel 8 is provided with a radially extending nip-

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ple 58 which is threaded for connection to a source of pressurized air (not shown) and the barrel has a piston assembly 59 disposed therein. The piston assembly is connected to the valve stem 51 and causes rearward movement of the stem when pressurized air is supplied to the spraying device 1. The barrel 8 communicates with the rearward air passageway 16 in the head 13 through a series of circumferentially disposed openings 60.

The piston assembly 59 comprises a piston washer 61 which may be made of leather or other suitable material, the piston washer being secured to the stem by means of a pair of spaced disks 62 and 63 which are held on the stem by a pair of spaced lock members 64 and 65 which are secured to the stem. A spring guide 66 is mounted on the rear end of the assembly 50 as is shown in Figure 7.

The rear end of the barrel 8 is threaded for engagement with a cap 67. The cap has an aperture 68 formed therein which is internally threaded to receive an adjustable knob 69. The knob engages a helical compression spring 70 which extends between the forward end of the knob and the spring guide 66 on the piston assembly 59.

For convenience in adjusting the pressure of the spring 70, an indicator disk 71 is mounted on the cap 67 and is suitably marked. A pointer 72 is fixedly attached to the knob for indicating the marks on the disk 71.

In order to prevent movement of the knob 69 from a preset position during operation of the spraying device 1, a helical spring 73 is disposed between the knob 69 and the cap 67.

If the barrel 8 is not ventilated at the rearward end, the piston assembly 59 is sluggish in operation causing the lubricant to be wasted. In order to overcome this difficulty, the adjustable knob 69 is provided with an opening 74 for permitting escape and entrance of air from and into the rear end of the barrel 8.

In operation of the spraying device 1, pressurized air is supplied to the nipple 58 on the barrel 8 and the air passes through the openings 60 in the packing and bearing member 56 located in the restricted end 9 of the barrel 8. The air is conducted into the chamber 18 of the transversally disposed valve 17. A measured amount of air passes into the second chamber 19 of the valve 17 and is conducted through the forward passageway 31 in the head 13 to the nozzle 33. At the same time, the pressurized air actuates the piston assembly 59, moving the needle valve 50 rearwardly and permitting the liquid to be withdrawn from the tip 34 which comprises a portion of the nozzle 33.

The liquid is supplied to the tip through the angularly disposed nipple 14 associated with the head 13 and passes through the longitudinally extending liquid passageway 15 formed in the head 13.

The air pressure which is supplied to the nozzle 33 may be adjusted by means of the knob 22 associated with the valve 17. In addition, the amount of liquid discharged from the tip 34 may be varied by adjustment of the knob 69 on the cap 67 of the barrel 8. Adjustment of this knob varies the pressure on the spring 70 which presses against the piston assembly 59 thereby determining the extent of opening of the needle valve 50 seated in the tip 34.

The reservoir 2 is preferably supported above the spraying device 1 so that liquid may be fed by gravity to the device. As shown in the drawings, the reservoir is mounted on the nipple 14 associated with the head 13 and is connected by means of a swivel joint 75. The reservoir 2 comprises a generally cylindrical shaped can 76 which is preferably made of a non-corroding metal such as aluminum or stainless steel. The can is provided with a lid 77 which is clamped to the top of the reservoir 2 by means of an ear and clamp arrangement 78. The lid is securely held at the top by means of a lock screw 79 which urges the lid 77 toward the can 76

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causing the clamp and ear arrangement 78 to fixedly engage an outturned flange 80 on the top of the can. The lid is provided with a vent 81 for permitting the escape of air from the reservoir 2.

The reservoir 2 is further provided with a discharge tube 82 which is preferably located along the periphery of the can 76 as is shown in Figures 2 and 5. Through location of the tube in this position, the can may be tipped on the edge assuring complete emptying of the can during operation. The tube 82 connects to the swivel joint 75 and supports the reservoir on the spraying device 1.

As has been previously pointed out, sedimentation tends to occur in the reservoir and the lubricating liquids often tend to separate out. Sedimentation interferes with the operation of the spraying device 1 and in addition may cause unsatisfactory operation of the machine with which the equipment is used. It is highly desirable that the lubricant be thoroughly mixed to disperse any sedimentation uniformly in the lubricant and it is also desirable that the oil be kept in a mixed condition to assure uniform lubricating characteristics. Such mixing is accomplished in accordance with the invention through the use of the agitating means 3. The agitating means comprises a tube 83 which is connected to the transversely disposed valve 17 associated with the head 13 and connects to a threaded nipple 84 on the second chamber 19 of the valve 17. The tube 83 connects to the inlet of a valve 87 at a point adjacent the upper edge of the reservoir 2 and a tube 83a connects to the outlet of the valve 87 and extends downwardly inside the reservoir 2 to a point closely adjacent the bottom for the purpose of assuring adequate mixing of the lubricant and dispersion of any sediment throughout the liquid. In order to prevent undue agitation of the liquid in the reservoir and incorporation of air into the lubricant, a valve 85 is disposed in the tube for regulating the amount of air discharged therefrom. In the drawings, the valve 85 is of the needle valve type and is particularly shown in Figure 6. As shown in this figure, the valve 85 comprises a valve stem 86 which is integrally connected to a knob 87 for adjusting purposes. The knob 87 is threadedly secured to the valve 85, as is illustrated.

The lower end of the tube 83a is preferably located adjacent the entrance to the discharge tube 82 so as to aid in helping prevent the liquid passageway 15 from becoming clogged by sediment. When the end of the tube 83a is positioned in this manner, the air which is discharged therefrom agitates the lubricant and insures the dispersion of the sediment at this point. The air is emitted from the agitating means 3 simultaneously with the opening of the valve 50 and the discharge of air through the nozzle 33, and the suction created by the air stream around the tip 34 together with the pressure at the entrance to the discharge tube 82 due to the discharge of air from the tube 83a provides an especially effective means of assuring that the sediment which passes into the passageway 15 will be forced out of the unit through the open valve 50.

The apparatus of the invention is desirably synchronized with the operation of the associated machine applying pressure air to the spraying device 1 only when needed. The application of the pressurized air is controlled by the mechanism 4 which comprises a commercially available cam actuated valve assembly. The valve assembly includes an arm 88 on which is supported a cam engaging roller 89. The arm 88 is pivotally supported and connects to a suitable valve which opens and closes responsive to actuation of the roller 89. The control mechanism is connected to a source of pressure air (not shown) through the conduit 6, the control mechanism 4 being connected to the spraying device 1 through the conduit 7 which comprises a tube 90 and hose 91 which are connected in series.

The roller 89 on the control mechanism 4 is operated

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by a cam 92 and, in the illustrated embodiment, the cam is carried on a shaft 93 of the punch press. The cam is conveniently mounted on the shaft by means of steel band 94 which is bolted to the cam 92 as shown at 95.

The apparatus of the invention may be supported on the machine in any one of several ways. As shown in the drawings, this support is accomplished by means of a rod 96, which is connected to the air tube 90 by means of a clamp 97. The rod may be mounted on the machine in any conventional manner.

In operation the apparatus, the cam 92 associated with the machine actuates the control mechanism 4 causing pressure air to be supplied to the spraying device 1. This causes operation of the spraying device 1 as has been before described but, in addition, causes agitating means 3 to operate thereby mixing the lubricant and dispersing any sedimentation throughout the liquid. This assures trouble-free operation of the spraying device 1 and satisfactory operation of the associated machine.

When the apparatus of the invention is used with other types of machines, as for example conveyors, the cam actuated roller may be tripped by other means than the cam 92, as for example, a conveyor hanger.

My apparatus is highly satisfactory in operation and can operate for long periods of time without difficulty. In addition, the apparatus accomplishes uniform lubrication with a minimum loss of fluid and applies lubricant of even consistency.

The various features of the invention which are believed to be new are set forth in the following claims:

I claim:

1. A lubricating device comprising in combination an air-actuated spraying device having an air chamber therein, a reservoir for a lubricant, a conduit for conducting lubricant from said reservoir to said spraying device, a valve in position for controlling the discharge port of said conduit, said valve being movable in response to the admission of pressurized air to said air chamber, and agitating means comprising a tube communicating with said air chamber and with said reservoir, said tube extending to a point closely adjacent said conduit at the bottom of said reservoir for directing pressurized air into the reservoir for agitating the lubricant, and the upper end of said reservoir being provided with a vent for permitting the escape of air from the reservoir.

2. A lubricating device comprising in combination an air-actuated spraying device having an air chamber therein, a reservoir for a lubricant supported above said spraying device permitting lubricant to flow by gravity into said spraying device, a conduit for supplying lubricant from said reservoir to said spraying device, a valve in position for controlling the discharge port of said conduit, said valve including a piston portion disposed in said air chamber and movable in response to the admission of pressurized air thereto, and agitating means comprising a tube communicating with said air chamber and with said reservoir for supplying pressurized air to said reservoir, said tube extending into said reservoir at a point adjacent the upper end of said reservoir so as to position a portion of said tube above the normal liquid level in said reservoir, the outlet end of said tube being positioned adjacent the bottom of said reservoir, and the upper end of said reservoir being provided with a vent for permitting the escape of air from the reservoir.

3. A lubricating device comprising in combination an air-actuated spraying device adapted to spray lubricant under pressure, said device having air and liquid chambers formed therein, a valve in position for controlling the discharge port of said liquid chamber, said valve including a piston portion disposed in said air chamber and movable in response to the admission of pressurized air to said air chamber means for intermittently pressurizing said air chamber, a reservoir supported above said spraying device, a conduit connected to the bottom of said reservoir and communicating with said liquid chamber in said

spraying device permitting lubricant to flow by gravity into said spraying device, agitating means connected to said air chamber and to said reservoir to cause intermittent agitation of the lubricant in said reservoir concurrent with pressurization of said air chamber, said agitating means including a tube connected to said spraying device and extending upwardly to a point above the level of liquid in said reservoir, said tube extending into said reservoir and terminating adjacent said conduit at the bottom of said reservoir, the upper end of said reservoir being provided with a vent for permitting the escape of air from the reservoir and adjustable valve means in said tube to vary the pressure of air in said tube.

4. A lubricating device comprising an air-actuated spraying device adapted to spray lubricant under pressure, said device having separate air and lubricant passageways formed therein, an emission nozzle for said spraying device, said air and lubricant passageways terminating at said nozzle in communication with each other, a needle valve disposed in said device in position for controlling the flow of lubricant through said lubricant passageway to said emission nozzle, means in said device forming a cylindrical chamber communicating with an upstream portion of said air passageway an air inlet means communicating with said chamber, a movable piston in said chamber fixed to said needle valve so as to regulate the latter in response to the flow of pressure air into said chamber through said air inlet means, a lubricant reservoir disposed above said device, a conduit placing the bottom of said reservoir in communication with said lubricant passageway in said device, a tube placing said air passageway in communication with the interior of said reservoir adjacent said conduit, a valve in said tube controlling the amount of air discharged into said reservoir, and intermittently operable air pressure means communicating with said air inlet of said device, whereby introduction of pressure air to said air inlet effects a regulating movement of said needle valve, dependent upon the amount of air pressure, and an agitation of the lubricant flowing into said conduit from said reservoir to prevent sedimentation.

5. A lubricating device adapted to be actuated by pressure air comprising, a barrel having an emission nozzle thereon, a lubricant reservoir, a lubricant inlet means on said barrel having communication with said lubricant reservoir, means defining a passageway in said barrel placing said lubricant inlet in communication with said nozzle, a needle valve disposed in said passageway to control the emission of lubricant therefrom, air intake means on said barrel having communication with a source

of pressure air, means in said barrel defining a passageway affording communication between said air intake and said emission nozzle, adjustable valve means controlling the flow of air through said air passageway in said barrel, a movable piston in said barrel connected with said needle valve and operable in response to the flow of pressure air through said air intake to regulate the flow of lubricant to said nozzle, conduit means placing said air passageway of said barrel in communication with a bottom portion of the interior of said reservoir, a valve means in said conduit regulating the flow of pressure air to said reservoir, and an air vent adjacent the upper portion of said reservoir.

6. A lubricating device adapted to be actuated by pressure air comprising, a barrel having an emission nozzle thereon, a lubricant reservoir disposed above said barrel and having an outlet adjacent the bottom of said reservoir, a lubricant inlet means on said barrel in communication with said reservoir outlet, means in said barrel defining a passageway affording communication between said lubricant inlet and said nozzle, a needle valve disposed in said passageway to control the emission of lubricant therefrom, air intake means on said barrel having communication with a source of pressure air, means in said barrel defining an air passageway affording communication between said air intake and said emission nozzle, an adjustable valve means controlling the flow of air through said air passageway in said barrel, a movable piston in said barrel connected with said needle valve and operable in response to the flow of pressure air through said air intake to effect a movement of said needle valve to regulate the flow of lubricant to said nozzle, conduit means affording communication between said air passageway, downstream of said adjustable valve, and an internal portion of said reservoir adjacent said lubricant outlet, an additional valve means in said conduit regulating the flow of pressure air to said reservoir, and an air vent in the upper portion of said reservoir.

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