April 28, 1959 J. K. STEWART 2,884,093

RAIL LUBRICATORS

Filed June 6, 1957 3 Sheets-Sheet 1

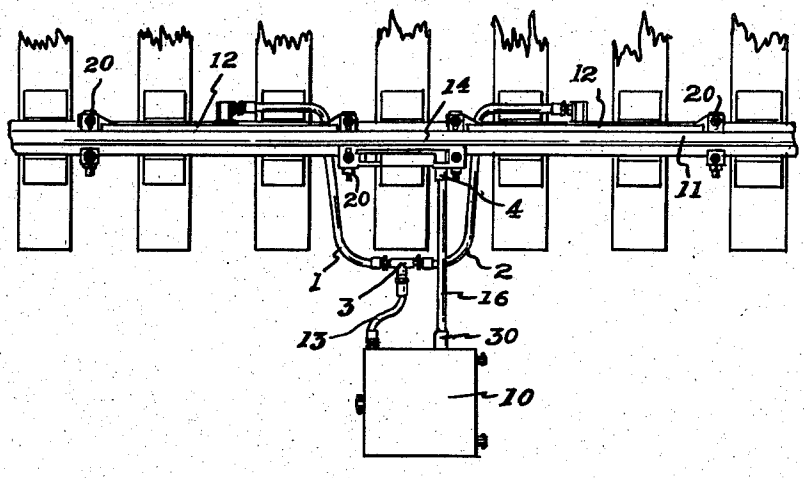


FIG. 1

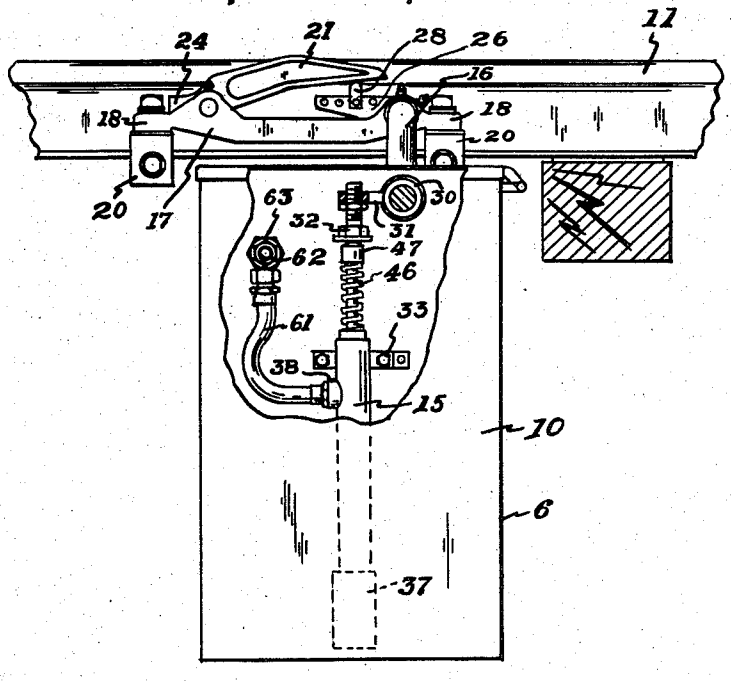


FIG. 2

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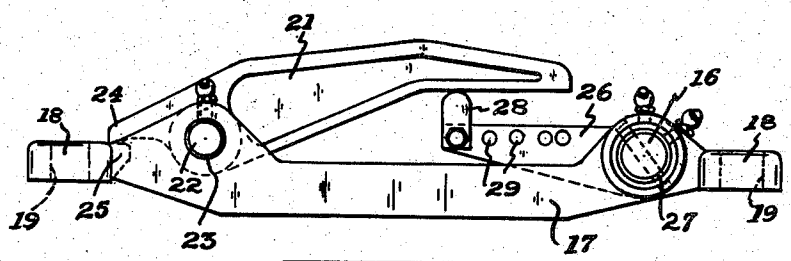


FIG. 3.

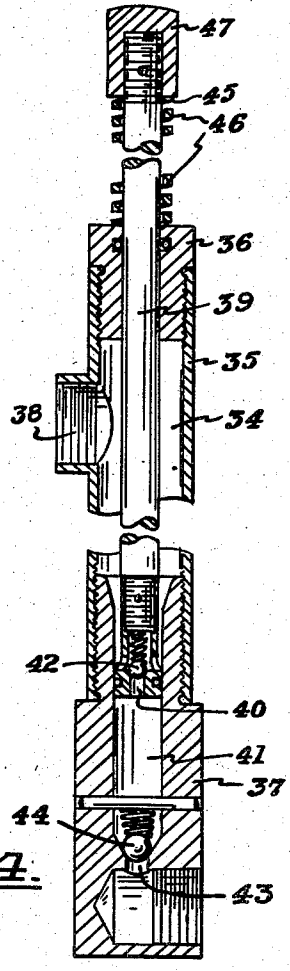


FIG. 4.

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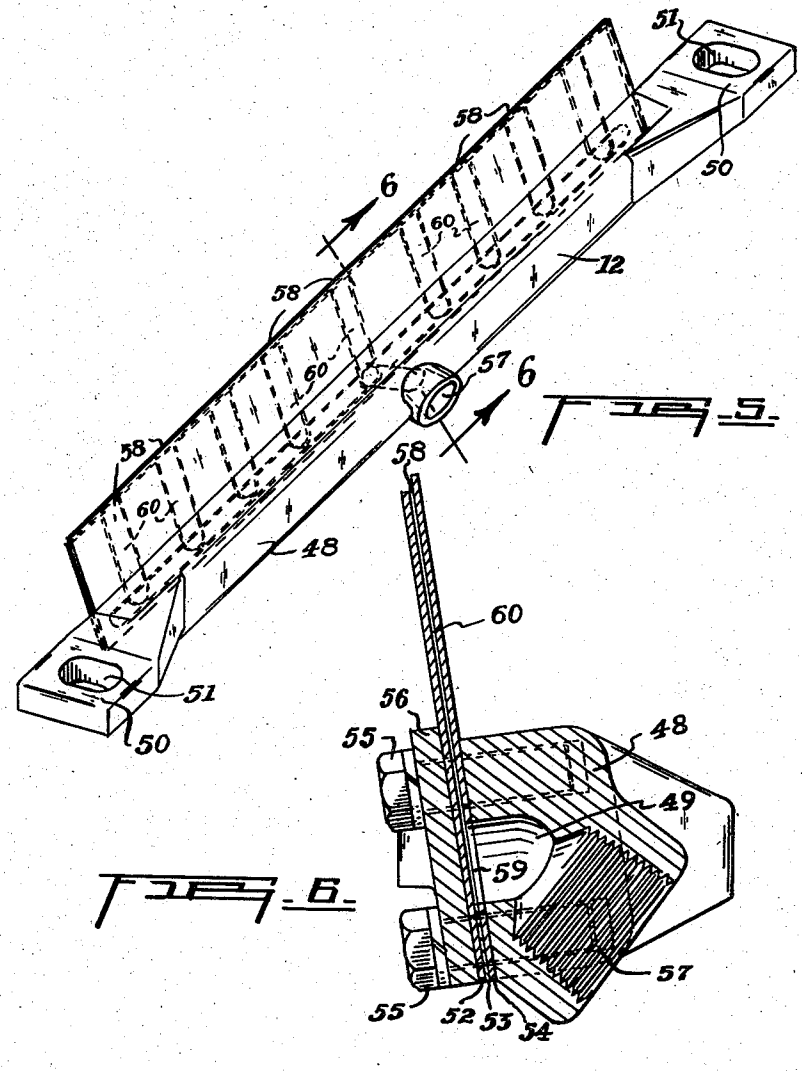


FIG. 5.

FIG. 6.

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RAIL LUBRICATORS

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6 Claims. (Cl. 184—3)

This invention relates to railroad rail lubricators.

A train passing over a curve in a railroad at a high speed develops a considerable amount of centrifugal force, and exerts a very high pressure against the inside edge of the outer rail upon which the train is running. This causes a very high rate of wear on curves and it is often necessary to replace these rails. In order to reduce the amount of wear on these curves, it is common to apply some form of lubricant to the inside of the outer rail. Various methods have been proposed for this lubrication, including that of simply applying the lubricant by hand. This is unsatisfactory due to the considerable amount of work involved and considerable distance to be travelled by the person doing this job. A number of devices have been developed for the automatic application of grease to railroad rails, some of which apply lubricant directly to the wheel of the train when necessary. The majority, however, apply lubricant by means of a pump to the inside of the rail from a reservoir mounted on or near the rail. These latter devices are operated by the rim of a wheel of the train passing over a lever mounted adjacent the rail in a position to be depressed by the rim of the wheel. Disadvantages of these systems include the lack of compensation for excessive movement of the actuating lever due to worn wheel rims, which excessive movement damages the mechanism of the pump. It is also common in some devices, which have their lubricant reservoir mounted independent of the rail and a drive shaft connecting the actuating lever adjacent the rail to the pump in the reservoir to have no means for compensation for the movement of the track in relation to the position of the reservoir, such movement occurring during the passage of a train. Further, it is usual to install in these devices a single stroke pump which delivers lubricant only on the force stroke. Therefore on the return stroke it is possible for foreign matter, in the neighbourhood of the applicator, to be sucked into the lubricant outlet, thus clogging it and impeding the efficiency of the apparatus. Also, the applicator for applying the grease to the track is often of such a nature that a wheel flange which projects downward from the rail to an excessive degree due to a worn wheel rim often strikes and damages it.

These disadvantages are overcome by the present invention which provides a lubricating device for railroad rails of the type which comprises an actuator adapted for operation by the wheels of a train, a lubricant reservoir mounted independent of the rail, and a pump operated by the actuator and arranged to pump lubricant from the reservoir to an applicator on the rail in response to movement of the actuator. In this rail lubricator the actuator comprises an arm mounted on the rail in position to be depressed by the rim of the wheel, means limiting the return after depression of the arm and lever means in position to be actuated by the depression of the arm. The pump means comprises a double acting force and lift pump having means limiting its force stroke,

the pump being adapted to deliver on its force stroke a predetermined percentage of oil and on the lift stroke the remaining percentage. Connecting means operatively connect the pump to the actuator, the connecting means comprising a flexible cable capable of absorbing displacement in excess of that required to drive the pump to its limit in the force stroke whereby movement of the rail in relation to the pump and reservoir does not alter the operative movement imparted to the pump by the actuator.

It will be apparent that this device overcomes the aforementioned disadvantages of known lubricating systems. The tendency of known systems to be damaged by excessive movement of the lever due to worn wheels is overcome by the provision in the present invention of a flexible cabinet connecting the lever to the pump. This cable absorbs, by its flexibility, any displacement in excess of that which is required to drive the pump on its force stroke. The disadvantage in the old systems of the damage of working parts caused by movement of the rail in relation to the lubricant reservoir is also overcome by this flexibile cable. Further, the pump in the present invention is a double acting pump which delivers approximately 35% of its lubricant on the downward stroke and 65% on the upward stroke, so that no foreign matter can be sucked into the applicator by the return action of the pump. The applicator in the present invention is composed of spring steel, which facilitates the loading of the applicator against the inside of the head of the rail in such a position that it cannot be damaged by a worn wheel rim.

Further advantages of this apparatus will be evident from the following detailed description thereof illustrated by the accompanying drawings, in which:

Figure 1 is a plan view of a preferred embodiment of the present invention installed on a rail,

Figure 2 is a side elevation of the actuator and reservoir of an embodiment of this invention with part of the reservoir shown in section to illustrate the pump stroke limiting means,

Figure 3 is a side elevation of an actuator mechanism of the present invention,

Figure 4 is a sectional elevation of the pump means,

Figure 5 is a perspective view of the lubricant applicator, and

Figure 6 is a section taken on the line 6—6 of Figure 5.

With reference to Figure 1, in which the general layout of a preferred embodiment of this invention is illustrated, 10 is a lubricant reservoir in a position remote from a rail 11. 12 are lubricant applicators attached adjacent the inside of a rail 11, and tubes 1, 2, and 13 allow the passage of lubricant from the reservoir 10 to the applicators 12. An actuating device 14 mounted adjacent the rail 11 in position to be depressed by the wheel of a car is operatively connected by means of the flexible drive shaft 16 to a pump 15 within the reservoir 10, as illustrated in Figure 2. A safety valve 62 is installed between the pump 15 and the applicators 12. Each of these features will be described in greater detail below.

The actuator, as illustrated in Figure 3, comprises a frame 17 having at its extremities lugs 18. Through these lugs 18 pass vertical holes 19 by which the actuator is secured to the rail clamps 20, in a manner which will be described below. A lever arm 21 is mounted on this frame 17 using a shaft 22 journalled at 23 in the frame 17 as its fulcrum. A shoulder 24 on the lever 21 projects beyond the fulcrum 22 of the lever 21 and abuts against a lug 25 on the frame 17, preventing the lever 21 from rising above a certain level relative to the frame 17.

A further lever 26 is rotatably mounted at 27 on the

frame 17 on a rigid extension 4 of the flexible shaft 16. This lever 26 has a lug 28 which is adjustable in relation to it by means of a series of holes 29, and is positioned so that depression of the lever 21 contacts the lug 28 and so moves the lever 26 and rotates the shaft 16. The shaft 16 terminates outside the reservoir 10 at a collar 30, to which it is secured. This collar 30 is rotatably mounted in the wall 6 of the lubricant reservoir 10. Within the reservoir 10, the collar 30 is attached to an arm 31, which drives the pump 15 through the arm throw adjusting means 32. The adjusting means comprises a flat-headed nut screwed into and locked to the arm 31.

The pump 15 is of the double-acting force and lift type. It is secured to the wall 6 of the reservoir 10 by the bracket 33. As illustrated in Figure 4, it comprises a sealed space 34, which is formed by a sleeve 35, an upper annular member 36 and a lower valve and cylinder member 37. The only outlet from the space 34 is at 38. A shaft 39 passes through the upper annular member 36 with which it forms a seal but is free to slide in relation to it. A piston 40 is attached to the lower end of the shaft 39. This piston slides in a cylinder 41 formed in the lower member 37, and contains a one-way spring loaded ball valve 42, which, on the force stroke of the pump, allows lubricant to pass from within the cylinder 41 to the area 34. The cylinder 41 has at its lower end at 43 a one-way spring loaded ball valve 44 which permits lubricant to enter the cylinder 41 from within the reservoir 10. Above the annular member 36, and between the annular member 36 and a radial abutment 45 at the upper end of the shaft 39 is a spring 46 which becomes solid when depressed to a certain degree. This spring 46 serves to limit the force stroke of the pump. A cap member 47 secured to the upper end of the shaft 39 provides an abutment for the spring 46 and engages the arm 31 driven by the shaft 16.

The lubricant applicator is illustrated in Figures 5 and 6. It comprises a frame member 48 having a channel 49 extending along one of its surfaces. This channel 49 terminates near the ends of the frame 48. At the extreme ends of the frame 48 are lugs 50 having holes 51 by which the applicator may be secured to the rail. Mounted on that face of the frame 48 along which the channel 49 extends, and of sufficient length to extend beyond the ends of the channel 49, are three plates 52, 53 and 54 formed of spring steel. These plates 52, 53 and 54 are of sufficient width to engage the side of the rail head when the applicator is mounted adjacent the rail 11. The plate 54 has a portion 59 cut out opposite the channel 49 and corresponding to the size thereof. The plate 53 has a plurality of channels 60 extending from its upper edge to a position opposite the channel 49. The three plates 52, 53, 54 are held onto the frame 48 by bolts 55 and a stiffening plate 56. It will be seen that liquid pumped into the channel 49 through the orifice 57 in the frame 48 will pass through the channel 59 in the plate 54 and up the channels 60 in the plate 53 and between plates 52 and 54, and out through the outlets 58.

The applicators 12 and the actuator 14 are secured to rail clamps 20 which are mounted on the foot of the rail 11.

The adjustable safety valve 62 is preferably installed at 63 in the wall of the reservoir 10. This valve may be of any known type and is hence not illustrated in detail. Its functions are to regulate the pressure of the lubricant passing from the pump 15 to the applicators 12 and to return to the reservoir 10 any lubricant delivered from the pump 15 in excess of a desired pressure, which pressure may arise if a train passes over the actuating lever 21 at a high speed, thus operating the pump too quickly. The valve 62 is accurately adjustable to vary the pressure of lubricant passing through it, thus, irrespective of the speed of the train passing over the arm, and of the wear condition of the wheel arm.

The constructional details of the important parts of this apparatus having been individually described in detail, the operation of the device as a whole and of the parts relative to each other will now be described.

The actuator mechanism 14 is mounted on the rail 11 in such a position that the lever arm 21 projects above the rail and will be depressed by the wheel of a car passing over the rail. This lever 21 in turn depresses the lever 26 which imparts rotary movement to the flexible shaft 16. This movement is transmitted to the pump 15 through the collar 30 and the arm 31. The adjusting screw 32 abuts against the cap member 47 of the shaft 39 and drives the shaft 39 and piston 40 downward. Assuming that the pump 15 has been primed and the reservoir 10 contains lubricant, the fluid in the cylinder 41 will pass through the ball valve 42 in the piston 40 and displace a quantity of fluid from the area 34 and cause the displaced fluid to leave the area 34 through the outlet 38. The spring 46 will cause the piston to rise when pressure is removed from the shaft 39 due to the car wheel having passed over the lever 21 on the actuator 14. On this return stroke, the piston will displace a further quantity of fluid from the area 34 out through the orifice 38. Also, on the return stroke a quantity of fluid will enter the cylinder 41 through the ball valve 44 due to atmospheric pressure. This cycle is repeated each time a car wheel depresses the lever 21.

The fluid displaced from the area 34 passes through the orifice 38 into a tube 61. This tube passes through the wall 31 of the reservoir 10 at 63. A safety valve 62 is installed here in case of excessive pressure in the pump or blocking of the tubes. A tube 13 leads from the outside of the reservoir 10 at 63 to a T joint 3, and the fluid is led through here and the tubes 1 and 2 to the applicators 12. Referring to Figures 6 and 5, it will be seen that fluid passing into the applicators through the inlet 57 will fill the channel 49, and pass through the channel 59 in the plate 54 into the channels 60 of the plate 53, and out of the orifices 58 onto the rail head. The applicator is mounted adjacent the rail in such a position that the plates 52, 53 and 54 exert a pressure against the rail head, thus preventing loss of grease behind the applicator. Further, due to the fact that these plates are formed of spring steel of a low thickness they are not likely to be damaged by worn wheel flanges contacting them.

The shaft 16 is flexible so that in the event of a train wheel being worn to the degree where the lever 21 is depressed too far, thus imparting to the shaft 16 displacement in excess of that required to drive the pump 15 in one force stroke, the excess movement will be absorbed by the shaft 16. Also, the tubes 1, 2 and 13 are flexible, to allow lateral movement of the rail 11 in relation to the lubricant reservoir 10.

What I claim as my invention is:

1. A rail lubricator of the type comprising an actuator adapted for operation by the wheels of a train, a lubricant reservoir, a pump operated by said actuator and arranged to pump lubricant from said reservoir to an applicator on the rail in response to movement of said actuator, wherein the actuator comprises an arm mounted adjacent the rail in position to be depressed by the rim of a wheel, means limiting the return after depression of the arm, and lever means in position to be actuated by the depression of said arm, and wherein the pump comprises a double acting force and lift pump having means limiting its force stroke, said pump delivering on its force stroke a predetermined percentage of lubricant and on the lift stroke the remaining percentage; and connector means operatively connecting said pump to said lever means comprising flexible cable means whereby displacement in excess of that required to drive the pump to its limit in said force stroke is absorbed, and whereby movement of said rail does not alter the operative movement imparted to said pump by said actuator.

2. A rail lubricator as defined in claim 1 having a lug

secured to the lever means in position to be contacted by the arm, said lug being adjustable in relation to its distance from the fulcrum of said lever means.

3. A rail lubricator as defined in claim 1 in which the pump comprises, a piston head slidable within a cylinder, a piston rod, a sleeve-like extension to said cylinder extending therefrom and along said piston rod, said cylinder extension terminating in a bearing for said piston rod and defining a space behind said piston, a one-way valve within the head of said cylinder forming an inlet for lubricant, and a further valve within said piston forming an outlet for the lubricant from said cylinder, and an orifice forming an egress from said sealed area, whereby lubricant is pumped to the applicator on both the force and return strokes of the pump.

4. A rail lubricator as defined in claim 1 wherein the applicator comprises two flexible plates adapted to be secured with their upper edges adjacent the rail head, means spacing said plates apart and defining a seal about the edges thereof, at least one aperture in said seal along the upper edge of said plates, and means whereby lubricant may be fed between said plates and out of said aperture.

5. A rail lubricator as defined in claim 4 wherein the plates are formed of spring steel, the plates being secured

to the rail to exert pressure thereagainst, whereby the said plates maintain their contact against the rail during movement of the rail relative to the applicator, and wherein the said plates are sufficiently close to the rail that they are not vulnerable to damage by worn wheel flanges.

6. A wheel lubricator as defined in claim 1 comprising an adjustable safety valve in the delivery line between the pump and the applicator arranged to maintain a constant lubricant delivery pressure to the applicator and to return to the reservoir lubricant delivered from the pump in excess of that pressure.

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