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CONVEYER LUBRICANT DISPENSER

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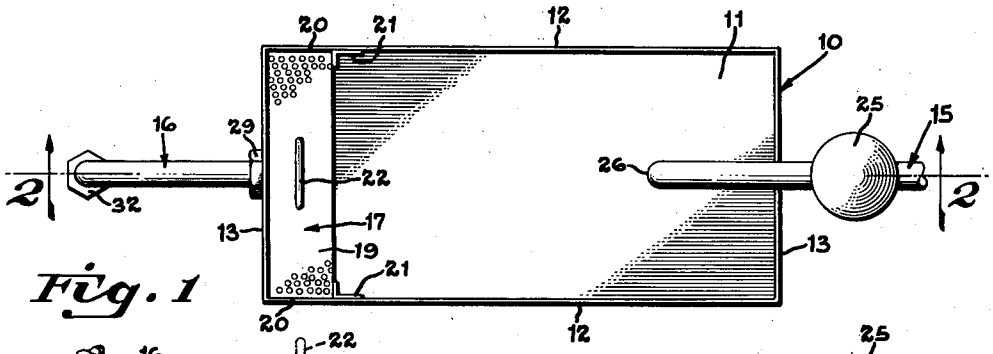

Fig. 1

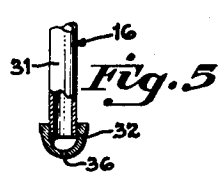

Fig. 5

Fig. 2

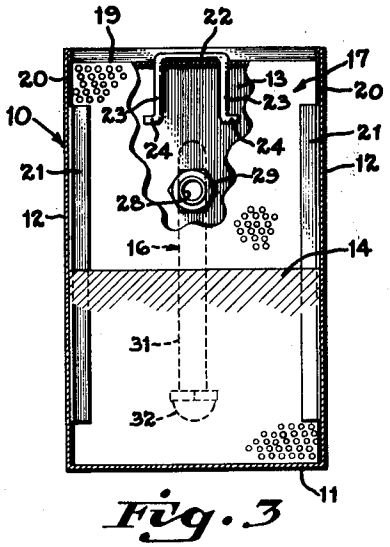

Fig. 3

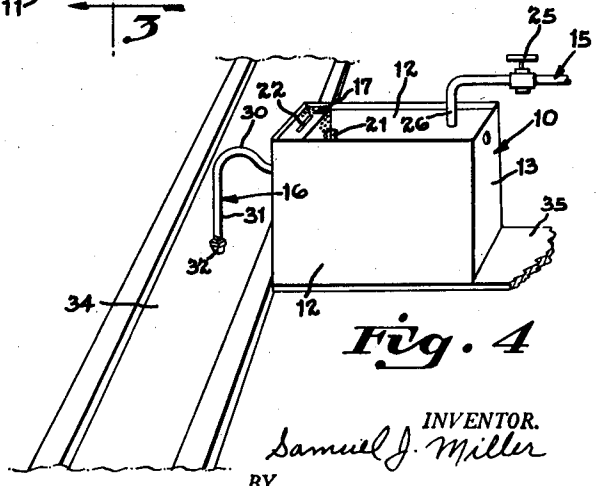

Fig. 4

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CONVEYER LUBRICANT DISPENSER

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This invention relates generally to an apparatus for mixing and dispensing lubricating liquid consisting of a mixture of water and water soluble lubricating material such as soap. The apparatus is intended particularly for applying a continuous surface film of lubricant upon the conveyors of bottling plants to lubricate the sliding parts and knuckles, and particularly to provide a slippery surface which aids in skidding the bottles to and from the conveyor at the various treating machines served by the conveyor system.

Conveyors of this type commonly consist of a link chain or pliable belt, presenting a flat surface for advancing the bottles in upright position relative to the treating equipment, for example, washing, sterilizing, filling and capping machines. The bottles are transferred to and from the conveyor at the various stations by suitable transfer mechanism which shift the bottles, usually in a direction lateral to the advance of the conveyor. Also, in some systems, the bottles may be shifted from one moving conveyor run to another or they may be arrested at one or more transfer points so that a group of bottles is held stationary pending transfer, while the conveyor belt upon which they are resting, continues its advance.

If the conveyor is run dry, there is a tendency for the bottles to topple when shifted, or to crowd one another from the conveyor when arrested at concentration stations, by reason of adhesion or excessive friction between the pliable conveyor surface and the bottles. In the absence of suitable lubrication, there is also severe wear on the parts of the conveyor and its moving track, with resultant increase in the power consumed to drive the machine. This problem is eliminated by wetting the conveyor surface with lubricant and this has been the practice in the bottling industry for many years, the lubricant being either in the form of bar soap, or more recently, liquid soap or other suitable lubricant. The liquid soap may be applied by placing it in drip tanks installed above the conveyor, the tanks being replenished periodically, or it may be applied by placing soap concentrate in a tank and adding fresh water to form a solution of liquid soap. However, the discharge of lubricant from these tanks usually is not uniform due to decreasing head pressure as the liquid level falls, with the result that either too much or too little lubricant is applied. Excessive lubrication not only is wasteful but causes an unsightly and dangerous overflow along the conveyor, while insufficient lubricant obviously impairs operating efficiency. Since the drip

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tanks are filled or controlled by hand, they are sometimes neglected, causing the conveyor to run dry until the situation is remedied.

It has been a primary object of the present invention to provide an automatic, self-mixing dispenser which constitutes a reservoir arranged to contain a supply of concentrated lubricating material so arranged that a supply of fresh water may be introduced continuously into the reservoir to absorb a uniform concentration of lubricant, a metered uniform quantity of solution being discharged intermittently upon the conveyor by means of a siphon tube which discharges when the solution reaches a predetermined level in the reservoir. The lubricant or soap concentrate for which the structure is intended is heavier than water and is supplied in a semi-solid or plastic state so that a mass of it is stored in the bottom of the reservoir with the water maintained above it for a period sufficiently long for the water to absorb a percentage of concentrate sufficient to perform the lubricating function. By virtue of this arrangement, a continuous trickle of fresh water may be supplied to the reservoir, causing the solution of water and concentrate to be mixed thoroughly by gentle agitation caused by the stream of fresh water being introduced, the solution being discharged periodically as the level rises sufficiently to initiate operation of the discharge siphon. By this arrangement, the conveyor is lubricated automatically so long as soap remains in the reservoir and the water supply is maintained. Since the area of soap or lubricant concentrate exposed to the water remains the same and the time period of exposure is constant, the amount of concentrate absorbed into solution may be controlled accurately by regulating the supply of fresh water and the frequency of discharge.

The siphon trap constitutes a tube bent to form an inverted gooseneck which curves upwardly from the end of the tube which communicates with the dispenser, the opposite end of the gooseneck including a vertical siphon tube. The gooseneck thus constitutes a trap to restrict the flow of solution until its level rises above the top of the gooseneck sufficiently to fill the trap and flow downwardly through the vertical siphon tube which develops the siphoning action. Although of simple construction, this arrangement has been found to operate in a reliable manner to discharge the solution between a fixed upper and lower liquid level as determined by the vertical distance between the intake end of the tube and the top of the gooseneck. Thus, the discharge frequency is determined by the period of time

necessary to raise the level from its lower to its upper limit and this can be controlled by regulating the fresh water supply.

In practice, the dispenser is filled approximately half full of concentrate and the fresh water supply, which is drawn from a service outlet, is regulated by a metering valve to provide the desired rate of discharge as determined by the particular needs of the conveyor system. Once established, the volume of lubricant discharged over a given time period remains constant, and as above noted, the concentration of lubricant in solution is uniform so long as any lubricant remains in the dispenser. The dispensers are installed above the conveyor system, preferably at points which are devoid of bottles, so that the lubricant film is introduced between the conveyor surface and bottles.

It has been determined that by placing a nipple having a restricted orifice upon the discharge end of the siphon tube, the head pressure necessary to initiate operation of the siphon tube may be increased. Apparently, this is due to surface tension at the orifice, since it is found that a smaller orifice requires a greater hydrostatic pressure and, hence, a higher liquid level to initiate siphoning than a larger orifice. Thus, the rise and fall of the liquid level and, consequently, the rate and frequency of discharge depend upon the orifice size. By supplying the user with several types of nipples he is able to determine experimentally the proper rate of discharge to suit the equipment. The dispenser can be operated without a nipple for a high rate of discharge or with selected nipples for various lesser rates of discharge.

From the foregoing and from the detailed description taken in conjunction with the drawings, those skilled in the art will comprehend readily various modifications of which the invention is capable.

In the drawings:

Figure 1 is a general top plan view of the dispenser.

Figure 2 is a longitudinal sectional view taken on line 2—2 of Figure 1, disclosing the structure in greater detail and illustrating diagrammatically the several liquid levels obtained by applying various orifice sizes to the siphon tube.

Figure 3 is a cross sectional view taken on line 3—3, Figure 2, and partially broken away to illustrate further details of construction.

Figure 4 is a diagrammatic perspective view illustrating the unit installed in operating position with respect to a conveyor run.

Figure 5 is a sectional view of a nipple having a smaller orifice and representing one of several nipples which may be installed interchangeably to regulate the operating characteristics of the dispenser.

In its preferred embodiment as illustrated, the dispenser consists of an open tank or reservoir 10 which is preferably rectangular in shape, consisting of a bottom 11, side walls 12—12 and end walls 13—13. The tank is formed from sheet metal and is sufficiently deep to contain in its lower portion a substantial mass of water soluble lubricant concentrate or soap as indicated diagrammatically at 14 in Figures 2 and 3. This material is supplied preferably as a plastic or semi-rigid gel, or in some cases it may be in pulverized form; in either event, the material forms a stratum reposing in the bottom of the tank with a liquid level maintained above it in temporary storage to absorb into solution a percentage of concentrate from the upper surface of the mass. Fresh water is supplied continuously to the reservoir by a supply pipe indicated generally at 15 and solution is decanted intermittently by the siphon unit indicated generally at 16 which communicates with the interior of the tank through the end wall 13.

A slidable screen 17 is mounted within the tank in spaced relationship with the end wall 13 so as to provide a chamber 18 delineated by the screen and end wall. The screen prevents entry into the siphon unit of lubricant concentrate and thus keeps the siphon clear and free-flowing. Screen 17 preferably is formed from a perforated sheet metal plate having a top wall 19 and vertical side walls 20—20 which serve to space the screen from the end wall. The screen is slidably mounted in position with respect to the end wall by a pair of vertical angle brackets 21—21 which are secured to the side walls 12—12 by soldering or brazing. In order to permit the screen to be removed, the top wall 19 includes a U-shaped handle 22 having vertical limbs 23—23 passing loosely through apertures formed in the top wall. The lower ends of the limbs include angular extensions 24 as shown in Figure 3, which serve as stops to engage the top wall when the handle is lifted. The limbs normally depend downwardly through the top wall, and the screen may be withdrawn like a drawer by grasping the handle and pulling it upwardly as shown in broken lines in Figure 2. Withdrawal of the screen permits the siphon unit to be cleaned out should it become clogged, by running a suitable tool, such as a flexible reamer, through it.

The water supply pipe 15 includes an adjustable metering valve 25 which serves to regulate water intake. It is desirable to have, in addition to the metering valve, a shut-off valve (not shown) in the supply line so that the metering valve may be adjusted to the requirements of the individual station and left undisturbed when the dispenser is shut down. As shown, the water is directed to the tank by a downwardly extended nozzle 26 so that the water trickles or drips into the tank from above. This arrangement is preferred for most installations but if it is desired to increase the rate of dilution, the nozzle 26 may be extended downwardly toward the bottom of the tank as at 27, to cause the incoming water to pass upwardly through the concentrate.

The siphon unit 16 is in the form of a tube having an inverted gooseneck with its intake end 28 communicating with the tank behind the screen 17, the intake end passing through an end wall 13 of the tank and secured by a pair of nuts 29—29 screwthreaded upon the end of the tube and in clamping engagement against the opposite sides of the wall. The connection may be made water tight by applying solder or brazing material to the crevices surrounding the tube and nuts. The intake end of the tube extends horizontally for a short distance then curves upwardly providing the gooseneck or trap section 30, which blends into the vertical tube section 31 to provide the siphoning action. Upon the lower end of the vertical tube there is screwthreaded an interchangeable nipple 32 having a restricted discharge aperture 33. Nipple 32 may be removed to increase the rate of discharge or it may be replaced by other nipples having different sized apertures to vary the rate of discharge, as hereinafter described.

The lubricator unit is installed above the conveyor run 34 at the point or points requiring

lubrication with the nipple 32 or discharge end of the tube in a position to project the lubricant solution by gravity upon the conveyor run. In many cases, the unit can simply be placed on the conveyor frame, while in others it may be necessary to mount it upon a bracket 35 (Figure 4), secured to a wall, post or other support.

The lubricating unit is put in operation by placing in it a supply of concentrate or soap as indicated in Figures 2 and 3, so that the tank is approximately half full. The water supply then is adjusted to provide the necessary rate of fresh water supply as determined by the particular installation. During operation, the liquid stored above the concentrate is constantly diluted by fresh water but at the same time it absorbs concentrate at approximately the same rate so that the solution remains fairly constant. Since only a portion of the total volume of stored liquid is discharged when the siphon operates, each discharge contains a substantially uniform percentage of concentrate in solution.

The water in temporary storage is agitated gently by the incoming trickle of fresh water supplied by the metering valve, causing the fresh water to be mixed thoroughly in the solution. This also promotes absorption of concentrate into solution. As the solution level rises, it enters the intake end 28 of the siphon unit and eventually fills and overflows the trap 30 and runs down the vertical siphon tube 31. Since the tube extends downwardly below the solution level, the solution flowing down the tube initiates a siphoning action which decants the solution at a rate greater than the supply of fresh water. The decanting or siphoning action continues until the solution level drops approximately to the intake end of the siphon unit, causing air to enter the tube to terminate the siphoning action. The unit then remains inactive until the liquid level again rises sufficiently to overflow the trap to initiate the next discharge.

The lubricating concentrate or soap is such that it retains its identity in the presence of water, the concentrate being absorbed into solution only from the upper exposed surface of the concentrate, causing progressive lowering of the stratum level. Thus, as the dispenser operates, the area exposed to the water remains constant so long as the concentrate supply lasts and the resulting solution of concentrate and water is uniform from one refill of concentrate to the next. The frequency of discharge is regulated by the metering valve 25 and orifice size, and having once been established, the unit will continue to operate automatically as long as concentrate is kept in it and the fresh water supply maintained.

As indicated in Figure 2, the solution in the tank has a basic level indicated at A which corresponds to the outlet end of the siphon tube. Above the basic or lower level A there is indicated a second level B, which indicates the fluctuating siphoning level when the dispenser is operated without the restricting nipple 32. This represents the condition of maximum discharge since the liquid will be siphoned off rapidly when it reaches its siphoning level. Thus, by adjusting the metering valve to increase properly the rate of fresh water supply, the dispenser is operated at maximum rate of discharge and at maximum frequency.

When a restricting nipple is placed upon the end of the siphon tube, the fluctuating level rises to the level indicated at C. This probably is due to resistance and surface tension developed by the liquid at the restricted orifice, with the result that the level rises considerably above the gooseneck before sufficient hydrostatic pressure is developed to initiate the siphoning action. The restricted aperture also restricts the flow of solution after siphoning starts, with the result that both the frequency and rate of discharge are decreased. When a nozzle having a still smaller orifice, as indicated at 36 in Figure 5, is installed, the surface tension is further increased and the liquid level rises proportionately as indicated at D, providing a further decrease in discharge frequency and rate.

The illustration is intended to represent several typical operating conditions but it will be apparent that the structure is not limited to the adjustment range shown. However, under practical operating conditions, the three variations in liquid level, combined with the proper regulation of the metering valve, provides a range of operation which is sufficient to adapt the dispenser to most conveyor installations. It is to be observed that in each case it is necessary to adjust the metering valve to supply fresh water at a rate less than the siphoning rate to provide intermittent operation. The detachable nipples thus provide major or basic range adjustments and the metering valve provides a minor adjustment within the defined ranges to permit accurate regulation of the discharge rate. The structure provides a highly efficient and reliable unit which mixes and dispenses automatically a uniform concentration of solution at constant volume without frequent service. Operation can be maintained almost indefinitely merely by replenishing at convenient intervals, the supply of concentrate in the tank. This lubrication is stabilized and the conveyor system is protected against wear constantly and rendered more efficient in operation.

Having described my invention, I claim:

1. A dispenser for mixing a continuous supply of water with a water soluble lubricant compound and discharging periodically a solution of water and lubricant compound comprising, a tank having a sufficient depth to maintain a substantial mass of lubricant compound in its lower portion with a liquid level of substantial depth in temporary storage in contact with and above the lubricating compound, a water supply line including a valve mounted above the tank for supplying constantly a metered quantity of water to the tank, a siphon tube including a horizontal portion with an inlet end passing through the wall of the tank in a plane above the level of the lubricant compound, the siphon tube including an inverted gooseneck rising substantially above the inlet end of the tube, the inverted gooseneck including a vertically depending tube section externally of the tank and extending downwardly substantially to the bottom of the tank, the elevation of the inlet end of the tube above the level of the lubricant compound delineating a permanent liquid level which is maintained above the lubricant compound, the inverted gooseneck rising above the inlet end of the tube to an elevation which delineates a liquid level in temporary storage above the permanent liquid level, the rate of discharge of the siphon tube being greater than the rate of fresh water supplied constantly to the tank by said valve to cause the siphon tube

periodically to siphon off the liquid in temporary storage.

2. A lubricant dispenser for mixing a continuous supply of water with a water soluble lubricant compound and dispensing a solution of water and lubricating compound, comprising a reservoir adapted to contain a mass of lubricating compound in its lower portion and a quantity of water in storage above the compound, a siphon tube having an end communicating with the upper portion of the tank at a point spaced upwardly from said lubricating compound, said siphon being adapted to intermittently decant the upper portion of the water maintained in storage in the reservoir and including a horizontal section opening into the interior of the tank, an upwardly curved portion, and a vertical portion depending downwardly from the curved portion to provide a siphon action, the curved portion of the tube being disposed at a level higher than the horizontal portion whereby the curved portion is effective to prevent liquid flow through the tube and thereby to maintain the liquid within the tank until the liquid level rises above the curved portion, whereupon the liquid flows through the curved portion downwardly into the depending portion, said depending portion of the tube including a restricted orifice presenting an impedance to the flow of water therethrough, said restricted orifice being effective to prevent the discharge of liquid until the liquid level rises to the top of the curved portion of said siphon tube.

3. A lubricant dispenser for mixing a continuous supply of water with a water soluble lubricant compound and dispensing a solution of water and lubricating compound, comprising a reservoir adapted to contain a mass of lubricating compound in its lower portion and a quantity of water in storage above the compound, a water supply line including a valve mounted above the tank for constantly supplying a metered quantity of water to the tank, a siphon tube having an end communicating with the upper portion of the tank at a point spaced upwardly from said lubricating compound, said siphon being adapted to intermittently decant the upper portion of the water maintained in storage in the reservoir and including a horizontal section opening into the interior of the tank, an upwardly curved portion and a vertical portion depending downwardly from the curved portion to provide a siphon action, the curved portion of the tube being disposed at a level higher than the horizontal portion whereby the curved portion is effective to prevent liquid flow through the tube and thereby to maintain liquid within the tank until the liquid level rises above the curved portion, whereupon the liquid flows through the curved portion downwardly into the depending portion, said depending portion of the tube including a restricted orifice presenting an impedance to the flow of water therethrough, said restricted orifice being effective to prevent the discharge of liquid until the liquid level rises to a level appreciably above the curved portion of said siphon tube.

4. A dispenser for mixing a continuous supply of water with a water soluble lubricant compound and discharging periodically a solution of water and lubricant compound comprising, a tank having a sufficient depth to maintain a substantial mass of lubricant compound in its lower portion with a liquid level of substantial depth in temporary storage in contact with and above the lubricating compound, a water supply line including a valve mounted above the tank for constantly supplying a metered quantity of water to the tank, a siphon tube including a horizontal portion with an inlet end passing through the wall of the tank in a plane above the level of the lubricant compound, the siphon tube including an inverted gooseneck rising substantially above the inlet end of the tube to delineate a normal discharge level, the gooseneck including a vertically depending tube section externally of the tank and extending downwardly substantially to the level of the bottom of the tank, the lower end of said tube being provided with a restricted orifice, said orifice providing a predetermined surface tension for impeding the discharge of liquid from the vertical tube and thereby causing a column of liquid to accumulate above said orifice and to raise the liquid in the tank to a level above the normal discharge level, said orifice being effective when said liquid level exceeds said discharge level to permit liquid flow at a rate greater than the water supply through said metering valve.

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