Oct. 30, 1945. G. H. BIERMAN 2,387,736

PUMP DEVICE FOR MACHINES FOR APPLYING COATING MATERIAL TO ARTICLES MOVING IN PROCESSIONS

Filed Jan. 23, 1943 3 Sheets-Sheet 1

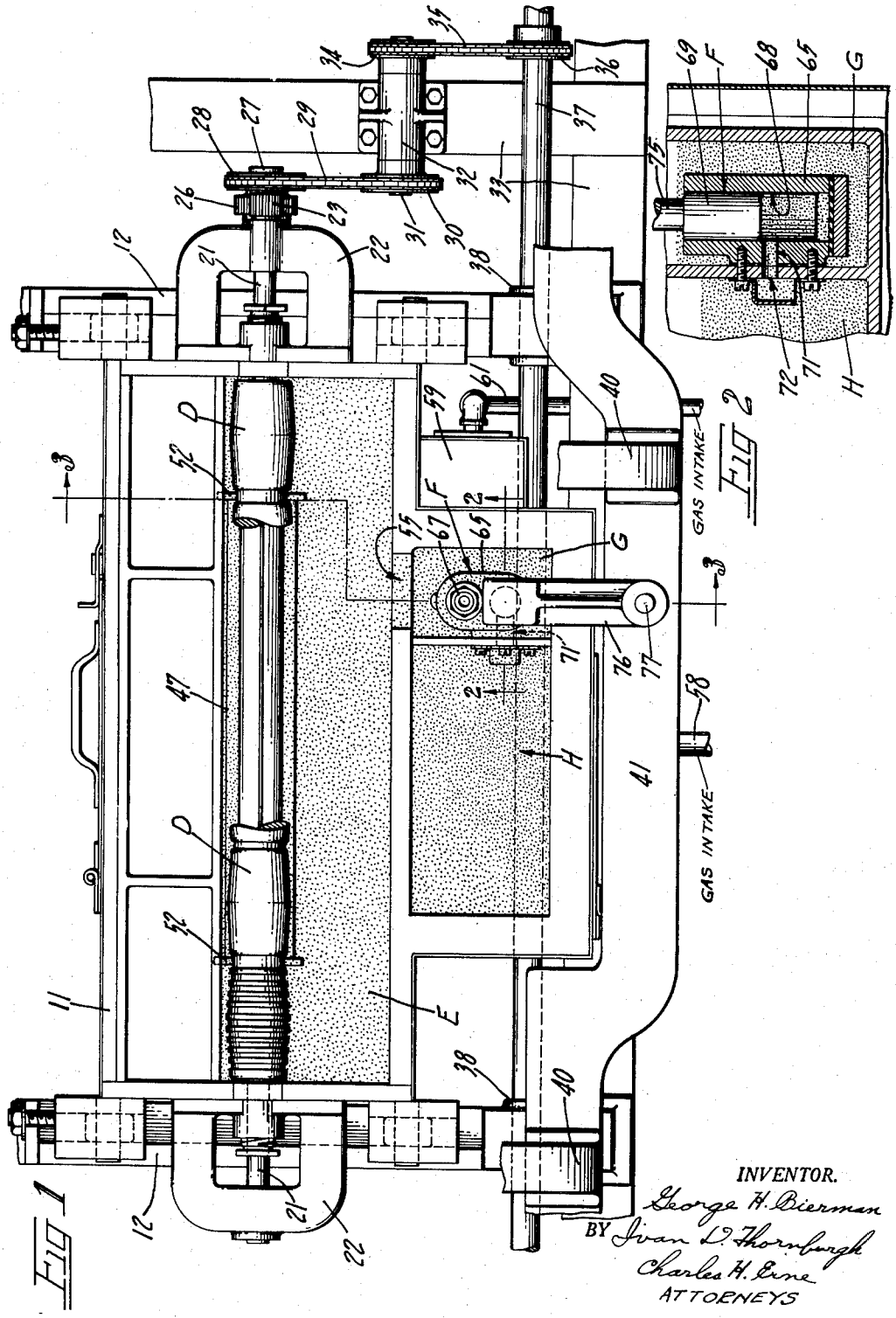


FIG 1

FIG 2

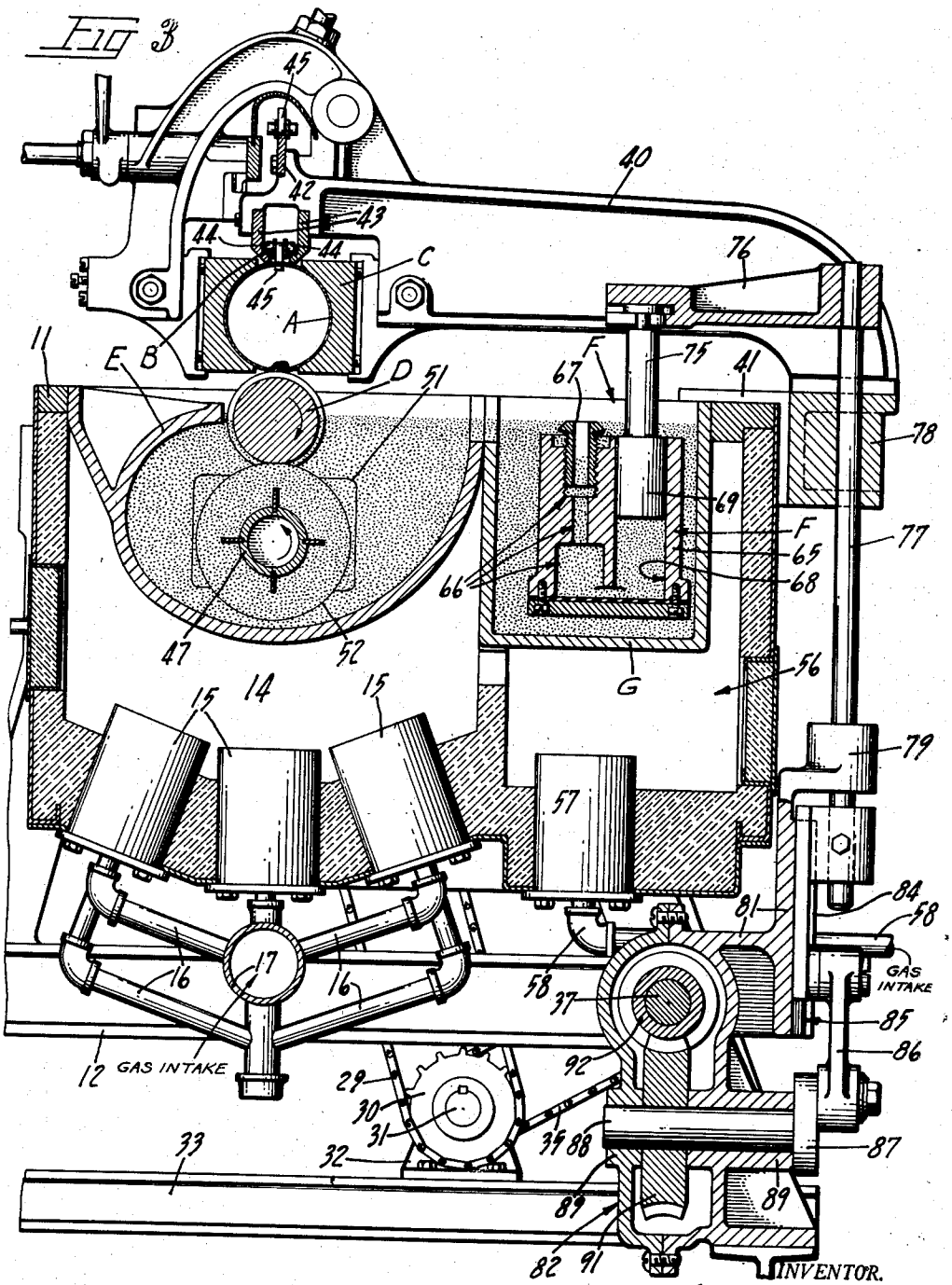
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Fig 3



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FIG 4

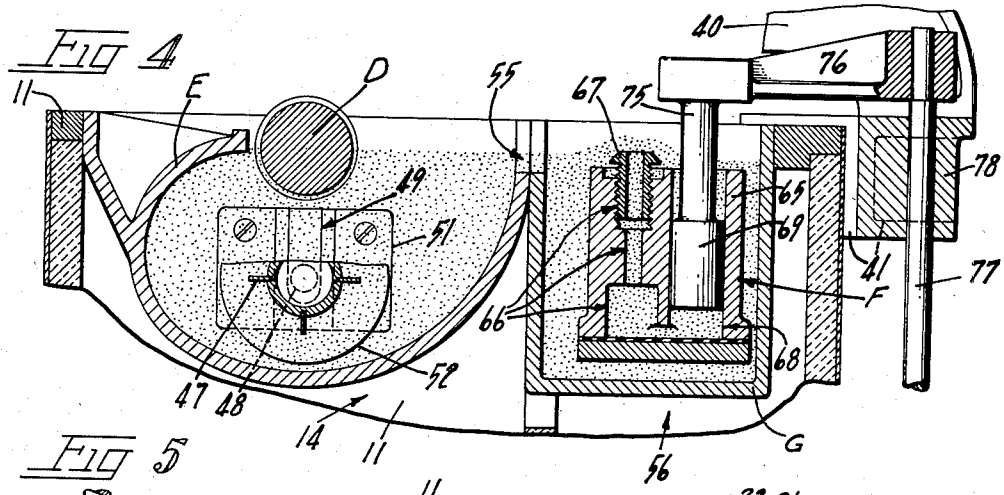
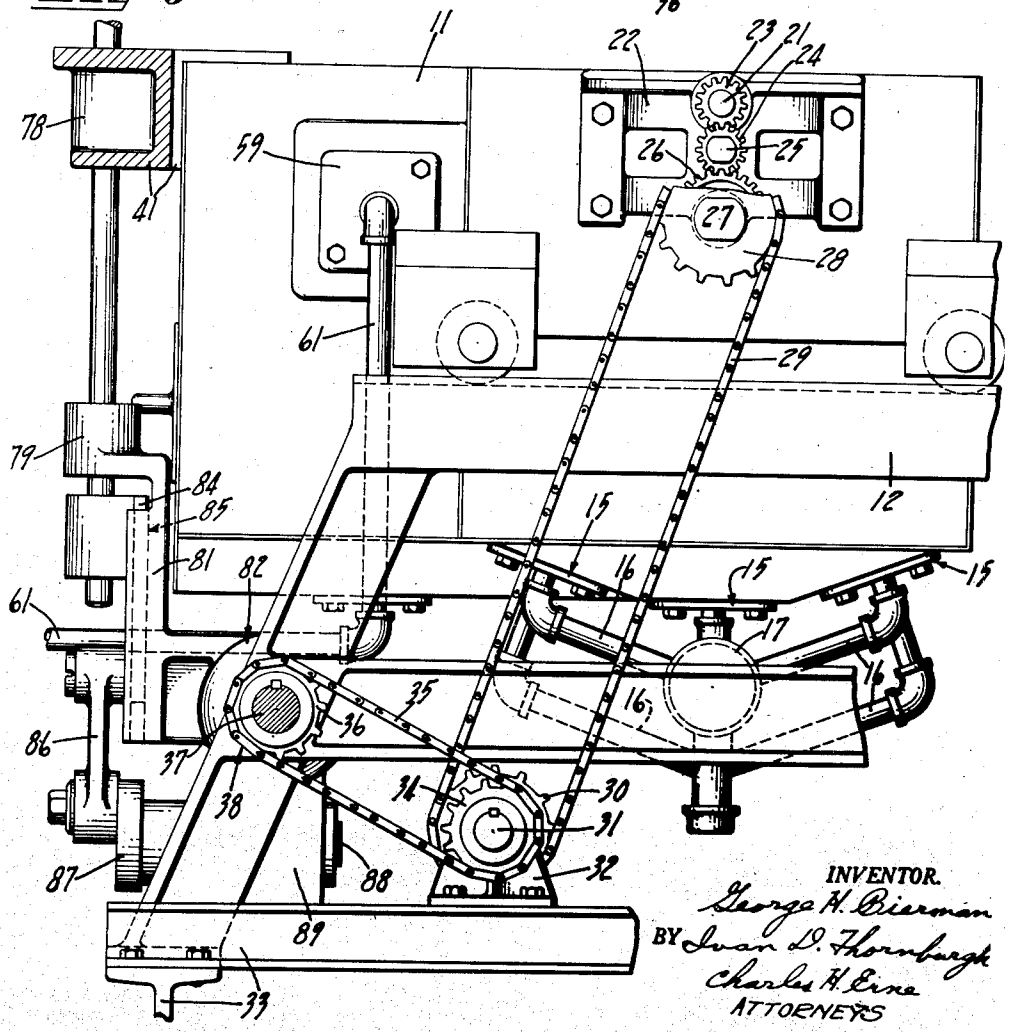


FIG 5



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PUMP DEVICE FOR MACHINES FOR APPLYING COATING MATERIAL TO ARTICLES MOVING IN PROCESSIONS

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Application January 23, 1943, Serial No. 473,378

4 Claims. (Cl. 103—39)

The present invention relates to a machine for applying a liquid coating substance onto sheet metal can bodies and the like from a bath of such substance and has particular reference to pump devices for maintaining a predetermined surface level of the substance in the bath.

In certain kinds of machines used in the container or can making industry, such as by way of example, can body side seam soldering machines, adhesive applying machines, stripe coat applying machines, and the like, the liquid substance is contained in an open reservoir or bath from which it is transferred by an applying roller onto the articles to be coated. In high speed operating machines where articles to be coated are passed along in a continuous procession which is sometimes interrupted, it is often difficult to maintain the surface level of the substance in the bath at the desired predetermined height so that a sufficient supply of the liquid will always be in the bath.

The instant invention contemplates overcoming this difficulty by providing a fluid pump device which will maintain the correct predetermined quantity of coating substance in a bath at all times.

An object therefore of the invention is the provision of pump devices in a machine for applying a liquid coating substance to articles, such pump devices being submerged in the liquid and operating to maintain a predetermined quantity of liquid substance in the bath at all times.

Another object is the provision in such pump devices of a discharge nozzle which may be adjusted to regulate and to maintain the surface level of the liquid in the bath at a predetermined height.

Numerous other objects and advantages of the invention will be apparent as it is better understood from the following description, which, taken in connection with the accompanying drawings, discloses a preferred embodiment thereof.

Referring to the drawings:

Figure 1 is a top plan view of a liquid applying machine embodying the instant invention with parts broken away;

Fig. 2 is an enlarged sectional detail taken substantially along the line 2—2 in Fig. 1, with parts broken away;

Fig. 3 is an enlarged transverse section taken substantially along the broken line 3—3 in Fig. 1, with parts broken away;

Fig. 4 is a sectional view similar to Fig. 3 and showing certain of the moving parts in a different position; and

Fig. 5 is an enlarged end elevation as viewed from the right in Fig. 1, with parts broken away.

As a preferred embodiment of the invention the drawings illustrate principal parts of a soldering machine in which molten solder is applied to the side seams of sheet metal can bodies A (Fig. 3). In such a machine the can bodies are propelled endwise, by an endless chain conveyor B, through an outside horse C with the side seams of the bodies in engagement with a rotating solder roll D disposed in a solder bath or reservoir E. This is a usual can body side seam soldering machine construction.

The solder reservoir E is formed as part of a housing 11 which is supported on frame legs 12 (see Figs. 1 and 5) disposed at each end of the housing. The housing encloses a combustion chamber 14 which is located directly below the reservoir and which is heated by a plurality of gas burners 15 secured in the housing for maintaining the solder in the reservoir in a molten condition. These burners are connected by pipes 16 to an intake manifold 17 which leads from any suitable supply of gas.

The solder roll D extends longitudinally of the reservoir E and is formed with trunnions 21 (Fig. 1) which are journaled in bearing brackets 22 bolted to the ends of the reservoir housing 11. The roll D is continuously rotated by a spur gear 23 (see also Fig. 5) which is mounted on one of the trunnions. The gear 23 meshes with an idler gear 24 mounted on a stud 25 threaded into the adjacent bearing bracket 22. The idler gear meshes with a driving gear 26 mounted on a stud 27 threaded in the bracket.

The driving gear 26 is secured to a sprocket 28 which is also mounted on the stud 27 and this driving gear is rotated by an endless chain 29. The chain also operates over a sprocket 30 mounted on a jack shaft 31 journaled in a bearing bracket 32 bolted to a frame 33 which constitutes the main frame of the soldering machine. The frame legs 12 are bolted to this main frame 33. The jack shaft is rotated by a sprocket 34 which is keyed thereto and which carries an endless chain 35. This chain is driven by a sprocket 36 mounted on a main drive shaft 37 journaled in bearings 38 formed in the frame legs. The main drive shaft is rotated from any suitable source of power.

The horse C extends approximately parallel with the solder roll D and is disposed directly above the solder roll. This horse is supported on

overhanging brackets 40 (Figs. 1 and 3) which are bolted to a longitudinal rail 41 which forms a part of the main frame 33.

The conveyor B operates over a pair of spaced sprockets located at the ends of the machine and one of these sprockets serves as a driving sprocket. Intermediate the sprockets the chain is supported on guide rails. The upper run of the chain rests on a longitudinal guide rail 42 while the lower run of the chain is supported by a pair of spaced and parallel track rails 43, these rails providing tracks for rollers 44 carried on the chain at spaced intervals. Feed fingers 45 carried by the chain engage behind the can bodies in the usual manner and propel them through the horse C.

The molten solder in the reservoir E is agitated by a hollow paddle wheel 47. This prevents accumulation of mush metal in the reservoir. "Mush metal" is a term used in can manufacture to designate the thick by-product of lead and tin of the solder which combines with iron and other impurities in the solder bath. It is not a soldering agent.

Paddle wheel 47 is submerged in the solder and extends parallel with and directly under the solder roll D. The wheel is formed with trunnions 48 which operate in vertical grooves 49 (see Fig. 4) of bearing blocks 51 disposed inside the reservoir and bolted to the ends thereof. Adjacent the trunnions the paddle wheel is formed with actuating discs 52 which frictionally engage against the solder roll. Through the buoyant action of the solder the discs of the submerged paddle wheel are held against the solder roll and hence the rotation of the roll rotates the paddle wheel. It is this action that keeps the solder agitated.

The molten solder is maintained at a predetermined level in the reservoir E by a pump device F which is located in an auxiliary reservoir G. The auxiliary reservoir is disposed adjacent the main reservoir and is in communication therewith by way of an overflow opening 55 in the separating walls so that the level of the solder in the main reservoir will correspond to or be the same as that in the auxiliary reservoir. Molten solder is supplied to these reservoirs by way of the pump device from a pre-melting tank H which is disposed adjacent the reservoir.

The auxiliary reservoir G and the pre-melting tank H are located within the housing 11 and are disposed in an auxiliary combustion chamber 56 (Fig. 3) formed in the housing. This chamber is heated by a gas burner 57 which is secured in the housing and which receives gas by way of a pipe 58 which leads from the source of gas supply hereinbefore mentioned. An auxiliary heater 59 (Figs. 1 and 5) disposed in a side of the housing 11 also supplies heat to the auxiliary chamber. This heater is connected by a pipe 61 to the source of gas supply.

The pump devices F include a pump casing 65 (Figs. 3 and 4) which is submerged in the molten solder in the auxiliary reservoir G and which is bolted in place to the partition wall between this reservoir and the pre-melting tank H (see Fig. 2). The casing is formed with a vertical discharge channel 66 (Figs. 3 and 4) of various diameters having at its upper end a discharge nozzle 67 threaded in the casing so that the nozzle can be adjusted vertically.

The discharge channel 66 extends down to the bottom of the casing where it communicates with a vertical cylinder 68 disposed adjacent thereto. Cylinder 68 contains a piston 69. Near the middle of the cylinder, a pair of aligned ports 71, 72 (Fig. 2) formed respectively in the pump casing 65 and in the partition wall of the auxiliary reservoir, connects the cylinder with the interior of the pre-melting tank H.

The piston 69 is formed on the lower end of a stem 75 (Figs. 3 and 4) which is carried in an overhanging arm 76. The arm is mounted on the upper end of a vertical actuating rod 77 carried in a pair of spaced bearings 78, 79. The upper bearing 78 is formed on the rail 41 of the main frame 33 while the lower bearing 79 is formed on a housing 81 of a gear reduction unit 82 secured to one of the main frames.

The lower end of the actuating rod 77 is connected to a slide 84 mounted in a vertical slideway 85 formed in the reduction unit housing 81. The slide is connected by a link 86 to a crank disc 87 formed on one end of a short shaft 88 journaled in bearings 89 of the reduction unit housing. The shaft is continuously rotated by a worm wheel 91 which meshes with a worm 92 mounted on the main driving shaft 37.

Hence through this worm and worm wheel connection with the main driving shaft 37, the actuating rod 77 is vertically reciprocated. This rod in turn reciprocates the pump piston 69 through an up or intake stroke and thence through a down or discharge stroke within its cylinder 68 in time with the other moving parts of the machine.

On the up stroke, the piston 69 rises to a position just above the intake ports 71, 72 and thus opens the ports and permits molten solder from the pre-melting tank H to flow into the pump cylinder 68 as shown in Figs. 2 and 3. This solder fills the cylinder and the discharge channel of the pump up to the level of the solder in the pre-melting tank, which level is maintained at a lower level than that of the solder reservoirs E and G.

On a down stroke, the pump piston 69 moves down over the port 71 and thereby cuts off communication between the cylinder 68 and the pre-melting tank H. This prevents back flow of solder from the cylinder into the tank. As the piston continues its downward travel (as shown in Fig. 4), it forces the solder from the cylinder into the discharge channel 66 and ejects it from the discharge nozzle 67 into the solder reservoirs E and G. This discharge of solder into the reservoirs replenishes that taken out by the solder roll D.

The quantity of solder ejected into the solder reservoirs E and G is slightly greater than that taken out by the solder roll. Hence this excess solder momentarily increases the height of the solder level slightly in the reservoirs. However, on the next up stroke of the pump piston 69, some of this excess solder flows back by way of the discharge nozzle 67 into the discharge channel 66 and the cylinder 68 of the pump.

This flow of excess solder continues until the level of the solder in the reservoir is flush with the top of the discharge nozzle, as best shown in Fig. 3. Hence the nozzle holds back the solder in the reservoir up to the level of the nozzle mouth, while that within the discharge channel continues to fall until the piston reaches its uppermost position of its up stroke. This uncovers the ports 71, 72.

At the top of the piston stroke, any solder within the pump at a level above that in the pre-melting tank H will flow back into the tank

through the opened ports 71, 72. If on the other hand the level of the solder within the pump is lower than that in the tank, solder will flow from the tank into the pump until the levels are equal.

On the next down stroke of the pump piston 69 the solder replenishing operation is repeated. In this manner the level of the solder in reservoirs E and G is maintained at a predetermined height at all times. Through the adjustable vertical position of the discharge nozzle 67, its top surface may be elevated to any desired height. Since it is the vertical position of the mouth of the nozzle that determines and maintains the surface level of the solder in the reservoirs, any desired level is controlled directly by a mere turning of the nozzle.

It will be understood that the usual practice of using a liquid flux on the surface of the solder bath may or will be herein employed but this does not change the procedure of soldering as described.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the form, construction and arrangement of the parts without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the form hereinbefore described being merely a preferred embodiment thereof.

I claim:

1. In a machine for applying a liquid substance onto articles moving in a procession, the combination of a reservoir for retaining the liquid, a supply tank from which liquid is received to replenish said reservoir, pump devices for transferring the liquid from the tank to said reservoir, and a discharge nozzle connecting with said pump devices and located in said reservoir for delivering liquid to the reservoir and for draining away excess liquid while holding back the remaining liquid to maintain its surface level at a predetermined height within said reservoir.

2. In a machine for applying a liquid substance onto articles moving in a procession, the combination of a reservoir for retaining the liquid, a supply tank from which liquid is received to replenish said reservoir, pump devices for transferring the liquid from the tank to said reservoir, and a movable discharge nozzle connecting with said pump devices and located in said reservoir for delivering liquid to the reservoir and for draining away excess liquid while holding back the remaining liquid to maintain its surface level at a predetermined height within said reservoir, said discharge nozzle being movable relative to said pump devices for changing the height of the surface level of the liquid in the reservoir.

3. In a machine for applying a liquid substance onto articles moving in a procession, the combination of a reservoir for retaining the liquid, a supply tank from which liquid is received to replenish said reservoir, pump devices submerged in the liquid in said reservoir for transferring the liquid from the tank to said reservoir, and a discharge nozzle connecting with said pump devices and located adjacent the surface level of the liquid in said reservoir for delivering liquid to the reservoir and for draining away excess liquid while holding back the remaining liquid to maintain its surface level at a predetermined height within said reservoir.

4. In a machine for applying a liquid substance onto articles moving in a procession, the combination of a reservoir for retaining the liquid, a supply tank from which liquid is received to replenish said reservoir, a pump casing located in said reservoir and having a cylinder connected by an intake port with said tank and by a discharge channel emptying into said reservoir, a reciprocable piston within said cylinder for forcing liquid into said discharge channel as the liquid is received in said cylinder by way of said port, means for reciprocating said piston, and a discharge nozzle in said pump casing and connecting with said discharge channel for delivering the liquid to the reservoir and for draining back excess liquid into said tank while withholding the remaining liquid in the reservoir to maintain its surface level at a predetermined height within said reservoir.

GEORGE H. BIERMAN.