United States Patent

[11] 3,575,135

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[54] **LIQUID-APPLYING APPARATUS**
10 Claims, 3 Drawing Figs.

[52] **U.S. Cl.** **118/243**
[51] **Int. Cl.** **B05c 1/02**
[50] **Field of Search** 118/263, 7, 243

[56] **References Cited**

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ABSTRACT: A liquid-applying apparatus for transferring a measured amount of liquid, such as liquid globule, from a body of such liquid stored in a receptacle to an object relatively remote from the receptacle. The apparatus finds particular usage on production lines where it is desired to apply a small amount of liquid substance to each product undergoing fabrication as it steps along the line. The receptacle is provided with an interior catch basin or reservoir for holding a measured amount of liquid obtained from that stored in the receptacle. A dauber or applicator reciprocably moves between the receptacle and the production line in timed relation to the advancement of the products making contact at one end of its motion with the liquid in the catch basin to pick up the liquid to be delivered and depositing at the other end of its motion the picked-up liquid on a product advancing along the production line. Provision is included for automatically raising and lowering the level of the liquid in the receptacle in synchronism with the transfer motion of the applicator and raising the liquid to fill the catch basin after each time the applicator leaves the receptacle and lowering the liquid level below the basin when the applicator returns to the receptacle for replenishment.

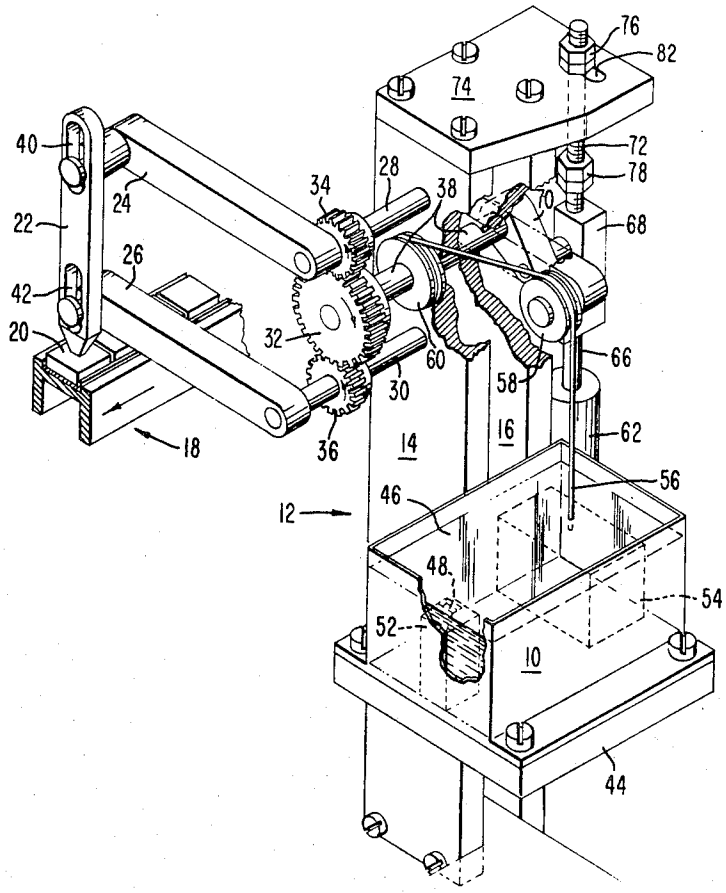
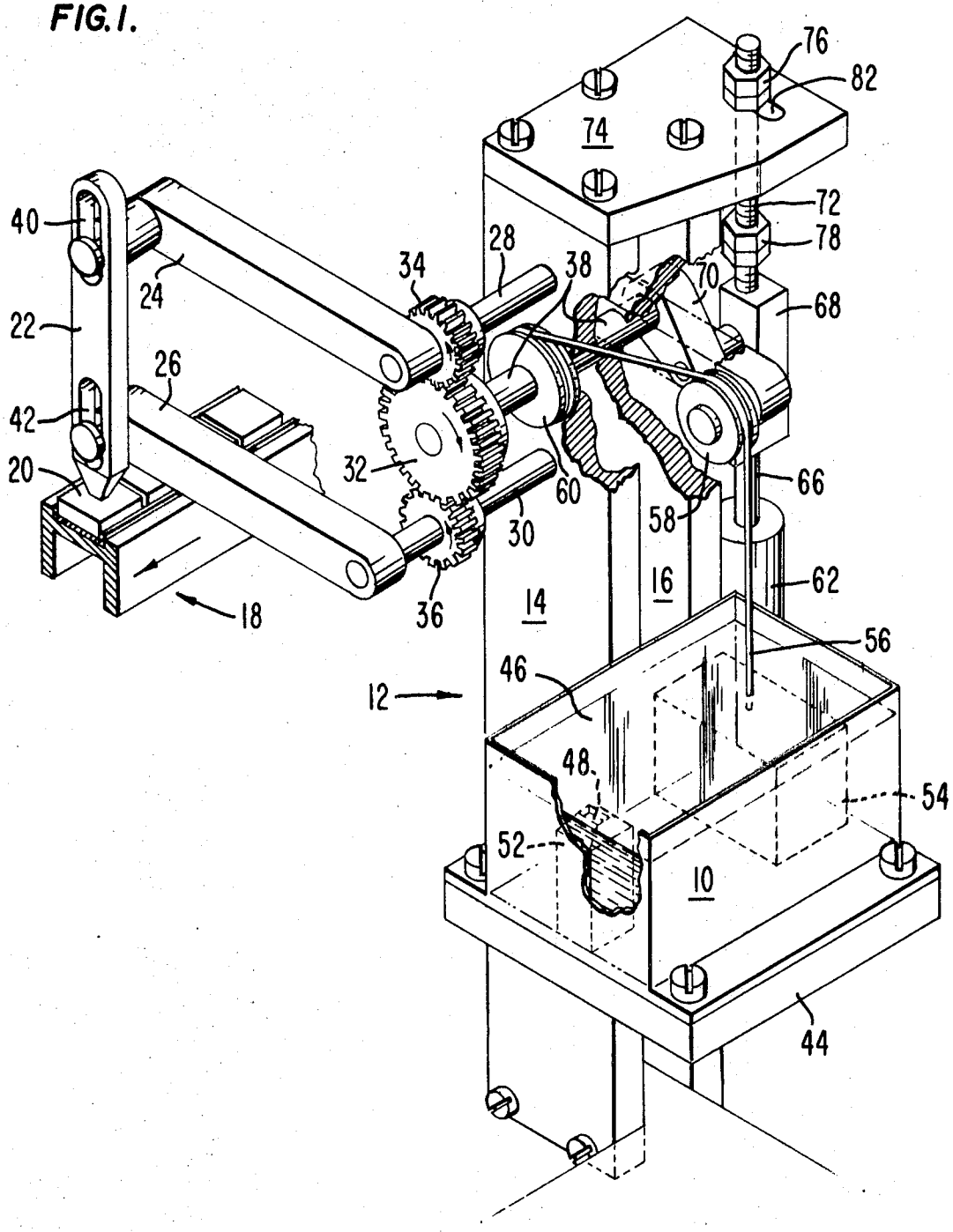


FIG. 1.



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FIG.2.

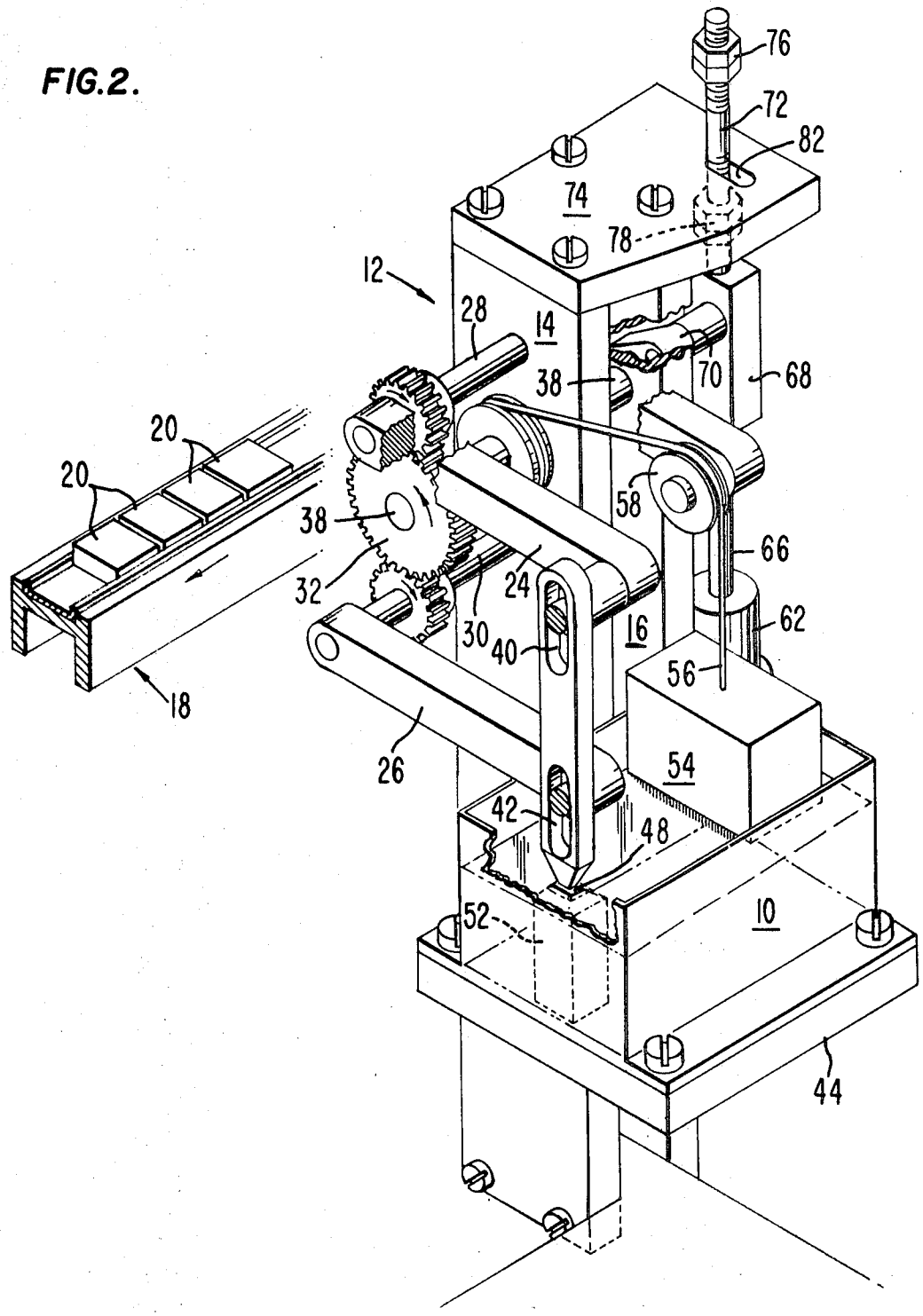
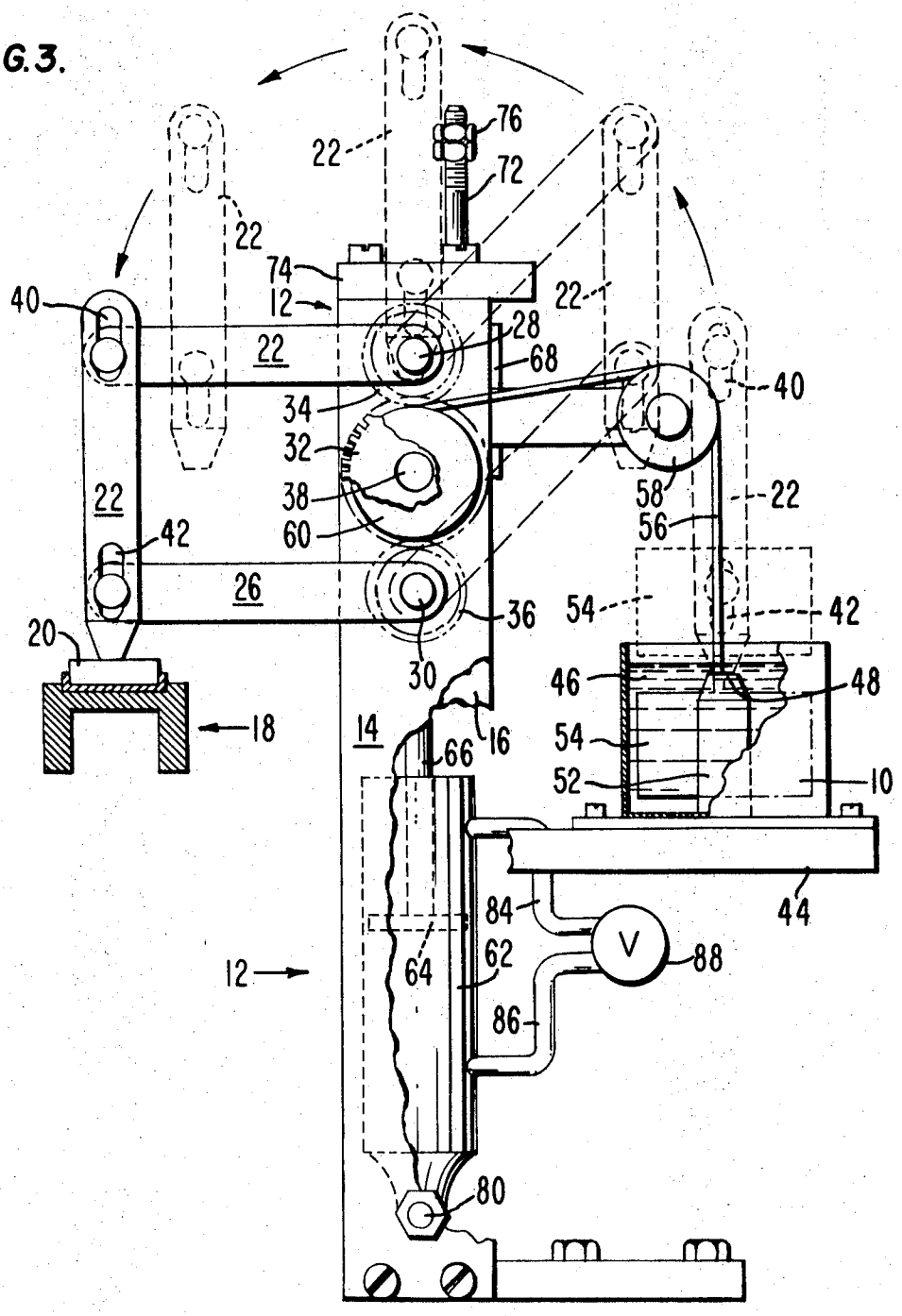

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FIG. 3.


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LIQUID-APPLYING APPARATUS

SUMMARY OF THE INVENTION

An important object of the invention is to provide a simply constructed, inexpensive and reliable apparatus for automatically extracting a limited amount of liquid substance from a source of such liquid and delivering the extracted liquid to an article remote from the pickup location in the receptacle.

Another important object of the invention is to provide improved apparatus of this nature which will expedite fabrication of products on assembly lines and which will function automatically and unattended to apply just the desired amount of liquid to articles undergoing production as they are successively advanced along the line.

A further object of the invention is to provide an improved apparatus for picking up and applying liquid globules to objects successively brought adjacent thereto which includes a novel transfer mechanism for picking up and delivering a liquid globule to each such object and further includes a receptacle serving as a source of such liquid having provision therein for automatically presenting a fresh globule of liquid for pickup by the transfer mechanism each time it returns to the liquid source in the receptacle.

In carrying out the objects of the invention, an apparatus is provided with a reciprocable transfer mechanism with repetitively functions to pick up a measured amount of liquid at one end of its motion from a source of such liquid and transfer the picked-up liquid to a relatively distant object where it is applied thereto and then returned to the source for replenishment. An important feature of the apparatus is the provision for loading the transfer mechanism with the desired quantity of liquid each time it returns the source of liquid and for presenting a new quantity of liquid for the next time around of the transfer mechanism. To accomplish this action, the liquid source is contained in a receptacle having a catch basin therein for holding the measured amount of liquid for transfer. Means is operatively associated with the transfer mechanism for automatically raising and lowering the level of the liquid in the receptacle in timed relation to the delivery and return motions of the transfer mechanism. The basin is so designed that a new supply of liquid will flow thereto only when the liquid level is raised to its higher level.

More specifically, the invention contemplates apparatus for picking up, delivering and applying a liquid globule to a product undergoing fabrication and then returning to a source of such liquid for repeating this action. A particular form of apparatus embodying the invention may be used adjacent to a production line along which articles being assembled are successively passed. Each liquid globule is removed by a dauber or applicator from a source of liquid in a receptacle and transferred to each article as it moves down the production line, the applicator effecting a reciprocal motion between the receptacle and the line in timed relation to the advancement of the articles. Concurrently with the motion of the applicator, the liquid within the receptacle is raised to a higher level for the purpose of filling a small catch basin with liquid while the applicator is out of the receptacle following which the level is lowered before the return of the applicator to the basin. The basin is located within the receptacle in line with the path of movement of the applicator and the two are shaped such that upon contact with one another the desired measure or globule of liquid is transferred from the basin to the applicator. The invention further contemplates novel drive mechanism for bodily translating the applicator from the receptacle to the production line with the extracted liquid globule suspended from the applicator for direct and immediate application to each successive article advancing along the production line. This drive mechanism also automatically raises and lowers the liquid level in the receptacle in timed relation to the motion of the applicator, and in a specific form of the invention accomplishes this action by means of mass whose amount of immersion in the liquid body in the receptacle is varied in accordance with the motion of the applicator.

The above-listed objects and aspects of the invention will be further expanded in the following detailed description. For a more complete understanding of the invention reference may be had to the following detailed description in conjunction with the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 and 2 are similar perspective views of apparatus embodying the invention showing the operating parts in different positions and partially broken away to expose concealed portions of the apparatus to view; and

FIG. 3 is a schematic view in side elevation of the transfer mechanism of the apparatus of FIGS. 1 and 2 showing in full and dotted outline the pickup and applying positions thereof and further illustrating the manner of automatically changing the level of the source of liquid in response to the movement of the transfer mechanism.

DESCRIPTION OF A PREFERRED EMBODIMENT

FIGS. 1 to 3 illustrate a preferred embodiment of the invention in which form a small quantity of liquid, such as a liquid globule or drop, is transferred from a liquid-containing receptacle to a conveyor track along which partially assembled products are fed. In this embodiment, the receptacle, identified at 10, is supported by and mounted on one side of an upright structure generally indicated at 12 and in the main composed of two upright parallel members 14 and 16. Extending along the other side of the upright structure 12 is a conveyor track 18 serving in this instance as an assembly line along which partially completed articles or products 20 are advanced. No attempt is made in the FIGS. to represent any particular article and accordingly a rectangular block 20 is simply used for such purpose. The articles may be advanced in the direction indicated by the arrow on the track in FIG. 1 and stepped intermittently therealong, pausing opposite to the structure 12 momentarily in order to receive a drop or globule of the liquid contained in the receptacle 10.

Bodily translatable between the receptacle 10 and track 18 is a liquid dauber or applicator 22 which is shown in the illustrated embodiment of the invention as an elongated slotted member having the lower end thereof tapered to a reduced cross section providing a small surface area for picking up the drop or globule of liquid. As better shown by the dotted- and full-line positions of the member 22 in FIG. 3 it is capable of being bodily moved from a position vertically extending above the receptacle 10 where it picks up the liquid globule to a similar vertical position above an article 20 where it functions to deposit the liquid globule thereon.

The applicator 22 is pivotally carried on the common end of a pair of parallel extending links 24 and 26. The opposite ends of these two links are fixed to parallel shafts 28 and 30 respectively each projecting laterally from the upright structure 12. The applicator 22 and the two links 24 and 26 may be considered as forming three sides of a parallelogram. The fourth side may be considered as being constituted by a train of gears comprising a center driving gear 32 and two smaller pinions 34 and 36 engaging diametrically opposite portions of the drive gear. The driving gear 32 is fixed to shaft 38 and rotation thereof in one or the other direction will impart rotation to the pinions 34 and 36 and through their respective shafts swing the links 24 and 26 in arcuate paths from one side to the other side of the upright support 12 carrying the applicator 22 therewith. In order that the two links 24 and 26 may pass one another when traversing their respective arcs, they are mounted for swinging movement in spaced-apart vertical planes, the lower link 26 being connected to the outer end of longer extending shaft 30 as compared to the upper link 24 which is connected to a shorter shaft 28. It is evident, therefore, from FIGS. 1 to 3 that this parallelogram arrangement will bodily transport the

applicator 22 from one side to the other side of the upright structure 12 while maintaining the applicator always in the same attitude or a vertical position.

Also the applicator member 22 has a loose pivotal connection with each of the two links 24 and 26 providing a permissible vertical movement with respect to the links. This is accomplished by providing an elongated slot at each of the connections to these links, the slot in the applicator for the upper link being identified at 40 and the slot in the applicator for the lower link at 42. The limited vertical movement provided by the slots enables the link to move vertically with respect to the links 24 and 26 for a certain advantage pointed out hereafter.

The receptacle 10 may be supported upon a shelve or platform 44 fixed to the upright structure 12 at an elevated position above the base thereof and on a level approximating that of the assembly line track 18. In operation, the receptacle will serve to store a body of liquid 46. Formed inside the receptacle 10 is a catch basin or reservoir indicated at 48 in the two FIGS. The basin may be formed by an upwardly opening recess at the top of a truncated section 50 of a post 52 rising from the bottom of the receptacle. As is evident in FIG. 2, the post 50 is deposed in line with the path of movement of the applicator 22 as the latter completes its downward motion over the receptacle 10. The lower tapered end of the applicator 22 is shaped to abut the upper edges of the basin 48 in the manner shown by the dotted position thereof in FIG. 3, and in this position further downward of the applicator is obstructed. The presence of its slots 40 and 42 of the applicator enables the links 24 and 26 to override the applicator after the latter contacts the basin 46. In like fashion this loose connection allows the links to override the applicator when the latter makes contact with an article advancing down the track 18. Such a provision avoids the necessity of precisely setting the amount of rotation to be imparted to the drive gear 32 and the pinions 34 and 36 for driving the parallelogram linkage in order to stop the movement of the applicator the instant it contacts either the basin or the article.

As the bottom end of the applicator 22 abuts the edge of the catch basin 48, it picks up some of the liquid therein. When the catch basin is filled with liquid, the surface tension of the liquid causes it to bulge above the edges of the basin, and when the applicator is brought down upon the post 52 the bottom surface area thereof breaks the surface tension of the liquid body in the basin causing a part of this liquid to transfer from the basin to the bottom end of the applicator. Thereafter, the transferred drop of globule of liquid is carried on the bottom end of the applicator from the vessel or receptacle 10 to the assembly link track 18 where it is deposited on the article 20 in position to receive the same.

During each movement of the applicator from the receptacle to the assembly track 18 and return, the catch basin 48 is completely refilled with liquid which it receives from the liquid content of the receptacle. This is automatically accomplished by causing the liquid level in the receptacle to rise above the level of the catch basin 48 and then to recede to a level below the basin before the applicator 22 returns for replenishment. A particularly economical way of accomplishing this action takes advantage of the rotative relationship of the gear wheels 32, 34 and 36 and is utilized in the present embodiment of the invention. A mass in the form of a rectangular block 54 is raised and lowered in another part of the receptacle. When the receptacle is properly filled and the mass 54 lowered into the receptacle, the volume of liquid displaced by the mass is sufficient to raise the level of the liquid body 46 in the receptacle to a level above that of the catch basin, and when the mass is lifted the consequent reduction in the liquid volume which it displaces causes the liquid level to fall below that of the basin. However, each time the liquid level is lowered below the basin, it leaves a small amount of the liquid therein to be picked up by the applicator. With reference to FIG. 3, the two different levels assumed by the liquid body 46 in the receptacle are shown at the right thereof and respectively correspond to the full-line and dotted-line positions of the mass 54.

The raising and the lowering of the mass 54 is controlled by the driving provision for swinging the applicator 22 from one side to the other side of the upright structure 12. As shown in the two FIGS. a cord or cable 56 is connected at one end to the upper part of the mass 54 and extends over a pulley 58 for attachment at its opposite end to a grooved wheel 60 which is fixed to the shaft 38 upon which the drive wheel 32 is mounted. It will be apparent from the operating geometry that the applicator controlling pinions 34 and 36 will rotate in directions opposite to that of the drive gear 32 and its shaft 38 and that therefore the mass 54 will be lowered into the liquid content of the receptacle when the links swing the applicator to the assembly line track 18 and will raise the mass higher in the liquid of the receptacle when the applicator returns to the receptacle for picking up the next succeeding globule of liquid.

Various provisions may be made for operating the drive gear 32 in order to swing the applicator alternately in opposite directions. In the embodiment disclosed herein this is accomplished by means of an air-pressure-operated cylinder identified at 62 having a piston 64 therein moveable in opposite directions by controlled flow if air into and out of the areas of the cylinder on opposite sides of the piston. The cylinder is mounted in vertical position along the rear side of the back-supporting member 16 of the upright structure 12, and projecting from the upper end of the cylinder there is a rod 66 connected to the piston therein. The rod in turn carries a block 68 upon which is journaled one end of a crank arm 70. The opposite end of the crank arm is fixed to the shaft 38 which rotates the drive wheel 32. Forming an upper extension of block 68 is a control bar 72 which passes through a top plate 74 fixed to the two upright supporting members 14 and 16. The bar 72 carries two sets of adjustable nuts 74 and 78 on opposite sides of the plate for engaging the plate and limiting the throw or stroke of the piston 64 and its rod 66.

To accommodate the arcuate movement of the crank arm 70 as it rocks the shaft 38, the cylinder 62 and associated parts including the rod 66 and control bar 72 are mounted for slight swingable movement in a vertical plane paralleling the plane of movement of the crank arm 70. For this purpose the bottom end of the cylinder 62 is pivotally supported upon a stud 80 allowing pivotal oscillation of the cylinder about its axis. The control bar 72 has a limited degree of sidewise movement provided by a slot 82 in the plate 74 through which the bar extends. In this manner the air cylinder 62 and its piston extensions will oscillate about the axis of the stud 80 to accommodate the swing of the crank arm 68.

Conduits for admitting fluid into and discharging fluid from the end sections of the cylinder are shown at 84 and 86. Preferably the conduits are made of flexible material to allow for the slight oscillatory movement of the cylinder. A valve generally shown at 88 operates in timed sequence with the advancement of the articles 20 along the production line track 18, delivering fluid through one of the conduits 82 or 84 while permitting fluid to discharge from the other conduit. This will cause the piston 64 to travel first in one direction then in the opposite direction in the cylinder 62 thereby raising and lowering the rod 66 and rocking the crank arm 70 to impart rotative movement to the drive wheel 32 alternately in opposite directions.

The operation of the apparatus is believed to be clearly understood from the previous description of the parts thereof. Nevertheless, the operation may be briefly set forth in one recitation for the convenience of the reader. Reciprocal movement of the piston in the cylinder 62 will swing the crank arm 70 back and forth imparting oscillatory motion to the shaft 38 and the drive gear 32. By virtue of the engagement of the pinions 34 and 36 with the drive gear, they will be rotated in the opposite direction thereto but in the same direction to one another and bodily carry the applicator from one side to

the other side of the supporting structure **12**. Since the weighted mass is coupled to the drive shaft **38** its movement is in the direction of the drive gear and accordingly reversed to that of the applicator with respect to the vessel or receptacle **10**. The result is that when the applicator **22** is bodily moved by the links out of and away from the receptacle **10** the mass **54** is lowered into the receptacle to cause the liquid level to rise therein and fill the basin or reservoir **48**. However, when the drive member **32** is rotated in the reverse direction, it raises the mass **54** thereby lowering the liquid level below that of the basin while at the same time the links **24** and **26** return the applicator to the receptacle and lower it into contact with the basin to pick up its next load. These motions occur in timed relation to one another and to the conveyance of the articles **20** along the assembly line **18** so that when the applicator is swung over in that direction one of the articles **20** is in position to receive the load carried by the applicator. It is to be noted that the geometry of the system transports the applicator in the same attitude or vertical position throughout its movements carrying the liquid drop or globule in suspension on the lower end thereof.

While a particular embodiment of the invention has been shown and described, it will be understood, of course, that it is not desired that the invention be limited thereto since modifications may be made. The foregoing explanation is therefore by way of illustration only. For example, although the apparatus is illustrated herein as being capable of depositing liquid drops or globules, the apparatus could be designed for picking up larger measures of liquid quantities and fluent solid material. It is, therefore, contemplated by the appended claims to cover any such modifications as fall with the true spirit and scope of the invention.

I claim:

1. Liquid-applying apparatus comprising, in combination, a receptacle adapted to contain a body of liquid, a reservoir in the receptacle adapted to contain a measured amount of the same liquid therein, means for changing the liquid level in the receptacle from a level below that of the reservoir to a higher level capable of flowing liquid into the reservoir, an applicator for applying a liquid globule, means mounting the applicator for bodily translatable movement from inside the receptacle where it contacts the reservoir to pick up a globule of liquid therefrom to a position remote from the receptacle where it deposits the liquid globule on an object, and means for moving said applicator in timed relation with the liquid-level-changing means and causing the applicator to contact the liquid in the reservoir when the liquid level is below the same and to lift the applicator out of the reservoir with a liquid globule attached thereto before the liquid level in the receptacle is raised to the level for filling the reservoir.

2. The invention described in claim **1** characterized in that the means for bodily translating the applicator comprises a pair of arms pivotally connected to the applicator to form a parallelogram arrangement for swinging the applicator in an arc from the receptacle to the object upon which the liquid globule is to be deposited and returned.

3. A liquid applicator comprising, in combination, a receptacle adapted to contain a body of liquid, a reservoir in the receptacle for containing a measured amount of the same liquid in the receptacle, means for changing the level of the liquid contained within the receptacle between two different levels, the higher level being capable of introducing liquid into the reservoir whereas the lower level is incapable of so doing, a dipping member mounted for movement into and out of contact with the liquid introduced into the reservoir to pick up a quantity of liquid therefrom, and means for moving said dipping member in timed relation with the means for changing the liquid level in the receptacle and causing the member to contact the liquid in the reservoir when the liquid body is at said lower level and to withdraw the member from contact with the liquid in the reservoir before the liquid body is raised to said higher level.

4. The invention described in claim **3** characterized in that the reservoir is in the form of an opened top basin over the sidewalls of which the liquid in the receptacle flows to fill the same at the time the liquid body is raised to its higher level, and in that the dipping member is shaped at its lower extremity to abut the top edge of the basin in order to effect transfer of liquid from the reservoir to the member.

5. In a liquid applicator, a vessel for containing a body of liquid, a member mounted for movement and having a vertical component of motion within the vessel, means for alternating raising and lowering the member with respect to the vessel, and means for changing the level of a body of liquid in the vessel in timed relation with the raising and lowering of the member and operable to raise the liquid level within the vessel when the member is raised and to lower the liquid level when the member is lowered.

6. The invention described in claim **5** characterized in that a catch basin is mounted within the vessel in line with the path of movement of the lower end of the member so as to be engaged thereby and disposed at a level in the basin between the upper and lower levels to which the liquid in the vessel is raised and lowered by said second means.

7. Liquid-drop-applying apparatus including in combination, an upright structure having on one side an assembly line track along which articles are conveyed and a receptacle on the other side for containing a liquid to be deposited in drop form on articles conveyed along the track, an applicator for transferring a drop of liquid, means carried by the upright structure for bodily transporting the applicator from the receptacle to the assembly line track and return, said last means including a pair of arms forming opposite sides of a parallelogram and journaled at one of their ends to the upright structure for swinging movement in adjacent parallel planes from said one side of the structure to said other side thereof and carrying the applicator on the other free ends of the arms, a reservoir in the receptacle for presenting a small quantity of liquid therein to the applicator when it is transported thereto, and means operable during the time that the applicator is away from the receptacle for filling said reservoir with liquid from the receptacle.

8. The invention described in claim **7** characterized in that said reservoir-filling means is operatively coupled to said pair of arms and accomplishes its function by raising the level of the liquid content of the receptacle to a height above the reservoir while the arms move the applicator away therefrom and lowers the level of the liquid in the receptacle below the reservoir when the arms return the applicator thereto for replenishment

9. The invention described in claim **7** characterized in that the pair of arms of the applicator-transporting means are swingable in vertical planes and are coupled to the applicator so as to maintain the applicator in the same attitude throughout its movement from the reservoir in the receptacle to the assembly line track.

10. Liquid-drop-applying apparatus comprising, in combination, a receptacle for containing a body of liquid, an applicator shaped to carry a drop of liquid in suspended condition, a pair of links forming opposite sides of a parallelogram and connected to the applicator so as to bodily transport the applicator from the receptacle to a position relatively remote therefrom and return the same without altering the attitude of the applicator, a catch basin in the receptacle operable to hold a small quantity of liquid therein, said catch basin being so disposed in the receptacle as to intercept the applicator when it returns the receptacle, a weighted mass, means suspending the weighted mass in the receptacle, a rotatable drive member, means coupling the mass-suspending means to the drive member and operable when the member is rotated in one direction to lower the mass in the receptacle and thereby to cause the level of the liquid body to fall below that of the basin, and means coupling the drive member to the pair of links and operable to swing the same and the applicator away from the receptacle during the time the mass is lowered and to swing the links and the applicator toward the receptacle for causing the applicator to pick up a drop of liquid from the basin during the time the mass is raised.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,575,135 Dated April 13, 1971

Inventor(s) John Wallace

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Col. 3, line 49, change "of" (first occurrence) to --or--

Col. 6, line 71, after "body" and before "to" insert --therein to rise above that of the catch basin to fill the same and operable when rotated in the opposite direction to raise the mass and thereby cause the level of the liquid body--.

Signed and sealed this 13th day of July 1971.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

WILLIAM E. SCHUYLER, J
Commissioner of Patent