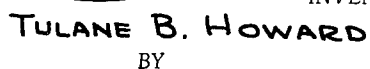


T. B. HOWARD

LIQUID SUPPLY SYSTEM

3 Sheets-Sheet 1



McMorrow, Berman + Davidson
ATTORNEYS

July 20, 1965

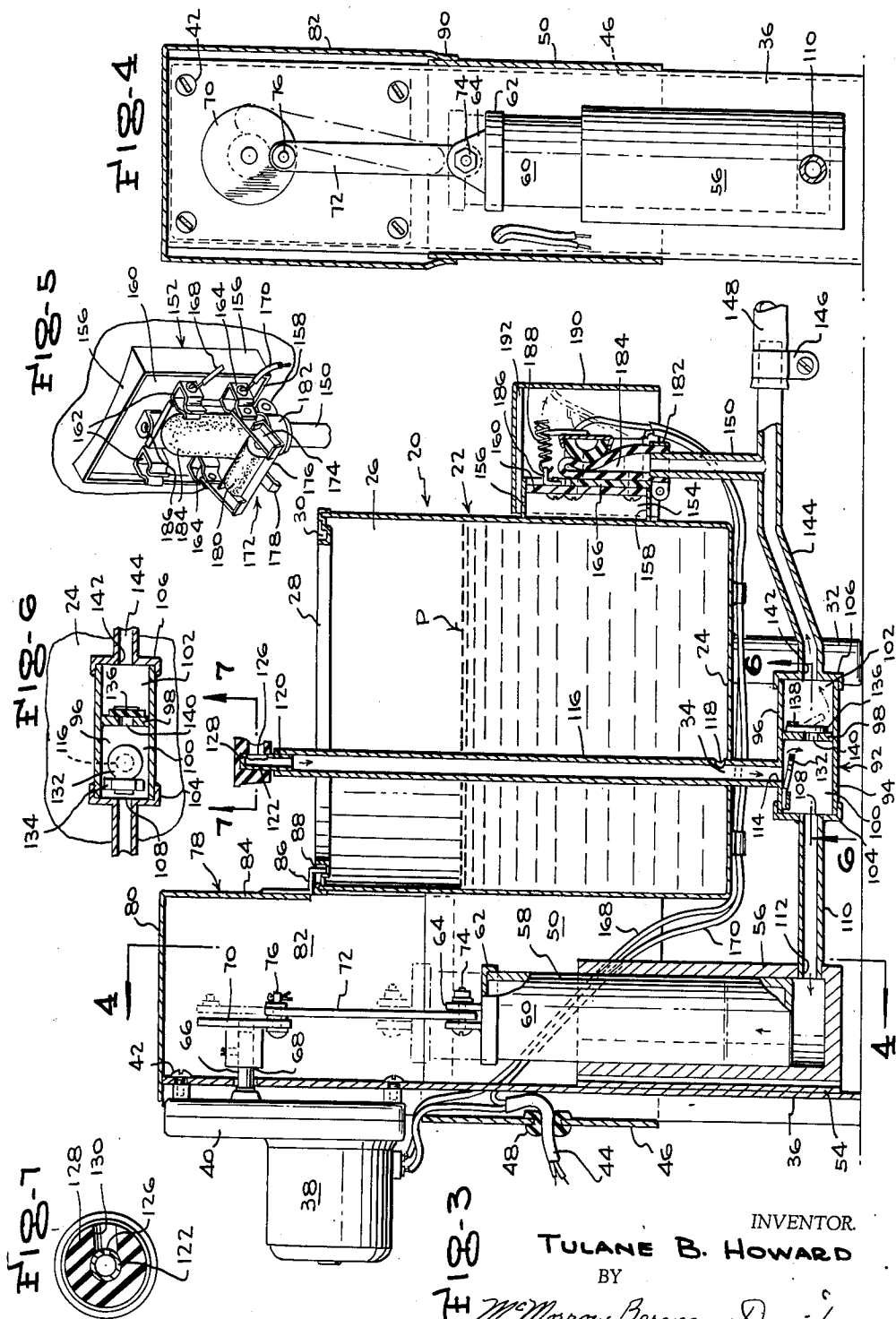
T. B. HOWARD

3,195,170

LIQUID SUPPLY SYSTEM

Filed Nov. 30, 1962

3 Sheets-Sheet 2



INVENTOR

TULANE B. HOWARD

BY

Fig. 3

McMorrow, Berman & Davidson

ATTORNEYS

July 20, 1965

T. B. HOWARD

3,195,170

LIQUID SUPPLY SYSTEM

Filed Nov. 30, 1962

3 Sheets-Sheet 3

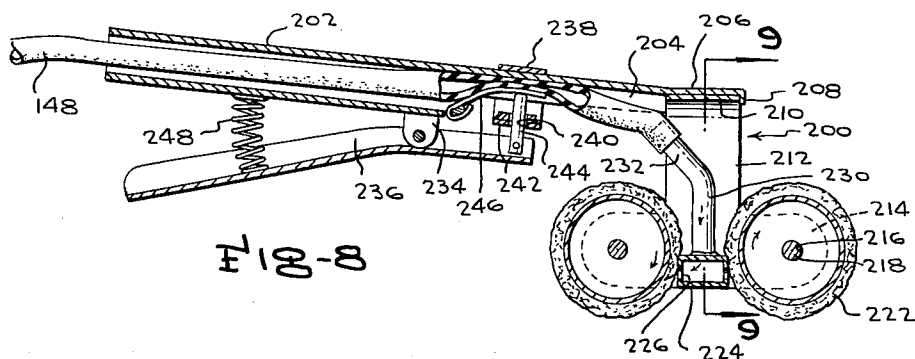


FIG-8

FIG-9

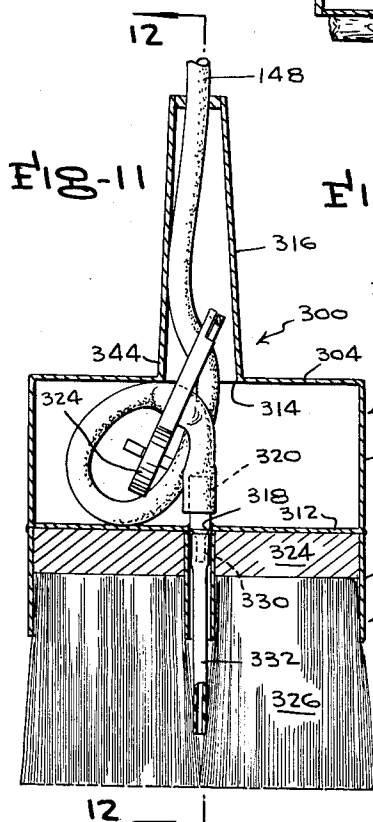
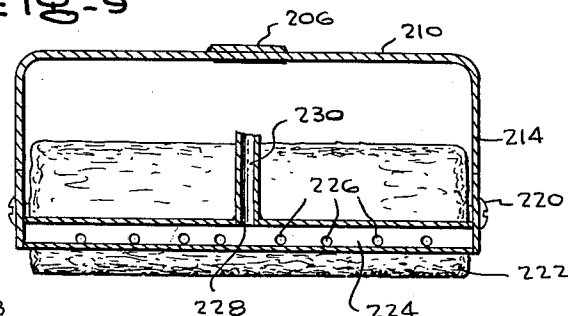


FIG-11

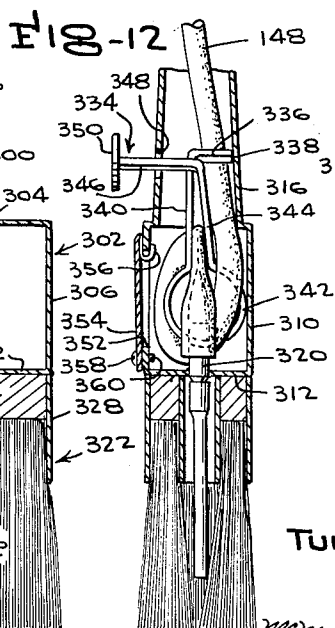


FIG-12

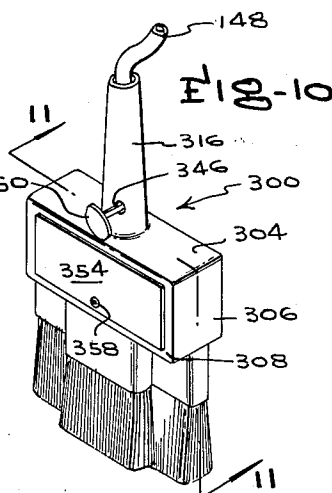


FIG-10

INVENTOR.
TULANE B. HOWARD
BY

McMorris, Permain & Davidson
ATTORNEYS

1

3,195,170

LIQUID SUPPLY SYSTEM

Tulane B. Howard, 4516 Argyle Terrace,
Washington, D.C.

Filed Nov. 30, 1962, Ser. No. 241,299

17 Claims. (Cl. 15—526)

This invention relates to a liquid supply system generally, and in the disclosed embodiment, to apparatus for supplying paint or the like to rollers or brushes.

A general objective of this invention is to supply liquid to liquid dispensing means through the employment of controlled apparatus regulating the flow of liquid to a desired rate adjusted in accordance with the viscosity of the material to be dispensed. It is recognized that automatic supply of paint to brushes has been previously known, and the present invention pertains to an improved system of such supply overcoming certain limiting features in the previously known art.

In furtherance of the general objective of the invention, the specific objects include the provision of an automatic paint supply system of non-complex construction and assembly, assembled, in large part, from readily available materials and components, which can be fabricated and sold at a relatively low cost.

Another objective is to provide a liquid supply system which comprises a container, a pump means, a flexible tube, and novel dispensing apparatus.

Further objects are to provide, in apparatus of the character indicated, means responsive to pressure in the tube effective to activate and deactivate the pumping means, and a means to prevent liquid feed-back into the pump.

Yet another object is to provide a variable liquid-air flow in the apparatus by means selectively controlling the volumetric air content of the liquid entering the tube.

A further objective is to provide a dispensing, plural brush or roller with a tube outlet means interposed between the brush or roller portions thereof, and having a manual flow control thereon, whereby the apparatus effectively controls the flow of liquid through the tube and onto the brush or roller.

Other and further objects and advantages of this invention will become apparent upon consideration of the following specification when read in conjunction with the annexed drawings, in which:

FIGURE 1 is a perspective view, with tube fore-shortened, of a liquid supply system constructed and assembled in accordance with the teachings of this invention;

FIGURE 2 is a top plan view of the container and pumping means, partially sectioned along line 2—2 of FIGURE 1, looking in the direction of the arrows;

FIGURE 3 is a sectional view taken substantially on the section line 3—3 of FIGURE 2, looking in the direction of the arrows;

FIGURE 4 is a vertical cross-sectional view taken substantially on the section line 4—4 of FIGURE 3, looking in the direction of the arrows;

FIGURE 5 is a perspective view of the means for activation and deactivation of the system responsive to fluid pressure, with portions removed for clarity of illustration;

FIGURE 6 is a sectional view along the line 6—6 of FIGURE 3, looking in the direction of the arrows;

FIGURE 7 is an enlarged, detail cross-section on line 7—7 of FIGURE 3, looking in the direction of the arrows;

FIGURE 8 is an enlarged sectional view along section line 8—8 of FIGURE 1, looking in the direction of the arrows;

FIGURE 9 is a vertical cross-sectional view along the line 9—9 of FIGURE 8, looking in the direction of the arrows;

2

FIGURE 10 is a perspective view of a plural dispensing brush of this invention;

FIGURE 11 is an enlarged sectional view through the brush along the line 11—11 of FIGURE 10, looking in the direction of the arrows; and

FIGURE 12 is a transverse sectional view, taken substantially along the line 12—12 of FIGURE 11, looking in the direction of the arrows.

Referring primarily to FIGURES 1 and 3, the apparatus of this invention is therein generally designated by reference numeral 20, and comprises a liquid container 22, resembling a paint can. The container 22 has a base 24 and surrounding side wall 26, a brim 28 being fixed to its open upper end to define its maximum liquid level. The brim 28 may be of any desired form, preferably including a paint catching channel 30. A pair of supports or legs 32 extend from the base 24 adjacent opposite sides thereof to support the container 22 above the floor or other supporting surface. For a purpose described in more detail below, the base 24 has an aperture 34 formed therein.

A substantially rectangular, elongated, upright standard 36 of channel form is provided, and a conventional electric motor 38 with its reduction gear assembly 40 is attached to the upper end thereof by screws 42 or the like. Energy is supplied to the motor through a wire 44 from a current source, there being a shield 46 with insulated wire passage 48, secured to the standard 36 below the motor. A pair of integral arms 50 extend inwardly from the shield 46 and each has an arcuate flange 52 on its distal end, the flanges being secured to the container wall 26 as shown in FIGURE 2. Thus, the standard 36 serves to further support the container 22.

Fixed to the standard 36 adjacent its lower end is a bracket 54 to which is fixed a cylinder 56 having an open upper end 58. A plunger or piston 60 is slidably mounted in the cylinder 56, the cylinder having an upper end part 62 with spaced, upstanding connection ears 64 projecting therefrom. A rotating shaft 66 extends from the reduction gear assembly 40 through an opening 68 in the standard 36 and has a disc 70 rotatably carried thereon. A link or piston rod 72 is pivoted between the ears 64 by screw means 74 at its lower end, and is connected to the disc 70 at its upper end by a cross pin assembly 76, whereby the rotary motion of the disc 70 is converted to a reciprocating motion of the link 72 which causes the piston 60 to reciprocate in the cylinder 56.

A removable box-like closure 78 encloses the disc-link assembly, and includes an upper wall 80, side walls 82, and a forward wall 84. The forward wall 84 has a clip with a projecting arm 86 and outer depending lip 88 which frictionally engages the container 22 in the brim channel 30 as seen in FIGURE 3. In FIGURE 4, it is seen that the side walls 82 have inwardly bent lower end portions 90 which frictionally engage about the arms 50 of the shield 46. Thus, the closure 78 may be conveniently disengaged for access to the disc-link assembly.

The apparatus 20 further comprises a novel means for the mixture of liquid from the container with ambient air and for pressurizing said mixture. This means includes a dual compartment valve 92 comprising an elongated, substantially rectangular, hollow body portion 94 having a top wall 96 and having an interior partition or division wall 98 dividing the body portion into a first compartment 100 and a second compartment 102. End caps 104, 106 are supplied for each of the ends of the body portion, the cap 104 having an opening 108 in which is received one end of a hollow tube 110, the other end of which is received in an opening 112 in the cylinder 56. The body portion 94 is located, preferably, beneath the bottom wall 24 of the container 22, and the body portion top wall 96 has an opening 114 therein in vertical alignment with the opening 34 of the container bottom wall 24. An elongated

gated, substantially tubular, hollow standard 116 is welded or otherwise secured to the top wall 96 about opening 114 and extends upwardly through opening 34 to a location at least above the maximum liquid level of the container 22. A liquid inlet opening 118 is provided in the standard adjacent the bottom wall 24, and the standard has an open upper end 120 above said maximum liquid level. Inserted in the end 120 is a hollow cap piece or plug 122 having an open upper end communicating with the hollow standard, and a closed end 124, there being a side air inlet opening 126 formed in the cap piece. A resilient cap 128 is frictionally supported on the plug 122 and also has a side opening 130, the cap 128 being manually rotatable with respect to the plug 122 such that maximum air inlet is permitted upon alignment of the side openings 126, 130, and the cap 128 also being manually reciprocable with respect to the cap piece 122 for further adjustment of the orifice of alignment between said openings—this structure being best illustrated in FIGURES 3 and 7.

Referring to FIGURES 3 and 6, it will be seen therein that the body portion 94 of valve 92 includes a flap closure 132 of resilient material secured to the interior of the wall 96 by a cross strap 134 to normally overlie the opening 114, thereby blocking passage of materials from the standard 116 into the first compartment 100. A similar flap closure 136 is secured to the division wall 98 in the compartment 102 by a strap 138, flap 136 serving to block an opening 140 formed in said wall. The cap 196 is apertured at 142 and a hollow outlet tube 144 is fixed thereto about this aperture 142.

Secured to the distal end of the tube 144 by a clamp 146 is an elongated, flexible tube 148.

A vertical tube 150 extends from the tube 144 in generally perpendicular attitude. A switch box 152 is secured to the adjacent side of the container. As seen in FIGURES 2, 3 and 5, the box 152 includes sides 154 and upper and lower ends 156, 158. A rectangular spacer 160 of non-conductive or insulating material is positioned between the sides 154 and ends 156, 158 in spaced relation to the container wall 26. A pair of upper clips or contacts 162 are secured in laterally spaced relation to the spacer 160, and a similar pair of lower clips or contacts 164 are vertically spaced therebelow on the spacer 160. A rectangular, non-conductive back member 166 extends between the vertically aligned pairs of clips, and as seen best in FIGURES 3 and 5, at least one vertically aligned pair has separate wires 168 and 170 connected to the respective upper and lower clips thereof, the wires being in circuit with the electrical supply conductive wire 44 for the motor 38. The clips constitute fixed electrical contacts. A bridge assembly 172, including pivot arms 174 pivotally secured at one end to the clips 164 is provided and includes a connecting cross pin 176 with projecting ear 178 and a resilient, non-conductive inwardly directed abutment 180. The upper end of the tube 150 has secured thereto, by a clamp 182, an inflatable resilient gland 184. A projecting lip 186 is secured to the back 160 above the horizontal plane of the upper clips 162, and as seen in FIGURES 2 and 3, a coil-type tension spring 188 connects this lip to the ear 178 of the bridge assembly 172 constantly biasing the bridge to its closed, circuit making location. A snap-type, removable cover box 190 encloses the switch means, preferably having electrical insulation covering 192 on the inner side of at least the top thereof.

The outer or distal end of the tube or hose 148 is connected to liquid dispensing means such as the roller assembly of FIGURES 1, 8 and 9, or the plural brush of FIGURES 10-12. The roller assembly of this invention is generally identified in the drawing by reference character 200 and comprises an elongated, hollow, tubular handle 202 having a semi-tubular extension 204 at one end. The extension 204 terminates in a flattened plate 206 at its outer end, with a terminal flange 208. Secured to the underside of plate 206 is a lateral bight 210 of a

U-shaped bracket having depending end arms 212. Integral with the end arms 212 are horizontal frames 214 with coaxial apertures 216 therein. Removable cross axles 218 extend between the frames in each pair of apertures 216 and have screw-type end connections 220, whereby the axles support paint rollers 222 of the known type. An elongated, hollow rectangular nozzle 224 extends between the frames 214 at a location interposed between the rollers, and has a plurality of openings 226 in each side facing the rollers 222 and a single top opening 228 to which is welded an upstanding pipe 230 with an angularly offset upper portion 232 which receives, frictionally, the end of the tube 148. Means for controlling flow through the tube 148 is provided and includes a boss 234 depending from handle 202 on which is pivoted a lever 236. An encircling saddle 238 is secured to the extension 204 having an opening 240 in its lower side surrounded by a washer 242 and a link 244 extends there-through. Link 244 is secured at one end to a spring pinch element 246 and at its outer end it is pivoted to the lever 236. The pinch element 246 is connected to the handle 202 in the manner shown in FIGURE 8 and tends normally to press the tube to the constricted condition of that figure. Aiding in constriction is an expansion spring 248 positioned between the lever and the handle. Thus, the tube 148 extends through the handle 202 to the pipe portion 232 and is opened from the constriction by manual pressure on the lever 236 toward the handle 202.

In FIGURES 10-12, the plural dispensing brush 300 of this invention, which may be substituted on the distal end of the tube 148 for the roller assembly 200 is shown. The brush 300 comprises a hollow, box-like body 302 having a top 304, ends 306, front and rear sides 308, 310, and a bottom 312. The top 304 has an opening 314 formed therein about which is fixed a frusto conical, hollow handle 316, and the bottom wall 312 has a coaxial opening 318 therein to which is welded a tube connection element 320. The tube 148 extends through the handle 316 and is curled within the body portion 302 and pressed over the connection element 320. A series of individual brush elements 322 are fixed to the outer side of the bottom each comprising a brush block 324 supporting bristles 326 in the usual manner, and a surrounding skirt 328. The brush elements 322 are located in surrounding relation to the opening 318 and a portion 330 of the connection element 320 is extended below the bottom 312 therebetween—a resilient tube nozzle 332 being pressed thereon.

Control for feeding paint to the brush comprises a scissors-type pressure means 334 including a leg 336 secured to the inner handle wall at 338 by welds or the like. Leg 336 merges into a generally right angularly arranged, flat spring arm 340 which extends into the body 302. A generally circular spring portion 342 is integrally connected to the spring arm 340 and to a second spring arm 344 which underlies the arm 340 and has an integral control link 346 extending through an opening 348 in the handle 316. Button 350 is located on the distal outer end of the link 346 and serves as a means, upon the application of manual pressure, for moving spring arms 340, 344 apart. As seen in FIGURES 11 and 12, the arms clamp the tube 148 to constrict same and prevent movement of fluid there-through, the constriction being overcome by inward actuation of button 350.

Access to the body 302 is provided through a relatively large, substantially rectangular opening 352 in the front 308 thereof which is normally covered by a door 354 having U-shaped clasps 356 at its upper end, and having a locking screw 358 engageable in aperture 360 at its lower end.

The operation of the invention in general, briefly summarized, involves placing a supply of paint P or other liquid to be dispensed in the container 22. The motor 38 is then supplied with E.M.F. to turn the disc 70 and reciprocate the link 72 causing alternative intake and

5

compression strokes of the piston 60 within the cylinder 56. On the intake stroke, a partial vacuum or suction is effected in the valve body 94 causing flap closure 132 to pivot away from the opening 114 and permitting a quantity of air-liquid mixture to be drawn into the first chamber 100. On the compression stroke, flap closure 132 closes the opening 114 and the air-liquid mixture is forced through the aperture 140 in the division wall 98 against the flap 136 and into the second chamber 102—it will be noted that once the air-liquid mixture is in the second chamber it cannot be drawn back onto the first chamber due to the arrangement of the flap 136. As pressure in the system is built up in this fashion, paint P may be released to the brush or roller by activation of the control 350 or 236 at selected intervals as desired.

The introduction of air for mixture with paint or other liquid to be dispensed, through the standard 116 is controlled by manipulation of the cap 128. This mixture is regulated in accordance with the viscosity of the material to be dispensed—materials that have viscosity normally resistant to the flow requiring relatively greater introduction of air than less dense materials. As stated above, this selective variance provides a means for control of the volumetric air content of the material to be pumped, and thus, density may be changed during operation if liquid flow indicates that change is desirable.

To prevent undesired pressure build-up, as the pressure increases, air-liquid mixture rises in the tube 150 and inflates the gland 184 moving the bridge assembly 172 against the spring 192 until contact is broken, thereby stopping the motor and pumping action. As paint is released by the operator, pressure is decreased, causing the gland to deflate from the spring action until the contact is restored and the motor started once again by completion of the circuit.

Having described and illustrated an embodiment of this invention in detail, it should be understood that this description and illustration is offered merely by way of example, and that this invention is to be limited in scope only by the appended claims.

What is claimed is:

1. A liquid supply system comprising:

- (a) a liquid container with a maximum liquid level;
- (b) a hollow standard extended through the liquid container having air inlet means above the maximum liquid level and having liquid inlet means below said level;
- (c) a dual compartment valve on the standard receiving liquid-air flow from the standard in a first chamber thereof and having a second chamber separated from the first chamber by a division wall;
- (d) cylinder-plunger means for alternately supplying compression in the first compartment in one phase, and for creating a partial vacuum therein in another phase;
- (e) the division wall having a controlled opening therein to supply liquid-air flow into the second compartment on compression in the first compartment, and closing the division wall during the partial vacuum phase;
- (f) an elongated tube means extending from the second compartment;
- (g) selectively controlled liquid dispensing apparatus operatively connected to the tube means; and
- (h) pressure sensitive means associated with the tube means to temporarily deactivate the cylinder-plunger means upon pressure build-up in the tube means above a selected level and to reactivate the cylinder-plunger means when the pressure recedes below said selected level.

2. A system as defined in claim 1, wherein the liquid dispensing apparatus comprises:

- (a) a bracket;
- (b) a pair of rollers rotatably mounted on the bracket; and

6

(c) a fluid discharge means interposed between the rollers.

3. A system as defined in claim 1, wherein the liquid dispensing apparatus comprises:

- (a) a frame;
- (b) a plurality of brush elements secured to the frame; and
- (c) fluid discharge means interposed between the brush elements.

4. A system as defined in claim 1, wherein the pressure sensitive means comprises:

- (a) an expandable gland having at least two sides;
- (b) fluid connection means between the gland and the tube;
- (c) a fixed contact on one side of the gland, and a movable contact on the opposite side thereof; and
- (d) spring means normally biasing the contacts together.

5. A system as defined in claim 1, and:

- (a) means for regulating air intake on the standard.

6. A liquid supply system comprising:

- (a) a liquid container with a maximum liquid level;
- (b) a hollow standard extended through the liquid container having air inlet means above the maximum liquid level and having liquid inlet means below said level;
- (c) valve means connected to the standard to receive liquid-air flow from the standard;
- (d) means, including a motor and a cylinder with piston, for pumping the liquid-air flow from the valve means;
- (e) an elongated tube means extending from the valve means; and
- (f) selectively controlled liquid dispensing apparatus operatively connected to the tube means.

7. A system as defined in claim 6, and:

- (a) pressure sensitive means associated with the tube means to temporarily deactivate the pumping means upon pressure build-up in the tube means above a selected level and to reactivate the last named means when the pressure recedes below said selected level.

8. A system as defined in claim 7, wherein the pressure sensitive means comprises:

- (a) an expandable gland having at least two sides;
- (b) fluid connection means between the gland and the tube means;
- (c) a fixed contact on one side of the gland, and a movable contact on the opposite side thereof; and
- (d) spring means normally biasing the contacts together.

9. A liquid paint supply system comprising:

- (a) a liquid container having a bottom wall, a side wall and a brim and having paint contained therein within a maximum liquid level;
- (b) supporting legs depending from the container bottom wall;
- (c) an elongated hollow standard extending through the container bottom wall and having an upper end above the brim and a lower end below the bottom wall;
- (d) the standard having air inlet means adjacent its upper end, and having a paint inlet opening adjacent the bottom wall;
- (e) a dual compartment valve on the standard receiving liquid-air flow from the standard in a first chamber thereof and having a second chamber separated from the first chamber by a division wall;
- (f) motor actuated cylinder-plunger means for alternately supplying compression in the first compartment on one phase, and for creating a partial vacuum therein in another phase;
- (g) the division wall having a controlled opening therein to supply liquid-air flow into the second compartment on compression in the first compartment,

- and closing the division wall during the partial vacuum phase;
- (h) a pipe extending outwardly from the second compartment of the valve;
- (i) an elongated, flexible tube connected to the pipe;
- (j) selectively controlled liquid dispensing apparatus operatively connected to the tube means; and
- (k) pressure sensitive means associated with the tube means to temporarily deactivate the cylinder-plunger means upon pressure build-up in the tube means above a selected level and to reactivate the cylinder-plunger means when the pressure recedes below said selected level.
10. A system as defined in claim 9, wherein the liquid dispensing apparatus comprises:
- (a) a bracket;
- (b) a pair of rollers rotatably mounted on the bracket; and
- (c) a fluid discharge means interposed between the rollers.
11. A system as defined in claim 9, wherein the liquid dispensing apparatus comprises:
- (a) a frame;
- (b) a plurality of brush elements secured to the frame; and
- (c) fluid discharge means interposed between the brush elements.
12. A liquid supply system as defined in claim 9, wherein the pressure sensitive means comprises:
- (a) an expandable gland having at least two sides;
- (b) fluid connection means between the gland and the tube;
- (c) a fixed contact on one side of the gland, and a movable contact on the opposite side thereof; and
- (d) spring means normally biasing the contacts together.
13. A liquid supply system as defined in claim 9, and:
- (a) means on the upper end of the standard for regulating air intake.
14. A liquid supply system as defined in claim 13, wherein said means for regulating air intake comprises:
- (a) a hollow plug inserted in the standard having a closed outer end wall and having a side opening formed therein; and
- (b) a resilient cap having a side opening registrable with the side opening of the plug and being rotatable and reciprocal on the plug to vary the orifice of alignment of the openings.

15. A switch responsive to fluid pressure in a fluid conveying system, the switch comprising:
- (a) a housing;
- (b) an insulating back member in the housing;
- (c) a first fixed electrical contact secured to the back member;
- (d) a second fixed electrical contact secured to the back member in spaced relation to the first contact;
- (e) a bridge having a pair of ends pivoted to one contact at an end thereof;
- (f) spring means normally urging the bridge to engage the other contact in circuit making engagement; and
- (g) an expandable gland operatively associated with the fluid system, interposed between the bridge and the other contact and effective to break the circuit upon expansion.
16. A switch as defined in claim 15, and:
- (a) a resilient abutment on the bridge contacting the gland.
17. A liquid supply system comprising:
- (a) a liquid container with a maximum liquid level;
- (b) a standard extending through the liquid container with air inlet means above the maximum level and liquid inlet means below said level;
- (c) a compartmented valve on the standard receiving liquid-air flow from the standard;
- (d) means for alternately supplying compression and for creating a partial vacuum in said valve;
- (e) an elongated tube means extending from the valve;
- (f) liquid dispensing apparatus operatively connected to the tube means; and
- (g) pressure sensitive switch means associated with the tube means to temporarily deactivate the system upon pressure build-up in the tube.

References Cited by the Examiner

UNITED STATES PATENTS

1,902,750	3/33	Barks	222—56
2,504,487	4/50	Anson	15—604
2,627,620	2/53	Gudze	15—562
3,115,278	12/63	Mylting	222—56

FOREIGN PATENTS

547,433	10/57	Canada.
793,449	4/58	Great Britain.

CHARLES A. WILLMUTH, *Primary Examiner.*