United States Patent [19]

Klingenberg

[11] **3,895,748**

[45] **July 22, 1975**

[54] **NO DRIP SUCK BACK UNITS FOR GLUE OR OTHER LIQUIDS EITHER SEPARATELY INSTALLED WITH OR INCORPORATED INTO NO DRIP SUCK BACK LIQUID APPLYING AND CONTROL APPARATUS**

[76] Inventor: **George R. Klingenberg,** 615 S. Wright, Tacoma, Wash. 98408

[22] Filed: **Apr. 3, 1974**

[21] Appl. No.: **457,447**

[52] **U.S. Cl.** **222/571;** 141/117; 141/119

[51] **Int. Cl.²** **B05B 1/28**

[58] **Field of Search** 222/571; 141/117, 119; 239/119

[56] **References Cited**

UNITED STATES PATENTS

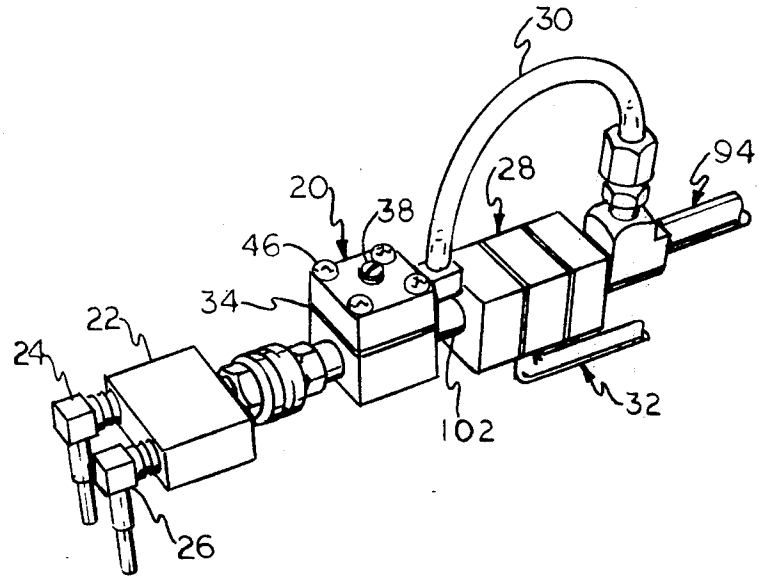
2,960,060	11/1960	Chatterton	222/108 X
3,014,620	12/1961	Moore	141/119 X
3,547,408	12/1970	Klingenberg	259/004

Primary Examiner—Stanley H. Tollberg
Assistant Examiner—John P. Shannon
Attorney, Agent, or Firm—Roy E. Mattern, Jr.

[57] **ABSTRACT**

A separate or incorporated no drip suck back unit for use with a liquid applying apparatus, wherein materials moving relative to the apparatus are selectively spotted, beaded or coated with a liquid, such as glue or plastic, through one or more nozzles, and wherein the no drip suck back unit prevents excess liquid from flowing or dripping from the apparatus during periods when no liquid is being applied. The unit consists of a housing with two interior passageways, one for liquid and the other for air, separated by a flexible diaphragm. The liquid being applied flows through the liquid passageway on its way to the nozzle. During application, compressed air is introduced into the air passageway, thus flexing the diaphragm away from its median position and reducing the volume of the liquid passageway. When application is stopped, the air passageway is vented to the atmosphere, thus reducing the pressure therein and permitting a spring to return the diaphragm to its median position. This return motion of the diaphragm increases the volume of the liquid passageway and draws the liquid back away from the nozzle so that no drip occurs.

20 Claims, 12 Drawing Figures



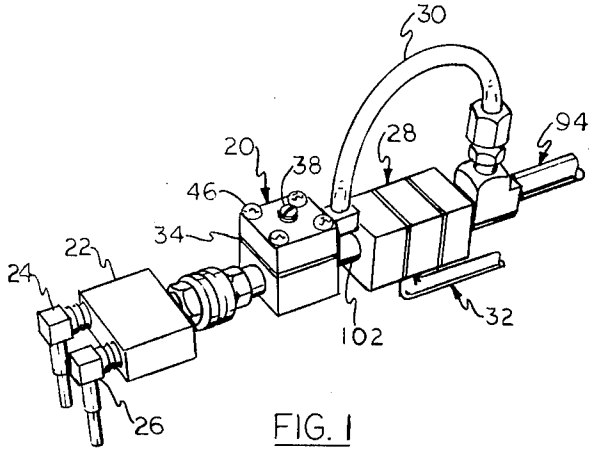


FIG. 1

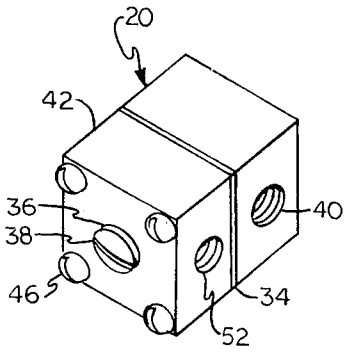


FIG. 2

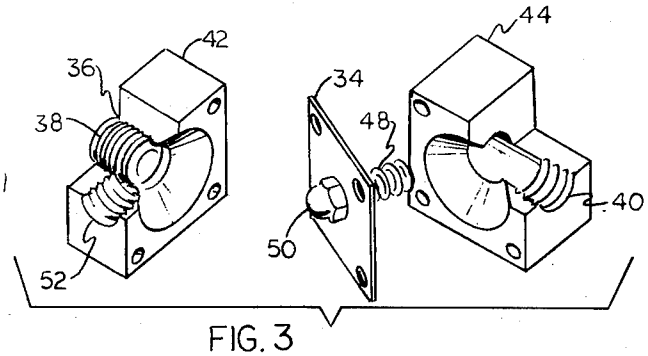


FIG. 3

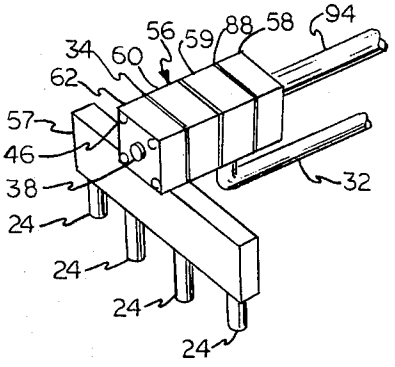


FIG. 4

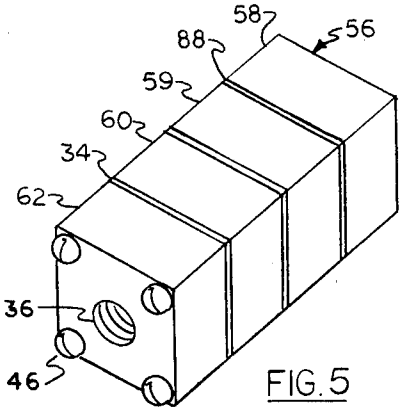


FIG. 5

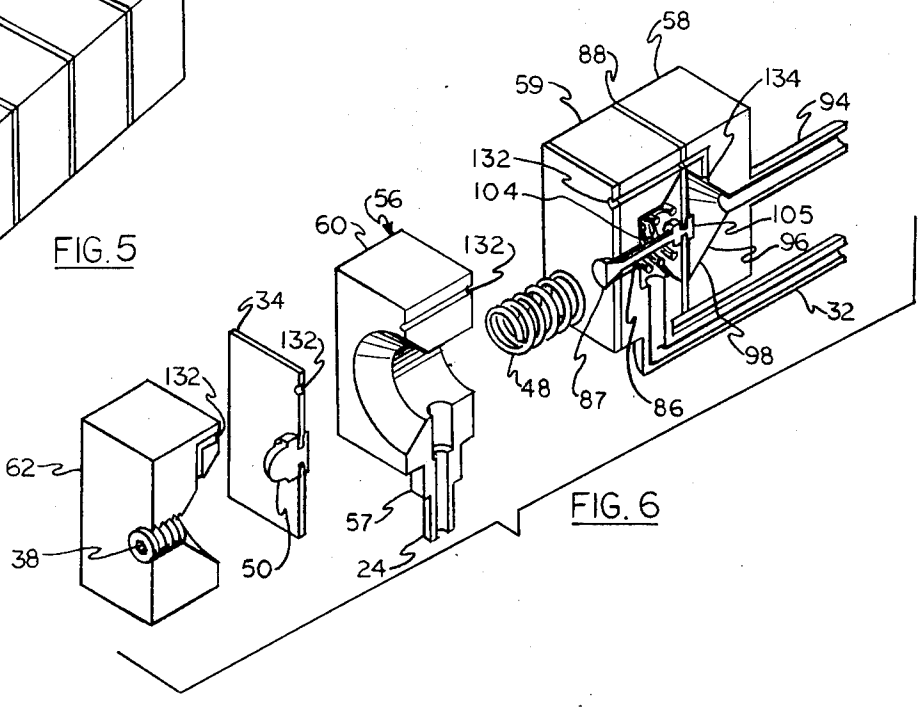
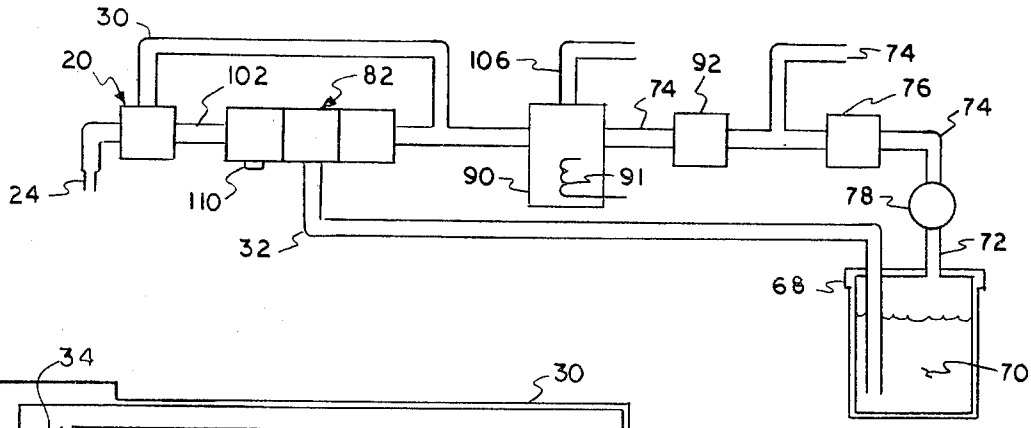


FIG. 6

FIG. 7



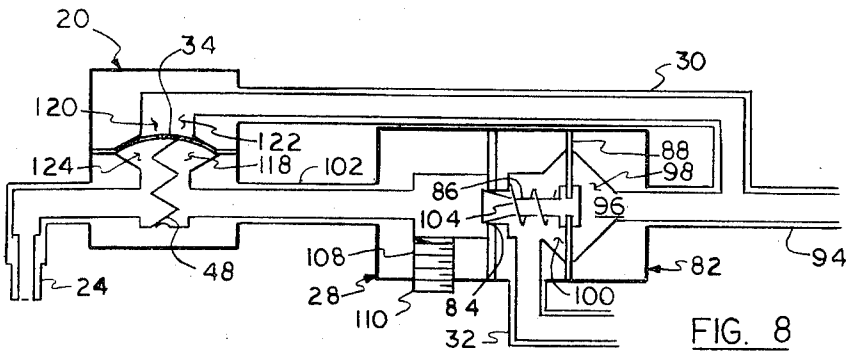


FIG. 8

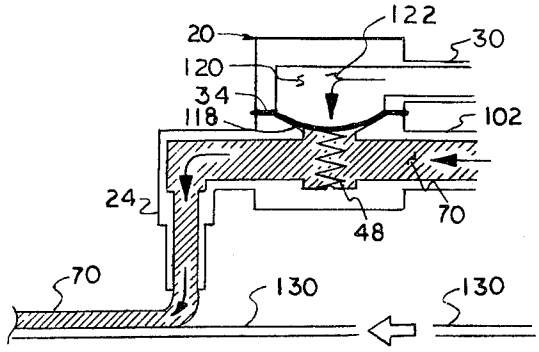


FIG. 9

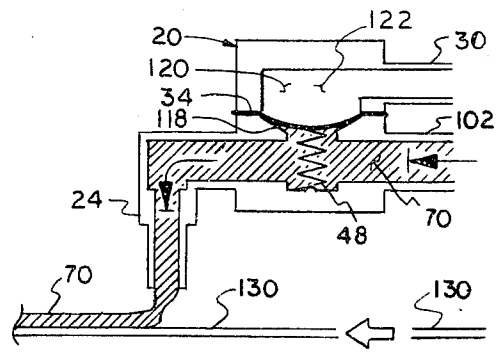


FIG. 10

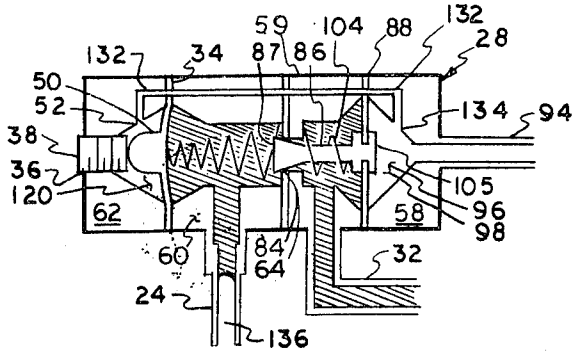


FIG. 12

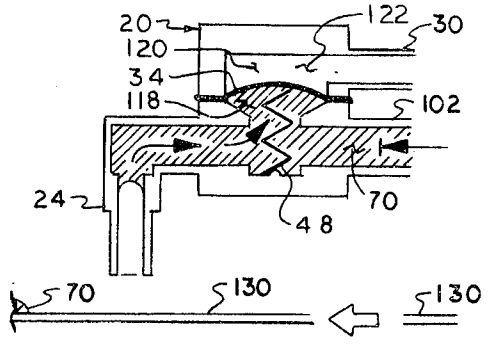


FIG. 11

NO DRIP SUCK BACK UNITS FOR GLUE OR OTHER LIQUIDS EITHER SEPARATELY INSTALLED WITH OR INCORPORATED INTO NO DRIP SUCK BACK LIQUID APPLYING AND CONTROL APPARATUS

BACKGROUND OF INVENTION

As indicated in prior art U.S. Pat. Nos. 2,960,060; 2,650,003; 2,912,169; and 2,800,365, the stopping of a liquid flow has been attempted. However, none of the units of the prior equipment is considered satisfactory in respect to the operation of liquid applying and control apparatus, wherein the cut off of a compressed air supply is first undertaken to thereafter stop the flow of a glue or other liquid, such as set forth in U.S. Pat. No. 3,547,408.

SUMMARY OF THE INVENTION

When thin, medium and thick glues, or other liquids, are being dispensed, especially glues being positioned on relatively moving materials, and the flow of glue must be cut off, unwanted dripping has been a troublesome problem. In contrast, there is no dripping, when this no drip suck back unit is operated in conjunction with liquid applying and controlling apparatus. It may be used as a separate unit of such apparatus or it may be incorporated into it. In either embodiment, there is a housing or a body having a chamber with a centrally positioned diaphragm. During application of a liquid, the diaphragm is deflectively moved to increase the air-side chamber volume by directing the control compressed air into this air-side chamber. When the control compressed air is cut off, a compression spring becomes effective to decrease the air side chamber volume and at the same time to increase the liquid or glue side chamber volume. This resulting diaphragm movement, altering these air, liquid volumes, produces the immediately responsive vacuum like sucking back of the liquid and no dripping occurs on the relatively moving material or anywhere else.

DRAWINGS

Two embodiments are illustrated in the figures of the drawings. Some of the figures indicate how a separate no drip glue suck back unit, which draws back or sucks back a sufficient amount of glue or other liquid to eliminate any dripping of glue or other liquid, may be used after the glue supply has been shut down or cut off, with any glue or other liquid supply unit, such as the gluing apparatus set forth in U.S. Pat. No. 3,547,408. Other figures indicate how a no drip glue suck back unit, which draws back or sucks back a sufficient amount of glue or other liquid to eliminate any dripping of glue or other liquid, after the glue supply has been shut down or cut off, may be initially designed to be directly incorporated into a modified gluing apparatus, as set forth in U.S. Pat. No. 3,547,408.

FIG. **1**, is a perspective view of a no drip spraying apparatus wherein the gluing apparatus of U.S. Pat. No. 3,547,408, is equipped with a separate glue no drip suck back unit placed near the glue or other liquid discharge exits;

FIG. **2** is an enlarged perspective view of the separate no drip glue suck back unit, shown in the no drip gluing apparatus of FIG. **1**;

FIG. **3** is an enlarged exploded perspective view of the no drip separate glue suck back unit shown in FIGS. **1** and **2**;

FIG. **4** is a perspective view of a no drip gluing apparatus wherein the no drip glue suck back unit is incorporated into a modified gluing apparatus as set forth in U.S. Pat. No. 3,547,408;

FIG. **5** is an enlarged perspective view of the incorporated no drip suck back gluing unit, shown in the no drip gluing apparatus of FIG. **4**;

FIG. **6** is an enlarged exploded perspective view of the incorporated no drip suck back gluing unit, shown in FIGS. **4** and **5**;

FIG. **7** is a partial schematic diagram of flow lines for air and glue and associated units arranged in an overall no drip suck back gluing apparatus, inclusive of the separate no drip glue suck back unit;

FIG. **8** is an enlarged partial schematic diagram of flow lines for air and glue or other liquid, and the associated units of the no drip suck back gluing apparatus, inclusive of the separate no drip glue suck back unit, showing this apparatus inactive awaiting the next signal or time to apply glue or other liquid;

FIGS. **9, 10** and **11**, are enlarged partial schematic diagrams of flow lines for air and glue or other liquid, the associated unit of the no drip suck back glue unit, and material in relative motion thereto, which is being glued or otherwise modified with a liquid, with various notes and flow arrows to indicate respectively, in FIG. **9**, the application of glue, in FIG. **10**, the stopping of the glue flow and in FIG. **11**, the sucking back, drawing back, or scavenging of the glue or other liquid, so none of the glue drips on the material passing by in relative motion, after the glue supply has been shut down or cut off.

FIG. **12**, is an enlarged partial schematic diagram of flow lines for air and glue and the incorporated no drip suck back gluing apparatus having the gluing apparatus, indicated in U.S. Pat. No. 3,547,408, and the no drip suck back unit.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Separate No Drip Suck Back Unit for Glue or Other Liquids Arranged with Liquid Applying and Control Apparatus

In FIGS. **1, 2** and **3**, the separate no drip suck back unit **20** for glue or other liquids is illustrated. In FIG. **1**, it is assembled with other components; such as the dual nozzle head **22** having the two nozzles **24, 26**, the control unit **28**, a compressed air line **30**, and a glue or other liquid supply line **32**. In FIG. **2**, the no drip suck back unit **20** is shown assembled, but before its installation, indicating about its exterior the location of the diaphragm **34**, the opening **36** to receive the adjusting screw **38**, the liquid or glue opening **40**, the top body portion **42**, the bottom body portion **44**, and the assembly fasteners **46**. In FIG. **3**, some of the parts illustrated in FIG. **2**, are shown in an exploded view, which also includes other parts, not seen after an assembly of the separate no drip suck back unit **20**. For example, the diaphragm return compression spring **48**, secured to the diaphragm **34** by fastener **50** is shown in this exploded view, and also the air opening **52**.

Incorporated No Drip Suck Back Unit for Glue or Other Liquids

In FIGS. 4, 5 and 6, the incorporated no drip suck back unit 56 for glue or other liquids is illustrated. In FIG. 4, it is assembled with other components, such as the quadruple nozzle head 57, a compressed air line 94, and a glue or other liquid supply line 32. In FIG. 5, the incorporated no drip suck back unit 56 is shown assembled, but before its installation, indicating about its exterior the location of the diaphragm 34, the opening 36 to receive the adjusting screw 38, the body portions 58, 59, 60 and 62 and assembly fasteners 46. In FIG. 6, some of the parts illustrated in FIG. 5, are shown in an exploded view, which also includes other parts, not seen after an assembly of the incorporated no drip suck back unit 56. For example, the diaphragm return compression spring 48, secured to the diaphragm 34 by fastener 50 is shown in this exploded view.

Overall Liquid Applying and Control Apparatus

In FIG. 7, an overall liquid applying and control apparatus is schematically illustrated in conjunction with a separate no drip suck back unit 20. An overall arrangement for an incorporated suck back unit 56 is very similar. In a pressurized glue or other liquid pot 68, a sufficient volume of glue 70, for example, is provided. Pressurization of pot 68 occurs upon the entry of compressed air through line 72 from a compressed air supply line 74 connected to an air compressor or other source, not shown, when the regulator 76, and valve 78 are adjusted for such pressurization flow of compressed air. Such pressurization causes the glue 70 or other liquid to flow through the glue supply line 32 to the control valve 82.

The glue 70 under pressure remains available in control valve 82 awaiting the opening of a glue flow orifice 84 within this valve, as illustrated in FIG. 8, wherein the glue 70 is indicated as having been previously flowing, but the flow has been stopped. To start again, the glue or other liquid flow orifice 84 is opened, upon movement of valve stem 86, which is secured to and moves with control diaphragm 88. When solenoid valve 90 is triggered, by electrical controls indicated by coil symbol 91, compressed air from supply line 74, passing through regulator 92, continues on through solenoid valve 90 and through air line 94, to enter the control valve 82. Immediately, inside the control valve 82 is the compressed air side volume 96 of the control chamber 98. The force created by the compressed air deflects the control diaphragm 88, moving the attached valve stem 86, thereby opening orifice 84. Then glue 70 or other liquid will flow from the glue line 32, into the glue side volume 100 of the control chamber 98 and on through glue line 102 leading to the separate no drip suck back unit 20. When the solenoid valve 90 is closed, return compression spring 104 returns the control diaphragm 88 and its valve stem 86 to their closed positions, closing the glue or other liquid orifice 84. This return is aided, as air under pressure in air line 94 and in portions of the solenoid valve 90 is exhausted through exhaust air line 106, as indicated in FIG. 7. Also, as shown in FIG. 8, the control valve 82 is optionally provided with an alternate glue or other liquid port or orifice 108, which is generally blocked by a threaded plug 110, but upon removal of the plug 110, it is available during inspection, cleaning and bypass operations in conjunction with the control valve 82.

As illustrated in FIGS. 7 and 8, the glue 70 or other liquid released by the control valve 82 and moving in glue line 102, enroute to one or more glue nozzles 24, passes through a separate no drip suck back unit, 20. When the glue 70 is so flowing to nozzles 24, under pressure which is maintained in the glue pot 70 and also thereby maintained on through the various glue lines, 32, 102, the control valve 82 is open under the force of air pressure. The solenoid valve 90 which also must be open at this time, is directing compressed air, via air line 94, into the branch air line 30, which in turn directs compressed air to the separate no drip suck back unit 20.

When the solenoid valve 90, through electrical controls indicated by symbol 91, is closed the compressed air in branch air line 30 is exhausted, and in the control valve 82 the glue orifice 84 is closed to stop the flow of glue or other liquid. When this occurs, then within the separate no drip suck back unit 20, as illustrated in FIG. 8, the diaphragm 34, under the differential changes in liquid and fluid pressures and under the force of compression spring 48, moves to increase the glue side chamber volume 118, while decreasing the air side chamber volume 120 of the interior chamber 122. When its interior chamber 122 is so changed, the separate no drip suck back unit 20, operates to suck back, draw back, or scavenge the glue 70 or other liquid, no longer under pressure, into the created vacuum void 124 of interior chamber 122.

The Specific Operation of the No Drip, Suck Back Unit, Operating Either as a Separate or Incorporated Unit

As previously reviewed in describing the overall liquid applying and control apparatus in conjunction with the illustrations of FIGS. 7 and 8, the operation of the no drip, suck back, unit 20 was described. To carry the description further, using schematic FIGS. 9, 10 and 11, the specific operation is set forth of the principal components of a no drip suck back unit, either in its separate embodiment 20 or in its incorporated embodiment 56.

In FIG. 9, the glue 70 or other liquid is being applied through nozzle 24 onto material 130 traveling in relative motion by the nozzle 24, as indicated by the respective motion arrows. At this time, the glue 70 is under pressure in glue lines 32 or 102, coming from the supply of glue under pressure in glue pot 68, as illustrated in FIG. 7. Also there is control compressed air in air branch line 30 which is effective, within the interior chamber 122, in deflecting the diaphragm 34 against both the resisting force of the compression spring 48 and the resisting compression force of the glue 70 or other liquid under pressure. During such compressed air deflection, the compressed air side of the diaphragm 34 defines a comparatively larger compressed air volume 120 and a comparatively smaller glue volume 118, under pressure, yet the flow of the glue 70 is completely unobstructed. The glue 70 flows on reaching the nozzle 24, where it is effectively discharged onto the material 130 during the arrow indicated relative motion.

In FIG. 10, the commencement of the cut off of the glue 70 or other liquid flow is illustrated. The electric controlled solenoid air valve 90 has just been operated to cut off the compressed air, otherwise available from compressed air line 74, and to commence to exhaust compressed air through air exhaust line 106, as illustrated in FIG. 7. This indirectly starts to reduce the air pressure in the branch air line 30 and air line 94, and also starts to cut off the glue 70 being supplied through

glue lines **32** and **102**, and on through the nozzle **24** to the material **130**, which is moving relatively by the nozzle **24**, as the directional arrows indicate.

In FIG. **11**, the exhausting of the compressed air has been completed and the diaphragm **34** has passed beyond its mid motion or mid chamber position. It thereby increases the glue side volume **118**, as the force of the compression spring **48** has become effective in so moving diaphragm **34** in the interior chamber **122**. Such movement of diaphragm **34** creates a vacuum void **124** into which the glue **70** is drawn, thereby sucking back and scavenging the glue **70** partially back up into the interior of the nozzle **24**, so no dripping, not even a drop, will occur, on the material **130** or elsewhere, as indicated by the motion arrows.

The Operation of the Incorporated No Drip Suck Back Unit

Previously, the operation of the no drip suck back unit as a separate unit **20** was described in conjunction with the overall apparatus illustrated in FIG. **7**, with references also being made to FIG. **8**. Also previously, the operation of the no drip suck back unit, either as a separate or incorporated unit, **20** or **56**, was described in reference to FIGS. **9**, **10** and **11**. Now the operation is further set forth in reference to the partial schematic diagram of FIG. **12**, indicating flow lines or passageways for air and glue or other liquid, in conjunction with the incorporated no drip suck back embodiment **56**, including components, some modified, of the gluing apparatus, as originally set forth in U.S. Pat. No. 3,547,408.

In the first body portions **58** and **59**, the flow of the glue **70** is controlled. As illustrated in FIG. **8**, the control diaphragm **88** is at its mid position in the interior chamber **98**, being retained there by the force of return compressed spring **104**, secured by fastener **105** to diaphragm **88**. In this position, its attached valve stem **86**, with its flared end **87**, closes the glue flow orifice **84**. The compressed air supplied through line **94** has been cut off and exhausted to atmosphere through exhaust line **106**, upon operation of the electrically controlled solenoid air valve **90**, as shown in FIG. **7**.

When air is again supplied under pressure, as the solenoid air valve **90** is opened, the control diaphragm **88** will be effective in deflecting against the force of return compression spring **104**, thereby opening the glue flow orifice **84**. Thereafter, glue coming in from line **32** and body portion **59** will go on to enter the body portion **60**, and then depart through its nozzle **24**. During this glue or other liquid applying time, material **130** is relatively moving by the nozzle **24**, and the glue **70** is not obstructed in its flow. Diaphragm **34** is moved against compression spring **48** to enlarge the air side volume **120** of interior volume **122**. This occurs, as compressed air comes through the interior branch line **132**, from the air side volume **96** of glue flow control unit **28**, through orifice **134** located in its first body portion **58** and is subsequently discharged through orifice **52** into the air side volume **120** of the last body portion **62**. This body portion **62** is in the incorporated suck back unit **56** which may be arranged in an overall incorporated assembly, as illustrated in FIG. **12**.

When the gluing is to be stopped, electrical controls, indicated by symbol **91**, are effectively used to operate a solenoid air valve **90**, whereby the compressed air is cut off and exhausted to atmosphere at or near by this solenoid air valve **90**. As a consequence, all the internal moving parts adjust to the positions illustrated in FIG. **12**. In the incorporated no drip suck back unit **56**, the compression spring **48** moves the diaphragm **34** effectively back beyond its mid position, in the absence of air under pressure, to enlarge the glue side volume **118** of the interior volume **122** and decrease the air side volume **120**, as alternately determined by the movable separating sealed diaphragm **34**.

Optionally, a threaded opening **36** is provided in the last body portion **62** to receive a threaded plug or stop **38**, which is selectably and variably inserted to contact an abutting fastener **50**. It, in turn, secures the compression spring **48** to the diaphragm **34**. Such adjustment is used to control the amount of suck back or scavenging which occurs during the stopping and cycling of the glue flow as materials **130** are selectively covered with glue in various specified locations, during the relative movement of the material **130** by the nozzles **24**, **26**, or by other discharge openings. The success of the suck back, which avoids any dripping, is indicated by the volume **136** cleared in the nozzle **24**. This variable adjustment of the degree of return of diaphragm **34** may also be optionally used in the separate no drip suck back unit **20** and other embodiments.

SUMMARY OF ADVANTAGES

Absolutely no dripping occurs when the no drip suck back unit in any of its embodiments is properly adjusted in respect to the type of glue or other liquid being applied and the related pressures of both the liquids and air. The no drip suck back units are easily manufactured, installed, and maintained. Because they operate to absolutely avoid unwanted dripping, there are no costs otherwise to be incurred in wasted glues or other liquids being applied in wrong places, often being coupled with the unwanted costs of any required clean up activities. Moreover, the no drip suck back unit by proper adjustment is suitable for aiding in the overall control of most liquids such as thin as well as thick glues and plastics.

I claim:

1. A no drip suck back unit for glue and other liquids to completely avoid any dripping after the stopping of the glue or other liquid being supplied through a discharge opening, comprising:

a. a body;

b. an interior chamber in the body;

c. a liquid passageway continuing through the body entering and leaving the interior chamber;

d. an air passageway entering the body and terminating in the interior chamber; and

e. a diaphragm flexible from its mid position in the interior chamber to move one way to decrease the liquid volume of the chamber and to move the opposite way to decrease the air volume of the chamber, the latter movement creating a vacuum volume to suck back liquid increasing the overall liquid volume of the interior chamber.

2. A no drip suck back unit for glue and other liquids, as claimed in claim **1**, wherein a compression spring is inserted in the interior chamber in the liquid volume to urge the diaphragm to its mid position and beyond.

3. A no drip suck back unit for glue and other liquids, as claimed in claim **1**, wherein compressed air is introduced in the interior chamber in the air volume to urge the diaphragm beyond its mid position decreasing the liquid volume.

4. A no drip suck back unit for glue and other liquids, as claimed in claim 3, wherein a compression spring is inserted into the interior chamber in the liquid volume to return the diaphragm beyond its mid position, upon the exhausting of the compressed air to atmosphere, thereby creating a vacuum volume into which liquid is sucked back.

5. A no drip suck back unit for glue and other liquids, as claimed in claim 1, wherein the body is formed of two portions extending in opposite directions from the diaphragm which also serves as a seal between them and defines the air and liquid volumes of the interior chamber.

6. A no drip suck back unit for glue and other liquids, as claimed in claim 1, having a liquid discharge nozzle means connected to the exit of the liquid passageway.

7. A no drip suck back unit for glue and other liquids, as claimed in claim 1, having a controllable compressed air supply means connected to the entrance of the air passageway.

8. A no drip suck back unit for glue and other liquids, as claimed in claim 1, having a controllable liquid supply means, under pressure, connected to the entrance of the liquid passageway.

9. A no drip suck back unit for glue and other liquids, as claimed in claim 1, having a controllable compressed air supply means connected to the entrance of the air passageway, and a controllable liquid supply means, under pressure, connected to the entrance of the liquid passageway.

10. A no drip suck back unit for glue and other liquids, as claimed in claim 2, having a controllable compressed air supply means connected to the entrance of the air passageway, and a controllable liquid supply means, under pressure, connected to the entrance of the liquid passageway.

11. A no drip suck back unit for glue and other liquids, as claimed in claim 10, having a liquid discharge nozzle means connected to the exit of the liquid passageway.

12. A no drip suck back unit for glue and other liquids, as claimed in claim 9, having a common control means for both the controllable compressed air supply and controllable liquid supply means.

13. A no drip suck back unit for glue and other liquids, as claimed in claim 10, having a common control means for both the controllable compressed air supply and controllable liquid supply means.

14. A combination of a separate no drip suck back unit and a liquid control unit installable in liquid supply equipment to completely avoid any dripping after the stopping of glue or other liquid being supplied through a discharge opening, comprising:

a. a no drip suck back unit having
   1. a body;
   2. an interior chamber in the body;
   3. a liquid passageway continuing through the body entering and leaving the interior chamber;
   4. an air passageway entering the body and terminating in the interior chamber; and
   5. a diaphragm flexible from its mid position in the interior chamber to move one way to decrease the liquid volume of the chamber and to move the opposite way to decrease the air volume of the chamber, the latter movement creating a vacuum volume to suck back liquid increasing the overall liquid volume of the interior chamber; and

b. a liquid control unit having
   1. a body;
   2. an interior chamber in the body;
   3. an air passageway entering the body and terminating in the interior chamber;
   4. a liquid passageway in the body entering the body and leaving the interior chamber;
   5. a diaphragm flexible from its mid position in the interior chamber to move one way to decrease the liquid volume of the chamber; and
   6. a valve and orifice subassembly positioned in the body and having a stem of the valve connected to the flexible diaphragm so the valve is moved upon flexing of the diaphragm to open the orifice allowing the flow of liquid on to the no drip suck back unit.

15. The combination of the separate no drip suck back unit and a liquid control unit, as claimed in claim 14, having a controllable source of compressed air directed simultaneously to the air passageways of both units and simultaneously exhausted from these air passageways thereby controlling the flexures of the respective flexible diaphragms and thereby stopping the liquid flow without any drip occurring.

16. The combination of the separate no drip suck back unit and a liquid control unit, as claimed in claim 15, having respective return compression springs moving each diaphragm toward the respective air volumes of the respective chambers.

17. An incorporated no drip suck back unit and liquid control unit installable in liquid supply equipment to completely avoid any dripping after the stopping of glue or other liquid being supplied through a discharge opening, comprising:

a. a body;
b. a first interior chamber in the body;
c. a first air passageway entering the body and terminating in the first interior chamber;
d. a first liquid passageway in the body entering the body and leaving the first interior chamber;
e. a first diaphragm flexible from its mid position in the first interior chamber to move one way to decrease the liquid volume of the chamber;
f. a valve and orifice subassembly positioned in the body and having a stem of the valve connected to the first flexible diaphragm so the valve is moved upon flexing of the first diaphragm to open the orifice allowing the flow of liquid on to the no drip suck back unit;
g. a second interior chamber in the body;
h. a second liquid passageway in the body continuing on from the first interior chamber to the second interior chamber and beyond continuing on through the body;
i. a second air passageway in the body commencing in the first interior chamber and terminating in the second interior chamber;
j. a second diaphragm flexible from its mid position in the second interior chamber to move one way to decrease the liquid volume of the second chamber and to move the opposite way to decrease the air volume of the second chamber, the latter movement creating a vacuum volume to suck back liquid increasing the overall liquid volume of the interior chamber.

18. The incorporated no drip suck back unit and liquid control unit installable in liquid supply equipment, as claimed in claim 17, having a controllable source of compressed air, exhaustable to atmosphere, connected to the first air passageway and utilized to control the flexures of the respective first and second diaphragms and thereby stopping the liquid flow without any drip occurring.

19. The incorporated no drip suck back unit and liquid control unit installable in liquid supply equipment, as claimed in claim 18, having respective return compression springs moving each diaphragm toward the respective air volumes of the respective chambers.

20. The incorporated no drip suck back unit and liquid control unit installable in liquid supply equipment, as claimed in claim 19, having an electrical operated solenoid air valve to control the source of compressed air.

* * * * *