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LIQUID APPLICATOR

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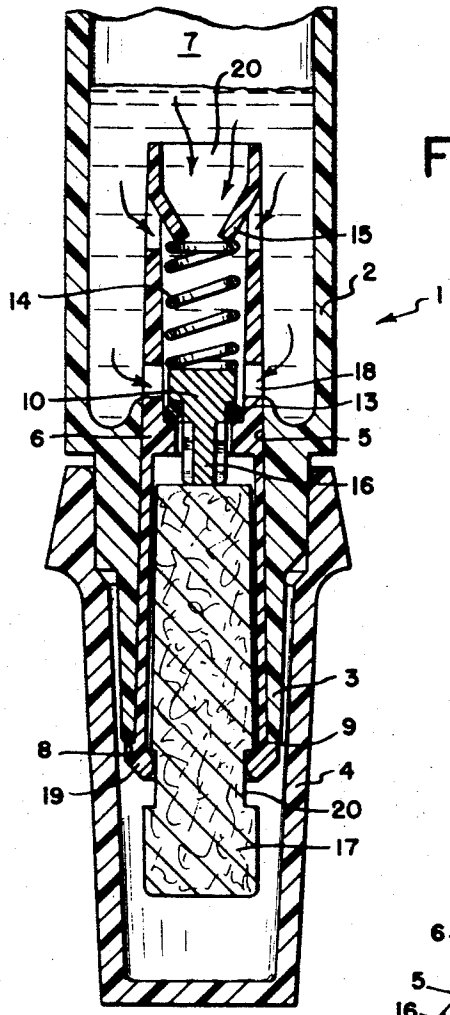


FIG. 1

FIG. 2

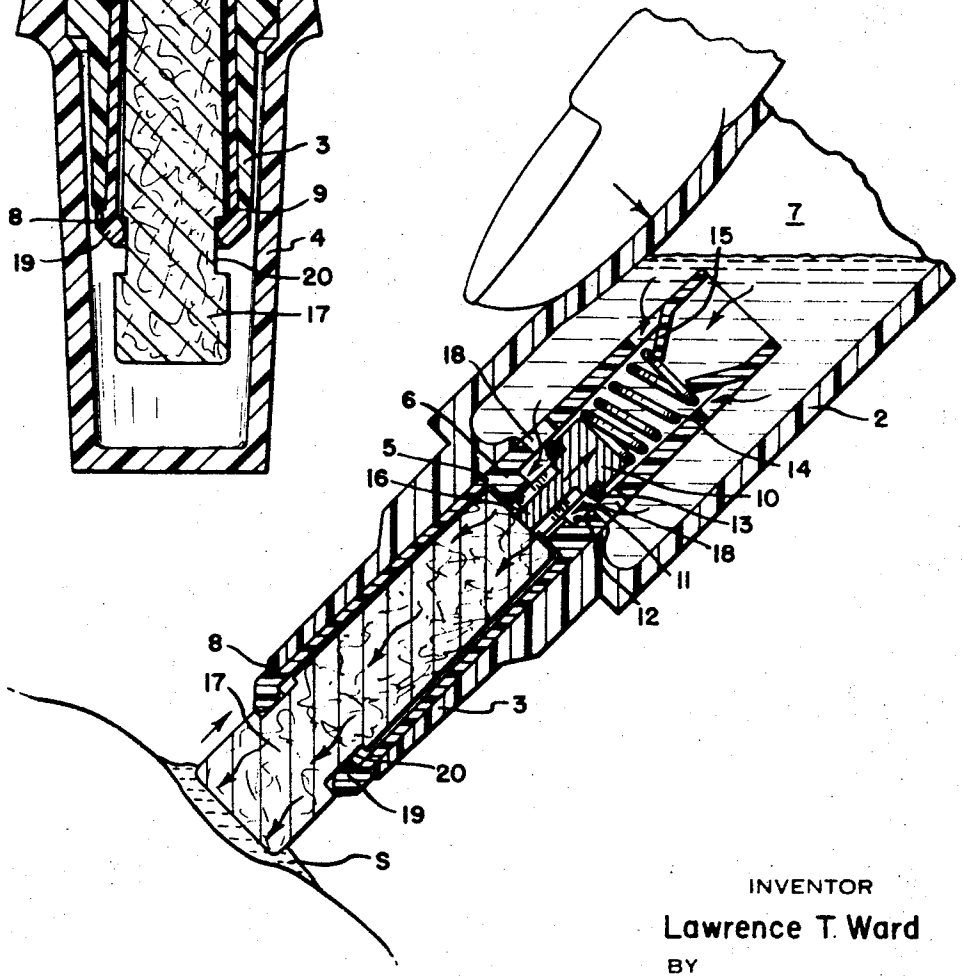


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FIG. 3

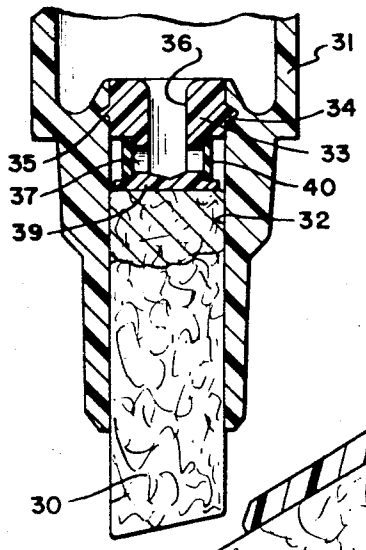


FIG. 4




FIG. 6

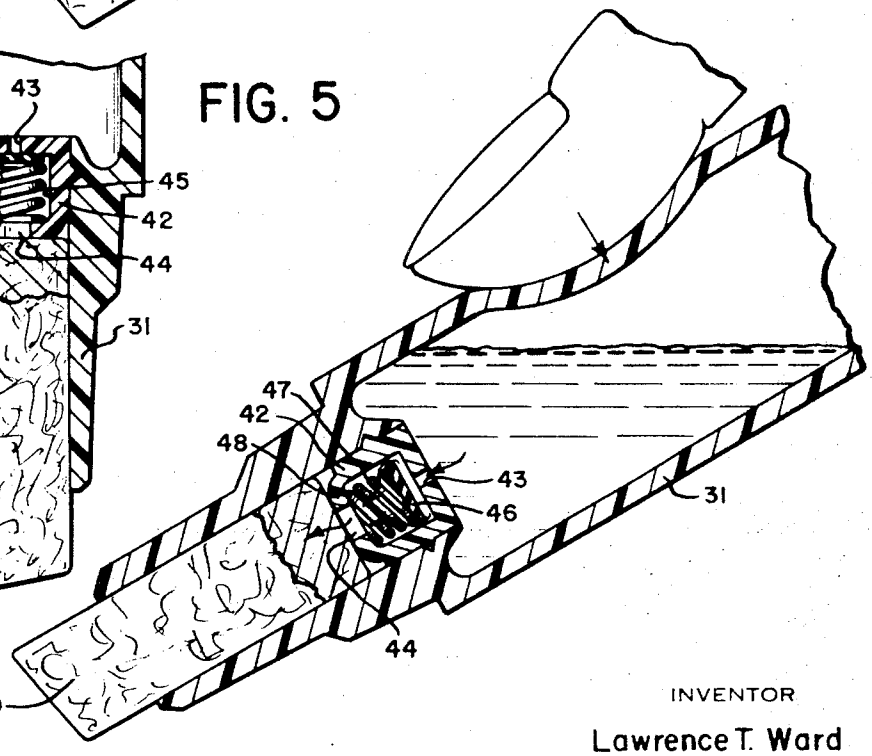


FIG. 5

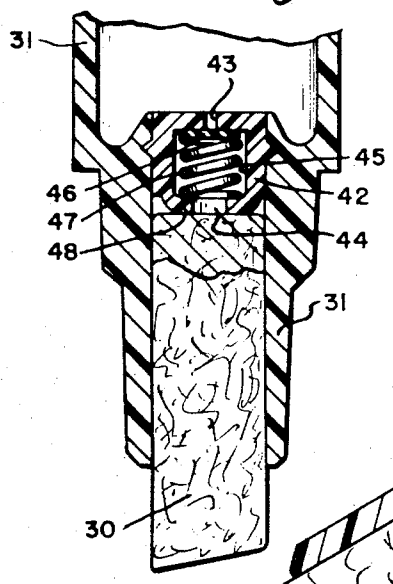


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FIG. 7

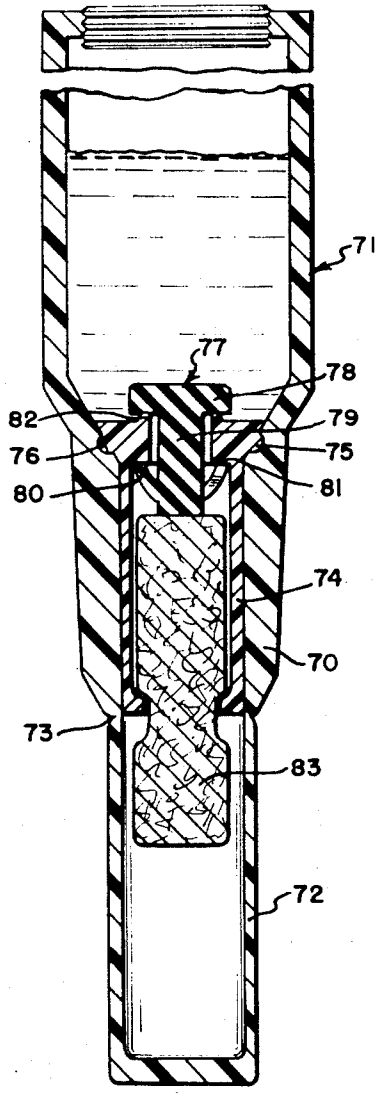



FIG. 8

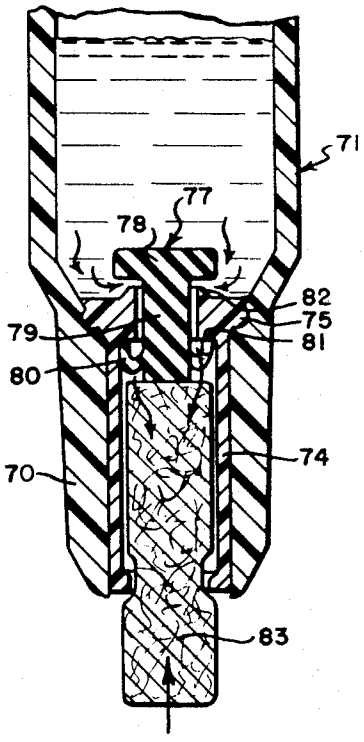
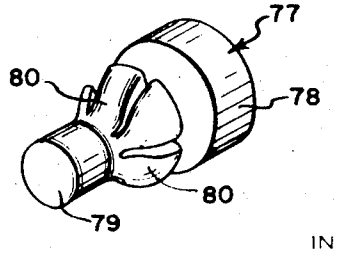



FIG. 9

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3,468,611

# LIQUID APPLICATOR

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U.S. Cl. 401—186 2 Claims

## ABSTRACT OF THE DISCLOSURE

A liquid applicator having a tubular member of flexible side wall construction, a porous applicator nib and valve means for controlling flow of liquid from the tubular member to the applicator nib.

This invention relates to a liquid applicator and more particularly to an applicator construction whereby evaporation of fluid in the applicator nib will be minimized between periods of use.

A problem existing in conventional applicators, particularly those with which highly viscous liquids are used, is to provide a means whereby the liquid may be forced from a container into a porous applicator nib and at the same time provide a means which will have a liquid reservoir adapted to be sealed from the atmosphere and which, when an outside force such as finger pressure is applied, will allow the liquid contents of the reservoir to be forced into an applicator nib whereby the liquid may be applied to a desired area. A further object of the invention is to provide for an applicator construction which permits ready assembly by machine methods.

Applicators of the type with which the invention is concerned have particular use with liquids where the normal wick action of a porous nib would be insufficient to draw the liquid from a liquid reservoir. Examples of such applicators are those used for applying pharmaceuticals, such as iodine to cuts and wounds, applying fluxes to areas to be soldered, applying liquid chalk to blackboards, applying adhesives, or applying any liquid having a high evaporation rate, and which, because of the nature of the liquid, must be forced from the applicator under pressure.

Broadly the invention comprises having a tubular member which is made of a flexible plastic or other material wherein the interior of the member serves as a fluid or liquid reservoir. A valve opening is included in one end of the member and a movable valve means is provided to open and close the valve opening. A resilient means is also included to urge the valve to a normally closed position. In addition a porous applicator nib is positioned in the end of the tubular member to receive fluid from the fluid reservoir when the valve means is in an open position and in order to apply the fluid to a desired area.

In a preferred embodiment of the invention, the applicator nib is movable within the applicator so as to force the valve open against the force of the resilient means whereby fluid may flow under the force of finger pressure being exerted on the side walls of the tubular member onto the porous applicator and thence to the area desired to be covered by the fluid. Other forms of the invention include particular valve constructions, structure whereby the valve, resilient means and nib may be assembled into the applicator as a unit, and frangible cover means integral with the tubular member whereby the applicator may be hermetically sealed.

Referring to the drawings in which preferred embodiments of my invention are shown,

FIGURE 1 is a partial cross-sectional view of one form of applicator according to the invention shown in a nonoperating position prior to fluid being applied to a surface area;



FIGURE 2 is a cross-sectional view similar to FIGURE 1 showing the applicator of FIGURE 1 in an operating position applying fluid;

FIGURE 3 is a cross-sectional view of a modified form of applicator shown in a nonoperating position;

FIGURE 4 is a cross-sectional view of the applicator of FIGURE 3 in operating position;

FIGURE 5 is a cross-sectional view of a further form of applicator having a nib fixed with respect to the applicator and in a nonoperating position;

FIGURE 6 is a view of the applicator of FIGURE 5 in operating position;

FIGURE 7 is a cross-sectional view of a further form of applicator having in addition a frangible protective cover and in a nonoperating position;

FIGURE 8 is a cross-sectional view of the applicator of FIGURE 7 shown in operating position; and,

FIGURE 9 is an enlarged perspective view of the valve means of the applicator of FIGURES 7 and 8.

Referring to the drawings in greater detail and in particular to FIGURES 1 and 2, there is illustrated an applicator **1** which comprises a tubular member **2** made of a flexible plastic whereby the tube is adapted to be deformed by finger pressure. The member **2** has a reduced portion **3** at one end over which a protective cover **4** may fit. The reduced portion in turn has a bore **5** in which a valve body **6** is inserted so as to extend into a fluid reservoir **7** formed within the tubular member. The valve body is positioned in the bore by shoulder **8** of the valve body engaging the annular end **9** of the member **2**.

The valve body **6** carries a valve member **10** which is adapted to open and close a valve opening **11** formed between a bore **12** in the valve body and an O-ring seal **13** carried by the valve member. The valve member **10** is urged to the closed position as shown in FIGURE 1 by a coil spring **14** which is positioned within the valve body **6** by means of prongs **15**. The valve member has a valve stem **16** which is engaged by a porous felt applicator nib member **17** which is movably carried within the valve body.

When the applicator is in the operating position as shown in FIGURE 2, the nib member is pressed against the surface S upon which fluid is to be applied. This forces the nib against the valve stem **16** to move the valve member **10** upwardly against the force of the spring **14** whereby fluid within the reservoir **7** will flow through openings **18** contained within the valve body, through the valve opening **11** and into the porous nib. Finger pressure depressing the side walls of the tubular member **2** increases the fluid pressure within the nib and so assists the flow of fluid through the valve opening into the porous nib.

In the construction shown in FIGURES 1 and 2, the tubular member is closed at its end opposite the applicator nib (not shown). Preferably, the tubular member will be of a molded single piece construction with the closed end integral with the tubular side walls to insure that there will be no leakage at the closed end.

The valve body member, nib and valve by their construction may be economically assembled together as a unit. This is done by forcing the nib into the end of the valve body such that the locking ridge **19** contained on the end of the valve body will engage with the groove **20** in the end of the applicator nib. The valve is then assembled into the valve body through the open end **20** and then the spring is inserted into the open end over the valve. The prongs **15** are next forced inwardly to hold the spring **14** in position. The nib, valve body and valve may then be assembled as a unit into the tubular member after it has been filled with fluid. Assembly of the valve

body, nib and valve as a unit facilitates automatically assembly of the applicator.

The cover **4** is then applied to the reduced end of the applicator to protect the nib **17** from dirt. This cover will also tend to keep the nib from drying out after initial use as the cover may be replaced onto the reduced end of the tubular member after each use of the applicator.

The applicator construction shown in FIGURES 3 and 4 differs from that shown in FIGURES 1 and 2 mainly in that the nib **30** is fixed relatively to the tubular member **31** and in that no separate valve body is provided to carry the valve means. In the construction shown, the tubular member **31**, which like that shown in FIGURES 1 and 2 comprises a flexible plastic, has a bore **32** into which a seat member **33** is fixed. A ridge **34** is provided on the outer periphery of the member **33** in order to lock the member into a groove **35** in the tubular member.

The member **33** is provided with a bore **36** which extends partway through the member **33** to connect with radially extending passages **37**. A reduced portion **39** of member **33** is provided and about which an expansible rubber sealing ring **40** is carried. When the rubber ring is in a relaxed position as shown in FIGURE 3, it will seal the passages **37** to shut off flow of any fluid from the reservoir such that the ring acts as a valve member. When, however, as shown in FIGURE 4, the sides of the tubular member **31** are forced inwardly by finger pressure, the resulting increase in pressure of the fluid will force the rubber ring to expand to allow fluid to flow through the passages **37** around the edges of the ring **39** and thence around the end of member **33** to contact the nib **30**.

The advantage of the construction shown in FIGURES 3 and 4 is that it comprises a minimum of parts, all of which are adapted to be made by molding processes, and further in that the construction shown allows for easy filling and assembly of the applicator. The steps of assembly and filling are that initially the rubber ring is forced over the end of the member **33** so as to engage the reduced portion **36**. The tubular member is then filled with fluid to a desired level. The assembled members **33** and **40** are then forced as a unit through the bore **32** until the ring **34** engages the groove **35** which locks member **33** into place. The applicator nib **30** is then forced into the end **31** until it engages the seat member **33**. Finally, a protective cover of the type shown in FIGURE 4 may be applied to the reduced end to protect the nib.

The construction shown in FIGURES 5 and 6 is generally similar to that shown in FIGURES 3 and 4 except that a different valve structure is shown. In the embodiment of these figures, the member **42** which serves as a valve cage has an inlet opening **43**, an outlet opening **44** and an inner bore **45**. The valve itself comprises a rubber disc **46** which is urged in an upward closing direction by a coil spring **47** positioned between the disc **46** and the inner end of the member **42**. The spring and disc are first assembled in the cage member and then the portion **48** of the cage is turned inwardly to hold the spring and valve disc in place.

The method of filling and assembly of the valve cage into the tubular member is similar to that in FIGURES 3 and 4, namely the tubular member **31** is initially filled with liquid, the valve cage, spring and valve are then inserted into the open end of the tubular member as a unit until the locking ridge engages the groove **35** and last the nib is inserted into the open end until it engages the valve cage.

A type of closure means which may be utilized for closing the open end of the tubular member is illustrated in FIGURE 7.

In both the constructions of FIGURES 3 and 5, the nib is fixed with respect to the tubular member and the only force moving the valve is that caused by increase of fluid pressure when the tubular member is deformed by finger pressure.

Referring to FIGURES 7 and 8, a still further embodiment is shown wherein the method of assembly is different from that of the previous embodiments. In this particular construction, the tubular member **71** comprises a flexible plastic tube which is so molded that the open end is opposite to that of the previous embodiments. The applicator end **70** of the tubular member **71** is joined to a protective cap **72** which is molded with the tubular member. Score lines **73** are provided in order that cap **72** may be easily broken off from the end **71**.

A valve body **74** is provided with locking and positioning ridge **75** which engages with a retaining groove **76** carried in the tubular member to lock and position the valve body within the member. The valve member **77** differs from the valves previously disclosed in that the resilient means for holding the valve in a closed position are molded with the valve body. As shown in FIGURE 9, the valve member **77** comprises a disc **78** which connects with a valve stem **79**. Valve stem **79** in turn has a plurality of fingers or prongs **80** which are adapted to engage with a shoulder **81** contained within the valve body. The disc **78** engages a valve seat **82** as shown in FIGURE 7 when the valve is in the closed position. A porous nib **83** is movably carried in the valve body in the same manner as shown in the applicator construction of FIGURES 1 and 2. The nib, as in the FIGURE 1 construction, engages the stem **79** of the valve in order to move the valve when the nib is pressed onto the surface to which fluid is to be applied.

When the applicator is used, the nib **83** is forced upwards as shown in FIGURE 8 to move the valve disc **78** off the seat **82** which then allows fluid to flow under the force of finger pressure into the valve body and to contact the porous nib.

The manner of assembly of this applicator differs from that of the previous embodiments. While the nib **83**, valve body **74** and valve **77** are assembled into the tubular member as a unit, they are put into the tubular member through the bottom open end prior to filling instead of after filling as in the other embodiments. After the tubular member is filled, the open end is sealed by spin welding a plug into the tubular member or by heat sealing in order to provide a permanent seal.

The construction shown in FIGURES 7–9 is particularly useful where highly volatile fluids are to be dispensed by the applicator. This is because the break-off cap **72** provides a hermetically sealed construction which minimizes any possibility of the highly volatile liquid evaporating.

I claim:

**1.** A liquid applicator comprising:

(a) a tubular member having flexible side walls wherein a portion of the interior of said member is adapted to form a fluid reservoir;

(b) a valve opening in a first end of said tubular member;

(c) closure means for closing a second open end of said tubular member opposite said first end;

(d) a valve body member a portion of which has a greater cross-sectional area than said valve opening and which has a lesser cross-sectional area than said second open end with a portion of said body member extending into said opening and where the valve body carries

(i) movable valve means,

(ii) resilient means for urging said valve means to a normally closed position, and

(iii) a movable porous writing nib contacting said valve means

whereby said valve body, valve means, resilient means and nib may be inserted as a unit into said valve opening through said second open end; and,

(e) a frangible seal portion integral with the first end of said tubular member and overlying said valve opening and writing nib to hermetically seal and protect said nib prior to use.

2. A liquid applicator according to claim 1 having in addition means for locking said valve body member in said valve opening.


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