(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 197 281 B1**

(12) # EUROPEAN PATENT SPECIFICATION

(45) Date of publication of patent specification: **11.09.91** (51) Int. Cl.[5]: **B43K 8/02**

(21) Application number: **86102514.6**

(22) Date of filing: **26.02.86**

(54) **Liquid applicator device.**

(30) Priority: **27.02.85 US 706100**
05.06.85 US 741537

(43) Date of publication of application:
15.10.86 Bulletin 86/42

(45) Publication of the grant of the patent:
11.09.91 Bulletin 91/37

(84) Designated Contracting States:
CH DE FR GB IT LI SE

(56) References cited:
DE-A- 3 303 341
FR-A- 1 016 052
US-A- 2 996 750
US-A- 3 640 631

(73) Proprietor: **FLOCON, INC.**
111 Lewis Drive Suite 221
Barrington, Illinois 60016(US)

(72) Inventor: **Kremer, Leon V.**
68 Dole Avenue
Crystal Lake IL 60014(US)
Inventor: **Keiras, Ronald E.**
420 Parkview Terrace Road West
Algonquin IL 60102(US)
Inventor: **Knickerbocker, Michael G.**
6513 Coachlight
McHenry IL 60060(US)

(74) Representative: **Strehl, Schübel-Hopf, Groening**
Maximilianstrasse 54 Postfach 22 14 55
W-8000 München 22(DE)

EP 0 197 281 B1

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid (Art. 99(1) European patent convention).

Description

The present invention relates to a liquid applicator device for applying an applicator liquid to a surface, comprising:
a liquid container;
an inner subassembly;
an outer subassembly;
said inner subassembly including a valve body, a valve element, a valve seal and bias means;
means connecting said valve body to said valve seal with said bias means raising said valve element into sealing engagement with said valve seal;
said outer subassembly including a valve closure and a surface applicator;
said valve closure having a first and a second end with an internal closure cavity extending therebetween;
said surface applicator having a proximal end and a distal end with said surface applicator being disposed in said internal closure cavity of said valve closure;
means connecting said valve closure to said valve body with said proximal end of said surface applicator engaging said valve element and with said distal end of said surface applicator extending external said second end of said valve closure for applying the applicator liquid to the surface;
means connecting said first end of said valve closure to said liquid container; and
said surface applicator moving said valve element from said sealing position to an open position upon depression of said distal end of said surface applicator on the surface enabling the flow of the applicator liquid from said container to said surface applicator.

The liquid applicator device of the above mentioned type is known from DE-A-3 303 341. A mouth piece is screwed on the neck of a container. An applicator wick is slideably guided within the mouth piece. Colour ink can be supplied to the applicator wick by means of a valve consisting of a housing, an insert, a valve rod and a helical spring. The housing and the insert are provided with outer flanges which are clamped between the upper face of the container neck and the downwardly directed surface of the mouth piece. The lower end of the spring engages the bottom of the valve housing, whereas the upper end of the spring is supported on an annular shoulder of the valve rod of which a sealing surface of it is pressed against a sealing surface of the valve insert. The sealing surfaces form the valve seat and a passage for the ink fluid. At the bottom of the valve housing there are provided several entrance openings for the ink fluid so that a substantially longitudinal channel is provided for supplying ink fluid to the applicator wick. The wick may be formed of plastic as to avoid that the ink and particularly the solvents of it can escape through the valve seat to the outer atmosphere. According to another embodiment of this known applicator device the applicator wick can be mounted within a sleeve-shaped holder having an outer shoulder at its distal end. The wick is securely mounted within the holder which is slideably mounted within the mouth piece. The holder and advantageously also the wick are seated on the front face of the valve rod so that smoother wick material can be used since the shoulder of the holder can be put on to the applicator surface whereby the holder is moved into the mouth piece activating the valve rod against the spring. This guiding effect can be achieved through the shoulder without compression of the wick tip by a respective inclined position of the applicator device in relation to the applicator surface.

US-A 3 640 631 discloses a marking applicator comprising a container having a fluid reservoir therein and a marking nib extending out of the other end of the container for applying fluid or ink to a surface. Said nib being disposed in a cylindrical holder having a central bore therein with at least two shoulders therein with one forming a valve seat. A valve plunger is secured to said nib and disposed within said bore. Said valve plunger has two sealing surfaces thereon with one adapted to seat against one of said shoulders. Spring biasing means normally maintain said valve plunger in a closed position seated upon said shoulder. A secondary reservoir is disposed within said valve plunger and in communication with said nib and an annular channel being provided between said valve plunger and said central bore. A bypass passage is disposed in said holder adjacent said central bore for applying fluid to the exterior of said nib when said valve plunger is unseated.

FR-A 1 016 052 discloses a nail-polish applicator the housing of which encloses a cavity closed at one end by a screw cap and being at the other end in communication with a chamber through an orifice surrounded by a shoulder. The distal end of the chamber is closed by a piece having a longitudinal bore. The piston is mounted within said chamber and rigidly connected to a rod which is longitudinally guided within said closure piece at the distal end of said chamber. The piston is engaged by one end of a spiral spring the other end of which engages the lower surface of the annular shoulder between the cavity enclosing the polish and the chamber. The distal end of the piston rod extends beyond the closure piece into a brush mounted on the outer end of said closure piece. If a finger nail is pressed against the outer end

of the piston rod, the piston providing together with the closure piece a valve is moved inwardly into the chamber so that the nail polish can flow through an annular channel surrounding the piston rod and wicking the brush so that the polish can be applied onto said finger nail.

US-A 3 640 631 shows a marking pen, the holding of which forms a container having a closed end and an open end. Adjacent the closed end is a fluid reservoir. Adjacent the open end is a cylindrical holder having a central bore extending therethrough. The member is secured to the interior of the casing by suitable means and has its outer surface tapered adjacent its upper end so that it can be press fitted into the end of the casing. The interior of the bore comprises an enlarged upper section which tapers inwardly. A cap is press fitted over the holder. The reduced section of the bore is provided with a longitudinally extending drilled passage therein which extends from a point adjacent the tapered seating surface to a point in spaced relationship with the annular shoulder. A marking tip extends loosely through the section of the bore and has its outer end extending a substantial distance beyond the end of the holder so that the tip can be readily used for marking with fluid. The interior end of the nib is press fitted into a cylindrical recess provided in the lower part of the valve plunger. The interior of the valve plunger is provided with a reduced bore therein above the recess which forms a secondary reservoir in communication with the exterior of the valve plunger through a drilled passage. The exterior surface of the valve plunger disposed in the section of the bore is of substantially less diameter than that of the bore section so as to provide an annular channel for fluid therearound. The valve plunger is provided with an outwardly flared rim or shoulder adapted to form a seal with bore section. The upper end of the valve plunger is provided with an outwardly flared rim adapted to seat against the tapered surface of the holder so as to form a fluidtight seal therewith. A spring is mounted over the stem of the valve plunger and is maintained in place by an annular retainer disc that is snapped into a recess in the top of the holder. When the marking nib is forced against a surface the biasing spring is compressed and the sealing rim is unseated and moves upwardly in the bore so that the main ink reservoir will communicate through the central opening in the disk. The ink will then flow around rim into the annular chamber, and the ink will pass through the drilled passage to the felt nib. Simultaneously, the sealing surface rim will move up above the drilled bypass passage so that the ink will also flow through the passage around rim to the lower end of bore section and into bore section so that ink will also be fed to the exterior of the felt nib.

Continuing efforts have been made in the past to improve the design of applicator devices, particularly in the mechanism for improving the communication of the applicator liquid from the liquid container to the surface applicator for writing, marking or otherwise applying the applicator liquid on a surface. In a typical prior art applicator device, the applicator liquid flows to the surface applicator only when the applicator device is held upside down allowing the applicator liquid to flow to the surface applicator by action of gravity.

Prior to the advent of the present invention, there have been various problems in the design, fabrication, assembly and the utilization of applicator devices of the prior art. Most prior art devices incorporating a valve have required an excessively large number of parts. In general, the prior art applicator devices incorporating a valve had to be filled with the applicator liquid and then held in an upright orientation during the process of assembling the remainder of the applicator device. Accordingly, the completed but unassembled component parts of the liquid applicator device had to be shipped from a component parts manufacturer to a filling plant whereat the component parts had to be assembled concurrently with the filling of the containers. In general, the filling plants desire to undertake only the final assembly of a product as opposed to undertaking the entire assembly as required by the prior art applicator devices. This necessarily increased not only the total manufacturing cost, but also required the filling plant to provide an additional assembly line as well as to provide the quality control for the applicator device mechanism.

Accordingly, writing, marking and applicator devices of the prior art did not permit the assembly of the applicator mechanism independent of the final assembly at a filling plant. As a result of these and various other factors, the unit price for liquid applicator devices has been unnecessarily high.

It should be readily appreciated that the fabrication of the valve mechanism of an applicator device independent of the liquid container is a significant advancement in the art. The applicator device of the present invention allows for the fabrication and assembly of the applicator device mechanism from a single manufacturing site. Thereafter, the applicator device mechanism may be shipped to a filling plant whereat the liquid container may be filled with an applicator liquid. The applicator device mechanism may then be sealed to the filled liquid container. Furthermore, the improved applicator device of the present invention permits a user to separate the applicator device mechanism from a depleted liquid container without disassembling the applicator device mechanism. Consequently, the applicator device of the present invention could be refilled by the user to thereby extend the utility of applicator device and to further reduce the overall cost of the use of the applicator device.

In the present patent application, we have improved the valve assembly through the incorporation of a superior sealing member interposed between the valve and the surface applicator which totally eliminates the need for a foam ring or foam disk sealer as required by most of the prior art devices. In addition, the novel sealing member of the present invention provides liquid seal between the valve and the surface applicator heretofore unknown in the art.

Therefore, it is an object of the present invention is to provide an improved applicator device for dispensing an applicator liquid wherein the applicator device mechanism may be constructed independently of the liquid container and subsequently coupled to the filled liquid container to form the completed applicator device.

Another object of the present invention is to provide an improved applicator device for dispensing an applicator liquid having an increased ease of assembly herein unknown in the prior art.

Another object of the present invention is to provide an improved applicator device for dispensing an applicator liquid which is more economical than the prior art applicator devices through the incorporation of component parts which permit the applicator device mechanism to be assembled by an assembly machine independent of the liquid container.

Another object of the present invention is to provide an improved applicator device for dispensing an applicator liquid which permits a user to separate the applicator device mechanism from a depleted liquid container without disassembling the applicator device mechanism for enabling the applicator device to be refilled by the user.

Another object of the present invention is to provide an improved applicator device for dispensing liquids such as inks, dyes, paints or chemicals and dispensing a wide variety of other types of viscous and non-viscous liquid products such as glues, insect repellants, oils, greases, lubricants, coating and the like.

Another object of the present invention is to provide an improved applicator device for dispensing an applicator liquid incorporating a surface applicator which permits a user to disperse the dispensed liquid on the surface.

Another object of the present invention is to provide an improved applicator device for dispensing an applicator liquid incorporating a valve for sealing the liquid container of the applicator device to prevent evaporation of the liquid in the liquid container.

Another object of the present invention is to provide an improved applicator device for dispensing an applicator liquid incorporating a valve that is moveable into an open position upon a user depressing a substantially rigid surface applicator on a surface.

Another object of the present invention is to provide an improved applicator device for dispensing an applicator liquid incorporating a valve that is moveable into an open position upon a user depressing a valve actuator for applying the liquid on a surface by a flexible surface applicator.

Another object of the present invention is to provide an improved liquid applicator device for dispensing an applicator liquid which provides an improved support for a surface applicator in the form of a fiber tip.

Another object of the present invention is to provide an improved liquid applicator device for dispensing an applicator liquid for use with a surface applicator in the form of a flexible applicator such as a paint brush or the like.

Another object of the present invention is to provide an improved applicator device for dispensing an applicator liquid incorporating a liquid container, a valve closure, a valve body, a valve element and bias means for sealing the liquid container and for dispensing and dispersing the liquid on the surface upon movement of the valve element into an open position.

Another object of the present invention is to provide an improved applicator device for dispensing an applicator liquid which is convenient for painting, marking, or applying a liquid to a surface.

Another object of the present invention is to provide an improved applicator device for dispensing an applicator liquid incorporating a novel sealing member having a superior seal between the valve and the surface applicator.

Another object of the present invention is to provide an improved applicator device for dispensing an applicator liquid incorporating a novel sealing member which is yieldable for maintaining a seal between the valve and a surface applicator irrespective of lateral movement or bending of the surface applicator relative to the valve.

Another object of the present invention is to provide an improved applicator device for dispensing an applicator liquid incorporating a novel sealing member which is suitable for use with a liquid dispensing device having either a fiber tip surface applicator or a brush surface applicator.

As to achieve the above mentioned object the present invention is characterized by

a tubular portion slideably receiving said surface applicator for forming a liquid seal between said proximal end and said distal end of said surface applicator during movement of said surface applicator parallel to

said longitudinal length of said surface applicator; and
a resilient plastic extending portion unitary with said valve seal for flexibly mounting said tubular portion with said internal closure cavity of said valve closure to maintain the liquid seal between said tubular portion and said surface applicator during deformation of said surface applicator perpendicular to the longitudinal length thereof.

According to a further improvement of the invention the applicator device for applying a liquid from a liquid container to a surface comprising in combination:
a valve having a valve body, a valve element and a valve seal;
said valve seal having a sealing surface for co-operation with said valve element;
means connecting said valve seal to said valve body;
said valve element being movable between a closed position wherein said valve element engages said sealing surface of said valve seal and an open position wherein said valve element is displaced from said sealing surface of said valve seal;
bias means for biasing said valve element into said closed position;
a valve closure having a first and a second end with an internal closure cavity extending therebetween;
a surface applicator having a longitudinal length terminating in a proximal end and a distal end;
said surface applicator being disposed in said internal closure cavity of said valve closure;
means connecting said valve closure to said valve body with said proximal end of said surface applicator engaging said valve element and with said distal end of said surface applicator extending external said second end of said valve closure;
means connecting said first end of said closure to said liquid container for enabling the flow of the liquid from the liquid container to said valve body;
said surface applicator being longitudinally movable along said longitudinal length upon depression of said distal end of said surface applicator on the surface for moving said valve element from said closed to said opened position for enabling the flow of the liquid from said valve body to said surface applicator;
characterized by a tubular portion slideably receiving said surface applicator for forming a liquid seal between said proximal end and said distal end of said surface applicator during said longitudinal movement of said surface applicator; and
said valve seal having a unitary resilient plastic extending portion for flexibly mounting said tubular portion within said internal closure cavity of said valve closure to maintain said liquid seal between said tubular portion and said surface applicator during deformation of said surface applicator due to lateral movement of said surface applicator.

Another improvement of the invention is related to an applicator device for applying a liquid from a liquid container to an applicator surface, comprising in combination:
a valve comprising a valve body, a valve element, a valve seal and biasing means;
a valve closure having a first and a second end with an internal closure cavity extending therebetween;
a surface applicator having a proximal end and a distal end with said surface applicator being disposed in said internal closure cavity of said valve closure;
means connecting said valve closure to said valve with said proximal end of said surface applicator engaging said valve element and with said distal end of said surface applicator extending external said second end of said valve closure;
said valve element being movable between a closed position and an open position for respectively inhibiting and permitting the flow of the applicator liquid from the liquid container to said surface applicator;
said bias means biasing said valve element into said closed position with said valve element being in sealing engagement with said valve seal;
characterized in that said valve seal having an extending portion for supporting a substantially tubular portion;
said tubular portion slideably receiving said surface applicator for forming a liquid seal therebetween;
means connecting said first end of said valve closure to said liquid container enabling said surface applicator to move said valve element from said sealing position to an open position upon depression of said distal end of said surface applicator on the applicator surface enabling the flow of the applicator liquid from said container to said surface applicator; and
said extending portion of said valve seal flexibly supporting said tubular portion for maintaining the liquid seal between said tubular portion and surface applicator irrespective of any deformation of said surface applicator.

BRIEF DESCRIPTION OF THE DRAWINGS

For a fuller understanding of the nature, objects and advantages of the invention, reference should be made to the following detailed description taken in connection with the accompanying drawings in which:

Fig. 1 is a side elevational view of a first embodiment of a liquid applicator device of the present invention;

Fig. 2 is an exploded view illustrating the first embodiment of the liquid applicator device of Fig. 1;

Fig. 3 is an enlarged sectional view of the liquid dispensing mechanism of Fig. 1 shown in a closed position;

Fig. 4 is an enlarged sectional view of the liquid dispensing mechanism of Fig. 1 shown in an open position;

Fig. 5 is a partial enlarged sectional view along line 5-5 in Fig. 3 showing only a valve body;

Fig. 6 is a partial enlarged sectional view along line 6-6 in Fig. 4 showing only a valve body;

Fig. 7 is a partial enlarged sectional view along line 7-7 in Fig. 4 showing only a valve element;

Fig. 8 is an enlarged sectional view of second embodiment of the liquid dispensing mechanism shown in a closed position;

Fig. 9 is an enlarged sectional view of the second embodiment of the liquid dispensing mechanism shown in an open position;

Fig. 10 illustrates the first step in a method of forming the liquid dispensing mechanisms of the present invention;

Fig. 11 illustrates the second step in the method of forming the liquid dispensing mechanisms of the present invention;

Fig. 12 is a side elevational view of a third embodiment of a liquid applicator device of the present invention;

Fig. 13 is an exploded view illustrating the third embodiment of the liquid applicator device of Fig. 12;

Fig. 14 is an enlarged sectional view of the liquid dispensing mechanism of Fig. 12 shown in a closed position;

Fig. 15 is an enlarged sectional view of the liquid dispensing mechanism of Fig. 12 shown in an open position;

Fig. 16 is an enlarged sectional view of a fourth embodiment of the liquid dispensing mechanism shown in a closed position;

Fig. 17 is an enlarged sectional view of the fourth embodiment of the liquid dispensing mechanism shown in an open position;

Fig. 18 is a view along line 18-18 in Fig. 17;

Fig. 19 illustrates the movement of a valve actuator shown in Figs. 16-18 by the finger of a user;

Fig. 20 is an elevational view of a fifth embodiment of the present invention illustrating the dispensing mechanism in combination with a flexible wall container;

Fig. 21 is a side elevational view partially in section of a sixth embodiment of the present invention illustrating an applicator device having plural surface applicators for dispensing a single applicator liquid;

Fig. 22 is a side elevational view partially in section of a seventh embodiment of the present invention illustrating an applicator device having plural surface applicators for dispensing plural applicator liquids;

Fig. 23 is a side sectional view of an eighth embodiment of the liquid dispensing mechanism shown in a closed position and incorporating an improved seal for the surface applicator;

Fig. 24 is a side sectional view of the eighth embodiment of the liquid dispensing mechanism of Fig. 23 shown in an open position;

Fig. 25 is a side sectional view of the eighth embodiment of the liquid dispensing mechanism of Figs. 23 and 24 showing a deformation of the surface applicator upon the surface applicator contacting a surface;

Fig. 26 is an enlarged partial side sectional view of the seal shown in Figs. 8 and 9;

Fig. 27 is an enlarged partial side sectional view of the seal shown in Figs. 23-25;

Fig. 28 is an enlarged partial side sectional view of a modification of the seal shown in Figs. 8 and 9; and

Fig. 29 is an enlarged partial side sectional view of a modification of the seals shown in Figs. 26-28.

Similar reference numerals refer to similar parts throughout the several views of the drawings.

DETAILED DISCUSSION

Fig. 1 is an elevational view of a first embodiment of the present invention illustrating a liquid applicator device 10 comprising a liquid container 12, a dispensing mechanism 14 and an overcap 16. The dispensing mechanism 14 includes a surface applicator 18 shown as a fiber tip for applying an applicator liquid to a surface (not shown) upon the depression of the fiber tip 18 against the surface.

Fig. 2 is an exploded view of a first embodiment of the present invention shown in Fig. 1. The liquid

container 12 is preferably constructed of a non-permeable metallic or plastic substance and is provided with a closed end 22, an open end 24 and cylindrical side walls 26. The open end 24 is adapted to receive and store a quantity of applicator liquid. When the applicator device 10 is used to apply a marking liquid, the marking liquid may be formed of opaque particles suspended in a carrier liquid. The applicator device 10 may include agitator means 28 shown as a single ball but a plurality of balls or a metal slug may be disposed within the liquid container 12. Preferably, the agitator means 28 is formed of a metallic substance having a specific gravity significantly greater than the carrier liquid and with the metallic material being selected to minimize any chemical reaction with the carrier liquid. The agitator means 28 disburses the suspended opaque particles within the carrier liquid in the event that the suspended opaque particles have become precipitated or settled from the carrier liquid.

The dispensing mechanism 14 includes an inner subassembly 31 and an outer subassembly 32 as also shown in Figs. 2-4. The inner subassembly 31 includes a valve body 34, bias means shown as a spring 36, a valve element 38 and a valve seal 40. The outer subassembly 32 comprises a valve closure 42, the surface applicator or fiber tip 18 and a foam collar 43. The valve body 34, the valve element 38, the valve seal 40 and the valve closure 42 are preferably formed of a plastic material or complementary plastic materials. The bias means is shown in this embodiment as a compression coil spring 36 which is preferably formed of stainless steel or another suitable material to preclude or minimize chemical reaction with the applicator liquid. Although the bias means has been shown as a compression coil spring 36 in the drawings, it should be understood that various other bias means may be used such as an integral plastic spring as disclosed in United States Patent 4,471,893.

As shown in greater detail in Figs. 3, 4, 5 and 6, the valve body 34 is a cup-shaped configuration having a bottom face 44, cylindrical side walls 46 and an enlarged annular open top having a shoulder 48. The bottom face 44 of the valve body 34 is of a generally triangular shape defining voids 49 between the apices 49A of the triangle as shown in Fig. 5. In order to allow essentially unrestricted flow of the applicator liquid from the liquid container 12 into the valve body 34, the valve body 34 is provided with aperture means shown in this embodiment as a plurality of liquid passing apertures including an axial hole 50 and a plurality of slots 52. The hole 50 is disposed in the bottom face 44 whereas the plurality of slots 52 are formed transversely in the peripheral sidewalls 46 of the valve body 34. The slots 52 are located adjacent the voids 49 to form large flow openings 53 between the inside surface of the liquid container 12 and the valve body 34 to facilitate the flow of the applicator liquid therebetween. A plurality of spring orientating ribs 54 are formed in the valve body 34 and extend between an inside surface of the cylindrical sidewalls 46 and an inside surface of the bottom face 44 as shown in Fig. 3, 4, and 6. The orientation ribs 54 enable the positioning of the coil spring 36 on a projection 56 extending from the bottom face 44 of the valve body 34. The projection 56 surrounds the axial hole 50 and frictionally engages the inner diameter of an inner spring end 60 of the coil spring 36. The inner diameter of an outer spring end 62 of the coil spring 36 is adapted to frictionally engage a projection 64 extending from the valve element 38.

The valve element 38 is formed in a cup-like configuration, with a closed face 72 and with circumferential side walls 74 and an open end 76. As also shown in Fig. 7, strengthening ribs 78 are located within the valve element 38 and extend from an inner surface of the closed face 72 to the open end 76 and terminate in the projection 64 which matingly engages the inner diameter of the outer end 62 of the coil spring 36. A sealing surface 80 is formed on a flared peripheral shoulder located on an open end 76 of the valve element 38. A flexible sealing seat 82 is formed on the inner end of the valve seal 40. The diameter of the sealing surface 80 is greater than the diameter of the sealing seat 82. Spring 36 urges the reciprocal valve element 38 into a closed position as shown in Fig. 3 whereat the sealing surface 80 of the valve element 38 is in contact with sealing seat 82 of the valve seal 40 to inhibit the flow of applicator liquid therethrough. The valve element 38 may be moved to an open position as shown in Fig. 4 whereat the sealing surface 80 of the valve element 38 is displaced from the sealing seat 82 of the valve seal 40 to permit the the flow of applicator liquid therethrough. In this embodiment, the depression of fiber tip 18 will compress the spring 36 and displace the sealing surface 80 from the sealing seat 82 as shown in Fig. 4. The sealing surface 80 is made flexible by virtue of the thickness of the material and by virtue of the selection of the valve seat material. The valve element 38 has a point 86 for receiving and positioning an inner end of the surface applicator 18.

The valve seal 40 is generally cylindrically shaped and is provided with a circumferential shoulder 84 of a diameter greater than the remainder of the valve seal 40. The valve seal 40 is inserted into the valve body 34 with the valve element 38 and spring 36 located therebetween. The shoulder 84 of the valve seal 40 engages with the shoulder 48 of the valve body 34 to limit the depth of penetration of the valve seal 40 into the valve body 34. The shoulder 84 is substantially the same diameter as the diameter of the annular shoulder 48 of the valve body 34 enabling the first subassemly 31 to be inserted into the seccnd

subassembly 32. The annular projection 88 extends from the valve seal 40 whereas an annular recess 90 is disposed in the valve body 34. The annular projection 88 is received within the annular recess 90 in an interlocking engagement to couple the valve seal 40 to the valve body 34 to form the independent inner subassembly 31 of the dispenser mechanism. The valve seal 40 is preferably a plastic material such as polyethylene or other similar moldable material which will assume a rigid shape but be slightly more flexible than the polypropylene of the valve body 34 and valve element 38 to allow the inner and outer subassemblies 31 and 32 to be readily snapped together.

The outer subassembly 32 may be fabricated independently of the inner assembly 31 and the liquid container 12. The outer subassembly 32 of the first embodiment includes the surface applicator 18 shown as a substantially rigid fiber tip, the valve closure 42 and a foam disk shown in this embodiment as a cylindrical foam collar 43. The fiber tip 18 is a cylindrically shaped member formed of a highly compacted fibrous material such as polyester or other similar material having properties which enable the fiber tip 18 to hold the original shape when moistened with the applicator liquid while simultaneously being capable of passing the applicator liquid from a proximal or an inner end 98 to a distal or an outer end 100 of the fiber tip 18 by capillary action.

The valve closure 42 is a hollow element with an outer portion 104 having tip centering ribs 106 on the inner surface adapted to be frictionally engaged by the surface applicator 18 to position and support the surface applicator 18. A central cylindrical portion 108 of the valve closure 42 is adapted to receive the foam collar 43. The foam collar 43 is formed as a hollow cylinder with an inner circumferential surface adapted to frictionally receive the surface applicator 18 therein. The exterior surface of the foam collar 43 is adapted to be frictionally received by the inner surface of the central portion 108 of the valve closure 42. In the alternative, a cylindrical disk may be disposed within the central portion 108 for contacting the inner end 98 of the surface applicator 18. In the case when a foam disk is used in place of the foam collar 43, the inner end 98 of the surface applicator 18 engages the foam disk. The surface applicator 18, valve closure 42 and the foam collar 43 comprise the independent outer subassembly 32.

The valve closure 42 has an inner portion 110 having a diameter greater than the remainder of the valve closure 42 which is provided with a circumferential inner recess 112 capable of receiving and positively retaining an annular projection 114 extending from the valve body 34 of the inner subassembly 31. In the assembled configuration the shoulder 84 of the valve seal 40 engages with shoulder 113 of the valve closure 42. Accordingly, the inner and outer subassemblies 31 and 32 may be joined together into a snap locking engagement by an automatic machine process.

The applicator dispensing mechanism 14 is joined to the container 12 in this embodiment by a press fit engagement. The exterior diameter 115 of the valve closure 42 is tapered to be inserted into the open end 24 of the container 12. The exterior surface of the valve closure 42 is also provided with a shoulder 116 for engaging with the open end 24 of the container 12 to axially limit the movement of the dispensing mechanism 14 relative to the container 12.

The overcap 16 includes an inner end 120 having an internal diameter selected for a friction fit with the valve closure 42. The shoulder 116 of the valve closure 42 limits the movement of the overcap 16 on the valve closure 42. The overcap 16 has a closed outer end 122 positioned to avoid contact with the surface applicator 18 when the overcap 16 is positioned on the valve closure 42 as shown in Fig. 3. The overcap 16 may be provided with external gripping ribs 124 for aiding in the removal of the overcap 16 by a user. The valve closure 42 and the overcap 16 are preferably formed of acetal or a similar moldable material which will inhibit evaporation of any carrier liquid or solvent within the applicator material.

Preferably, the valve closure 42 and the overcap 16 are more rigid than the other elements of the applicator dispensing mechanism 14. The foam disk or collar 43 is preferably formed of an open cell, foaminous material to provide controlled flow of applicator liquid therethrough. The foam disk or collar 43 also functions as a reservoir to provide applicator liquid to a larger surface area of the surface applicator 18. The foam collar 43 further eliminates the need for keeping the valve mechanism continuously open during the dispensing process. The foam disk or collar 43, like all of the other elements of the liquid applicator device 10, is fabricated from a material which will not be adversely affected chemically when contacted by the applicator liquid.

As can be seen in Figs. 3 and 4 the foam disk or collar 43 is located in a liquid chamber 128 defined by the valve element 38, the valve closure 42 and surface applicator 18 whereby depression of the rigid fiber tip 18 will compress the spring 36 to separate the sealing surface 80 of the valve element 38 from the sealing seat 82 of the valve seal 40 as shown in Fig. 4. The separation of the sealing surface 80 of the valve element 38 from the sealing seat 82 of the valve seal 40 permits the flow of the applicator liquid by action of gravity from the container 12 through valve body 34 to the liquid chamber 128 and then to the surface applicator 18. The release of the depressing pressure from the rigid fiber tip 18 will return the sealing

surface 80 of the valve element 38 into sealing engagement with the sealing seat 82 of the valve seal 40 as shown in Fig. 3 to inhibit the flow of the applicator liquid from the container 12 to the rigid fiber tip 18.

Figs. 8 and 9 illustrate a second embodiment of the invention shown in Figs. 2-7. In this second embodiment, the liquid dispensing mechanism 10A is identical to the mechanism heretofore described with similar parts being labeled with similar reference numerals followed by the letter A. In this embodiment the valve seal 40A includes an extending portion 150A having an inwardly projecting wall 152A for contacting the surface applicator 18A. The extending portion 150A and the inwardly projecting wall 152A create a chamber 128A which functions as a liquid reservoir for the inner end 98A of the rigid fiber tip 18A to replace the reservoir created by the foam collar 43 in Figs. 2-4. The inwardly projecting wall 152A acts as a seal for the liquid chamber 128A and prevents the flow of the applicator liquid along the side of the surface applicator 18A. The projecting wall 152A further stabilizes the felt tip 18A. This contribution to the art not only reduces the number of required parts and cost, but also facilitates the manufacturing process since the foam disk or collar 43 has been the most difficult element to handle in the assembly of the liquid applicator device 10. In the manufacture of the prior art liquid applicator devices, the sponge-like characteristics of the foam collar 43 often required that the foam collars had to be applied and assembled in a hand operation. The elimination of the foam collar 43 from the liquid applicator device 10 and the associated manufacturing process thus permits the entire fabrication and assembly process to be readily done on totally automated machinery. The embodiment shown in Figs. 8 and 9 provide superior performance and eliminate the need for any foam which was required in many of the prior art devices.

Figs. 10 and 11 illustrate in greater detail the method of assembling the liquid applicator devices of the present invention as described heretofore and described hereinafter. Fig. 10 shows the coil spring 36 being frictionally attached to the cup-shaped body 34 with the inner diameter of the inner spring end 60 being received on the projection 56 of the inner surface of the bottom face 44 of the valve body 34. The projection 64 extending from the valve element 38 is then axially placed into a frictional relationship with the inner diameter of the outer spring end 62 of the spring 36. The valve seal 40 is then axially press fit against the shoulder 48 of the valve body 34 with recess 90 of the valve body 34 receiving projection 88 of the valve seal 40 as best shown in Figs. 3 and 4. As also shown in Fig. 10, the cylindrical foam collar 43 is frictionally located over the surface applicator 18 and the outer end 100 of the surface applicator 18 is inserted into the internal centering ribs 106 of the cylindrical valve closure 42. The outer end 100 of the surface applicator 18 is exposed for applying the liquid to the surface whereas the inner end of the surface applicator within the valve closure 42 is adapted to contact the closed face 72 of the valve element 38.

As shown in Fig. 11, the inner subassembly 31 and the outer subassembly 32 are mated to one another with shoulder 84 of the valve seal 40 engaging shoulder 113 of the valve closure 42 and with the projection 114 of the valve body 34 being received within the recess 112 of the valve closure 42 as best shown in Figs. 3 and 4. The overcap 16 may optionally be inserted onto the completed applicator dispensing mechanism 14 comprising the inner subassembly 31 and the outer subassembly 32.

The applicator dispensing mechanism 14 comprising the inner and outer subassemblies 31 and 32 and preferably with the overcap in place may then be shipped to a filling plant wherein the applicator liquid is placed within the container 12. Preferably, the exterior diameter 115 of the valve closure 42 is press fit into the open end 24 of the container 12 as shown in Figs. 1-9. The second embodiment, the liquid applicator devices 10A is fabricated and assembled in a manner similar to the first embodiment. The inner subassembly 31A is fabricated in a similar manner. However in the outer subassembly 32A, the step of inserting the foam collar 43 is omitted from the fabrication process. In the second embodiment, the inner end 98A of the surface applicator 18A is axially inserted into the extending wall 152A of the valve seal 40A. The inner subassembly 31A and the outer subassembly 32A are mated to one another as heretofore described.

The liquid applicator device of the present invention may readily be used for marking or writing in a manner similar to conventional writing devices or may readily be used to apply other liquids such as perfumes, chemicals, lubricants or most any other desired liquid. With the removal of the overcap 16, the surface applicator 18 is exposed for applying the applicator liquid on the desired surface in a conventional manner. When a user determines that the supply of applicator liquid to the surface applicator 18 has become insufficient, the user can supply additional applicator liquid to the surface applicator 18. The additional applicator liquid is supplied to the surface applicator 18 by holding the applicator device 10 with a surface applicator 18 below the container 12 and simultaneously depressing the fiber tip 18 against a surface. The surface applicator 18 will slide axially into the valve closure 42 thereby axially moving the valve element 38 against the force of the spring 36 to separate the sealing surface 80 of the valve element 38 from the sealing seat 82 of the valve seal 40. The applicator liquid may then flow from the container 12 under the influence of gravity through the slots 52 and hole 50 of the valve body 34 around the sealing

surface 80 of the valve element 38 into the liquid chamber 128 for contacting the surface applicator 18.

In the first embodiment, the foam collar 43 in the liquid chamber 128 functions as a seal to preclude the flow of applicator liquid other than through the surface applicator 18. The foam collar 43 also assists in conveying the applicator liquid to a broader surface area of the surface applicator. The second embodiment 10A is void of the foam collar 43 and therefore the applicator liquid flows directly into a liquid chamber 128A for contacting the inner end 98A of the surface applicator 18. The projecting wall 152A precludes the movement of the applicator liquid therebeyond.

When the inner end 98 of the surface applicator 18 has received additional applicator liquid, the additional applicator liquid migrate along the entire length of the surface applicator 18 by capillary action. Accordingly, an operator can maintain an optimum amount of the applicator liquid on the outer end 100 of the surface applicator 18 over an extended period of time.

Figs 10 and 11, also show a variation of the first embodiment wherein the valve closure 42T also comprises threads 160 for engaging with threads 162 on the container 12T. The use of a threaded engagement between the valve closure 42T and the container 12T enables the operator to unscrew the applicator dispensing mechanism 14 from the container 12T and to refill the container 12T with the applicator liquid. When the container 12T eventually has been depleted of applicator liquid, the dispensing mechanism may be readily separated from the container 12T, if desired, and refilled with applicator liquid and then be reassembled. During such process, the elements of the dispensing mechanism 14 are retained in an assembled condition independent of the coupling to the container 12T. In prior art devices, the dispensing mechanism would not be maintained in an assembled condition since the interconnection between the container and dispensing mechanism secures the elements of the dispensing mechanism. Although a press fit and a threaded engagement have been shown herein, it should be appreciated by those skilled in the art that various means may be incorporated for securing the container to the dispensing mechanism 14.

Fig. 12 is an elevational view of a third embodiment of the present invention illustrating a liquid applicator device 10B comprising a liquid container 12B, a dispensing mechanism 14B and an overcap 16B. The dispensing mechanism 14B includes a surface applicator 18B shown as a flexible brush for applying an applicator liquid to the surface.

Fig. 13 is an exploded view of the third embodiment of the invention shown in Fig. 12. The dispensing mechanism 14B includes an inner subassembly 31B and an outer subassembly 32B which are also shown in Figs. 14 and 15. The inner subassembly 31B includes a valve body 34B, bias means shown as a spring 36B, a valve element 38B and a valve seal 40B. The outer subassembly 32B comprises a valve closure 42B, the surface applicator brush 18B and the foam collar 43B. The third embodiment of Figs. 12-15 is similar to the first embodiment shown in Figs. 1-7 with similar parts being labeled with the same reference numerals followed by the letter B. In the third embodiment 10B, the surface applicator comprises a valve actuator 180B and a brush 182B disposed within the valve actuator 180B. The valve actuator 180B is preferably formed of a plastic tubular material with the fibers of the brush 182B being retained within the valve actuator 180B by means well known to those skilled in the art. The valve actuator 180B includes a single actuator orifice 184B or a plurality of valve actuator orifices 184B disposed adjacent the proximal or inner end 98B of the valve actuator 180B. The valve actuator orifice 184B enables the passage of the actuator liquid from the foam collar 43B to the fibers of the brush 182B. The applicator liquid may then flow by capillary action from the inner end 98B to the outer end 100B of the valve actuator 180B to migrate to a distal end 186B of the brush 182B. The valve actuator 180B is movable within the outer portion 104B of the valve closure 42B and is guided by the ribs 106B in a manner similar to the fiber tip 18 of Figs. 1-11. Since the brush 182B is flexible, the valve actuator 180B is used to move the valve element 38A from the closed position as shown in Fig. 14 to the open position as shown in Fig. 15. The valve actuator 180B may be conveniently moved by pressing the outer end 100B of the valve actuator 180B against a surface such as an edge of the overcap 16B or any other convenient surface. The applicator mechanism 14B and the function of the valve element 38B operates in the same manner as the applicator mechanism 14 and the valve element 38 previously described with reference to Figs. 1-7.

Figs. 16 and 17 illustrate a fourth embodiment of the invention which is similar to the third embodiment shown in Figs. 12-15 with similar parts being labeled with the same reference numerals follow by the letter C. In the fourth embodiment 10C, the surface applicator comprises a valve actuator 180C and a brush 182C disposed within the valve actuator 180C. The valve actuator 180C includes a valve actuator orifice 184C disposed adjacent a proximal or inner end 98C of the valve actuator 180C. The valve actuator orifice 184C enables the passage of the actuator liquid from the liquid chamber 128C formed by the extending portion 150C and the projecting wall 152C to the fibers of the brush 182C. The applicator liquid may then flow ,by capillary action from the proximal or inner end 98C through a distal or outer end 100C of the valve actuator

180C to a distal end 186C of the brush 182C. The valve actuator 180C is movable within the outer portion 104C of the valve closure 42C and is guided by the ribs 106C in a manner similar to Figs. 12-15. The projecting wall 152C of the extending portion 150C form a sliding seal with the valve actuator 180C to direct the applicator liquid to the valve actuator orifice 184C. In a manner similar to Figs. 12-15, the valve actuator 180C is used to move the valve element 38C from the closed position as shown in Fig. 16 to the open position as shown in Fig. 17. In this embodiment, the valve actuator 180C includes a contact member 188C shown in greater detail in Figs. 18 and 19. The contact member 188C is shown as a disk integrally formed with the tubular portion of the valve actuator 180C but it should be understood that the contact member 188C may take various forms and shapes and may be an independent unit secured to the tubular portion of the valve actuator 180C by various means. The contact member 188C aids the user by providing a large area in which to contact a surface for displacing the valve actuator 180C inwardly to displace the valve element 38C as heretofore described. The applicator mechanism 14C and the function of the valve element 38C operates in the same manner as the applicator mechanism 14A and the valve element 38A previously described with reference to Figs. 8 and 9.

Fig. 20 is a side view partially in section of a fifth embodiment of the present invention illustrating a liquid applicator device 10P comprising a liquid container 12D, an applicator mechanism 14D and an overcap (not shown). The applicator mechanism 14D includes a surface applicator 18D for applying the applicator liquid to the surface. Although the surface applicator 18D has been shown comprising a brush 182D, other surface applicators may be used including the fiber tip 18 shown in Figs. 1-7.

In the fifth embodiment, the valve closure 42D also comprises threads 130D for engaging with threads 132D on the liquid container 12D. The use of a threaded engagement between the applicator mechanism 14D and the container 12D enables the user to unscrew applicator mechanism 14D from the liquid container 12D and to refill the liquid container 12D with the applicator liquid as heretofore described.

The applicator device 10D also includes a flexible wall container 12D which is preferably a flexible plastic container enabling the user to reduce the internal volume of the container 12D by squeezing or otherwise flexing the container sidewall 26D. The applicator mechanism 14D in combination with the flexible wall container 12D allows the user to dispense the applicator liquid under pressure. The dispensing of the applicator liquid under pressure enables the dispensing of viscous liquids such as glues, gels and other viscous materials. Although the means of dispensing the applicator liquid under pressure has been shown as a flexible wall liquid container 12D, it should be understood that various other means may be used to reduce the internal volume of the liquid container.

Fig. 21 is a side elevational view partially in section of a sixth embodiment of the present invention illustrating an applicator device 10E having a first surface applicator 18 on one end 24 of a liquid container 12E and a second surface applicator 18E on a second end 24E of the liquid container 12E. In this embodiment, the first applicator mechanism 14 and the first surface applicator 18 are identical to the first or second embodiments shown in Figs. 1-11 whereas the second applicator mechanism 14E and the second surface applicator 18E utilize a brush applicator device as shown in Figs. 12-15. In this embodiment, the liquid container 12E contains a common applicator liquid for dispensing through each of the first and second surface applicators 18 and 18E.

Fig. 22 is a side elevational view partially in section of a seventh embodiment of the present invention illustrating an applicator device 10F having a first surface applicator 18F on one end 24F of a liquid container 12F and a second surface applicator 18G on a second end 24G of the liquid container 12F. In this embodiment, the liquid container 12F contains an intermediate wall 138F to separate the liquid container 12F into a first and a second container portion 141F and 141G to respectively receive a first and a second applicator liquid for dispensing through the first and second surface applicators 18F and 18G, respectively. The intermediate wall 138F may be an independent unit which is inserted into a tubular container or may be integrally formed with the container.

Fig. 23 and 24 are side sectional views in a closed and an open position of an eighth embodiment of the invention illustrating a liquid marking device ION which is similar to the mechanism described in Figs. 8 and 9 with similar parts being labeled with similar reference numerals followed by the letter H. In this embodiment, the valve seal 40H includes an extending portion 150H having a flexible mounting wall 151H for flexibly supporting a tubular portion 152H. The tubular portion 152H is flexibly mounted within the internal closure cavity 108H of the valve closure 42H by a resiliency in the plastic of the flexible mounting wall 151H located between the tubular portion 152H and the valve seal 40H. The tubular portion 152H slidably receives the surface applicator 18H and forms a liquid tight seal between the proximal end 98H and the distal end 100H of the surface applicator 18H and prevents the flow of the applicator liquid along the side of the surface applicator 18H. In addition, the extending portion 150H, the flexible mounting wall 151H and the tubular portion 152H create a chamber 128H which functions as a liquid reservoir for the inner end

98H of the surface applicator 18H to replace the reservoir created by the foam collar 43 in Figs. 2-4.

Preferably, the surface applicator 18H is substantially cylindrical with the tubular portion 152H having a cylindrical inner orifice 153H for slidably receiving the substantially cylindrical surface applicator 18H. In this embodiment, the flexible mounting wall 151H is integrally formed with the valve seal 40H, the extending portion 151H and the tubular portion 152H and is secured to a central area of the tubular portion 152H. Accordingly, the tubular portion 152H comprises an inner tubular portion 156H and an outer tubular portion 158H.

The resiliency in the plastic of the flexible mounting wall 151H enables the tubular portion 152H to pivot within the internal closure cavity 108H of the valve closure 42H to maintain the liquid tight seal between the tubular portion 152H and the surface applicator 18H irrespective of any deformation of the surface applicator 18H. In addition, the extending portion 150H, the flexible mounting wall 151H and the tubular portion 152H stabilizes the inner end 98H of the surface applicator 18H.

In the prior art marking devices, an operator will in some cases add excessive pressure to the surface applicator when the surface applicator is pressed against a surface. An excessive pressure on the surface applicator caused the surface applicator to deform thereby destroying the seal between the surface applicator and the valve closure. Accordingly, the excess pressure resulted in excess liquid leaking along the outer surface of the surface applicator. If the surface applicator was already substantially saturated with the liquid, the excess liquid could not be absorbed by the surface applicator and would run along the side of the surface applicator to the surface. The operator was then required to clean the excessive liquid from the surface applicator before continuing the marking process. This inconvenience was a major disadvantage of the prior art marking devices.

Fig. 25 illustrates a side sectional view of the liquid applicator device 10H for applying an applicator liquid to a surface 160H. Fig. 25 also Illustrates an operator applying excessive pressure to the surface applicator 18H as the surface applicator 18H is pressed against a surface 160H causing deformation of the surface applicator 18H. In contrast to the prior art applicator devices, the flexible mounting wall 151H enables the pivoting of the tubular portion 152H within the internal closure cavity 108H as shown in Fig. 25 to maintain a liquid tight seal between the tubular portion 152H and the surface applicator 18H irrespective of any deformation of the surface applicator 18H. Accordingly, an excessive pressure applied to the present invention does destroy the seal and does result in excess liquid leaking along the outer surface of the surface applicator 18H. The embodiment shown in Figs. 23-25 provide superior performance to the prior art applicator devices and eliminate the inconvenience caused by leaking which was a major disadvantage of the prior art marking devices.

Fig. 26 is an enlarged partial side sectional view of the seal shown in Figs. 8 and 9 whereas Fig. 27 is an enlarged partial side sectional view of the seal shown in Figs. 23-25. In the embodiment shown in Fig. 26, the tubular portion 152I is void of an inner tubular portion and comprises only an outer tubular portion 158I. In the embodiment shown in Fig. 27, the tubular portion 152J comprises both an inner tubular portion 156J and an outer tubular portion 158J. In the embodiment shown in Fig. 28, the tubular portion 152K is void of an inner tubular portion and comprises a modified outer tubular portion 158K. In the embodiment shown in Fig. 29, the tubular portion 152L comprises an inner tubular portion 156I and is void of an outer tubular portion.

The various embodiments set forth in Figs. 26-29 illustrate different structures which are preferably used with different surface applicators and different applicator liquids. The tubular portion 152J shown in Fig. 27 has the greatest axial length and is the most suited for use with nonviscous liquids and/or surface applicators having a liquid impermeable valve actuator such as the valve actuator 180B shown in Figs. 12-15. The greater axially length of the tubular portion 152J provides a greater distance for non-viscous liquids to migrate along the side of the surface applicator 18J. Furthermore, the greater axially length of the tubular portion 152J provides increased surface tension to inhibit the migration of non-viscous liquids along the side of the surface applicator 18J. However, the greater axially length of the tubular portion 152J produces greater friction between the tubular portion 152J and the surface applicator 18J and accordingly requires a stronger spring to properly return the sealing surface into sealing engagement with the sealing seat 82J.

The embodiment shown in Figs. 26 and 29 have equivalent axial lengths with the tubular portion 152I having only the outer tubular portion 158I and with tubular portion 152L having only the inner tubular portion 156L. The embodiments shown in Figs. 26 and 29 provides suitable sealing for non-viscous liquids without requiring stronger springs to properly return the sealing surfaces into sealing engagement with the sealing seats 82I and 82L.

In the embodiment shown in Fig. 28, the tubular portion 152K has the least axial length and is the most suited for viscous liquids and/or surface applicators without a liquid impermeable valve actuator such as the valve actuator 180B shown in Figs. 12-15. In this embodiment, the outer tubular portion is undercut at 161K

to define an annular seal 159K for engaging the surface applicator 18K. The shorter axially length of the tubular portion 152K produces the least friction between the tubular portion 152K and the surface applicator 18K. Accordingly, the embodiment shown In Fig. 28 provides suitable sealing for viscous liquids and requires the weakest springs to properly return the sealing surface into sealing engagement with the sealing seat 82K. Although the various embodiments set forth in Figs. 26-29 Illustrate different structures which are preferably used with different surface applicators and different applicator liquids, each of the embodiments shown in Figs. 26-29 provide a superior seal to the foam collar or disk 43 shown in Figs. 1-4.

When the applicator devices disclosed herein and the applicator devices of the prior art are subjected to an open valve condition for a prolonged period of time, the applicator liquid will attempt to migrate along the sides of the surface applicator. The valve condition in this specification exists when the applicator device is in an operating position and the surface applicator is depress against the applicator surface for an extended period of time. Under an open valve condition, the applicator liquid tends to migrate or flood along the sides of the surface applicator. The applicator liquid that ultimately floods or migrates along the sides of the surface applicator results in an excessive amount of applicator liquid being applied to the applicator surface. The excessive amount of applicator liquid that is applied to the applicator surface is extremely undesirable since the excessive amount of applicator liquid is uncontrolled by the surface applicator and is accordingly uncontrollable by an operator.

Accordingly, a test was devised to determine the amount of excessive applicator liquid that ultimately floods or migrates along the sides of the surface applicator and is deposited on the applicator surface. The test measured the weight loss of the applicator device with the applicator liquid within the liquid container when the applicator device was subjected to an open valve condition multiple times. The weight loss represents the weight of the applicator liquid that is applied to the applicator surface. An applicator device having a higher weight loss will have a higher amount of excessive applicator liquid that floods or migrates along the sides of the surface applicator and is deposited on the applicator surface.

Table A illustrates the results of a test between the applicator device 10 shown in Figs. 1-4 incorporating the foam collar 43 and the applicator device 10H having the tubular portion 152H shown in Figs. 23-25. Each of the applicator devices 10 and 10H were filled with the same quantity of applicator liquid and were each intermittently (1) weighed, (2) subjected to an open valve condition for fifteen seconds, (3) subjected to a closed valve condition and (4) weighed. Each of the applicator devices 10 and 10H was subjected to the open valve condition thirty-six (36) times.

TABLE A

Trial No.	FIGS. 23-25	FIGS. 1-4
1	12.94 grams	12.84 grams
2	12.94	12.81
3	12.93	12.78
4	12.92	12.77
5	12.91	12.75
6	12.90	12.72
7	12.89	12.68
8	12.88	12.67
9	12.87	12.62
10	12.87	12.60
11	12.86	12.56
12	12.85	12.52
13	12.84	12.49
14	12.84	12.47
15	12.82	12.45
16	12.82	12.41
17	12.82	12.40
18	12.81	12.37
19	12.80	12.35
20	12.80	12.34
21	12.80	12.31
22	12.79	12.31
23	12.79	12.28
24	12.78	12.27
25	12.78	12.24
26	12.77	12.22
27	12.77	12.19
28	12.77	12.17
29	12.77	12.15
30	12.76	12.12

31	12.75	12.10
32	12.74	12.06
33	12.74	12.74
34	12.74	12.74
35	12.73	11.99
36	12.73	11.98
TOTAL LOSS		
	0.21 grams	0.86 grams
LARGEST AMOUNT LOST BETWEEN TRIALS		
	0.02 grams	0.05 grams

The above test illustrates that the applicator device 10H having the tubular portion 152H shown in Figs. 23-25 had significantly less weight loss than the the applicator device 10 shown in Figs. 1-4 incorporating the foam collar 43. The applicator device 10H lost a total weight of 0.21 grams of applicator liquid whereas the applicator device 10 lost a total weight of 0.86 grams of applicator liquid. Since the amount of applicator liquid lost (0.21 grams) by the applicator device 10H was sufficient to provide a suitable coating on the applicator surface, then the amount of applicator liquid lost (0.86 grams) by the applicator device 10 that is greater than 0.21 grams represents the excessive amount of applicator liquid that is applied to the applicator surface. The excessive amount (0.65 grams) of applicator liquid that was applied on the applicator surface is the undesirable and uncontrollable applicator liquid. Furthermore, the above test illustrates that the applicator device 10H produces a more efficient use of the applicator liquid than the the applicator device 10. Accordingly, applicator device 10H will have a longer useful life than the the applicator device 10.

Similar tests were performed on the various embodiments set forth in Figs. 26-29. The embodiment shown in Fig. 27 has the greatest axial length and experienced the least weight loss. The embodiments shown in Figs. 26 and 29 have equivalent axial lengths and experienced an equal weight loss which was greater than the weight loss experienced by the embodiment shown in Fig. 27. The embodiment shown in Fig. 28, has the least axial length and experienced the greatest weight loss. However, each of the embodiments shown in Figs. 26-29 providing a superior seal to the foam collar or disk 43 shown in Figs. 1-4.

Although the present invention is primarily suited for the application of a marking liquid such as ink, paint or the like to a writing surface, the present invention also finds many other useful functions in the dispensing or application of other liquid. The present inventions may be used to apply a variety of liquid such as insect repellants, perfumes, lubricants, chemicals or any other suitable liquids. In addition, the various embodiments set forth herein may be altered and interchanged to produce an applicator device for a particular use as should be well known to those skilled in the art.

The present disclosure includes that contained in the appended claims as well as that of the foregoing description. Although this invention has been described in its preferred forms or embodiments and methods with a certain degree of particularity, it is understood that the present disclosure of the preferred form has been made only by way of example and that numerous changes in the details of construction fabrication and use and including the combination and arrangement of parts and steps may be resorted to without departing from the scope of the invention.

Claims

1. A liquid applicator device (10H) for applying an applicator liquid to a surface, comprising:
a liquid container (12H; 12J);
an inner subassembly (36H, 34H, 34J; 151H; 151J; 38H; 38J);
an outer subassembly (42H; 42J; 18H; 18J);
said inner subassembly including a valve body (34H; 34J), a valve element (38H; 38J), a valve seal

(40H, 40J) and bias means (36H);
means connecting said valve body (34H; 34J) to said valve seal (40H; 40J) with said bias means (36H) biasing said valve element (38H; 38J) into sealing engagement with said valve seal;
said outer subassembly including a valve closure (42H; 42J) and a surface applicator (18H; 18J);
said valve closure (42H; 42J) having a first and a second end with an internal closure cavity (108H) extending therebetween;
said surface applicator (18H; 18J) having a proximal end (98H) and a distal end (100H) with said surface applicator being disposed in said internal closure cavity (108H; 108J) of said valve closure (42H; 42J);
means connecting said valve closure (42H; 42J) to said valve body (34H; 34J) with said proximal end (98H) of said surface applicator (18H; 18J) engaging said valve element (38H; 38J) and with said distal end (100H) of said surface applicator (18H; 18J) extending external said second end of said valve closure (42H, 42J) for applying the applicator liquid to the surface;
means connecting said first end of said valve closure (42H; 42J) to said liquid container (12H; 12J); and
said surface applicator (18H; 18J) moving said valve element (38H; 38J) from said sealing position to an open position upon depression of said distal end of said surface applicator on the surface enabling the flow of the applicator liquid from said container to said surface applicator,
characterized by
a tubular portion (152H; 152J) slidably receiving said surface applicator (18H; 18J) for forming a liquid seal (40H; 40J) between said proximal end (98H) and said distal end (100H) of said surface applicator (18H; 18J) during movement of said surface applicator (18H; 18J) parallel to said longitudinal length of said surface applicator (18H; 18J); and
a resilient plastic extending portion (150H; 150J; 151H; 151J) unitary with said valve seal (40H; 40J) for flexibly mounting said tubular portion (152H; 152J) with said internal closure cavity (108H) of said valve closure (42H; 42J) to maintain the liquid seal between said tubular portion (152H; 152J) and said surface applicator (18H; 18J) during deformation of said surface applicator perpendicular to the longitudinal length thereof.

2. Applicator device as set forth in claim 1, wherein said surface applicator (18H; 18J) is substantially flexible for dispersing the applicator liquid on the surface (160H).

3. Applicator device as set forth in claim 1, wherein said surface applicator (18H; 18J) is substantially cylindrical; and
said tubular portion (152H; 152J) includes a cylindrical inner orifice (153H) for slidably receiving said substantially cylindrical surface applicator (18H).

4. Applicator device as set forth in claim 3, wherein said means connecting said first end of said valve closure (42H; 42J) to said container (12H; 12J) includes said valve closure being press fitted into an open end of said container (12H; 12J).

5. Applicator device as set forth in claim 1, wherein said resilient plastic extending portion (150H; 150J) is secured to a generally central area of said tubular portion (152H; 152J).

6. Applicator device as set forth in claim 1, wherein said resilient plastic extending portion (150H; 150J) is integrally formed with and secure to an end of said tubular portion (152H; 152J).

7. Applicator device as set forth in claim 1, wherein said surface applicator (18H; 18J) is substantially rigid.

8. Applicator device as set forth in claim 7, wherein said surface applicator (18H; 18J) is a fiber tip.

9. Applicator device as set forth in claim 1, wherein said surface applicator (18H; 18J) is a flexible applicator;
and
a rigid valve actuator cooperating with said flexible applicator (18H; 18J) for moving said valve element (38H; 38J) from said closed position to said open position upon depression of said valve actuator on a surface (160).

10. Applicator device as set forth in claim 9, wherein said flexible surface applicator (18H; 18J) is a brush applicator.

11. Applicator device as set forth in claim 1, wherein said means connecting said first end of said valve closure (42H; 42J) to said liquid container (12H; 12J) includes a press fit engagement.

12. Applicator device as set forth in claim 1, wherein said container (12H; 12J) is substantially rigid.

13. Applicator device as set forth in claim 1, wherein said container (12H; 12J) includes means for reducing the volume of said container to force the applicator liquid from said container (12H; 12J) through said applicator opening to said surface applicator when said valve element (38H; 38J) is in said open position.

14. Applicator device as set forth in claim 13, wherein said means for reducing the volume of said container (12H, 12J) includes said container having a resilient flexible container wall.

15. Applicator device for applying a liquid from a liquid container to a surface, comprising in combination:
a valve having a valve body (34H; 34J), a valve element (38H; 38J) and a valve seal (40H; 40J);
said valve seal (40H; 40J) having a sealing surface for cooperation with said valve element (38H; 38J);
means connecting said valve seal (40H; 40J) to said valve body (34H; 34J);
said valve element (38H; 38J) being movable between a closed position wherein said valve element (38H; 38J) engages said sealing surface of said valve seal (40H; 40J) and an open position wherein said valve element (38H; 38J) is displaced from said sealing surface of said valve seal (40H; 40J);
bias means (36H; 36J) for biasing said valve element (38H; 38J) into said closed position;
a valve closure (42H; 42J) having a first and a second end with an internal closure cavity (108H; 108J) extending therebetween;
a surface applicator (18H; 18J) having a longitudinal length terminating in a proximal end (98H) and a distal end (100H);
said surface applicator (18H; 18J) being disposed in said internal closure cavity (108H; 108J) of said valve closure (42H; 42J);
means connecting said valve closure (42H; 42J) to said valve body (34H; 34J) with said proximal end (98H; 98J) of said surface applicator (18H; 18J) engaging said valve element (38H; 38J) and with said distal end (100H; 100J) of said surface applicator (18H; 18J) extending external said second end of said valve closure (42H; 42J);
means connecting said first end of said valve closure (42H; 42J) to said liquid container (12H; 12J) for enabling the flow of the liquid from the liquid container (12H; 12J) to said valve body (34H; 34J);
said surface applicator (18H; 18J) being longitudinally movable along said longitudinal length upon depression of said distal end (100H; 100J) of said surface applicator (18H; 18J) on the surface (160H) for moving said valve element (38H; 38J) from said closed to said open position for enabling the flow of the liquid from said valve body (34H; 34J) to said surface applicator (18H; 18J);
a tubular portion (152H; 152J) slidably receiving said surface applicator (18H; 18J) for forming a liquid seal between said proximal end (98H; 98J) and said distal end (100H; 100J) of said surface applicator (18H; 18J) during said longitudinal movement of said surface applicator; and said valve seal (40H; 40J) having a unitary resilient plastic extending portion (150H; 150J) for flexibly mounting said tubular portion (152H; 152J) within said internal closure cavity (108H; 108J) of said valve closure (42H; 42J) to maintain said liquid seal between said tubular portion (152H; 152J) and said surface applicator (18H; 18J) during deformation of said surface applicator (18H; 18J) due to lateral movement of said surface applicator.

16. Applicator device as set forth in claim 15, wherein said means connecting said valve body (34H; 34J) to said valve seal (40H; 40J) includes a recess disposed in one of said valve body (34H) and said valve seal (40H) for receiving a projection extending from the other of said valve body (34H; 34J) and said valve seal (40H; 40J).

17. Applicator device as set forth in claim 15, wherein said means connecting said valve closure (42H; 42J to said valve body (34H; 34J) includes a recess disposed in one of said valve closure (42H; 42J) and said valve body (34H; 34J) for receiving a projection extending from the other of said valve closure (42H; 42J) and said valve body (34H; 34J).

18. Applicator device as set forth in claim 15, wherein said valve seal (40H; 40J) comprises an annular sealing surface; and
said valve element (38H; 38J) comprises an annular shoulder for engaging with said annular sealing surface.

19. Applicator device as set forth in claim 15, and further including aperture means located in said valve body (34H; 34J) for permitting the flow of applicator liquid from said liquid container (12H; 12J) to said surface applicator (18H; 18J).

20. Applicator device as set forth in claim 15, wherein said means for connecting said first end of said valve closure (42H; 42J) to said container (12H; 12J) includes thread means.

21. Applicator device for applying a liquid from a liquid container to an applicator surface, comprising in combination:
a valve comprising a valve body (34H; 34J), a valve element (38H; 38J), a valve seal (40H; 40J) and biasing means (36H; 36J);
a valve closure (42H; 42J) having a first and a second end with an internal closure cavity (108H; 108J) extending therebetween;
a surface applicator (18H; 18J) having a proximal end (98H; 98J) and a distal end (100H; 100J) with said surface applicator being disposed in said internal closure cavity (108H; 108J) of said valve closure (42H; 42J);
means connecting said valve closure (42H; 42J) to said valve with said proximal end (98H; 98J) of said surface applicator (18H; 18J) engaging said valve element (38H; 38J) and with said distal end (100H; 100J) of said surface applicator (18H; 18J) extending external said second end of said valve closure (42H; 42J);
said valve element (38H; 38J) being movable between a closed position and an open position for respectively inhibiting and permitting the flow of the applicator liquid from the liquid container (12H; 12J) to said surface applicator (18H; 18J);
said bias means (36H; 36J) biasing said valve element (38H; 38J) into said closed position with said valve element being in sealing engagement with said valve seal (40H; 40J);
said valve seal (40H; 40J) having an extending portion (150H; 150J) for supporting a substantially tubular portion (152H; 152J);
said tubular portion (152H; 152J) slidably receiving said surface applicator (18H; 18J) for forming a liquid seal therebetween;
means connecting said first end of said valve closure (42H; 42J) to said liquid container (12H; 12J) enabling said surface applicator (18H; 18J) to move said valve element (18H; 18J) from said sealing position to an open position upon depression of said distal end of said surface applicator (18H; 18J) on the applicator surface (160H) enabling the flow of the applicator liquid from said container (12H; 12J) to said surface applicator (18H; 18J); and
said extending portion (150H; 150J) of said valve seal (40H; 40J) flexibly supporting said tubular portion (150H; 150J) for maintaining the liquid seal between said tubular portion (150H; 150J) and said surface applicator (18H; 18J) irrespective of any deformation of said surface applicator.

Revendications

1. Dispositif applicateur de liquide (10H) pour appliquer un liquide d'applicateur sur une surface, comprenant :
un réservoir de liquide (12H ; 12J) ;
un sous-assemblage interne (36H, 34H, 34J ; 151H ; 151J ; 38H ; 38J) ;
un sous-assemblage externe (42H ; 42J ; 18H ; 18J) ;
ledit sous-assemblage interne incluant un corps de vanne (34H ; 34J), un élément de vanne (38H ; 38J), une étanchéité de vanne (40H : 40J) et un moyen de poussée (36H) ;
un moyen qui connecte ledit corps de vanne (34H ; 34J) à ladite étanchéité de vanne (40H ; 40J) avec ledit moyen de poussée (36H) qui exerce une poussée sur ledit élément de vanne (38H ; 38J) pour l'amener en engagement d'étanchéité avec ladite étanchéité de vanne ;
ledit sous-assemblage externe incluant une fermeture de vanne (42H ; 42J) et un applicateur de surface (18H ; 18J) ;
ladite fermeture de vanne (42H : 42J) ayant des première et seconde extrémités, une cavité de

fermeture interne (108H) s'étendant entre ;

ledit applicateur de surface (18H ; 18J) ayant une extrémité proximale (98H) et une extrémité distale (100H), ledit applicateur de surface étant disposé dans ladite cavité de fermeture interne (108H ; 108J) de ladite fermeture de vanne (42H ; 42J) ;

un moyen qui connecte ladite fermeture de vanne (42H ; 42J) audit corps de vanne (34H ; 34J), ladite extrémité proximale (98H) dudit applicateur de surface (18H ; 18J) engageant ledit élément de vanne (38H ; 38J) et ladite extrémité distale (100H) dudit applicateur de surface (18H ; 18J) s'étendant à l'extérieur de ladite seconde extrémité de ladite fermeture de vanne (42H ; 42J) pour appliquer le liquide d'applicateur sur la surface ;

un moyen qui connecte ladite première extrémité de ladite fermeture de vanne (42H ; 42J) audit réservoir de liquide (12H ; 12J) ; et

ledit applicateur de surface (18H ; 18J) déplaçant ledit élément de vanne (38H ; 38J) depuis ladite position d'étanchéité jusqu'à une position ouverte suite à la dépression de ladite extrémité distale dudit applicateur de surface sur la surface en permettant l'écoulement du liquide d'applicateur depuis ledit réservoir jusqu'audit applicateur de surface ;

caractérisé par :

une partie tubulaire (152H ; 152J) qui reçoit par glissement ledit applicateur de surface (18H ; 18J) pour former une étanchéité au liquide (40H ; 40J) entre ladite extrémité proximale (98H) et ladite extrémité distale (100H) dudit applicateur de surface (18H ; 18J) lors du mouvement dudit applicateur de surface (18H ; 18J) parallèlement à ladite longueur longitudinale dudit applicateur de surface (18H ; 18J) ; et

une partie en plastique élastique (150H ; 150J ; 151H ; 151J) qui fait corps avec ladite étanchéité de vanne (40H ; 40J) pour monter de manière flexible ladite partie tubulaire (152H ; 152J) avec ladite cavité de fermeture interne (108H) de ladite fermeture de vanne (42H ; 42J) afin de maintenir l'étanchéité au liquide entre ladite partie tubulaire (152H ; 152J) et ledit applicateur de surface (18H ; 18J) lors de la déformation dudit applicateur de surface perpendiculairement à sa longueur longitudinale.

2. Dispositif applicateur selon la revendication 1, dans lequel ledit applicateur de surface (18H ; 18J) est sensiblement flexible pour disperser le liquide d'applicateur sur la surface (160H).

3. Dispositif applicateur selon la revendication 1, dans lequel :

ledit applicateur de surface (18H ; 18J) est sensiblement cylindrique ; et

ladite partie tubulaire (152H ; 152J) inclut un orifice interne cylindrique (153H) pour recevoir par glissement ledit applicateur de surface sensiblement cylindrique (18H).

4. Dispositif applicateur selon la revendication 3, dans lequel ledit moyen qui connecte ladite première extrémité de ladite fermeture de vanne (42H ; 42J) audit réservoir (12H ; 12J) inclut ladite fermeture de vanne qui est emmanchée en force à l'intérieur d'une extrémité ouverte dudit réservoir (12H ; 12J).

5. Dispositif applicateur selon la revendication 1, dans lequel ladite partie en extension plastique élastique (150H ; 150J) est fixée à une zone généralement centrale de ladite partie tubulaire (152H ; 152J).

6. Dispositif applicateur selon la revendication 1, dans lequel ladite partie en extension plastique élastique (150H ; 150J) est formée de manière à faire corps avec une extrémité de ladite partie tubulaire (152H ; 152J) et à lui être fixée.

7. Dispositif applicateur selon la revendication 1, dans lequel ledit applicateur de surface (18H ; 18J) est sensiblement rigide.

8. Dispositif applicateur selon la revendication 7, dans lequel ledit applicateur de surface (18H ; 18J) est une pointe en fibres.

9. Dispositif applicateur selon la revendication 1, dans lequel :

ledit applicateur de surface (18H ; 18J) est un applicateur flexible ; et

un dispositif d'actionnement de vanne rigide coopère avec ledit applicateur flexible (18H ; 18J) pour déplacer ledit élément de vanne (38H ; 38J) depuis ladite position fermée jusqu'à ladite position ouverte suite à la dépression dudit dispositif d'actionnement de vanne sur une surface (160).

10. Dispositif applicateur selon la revendication 9, dans lequel ledit applicateur de surface flexible (18H ; 18J) est un applicateur à brosse.

11. Dispositif applicateur selon la revendication 1, dans lequel ledit moyen qui connecte ladite première extrémité de ladite fermeture de vanne (42H ; 42J) audit réservoir de liquide (12H ; 12J) inclut un engagement par ajustage serré.

12. Dispositif applicateur selon la revendication 1, dans lequel ledit réservoir (12H ; 12J) est sensiblement rigide.

13. Dispositif applicateur selon la revendication 1, dans lequel ledit réservoir (12H ; 12J) inclut un moyen pour réduire le volume dudit réservoir afin de forcer le liquide d'applicateur qui provient dudit réservoir (12H ; 12J) au travers de ladite ouverture d'applicateur jusqu'audit applicateur de surface lorsque ledit élément de vanne (38H ; 38J) est dans ladite position ouverte.

14. Dispositif applicateur selon la revendication 13, dans lequel ledit moyen pour réduire le volume dudit réservoir (12H ; 12J) inclut ledit réservoir qui a une paroi de réservoir flexible élastique.

15. Dispositif applicateur pour appliquer un liquide depuis un réservoir de liquide sur une surface, comprenant en combinaison :

une vanne ayant un corps de vanne (34H ; 34J), un élément de vanne (38H ; 38J) et une étanchéité de vanne (40H ; 40J) ;

ladite étanchéité de vanne (40H ; 40J) ayant une surface d'étanchéité pour coopérer avec ledit élément de vanne (38H ; 38J) ;

un moyen qui connecte ladite étanchéité de vanne (40H ; 40J) audit corps de vanne (34H ; 34J) ;

ledit élément de vanne (38H ; 38J) étant mobile entre une position fermée dans laquelle ledit élément de vanne (38H ; 38J) engage ladite surface d'étanchéité de ladite étanchéité de vanne (40H ; 40J) et une position ouverte dans laquelle ledit élément de vanne (38H ; 38J) est déplacé de ladite surface d'étanchéité de ladite étanchéité de vanne (40H ; 40J) ;

un moyen de poussée (36H ; 36J) pour imprimer une poussée audit élément de vanne (38H ; 38J) pour l'amener dans ladite position fermée ;

une fermeture de vanne (42H ; 42J) ayant des première et seconde extrémités, une cavité de fermeture interne (108H ; 108J) s'étendant entre ;

un applicateur de surface (18H ; 18J) ayant une longueur longitudinale qui se termine en une extrémité proximale (98H) et en une extrémité distale (100H) ;

ledit applicateur de surface (18H ; 18J) étant disposé dans ladite cavité de fermeture interne (108H ; 108J) de ladite fermeture de vanne (42H ; 42J) ;

un moyen qui connecte ladite fermeture de vanne (42H ; 42J) audit corps de vanne (34H ; 34J), ladite extrémité proximale (98H ; 98J) dudit applicateur de surface (18H ; 18J) engageant ledit élément de vanne (38H ; 38J) et ladite extrémité distale (100H ; 100J) dudit applicateur de surface (18H ; 18J) s'étendant à l'extérieur de ladite seconde extrémité de ladite fermeture de vanne (42H ; 42J) ;

un moyen qui connecte ladite première extrémité de ladite fermeture de vanne (42H ; 42J) audit réservoir de liquide (12H ; 12J) pour permettre l'écoulement du liquide depuis le réservoir de liquide (12H ; 12J) jusqu'audit corps de vanne (34H ; 34J) ;

ledit applicateur de surface (18H ; 18J) étant mobile longitudinalement le long de ladite longueur longitudinale suite à la dépression de ladite extrémité distale (100H ; 100J) dudit applicateur de surface (18H ; 18J) sur la surface (160H) pour déplacer ledit élément de vanne (38H ; 38J) depuis ladite position fermée jusqu'à ladite position ouverte afin de permettre l'écoulement du liquide depuis ledit corps de vanne (34H ; 34J) jusqu'audit applicateur de surface (18H ; 18J) ;

une partie tubulaire (152H ; 152J) qui reçoit par glissement ledit applicateur de surface (18H ; 18J) pour former une étanchéité au liquide entre ladite extrémité proximale (98H ; 98J) et ladite extrémité distale (100H ; 100J) dudit applicateur de surface (18H ; 18J) lors dudit mouvement longitudinal dudit applicateur de surface ; et

ladite étanchéité de vanne (40H ; 40J) ayant une partie en extension plastique élastique d'un seul tenant (150H ; 150J) pour monter de manière flexible ladite partie tubulaire (152H ; 152J) à l'intérieur de ladite cavité de fermeture interne (108H ; 108J) de ladite fermeture de vanne (42H ; 42J) afin de maintenir ladite étanchéité au liquide entre ladite partie tubulaire (152H ; 152J) et ledit applicateur de surface (18H ; 18J) lors de la déformation dudit applicateur de surface (18H ; 18J) qui est due à un

mouvement latéral dudit applicateur de surface.

16. Dispositif applicateur selon la revendication 15, dans lequel ledit moyen qui connecte ledit corps de vanne (34H ; 34J) à ladite étanchéité de vanne (40H ; 40J) inclut un évidement disposé dans un élément pris parmi ledit corps de vanne (34H) et ladite étanchéité de vanne (40H) pour recevoir une projection qui s'étend depuis l'autre des éléments parmi ledit corps de vanne (34H ; 34J) et ladite étanchéité de vanne (40H ; 40J).

17. Dispositif applicateur selon la revendication 15, dans lequel ledit moyen qui connecte ladite fermeture de vanne (42H ; 42J) audit corps de vanne (34H ; 34J) inclut un évidement qui est disposé dans un élément pris parmi ladite fermeture de vanne (42H ; 42J) et ledit corps de vanne (34H ; 34J) pour recevoir une projection qui s'étend depuis l'autre élément parmi ladite fermeture de vanne (42H ; 42J) et ledit corps de vanne (34H ; 34J).

18. Dispositif applicateur selon la revendication 15, dans lequel :

ladite étanchéité de vanne (40H ; 40J) comprend une surface d'étanchéité annulaire ; et

ledit élément de vanne (38H ; 38J) comprend un épaulement annulaire pour s'engager avec ladite surface d'étanchéité annulaire.

19. Dispositif applicateur selon la revendication 15, incluant en outre un moyen d'ouverture localisé dans ledit corps de vanne (34H ; 34J) pour permettre l'écoulement du liquide d'applicateur depuis ledit réservoir de liquide (12H ; 12J) jusqu'audit applicateur de surface (18H ; 18J).

20. Dispositif applicateur selon la revendication 15, dans lequel ledit moyen pour connecter ladite première extrémité de ladite fermeture de vanne (42H ; 42J) audit réservoir (12H ; 12J) inclut un moyen de filetage.

21. Dispositif applicateur pour appliquer un liquide depuis un réservoir de liquide jusqu'à une surface d'applicateur, comprenant en combinaison :

une vanne comprenant un corps de vanne (34H ; 34J), un élément de vanne (38H ; 38J), une étanchéité de vanne (40H ; 40J) et un moyen de poussée (36H ; 36J) ;

une fermeture de vanne (42H ; 42J) ayant une première extrémité et une seconde extrémité, une cavité de fermeture interne (108H ; 108J) s'étendant entre ;

un applicateur de surface (18H ; 18J) ayant une extrémité proximale (98H ; 98J) et une extrémité distale (100H ; 100J), ledit applicateur de surface étant disposé dans ladite cavité de fermeture interne (108H ; 108J) de ladite fermeture de vanne (42H ; 42J) ;

un moyen qui connecte ladite fermeture de vanne (42H ; 42J) à ladite vanne, ladite extrémité proximale (98H ; 98J) dudit applicateur de surface (18H ; 18J) engageant ledit élément de vanne (38H ; 38J) et ladite extrémité distale (100H ; 100J) dudit applicateur de surface (18H ; 18J) s'étendant à l'extérieur de ladite seconde extrémité de ladite fermeture de vanne (42H ; 42J) ;

ledit élément de vanne (38H ; 38J) étant mobile entre une position fermée et une position ouverte pour respectivement empêcher et permettre l'écoulement du liquide d'applicateur depuis le réservoir de liquide (12H ; 12J) jusqu'audit applicateur de surface (18H ; 18J) ;

ledit moyen de poussée (36H ; 36J) imprimant une poussée audit élément de vanne (38H ; 38J) pour l'amener dans ladite position fermée, ledit élément de vanne étant en engagement d'étanchéité avec ladite étanchéité de vanne (40H ; 40J) ;

ladite étanchéité de vanne (40H ; 40J) ayant une partie en extension (150H ; 150J) pour supporter une partie sensiblement tubulaire (152H ; 152J) ;

ladite partie tubulaire (152H ; 152J) recevant par glissement ledit applicateur de surface (18H ; 18J) pour former une étanchéité au liquide entre ;

un moyen qui connecte ladite première extrémité de ladite fermeture de vanne (42H ; 42J) audit réservoir de liquide (12H ; 12J) en permettant audit applicateur de surface (18H ; 18J) de déplacer ledit élément de vanne (18E ; 18J) de ladite position d'étanchéité jusqu'à une position ouverte suite à la dépression de ladite extrémité distale dudit applicateur de surface (18H ; 18J) sur la surface d'applicateur (160H), ce qui permet l'écoulement du liquide d'applicateur depuis ledit réservoir (12H ; 12J) jusqu'audit applicateur de surface (18H ; 18J) ;

et

ladite partie en extension (150H ; 150J) de ladite étanchéité de vanne (40H ; 40J) supportant de

manière flexible ladite partie tubulaire (150H ; 150J) pour maintenir l'étanchéité au liquide entre ladite partie tubulaire (150H ; 150J) et ledit applicateur de surface (18H ; 18J) indépendamment de toute déformation dudit applicateur de surface.

Patentansprüche

1. Eine Flüssigkeitsauftragvorrichtung (10H) zum Auftragen einer Applikatorflüssigkeit auf eine Oberfläche bestehend aus:
einem Flüssigkeitsbehälter (12H, 12J);
einer inneren Baugruppe (36H, 34H, 34J, 151H, 151J, 38H, 38J);
einer äußeren Baugruppe (42H, 42J, 18H, 18J),
wobei die innere Baugruppe einen Ventilkörper (34H, 34J), ein Ventilelement (38H, 38J), eine Ventildichtung (40H, 40J) und eine Vorspannvorrichtung (36H) umfaßt; Mittel, die den Ventilkörper (34H, 34J) mit der Ventildichtung (40H, 40J) verbinden, wobei die Vorspannvorrichtung (36H) das Ventilelement (38H, 38J) in abdichtender Anlage an der Ventildichtung vorspannt;
die äußere Baugruppe einen Ventilverschluß (42H, 42J) und einen Flächenapplikator (18H, 18J) umfaßt;
der Ventilverschluß (42H, 42J) ein erstes und ein zweites Ende mit einem inneren Verschlußhohlraum (108H) aufweist, der sich dazwischen erstreckt;
der Flächenapplikator (18H, 18J) ein hinteres Ende (98H) und ein vorderes Ende (100H) aufweist, wobei der Flächenapplikator in dem inneren Verschlußhohlraum (108H, 108J) des Ventilverschlusses (42H, 42J) angeordnet ist;
Mitteln, die den Ventilverschluß (42H, 42J) mit dem Ventilkörper (34H, 34J) verbinden, wobei das hintere Ende (98H) des Flächenapplikators (18H, 18J) an dem Ventilelement (38H, 38J) anliegt und das vordere Ende (100H) des Flächenapplikators (18H, 18J) sich außerhalb des zweiten Endes des Ventilverschlusses (42H, 42J) zum Auftragen der Applikatorflüssigkeit auf die Oberfläche erstreckt;
Mitteln, die das erste Ende des Ventilverschlusses (42H, 42J) mit dem Flüssigkeitsbehälter (12H, 12J) verbinden und
wobei der Flächenapplikator (18H, 18J) das Ventilelement (38H, 38J) aus der abdichtenden Stellung in eine Offenstellung nach dem Niederdrücken des vorderen Endes des Flächenapplikators auf die Oberfläche bewegt und das Fließen der Applikatorflüssigkeit aus dem Behälter zu dem Flächenapplikator ermöglicht,
gekennzeichnet durch
ein Rohrteil (152H, 152J), das von dem Flächenapplikator (18H, 18J) zur Bildung einer Flüssigkeitsdichtung (40H, 40J) zwischen dem hinteren Ende (98H) und dem vorderen Ende (100H) des Flächenapplikators (18H, 18J) während der Bewegung des Flächenapplikators (18H, 18J) parallel zur Längsrichtung des Flächenapplikators (18H, 18J) aufgenommen verschiebbar wird; und
einem sich längs erstreckenden Teil (150H, 150J, 151H, 151J) aus elastischem Kunststoff, der mit der Ventildichtung (40H, 40J) für eine flexible Anordnung des Rohrteils (152H, 152J) in dem inneren Verschlußhohlraum (108H) des Ventilverschlusses (42H, 42J) einheitlich ausgebildet ist, um die Flüssigkeitsdichtung zwischen dem Rohrteil (152H, 152J) und dem Flächenapplikator (18H, 18J) während der Deformation des Flächenapplikators senkrecht zur Längsrichtung desselben aufrechtzuerhalten.

2. Auftragvorrichtung nach Anspruch 1, bei der der Flächenapplikator (18H, 18J) zur Verteilung der Applikatorflüssigkeit auf der Oberfläche (160H) im wesentlichen flexibel ist.

3. Auftragvorrichtung nach Anspruch 1, bei der der Flächenapplikator (18H, 18J) im wesentlichen zylindrisch ist; und
der Rohrteil (152H, 152J) eine zylindrische innere Öffnung (153H) für eine verschiebbare Aufnahme des im wesentlichen zylindrischen Flächenapplikators (18H) umfaßt.

4. Auftragvorrichtung nach Anspruch 3, bei der das erste Ende des Ventilverschlusses (42H, 42J) mit dem Behälter (12H, 12J) verbindende Mittel den Ventilverschluß umfaßt, der in ein offenes Ende des Behälters (12H, 12J) mit Preßsitz eingesetzt ist.

5. Auftragvorrichtung nach Anspruch 1, bei der sich der längs erstreckende Teil (150H, 150J) aus elastischem Kunststoff in einem im allgemeinen mittleren Bereich des Rohrteils (152H, 152J) befestigt ist.

6. Auftragvorrichtung nach Anspruch 1, bei der sich der längs erstreckende Teil (150H, 150J) aus elastischem Kunststoff mit einem Ende des Rohrteils (152H, 152J) einheitlich ausgebildet und an diesem befestigt ist.

7. Auftragvorrichtung nach Anspruch 1, bei der der Flächenapplikator (18H, 18J) im wesentlichen starr ist.

8. Auftragvorrichtung nach Anspruch 7, bei der der Flächenapplikator (18H, 18J) eine Faserspitze ist.

9. Auftragvorrichtung nach Anspruch 1, bei der der Flächenapplikator (18H, 18J) ein flexibler Applikator ist; und ein starrer Ventilbetätiger mit dem flexiblen Applikator (18H, 18J) zum Bewegen des Ventilelementes (38H, 38J) aus der geschlossenen Stellung in die offene Stellung nach dem Niederdrücken des Ventilbetätigers auf eine Oberfläche (160) zusammenwirkt.

10. Auftragvorrichtung nach Anspruch 9, bei der der flexible Flächenapplikator (18H, 18J) ein Bürstenapplikator ist.

11. Auftragvorrichtung nach Anspruch 1, bei der das das erste Ende des Ventilverschlusses (42H, 42J) mit dem Flüssigkeitsbehälter (12H, 12J) verbindende Mittel eine Preßsitzverbindung umfaßt.

12. Auftragvorrichtung nach Anspruch 1, bei der der Behälter (12H, 12J) im wesentlichen starr ist.

13. Auftragvorrichtung nach Anspruch 1, bei der der Behälter (12H, 12J) ein Mittel zum Reduzieren des Behältervolumens umfaßt, um die Applikatorflüssigkeit aus dem Behälter (12H, 12J) durch die Applikatoröffnung zu dem Flächenapplikator zu drücken, wenn das Ventilelement (38H, 38J) sich in der offenen Stellung befindet.

14. Auftragvorrichtung nach Anspruch 13, bei der das Mittel zur Verringerung des Volumens des Behälters (12H, 12J) einen Behälter mit einer elastischen biegsamen Behälterwand umfaßt.

15. Auftragvorrichtung zum Auftragen einer Flüssigkeit aus einem Flüssigkeitsbehälter auf eine Oberfläche, bestehend aus der Kombination:
eines Ventils mit einem Ventilkörper (34H, 34J);
einem Ventilelement (38H, 38J) und einer Ventildichtung (40H, 40J);
wobei die Ventildichtung (40H, 40J) eine Dichtungsfläche zum Zusammenwirken mit dem Ventilelement (38H, 38J) aufweist;
einem die Ventildichtung (40H, 40J) mit dem Ventilkörper (34H, 34J) verbindenden Mittel;
wobei das Ventilelement (38H, 38J) zwischen einer Schließstellung, in der das Ventilelement (38H, 38J) an der Dichtungsfläche der Ventildichtung (40H, 40J) anliegt, und einer Offenstellung bewegbar ist, in der das Ventilelement (38H, 38J) von der Dichtungsfläche der Ventildichtung (40H, 40J) wegbewegt ist;
einer Vorspannvorrichtung (36H, 36J) zum Vorspannen des Ventilelementes (38H, 38J) in die Schließstellung;
einem Ventilverschluß (42H, 42J) mit einem ersten und einem zweiten Ende, wobei sich ein innerer Verschlußhohlraum (108H, 108J) dazwischen erstreckt;
einem Flächenapplikator (18H, 18J), der sich längs erstreckt und in einem hinteren Ende (98 H) und in einem vorderen Ende (100H) ausläuft;
wobei der Flächenapplikator (18H, 18J) in dem inneren Verschlußhohlraum (108H, 108J) des Ventilverschlusses (42H, 42J) angeordnet ist;
einem Mittel, das den Ventilverschluß (42H, 42J) mit dem Ventilkörper (34 H, 34J) verbindet, wobei das hintere Ende (98H, 98J) des Flächenapplikators (18H, 18J) an dem Ventilelement (38H, 38J) anliegt und das vordere Ende (100H, 100J) des Flächenapplikators (18H, 18J) sich außerhalb des zweiten Endes des Ventilverschlusses (42H, 42J) erstreckt;
einem Mittel, das das erste Ende des Ventilverschlusses (42H, 42J) mit dem Flüssigkeitsbehälter (12H, 12J) verbindet, damit die Flüssigkeit aus dem Flüssigkeitsbehälter (12H, 12J) zu dem Ventilkörper (34H, 34J) fließen kann;
wobei der Flächenapplikator (18H, 18J) in Längsrichtung nach dem Niederpressen des vorderen Endes (100H, 100J) des Flächenapplikators (18H, 18J) auf die Oberfläche (160 H) zum Bewegen des Ventilelementes (38H, 38J) aus der geschlossenen in die geöffnete Stellung längs bewegbar ist, um

das Fließen der Flüssigkeit aus dem Ventilkörper (34H, 34J) zu dem Flächenapplikator (18H, 18J) zu ermöglichen;
einem Rohrteil (152H, 152J), der von dem Flächenapplikator (18H, 18J) zur Bildung einer Flüssigkeitsdichtung zwischen dem hinteren Ende (98H, 98J) und dem vorderen Ende (100H, 100J) des Flächenapplikators (18H, 18J) während der Längsbewegung des Flächenapplikators verschiebbar aufgenommen wird; und die Ventildichtung (40H, 40J) einen einheitlichen, sich längs erstreckenden Teil (150H, 150J) aus elastischem Kunststoff für die flexible Anordnung des Rohrteils (152H, 152J) innerhalb des inneren Verschlußhohlraums (108H, 108J) des Ventilverschlusses (42H, 42J) aufweist, um die Flüssigkeitsdichtung zwischen dem Rohrteil (152H, 152J) und dem Flächenapplikator (18H, 18J) während der Verformung des Flächenapplikators (18H, 18J) aufgrund der seitlichen Bewegung des Flächenapplikators aufrechtzuerhalten.

16. Auftragvorrichtung nach Anspruch 15, bei der das Mittel, das den Ventilkörper (34H, 34J) mit der Ventildichtung (40H, 40J) verbindet, eine Ausnehmung umfaßt, die in einem der Ventilkörper (34H) und der Ventildichtung (40H) zur Aufnahme eines Vorsprungs angeordnet ist, der sich von dem anderen der Ventilkörper (34H, 34J) und der Ventildichtung (40H, 40J) erstreckt.

17. Auftragvorrichtung nach Anspruch 15, bei der das Mittel, das den Ventilverschluß (42H, 42J) mit dem Ventilkörper (34H, 34J) verbindet, eine Ausnehmung umfaßt, die in einem der Ventilverschlüsse (42H, 42J) und dem Ventilkörper (34H, 34J) zur Aufnahme eines Vorsprungs angeordnet ist, der sich von dem anderen der Ventilverschlüsse (42H, 42J) und dem Ventilkörper (34H, 34J) erstreckt.

18. Auftragvorrichtung nach Anspruch 15, bei der die Ventildichtung (40H, 40J) eine ringförmige Dichtungsfläche umfaßt; und
das Ventilelement (38H, 38J) aus einer Ringschulter zur Anlage an der ringförmigen Dichtungsfläche besteht.

19. Auftragvorrichtung nach Anspruch 15, umfassend eine Durchbrechung, die in dem Ventilkörper (34H, 34J) für den Durchtritt der Applikatorflüssigkeit aus dem Flüssigkeitsbehälter (12H, 12J) zu dem Flächenapplikator (18H, 18J) vorgesehen ist.

20. Auftragvorrichtung nach Anspruch 15, bei der das Mittel zur Verbindung des ersten Endes des Ventilverschlusses (42H, 42J) mit dem Behälter (12H, 12J) eine Schraubvorrichtung umfaßt.

21. Auftragvorrichtung zum Auftragen einer Flüssigkeit aus einem Flüssigkeitsbehälter auf eine Auftragfläche, bestehend in Kombination aus:
einem Ventil, umfassend einen Ventilkörper (34H, 34J), ein Ventilelement (38H, 38J), eine Ventildichtung (40H, 40J) und eine Vorspannvorrichtung (36H, 36J);
einen Ventilverschluß (42H, 42J) mit einem ersten und zweiten Ende und einem sich dazwischen erstreckenden inneren Verschlußhohlraum (108H, 108J);
einem Flächenapplikator (18H, 18J) mit einem hinteren Ende (98H, 98J) und einem vorderen Ende (100H, 100J), wobei der Flächenapplikator in dem inneren Verschlußhohlraum (108H, 108J) des Ventilverschlusses (42H, 42J) angeordnet ist; einem Mittel, daß den Ventilverschluß (42H, 42J) mit dem Ventil verbindet, wobei das hintere Ende (98H, 98J) des Flächenapplikators (18H, 18J) an dem Ventilelement (38H, 38J) anliegt und das vordere Ende (100H, 100J) des Flächenapplikators (18H, 18J) sich außerhalb des zweiten Endes des Ventilverschlusses (42H, 42J) erstreckt;
wobei
das Ventilelement (38H, 38J) zwischen einer Schließstellung und einer Offenstellung zum jeweiligen Verhindern und Ermöglichen des Fließens der Applikatorflüssigkeit aus dem Flüssigkeitsbehälter (12H, 12J) zu dem Flächenapplikator (18H, 18J) bewegbar ist;
die Vorspannvorrichtung (36H, 36J) das Ventilelement (38H, 38J) in die Schließstellung vorspannt und das Ventilelement sich in dichtender Anlage an der Ventildichtung (40H, 40J) befindet;
die Ventildichtung (40H, 40J) einen sich längs erstreckenden Teil (150H, 150J) aufweist, der ein im wesentlichen rohrförmiges Teil (152H, 152J) trägt;
der Rohrteil (152H, 152J) von dem Flächenapplikator (18H, 18J) zur Bildung einer dazwischen vorgesehenen Flüssigkeitsdichtung verschiebbar aufgenommen wird;
das das erste Ende des Ventilverschlusses (42H, 42J) mit dem Flüssigkeitsbehälter (12H, 12J) verbindende Mittel es dem Flächenapplikator (18H, 18J) ermöglicht, das Ventilelement (18H, 18J) aus

der abdichtenden Stellung in eine Offenstellung nach dem Niederdrücken des vorderen Endes des Flächenapplikators (18H, 18J) auf die Auftragfläche (160H) zu bewegen und das Fließen der Auftragflüssigkeit aus dem Behälter (12H, 12J) zu dem Flächenapplikator (18H, 18J) zu ermöglichen; und
der sich längs erstreckende Teil (150H, 150J) der Ventildichtung (40H, 40J) den Rohrteil (150H, 150J) zur Aufrechterhaltung der Flüssigkeitsdichtung zwischen dem Rohrteil (150H, 150J) und dem Flächenapplikator (18H, 18J) unabhängig von jeglicher Verformung des Flächenapplikators flexibel abstützt.

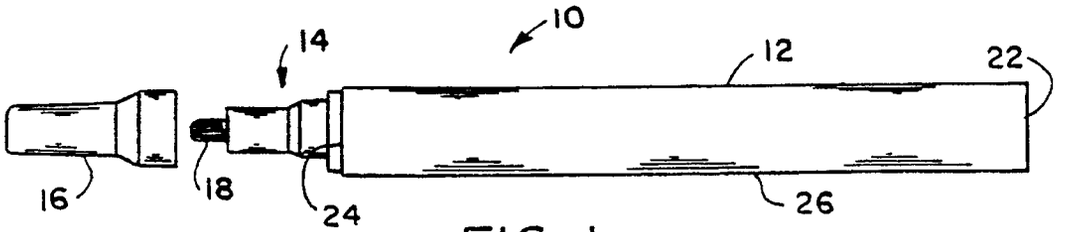

FIG. 1

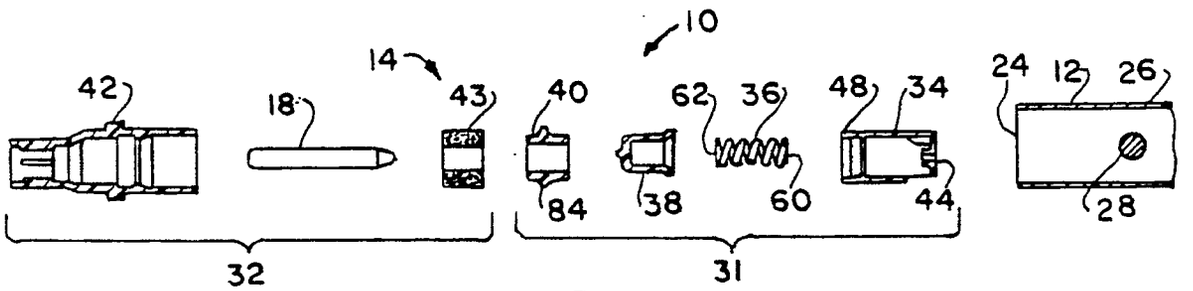

FIG. 2

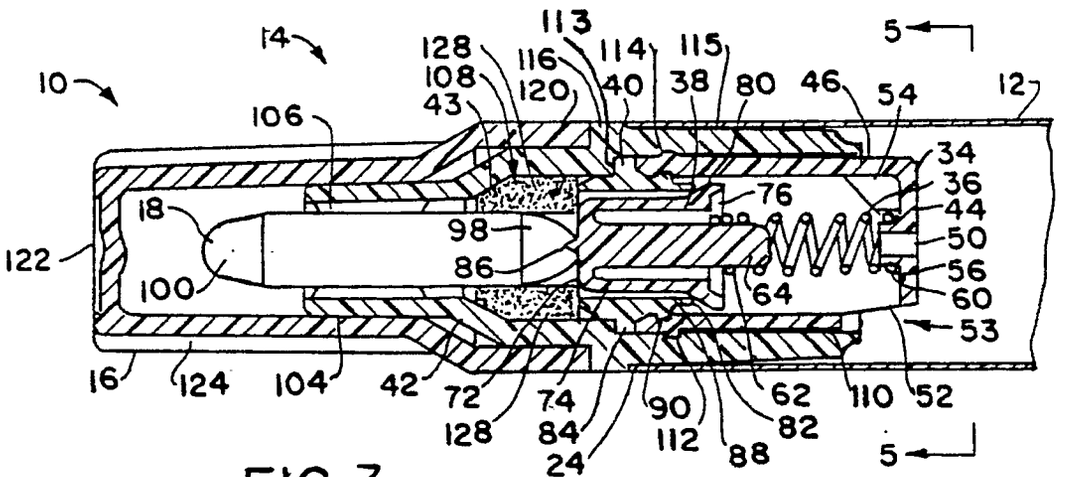

FIG. 3

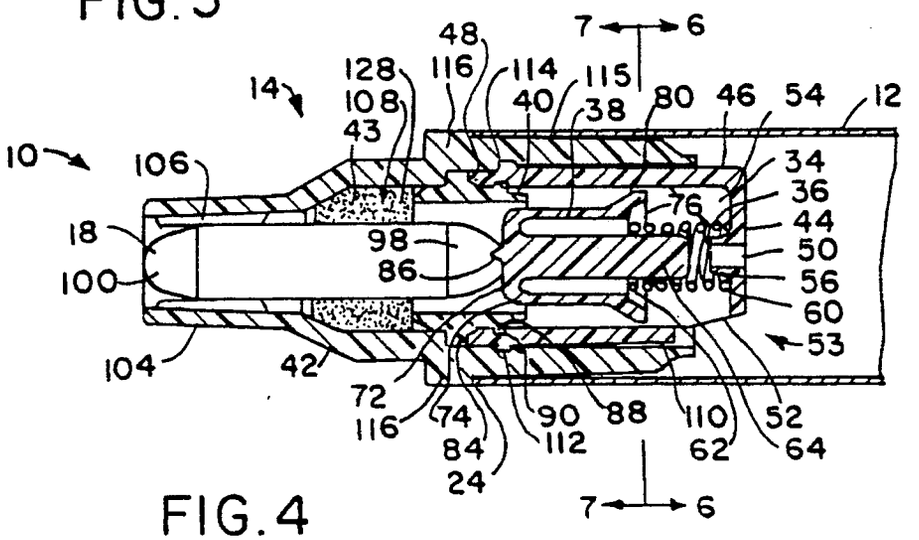

FIG. 4

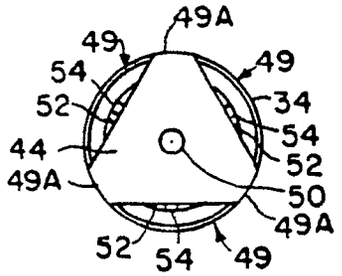

FIG. 5

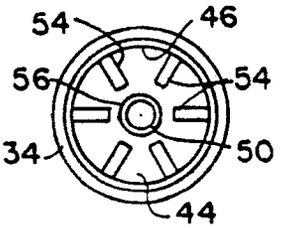

FIG. 6

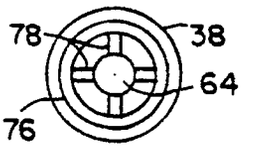

FIG. 7

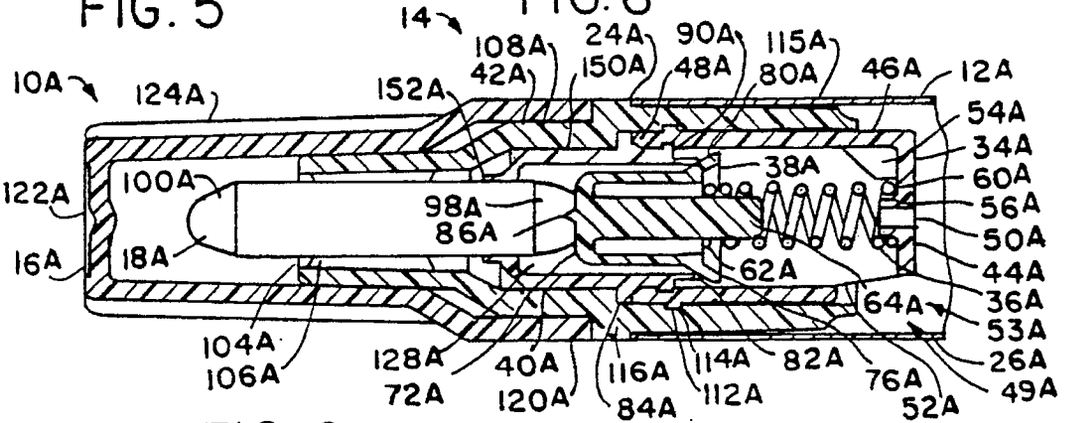

FIG. 8

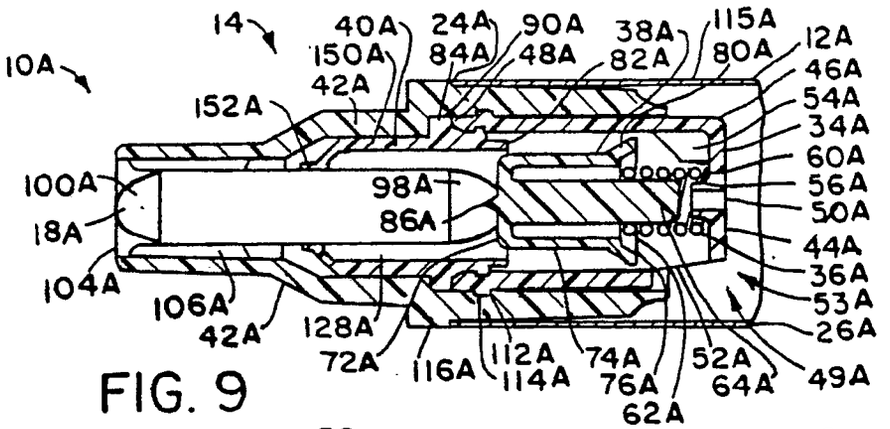

FIG. 9

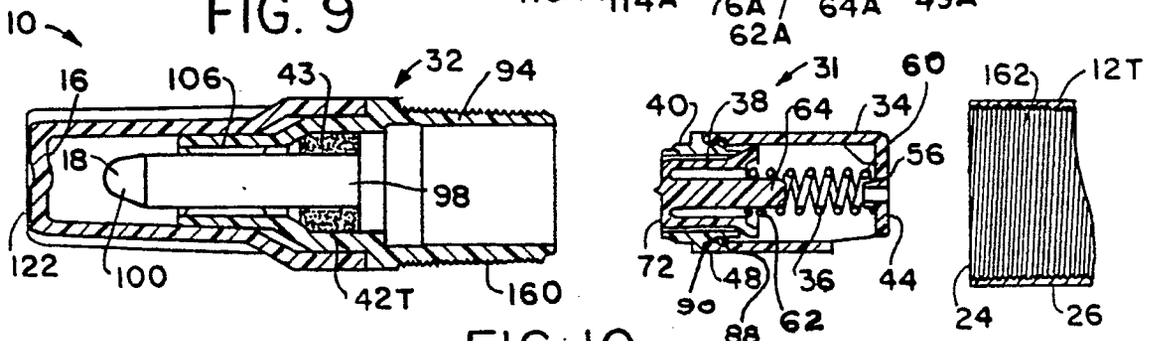

FIG. 10

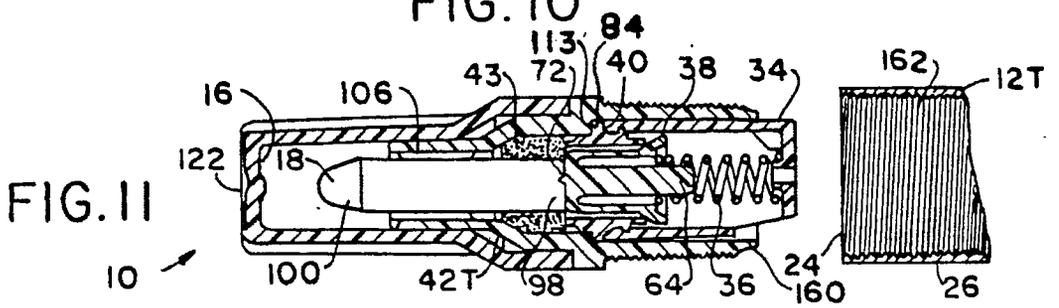

FIG. 11

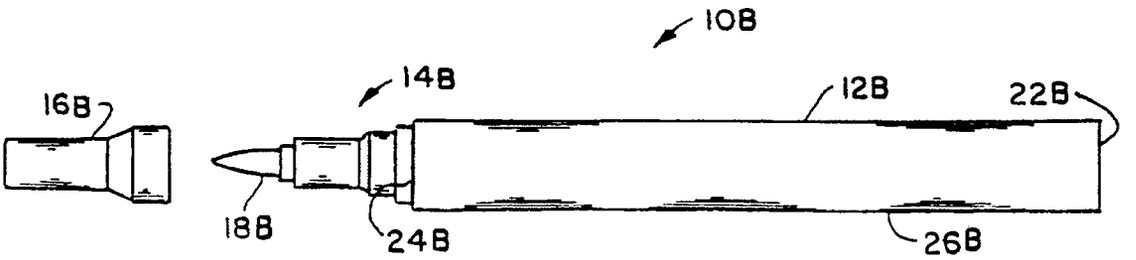

FIG. 12

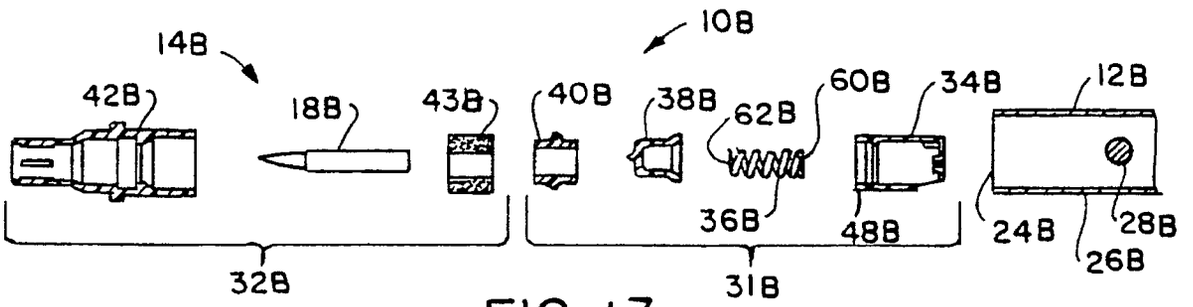

FIG. 13

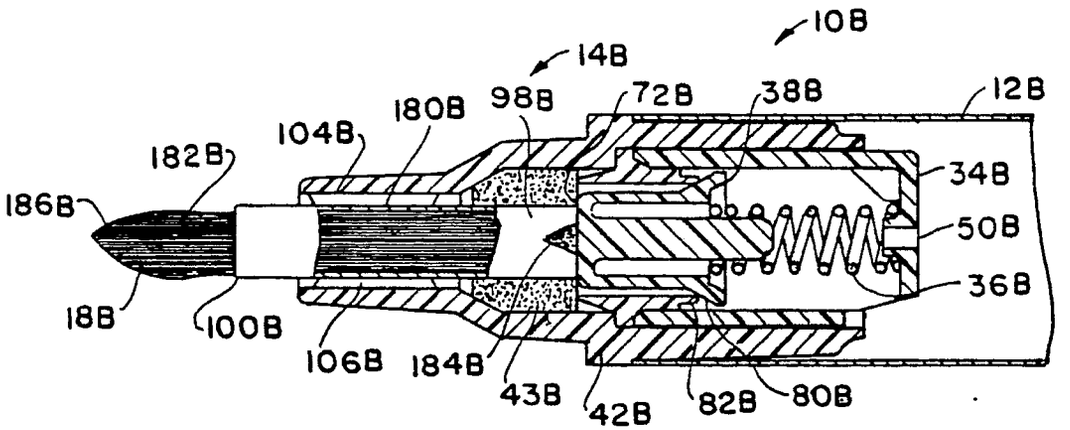

FIG. 14

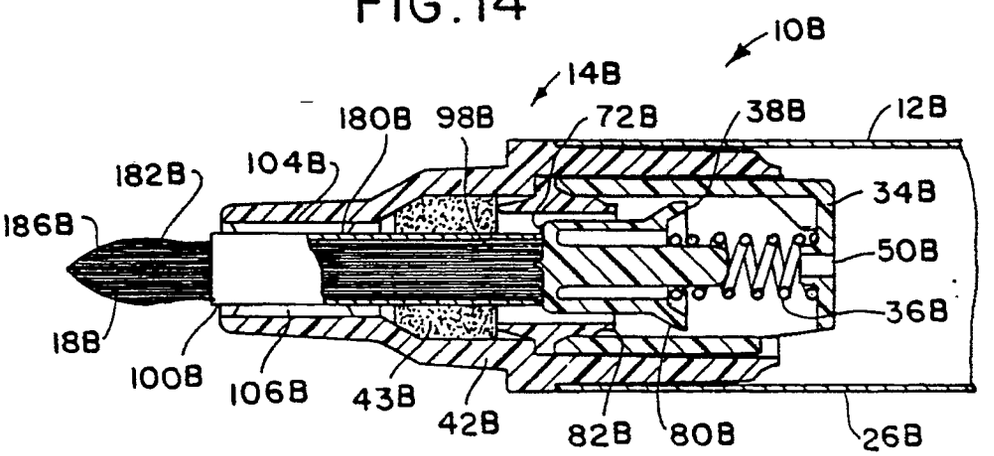

FIG. 15

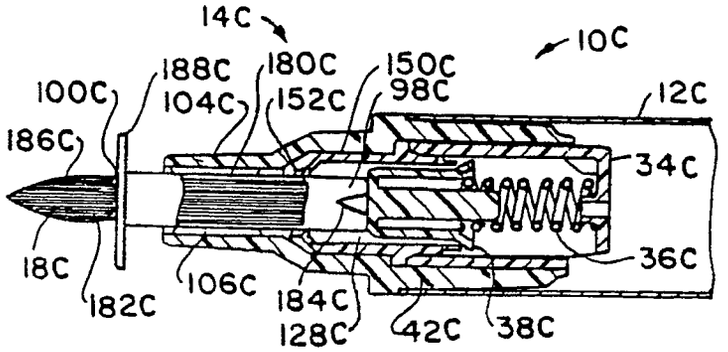

FIG. 16

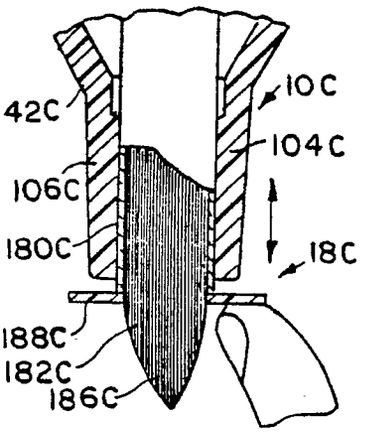

FIG. 19

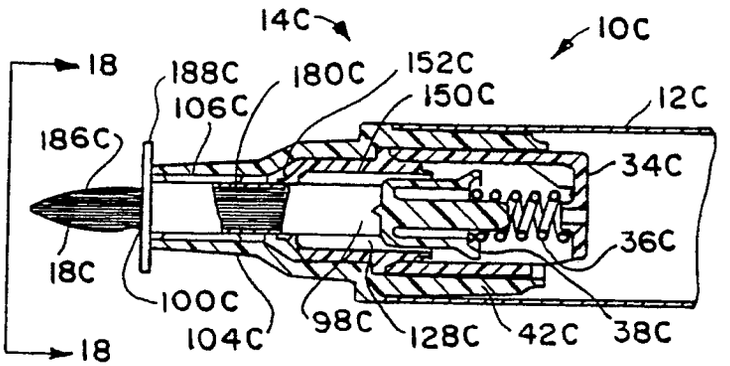

FIG. 17

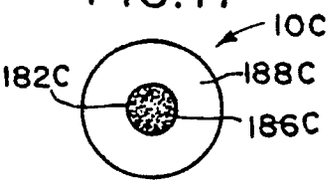

FIG. 18

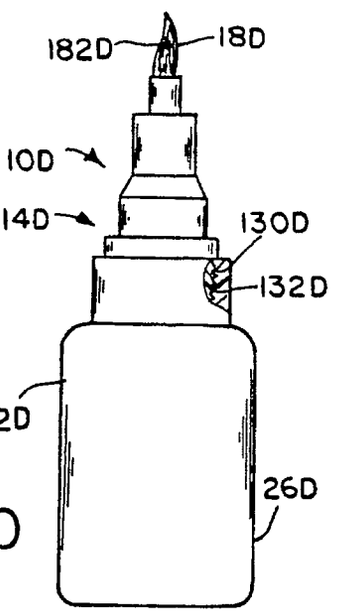

FIG. 20

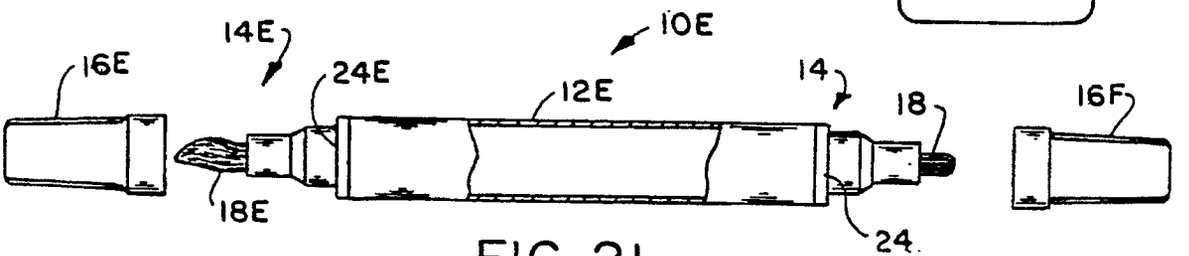

FIG. 21

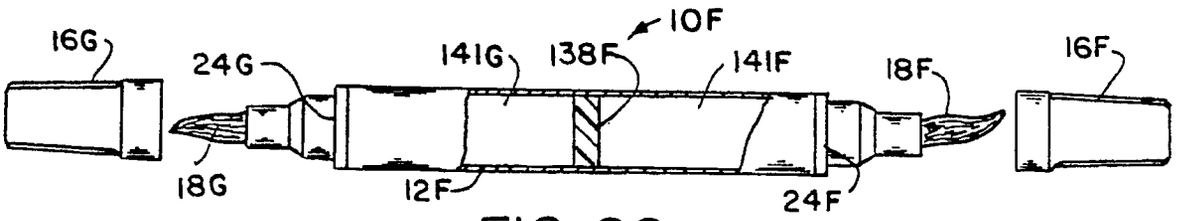

FIG. 22

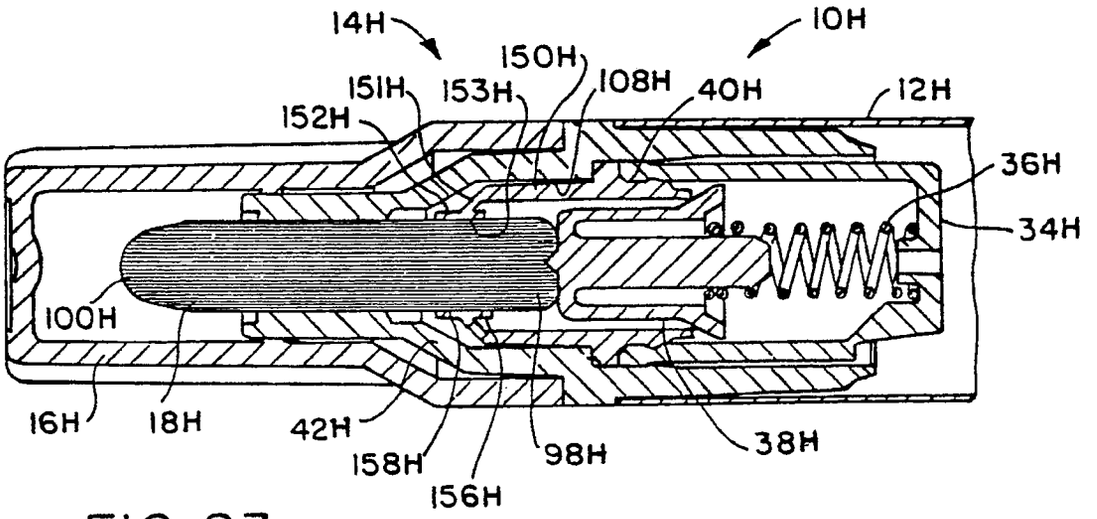

FIG. 23

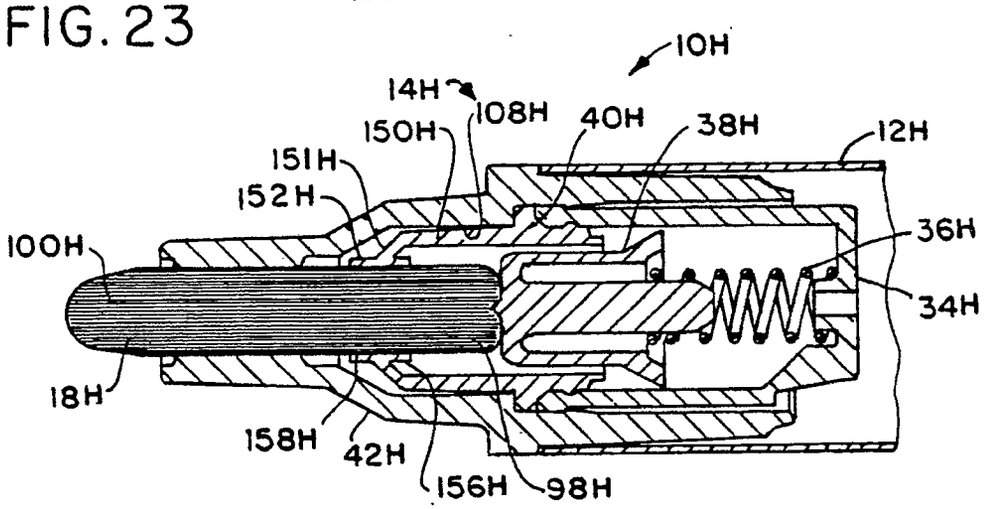

FIG. 24

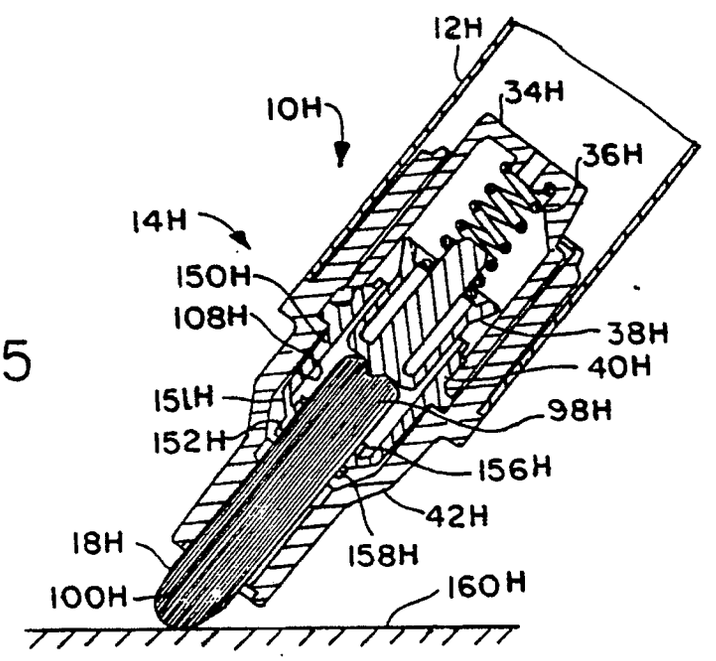

FIG. 25

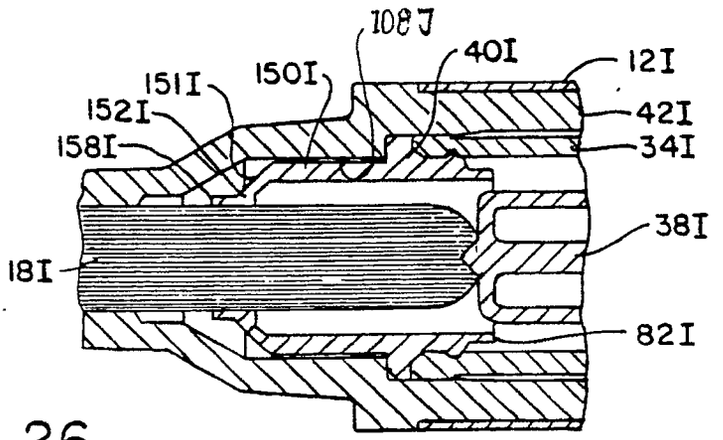

FIG. 26

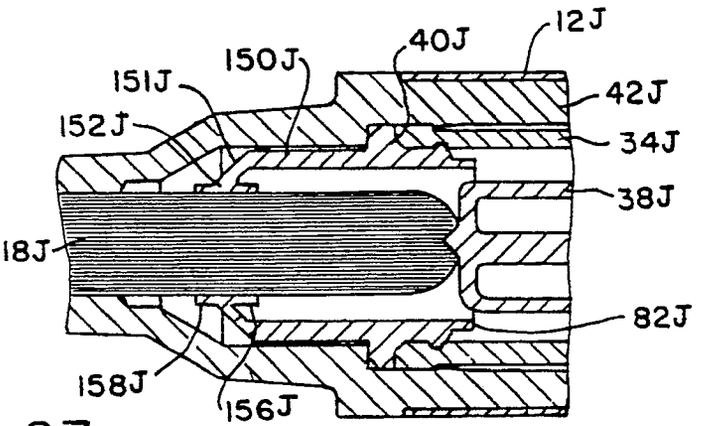

FIG. 27

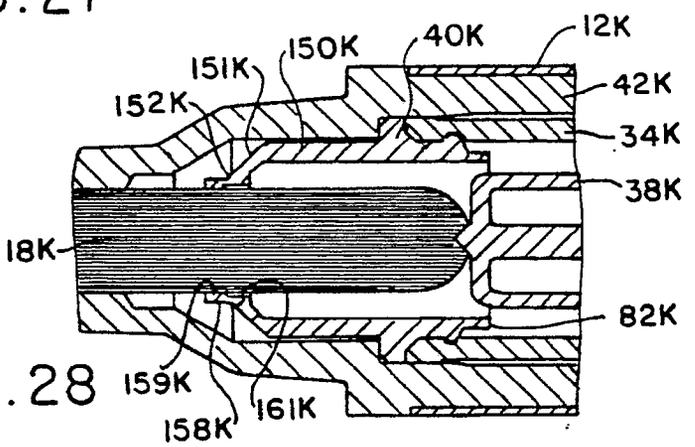

FIG. 28

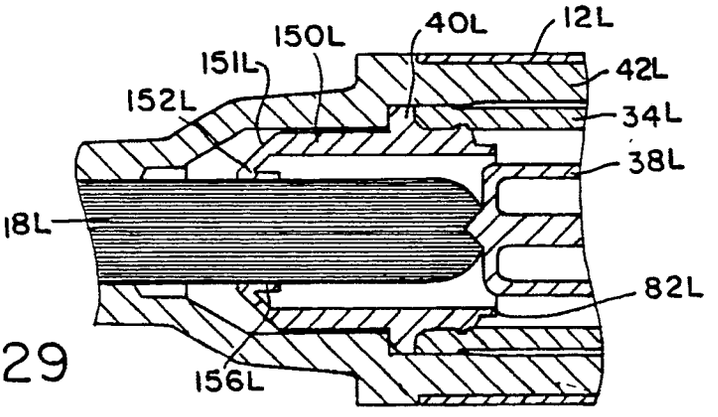

FIG. 29