United States Patent [19]

Micallef

[11] **3,749,290**

[45] **July 31, 1973**

[54] **TRIGGER ACTUATED PUMP**

[75] Inventor: **Lewis A. Micallef,** New York, N.Y.

[73] Assignee: **Leeds and Micallef,** New York, N.Y.

[22] Filed: **June 7, 1971**

[21] Appl. No.: **150,417**

[52] **U.S. Cl.** **222/385**

[51] **Int. Cl.** **B67d 5/42**

[58] **Field of Search** 222/213, 383, 385, 222/484, 528, 529, 450, 540; 417/479

[56] **References Cited**

UNITED STATES PATENTS

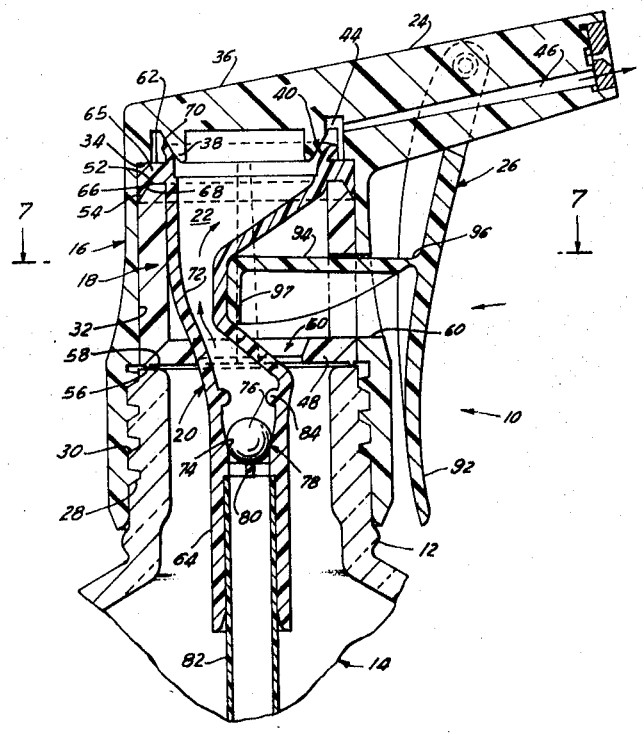
2,772,817	12/1956	Jauch	222/540 X
3,494,512	2/1970	Haynes	222/383
2,709,025	5/1955	Scott	222/383 X
2,527,614	10/1950	Arpin	417/479 X
2,534,504	12/1950	Engstrom	222/383 X
3,248,021	4/1966	Corsette et al.	222/385 X

Primary Examiner—Samuel F. Coleman
Assistant Examiner—Norman L. Stack, Jr.
Attorney—Kane, Dalsimer, Kane, Sullivan and Smith

[57] **ABSTRACT**

A manually actuated trigger pump is adapted to be fitted on the neck of a container for dispensing a liquid therefrom. The pump includes an outer tubular shell having lower internal threads for fittedly engaging the outer threads on the neck of the container. A laterally extending nozzle projects from the shell either as an integral part thereof or as a separate component having means for securely fastening the nozzle to the shell. A bulbous tubular member defining a pump chamber is disposed interiorly of the shell. The upper part of the tubular member is adapted to be secured to the outer shell and also includes a concentric rim engageable with surfaces of the shell in defining an upper outlet valve. The lower end of the flexible tubular member is of lesser diameter and provides an inlet valve seat for receiving a ball check valve. A dip tube is adapted to extend downwardly from the lower end of the tubular member for providing a passage therethrough into the pump chamber of the liquid contents of the container. A trigger mechanism adapted to be finger actuated extends through the shell and is adapted to engage the tubular member and collapse it for expelling the contents of the pump chamber. In this connection, the lower check valve will close the lower end of the pump chamber and the collapsing of the tubular bulb will cause its liquid contents to be expelled out through the upper valve and out of the outlet opening into the nozzle into the selected discharge spray pattern. Upon release of the trigger, the tubular bulb will return to its original fully distended position. During this transition the upper outlet valve will reseal and the lower ball check valve will be unseated to permit liquid from the interior of the container to be pulled upwardly through the dip tube into the pump chamber. This amount of liquid will be replaced by a corresponding amount of air which will be permitted egress into the container interior through the opening of an air inlet valve defined by the outer surfaces of the bulb and radially inwardly extending surfaces of the outer shell. When the bulb is fully distended, this air check valve will be closed and the lower check valve at the base of the tubular member will be reseated to close the valve chamber until the next pumping cycle.

20 Claims, 11 Drawing Figures



PATENTED JUL 31 1973

3,749,290

SHEET 1 OF 7

FIG.2

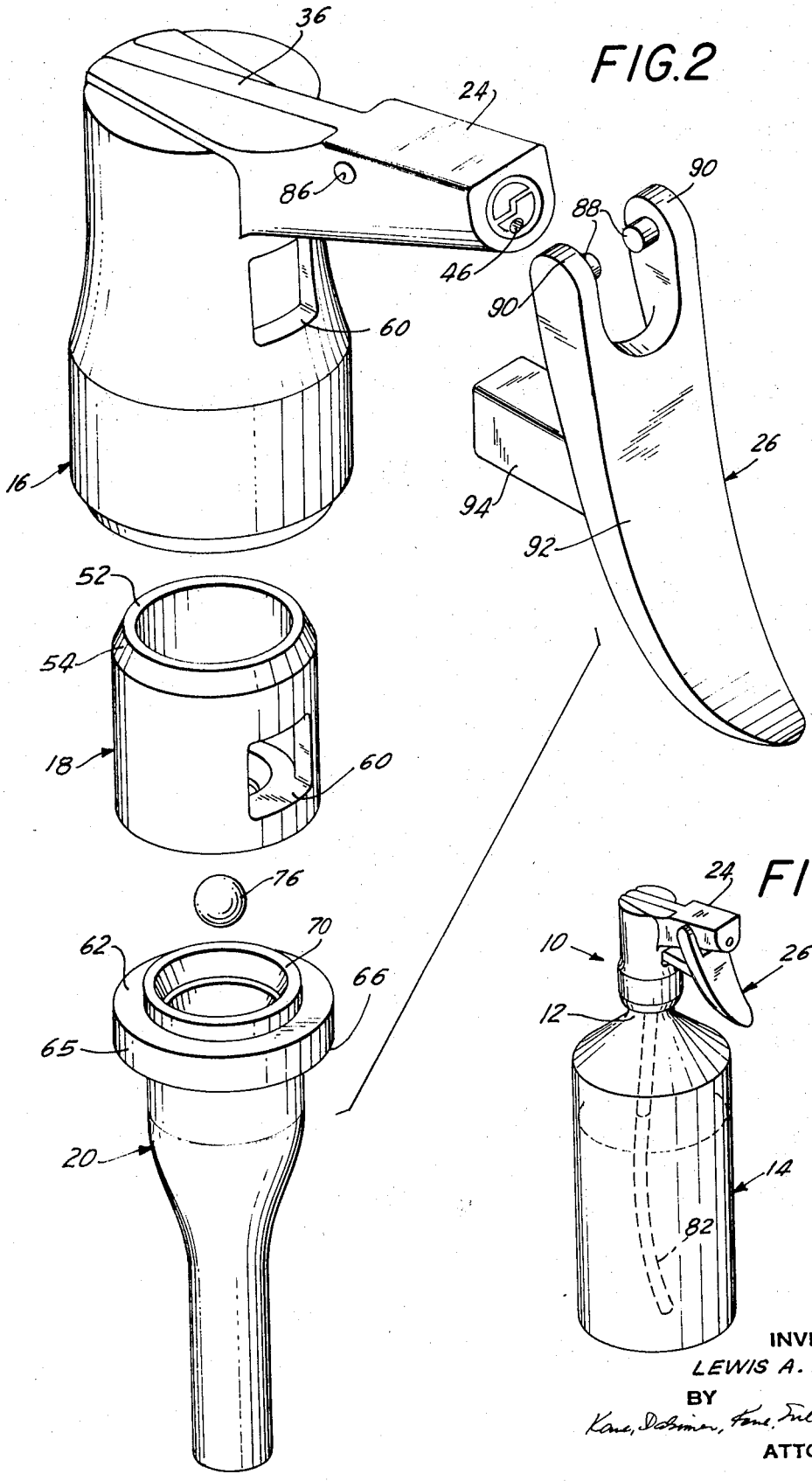


FIG.1

INVENTOR
LEWIS A. MICALLEF
BY
Kane, Dalsimer, Kane, Sullivan & Kurucz
ATTORNEYS

FIG. 3

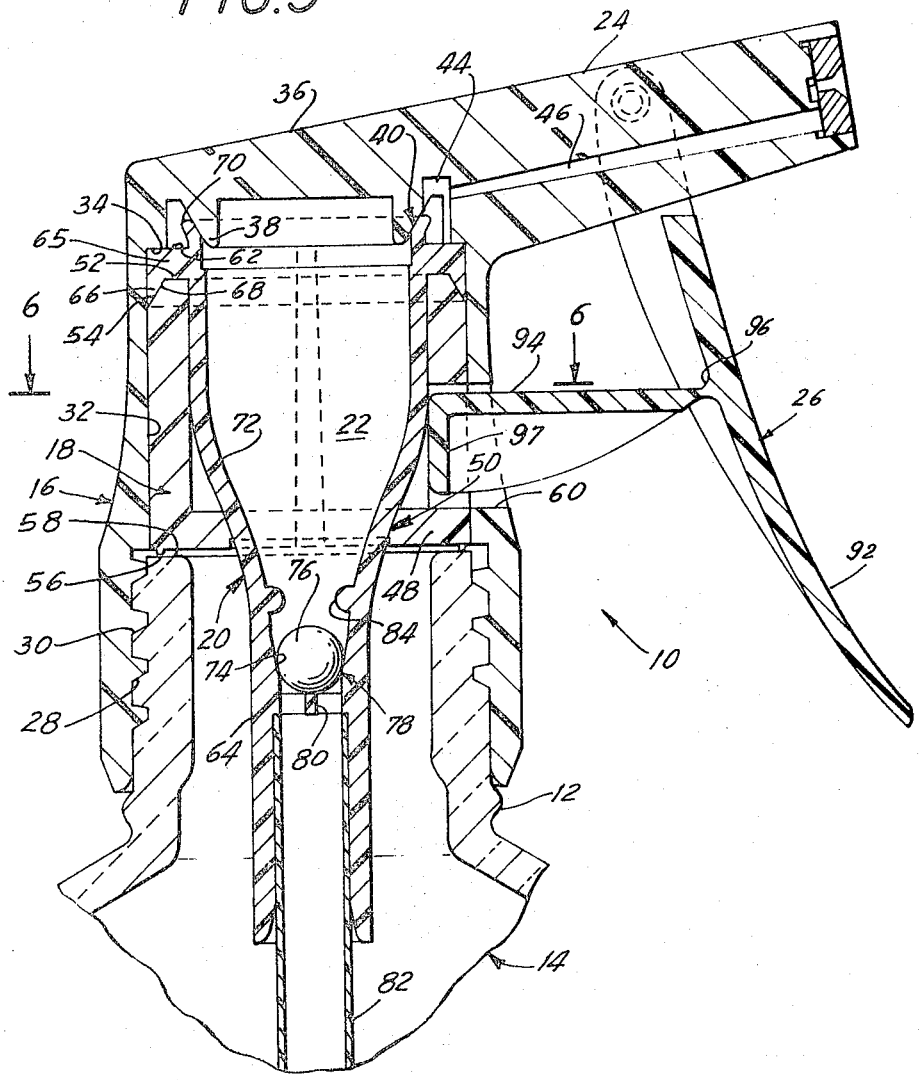
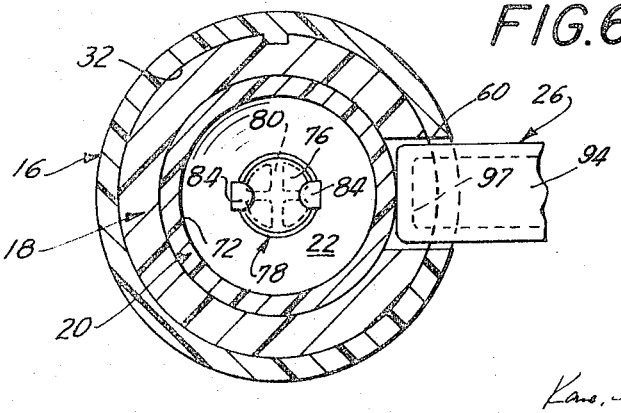


FIG. 6



INVENTOR
LEWIS A. MICALLEF
BY
Kane, Dalsimer, Kane, Sullivan & Kurucz
ATTORNEYS

FIG. 4

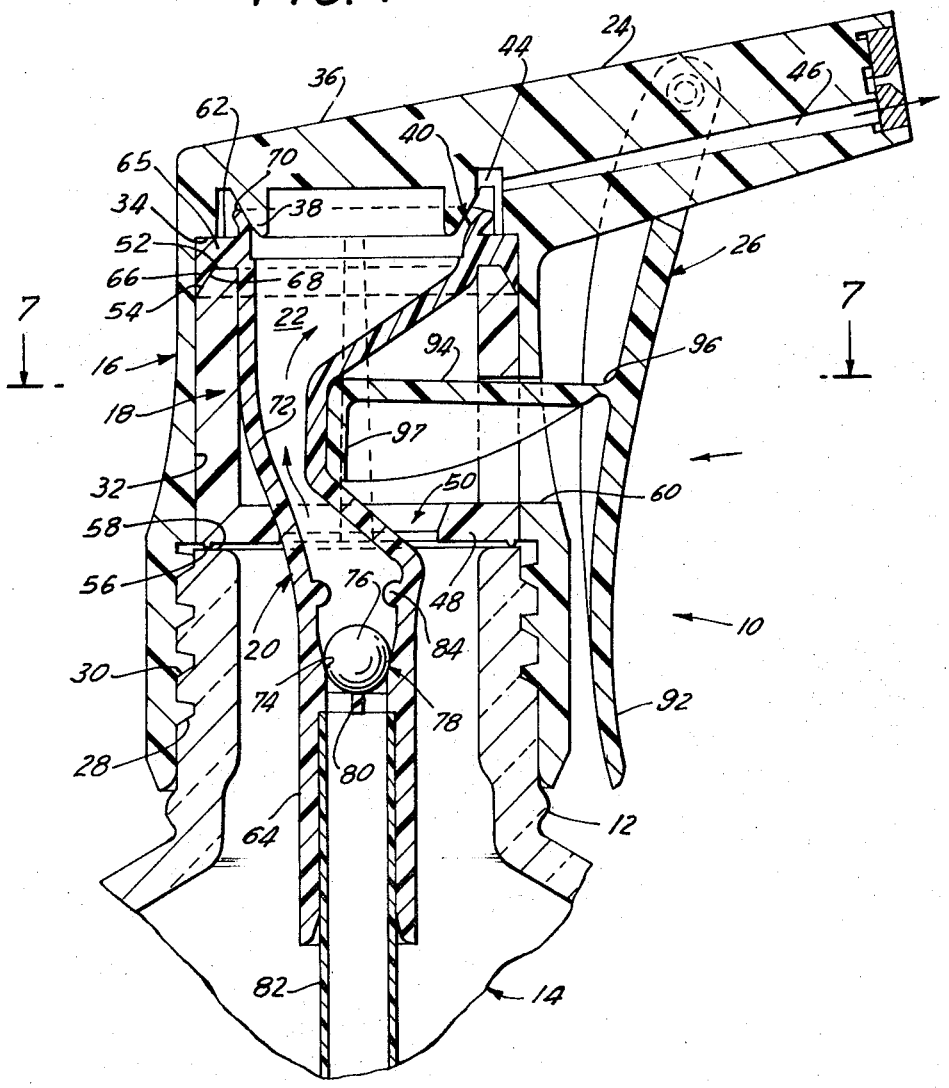
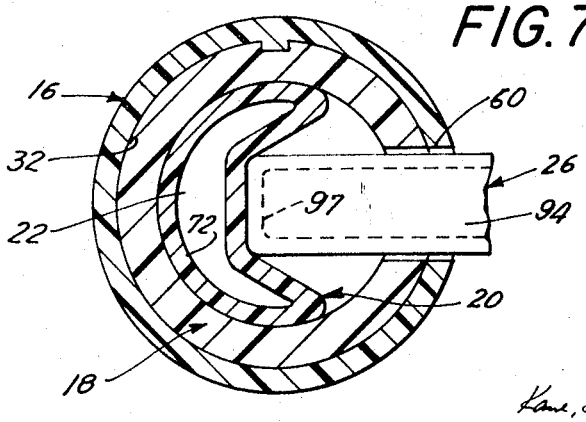
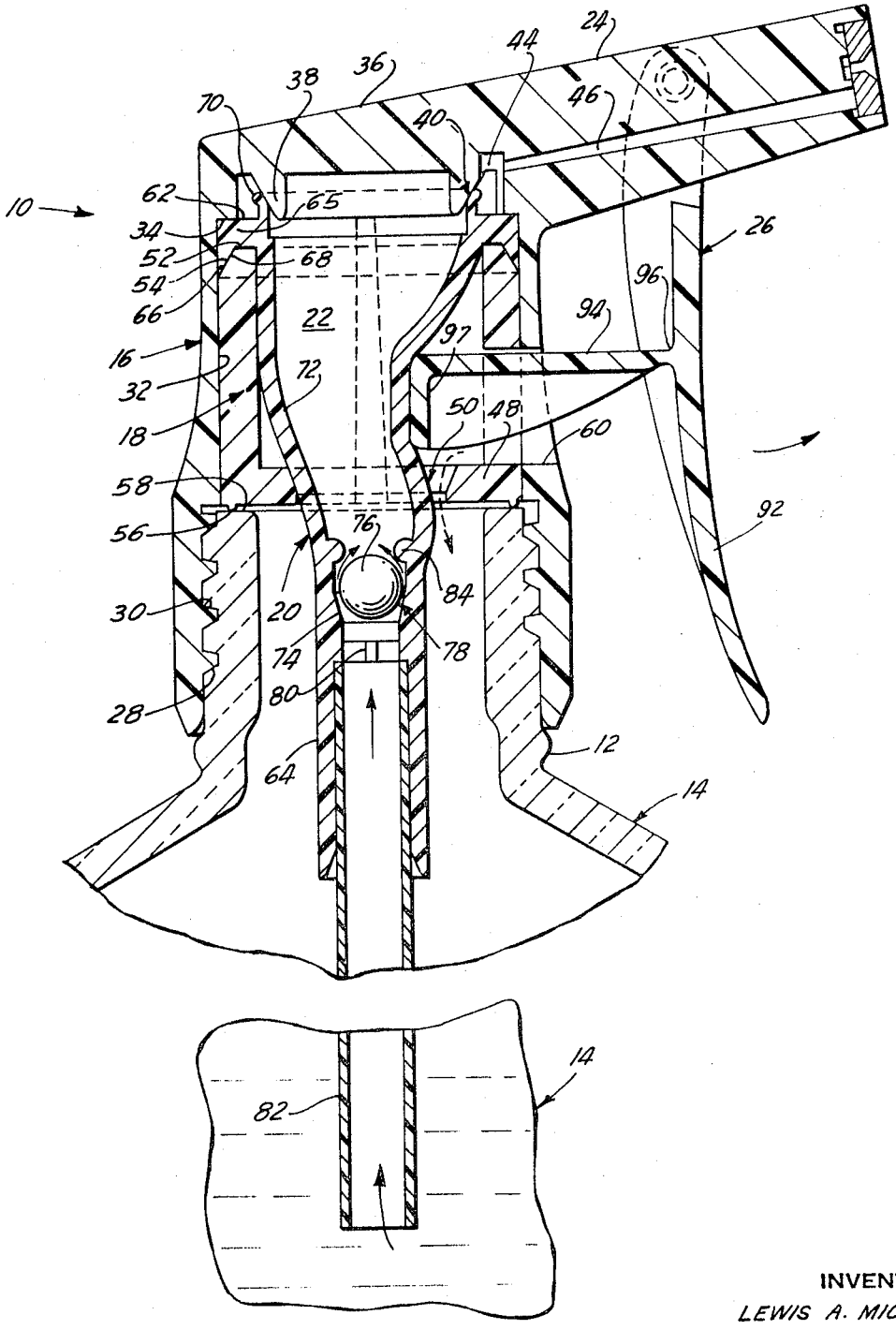


FIG. 7



INVENTOR
LEWIS A. MICALLEF
BY
Kane, Dalsimer, Kane, Sullivan & Kurucz
ATTORNEYS

FIG. 5



INVENTOR
LEWIS A. MICALLEF
BY
Kane, Dalsimer, Kane, Sullivan & Kurucz
ATTORNEYS

FIG. 9

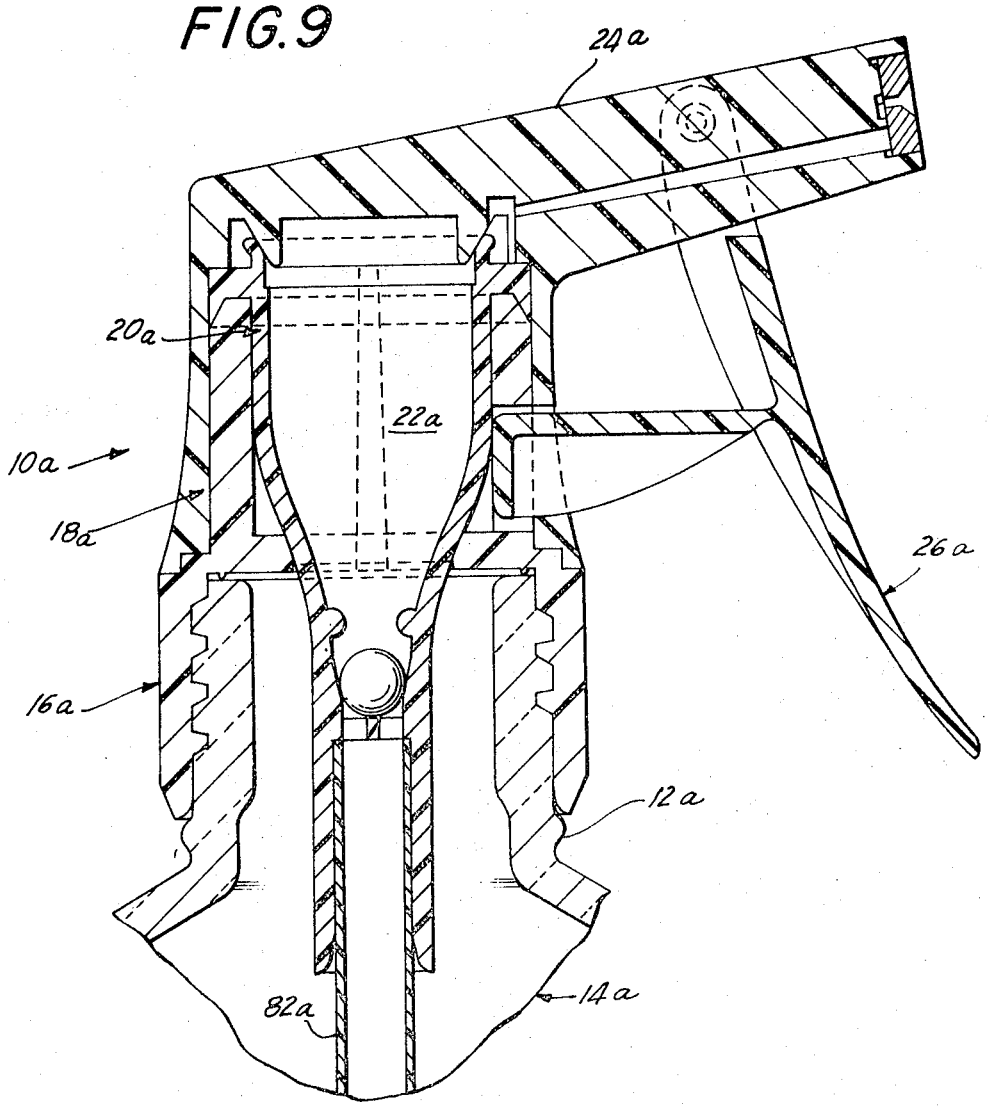
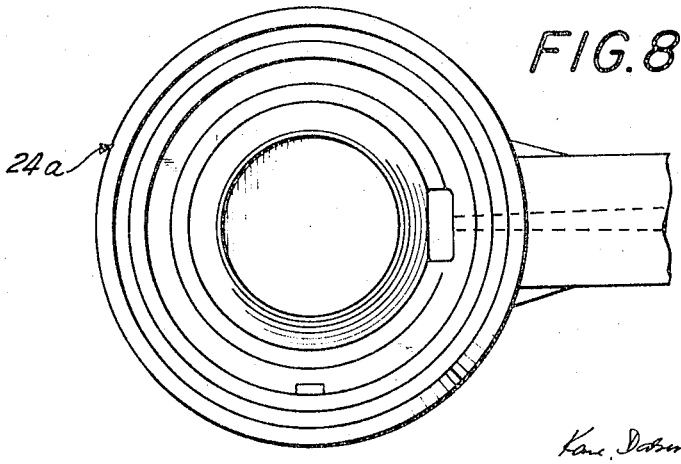
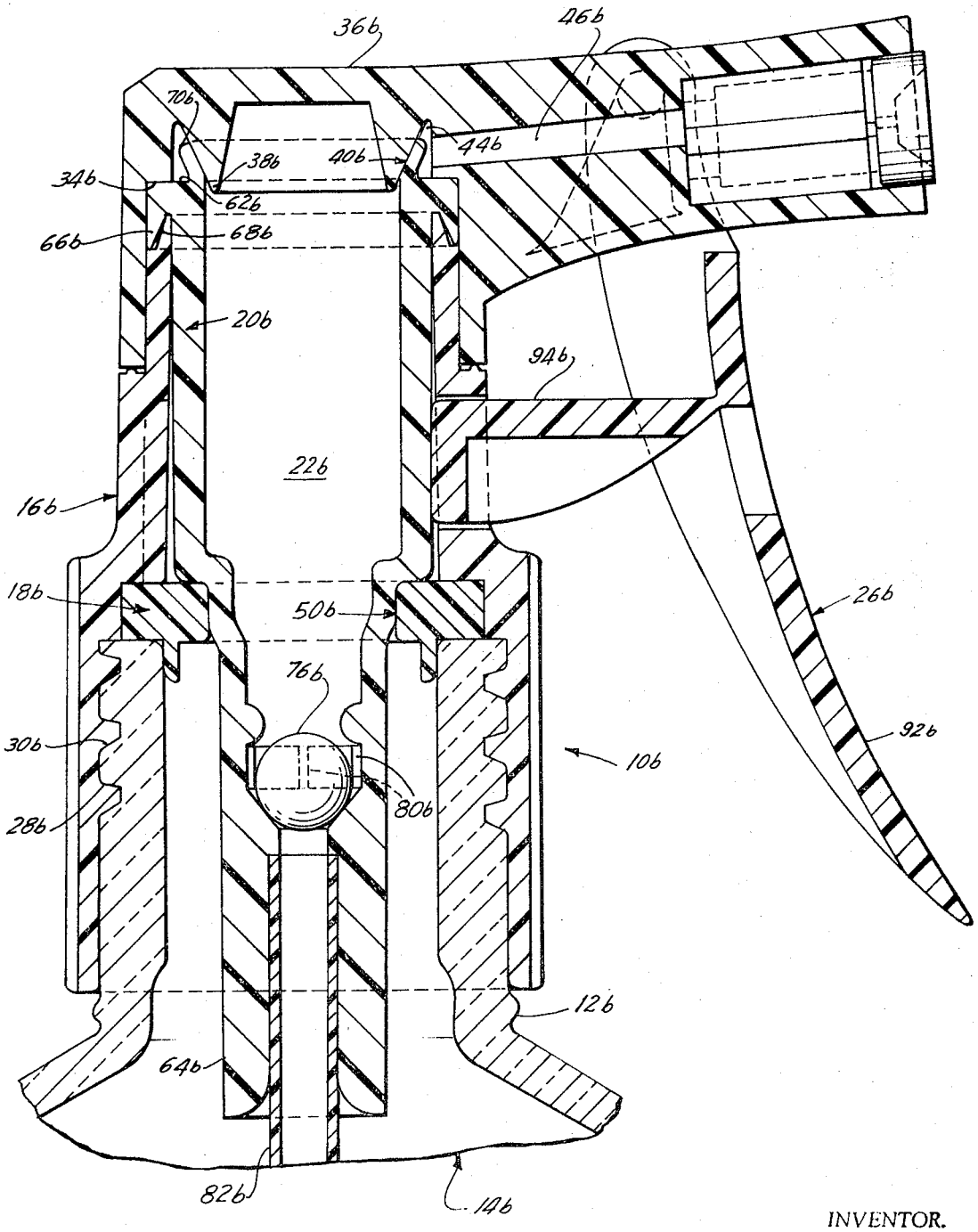


FIG. 8



INVENTOR
LEWIS A. MICALLEF
BY
Kane, Dalsimer, Kane, Sullivan & Kurucz
ATTORNEYS

FIG. 10



INVENTOR.
LEWIS A. MICALLEF

BY

Kane, Dalsimer, Kane, Sullivan & Kurucz

ATTORNEYS

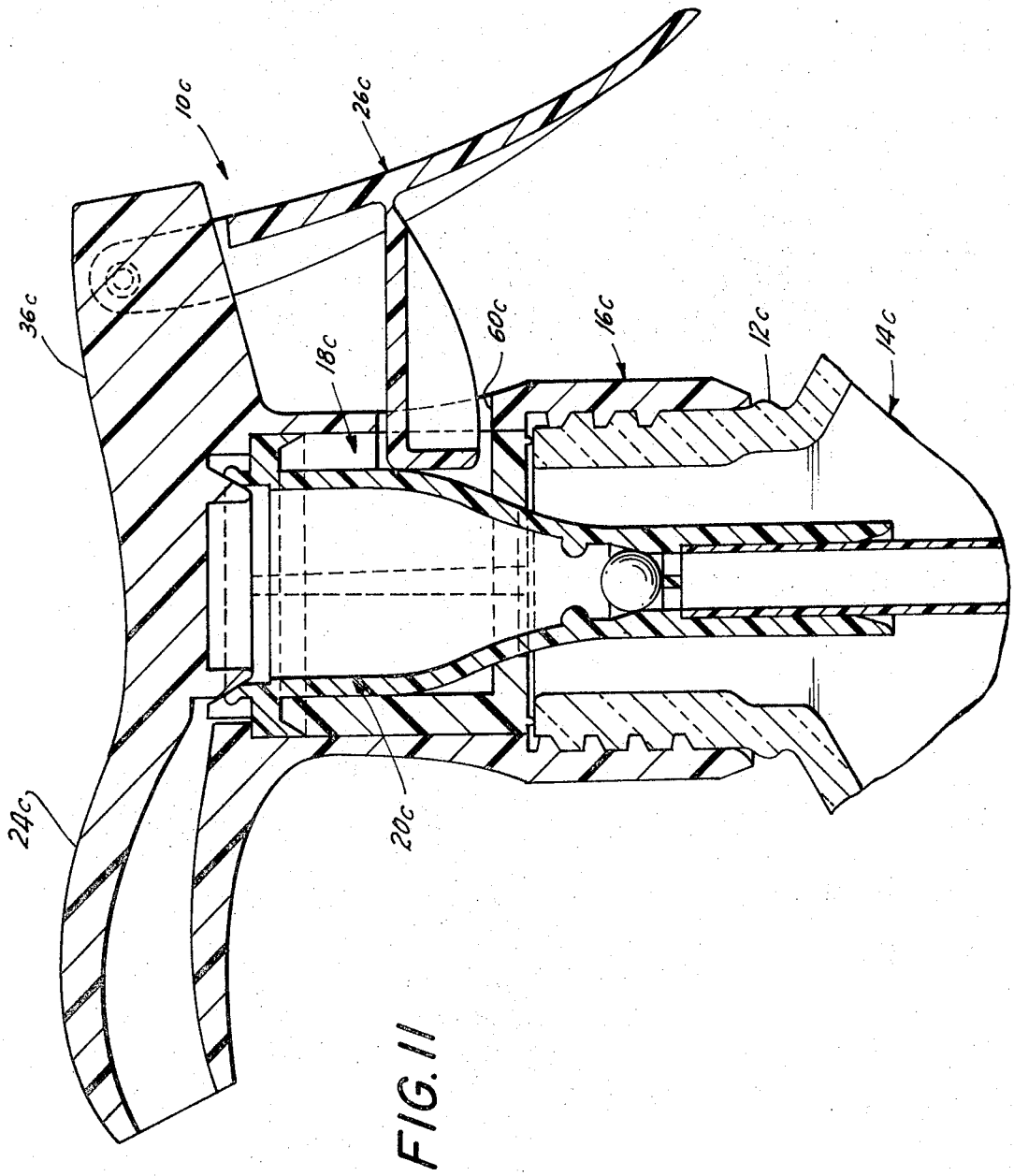


FIG. 11

INVENTOR
LEWIS A. MICALLEF
BY
Kane, Dalsimer, Kane, Sullivan & Kurucz
ATTORNEYS

TRIGGER ACTUATED PUMP

BACKGROUND OF THE INVENTION

Manually operated trigger actuated dispensing pumps for liquid containers have been proposed in the past and one having wide commercial application is disclosed in U.S. Pat. No. 3,061,202 granted Oct. 30, 1962. However, pumps of this type have proven to be costly requiring a large number of parts, each individually complex and relatively costly to manufacture and assemble.

SUMMARY OF THE INVENTION

This invention has as a principal object the construction and assembly of an extremely inexpensive manually operated trigger actuated pump constructed of a minimum number of parts, each individually simple and inexpensive to manufacture and assemble.

Another object is to provide a pump of the foregoing type which may be actuated by the forefinger of the hand holding the container and in accordance with a related embodiment the thumb of this hand.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the manually operated trigger actuated pump fitted on the neck of a container for liquid to be dispensed;

FIG. 2 is an exploded perspective view of the component parts of the pump drawn to an enlarged scale;

FIG. 3 is a longitudinal sectional view of the pump shown associated with the neck of the container with the bulbous tubular member defining the pump chamber shown in a fully distended position;

FIG. 4 is a similar view with the trigger actuated to collapse the bulbous tubular member to thereby expel the liquid contents of the pump chamber out through the dispensing nozzle;

FIG. 5 is a similar view showing the trigger retreating to its initial position to cause the bulbous tubular member to expand towards its fully distended position thereby causing liquid to flow into the pump chamber and air to enter the neck of the container to replace the liquid pulled into the pump chamber;

FIG. 6 is a cross-sectional view taken along the line 6—6 of FIG. 3;

FIG. 7 is a cross-sectional view taken along the line 7—7 of FIG. 4;

FIG. 8 is a bottom plan view;

FIG. 9 is a view similar to FIG. 3 but showing a different construction of outer shell;

FIG. 10 is a longitudinal sectional view of a somewhat preferred embodiment of pump; and

FIG. 11 is a longitudinal sectional view of another embodiment of a pump incorporating the teachings of this invention which is thumb actuated.

DETAILED DESCRIPTION OF THE DISCLOSED EMBODIMENTS

In the drawings the manually operated finger actuated pump **10** is shown on the neck **12** of a container **14** having the selected liquid to be dispensed. In the embodiment of the pump shown in FIGS. **1** to **8**, the pump includes an outer shell **16** and associated shell **18** both of which define a component retaining body, an interior flexible tubular member **20** defining pump chamber **22**, a dispensing nozzle **24** which may form an integral part of the outer shell **16** and a trigger assembly **26** for actuating the walls of the tubular member **20** and, consequently, the pump chamber **22**.

The outer shell **16** serves to couple the pump to the neck **12** of the container and, consequently, is formed with internal threads **28** which mate with the external threads **30** on the neck **12** of the container **14**. The internal cylindrical wall **32** of shell **16** is furnished with a rather close fit with the outer wall of shell **18** for securely fastening therebetween the upper end of the tubular member **20**. In this connection, the annular shoulder **34** of the outer shell engages with the associated upper surfaces of the tubular member **20**. In addition, a top **36** of the outer shell is provided with an annular downwardly depending lip **38** which cooperates with associated surfaces on the upper end of the tubular member **20** in defining the upper outlet valve **40**. The top **36** of the outer shell **16** extends into the integral outwardly depending nozzle **24** and is furnished with a passageway **44** which communicates with the discharge orifice **46** of the nozzle **24**. It should be understood that nozzle **24** may be furnished with any one of a series of known dispensing nozzle configurations for purposes of providing the desired discharge pattern of the contained liquid to be dispensed.

The inner shell **18** is tubular in configuration and cooperates with the outer shell **16** in securing the upper end of the inner tubular member **20** and at the same time is provided with a radially inwardly extending flange **48** which cooperates with associated surfaces of the tubular member **20** in defining the air inlet valve **50** which permits air to be introduced into the interior or headspace of the container **14** to replenish liquid drawn into the pump chamber **22**. The upper end **52** of the inner shell **18** includes an outer annular and beveled face **54** which receives a correspondingly shaped surface of the upper end of the tubular member **20** to facilitate anchoring the tubular member **20** between the outer shell **16** and inner shell **18**. The base of the inner shell **18** is provided with an annular sealing lip **56** which engages with the upper lip **58** of the neck **12** of the container **14**. As will be appreciated this seal is effectuated upon screwing the outer shell **16** completely upon the neck **12**. The inner shell **18** together with the outer shell **16** define an opening **60** through which the operating means of trigger **26** is adapted to travel in changing the volume of the pump chamber **22** during the pumping cycle.

The tubular member **20** is constructed of any one of many available moldable flexible materials of either synthetic or natural resin or plastic and is essentially elastomeric in nature. The upper end **62** of the tubular member **20** is larger in diameter than the lower end **64** and is provided with an outwardly extending radial flange **65** which terminates in a downwardly depending annular apron **66** having an inner beveled face **68** which meets with the beveled face **54** at the upper end of the inner shell **18**. It will be noted in FIG. **3** that the periphery of the flange **65** and the apron **66** are disposed between the adjacent surfaces of the inner shell **18** and outer shell **16** to lock the tubular member **20** in place. The upper end **62** of the tubular member **20** is also provided with an upwardly extending annular sealing lip **70** which cooperates with the lip **38** at the upper end **36** of the outer shell **16** in defining the outlet valve **40**, the opening and closing of which will be described in detail shortly. The intermediate part of the tubular member **20** is defined by a tubular bulbous side wall **72**

which defines the pump chamber **22**. The lower end **64** of the tubular member **20** defines an annular valve seat **74** which cooperates with ball **76** in defining an inlet check valve **78** for sealing liquid in the pump chamber **22** and at the same time permits passage therethrough of liquid from the container interior into the pump chamber **22**. Any one of a number of projections **80** may be adapted below the valve seat **74** to assure against the ball **76** being forced or driven down into the lower end **64** of the tubular member **20** or perhaps into the dip tube **82**. The dip tube **82** is suitably connected to the bottom end **64** of tubular member **20** and serves to direct the liquid from the interior of the container **14** into the pump chamber **22**. Projections **84** may also be provided on the interior of the tubular member **20** above the ball **76** to limit the extent of upward travel of the ball when unseated. The exterior surface of the bulbous side wall **72** cooperates with adjacent surfaces of the radial flange **48** in defining the air inlet valve **50** as explained above.

In the embodiment of pump **10** under consideration, the trigger assembly **26** is coupled with the nozzle **24** by means of a hinged connection which may include recesses **86** in the exterior sides of the nozzle which conveniently receive the pins **88** which extend inwardly from the pair of spaced arms **90** at the upper end of the finger engaging trigger **92**. An operating arm **94** is hingedly coupled with the trigger **92** and extends laterally therefrom. The hinge connection may be provided by means of the reduced thickness **96** at the juncture between the operating arm **94** and trigger **92**. The other end of the arm **94** is provided with a depending flange **97** which extends through the opening **60** into engagement with the exterior of the bulbous side walls **72** of the tubular member **20**.

Assuming the disposition of parts shown in FIG. **3** and the pump chamber **22** filled with liquid to be dispensed, the valves **40, 78** and **50** will be closed. When it is desired to dispense the liquid contents of the pump chamber **22**, the trigger assembly **26** is actuated by applying finger pressure to the trigger **22** to move the operating arm **94** inwardly to cause the flange **97** to depress or collapse the bulbous side wall **72** to the position shown in FIG. **4**. At the outset and during this movement, the ball **76** will be forced into tighter engagement with its seat **74** and the pressure of the contained liquid in chamber **22** will force the lip **70** at the upper end of the tubular member **20** away from its associated lip **38** out of the outer shell **16** to open the valve **40**. The pressurized liquid in pump chamber **22** will be forced out through the outlet opening thus provided by the open valve **40** into the opening **44** and out through the discharge orifice **46** of the nozzle **24**. Upon release of the trigger **26**, the elastic properties of the bulbous side walls **72** will urge tubular member **20** and particularly its side walls to return to its initial and normal molded condition. At the initiation of this return movement and throughout this return movement, the valve **40** will close automatically and the negative pressure within the pump chamber **22** will cause the ball **76** to unseat from its accommodating seat **74**. This negative pressure will draw liquid from the interior of the container **14** up through the dip tube **82** into the pump chamber **22** until the bulbous side wall **72** assumes its fully distended position as shown in FIG. **3**. Throughout this excursion, the liquid that is drawn up into the pump chamber **22** is replaced by air which is permitted to enter the container interior or head-space through the opened valve **50**. When the pump chamber **22** is filled, the valve **78** will close as well as the air inlet valve **50**. The disposition of parts during the excursion from the collapsed position to the fully distended position of the tubular member **20** is shown in FIG. **5**. When it is desired to dispense more of the liquid contents, the trigger assembly is actuated as often as desired and the pumping cycle will be repeated.

Reference is now made to FIG. **9** wherein another embodiment of pump **10*a*** is disclosed. Corresponding parts will be similarly numbered with an accompanying subscript *a*. The essential difference between the embodiment shown in FIG. **9** and that shown in the preceding figures is the formation of the nozzle **24*a*** and outer shell member **16*a*** as separate parts while at the same time integrally forming the outer shell **16*a*** and the inner shell **18*a***. Under these circumstances the tubular downwardly depending apron **100** of the nozzle **24*a*** will be suitably secured by either heat or adhesive to the adjacent surfaces of the shells **16*a*** and **18*a***. In all other respects, the construction and operation of the pump **10*a*** is identical to that of the previously described pump **10** of the preceding figures.

A somewhat preferred embodiment of the invention is illustrated in FIG. **10** where parts corresponding to the other embodiments herein will be similarly numbered. Thus the pump **10b** is of such a nature that the parts may be constructed at a relatively low cost and at the same time assembled at a lower cost. It will be noted that the grid **80** has been eliminated which may prove to be desirable in the event flashing may occur at this juncture incident to the molding of the tubular member **20** from certain moldable elastomeric materials. The ribs or lands **80*b*** in the discussed embodiment serve the purpose of preventing the ball **76*b*** from chattering and also prevent the ball from rolling out of position and thus possibly cause inadvertent unseating thereof from its valve seat when the pump **10*b*** is tilted. Obviously the number and height of the lands **80*b*** permit flow of product past the ball into the pump chamber when the ball **76** is unseated when it is desired to withdraw the product from the container into the pump chamber.

Referring now to the embodiment of the invention shown in FIG. **11**, it should be understood that the pump **10*c*** is again essentially the same as the pump **10** of FIGS. **1** to **8** but in the present instance the pump is actuated by means of thumb pressure rather than the pressure of the operator's forefinger and perhaps middle finger. As will be noted, the essential difference in these pumps is in the location of the trigger assembly **26*b***. In the embodiment of FIG. **11** the trigger assembly **26*b*** is hingedly connected to the top **36*c*** of the outer shell **16*c*** at a position distal that of the dispensing nozzle **24*c*** which is shown as a lotion type nozzle but others can be used as well. Except for the finger of the operator that is used to actuate the pump and the relocation of the accommodating opening **60c** in the shells **16*c*** and **18*c***, the construction and operation of the pump of FIG. **11** is essentially the same as that of the preceding pumps **10, 10*a***, and **10*b***.

Thus, the several aforenoted objects and advantages are most effectively attained. Although several preferred embodiments of the invention have been disclosed and described in detail herein, it should be understood that this invention is in no sense limited

thereby and its scope is to be determined by that of the appended claims.

I claim:

1. A manually operable liquid dispensing pump for use and incorporation on a container for liquid to be dispensed comprising in combination:

a component retaining body;

a tubular member carried by said body having a top and a bottom and having a flexible wall defining a variable volume pump chamber adapted to assume a fully distended position of maximum volume and a collapsed position of lesser volume;

an operating means carried by said body and adapted to be manually moved from a starting position and forced into engagement with the flexible wall of the tubular member to flex the flexible wall from its distended position to its collapsed position and permit the return of the wall to its distended position, whereupon the operating means resumes its starting position, liquid inlet port at said bottom and outlet port at said top, both ports being in communication with the pump chamber and having, respectively, an inlet valve and an outlet valve associated therewith, said inlet valve adapted to be closed when liquid to be dispensed is in the pump chamber and when it is dispensed therefrom as the pump chamber decreases in volume and adapted to be opened when the liquid to be dispensed is drawn into the pump chamber from the inlet port as the pump chamber volume increases and said outlet valve adapted to open when the pump chamber decreases in volume as the liquid therein is dispensed out the outlet port and adapted to close when the pump chamber increases in volume;

means being provided by cooperating surfaces of the tubular member and component retaining body for cooperating in directing the liquid to be dispensed out of the outlet port and eventually into the selected dispensing pattern and isolate this liquid away from the pump chamber and tubular member;

the operating means when forced into engagement with the flexible wall of the tubular member to reduce the volume of the pump chamber thereby pressurizing liquid to be dispensed in the pump chamber and, at the same time, with the inlet valve closed, causing the outlet valve to open whereupon the liquid in the pump chamber is adapted to flow into the outlet port and be dispensed therefrom; and

the operating means when permitted to return to and resume its starting position permits the volume of the pump chamber to increase thereby lowering the pressure in the pump chamber and, at the same time, with the outlet valve closed, causing the inlet valve to open whereupon the liquid to be dispensed is drawn through the inlet port into the pump chamber until the flexible wall of the tubular member reaches its distended position whereupon the inlet valve closes to trap the liquid to be dispensed in the pump chamber.

2. The invention in accordance with claim 1 wherein air network means are provided for permitting the passage of air from the ambient into the container to replenish the volume of the liquid to be dispensed which is drawn from the container interior into the pump chamber through the inlet port.

3. The invention in accordance with claim 1 wherein the container comprises a neck defining an opening and said pump extending across the opening defined by the neck, the component retaining body being in the form of a cap connected with the container neck.

4. The invention in accordance with claim 1 wherein the means cooperating in directing the liquid being dispensed includes a radially extending flange at the top of the tubular member which cooperates with the component retaining body in providing a seal which isolates the pump chamber from the outlet port and the path of travel of the liquid dispensed out of the outlet port.

5. The invention in accordance with claim 1 wherein the component retaining body includes means for connecting the pump across the opening of a container and a discharge nozzle extending in a lateral direction, the discharge nozzle defining said outlet port.

6. The invention in accordance with claim 5 wherein the operating means comprises a trigger and means hingedly connecting the trigger to the nozzle.

7. The invention in accordance with claim 1 wherein the component retaining body is comprised of an inner and outer shell connected with one another and threaded means on one of said shells for threadedly coupling the pump to the threaded neck of a container.

8. The invention in accordance with claim 7 wherein one of the shells includes sealing means for sealing the pump across the neck of the container.

9. A manually operable liquid dispensing pump for use and incorporation on a container for liquid to be dispensed comprising in combination:

a component retaining body;

a tubular member carried by said body having a flexible wall defining a variable volume pump chamber adapted to assume a fully distended position of maximum volume and a collapsed position of lesser volume;

an operating means carried by said body and adapted to be manually moved from a starting position and forced into engagement with the flexible wall of the tubular member to flex the flexible wall from its distended position to its collapsed position and permit the return of the wall to its distended position whereupon the operating means resumes its starting position, liquid inlet port and outlet port both being in communication with the pump chamber and having, respectively, an inlet valve and an outlet valve associated therewith, said inlet valve adapted to be closed when liquid to be dispensed is in the pump chamber and when it is dispensed therefrom as the pump chamber decreases in volume and adapted to be opened when the liquid to be dispensed is drawn into the pump chamber from the inlet port as the pump chamber volume increases and said outlet valve adapted to open when the pump chamber decreases in volume as the liquid therein is dispensed out the outlet port and adapted to close when the pump chamber increases in volume;

the operating means when forced into engagement with the flexible wall of the tubular member to reduce the volume of the pump chamber thereby pressurizing liquid to be dispensed in the pump chamber and, at the same time, with the inlet valve closed, causing the outlet valve to open whereupon the liquid in the pump chamber is adapted to flow into the outlet port and be dispensed therefrom;

the operating means when permitted to return to and resume its starting position permits the volume of the pump chamber to increase thereby lowering the pressure in the pump chamber and, at the same time, with the outlet valve closed, causing the inlet valve to open whereupon the liquid to be dispensed is drawn through the inlet port into the pump chamber until the flexible wall of the tubular member reaches its distended position whereupon the inlet valve closes to trap the liquid to be dispensed in the pump chamber; and

the operating means being in the form of a trigger and an operating arm hingedly connected to and extending laterally from the trigger in the direction of the tubular member and essentially normal to the longitudinal axis thereof, and the component retaining body having an opening through which the operating arm extends to permit engagement of the operating arm with the tubular member upon actuation of the trigger.

10. The invention in accordance with claim **9** wherein the component retaining body includes a laterally projecting discharge nozzle having incorporated therein the outlet port and the trigger being hingedly coupled with the discharge nozzle.

11. The invention in accordance with claim **9** wherein the component retaining body comprises a discharge nozzle having incorporated therein said outlet port and the trigger being hingedly connected with surfaces of the component retaining body distal the discharge nozzle whereby the trigger is adapted to be actuated manually by the movement of the thumb of the operator of the pump.

12. A manually operable liquid dispensing pump for use and incorporation on a container for liquid to be dispensed comprising in combination:

a component retaining body;

a tubular member carried by said body having a flexible wall defining a variable volume pump chamber adapted to assume a fully distended position of maximum volume and a collapsed position of lesser volume;

an operating means carried by said body and adapted to be manually moved from a starting position and forced into engagement with the flexible wall of the tubular member to flex the flexible wall from its distended position to its collapsed position and permit the return of the wall to its distended position whereupon the operating means resumes its starting position, liquid inlet port and outlet port both being in communication with the pump chamber and having, respectively, an inlet valve and an outlet valve associated therewith, said inlet valve adapted to be closed when liquid to be dispensed is in the pump chamber and when it is dispensed therefrom as the pump chamber decreases in volume and adapted to be opened when the liquid to be dispensed is drawn into the pump chamber from the inlet port as the pump chamber volume increases and said outlet valve adapted to open when the pump chamber decreases in volume as the liquid therein is dispensed out of the outlet port and adapted to close when the pump chamber increases in volume;

the operating means when forced into engagement with the flexible wall of the tubular member to reduce the volume of the pump chamber thereby pressurizing liquid to be dispensed in the pump chamber and, at the same time, with the inlet valve closed, causing the outlet valve to open whereupon the liquid in the pump chamber is adapted to flow into the outlet port and be dispensed therefrom;

the operating means when permitted to return to and resume its starting position permits the volume of the pump chamber to increase thereby lowering the pressure in the pump chamber and, at the same time, with the outlet valve closed, causing the inlet valve to open whereupon the liquid to be dispensed is drawn through the inlet port into the pump chamber until the flexible wall of the tubular member reaches its distended position whereupon the inlet valve closes to trap the liquid to be dispensed in the pump chamber; and

the tubular member including an upper end and a lower end with both ends being opened and the upper end being of larger dimension than the lower end, the lower end containing the inlet valve and the upper end cooperating with surfaces of the component retaining body for defining said outlet valve.

13. The invention in accordance with claim **12** wherein the lower end of the tubular member defines a valve seat for the inlet valve, the inlet valve including a ball adapted to rest on the valve seat, means for preventing the ball from being forced out of the tubular member into the container, and means for limiting the movement of the ball away from the valve seat when the inlet port is opened.

14. The invention in accordance with claim **13** wherein the lower end of the tubular member includes means for coupling with a dip tube.

15. A manually operable liquid dispensing pump for use and incorporation on a container for liquid to be dispensed comprising in combination:

a component retaining body;

a tubular member carried by said body having a flexible wall defining a variable volume pump chamber adapted to assume a fully distended position of maximum volume and a collapsed position of lesser volume;

an operating means carried by said body and adapted to be manually moved from a starting position and forced into engagement with the flexible wall of the tubular member to flex the flexible wall from its distended position to its collapsed position and permit the return of the wall to its distended position whereupon the operating means resumes its starting position, liquid inlet port and outlet port both being in communication with the pump chamber and having, respectively, an inlet valve and an oulet valve associated therewith, said inlet valve adapted to be closed when liquid to be dispensed is in the pump chamber and when it is dispensed therefrom as the pump chamber decreases in volume and adapted to be opened when the liquid to be dispensed is drawn into the pump chamber from the inlet port as the pump chamber volume increases and said outlet valve adapted to open when the pump chamber decreases in volume as the liquid therein is dispensed out the outlet port and adapted to close when the pump chamber increases in volume;

the operating means when forced into engagement with the flexible wall of the tubular member to re-

duce the volume of the pump chamber thereby pressurizing liquid to be dispensed in the pump chamber and, at the same time, with the inlet valve closed, causing the outlet valve to open whereupon the liquid in the pump chamber is adapted to flow into the outlet port and be dispensed therefrom;

the operating means when permitted to return to and resume its starting position permits the volume of the pump chamber to increase, thereby lowering the pressure in the pump chamber and, at the same time, with the outlet valve closed, causing the inlet valve to open whereupon the liquid to be dispensed is drawn through the inlet port into the pump chamber until the flexible wall of the tubular member reaches its distended position whereupon the inlet valve closes to trap the liquid to be dispensed in the pump chamber; and

the tubular member and the component retaining body providing interengaging surfaces defining a normally closed air check valve for preventing air from passing therethrough into the container, and the air check valve adapted to be opened to permit replenishing of air in the container as a corresponding amount of liquid is drawn therefrom upon flexing of the flexible wall of the tubular member from its distended position to its collapsed position.

16. The invention in accordance with claim **15** wherein the inlet valve is disposed below the air check valve such that distortion of the tubular member flexible wall upon collapsing of the wall by the operating means does not affect the closure afforded by the inlet valve.

17. The invention in accordance with claim **15** wherein the interengaging surfaces defining the normally closed air check valve include:

a radially inwardly extending flange engaging the outer face of the tubular body between the inlet port and the outlet port when the tubular member is in its distended position; and

when the tubular member is in its collapsed position the outer face is flexed away from the flange by the operating means.

18. A manually operable liquid dispensing pump for use and incorporation on a container for liquid to be dispensed comprising in combination:

a component retaining body;

a tubular member carried by said body having a flexible wall defining a variable volume pump chamber adapted to assume a fully distended position of maximum volume and a collapsed position of lesser volume;

an operating means carried by said body and adapted to be manually moved from a starting position and forced into engagement with the flexible wall of the tubular member to flex the flexible wall from its distended position to its collapsed position and permit the return of the wall to its distended position whereupon the operating means resumes its starting position, liquid inlet port and outlet port both being in communication with the pump chamber and having, respectively, an inlet valve and an outlet valve associated therewith, said inlet valve adapted to be closed when liquid to be dispensed is in the pump chamber and when it is dispensed therefrom as the pump chamber decreases in volume and adapted to be opened when the liquid to be dispensed is drawn into the pump chamber from the inlet port as the pump chamber volume increases and said outlet valve adapted to open when the pump chamber decreases in volume as the liquid therein is dispensed out the outlet port and adapted to close when the pump chamber increases in volume;

the operating means when forced into engagement with the flexible wall of the tubular member to reduce the volume of the pump chamber thereby pressurizing liquid to be dispensed in the pump chamber and, at the same time, with the inlet valve closed, causing the outlet valve to open whereupon the liquid in the pump chamber is adapted to flow into the outlet port and be dispensed therefrom;

the operating means when permitted to return to and resume its starting position permits the volume of the pump chamber to increase thereby lowering the pressure in the pump chamber and, at the same time, with the outlet valve closed, causing the inlet valve to open whereupon the liquid to be dispensed is drawn through the inlet port into the pump chamber until the flexible wall of the tubular member reaches its distended position whereupon the inlet valve closes to trap the liquid to be dispensed in the pump chamber; and

the outlet valve being defined by concentric interengaging surfaces of the upper part of the tubular member and the component retaining body, said interengaging surfaces defining a seal when the outlet valve is closed to retain the liquid contents of the chamber when the flexible wall is fully extended, and the seal is adapted to be broken and the outlet port opened upon flexing of the flexible wall from its distended position to its collapsed position.

19. The invention in accordance with claim **18** wherein the concentric interengaging surfaces include:

an annular downwardly depending lip on the interior of the component retaining body; and

an upwardly extending annular sealing lip at the top of the tubular member engaging with radially outer surfaces of the lip of the component retaining body.

20. A dispensing pump for a substance to be dispensed comprising in combination:

a component retaining body;

a tubular member within said body having a top and bottom and having a distortable wall defining a variable volume pump chamber adapted to assume a fully distended position of maximum volume and a collapsed position of lesser volume;

an operating means to distort the wall from its distended position to its collapsed position and the operating means being adapted to resume its starting position, inlet port at said bottom and outlet port at said top both ports being in communication with the pump chamber and having, respectively, an inlet valve and an outlet valve associated therewith, said inlet valve adapted to be closed when the substance to be dispensed is in the pump chamber and when it is dispensed therefrom as the pump chamber decreases in volume and adapted to be opened when the substance to be dispensed is drawn into the pump chamber from the inlet port as the pump chamber volume increases and said outlet valve adapted to open when the pump chamber decreases in volume as the substance therein is dis-

pensed out the outlet port and adapted to close when the pump chamber increases in volume;

means being provided by cooperating surfaces of the tubular member and component retaining body for cooperating in directing the substance to be dispensed out of the outlet port and eventually into the selected dispensing pattern and isolate this substance away from the pump chamber and the tubular member;

the operating means being adapted to permit the reduction of the volume of the pump chamber thereby pressurizing the substance to be dispensed in the pump chamber and, at the same time, with the inlet valve closed, causing the outlet valve to open whereupon the substance in the pump chamber is adapted to flow into the outlet port and be dispensed therefrom; and

the operating means being adapted to permit the volume of the chamber to increase thereby lowering the pressure in the pump chamber and, at the same time, with the outlet valve closed, causing the inlet valve to open whereupon the substance to be dispensed is drawn through the inlet port into the pump chamber until the wall of the tubular member reaches its distended position whereupon the inlet valve closes to trap the substance to be dispensed in the pump chamber.

* * * * *