United States Patent [19]

Williams

[11] **3,902,815**

[45] **Sept. 2, 1975**

[54] **POSITIVE DISPLACEMENT DISPENSER**

[75] Inventor: **David R. Williams,** Dallas, Tex.

[73] Assignee: **Liquid Paper Corporation,** Dallas, Tex.

[22] Filed: **Apr. 1, 1974**

[21] Appl. No.: **456,686**

[52] **U.S. Cl.** **401/264;** 222/207; 222/518; 401/209

[51] **Int. Cl.²** **B43K 5/18**

[58] **Field of Search** 222/207, 212, 213, 506, 222/509, 513, 518, 441, 447, 448, 449, 501; 401/209, 258–260, 264

[56] **References Cited**

UNITED STATES PATENTS

912,794	2/1909	Bostock	222/518
2,143,661	1/1939	Schrader	222/207
2,737,329	3/1956	Bolsey	222/207
2,876,935	3/1959	Lindberg	222/207
2,984,393	5/1961	Magnenat	222/518
3,154,222	10/1964	Heckman	222/213
3,224,650	12/1965	Willits	222/207

FOREIGN PATENTS OR APPLICATIONS

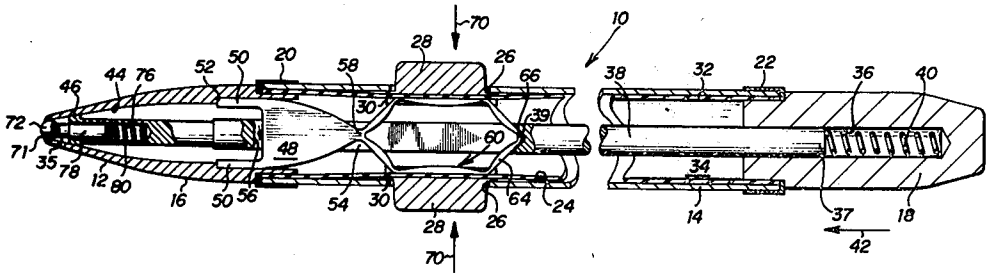
149,734	12/1931	Switzerland	401/260

Primary Examiner—Allen N. Knowles
Assistant Examiner—H. Grant Skaggs, Jr.
Attorney, Agent, or Firm—Richards, Harris & Medlock

[57] **ABSTRACT**

A dispenser for volatile viscous liquids such as correction liquids used to mask typographical errors on a sheet of paper. This dispenser has a housing with a longitudinal chamber having a cylindrical resilient walled bladder therein forming a liquid storage volume. Tabs extend from the housing and are radially movable with respect to the housing to compress the resilient bladder and the fluid in the storage volume. A conical walled chamber is formed at one end of the dispenser and communicates with said liquid storage volume. A first normally closed valve member controls the flow of liquid from the storage volume to a dispensing volume formed adjacent a dispensing aperture. A cam member interconnects the tabs and the first valve member for simultaneously opening the first valve and forcing liquid to flow from said storage volume to said dispensing volume when said tabs are moved. A normally closed ball valve is seated in the dispensing aperture and is axially moved upon engagement with a sheet of paper to open said dispensing aperture and displace liquid from said dispensing volume.

1 Claim, 5 Drawing Figures



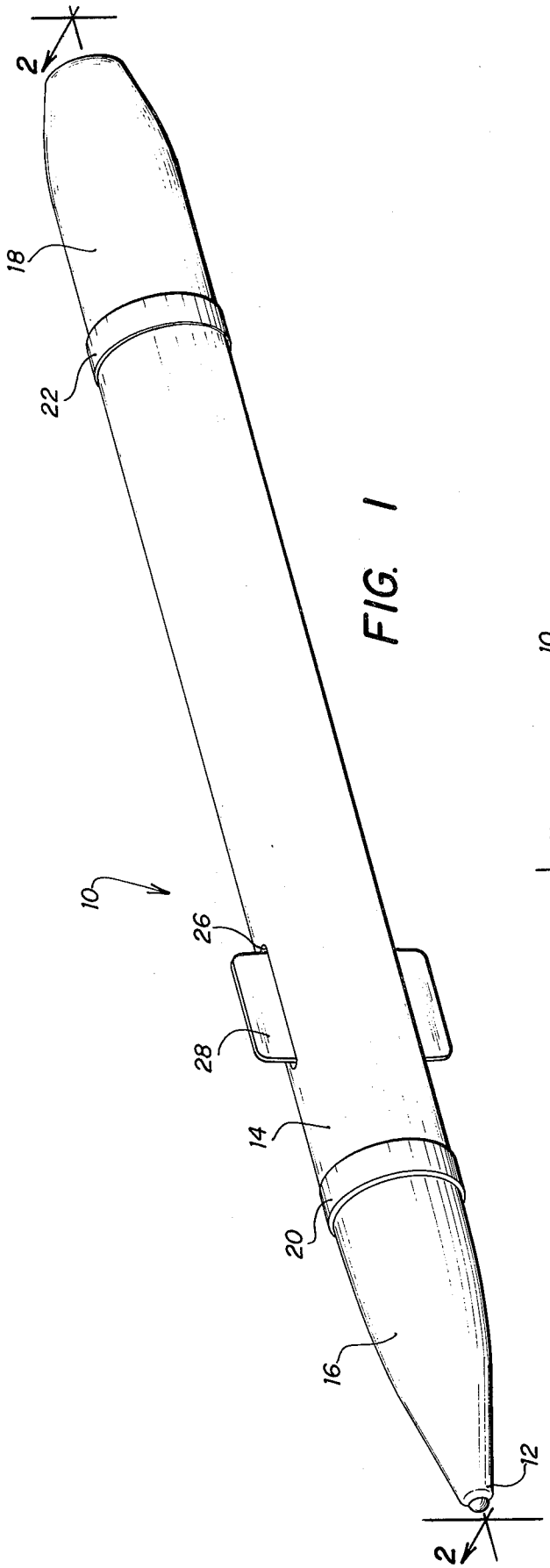

2
18
22
10
26
28
14
20
16
12
2

FIG. 1

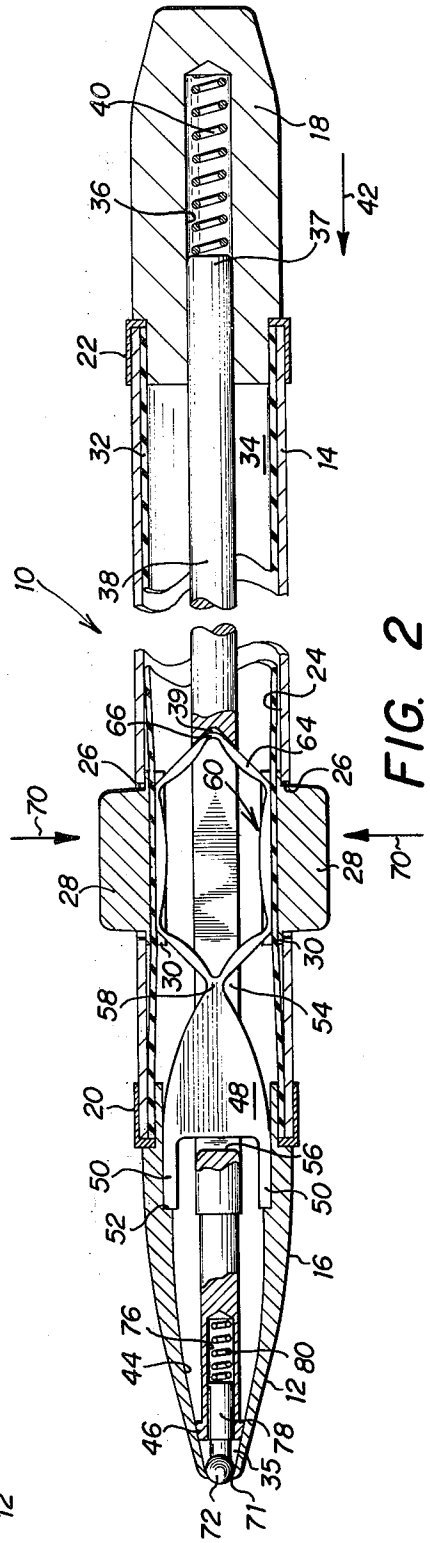

40
18
36
37
42
22
32
34
14
38
10
24
39
66
64
26
26
60
70
70
28
28
30
30
58
54
48
20
50
56
50
52
16
76
44
80
12
46
78
35
72
71

FIG. 2

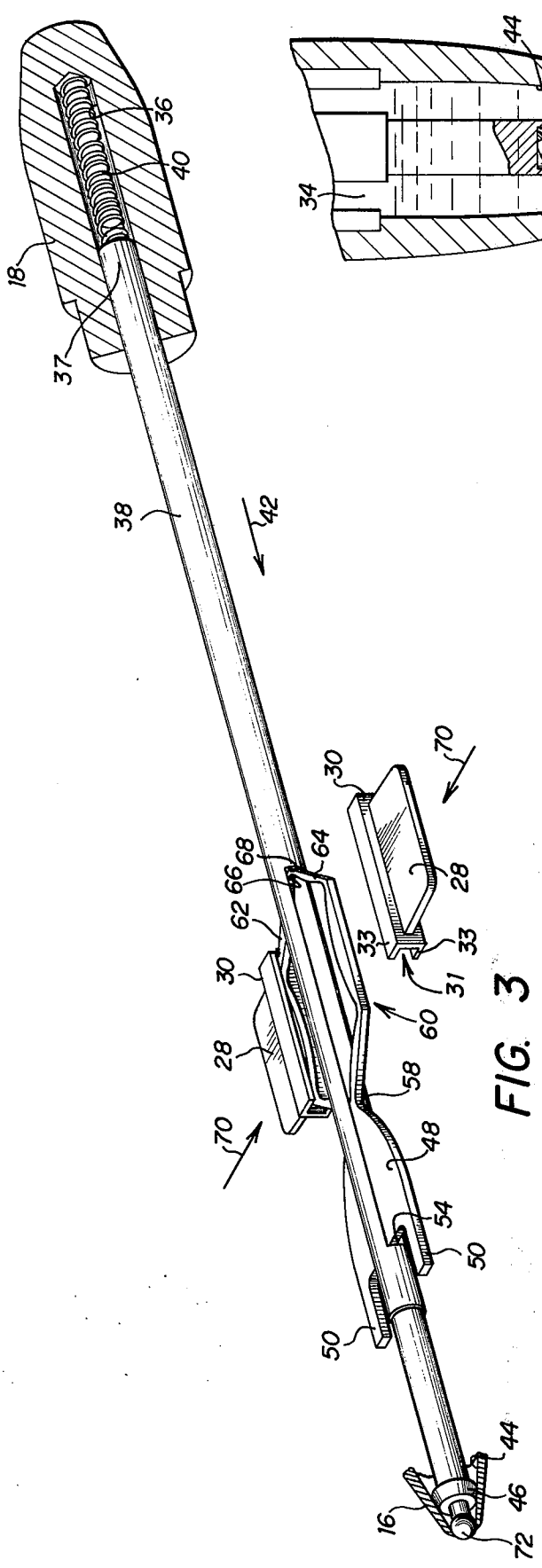


FIG. 3

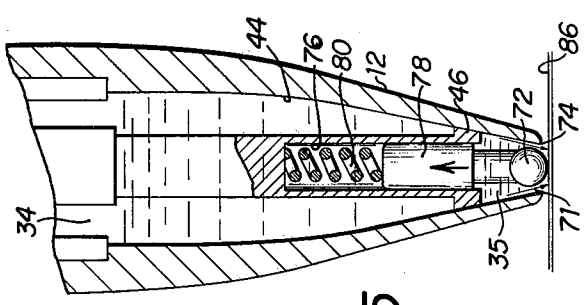


FIG. 5

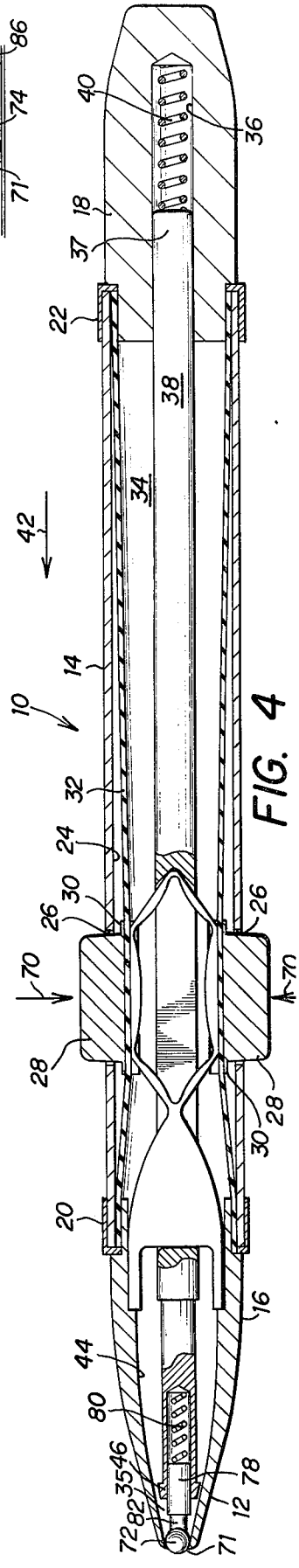


FIG. 4

POSITIVE DISPLACEMENT DISPENSER

BACKGROUND OF THE INVENTION

The present invention relates to improvements in dispensers for exotic liquids. In another aspect, the present invention relates to an improved dispenser for reliably dispensing measured quantities of viscous, volatile liquids such as correction liquids, glue and the like.

One unique dispensing problem is found in the dispensing of correction liquids to mask typographical errors and the like. These correction liquids are viscous and conventionally consist of opaque particles suspended in a volatile liquid carrier. The liquid is applied over the error, and the volatile carrier evaporates leaving a coating formed by the opaque particles.

It has long been recognized that the provision of a reliable dispensing apparatus for correction liquid is highly desirable, but the unusual characteristics of this liquid make the provision of such an apparatus difficult.

The small size of the errors over which the material must be applied requires that the dispenser be capable of measuring and dispensing extremely small volumes of liquid. This is because, in situations where it is desired to correct only one character, the dispensing of a very small amount of liquid is required. If larger amounts than are required are dispensed, the liquid can become smeared and detract from the appearance of the document. This dispensing in small volumes is complicated by the unusual flow characteristics of the correction liquid. For example correction liquid sold under the trademark "Liquid Paper," by the Liquid Paper Corp., Dallas, Tex., exhibits characteristics of being a thixotropic fluid and is viscous in the range of 100 to 600 cps. These characteristics make dispensing small volumes of the liquid through small openings extremely difficult.

In normal use, a dispenser could be used numerous times throughout the day or left unused for days or even weeks. This irregular use frequency requires that the dispenser reliably store and dispense correction liquid over long periods of time. The high volatility of the liquid causes the liquid to dry whenever it is exposed to the air. Accordingly, the dispenser must protect its reservoir of liquid from ruinous contact with the air while preventing the build up and plugging of the dispensing aperture by dried up liquid.

Therefore, according to one aspect of the present invention, an improved dispenser is disclosed which can repeatedly dispense liquids such as correction liquid over long periods of time. According to another aspect of the present invention, an improved dispenser is disclosed which provides controlled dispensing of small quantities of liquids such as correction liquid.

Therefore, according to the present invention, an improved liquid dispenser apparatus is provided having communicating liquid storage and dispensing volumes. The dispensing volume is of a size to contain a small quantity of correction liquid to be dispensed while the storage chamber provides a larger volume for correction liquid. Suitable valving is provided to selectively separate the volumes and to fill the dispensing volume with correction liquid from the storage volume. Metered dispensing is accomplished by displacing liquid from the dispensing volume onto the paper.

BRIEF DESCRIPTION OF THE DRAWINGS

The objects and advantages of the improved dispenser of the present invention will be readily apparent from the reading of the following detailed description of the device constructed in accordance with the invention by reference to the accompanying Drawings thereof, wherein:

FIG. 1 illustrates a perspective view of a dispenser incorporating the improved features of the present invention;

FIG. 2 is a reduced section of the device taken along line 2—2 of FIG. 1, looking in the direction of the arrows;

FIG. 3 is an exploded perspective view of the device;

FIG. 4 is a sectional view of the tip of the dispenser illustrating the internal valve in the open condition allowing liquid to flow into the dispensing volume; and

FIG. 5 is an enlarged sectional view similar to FIG. 4 illustrating the internal valve in the closed position and the dispensing valve in the open or dispensing position allowing liquid to be dispensed from the dispensing volume onto a surface.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the Drawings wherein like reference characters represent like and corresponding parts throughout the several views, there is illustrated an improved liquid dispenser **10** embodying the present invention. In the present embodiment, the dispenser is used to store correction liquid and dispense metered quantities of the liquid onto a flat surface, for example, to correct typographical errors on a sheet of paper. It is envisioned, of course, that other exotic liquids could be dispensed from dispenser **10.**

The dispenser **10** is illustrated as being tapered at one end **12** to allow the user to easily observe and control the dispensing of correction liquid from the dispenser **10.** The dispenser **10** includes an elongated rigid housing **14** having lower and upper sections **16** and **18,** respectively, connected to the housing by members **20** and **22,** respectively. The housing **14** defines a cylindrical chamber **24.** Two slots **26** extend through opposite sides of the housing **14.**

Tabs **28** extend through the slots **26** and each has a transverse flange **30** of a size larger than the slots **26** to limit movement of the tabs **28** in the outward direction. The flanges **30** each have pockets **31** formed by ridges **33.**

A cylindrical-shaped bladder **32** is positioned within the chamber **24** and is sealed at its ends between sections **16** and **18** to define a correction liquid storage volume **34.**

The upper section **18** is provided with a concentrically positioned axially extending bore **36.** This bore **36** is of a size to receive in sliding engagement the upper end **37** of valve stem **38.** A compression spring **40** is positioned within the bore **36** to resiliently engage the upper end **37** of the valve stem **38** and resiliently urge the valve stem **38** to move in the direction of arrow **42.**

The valve stem **38** extends axially through the volume **34** and into a frustoconical chamber **44** formed in the lower section **16.** A frustoconical-shaped valve member **46** is formed on the end of the valve stem **38** to engage the interior wall of the conical chamber **44.**

The contact of valve 46 and wall of chamber 44 separates a small dispensing volume 35 from volume 34.

The apex angles of the frustoconical-shaped valve 46 and the conical chamber 44 are designed to be identical so that surface contact is provided between the two members. In the preferred embodiment, these half angles are in the range of 12° to 14°.

In operation, the spring 40 resiliently urges the valve stem 38 in the direction of arrow 42 so that valve 46 is resiliently held in contact with the walls of the chamber 44. To fill the volume 35 with correction liquid, the valve stem 38 can be caused to move in the reverse direction of the arrow 42, thus compressing spring 40 and moving the valve 46 away from the walls of the chamber 44 to allow correction liquid to flow from the volume 34.

To axially move the valve stem 38, a cam member 48 is provided in the interior of the volume 34. Cam 48 has a bifurcated portion at one end which forms a pair of feet 50. Feet 50 engage an annular shoulder 52 formed in the interior of the lower section 16 to restrict movement of the cam 48 in the direction of arrow 42.

A slot 54 is formed in valve stem 38 for receiving the cam 48 therein. This slot 54 extends a limited distance along the length of the valve stem 38 and has a seat 39 formed in one end thereof. The slot 54 is of a length so that clearance 56 is provided on the slot 54 to prevent contact between the cam 48 and the stem 38 during axial movement of the stem with respect to the cam 48.

Cam 48 has a necked portion 58 which is connected to a compressible spring portion 60. Spring portion 60 is formed by a pair of arms 62 and 64. These arms radially extend from the portion 58 to engage the interior walls of the bladder 32 at points radially aligned with the pockets 31 of tabs 28. Arms 62 and 64 are joined at point 66 and contact the valve stem 38 at seat 39. Arms 62 and 64 are constructed from resilient material and are compressible in the directions of arrows 70 by movement of the tabs 28. Movement of the tabs 28 in the direction of arrows 70 will deform the bladder 32 thus pressurizing the liquid therein and forcing the valve stem 38 to move in the reverse direction of arrow 42 to open the valve 46.

The tapered end 12 of the lower section 16 has a dispensing aperture 71 which communicates with the dispensing valve 35. This aperture 71 is located below the valve 46 at the smaller end of section 16. A ball valve 72 is positioned to selectively seal aperture 71. The ball valve 72 is axially movable to and away from the aperture 71 and when seated with the edge of the aperture, makes contact along line 74.

The valve member 46 has an axially extending cylindrical bore 76 in which is reciprocally mounted a valve actuator 78. This bore 76 is in fluid communication with dispensing volume 35 to allow axial movement of the actuator in the bore 76. A compression spring 80 is mounted in the upper end of the bore 76 to resiliently urge the valve actuator 78 in the direction of arrow 42. The lower end of the valve actuator 78 is provided with a socket 82 which engages the valve 72 and resiliently urges the valve to move in the direction of the arrow 42 to seal the dispensing aperture 71. The spring constant of the spring 80 is designed to allow compression of spring 80 by movement of ball 72 without causing deflection of spring 40 or movement of valve stem 38.

OPERATION OF THE DEVICE

In operation the dispenser 10 as used to dispense small volumes of correction liquids on sheets of paper or the like to correct typographical errors will be described. To adequately correct these typographical errors, the dispenser 10 must have the capability to accurately position and dispense a small volume of correction liquid on a small area to cover only the error with the liquid.

The dispenser 10 is provided with an internal storage volume 34 for storing a volume of correction liquid and a liquid metering structure controlling the quantity of correction liquid dispensed from the dispenser 10. Initially, the storage volume 34 is filled with correction liquid. This step would normally be accomplished at assembly of the device.

If it is desired to dispense liquid from the dispenser 10, the tabs 28 are depressed in the directions of arrows 70. This pressurizes the liquid in volume 34 by deflecting the bladder 32 as illustrated in FIG. 4. Depression of the tabs 28 also deforms the arms 62 and 64 forcing the valve stem 38 to move in the reverse direction of arrow 42. Simultaneously, valve 46 moves away from the interior wall of conical chamber 44 to allow liquid to flow to the volume 35. As pressure is released from the tabs 28, the compression of the spring 40 forces the valve stem to return to the position illustrated in FIG. 2.

The dispenser can then be placed adjacent to the portion of typing to be corrected and the ball 72 deflected by contact with the surface of the sheet of paper 86 as illustrated in FIG. 5, thus opening the dispensing aperture 71. The movement of the ball 72 into the volume 35 will positively displace a limited volume of correction liquid from the volume 35 and force liquid to flow through the dispensing aperture 71. The amount of fluid which is dispensed by the dispenser 10 is limited by the displacement action of the ball 72, thus allowing accurate volume control of the dispenser liquid.

To dispense additional liquid, the process can be repeated.

It is to be understood, of course, that the foregoing disclosure relates only to a preferred embodiment of the present invention and that numerous alterations may be utilized to practice the present invention without departing from the spirit and scope of the invention as defined in the appended claims.

I claim:

1. A dispenser for dispensing liquids such as correction liquids and the like comprising in combination:

a. a housing having first and second chambers, said housing tapering at one end and forming a dispensing aperture for dispensing liquid from said second chamber;

b. a cylindrical resilient bladder in said first chamber and defining a first liquid storage volume;

c. a valve stem extending axially through said first storage volume;

d. a conical valve seat surface formed in said housing between said first storage volume and said second chamber,

e. an intermediate valve member formed on one end of said stem, said valve member having a frustoconical contact surface,

f. means resiliently contacting said valve stem to urge said contact surface and said valve member in a di-

rection to contact said valve seat in surface contact whereby flow between said first storage volume and said second chamber is prevented;

g. an annular valve seat formed around the interior of said dispensing aperture;

h. a ball valve normally contacting said annular valve seat to prevent flow of liquid from said second chamber;

i. socket means contacting said ball valve; j. resilient means contacting said socket means to resiliently urge said socket means and said ball valve to move in a direction to seat said ball valve with said annular seat;

k. radially movable actuator tabs extending from the exterior of said housing to contact said bladder for deflecting said bladder; and

l. cam means extending between and contacting the interior of said bladder and said valve stem for simultaneously moving said valve stem in a direction to open said intermediate valve when said bladder is deflected whereby fluid is caused to flow from said first chamber to said second chamber.

* * * * *