Aug. 19, 1969 W. E. PALICH 3,461,868

MEDICAMENT INJECTION DEVICE

Filed April 1, 1966

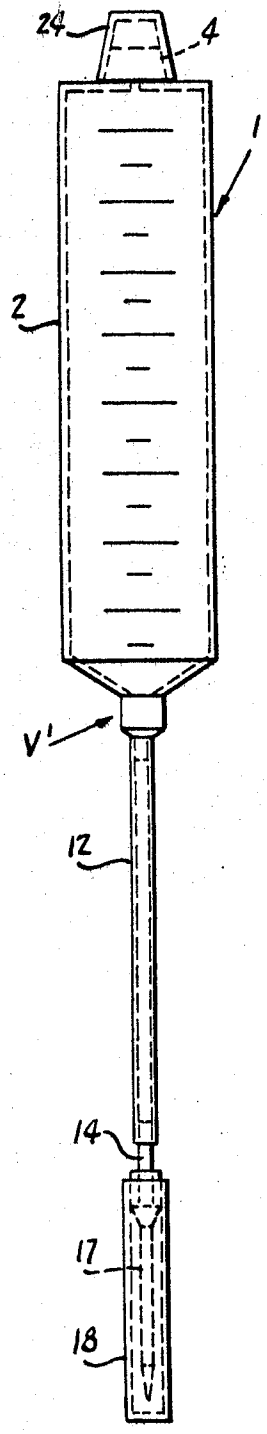


FIG. 1

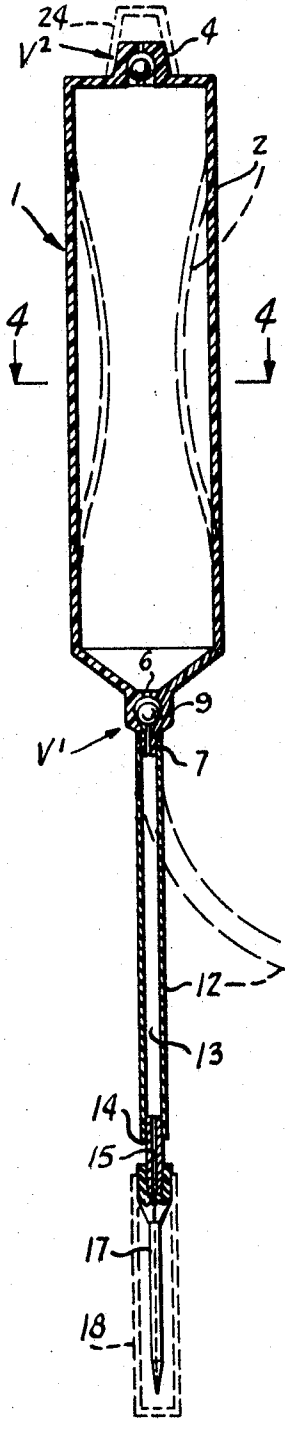


FIG. 2

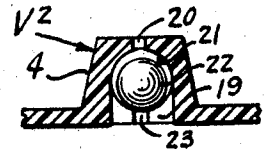


FIG. 3

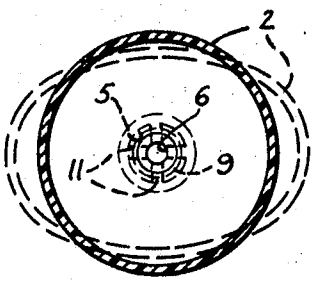


FIG. 4

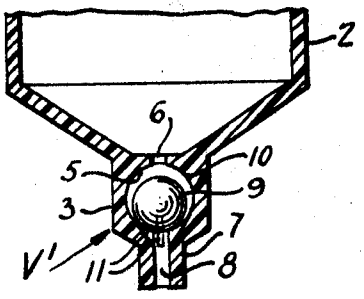


FIG. 5

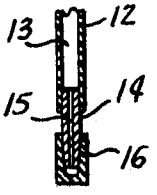


FIG. 6

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MEDICAMENT INJECTION DEVICE

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ABSTRACT OF THE DISCLOSURE

A medicament injection device comprising an elastic translucent receptacle having a check valve controlled delivery means at one end and a check valve controlled vent means at the other end. The check valve means and the receptacle are formed as a one-piece construction. A flexible and collapsible delivery tube, which functions as a pump when collapsed, is attached at one of its ends to the check valve controlled delivery means and has a tapered tip member at its other end for receiving a correspondingly tapered hypodermic needle or cap. The vent means valve body is also externally tapered and provided with a cooperating tapered cap.

The present invention relates generally to receptacles and particularly to compressible receptacles adapted to dispense fluid therefrom. The invention finds particular utility when employed as a medicament injection device of the hypodermic type and is accordingly described herein in this environment.

The need for the injection of medicament often is necessitated under emergency conditions, such as at the scene of an accident or under battle conditions of the armed forces, where (a) assembly, (b) initial filling, and (c) repeated sterilization is impractical or even impossible. There thus remains a need for a simple, efficient and relatively inexpensive disposable hypodermic unit for use under emergency conditions and the primary object hereof is to satisfy this need, and additionally provide such a device which has universal application.

More specifically, one of the primary objects of the present invention is to provide a receptacle means that is readily adapted for use as a hypodermic device and which is sterile and ready for immediate use in emergency without requiring initial assembly by the user and/or initial filling, as presently required by many existing devices of the type in question.

Further objects hereof are to provide a device conforming with the preceding primary objects which can be disposable and (a) wherein repeated accurately measured dosages may be injected therewith; (b) wherein when the device is associated with a hypodermic needle or has the same as a part thereof, the user can readily determine that the hypodermic needle is properly positioned with respect to the lumen of a blood vessel; and (c) wherein the discharge from the device is controlled and maintained at a steady and uniform rate.

A still further object of the invention is to produce a device according to the present teachings which is simple in construction and made of readily available inexpensive materials so that once emptied of its contents, it may be discarded.

The invention will be better understood, and objects other than those set forth above will become apparent, after reading the following detailed description thereof. Such description refers to the annexed drawings presenting preferred and illustrative embodiments of the invention.

In the drawings:

FIGURE 1 is a side elevation of a device constructed in accordance with the present invention;

FIGURE 2 is a longitudinal sectional view of the device of FIGURE 1 showing in dotted lines the medicament receptacle thereof partially collapsed;

FIGURE 3 is a fragmentary sectional view through the upper end of the receptacle of FIGURE 1 showing a preferred form of air inlet valve used therewith;

FIGURE 4 is a horizontal section through the receptacle, taken substantially on the line 4—4 of FIGURE 2;

FIGURE 5 is an enlarged fragmentary sectional view through the lower end of the receptacle of FIGURE 1 showing a preferred form of reverse flow preventing check valve used therewith; and

FIGURE 6 is a fragmentary sectional view of a modified form of closure used with the device of FIGURE 1.

Referring now to the drawings, it is to be initially noted that the device shown therein includes the combination of a receptacle **1**, a collapsible elastic delivery tube **12**, and a pair of valves V^1 and V^2. The receptacle **1** is formed, at least in part, of an elastic material, as explained more fully below. The valve means V^1 serves to preclude the flow of fluid from the tube **12** into receptacle **1** when the tube is collapsed and the valve means V^2 serves as a vent means for precluding the formation of a vacuum in the receptacle.

In use, the body of the receptacle **1** is filled with medicament of any desired composition. The receptacle itself can be formed from any well known plastic, such as polyethylene or polyvinyl chloride, and is preferably at least translucent and desirably transparent. Means for indicating the volumetric content therein, graduations or indicia are provided, preferably on the exterior thereof as a longitudinally extending scale. The wall **2** of receptacle **1** being elastic, permits compression thereof. An outlet valve body **3** is disposed at one end of receptacle **1** and an air inlet valve body **4** at the other end thereof. While desirably the whole body is integral in ultimate construction, the valve bodies are preferably formed separately so that the ball of valve means can be placed therein. For example, a neck portion or top closure with valve body **3** as part thereof is formed, a top portion or closure with valve body **4** therein is formed and a cylindrical tubular portion is formed. These three portions are joined together thereafter by heat sealing or the like to provide a final integral unit with the balls for each valve means being previously pressed into their associated chambers through the larger openings thereto by virtue of the flexible wall construction of the various portions.

The outlet valve has the chamber **5** thereof in communication with the interior of the final receptacle through passage **6**, the outlet valve body preferably has a tapering exterior in the form of a projecting neck or outlet nipple **7**, through which an outlet passage **8** extends. The chamber **5**, according to the illustrated embodiment, is provided with a substantially spherical interior valve seat surrounding passage **6** and also with a cooperating one-way ball valve which when seated on said seat precludes reverse flow into the receptacle. Free passage of medicament from the container around the ball valve when it is unseated by gravity or pressure is desirably insured by slots **11** which extend between passage **8** and chamber **5**.

Attached to the outlet nipple **7** is a resilient flexible plastic or latex tube **12** having a passageway therethrough. The end of the tube preferably carries a frictionally engaged tip member **14** having a tapered forward portion and cylindrical rear portion, through which extends a passagewag **15**. The exterior of the tip, by virtue of its taper, can conveniently frictionally receive a cap **16** to prevent contamination of the tip or alternatively the tip, by virtue of its taper, is also adapted to readily receive a conventional needle **17**. Should the tube be provided with a needle rather than cap **16**, then a needle cap **18** is desirably pro-

vided for the needle to protect it from damage as well as from contamination.

The valve means V^2 also takes the form of a projecting body **4** and has a chamber **19** therein and a passage **20** extending from said chamber to the exterior of the valve body in order to provide an atmospheric vent for the receptacle. In the chamber and surrounding the passage **20**, the body **4**, again according to the illustrated embodiment, is provided with a spherical valve seat **21**. Arranged for cooperation with such seat is a spherical one-way ball valve **22**. The arrangement is such that when pressure is developed in the receptacle by the application of a collapsing force thereto, ball valve **22** is seated on seat **21** thereby preventing the discharge of medicament from the receptacle through passage **20**. Means are provided to prevent the ball from dropping into the receptacle when a collapsing force which has been applied to the receptacle is removed, and such means preferably comprises fingers **23** disposed and structured to retain the ball in valve chamber **19**. Atmospheric air may enter the receptacle through passage **20** and chamber **19** to preclude the formation of a vacuum in the receptacle while the needle is still inserted into a blood vessel, the ball valve **22** resting on fingers **23** under such conditions. In order to prevent the possibility of contamination of the medicament through the vent passage while the device is out of use, a cap **24** having an outwardly flared interior is frictionally mounted on the tapered outer surface of air inlet valve **4**.

With the cap **24** tightly secured to the inlet body **4**, cap **16** or **18** may be removed and tube **12** collapsed to expel air therefrom. While the tube is still collapsed, the removed cap is again applied. This manipulation of the device results in a slight vacuum being produced in the receptacle. This slight vacuum not only aids in preventing leakage of medicament from the receptacle but also it serves to signify to the user that the contents of the receptacle are fresh and uncontaminated.

The structure shown in the drawings and described above is preferred since it lends itself to conventional molding and assembly techniques as well as to convenient volumetric measuring, both of which advantages are particularly significant. However, other valve means or contours or shapes might be used, although it would appear less advantageous.

In the operation of the embodiment of the invention illustrated in FIGURES 1 and 2, cap **18** is removed from the needle and flexible tube **12** is partially collapsed by squeezing thereon. Upon collapse of the tube **12**, spherical valve **9** is caused to seat on valve seat **5** preventing displaced air from entering the receptacle. While the tube **12** is still collapsed, needle **17** is inserted into the lumen of a blood vessel. If the needle has been properly located, upon allowing the collapsed tube to return to its original shape, blood will be drawn into the tube **12** and will constitute a visible indication to the user that the needle has been properly inserted into the lumen. During the return of the collapsed tube to its original shape substantially no medicament will be drawn into tube **12** because closure of vent **20** by cap **24** precludes the entry of air into the receptacle.

When it is desired to inject medicament into a patient and it has been determined that the needle has been properly located, cap **24** may be removed and the receptacle **2** collapsed an amount sufficient to discharge a predetermined quantity of medicament from the receptacle. During such collapsing, valve **22** will seat on seat **21** preventing escape of medicament through the vent. However, when the collapsing force on the receptacle is released, valve **22** will become unseated permitting air to enter the receptacle, enabling it to return to its original condition.

After reading the foregoing detailed description, it will be apparent that the objects set forth initially have been successfully achieved. Accordingly,

What is claimed is:

1. A medicament injection device comprising a receptacle formed, at least in part, of an elastic translucent plastic material provided with volume indicia thereon at said translucent part; said receptacle having a medicament delivering means at one end and a vent means at its opposite end; said medicament delivery means and said vent means each including a check valve body having a spherical shaped valve seat therein; said receptacle and said check valve bodies being formed as a one-piece construction; a spherical valve member disposed in each of said check valve bodies for cooperation with its associated valve seat; a flexible delivery tube attached to said medicament delivery means; a delivery tip member attached to the discharge end of said delivery tube, said delivery tip member having an exterior tapered surface adapted to receive a hypodermic needle or a closure cap having an internal bore of corresponding taper; a hypodermic needle frictionally attached to said delivery tip member; said vent means having a tapered exterior surface and a removable closure cap frictionally mounted on said tapered exterior surface.

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