Jan. 29, 1963 R. K. McCONNAUGHEY 3,075,525

VENTING CLOSURES AND SEPARATORS FOR HYPODERMIC SYRINGES

Filed July 15, 1959 2 Sheets-Sheet 1

Fig. 1.

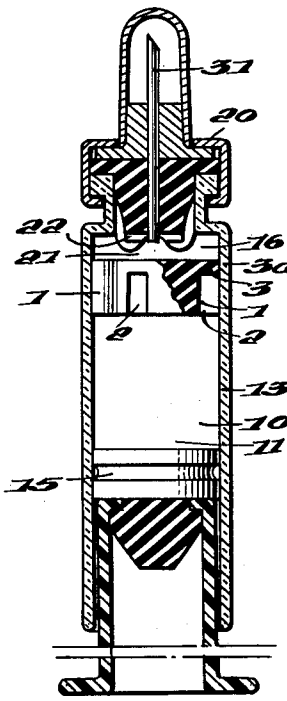


Fig. 5.

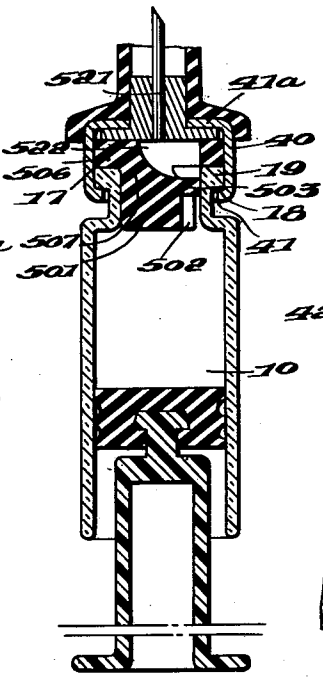


Fig. 6.

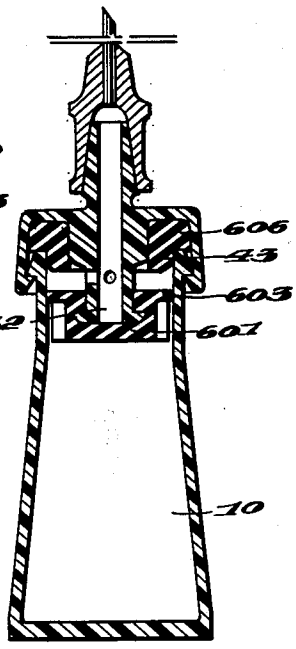


Fig. 4.

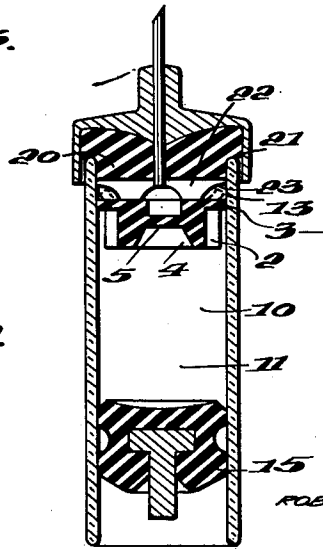


Fig. 9.

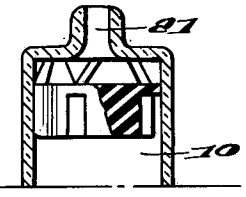


Fig. 9a.



Fig. 3.

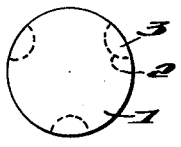
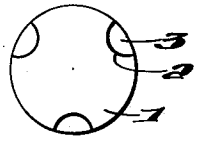


Fig. 2.



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Fig. 7.

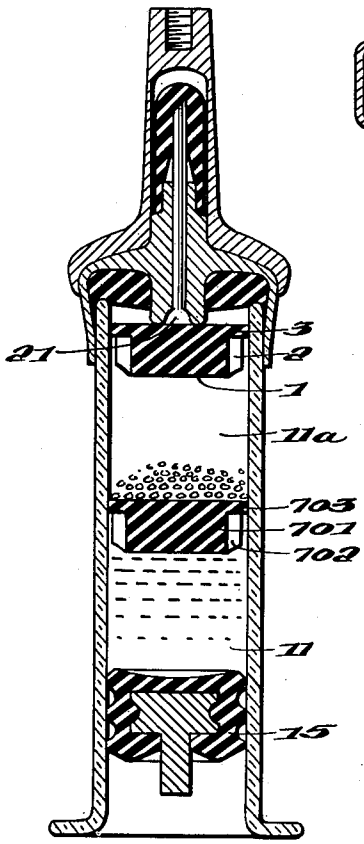


Fig. 8.

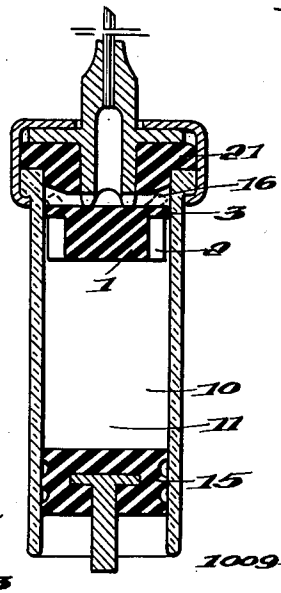


Fig. 10.

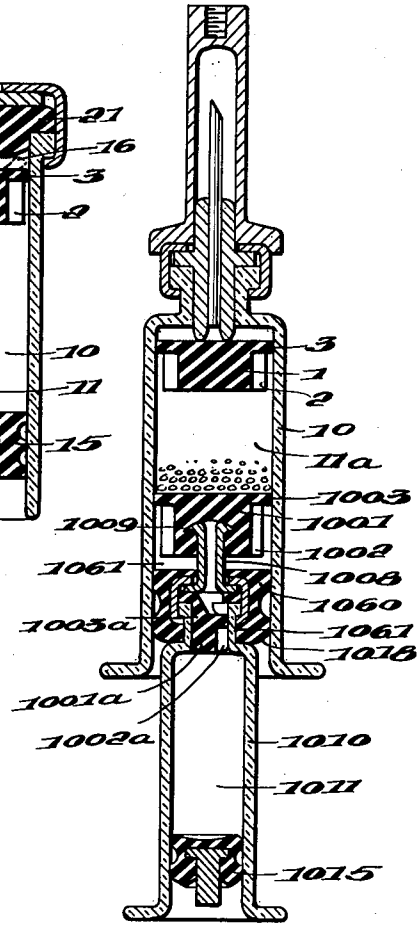
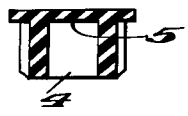


Fig. 12.



Fig. 11.



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VENTING CLOSURES AND SEPARATORS FOR HYPODERMIC SYRINGES

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Filed July 15, 1959, Ser. No. 827,278
26 Claims. (Cl. 128—218)

This application relates to ventable means of sealing, stoppering, or otherwise closing a tubular segment of containers, including, but not exclusively confined to, tubular hypodermic syringe or medicament cartridges and other medicament containers, and of separating such containers into aligned compartments, and to containers embodying such means.

In the design of disposable hypodermic syringe packages, especially syringe packages using tubular barrels, one of the problems to be met has been the devising of simple and inexpensive means whereby, although contact between the medicament and the channel of the needle or other exit passage, is prevented during the period of storage and handling, the user of the syringe can, at will, readily and with a minimum of manipulation, bring the channel of the needle into communication with the medicament chamber of the cartridge so that the contents may be ejected or material may be drawn through the needle by aspiration to check the placement of the needle point or for other purposes. It is an objective of this invention to provide simple and inexpensive means for accomplishing the results just described.

Another objective of this invention is to provide simple and inexpensive means whereby the cylindrical bore of containers, including the barrel of a hypodermic syringe or a medicament cartridge, can be divided into two or more separate, aligned compartments, each sealed off from the others, and each adapted to contain a substance which it is desired to keep separate from the substance in each other compartment, in a manner that will enable the user readily and with a minimum of manipulation to disrupt the separation, bring the separate compartments into communication with one another, transfer the contents of such compartments into others of such compartments, and eject the contents of the container.

As applied to hypodermic syringes and disposable medicament cartridges. It is an object of this invention to enable the user to accomplish these results by movements typical of the usual operation of ordinary hypodermic syringes having an open passage between the medicament chamber and the channel of the needle.

It is an additional object of this invention to provide, in a disposable syringe cartridge having, permanently affixed to the cartridge, a hypodermic needle, or means of attaching such a needle, a ventable occlusion of the passage from the medicament chamber of the cartridge to the exit channel that will keep the medicament from being ejected from the cartridge prematurely as a result of changes in pressure of the magnitude normally encountered in the course of handling and storing such cartridges, without the necessity of using an occluding plug or sheath covering the point of the needle, such as those commonly used with needle attached cartridges now available.

It is a further objective of the invntion to provide a closure or separator for use in a syringe cartridge that will achieve the objectives stated above which can be made and assembled into a container in conformity with established filling and stoppering techniques at a cost that does not substantially exceed the cost of ordinary stoppers, sealing gaskets, or other forms of closure. The forms of closure heretofore customarily used in connection with needle attached hypodermic syringes either permit the medicament packaged in the cartridge access

to the channel of the attached needle, or utilize, as a barrier between the medicament chamber and the attached needle, an imperforate membrane which must be perforated prior to use of the syringe to bring the channel of the needle into communication with the medicament chamber. The form of closure which leaves the channel of the needle open, in communication with the medicament as a result of contact between the medicament and the material of the needle assembly, and creates a risk of the medicament hardening in the needle or in the exit channel or otherwise occluding the exit channel and thereby causing difficulty in ejecting the contents. The form of closure using an imperforate membrane to preclude contact between the medicament and the needle assembly prior to use requires that the syringe include means for perforating the membrane. Such structures generally require a double pointed needle or some other puncturing device, and in most cases impose the need for preliminary manipulation, prior to use, of either a movable needle assembly or a separate stylet or other puncturing device, thus adding cost and complication to the structure and complication to the steps required to prepare the syringe for use. It is an object of this invention to avoid these disadvantages in cost, complexity of structure, and complexity of the steps required to prepare the cartridge for use.

The manner in which such objects are accomplished will become more readily apparent from the following description of the invention when read in conjunction with the accompanying drawings.

The essential element of the invention consists of a cylindrical or red-shaped elastic plug of rubber or other material having generally similar characteristics of elasticity, which may be either held in a fixed position in the bore of the container, or mounted reciprocally in the bore, such plug having a diameter sufficiently greater than the inside diameter of the cylindrical passage to be sealed that it will fit snugly within such passage and provide a tight contact between the outer surface of the plug and the inner surface of the wall of the container, such plug having one or more longitudinal grooves on its outer surface, each groove forming a passage between the plug and the wall of the container, one end of such passage being open and communicating with the medicament chamber of the container, the other end being closed by an elastic flap or dam formed integrally with the plug, and of the same material, the arc of the outer edge of said dam having the same radius as the arc of the circumference of the plug, so that the surface of the outer edge of the dam is in snug contact with the inner surface of the wall of the container, sealing off the passage formed by the groove except when, as the result of variations, induced by the user, in the relative pressures bearing against either the forward or the rearward face of the flexible dam, the greater pressure on one side or the other causes the dam to be deflected away from the wall of the container to form a lip or channel through which material on one side of such dam may pass into the space on the other side.

This basic structure is common to the several forms of the invention illustrated and described. The variations described consist primarily of variations in the manner and means of positioning and holding one or more of such grooved plugs in the bore of the container, variations in the material of which the plug is made, and variations in the number and relative size of the grooves and in the thickness of the membrane in relation to the size of the grooves and in relation to the stiffness of the material of which the plug is made.

FIGURE 1 is a side view of the basic form of the invention in position in the barrel of a hypodermic syringe cartridge with needle attached.

FIGURE 2 is a rear end view of the form shown in FIGURE 1.

FIGURE 3 is a front end view of the form shown in FIGURE 1.

FIGURE 4 is a cut away side view of a cylindrical container with the form of the invention shown in FIGURE 1 in place in the bore.

FIGURE 5 is a cut away side view of a form of the invention which has, attached to its forward end, an annular flange adapted to serve as a sealing ring or gasket to seal the forward end or rim of a container having a cylindrical portion and to hold the plug firmly in position adjacent one opening of the cylindrical portion.

FIGURE 6 shows a variant of the form shown in FIGURE 5 in a container which is a collapsible tube.

FIGURE 7 shows the basic form of the invention shown in FIGURE 1 so positioned in the bore of the container that it can serve as a separator between aligned compartments to facilitate separate storage of two substances within the container and ultimate commingling and ejection of such substances when the user actuates the plunger.

FIGURE 8 shows a variant of the form of the invention shown in FIGURE 1 in position in a disposable hypodermic syringe closed at the front end by a flange cylindrical stopper with a needle hub projecting rearward through a passage in the stopper and holding the plug out of contact with the stopper.

FIGURE 9 shows a form of the invention having, on its forward face, projections designed to serve as spacers to keep the forward face of the plug out of contact with any barrier across the bore of the barrel or any constriction in the wall of the container that otherwise would impede the forward opening of the dams under pressure.

FIGURE 10 shows the invention used in combination with, and attached, by a tubular connector, to a separage cartridge also containing medicament.

FIGURE 11 shows a form of the invention having a central cavity in the rearward face of the plug, such cavity being closed by a membrane which facilitates aspiration by pulsation of the membrane.

FIGURE 12 shows a form having a central cavity in the forward face of the plug, such cavity being closed by a membrane which facilitates aspiration by pulsation of the membrane. This figure also shows a shallow circular groove in the forward face which tends to facilitate forward deflection of the dams occluding the grooves.

The basic form of the invention is illustrated in FIGURES 1, 2, 3 and 4 which show its basic structure and functioning. In this form the invention consists of a cylindrical plug or piston **1** of rubber, or other material having similar elastic characteristics, said plug having one or more longitudinal grooves **2** running forward in the outer surface of the plug parallel to its longitudinal axis to a point adjacent the forward face of the plug, at which point the groove is occluded by a relatively thin flap or dam **3** formed of the same material as the plug and lying across the groove at right angles to its longitudinal axis, the radius of the laterial surface of said dam being the same as the radius of the lateral surface of the plug, so that when the plug is at rest in the bore of a tubular container (**10**), the outer edge **3***a* of the dam **3** lies flush against the inner wall **13** of the container **10** and seals off the passage formed by the groove **2**.

One end of the container is closed by a barrier **20**, shown in FIGURE 1 as an inturned shoulder in the barrel and in FIGURE 4 as a stopper, said barrier having a central exit passage **21** communicating with a cannula **31** mounted at the end of the container, said barrier having one or more lateral grooves in its rear face **22** in FIGURE 4 or having its rear face otherwise so formed as to keep the forward face of the plug from flush contact with the barrier so as to provide free spaces or one or more lateral passages or openings between the central exit passage **21** and laterally disposed areas of the bore and thereby permit material to flow from the groove **2** into the exit passage **21** when the plug **1** is pressed fully forward. The barrier may also be beveled or grooved **23** adjacent the wall **13** of the container **10** to provide space forward of the dam **3**, into which the dam may move when deflected forward (as shown by the broken lines in FIGURE 4) under pressure from the rear by the contents of the medicament chamber **11**, forced through the groove **2** by forward movement of the plunger piston **15**.

In the form shown in FIGURE 9, instead of the lateral grooves **22** and the beveled rim **23** of the barrier, the plug has on its forward face integrally formed projections adapted to keep the forward face of the plug out of contact with the barrier, so as to permit the dam to be deflected forward and to provide space between the barrier and the forward face of the venting plug, through which the contents of the medicament chamber **10** may flow laterally to reach the exit passage **21**. The same result is achieved in the form shown in FIGURE 8 by a rearward projecting segment of the needle hub which holds the plug away from contact with the rear face of the barrier.

The manner in which the grooved plug operates to seal off the medicament chamber **11** from communication with the exit passage **21** of the container and to permit the contents of the medicament chamber to be ejected at the will of the user through the groove (*a*) past the dam **3** and out of the container through the passages **22** and **21** is indicated by the above description.

The sensitivity of the venting means afforded by the flap or dam may be varied by varying the size of the grooves (and accordingly the area of the dam), the thickness of the dam or the stiffness of the material of which it is made, in relation to one another. By such variations the invention may be adapted, over a wide range, to resist opening until the pressure bearing on the rear face of the dam reaches approximately a predetermined level.

Normally the dam cannot be deflected rearward as readily as it can be deflected forward, inasmuch as it is not supported on its forward side by the walls of the groove as it is to the rear. This characteristic can, of course, be reversed by placing the dam at the rear end of the groove or ease of deflection in both directions can be equalized by positioning the dam across the groove at a point intermediate the ends.

However, in the form shown in FIGURES 1–4, if the resistance to movement caused by friction of the plug against the wall of the container is caused to be high by fitting the plug tightly in the bore of the container or by other means of impeding its rearward movements, or unless the dam is made very thin and flexible and highly sensitive to pressure, the plug will move rearward in the bore when the plunger piston is drawn rearward before the dams are deflected rearward and accordingly will draw into the chamber **16** between the plug **1** and the barrier **20** material at or adjacent the opening of the cannula. When the container is aspirated in this fashion the product of aspiration will be visible in the chamber **16** ahead of the plug if the walls of the container are transparent.

If the dam is relatively sensitive, or the plug is not readily movable reciprocally in the bore, the dams may be deflected rearward when the plunger piston is moved rearward before the plug moves rearward, thus permitting the product of aspiration to pass rearward, past the dam **3** and into the groove **2**, where it will be readily visible if the wall of the container is transparent.

The manner of aspiration may thus be varied by varying the flexibility of the dam in relation to the reciprocal mobility of the plug.

The forms shown in FIGURES 4, 11 and 12 provide for a third method of aspiration. In these forms, the membrane diaphragm **5** across the central passage **4** in the plug may be pulsated by slight forward and rearward movements of the plunger shaft, insufficient to vent the

dam or move the plug. Such pulsations cause the membrane to act as a diaphragm pump to draw material adjacent the opening of the passage into the chamber **16** where, if the wall of the container is transparent, it will be visible to the user.

In the form shown in FIGURE 5 the plug **501** forms the shaft of a flanged stopper and is held fixed in the bore of the container adjacent the opening at one end by a flange **506**, the rear face of which abuts the forward rim **17** of the container **10** and is held in that position by suitable attachment means. The means shown in FIGURE 5 consist of a connector **40** with two inturned flanges **41** and **41***a*, one bearing against the rearward facing shoulder **18** of a lip **19** at the end of the barrel **10**, the other bearing on the forward face of a needle hub or a ferrule adapted to attachment of a needle. Other means of holding the stopper in the barrel may be used.

The flange **506** serves as a gasket or washer to seal the junction of the connector cap **40** and the forward rim **17** of the barrel **10**. The flange is attached to the plug by one or more connecting members **507** which, in addition to connecting the flange **506** and the plug **501**, keep the flange in spaced relation remote from the dam **503** so that room is available between the forward face of the dam **503** and the rearward face of the flange **506** to permit deflection of the dam forward under pressure against its rearward face. The connecting member is so formed as to provide a passage **522** between the opening provided by the deflected dam **503** and the exit channel **521**.

FIGURE 6 shows an alternative version of the form shown in FIGURE 5 wherein the container is a collapsible tube and wherein, instead of the integral stopper with a flange **506** of FIGURE 5 a separate ring gasket or washer **606** is used, and the plug **601** is held fixed in position in the bore of the container **10** and out of range by the dam **603** by a separate connector member **42** projecting rearward from the barrier **43** and fastened to the plug. The fastening means shown in FIGURE 6 is a hollow generally mushroom-shaped rearward projecting nozzle formed as a part of the needle hub, which fits into a cavity in the forward face of the plug and has one or more holes **44** in its wall, each being adapted to permit the contents of the container to flow into the bore of the hub. Other suitable means, for example threads or annular rings on the connector member **42**, matching female threads or rings in the plug, may be used within the spirit of the invention for connecting, fastening and spacing the washer and the plug.

FIGURE 7 shows the plug **701** mounted reciprocally in the bore of the container in position to serve as a ventable separator between two chambers **11** and **11***a*. The structure of the plug **701** as shown does not differ essentially from that shown in FIGURE 1. It is, however, positioned in the bore so as to provide, forward of the plug **701**, a chamber **11***a* of adequate size to accommodate the required quantity of any substance it may be desired to store in the container separately from the substance to be stored in the rearward chamber **11** between the separator plug **701** and the plunger piston **15**. As shown in FIGURE 7 another grooved venting plug **1** may, if desired, be used as a venting closure at the forward end of the container and would function in the manner stated in the description of FIGURES 1–4 above. As an alternative, the forms of the invention shown in FIGURES 5 or 6 could also be used for this purpose; or any other suitable means of closing off the exit passage until the contents of the container are to be ejected could be used in combination with the grooved plug separator as shown in FIGURE 7.

In operation the grooved flap dam separator plug, as shown in FIGURE 7, would function as follows: It would be placed at a point in the bore that would leave the required amount of space forward and rearward of the plug to accommodate the quantities of material to be stored in each of the two compartments. The material to be stored in either of the compartments could then be introduced and that end of the container closed, then the material to be stored in the other compartment could be introduced and that end of the container closed. Preferably, for this application, but not necessarily, a dry or powdered substance would be stored in the forward chamber **11***a* and a liquid in the rearward chamber **11**. To actuate the syringe the plunger piston **15** is moved forward, forcing the material in the rear chamber **11** through the groove **702** and past the deflected dam **703** into the forward chamber **11***a* where it may be mixed with the substance contained in that chamber. After the mixing of the two substances is completed, the syringe may be aspirated, by drawing back on the plunger shaft **15**, and if this shows that the needle is suitably placed, the plunger shaft may then be moved forward to eject the mixed materials through the forward venting plug **1**, if one is used, and out through the exit passage **21**.

An alternative application of the form shown in FIGURE 7 is the storage and injection of multiple measured doses of a liquid medicament. In this application measured quantities of the medicament would be loaded into each of the chambers **11** and **11***a* and each end of the cartridge would be closed. If the exit passage **21** is not occluded, when the plunger shaft is moved forward, there being liquid in each chamber, the contents of the forward chamber **11***a* would normally be ejected through the exit passage before the contents of the rearward chamber **11** would be free to transfer past the separator plug **701** into the forward chamber. This would be true also in case a venting closure is used adjacent the exit passage, unless the valves formed by the dams on the forward venting closure **1** are made less sensitive than those of the rearward separator **701**. Thus, the measured dose stored in the forward chamber **11***a* could be administered without disturbing or diminishing the measured dose stored in the rearward chamber, forward movement of the plunger piston being discontinued as soon as the forward chamber is emptied. The dose contained in the rearward chamber **11** would remain sealed within that chamber, and could be administered later, merely by resuming the forward movement of the plunger piston.

FIGURE 10 shows a form of the invention **1001** used in combination with and attached, by a tubular connecting toggle member **1008**, to a separate cartridge **1010** in a manner that provides for a multiple seal between the medicament chamber **1011** in the separate cartridge, and the chamber **11***a* forward of the venting plug. In this form the separate cartridge **1010** may be separately filled and closed by any suitable means. It may have, at its forward end any suitable venting closure, including, if desired, a venting plug of the form shown in FIGURES 1–4 or 6, or as shown in FIGURE 10, a venting closure **1001***a* of the kind shown in FIGURE 6. Projecting forward from this cartridge is a tubular connector member **1008** flanged at its forward end to provide a mushroom-shaped head, adapted to lock within a comparably shaped cavity **1009** opening into the rearward face of the venting plug **1001**. Surrounding the tubular connector, and the forward end of the separate cartridge **1010** is an elastic cap **1060** with an internal annular bead **1062** adapted to fit into the groove **1018** formed by the neck of the cartridge **1010** and to lock the elastic cap onto the forward end of the separate cartridge when the cap is inserted into the bore of the container **10**. The cap **1060** may have annular grooves to accentuate its sealing action and facilitate its movement reciprocally in the container. Any other forms of closure of the separate cartridge which afford or permit the placement of a sealing ring adjacent the forward end of the separate cartridge to seal, as by a piston, the bore of the larger container at that point may be used.

The separate cartridge, filled and closed and with the

elastic piston cap in place is then attached to the venting plug **1001** by pressing the flanged connector into the cavity **1009** and this assembly is pressed forward into the container **10** into which will have been introduced whatever substance it may be desired to store separately in the forward chamber **11***a*. When his has been done, the substance in the medicament chamber **1011** of the separate cartridge **1010** is sealed off from the substance in the forward chamber **11***a* at three points: (*a*) by the venting closure **1001***a* at the forward end of the separate cartridge, if one is used; (*b*) by the elastic material of the venting plug **1001** surrounding the flanged tubular connector **1008** and (*c*) by the dam **1003** occluding the passage formed by the grooves **1002** in the venting plug.

When it is desired to mix and eject the contents of the device the following steps are followed: the plunger shaft **1015** in the separate cartridge is moved forward, forcing the contents of the medicament chamber **1011** through the grooves **1002***a* and past the dam **1003***a* of the venting plug in the separate cartridge, thence through the tubular connector **1008** where the pressure of the liquid, actuated by the forward movement of the plunger shaft, expands the elastic material of the venting stopper surrounding the connector, permitting the expelled medicament to flow around the tubular connector, through the cavity **1009** and into the chamber **1061** between the forward face of the elastic cap **1060**, and the venting plug **1001** and from that chamber, through the groove **1002** and past the dam **1003** into the forward chamber **11***a* where it may be mixed with the contents of that chamber and from which it may be ejected by continuing downward pressure on the plunger shaft, the separate cartridge, with its piston cap **1060** becoming in essence a plunger and plunger piston within the container. The mixture may, of course, be withdrawn or ejected from the container by other means if an exit passage or other means for ejection in the manner just described are not provided. For example, a device of this construction may be made as a storage and mixing bottle from which the ultimately mixed contents may be withdrawn by a hypodermic needle through a rubber stopper, or from which the contents may be poured when the closure is removed.

I claim:

1. A ventable closure means, in combination with a container which has a cylindrical portion communicating with an opening at one end, there being an annular barrier at said one end of said container, said barrier having a central opening said container being adapted to be filled by increasing, and emptied by decreasing its internal volume, said closure means consisting of a cylindrical plug of elastic material fitting snugly within the bore of said cylindrical portion, said plug having one or more longitudinal grooves in its outer surface, each groove forming a passage between said plug and the wall of said container, each passage having one end open and the other end closed by a flexible, elastic dam, the arc of the outer edge of said dam having approximately the same radius as the arc of the circumference of the plug, and the outer edge of said dam being in snug contact with the wall of said container, sealing off the passage formed by said groove except when, as a result of variations, induced by the user of the container in the relative pressures bearing against the opposite faces of said dam, the greater pressure bearing against one side causes said dam to be deflected away from the wall of said container to form a channel through which fluent material on one side of said dam may pass into the space on the other side, there being interposed between the rearward face of said barrier and the forward face of said plug, within said container, means of keeping said barrier and said plug in such spaced relationship as will permit each said dam to be deflected forward and any fluent substance passing from said passage through said channel formed by said deflected dam to flow laterally between said plug and said barrier and through the opening in said barrier.

2. The construction of claim 1 wherein said plug is reciprocally mounted in the bore of said container.

3. The construction of claim 2 wherein said plug has a central cylindrical cavity in its rearward face and a flexible elastic membrane adjacent its forward face, said membrane forming the base of said cavity.

4. The construction of claim 2 wherein said plug has a central cavity in its forward face and a flexible elastic membrane adjacent its rearward face, said membrane forming the base of said cavity.

5. The construction of claim 2 wherein said plug has a central cylindrical passage closed by a membrane at a point intermediate the ends of said passage.

6. The construction of claim 2 wherein the means for keeping said barrier and said plug in said spaced relationship consists of one or more projections extending forward from the forward face of said plug.

7. The construction of claim 2 wherein said means for keeping said barrier and said plug in said spaced relationship consists of one or more rearwardly extending projections of said barrier, so shaped and so disposed as to maintain said plug in spaced relation to said barrier when said plug is pressed fully forward in the bore of said container and thereby to permit each said dam to be deflected forward and to permit any fluent substance passing from said passage through the channel formed by said deflected dam to flow laterally between said plug and said barrier and through the opening in said barrier.

8. The construction of claim 7 wherein the central portion of said barrier consists of a rearward-extending projection of a generally cylindrical hub, the forward end of said hub being adapted for attachment of a hypodermic needle, and one or more of said rearward extending projections is a segment of the rearward rim of said hub.

9. The construction of claim 7 wherein the central portion of said barrier consists of a rearward extending projection of a generally cylindrical hub, to the forward end of which a hypodermic needle is attached, and one or more of said rearward extending projections is a segment of the rearward rim of said hub.

10. The construction of claim 7 wherein said barrier is a hollow elastic stopper mounted in said one end of said container, said stopper having a central opening.

11. The construction of claim 1 wherein said plug is connected by an integral connecting member with an outwardly extending annular elastic flange and is held fixed in the bore of said container in spaced relation to said flange, the rear face of said flange bearing against the forward rim of said container, said connecting member being so formed as to provide sufficient space forward of each said dam to permit said dam to be deflected forward and to permit any fluent material passing through the channel formed by said deflected dam to flow forward past said connecting member and past and inside of said flange.

12. The construction of claim 1 wherein the central portion of said barrier consists of a rearward-extending projection of a generally cylindrical hub the forward end of which is adapted for attachment of a cannula, said hub having an outwardly directed annular flange intermediate its ends, the rear face of said flange bearing against the forward face of an elastic annular gasket, said gasket forming the outer portion of said barrier, said flange holding said gasket firmly squeezed between said flange and the forward rim of said container, the portion of said hub projecting rearward beyond said gasket being attached to said plug, and holding said plug fixed in the bore of said container in such spaced relation to said gasket and said flange as to permit each said dam to be deflected forward and to permit any fluent material passing through the channel formed by said deflected dam to flow laterally between said plug and said gasket, said portion of said hub projecting rearward beyond said gasket having one or more holes in its circumference between said plug and said gasket, each said hole being

adapted to permit said fluent material to flow into and through said hub.

13. The construction of claim 1 wherein the forward end of said container is adapted for attachment of a cannula, and a piston is reciprocally mounted adjacent the rearward end of said container, and wherein said plug is reciprocally mounted in the bore of said container and so positioned between said cannula and said piston as to provide aligned compartments within said container forward and rearward of said plug, said compartments being adapted to separate storage of substances within said container.

14. A disposable hypodermic syringe cartridge consisting of a cylindrical barrel, a flanged elastic stopper mounted at the forward end of said barrel, the flange of said stopper bearing against and sealing the forward rim of said barrel, said stopper being formed to provide a passage through said stopper, a flanged hub adapted to mounting of a hypodermic needle bearing against the forward face of said elastic stopper, a hypodermic needle affixed to said hub, a sheath covering said needle and removably attached to said hub, a plunger piston mounted reciprocally adjacent the rearward end of said barrel, said plunger piston being adapted to attachment of a plunger shaft, a plunger shaft adapted to attachment to said plunger piston, a cylindrical plug mounted reciprocally in said barrel between said plunger piston and said stopper, said plug having one or more longitudinal grooves in the outer surface, each such groove forming a passage between said plug and the wall of said barrel, each such passage being closed by a flexible elastic dam, the arc of the outer edge of said dam being approximately the same as the arc of the circumference of said plug and the outer edge of said dam being in snug contact with the wall of said barrel, sealing off the said passage except when, as a result of variations, induced by the user in the relative pressures bearing against the opposite sides of said dam, the greater pressure on one side causes said dam to be deflected away from the wall of said barrel thereby forming a channel through which material on one side of said dam may pass into the space on the other side.

15. The construction of claim 1 wherein said container is a hypodermic syringe cartridge and the means of increasing or decreasing its internal volume is a piston mounted reciprocally adjacent its rearward end.

16. The construction of claim 1 wherein said container is a collapsible tube having a cylindrical segment adjacent its forward end, and said means of decreasing its internal volume consists of squeezing said tube.

17. The construction of claim 1 wherein the outer annular portion of said barrier consists of an annular elastic gasket that bears against the forward rim of said container and said means of keeping said plug and said barrier in said spaced relationship consists of one or more integral connecting members joining said elastic gasket and said plug.

18. The construction of claim 1 wherein the outer annular portion of said barrier consists of an annular elastic gasket and the central portion of said barrier consists of a segment, surrounded by said gasket, of a rearward extending projection of a hollow, generally cylindrical hub, said hub having an outwardly directed annular flange intermediate its ends, said gasket being interposed between said flange and the forward rim of said container, said means of keeping said barrier and said plug in said spaced relationship consisting of a portion of said hub projecting rearward beyond said gasket, attached to said plug and holding said plug fixed in the bore of said container, said portion of said hub projecting rearward of said gasket having one or more holes in its lateral wall between said plug and said gasket, each said hole being adapted to permit fluent material to pass through said lateral wall of said hub.

19. A disposable hypodermic syringe consisting of a cylindrical barrel, a plunger piston reciprocally mounted in said barrel adjacent the rearward end thereof, said piston being adapted to attachment of a plunger shaft, a flanged hub permanently mounted at the forward end of said barrel, said hub being adapted to attachment of a hypodermic needle, a hypodermic needle attached to said hub, a hood adapted to cover said hypodermic needle removably attached to said hub, said hood being adapted, when removed from said hub, to be attached to said piston and to function as a plunger shaft, a flanged cylindrical elastic stopper having a central passage mounted in said forward end of said barrel, the flange of said stopper being interposed between the flange of said hub and the forward rim of said barrel, a hollow, cylindrical rearward projection of said hub extending through the central passage of said stopper and affixed at its rearward end to a cylindrical elastic plug, said plug fitting snugly within said barrel, said projection of said hub holding said plug out of contact with said stopper, there being one or more holes in the wall of said rearward projection, between said plug and said stopper, said holes being adapted to permit fluent materials to pass through said holes and through said hub, said plug having one or more longitudinal grooves in its lateral surface, each such groove forming a passage between said plug and the wall of said barrel, each such passage being closed by an elastic dam, the arc of the outer edge of said dam being approximately the same as the arc of the circumference of said plug, and the outer edge of said dam fitting snugly against the wall of said plug and sealing the bore of said barrel around the circumference of said plug where said dams are located except when, as a result of variations induced by the user of the syringe, in the relative pressures bearing on opposite sides of said dams, one or more of said dams is deflected away from the wall of said barrel to form a channel through which material on one side of said dam may pass into the space on the other side.

20. A medicament container package adapted for separate storage of two or more substances in separate tubular barrels, said package consisting of a cylindrical container having an annular barrier partially closing the forward end, said barrier having a central opening, a cylindrical plug reciprocally mounted snugly within the bore of said container, said plug having one or more longitudinal grooves in its lateral surface, each said groove forming a passage between said plug and the wall of said container, said passage being closed by a flexible elastic dam positioned at right angles to the axis of said groove, the outer edge of said dam having an arc approximately equal to the arc of the circumference of said plug, the outer edge of said dam fitting snugly against the wall of said container except when it is deflected away from said wall by greater pressure bearing against one side of said dam than the pressure bearing against the other side, said plug having a centrally located mushroom-shaped cavity opening on the rearward face, a tubular connector member having a flanged forward end positioned within said mushroom-shaped cavity, the rearward end of said connector member being affixed to the forward end of a smaller tubular container, the junction of said connector member and said smaller container being sealed against the passage of liquid except through said connector member, said connector member holding said smaller container in spaced relation to said plug, an elastic annulus surrounding said connector member and fitting snugly within the bore of said container sealing the bore of said container as by a reciprocally mounted piston, the passage through said tubular connector member communicating as a cannula with the interior of said smaller container at one end and with the cavity in said plug at the other, a plunger piston reciprocally mounted within said smaller container, and adapted to attachment of a plunger shaft, and a plunger shaft adapted to attachment to said plunger piston.

21. The construction of claim 20 wherein said barrier

is formed to provide at the forward end of said container, means adapted to attachment of a cannula and to removable attachment of a protective hood covering such attachment means.

22. The construction of claim 21 wherein a cannula is attached at the forward end of said container and such protective hood covers said cannula.

23. The construction of claim 21 wherein said cannula is a hypodermic needle.

24. The construction of claim 21 wherein said container and said smaller container each has gripping means adjacent its rearward end.

25. The construction of claim 21 wherein said container and said smaller container each has an internal ventable closure means mounted adjacent its forward end.

26. A disposable hypodermic syringe cartridge consisting of a generally cylindrical barrel, a plunger piston mounted reciprocally in said barrel, said piston being adapted to attachment of a plunger shaft, a forward-projecting hypodermic needle attached to a generally cylindrical hub, mounted at the forward end of said barrel, said hub having an annular flange, a protective hood removably attached to said hub said hood being adapted to cover said hypodermic needle when so attached and, when removed from said hub, to be attached to said piston and to function as a plunger shaft, a cylindrical plug of elastic material fitting snugly within said barrel adjacent the forward end of said barrel said plug being attached by one or more integral connecting members to an annular elastic gasket interposed between the flange of said hub and the forward end of said barrel, said plug having one or more longitudinal grooves in its lateral surface, projected forward from its rearward end, each such groove forming a passage between said plug and the wall of said barrel, each such passage being open at its rearward end and closed at the forward end by a flexible elastic dam, the arc of the outer edge of each said dam having approximately the same radius as the arc of the circumference of said plug and the outer edge of each said dam being in snug contact with the wall of said barrel and being adapted to seal off the passage formed by said groove except when, as a result of variations, induced by movement of said piston, in the relative pressures bearing against the opposite faces of said dam a greater pressure bearing against one side causes said dam to be deflected away from the wall of said barrel and to form a channel through which fluent material located at one side of said dam may pass into space on the other side thereof, each of said integral connecting members being so formed as to hold said plug in such spaced relationship with said gasket as to permit said dams to be deflected forward and to permit fluent material to flow between the channel formed by said deflected dam and the channel of said hypodermic needle.

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