

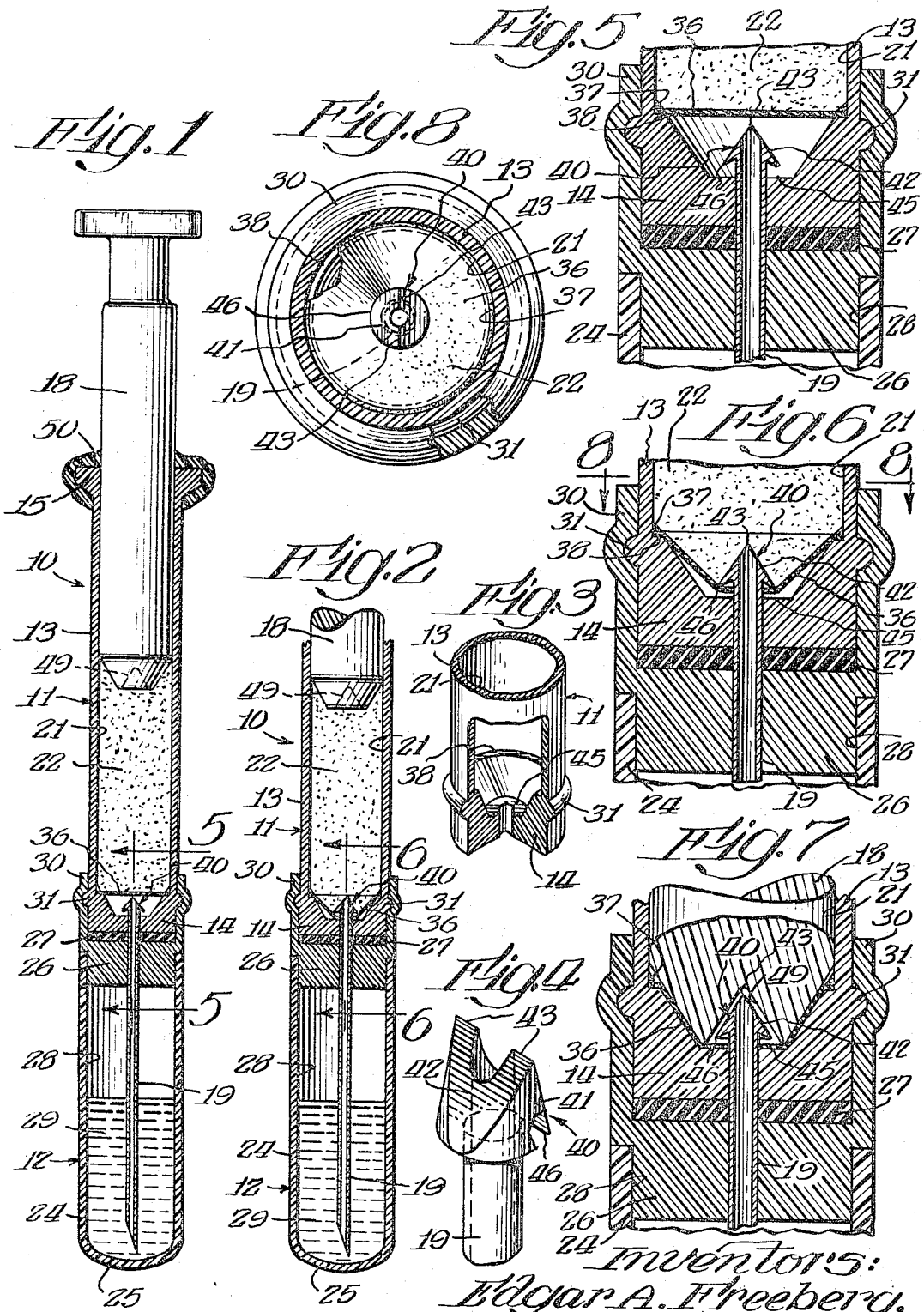
June 27, 1967

E. A. FREEBERG ET AL

3,327,710

COMBINATION HYPODERMIC SYRINGE AND MIXING CONTAINER

Filed Nov. 15, 1963



Inventors:
 Edgar A. Freeberg,
 John DeSanto & Titus Koffa
 BY MASON, KOLEHMAINEN, RATHBURN & WYSS ATTYS

1

2

3,327,710
COMBINATION HYPODERMIC SYRINGE
AND MIXING CONTAINER

John De Santo and Edgar A. Freeberg, both of 1151 N. State St., Chicago, Ill. 60610, and Titus Haffa, 864 W. North Ave., Chicago, Ill. 60622

Filed Nov. 15, 1963, Ser. No. 324,047

1 Claim. (Cl. 128—218)

The present invention relates generally to a container, and more specifically to a combination hypodermic syringe and multi-compartmented container. The new and improved material container is adapted to contain different types of material in separate compartments within the container with means whereby the materials may be intermixed together prior to use.

One typical use of the container according to the present invention would be in the pharmaceutical industry wherein it is necessary to maintain certain materials or drugs separate until such time as it is desired to use them. One such drug involves an aqueous solution of penicillin wherein the dry crystalline powder is maintained separate from the water until use. Prior to using the penicillin, it is necessary to intermix the crystalline penicillin powder and the aqueous solution. Of course, it will be appreciated that such mixing must be done in a sterile manner and that any spillage of the material is undesirable.

Accordingly, it is an object of the present invention to provide a new and improved container for containing two different materials in two separate compartments therein so that there is no mixing together of the fluids until the desired time.

A further object of the present invention is to provide a new and improved combination hypodermic syringe and multi-compartmented container of the type described wherein the separate materials may be rapidly and thoroughly mixed together at the desired time without opening the container externally, thus eliminating the possibility of spillage or contamination of the materials within the container.

Another object of the present invention is to provide a new and improved combination hypodermic syringe and multi-compartmented container of the type described which can be more economically produced in large quantities than those heretofore known, and which can readily and easily be filled with the desired materials so that the hypodermic syringe and container is expendible and may be discarded after use.

Another object of the present invention is the provision of a new and improved combination hypodermic syringe and multi-compartmented container wherein the unit is self-contained and the drugs for injection by the hypodermic syringe are contained within the compartments of the syringe and container.

Yet another object of the present invention is the provision of a new and improved combination hypodermic syringe and multi-compartmented container of the type described wherein the materials in the separate compartments are held isolated from each other without danger of leakage or contamination between the compartments until such time as it is desired to use the contents of the container.

These and other objects and advantages of the present invention are accomplished by the provision of a new and improved combination hypodermic syringe and multi-compartmented container of the type wherein a hypodermic syringe of the type including a cylinder provided with a plunger and a needle is joined to a readily detachable vessel such that the needle communicates between the cylinder and the vessel. With the plunger partly withdrawn from the cylinder, there is provided a first con-

tainer in the cylinder. The readily detachable vessel forms a second container. When it is desired to use the materials, the plunger of the hypodermic syringe can be depressed and withdrawn in order to intermix the materials in the cylinder and vessel.

In a preferred embodiment of the invention, the hypodermic needle extends through a lower closed end of the cylinder and has a sharp projection extending inwardly of the closed end. Moreover, in order to insure isolation of the materials within the container until such time as the contents are to be used in the preferred embodiment there is provided a rupturable diaphragm extending across the lower end of the cylinder, slightly above the point of projection of the needle, to separate the cylinder from the vessel. Depression of the plunger will be effective to push the diaphragm against the pointed portion of the needle and rupture the diaphragm to permit intermixing of the materials.

It will be understood that the readily removable vessel may consist of a frangible vessel of glass or similar material which may be fractured in order to provide for usage of the hypodermic needle, or, in the alternative, the readily removable vessel may comprise a vessel detachably secured to the hypodermic cylinder. Moreover, if desired, means may be provided for restraining or locking the plunger against accidental displacement and consequent premature mixing of the materials.

For a better understanding of the present invention, reference should be had to the following detailed description, when taken in conjunction with the drawing, in which:

FIG. 1 is a cross-sectional view of the combination hypodermic needle and multi-compartmented container in accordance with the present invention;

FIG. 2 is a cross-sectional view of the combination hypodermic syringe and multi-compartmented container similar to that illustrated in FIG. 1, but illustrating the diaphragm ruptured;

FIG. 3 is a fragmentary isometric view illustrating a detail of the cylinder of the hypodermic syringe;

FIG. 4 is a fragmentary isometric view of the sharp end projection of the hypodermic needle according to an embodiment of the present invention;

FIG. 5 is a fragmentary enlarged cross-sectional view illustrating one position of the hypodermic syringe with the rupturable diaphragm intact;

FIG. 6 is a fragmentary, enlarged view of the hypodermic syringe illustrating the rupturable diaphragm after it has been ruptured by the sharp end projection of the hypodermic needle;

FIG. 7 is an enlarged fragmentary cross-sectional view of the hypodermic syringe illustrated with the plunger in a fully depressed position; and

FIG. 8 is a cross-sectional view of the hypodermic syringe taken along lines 8—8 of FIG. 6.

Referring now to the drawing, and particularly to FIG. 1 thereof, there is illustrated a container 10 forming a combined hypodermic syringe and multi-compartmented container according to the present invention, and including a modified hypodermic syringe 11 and an additional vessel 12. As is well known in the medical and veterinarian arts, the syringe 11 is formed of an elongated cylinder 13 closed at one end by a suitable plug 14. The other end of the cylinder 13 is open and may be formed with an external bead 15 to facilitate gripping of the syringe.

Additionally, the syringe 11 is provided with a plunger 18 slidably received through the open end of cylinder 13. The syringe 11 contains a hypodermic needle 19 extending through the plug 14 and terminating within the cylinder 13. The hypodermic needle 19 is of the type used for

3

intramuscular or intravenous injection of medications. The cylinder 13, plunger 18, and needle 19 may be formed of any suitable material. Preferably, the syringe is of low cost construction and suitable for discarding after a single use. Typically, the cylinder 13 and plunger 18 are formed of glass or other ceramic material, and the needle 19 is formed of metal such as stainless steel. However, in order to reduce the cost of the syringe, other materials of lower cost may be used, for example, the cylinder 13 and plunger 18 may suitably be formed of a suitable plastic material. It will be appreciated that when the plunger 18 is partially withdrawn from the cylinder 13, a first compartment 21 will be formed within the cylinder 13 for receiving any suitable medical preparation such as crystalline penicillin powder 22.

In order to form a second compartment for containing other material or medical preparation, there is provided the vessel 12, here shown in the general form of an elongated tube having cylindrical side walls 24 and closed at one end by an end wall 25. The other end of the vessel 12 is closed by a plug 26. The needle 19 extends through the plug and communicates to the interior of the vessel 12. In this manner the vessel 12 forms a second compartment 28 for containing any suitable material such as medical preparations, here indicated as an aqueous solution 29. The vessel 12 including the plug 26 may be formed of any suitable material, and, specifically, the vessel 12 may be formed of glass, plastic, or other suitable materials, while the plug 26 may be formed of rubber, plastic, or other material sufficiently resilient to permit sealing between the side walls 24 of the vessel 12 and the plug 26, and additionally provide sealing between the needle 19 with the plug 26.

If desired, a gasket 27 may be provided between the lower end or plug 14 of the cylinder 13 and the inner surface of the plug 26 to more effectively provide a seal for the lower vessel 12 with the cylinder 13.

In order to connect the vessel 12 with the syringe 11, the plug 26 of the vessel 12 may be provided with an upwardly extending cup-shaped portion 30, and the lower end of the cylinder 13 is provided with an external bead 31 so that the cup-shaped portion 30 will resiliently snap over the bead 31 thereby securely joining the vessel 12 to the syringe 11. It will be appreciated that the vessel 12 may readily be removed from the syringe 11 by detaching the plug 26 from the cylinder 13. If desired, however, other means of separating the vessel 12 may be provided, for example, the vessel 12 may be of frangible material such as glass, and may readily be removed from the syringe by shattering the glass vessel.

For positively maintaining the materials 22 and 29 in the respective compartment isolated from each other without danger of breakage or contamination between the compartments until such time as it is desired to use the contents of the container, the lower end of the cylinder 13 may be hermetically closed by a rupturable diaphragm 36, the periphery of which may be secured to the inner wall of the cylinder 13. As illustrated, the periphery of the diaphragm 36 is secured by suitable cement 37 to a shoulder 38 in the cylinder 13. Depression or withdrawal of the plunger 18 in the cylinder 13 in this manner will be effective to rupture the diaphragm 36 and permit intermixing of the materials in the container.

To facilitate the rupture of the diaphragm 36, means may be provided to pierce the diaphragm upon depression or withdrawal of the plunger 18. As illustrated, the needle 19 is provided with a sharp end projection 40, as best illustrated in FIG. 4, formed of an enlarged conically shaped point 41 and having wedge-shaped inclined surfaces 42 providing a pair of sharp points 43 on the projection. The projection 40 extends into the cylinder 13 into a depression 45, FIG. 3, of inverted frusto-conical shape extending below the shoulder 38. In this manner the points 43 of the projection 40 are closely spaced

4

from the rupturable diaphragm. Depression of the plunger 18 within the cylinder 13 is effective to bring the diaphragm 36 into contact with the projection 40 of the needle and thereby assist in rupturing the diaphragm as illustrated in FIG. 6.

The enlarged conical point 41 forms a lower surface 46 of larger cross section than the external diameter of the needle 19 and is thereby effective to hold the ruptured diaphragm 36 out of the way of the materials in the cylinder, as best illustrated in FIG. 6.

In order to permit discharge of all of the contents of the syringe 11, the lower end of the plunger 18 is provided with a depression 49, best illustrated in FIG. 7, complementary to the projection 40, so that upon depression of the plunger 18 fully into the cylinder 13, the plunger will conform to the shape of the conical depression 45 in the end wall or plug 14 of the cylinder 13, and the depression 49 in the end of the plunger 18 will permit the projection 40 to be received therein, thereby providing for utilizing of the maximum amount of medication from the syringe 11, as best illustrated in FIG. 7.

To prevent accidental depression of the plunger 18, and to seal the compartment 21 between the cylinder 13 and the plunger 18, there may be provided a suitable seal or plug 50, FIG. 1. The plug 50 may be snapped over the bead 15 and may tightly engage the plunger 18 to restrain the plunger 18 against accidental displacement and to seal the compartment 21. The plug 50 may be of suitable material which would permit its removal from the bead 15 prior to use of the syringe; or it may suitably resiliently engage the plunger 18 so that the plunger 18 may be forced against the restraining effect of the plug 50.

From the above description, the operation of the combined hypodermic syringe and multi-compartment container is believed clear. However, briefly, it will be appreciated that in the illustrated embodiment, there is provided a first compartment 21 formed within the cylinder 13 of the hypodermic syringe, and a second compartment 28 is formed by a vessel 12 joined to the lower end of the cylinder 13. The needle 19 communicates between the compartments. A rupturable diaphragm 36 is provided to insure against contamination of the materials within the compartments until such time as it is desired to use the materials. When it is desired to use the materials, the plunger 18 is depressed slightly, bringing the diaphragm 36 into contact with the sharp end projection 40 of the needle 19, as illustrated in FIGS. 2 and 6, and thereby rupturing the diaphragm. The diaphragm will be held in the displaced position by the lower surface 46 of the projection 40 as illustrated in FIG. 6. The material 29 in the vessel 12 can now be withdrawn from the vessel 12 into the cylinder 21 by withdrawing the plunger 18 from the cylinder 13. Once the material 29 has been transferred to the cylinder 13, the materials 29 and 22 will intermix to provide the desired medical substance. The vessel 12 may be removed from the hypodermic syringe 11, for example by breaking the vessel 12 or by unsnapping the plug 26 from the cylinder 13. The hypodermic syringe is now charged with the desired medication, and is sterile and ready for use for injection.

While a particular embodiment of the present invention has been shown and described, it will be understood that many changes and modifications may be made, and it is, therefore, intended by the appended claim to cover all such changes and modifications as fall within the true spirit and scope of the present invention.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

70 A combination hypodermic syringe and multi-compartmented container comprising a hypodermic syringe including a cylinder closed at one end forming a first compartment provided with an inverted frusto-conical depression in said end, a plunger slidably received within said cylinder extending through the other end thereof having

5

a frusto-conical projection receivable in said depression, said projection having a recess in its end surface, and a hypodermic needle extending through said closed end having a sharp end portion defined by an enlarged wedge-shaped point extending into said compartment, said recess providing clearance for said portion; a vessel removably attached to said closed end of said cylinder to form a second compartment, the other end of said needle extending into said vessel; and a rupturable diaphragm within said cylinder closely spaced above said sharp end portion of said needle, the depression of said plunger within said cylinder being effective to bring said diaphragm into contact with said sharp end portion and to rupture said diaphragm, said wedge-shaped point having a base of larger diameter than the remainder of said needle forming a surface effective to retain a ruptured diaphragm in displaced position, said cylinder including bead means adjacent said other end thereof, and a plug locked over said bead and tightly engaging said plunger restraining said plunger against accidental displacement.

6

References Cited

UNITED STATES PATENTS

	1,179,561	4/1916	Reed -----	128—218
	1,646,256	10/1927	Patten -----	128—218
5	2,460,039	1/1949	Scherer et al. -----	128—218
	2,617,359	11/1952	Van Horn et al. -----	128—215
	2,725,057	11/1955	Lockhart -----	128—218
	2,771,880	11/1956	Gotthart -----	128—218
10	2,772,677	12/1956	Ulert et al. -----	128—215
	2,847,996	8/1958	Cohen et al. -----	128—218

FOREIGN PATENTS

	443,658	7/1912	France.
15	133,863	9/1902	Germany.
	407,559	3/1934	Great Britain.

RICHARD A. GAUDET, *Primary Examiner.*D. L. TRULUCK, *Examiner.*