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HYPODERMIC SYRINGE, MEDICAMENT CONTAINER THEREFOR,
AND METHOD FOR PREPARING SAME
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2,193,489

Fig. 1a.

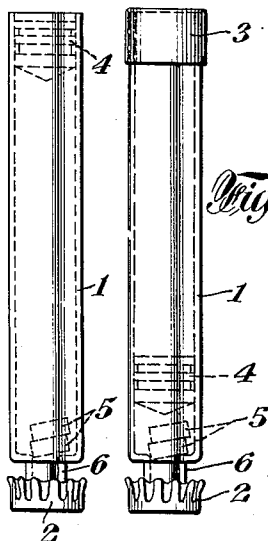


Fig. 1b.

Fig. 2.

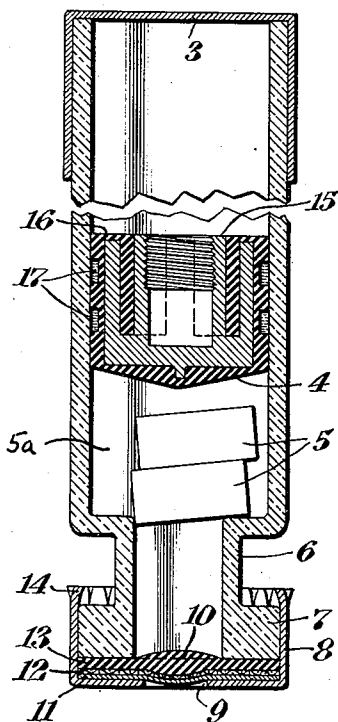


Fig. 3.

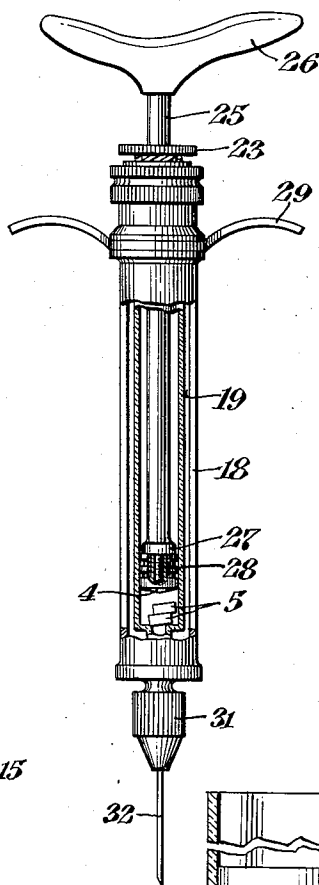


Fig. 5.

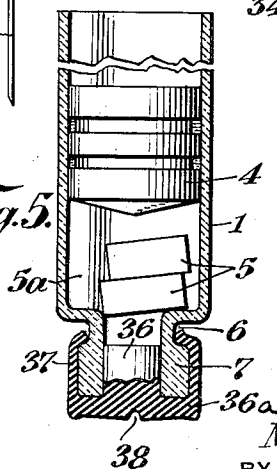
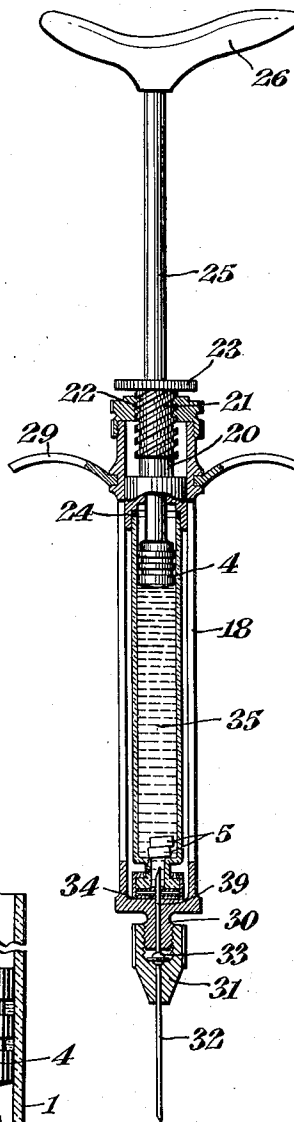


Fig. 4.



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HYPODERMIC SYRINGE, MEDICAMENT CONTAINER THEREFOR, AND METHOD FOR PREPARING SAME

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2 Claims. (Cl. 128—218.1)

This invention relates to improvements in hypodermic syringes of the cartridge type, particularly to improvements in the medicament containers or cartridges therefor, and to an improved method of preparing the same.

In Patent No. 1,909,591, granted May 16, 1933, to Mendel Nevin, there is described a hypodermic syringe and a method of utilizing the same wherein the medicament is disposed in dry undissolved form, as in the form of a powder or tablet, in a glass ampule sealed off at one end by a glass nipple, which is broken off for insertion of the cannula, the opposite end of said ampule being closed by a rubber covered plunger having an exposed threaded metal sleeve for attachment to a plunger bar forming part of the syringe.

Inasmuch, however, as certain types of hypodermic syringes are constructed for use in conjunction with medicament containing cartridges rather than ampules, the dry medicament type of container has not heretofore been available for use in conjunction with syringes of the cartridge type. It is, therefore, an object of the present invention to provide a dry medicament container of the cartridge type, one end of which is sealed by a closure member puncturable by a cannula and the opposite end of which is sealed by a plunger attachable to a plunger bar forming part of the syringe.

With either the ampule or cartridge type of dry medicament containers above described, wherein the plunger seals one end of the container, the plunger must be first depressed, and, with the cannula inserted in the liquid to be injected, the plunger is then withdrawn to suck the liquid into the ampule or cartridge and thus into contact with the medicament for dissolving the same, whereupon the hypodermic injection is effected by again depressing the plunger with the cannula subcutaneously disposed.

The above type of dry medicament containers represents a distinct advance over earlier types wherein the medicament was placed in the container in liquid form and was thus more susceptible to loss through leakage, oxidation and other deteriorating effects. The use, however, of the plunger to seal one end of the dry medicament container, permits the medicament to shake about in the container in handling owing to its small volume in relation to the container interior. Some of the medicament may thus adhere to the container wall resulting in loss of a certain amount of the dose in the preliminary depression and subsequent withdrawal of the plunger to draw in the liquid. Also, the preliminary depres-

sion of the plunger may blow a certain amount of the charge through the cannula thereby to produce some additional loss of the medicament.

According to a further object of the present invention, these possibilities may be eliminated by initially assembling the plunger in the container near the end thereof which receives the cannula, the plunger thus forming with the container a relatively small compartment within the same adjacent the cannula receiving end, in which the medicament is placed and confined. The end of the container which receives the cannula is of course sealed prior to use. Preferably also the opposite end is likewise sealed.

When a container of this type is ready for use, the seal or seals are broken, the cannula penetrating to the medicament containing compartment from one end of the cartridge with the plunger bar of the syringe entering the cartridge from the opposite end for screw-threaded attachment to the plunger. The cannula is thereupon inserted in the liquid to be injected and by the single action of withdrawing the plunger, the liquid is drawn into the container to dissolve the medicament preparatory to injection, the latter being accomplished by thereafter simply depressing the plunger.

By virtue of this preferred container assembly little or no shaking about of the medicament within the container is possible, so that none is lost through movement of the piston or by discharge through the cannula while in the dry state.

A decided advantage of this preferred assembly resides in the fact that the container may, without injury, be sterilized by the usual procedures of submerging in boiling water, autoclaving, etc., whereas this is not a safe procedure with other assemblies. The attempt to so sterilize liquid containing cartridges will vaporize the liquid and thereby blow out the plunger. Likewise, with the dry medicament type of container having the plunger located at one end, the amount of air within the container is sufficiently great that the expansion thereof resulting from an attempt at sterilization will ordinarily expel the plunger. In contrast to this, with the preferred type of container, the medicament containing chamber is relatively so small, and the plunger inserted therein initially to such a depth, that it is merely shifted along the tube slightly during sterilization, without, however, exposing the medicament. It is to be understood of course in this connection that the seal closing the plunger end of the

container, when provided, would be broken prior to sterilization.

Further and more specific objects, features and advantages will more clearly appear from the detailed description given below, taken in connection with the accompanying drawing which forms part of the specification, and which illustrates one embodiment of an apparatus suitable for carrying out the invention.

10 In the drawing:

Fig. 1a shows in side elevation a cartridge assembly in accordance with the embodiment of the invention first referred to, wherein the plunger is located at and seals one end of the container, the opposite end being sealed with a closure puncturable by a cannula;

Fig. 1b is a similar view of a container according to the preferred embodiment, wherein the plunger is disposed near the cannula receiving end of the container for confining the medicament within a relatively small chamber thereat;

Fig. 2 is an enlarged view of the Fig. 1b embodiment taken in longitudinal section;

Fig. 3 shows in side elevation the cartridge assembled in a hypodermic syringe, the cartridge being shown in longitudinal section, with the plunger bar of the syringe in its depressed position threaded to the plunger preparatory to withdrawing the same to suck the liquid to be injected into the cartridge;

Fig. 4 is a view similar to Fig. 3 showing the plunger withdrawn and the cartridge filled with the liquid to be injected, portions of the syringe being shown in longitudinal section to show the construction thereof more in detail; while

Fig. 5 shows in longitudinal section a modified cartridge construction.

Referring to the drawing, in the several figures of which like elements are similarly designated, the cartridge of Fig. 1a consists in part of a tubular member 1, preferably of glass, closed at one end by a cap 2 of special construction described hereinafter, and at its opposite end by a plunger 4. Within the container is disposed the dry, undissolved medicament which may be in the form of capsules 5 as shown, or in the form of a powder as desired.

For attaching the cap 2, the tube 1 is provided near one end with a constricted neck 6 terminating in a flange 7 as shown more in detail in Fig. 2. The cap comprises a metal cup-shaped member 8 provided in its base with an aperture 9, closed by a diaphragm 10, consisting of successive layers of metal foil 11, cloth 12, and rubber 13. The cap as thus assembled is fitted over the flanged end of tube 1 and the edges of member 8 crimped over the edge of flange 7 as shown at 14 so that the cap makes a fluid-tight engagement capable of resisting high pressure. The detailed construction of the cap and its method of attachment are fully described in Patent No. 2,020,828 granted to Samuel D. Goldberg.

The plunger 4 comprises a centrally tapped metal member 15 embedded in rubber 16, which thus forms an impervious coating resiliently engaging the interior wall of tube 1. In order to permit the plunger to move smoothly and easily in the container, the lateral surface is peripherally grooved at 17, the grooves being filled with some neutral viscous medium such as glycerine.

In assembling the cartridge of Fig. 1a, the tube 1 may be closed at its constricted end by cap 2, the medicament 5 dropped into the open end which is thereupon sealed by insertion of the plunger 4.

The preferred assembly of Fig. 1b is similar with the exception that after the medicament 5 is dropped into the open end, the plunger is inserted and depressed to about the position shown, thereby in conjunction with the tubular member 1, forming adjacent the cannula receiving end, a relatively small chamber 5a in which the medicament is contained and confined. The open end of the container is thereupon preferably provided with a closure member or cap 3 usually of some organic material such as rubber, gelatine, etc. In the event that gelatine is employed as a closure, the tubular member is capped with the gelatine while in a semi-hardened state, so that as it hardens it will shrink about the tube to seal the opening. Where the cap is of rubber it is simply pressed onto the tube either with or without an interposed sealing medium as desired.

In preparing the cartridge as aforesaid, all parts are thoroughly sterilized and the medicament introduced in aseptic condition. Likewise, the assembly is carried on under aseptic conditions throughout.

The syringe, Figs. 3 and 4, includes a tubular cartridge holder 18 adapted to contain the cylindrical cartridge or medicament container, the cap 3 of which, if employed, is stripped off prior to insertion in the syringe. In order to permit the admission of the cartridge the holder has an opening 19 which is of proper length for the purpose. For the purpose of retaining the cartridge in place, the upper end thereof is engaged by a rotatable plug 20 having an exteriorly screw-threaded portion 21 coacting with the interior screw threads 22 on the upper part of the holder. The top of plug 20 is provided with a knurled portion 23 whereby it is manually rotatable, to move the plug toward or away from the end of the cartridge. The lower end of the plug is provided with a depending flange 24 which fits around the upper end of the cartridge. Passing through the plug is the plunger bar 25 terminating at its upper end in a hand grip 26, the lower end terminating in a flanged portion 27 and a threaded portion 28 for screw threaded attachment to the tapped metal member 15 of plunger 4. The usual finger grip 29 at the upper end of the syringe is provided to be gripped when the plunger rod is forced downwardly by the pressure of the hand on the hand grip 26.

The cartridge holder 18 terminates at its lower end in a centrally drilled stud 30, onto which a centrally drilled sleeve 31 housing a cannula 32 is threaded, the cannula thus passing up through the bore in stud 30 and being provided with an enlarged portion 33 intermediate the stud and sleeve to prevent longitudinal movement thereof as thus assembled.

The cartridge as so prepared and used with the syringe, is, after removal of the cap 3 when so provided, introduced through the opening 19 of the syringe, the screw-threaded clamping plug 20 having been moved upwardly in order to admit the cartridge. The upper end of the cannula 32 thus bears against foil 11 at the aperture 9 of cap 2, so that as plug 20 is screwed down to engage the cartridge and force it toward the cannula, the sharp end thereof pierces the diaphragm 10 and thus penetrates into the medicament containing interior of the tube. At the same time, the cartridge is firmly seated and clamped in place between the plug 20 and the flat inner base 34 of the holder. Thereupon the hand grip 26 is rotated to screw-threadedly attach the plunger rod 25 to the plunger 4. The exposed end of

the cannula is then inserted into the liquid to be injected and if the cartridge is of the type shown in Fig. 1b, the plunger is simply withdrawn by means of the rod 25 and hand grip 26, to draw the liquid 35 into the interior of the cartridge and into contact with the medicament. If, on the other hand, the cartridge is of the type shown in Figure 1a, the plunger is depressed prior to immersing the cannula, after which the manipulation is the same as before. When the medicament has dissolved in the liquid the syringe is ready for the hypodermic injection which is effected by depressing the plunger while the cannula is subcutaneously disposed.

Although the preferred embodiment of the invention has been described in detail as applied to the cartridge type of container shown in Fig. 1b, it is apparent that the same principles are applicable to the ampule type of container consisting of a glass tube sealed off at one end in a nipple which is broken off in use to permit insertion of the cannula into the medicament containing interior of the ampule, in which event a syringe of the type disclosed in the aforesaid Patent No. 1,909,591 to Nevin may be employed. In this case the medicament would be deposited in the open end of the ampule, and the plunger inserted and depressed to a point near the glass nipple, thereby to retain and confine the medicament within a relatively small region adjacent the nipple.

The invention is likewise applicable to the type of container shown in Fig. 5 which is generally similar in construction to that of Figs. 1 and 2, except for the closure which receives the cannula. This closure comprises a cap 36a of rubber or the like having a plug portion 36 fitting into the container bore, and a sleeve-like portion 37 which may be flexed outwardly and over flange 7 of the container tube 1, the cap thus serving, by virtue of its flexure and pliancy, to provide a liquid-tight seal capable of withstanding a high degree of hydrostatic pressure. The lower exposed surface of the cap is preferably provided with a central indentation 38 to facilitate entry of the cannula.

A cartridge or ampule wherein the plunger is initially depressed as in Figs. 1b and 5, can, as stated, be thoroughly sterilized without injury prior to use by submerging in boiling water, autoclaving, etc., owing to the negligible expansion

of gases occurring in chamber 5a, which at most will merely shift the plunger 4 upward slightly without exposing the medicament content 5 thereof.

It will be observed from Fig. 4, that the end 39 of the cannula which pierces the closure, is shorter than that employed in prior devices of this character. This is of advantage in that it eliminates or greatly minimizes the introduction by the cannula of air bubbles within the cartridge.

By recital in the appended claims of seals for the ends of the container "adapted to be unsealed" or "adapted for unsealing" is meant seals which may be unsealed in any of the various ways for purposes of hypodermic injection, such as by puncturing with a cannula, breaking off a frangible glass nipple as in the case of an ampule, removing or stripping off a cap of rubber, gelatine, etc., etc.

What I claim is:

1. A single-chambered, elongated medicament container for use in hypodermic syringes of the cartridge or ampule type, said container having means sealing an end thereof, a plunger positioned in said container near said end and forming with said container a relatively small compartment, undissolved medicament disposed in said compartment, the remainder of said container being devoid of solid or liquid media, the means sealing said container being adapted for unsealing to permit entry of a cannula, and said plunger being provided with means for attaching a plunger bar insertable in the opposite end of said cartridge.

2. A single-chambered, elongated medicament container for use in hypodermic syringes of the cartridge or ampule type, said container having two sealed ends, a plunger positioned in said container near one end and forming with said container a relatively small compartment, undissolved medicament disposed in said compartment, the remainder of said container being devoid of solid or liquid media, the means sealing the container ends being adapted for unsealing to permit entry respectively of a cannula into the end of said container comprising said compartment and of a plunger bar into the opposite end of said container, and said plunger being provided with means for attaching said plunger bar.

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