

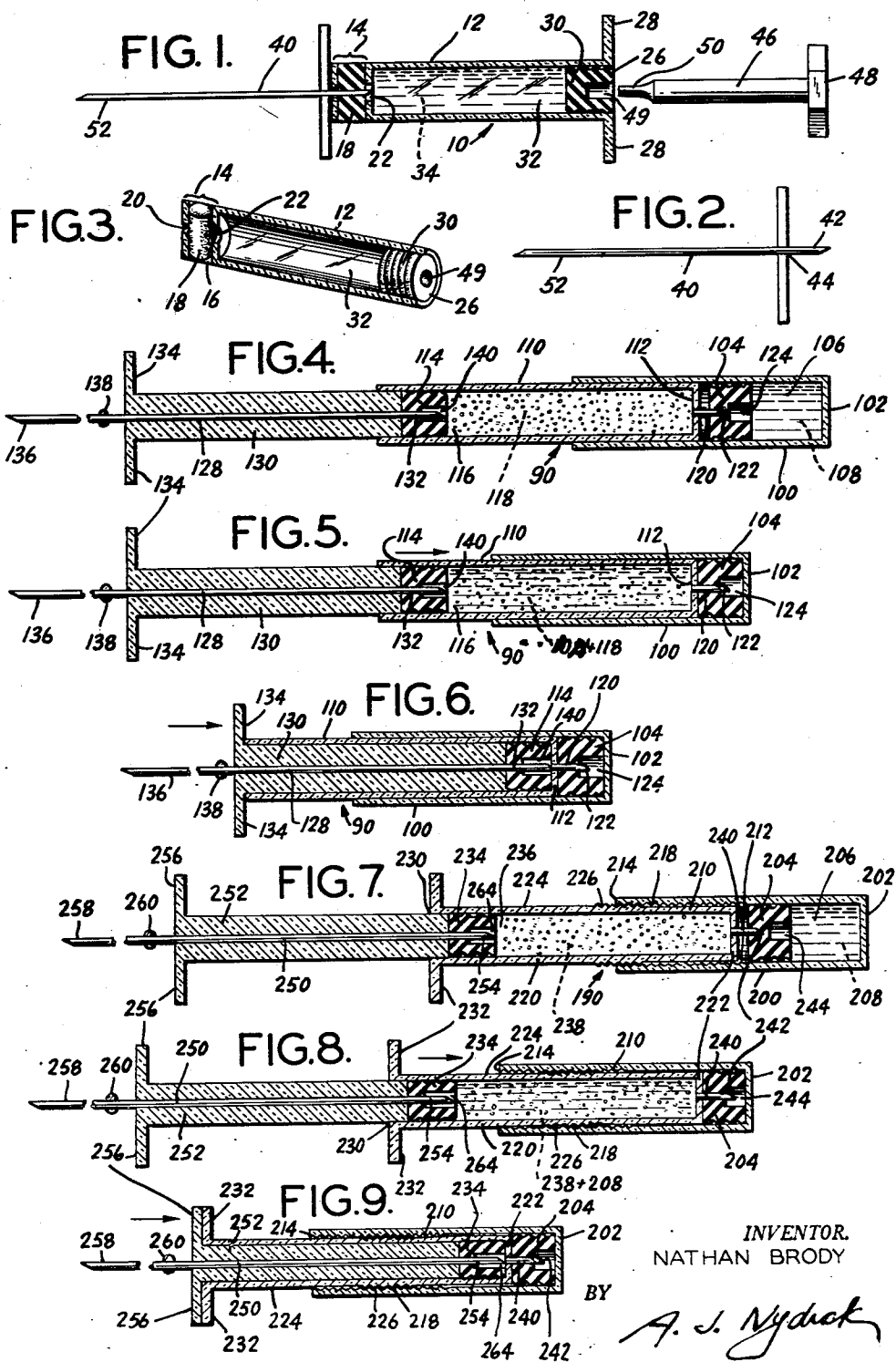
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DISPOSABLE SYRINGE

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DISPOSABLE SYRINGE

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4 Claims. (Cl. 128—220)

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This invention relates to disposable hypodermic syringes and in particular is directed to novel ampules and disposable needles which, in combination with each other, provide novel structures in this art.

Developments in therapeutic materials which are administered by hypodermic syringes have brought to the fore situations which make it inexpedient to use the conventional hypodermic syringe.

For example, the administration of a viscous drug, such as penicillin in oil, entails great labor and difficulty in maintaining the conventional hypodermic syringe in sterile working condition. For this reason it is advantageous to utilize as the body of the syringe a cartridge containing penicillin in oil which, by combination of a disposable needle therewith, entirely dispenses with the loading and cleaning of a conventional syringe.

In other instances it has been found that some drugs or therapeutic agents in solution form are unstable. Stock solutions of such drugs cannot be relied upon in carrying out hypodermic administrations and for such reason it is highly desirable to utilize a multi-chambered ampule in which each of the chambers is filled with an ingredient that can be brought together just prior to the actual injection. With a multi-chambered ampule, each chamber being filled with an ingredient that can be combined just prior to injection, the ampule, when fitted with a disposable needle, constitutes a disposable syringe. Although it has been proposed heretofore to provide ampules or cartridges, either single-chambered or multi-chambered, for use with a needle inserted therein, such prior devices have failed to afford the requisite efficiency or have been so expensive as severely to increase the cost of medication.

Accordingly, it is among the objects of this invention to provide a novel ampule which may readily function as the body of a filled syringe by the combination of such ampule with a quickly inserted and easily manipulable inexpensive disposable needle.

Another object of the invention is the provision of a novel multi-chambered ampule containing ingredients of an injectible material adapted for quick and easy preparation of the injectible material in the fresh condition just prior to the administration thereof.

A further object of the invention is the provision of such multi-chambered ampules that it may readily function as the body of a filled syringe by combination with an easily manipulable, inexpensive disposable needle.

Another object of this invention is to provide exceedingly substantial economies in the manufacture of disposable syringes.

Other objects and advantages of this invention

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will become apparent from the more detailed description thereof, taken in conjunction with the accompanying drawings wherein

Fig. 1 is a longitudinal, cross-sectional view of a single-chambered ampule as adapted for use as a disposable syringe.

Fig. 2 is a cross-sectional view of the disposable needle used in forming the disposable syringe illustrated in Fig. 1.

Fig. 3 is a perspective view of the cartridge as shown in the cross-sectional view illustrated in Fig. 1.

Fig. 4 is a longitudinal, cross-sectional view of a multi-chambered ampule provided with a disposable needle inserted therein, the rear chamber being shown filled with a fluid and the front chamber filled with a powdered or crystalline material.

Fig. 5 is a cross-sectional view of the embodiment illustrated in Fig. 4 showing the liquid contents of the rear chamber after the same have been transferred to the front chamber.

Fig. 6 is a cross-sectional view of the embodiment illustrated in Figs. 4 and 5 after the contents thereof have been completely discharged.

Fig. 7 is a longitudinal, cross-sectional view of another form of multi-chambered ampule with a disposable needle inserted therein, the rear chamber being shown filled with a fluid and the front chamber filled with a powdered or crystalline material.

Fig. 8 is a cross-sectional view of the embodiment illustrated in Fig. 7, showing the liquid contents of the rear chamber after transfer thereof to the front chamber.

Fig. 9 is a cross-sectional view of the embodiment illustrated in Fig. 8, showing the same after the contents of the cartridge have been completely discharged.

Referring more particularly to Figs. 1 to 3, the numeral 10 designates an ampule comprising a cartridge or cylinder 12 made of glass or other appropriate transparent material such as plastic or the like. The forward end of the cylinder is a solid, relatively thick base 14 formed integrally with the wall thereof. This base is provided with a bore 16, transverse to the axis of the cylinder, within which bore is inserted a plug 18 of rubber or other appropriate resilient material. The base 14 is also provided with an axially disposed bore 20, said bore, on the side extending from the inside of the cylinder to the plug, being preferably larger in diameter than the bore on the other side of the plug extending to the external side of the base. This enlargement forms an axially disposed recess 22 on the inside of the base. The rear or open end 26 of the cylinder, terminates in wings or finger holds 28 which may be formed integrally with the wall of the cylinder. Posi-

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tioned at the open end of the cylinder is a rubber plug or stopper 30, held in frictional engagement by the wall, thus forming a chamber 32. The chamber 32 may be filled with an injectible material 34. As thus filled the ampule 10 may be sterilized in accordance with appropriate procedures. The sterilized ampule may be used directly as the body of a filled syringe. To accomplish this purpose a double ended, sterilized hypodermic needle 40 may be inserted into the base of the cylinder. The extent of the penetration of the rear end 42 is controlled by a stop 44 affixed to or mounted on the needle. This stop may be of winglike shape so as to provide a finger hold. A stem or rod 46, provided with a thumb rest or support 48, may be inserted in the plug 30. If desired, the external side of the plug 30 may be provided with an axially disposed recess 49, to receive the front end 50 of the stem. The forward end 52 of the needle may then be inserted into the locus of injection. With the needle inserted in the body, and the structure being held for appropriate manipulation, the stem may then be pushed forward, the plug 30 acting as a piston, until the contents of the cartridge have been discharged into the body. It will be noted that the recess 22 in the base provides a space within which the rear open end of the needle is fully exposed and at the same time allows for the plug 30 to travel the entire length of the chamber until it reaches the base 14.

It will be observed that the device just described makes it possible to prepare for distribution a package containing the filled ampule 10, the needle 40, and the stem 46, all in sterile condition and ready for assemblage by the physician at the time he proceeds hypodermically to administer the contents to the patient.

It is also to be noted the base of the ampule is rigid, in contrast with ampules provided with movable plugs or stoppers at both ends, thereby completely eliminating any danger of a stopper being dislodged from an ampule during the course of injection of the drug. When the injectible material is viscous, such as penicillin in oil, a relatively great amount of pressure is required to effectuate the discharge of the drug from the chamber into the needle and thence to the body. Such pressures oftentimes are sufficiently great to force out one of the stoppers when using cartridges provided with stoppers at both ends. The danger of dislodging a stopper is entirely obviated by the structure just described, since the forward end is rigid and the pressure exerted against the stopper causes it to move inwardly of the cartridge.

It will also be appreciated that great economies in the cost of producing the cartridge itself and the relative inexpensiveness of the hypodermic needle used in combination therewith, as well as the cheapness of the piston stem, may be achieved by the structure just described. When the drug has been administered the relatively inexpensive needle and cheap stem may be discarded along with the exhausted ampule.

Referring now to the embodiments illustrated in Figs. 4 to 6 (a multi-chambered ampule 90, adapted to hold two different ingredients which are combined with each other just prior to administration) the numeral 100 designates a cylinder or cartridge made of glass or other appropriate, transparent material such as plastic or the like, the base or rear end 102 thereof being solid and formed integrally with the wall of the cylin-

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der. Positioned about midway the length of the cylinder 100 is a rubber plug or stopper 104, held in frictional engagement by the wall, thus forming a chamber 106. This chamber may be filled, as shown, with a liquid ingredient 108. Set slidably within the unfilled or open portion of the cylinder 100 is a second cylinder or cartridge 110 made of glass or other appropriate transparent material. The base or rear end 112 of this second cylinder is likewise solid and formed integrally with the wall thereof. Positioned near the open end of the cylinder 110 is a rubber plug or stopper 114, held in frictional engagement by the wall, thus forming a second chamber 116. This chamber may be filled, as shown, with a second ingredient such as powder or fine crystals 118. Set within the base 112 is a short length of a single-pointed hypodermic needle 120 positioned axially. The pointed end 122 of this needle partially penetrates the plug 104 so that the materials contained in each of the chambers 106 and 116 are effectively sealed therein and kept separated from each other until such time as the pointed end 122 is caused completely to penetrate the stopper 104. The stopper 104 may be provided with an axially disposed recess 124 thus diminishing the thickness of the stopper so that the needle 120 can readily rupture or penetrate this stopper. The recess also provides a space within which the pointed open end 122 of the needle is fully exposed and at the same time allows for the stopper 104 to travel the entire length of chamber 106 until it reaches the base 102.

In order to prepare the ampule 90 for the injection, the cartridge 110 is pushed rearwardly so that the needle penetrates the stopper 104 and comes to rest within the recess 124. The pushing is continued with resultant flow of the fluid 108 into the chamber 116, until all the fluid is transferred to that chamber when the stopper 104 reaches the base 102, as shown in Fig. 5. The ampule is then appropriately shaken or agitated so that the ingredients 108 and 118 are thoroughly combined with each other to form the fluid that is to be hypodermically injected. When the injectible product is ready for administration, a double-ended administration hypodermic needle 128, set axially within the stem 130, is inserted into the stopper 114. The rear end 132 of this needle extends for such length beyond the enclosing rod or stem as to penetrate the stopper 114 sufficiently to expose the needle opening fully to the chamber 116. The external diameter of the stem is of such dimension as will permit of its being snugly and slidably engaged within the cartridge 110. The stem 130 may be provided at its forward end with wings or finger holds 134. The forward end 136 of the needle may then be inserted in the locus of application, and its penetration into the body limited, if desired, by the provision of a hub 138. When the needle 128 has been inserted, the fluid contents of the ampule may be injected by holding the structure (now a syringe) between the finger holds 134 and the thumb which bears against the base 102, and pushing the base forward until the desired amount of the fluid contents have entered the body. When all of the fluid contents have been expelled from the ampule the structure appears as shown in Fig. 6. It is to be noted that the stopper 114 may be provided with an axially disposed recess 140, similar to recess 124. This recess diminishes the thickness of the stopper so that the rear end of the administration needle

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can readily penetrate the same. It also provides a space within which the pointed open rear end of the administration needle is fully exposed to the fluid contents of chamber 116, while allowing for the stopper 114 to travel the entire length of the chamber 116 until it reaches the base 112 thereof, and thus assures complete discharge of the chamber's contents.

In the embodiment illustrated in Figs. 7 to 9 (a multi-chambered ampule 190, adapted to hold two different ingredients which are combined with each other just prior to administration) the numeral 200 designates a cylinder or cartridge made of glass or other appropriate transparent material such as plastic or the like, the base or rear end 202 thereof being solid and formed integrally with the wall of the cylinder. Positioned about midway the length of the cylinder 200 is a rubber plug or stopper 204, held in frictional engagement by the wall of the cylinder, thus forming a chamber 206. This chamber may be filled, as shown, with a liquid ingredient 208. The inner wall 210 of the cartridge 200, extending from a point slightly forward of the outer surface 212, of the plug 204, is threaded up to the open end 214, of the cylinder as at 218. Set within the cartridge 200 is a second cartridge 220, made of glass or other appropriate transparent material. The base or rear end 222 of this second cylinder is likewise solid and formed integrally with the wall thereof. The external side 224 is threaded as at 226, in the region approximately midway the forward and rear ends thereof, so that when the second cylinder is inserted within the first cylinder a portion of the external threads of the second cylinder are held in engagement by the internal threads of the cylinder 200. The forward end 230 of the cylinder 200 is provided with wings or finger holds 232. Positioned near the open end of the inner cylinder 220, is a rubber plug or stopper 234, held in frictional engagement by the wall, thus forming a second chamber 236. This chamber may be filled, as shown, with a second ingredient such as powder or fine crystals 238. Set within the base 222, is a short length of a single-pointed hypodermic needle 240 positioned axially of the cylinder. The pointed end 242 of this needle partially penetrates the plug 204, so that the materials contained in each of the chambers 206 and 236 are effectively sealed therein and kept separate from each other until such time as the pointed end 242 is caused completely to penetrate the stopper 204. The stopper 204 may be provided in a manner similar to stopper 104, with an axially disposed recess 244, thus diminishing the thickness of the stopper so that the needle 240 can readily rupture or penetrate this stopper. This recess also provides a space within which the pointed end 242 of the needle is fully exposed and at the same time allows for the stopper 204 to travel the entire length of the chamber 206 until it reaches the base 202.

In order to prepare the ampule 190 for the injection, the cartridge 200 may be grasped in one hand and the wings 232 with the other, and the cartridge 220 screwed into the cartridge 200. The needle 240 thus penetrates the stopper 204, and by continuing the rotation of the two cartridges with respect to each other, the fluid 208, in chamber 206, is transferred to the chamber 236 until the plug 204, comes to rest against the base 202 as shown in Fig. 8. The ampule is then appropriately shaken or agitated so that the ingredients 208 and 238 are thoroughly com-

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bined with each other to form the fluid that is to be hypodermically injected. When the injectible product is ready for administration a double-ended administration hypodermic needle 250, set axially within the stem 252, is inserted in the stopper 234. The rear end 254 of this needle extends beyond the encasing rod or stem 252 sufficiently to expose the needle opening fully to the chamber 236. The external diameter of the stem is of such dimension as will permit of its being snugly and slidably engaged within the cartridge 220. The stem 252 may be provided at its forward end with wings or finger holds 256. The forward end 258 of the needle may then be inserted in the locus of application. Its penetration to the body may be limited if desired by the provision of hub 260. When the forward end of the needle 258 has been inserted, the fluid contents of the ampule may be injected by holding the structure (now a syringe) between the finger holds 256, and the thumb which bears against the base 202, and pushing the base forward until the desired amount of the fluid contents have entered the body. When all of the fluid contents have been expelled from the ampule the structure appears as shown in Fig. 9. It will be observed that the stopper 234 may be provided with an axially disposed recess 264 (similar to the recess 140). This recess diminishes the thickness of the stopper so that the rear end of the administration needle can readily penetrate the same. It also provides a space within which the pointed open rear end of the administration needle is fully exposed to the fluid contents of chamber 236, while allowing for the stopper 254 to travel the entire length of the chamber 236 until it reaches the base 222 thereof, and thus assures complete discharge of the chamber's contents.

It will be appreciated that the dimensions of the chambers are such that when the contents of the first chamber are transferred into the second chamber they will be retained therein. When the first chamber is filled with a liquid and the second chamber filled with powdered or crystal material, the space between the granules of the powder or the crystals will be such as to provide "room" for the fluid. In such case the volume of the first chamber may be about half of that of the second chamber. If the materials contained in the two chambers are both liquid ingredients, it will be obvious that the second chamber cannot be filled in entirety with its ingredients and that sufficient space must be left to accommodate the liquid which subsequently will be transferred thereto from the first chamber.

It will be observed that the forms of multi-chambered ampules thus described provide for the quick and easy administration, by hypodermic injection, of an injectible fluid which is prepared from two separated portions of its component ingredients just prior to administration. An ampule of such structure makes it possible to maintain the component ingredients in sterile condition until the time they are combined to produce a fresh fluid and thus obviates the dangers inherent in using ampules containing solutions or fluids which deteriorate on standing.

It also will be noted that the ampules just described make it possible to prepare for distribution a package holding a multi-chambered ampule filled with the component ingredients of an injectible fluid and an administration needle, both in sterile condition and ready for

assemblage by the physician at the time he proceeds hypodermically to administer the injectible material. Such combination provides very substantial economies in manufacture because of the simplicity of construction. Furthermore, such multi-chambered ampules provide the additional advantage inherent in the solid base thereof as contrasted with ampules provided with stoppers at the end of open cylinders. The positive movement of the movable stopper toward the solid base completely eliminates any danger of dislodgment of a stopper, either during the course of preparing the fluid for administration or during the course of the injection.

It will be appreciated that the embodiments hereinabove described are merely illustrative of the manner in which this invention may be accomplished and, accordingly, that the appended claims will be understood as defining the invention within the full spirit and scope thereof.

I claim:

1. A hypodermic syringe comprising in combination a multi-chamber cartridge comprising a first cylinder having a base integral therewith and a movable stopper set within said cylinder at a point midway the base and the open end thereof; a second cylinder set within the open portion of the first cylinder, said second cylinder having a base integral therewith, and a movable stopper positioned near the open end thereof, and a needle in the base of the second cylinder adapted to penetrate the movable stopper of the first cylinder; a double ended hypodermic needle set within a stem adapted to move inwardly of the second cylinder, the rear end of said double ended needle being adapted to penetrate the movable stopper of the second cylinder.

2. A hypodermic syringe comprising in combination a multi-chambered cartridge comprising a first cylinder having a base integral therewith and a movable stopper set within the said cylinder at a point midway the base and the open end thereof; a second cylinder set within the open portion of the first cylinder, said second cylinder having a base integral therewith, and a movable stopper near the open end thereof, said second cylinder being held in movable engagement with the first cylinder, and a needle in the base of the second cylinder that partially penetrates the stopper of the first cylinder, thereby forming a first chamber in the first cylinder and a second chamber in the second cylinder adapted for communication upon complete penetration of the aforesaid stopper of the first cyl-

inder by the needle inserted therein; a double ended hypodermic needle set within a stem adapted to move inwardly of the second cylinder, the rear end of said needle being adapted to penetrate the movable stopper of the second cylinder.

3. A multi-chambered cartridge for use in the administration of injectible materials comprising: a cylinder having a base formed integrally therewith, the inner wall of said cylinder being threaded from a point approximately midway the length thereof to the open end of the cylinder; a slidable stopper set within the cylinder at a point midway the base and the open end thereof; a second cylinder set within the open portion of the first cylinder, said second cylinder being held in engagement with the first cylinder by external threads on the wall thereof, said second cylinder having a base integral therewith; a slidable stopper set near the open end thereof; and a needle extending from the base of the second cylinder adapted to penetrate the stopper set within the first cylinder.

4. A multi-chambered cartridge for use in the administration of injectible materials comprising: a cylinder having a base formed integrally therewith, the inside of the wall of said cylinder being threaded from a point approximately midway the length thereof to the open end of the cylinder; a slidable stopper positioned within the cylinder approximately midway the base and the open end thereof; a second cylinder, having a base formed integrally therewith and set with its base within the first cylinder, said second cylinder being movably held by the engagement of the threads of the first cylinder with an externally threaded portion on the wall of the second cylinder; a slidable stopper positioned within the second cylinder; and a longitudinally bored needle, set within the base of the second cylinder, extending outwardly from the inner side of the base and of a length approximately the thickness of the stopper within the first cylinder.

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