

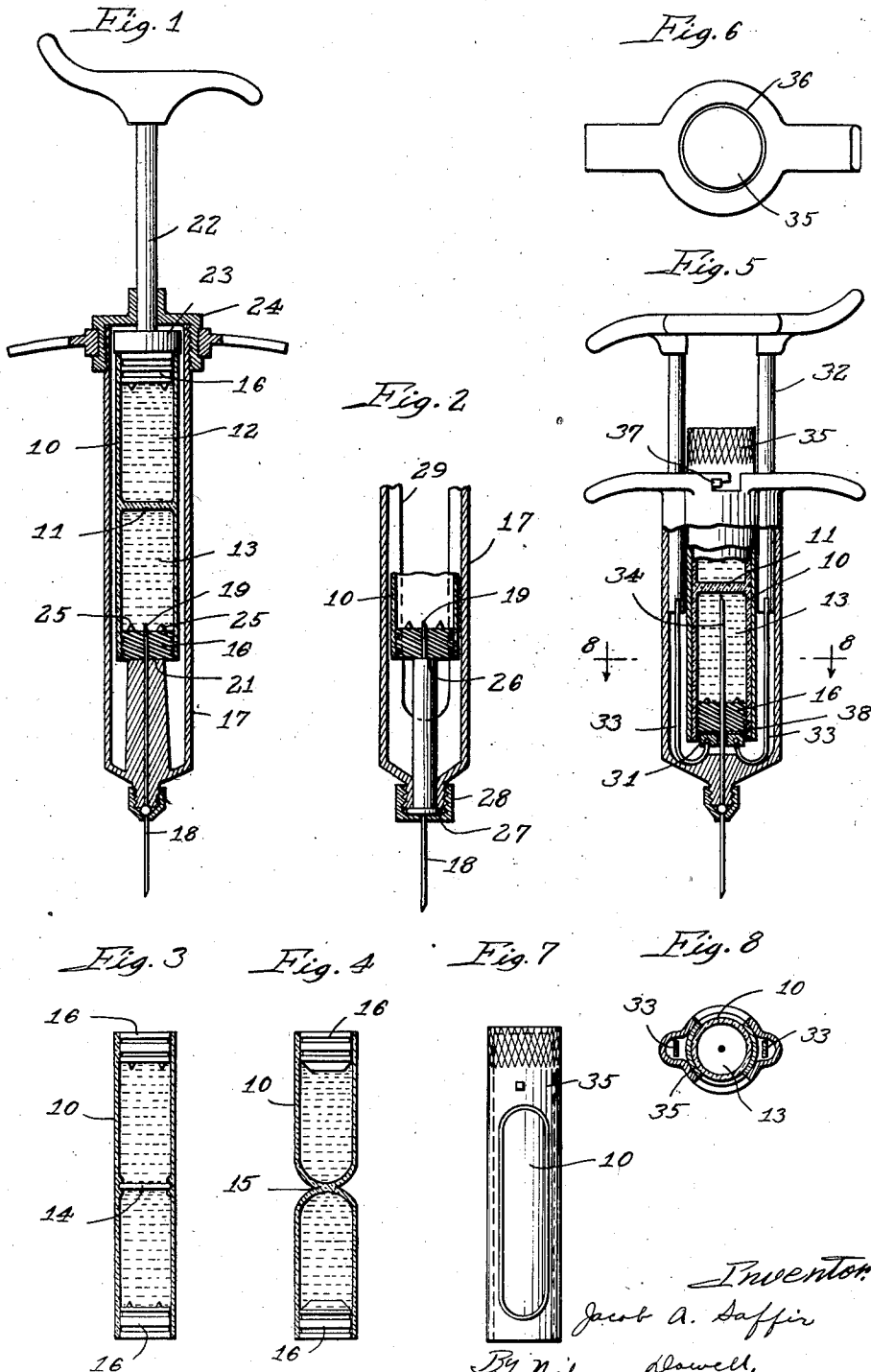
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HYPODERMIC SYRINGE AND CARTRIDGE THEREFOR

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HYPODERMIC SYRINGE AND CARTRIDGE
THEREFOR

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10 Claims. (Cl. 128—220)

My invention relates to hypodermic syringes of the kind embodying a normally sealed medicament package or cartridge.

I have aimed to provide improved means for hypodermic medication, particularly with a view to obtaining greater economies in the cost of medicament packages or cartridges and in this way to promote more extensive use of a higher type of hypodermic medication. I have also aimed to provide an improved hypodermic syringe and medicament cartridge designed for promoting sterility in hypodermic injections under the many conditions and requirements of this practice. A further object of my invention is to improve the construction of hypodermic syringes and medicament cartridges with a view to preventing or avoiding contaminations which are apt to result from the use of prior devices as for example where a second injection is made with the same cartridge and the medicament is contaminated by reason of the sucking-back action through the needle. Another objection to prior devices which is overcome by my invention is the troubles incident to rubber stoppers on the cartridge tubes being forced off or released on account of internal pressure of the fluid medicament during the ejecting operation.

Among the further objects of my invention is the provision of an improved hypodermic syringe and medicament cartridge one of the features of which is an aseptic packaging and dispensing cartridge having a plurality of separate medicament containing chambers whereby given quantities or varieties of medicaments are selectively available in a single cartridge, thus promoting certain economies and advantages in the practice of hypodermic medication referred to hereinafter.

A further object of my invention is to provide as a new article of manufacture, a plural chamber hypodermic cartridge.

A further object is to provide an improved hypodermic syringe in which the medicament is discharged from the medicament containing chamber of the cartridge by a piston closure in the lower end of the cartridge caused to eject the medicament by downward movement of plunger means on the syringe.

Other objects and attendant advantages will be appreciated by those skilled in this art as the invention becomes better understood by reference to the following description when considered in connection with the accompanying drawing, in which—

Figure 1 is a longitudinal section of a hypo-

dermic syringe and cartridge therefor, embodying my invention;

Fig. 2 is a fragmentary longitudinal section showing a modified form of medicament ejecting means;

Figs. 3 and 4 are longitudinal sections showing different forms of medicament containing cartridges in accordance with my invention;

Fig. 5 is a longitudinal section, part in elevation, of a modified form of hypodermic syringe embodying my invention;

Fig. 6 is a top view of the plunger part of the syringe shown in Fig. 5;

Fig. 7 is an elevation of the removable cartridge container used with the form shown in Fig. 5; and

Fig. 8 is a cross-section taken on the section line 8—8 of Fig. 5.

My invention contemplates the provision of a medicament containing cartridge or package having a plurality of separate medicament containing chambers each of which is preferably permanently sealed at one end and is provided with a normally closed sealing means at the opposite end such, for example, as a pierceable piston closure adapted to eject the fluid medicament by being forced lengthwise in the chamber, also the provision of a suitable hypodermic syringe or holder in which the plural chamber cartridge may be positioned with any selected chamber in fluid ejecting relation with the needle. The cartridge or ampule, as it is sometimes called, may be constructed in any of various ways and of different materials, but I prefer to employ a tubular glass body. Within this body I provide one or more partitions dividing the body into a plurality of separate chambers each adapted to contain a fluid medicament in sterile condition and isolated from the other chamber or chambers in the body. These partitions may extend lengthwise of the tubular body or transverse thereto and may be formed in various ways. The chambers in each cartridge may be of the same or different volumetric capacity and may contain the same or different medicaments according to the conditions or requirements of use, as will be explained more fully hereinafter. By making the chambers permanently sealed except at the fluid ejection end and by providing a plurality of such chambers in a single tubular body I obtain greater economy in cost of manufacture and at the same time obtain certain distinct advantages and avoid certain objections in prior art devices. For example, it is common practice to use medicament containing cartridges in

the form of glass tubes having a rubber piston type closure in one end and a rubber stopper at the opposite end. These rubber stoppers, closures or tips not infrequently are forced off or are loosened from the tube by internal pressure of the fluid during the ejecting operation, particularly when the needle encounters dense tissue or bony structure, causing loss of the fluid and embarrassment to the practitioner on account of the necessity of reloading the syringe and making a second application. Again, where a second injection is to be made with fluid from the same cartridge, or where the remaining fluid is used for an injection on another patient (a practice to be condemned), there is considerable likelihood of contamination on account of the back-suction of blood or matter from the patient's tissue with the result that if the medicament is to be sterile for each injection it is necessary to employ a fresh cartridge for every use. With my invention the multichamber cartridge can be produced approximately at the cost of a single cartridge, thus reducing the cost of cartridges per application and promoting more general use of a higher type of hypodermic medication. Cartridges made according to my invention lend themselves particularly well to embodiment in convenient sizes and capacities so that less space is occupied for packing, carrying and storage. Another advantage is that the cartridge is quickly accessible for second use because it is only necessary for the practitioner to reposition or index the cartridge in the syringe. This invention is also particularly advantageous where the treatment calls for predetermined quantities or medicaments designated by number, such as treatment No. 1 and No. 2, inasmuch as the single cartridge contains plural chambers which may be designated by the particular treatment numerals and used selectively or in succession.

The medicament containing cartridge or package shown in the drawing is in the form of a glass tube designated generally by the reference numeral 10. This tube is provided with one or more interior partitions which may be either longitudinally or transversely disposed in such manner as to form a plurality of separate and independent medicament chambers permanently sealed at one end and normally sealed at the opposite end by a closure which may also serve as a plunger for ejecting the fluid medicament. A cartridge having interior partitions longitudinally and transversely disposed in accordance with the invention herein disclosed is illustrated in my application for patent, Serial No. 753,826, filed November 20, 1934. Where the partitions are transversely disposed as shown in the drawing the cartridge is divided into two chambers. In the form shown in Figure 1, a transverse partition 11 is cast or otherwise suitably formed integral with the cylindrical body or cartridge dividing the same into chambers 12 and 13. In the form shown in Fig. 3 a partition 14 is inserted and sealed at its peripheral edge in an internal groove in the wall of the cartridge. In the form shown in Fig. 4 the tubular glass body is constricted at a medial point as at 15 by pinching, or by a rolling or spinning operation when hot, or by any other suitable method, to permanently separate the medicament chambers and seal the inner end of each such chamber from the other. This I believe to be the most commercially practicable form because of its structural merit, as well as its low cost of manufacture. Each medicament chamber is normally sealed at its open

end by suitable means such as a rubber piston type closure 16, the periphery of which may be grooved to facilitate the piston action and improve the sealing condition. In this form of my invention each rubber piston is adapted to be pierced by a needle or canula having communication with the hypodermic needle or formed integrally therewith. My invention, however, in its broader aspect is not limited to this particular means of closing the open end of each chamber or of ejecting the fluid medicament but comprehends any suitable means for closing such open ends and also any suitable means for establishing a fluid ejection passage communicating between the selected chamber and the hypodermic needle. It will be noted that the cartridge is a self-contained unit, ready for immediate use, which may be produced as a separate article of manufacture, the respective chambers of which are normally sealed and contain predetermined quantities or varieties of medicament according to the intended use.

The hypodermic syringe of which the medicament containing cartridge is a component part, may be suitably formed to hold the cartridge. The syringe includes a hypodermic needle and means preferably in the nature of a plunger for manipulation by the fingers for effecting the ejection of the medicament from the cartridge. The embodiments herein shown are for purpose of illustration, one form, Fig. 1, having a plunger for forcing the cartridge lengthwise in the barrel-like body of the holder and having means within the holder for causing the lowermost piston to be forced lengthwise in its chamber in a fluid ejecting action when the cartridge is so moved, and the other form, Fig. 5, having means for forcing the selected piston lengthwise in its chamber while the cartridge remains at rest. Referring more particularly to Fig. 1, the barrel body 17 is equipped at its lower end with a suitable removable hypodermic needle 18 which in this instance is extended inwardly to provide a canula 19 adapted for piercing the piston. Within the barrel body is provided a stationary abutment 21 located a distance from the needle end of the body corresponding substantially with the length of the longest chamber within the cartridge. In the operating condition, the cartridge rests on the abutment 21, the piston 16 bearing directly against said abutment. The barrel body is equipped at its upper end with a suitable plunger 22 the head 23 of which bears against the adjacent end wall of the glass tube and is adapted by operation of the plunger to force the cartridge lengthwise in the barrel body in a fluid ejecting stroke without disturbing the upper piston, it being observed that the fluid in the lower chamber 13 will be displaced through the hypodermic needle by reason of the piston action. In this instance, the plunger 22 is guided in a bearing cap 24 threaded onto the barrel body. Suitable finger grips are provided for manipulating the plunger. It is immaterial whether the piston is pierced by the canula 19 by the act of inserting the cartridge into position or by the action of the plunger after the syringe and cartridge have been completely assembled. I provide on the inner face of each piston one or more projecting bumper elements 25 adapted to strike against the partition or end wall 11 to prevent the point of the piercing canula from striking said wall.

In the form shown in Fig. 2 the hypodermic needle 18 and the canula 19 are formed integral with a piston abutment 26 and this part is also

shaped to provide an annular retaining collar 27. A nut element 28 clamps the retaining collar 27 against the lower threaded end of the barrel body 17, thereby securing the needle element in position. The barrel body may be cut away as at 29 in order to expose the cartridge to view.

In Figs. 5, 6, 7 and 8 I have shown a modified form in which the cartridge 10 is held in the barrel body against lengthwise movement and the piston 16 is forced upwardly into the medicament chamber 13 by means of thrust element or abutment 31 operated by a plunger device 32 through the intermediary of suitable flexible elements such as spring ribbons 33. In this form the canula 34 is extended into close proximity to the partition 11 in order that substantially all of the fluid may be ejected. The cartridge may be retained in the holder body by any suitable means which will permit of selective positioning or indexing of the cartridge to place any selected medicament chamber in ejecting relation with the hypodermic needle. In this instance I have shown the cartridge 10 inserted into a removable cartridge holder or container through the lower open end thereof. This cartridge container in turn is adapted to be inserted into the barrel body through the opening 36 in the movable plunger element and releasably retained in operative position on the barrel body by means of a bayonet joint connection 37 or any suitable means. The face of the rubber piston closure 16, shown in Fig. 5, is covered by a thin metallic sheath 38 which may be of aluminum or a suitable metallic foil pierceable by the canula and serving to add rigidity to the face of the piston. This sheath not only reinforces the face of the piston and prevents distortion of the latter by reason of the action of the piston engaging member but is also adapted for flaming before use of the cartridge. The sheath may be advantageously employed in all forms of the invention above described and is also adapted for general application to any medicament cartridge having a piston closure.

Among the advantages of my invention will be noted the novel embodiment of a medicament cartridge within a hypodermic syringe in which the medicament containing chamber is sealed at its upper end and has a pierceable plunger closure in its lower end and in which the hand operated plunger is moved in a downward stroke to effect discharge of the medicament from the chamber through said closure which in turn has, in effect, a movement opposite to that of said hand plunger resulting either from downward bodily movement of the cartridge as in the form shown in Figure 1, or upward movement of the piston closure as in the form shown in Fig. 5. Another advance in this art which promotes greater practicability of my invention is the bodily movement of the cartridge by direct manual operation of the plunger to effect discharge of the medicament through the hypodermic needle. In this connection, it will be noted that the plunger acts against the end wall of the glass tube and effects discharge of the liquid medicament by a pressure stroke directly against the butt-end of the tube without disturbing the piston closure in the adjacent end of the tube. This eliminates any tendency to dislodge or displace the closure adjacent to the plunger head and insures against undue displacement or leakage of the medicament. Still another advance is the provision of the plural chamber cartridges which are used in a new and distinctive manner and are a factor in avoiding or eliminating con-

tamination. It will be readily apparent to those skilled in this art that my invention enables greater economy in the cost of cartridges and also promotes more extensive use of a higher type of sterile hypodermic medication.

The term "medicament" is used herein and in the claims as meaning any liquid or fluid medicine to be administered by means of hypodermic injection. The claims are, therefore, to be interpreted broadly with this in mind; and while I have, for purpose of illustration, shown and described several embodiments, it should be understood that my invention may be embodied in other forms within the spirit and scope of the appended claims, in which I claim:

1. A hypodermic syringe having a hypodermic needle and a tubular cartridge provided with a plurality of medicament containing chambers sealed from one another each permanently closed at one end and having a pierceable closure at the opposite end, each of said closures being pierceable by the hypodermic needle while maintaining the seal between the chambers, whereby to permit of selective ejection of the medicament contents of the several chambers for hypodermic injection of said medicament through the needle.

2. In a hypodermic syringe comprising, in combination, a medicament cartridge having a plurality of separate medicament containing chambers each provided with a pierceable piston closure, a cartridge holder equipped with a hypodermic needle, the medicament cartridge being held in the holder in a stationary position with one of its piston closures in ejecting relation to the needle, said piston closure in such relation being in close proximity to the needle of the holder, means for piercing said plunger closure for establishing communication between said chamber and the hypodermic needle, said cartridge and piercing means adapted to be brought into operative relation with any piston closure in said ejecting position, and plunger means on the holder including a piston engaging member for forcing the piercing piston closure into its chamber for ejecting the medicament through the needle.

3. A cartridge for use in a syringe having a piercing hypodermic needle through which the contents of the cartridge can be ejected, said cartridge comprising a tubular body open at each end and having a fixed, permanent and imperforate partition intermediate its ends dividing it into separate non-communicating chambers, and a piston closure in the outer end of each chamber, each chamber being permanently separated from the other by said partition, and each chamber being imperforate between the partition and its piston closure, the contents of each chamber being dischargeable therefrom independently of the other when the cartridge is used in a syringe adapted to receive either end thereof in cooperative relation with a canula or hypodermic needle, and when the piston closure at such end is moved inwardly into its respective chamber in a piston action for forcibly expelling the contents thereof through the said canula or needle.

4. A syringe comprising, in combination, a cartridge holder, a plunger, a canula or needle projecting within the cartridge holder, a cartridge comprising a tubular body open at each end and having a fixed, permanent and imperforate partition intermediate its ends dividing the body into separate incommunicable chambers, and a piston closure in the outer end of each chamber, each chamber being separated

from the other by said partition, the piston closures being individually pierceable by said canula depending on selective positioning of the cartridge in the holder with either end of the cartridge in cooperative relation with said canula, and an abutment fixed in the cartridge holder adjacent to said canula, the cartridge adapted to be positioned within said holder intermediate said plunger and said abutment with said abutment bearing against the piston closure pierced by the canula and the plunger bearing against the opposite end of the cartridge body so that thrust of the plunger is directly against said body, the plunger being operable to move the cartridge lengthwise in the holder and force the pierced piston closure against said abutment inwardly into its chamber to forcibly expel the contents thereof through said canula, the cartridge being reversible end for end in the holder to position the other chamber in said cooperative relation between the plunger and the abutment.

5. A syringe comprising, in combination, a cartridge holder, a plunger, a canula or needle projecting within the cartridge holder, a cartridge comprising a tubular body open at each end and having a fixed, permanent and imperforate partition intermediate its ends dividing the body into separate incommunicable chambers, and a piston closure in the outer end of each chamber, each chamber being separated from the other by said partition, the piston closures being individually pierceable by said canula depending on selective positioning of the cartridge in the holder with either end of the cartridge in cooperative relation with said canula, and an abutment fixed in the cartridge holder adjacent to said canula, the cartridge adapted to be positioned within said holder intermediate said plunger and said abutment with the plunger bearing against one end of the cartridge body and the abutment bearing against the pierceable piston closure, the plunger being operable to move the pierced piston closure inwardly into its chamber to forcibly expel the contents thereof through said canula, the cartridge being reversible end for end in the holder to position the other chamber in said cooperative relation between the plunger and the abutment.

6. A syringe comprising, in combination, a cartridge holder, a plunger, a canula or needle projecting within the cartridge holder, a cartridge comprising a tubular body open at each end and having a fixed, permanent and imperforate partition intermediate its ends dividing the body into separate incommunicable chambers, and a piston closure in the outer end of each chamber, each chamber being permanently separated from the other by said partition, the piston closures being individually pierceable by said canula depending on selective positioning of the cartridge in the holder with either end of the cartridge in cooperative relation with said canula, and an abutment fixed in the cartridge holder adjacent

to said canula, the cartridge adapted to be positioned within said holder intermediate said plunger and said abutment, one of which said plunger and abutment bears against the pierced piston closure and the other against the opposite end of the cartridge body, whereby upon relative movement between the plunger and the abutment in a medicament expelling action said pierced piston closure will be forced inwardly into its chamber to forcibly expel the contents thereof through said canula, the cartridge being reversible end for end in the holder to position the other chamber in said cooperative relation between the plunger and the abutment.

7. A medicament cartridge comprising a tube open at both ends and imperforate between its two ends, said tube having an imperforate transverse partition intermediate its two ends dividing the tube into two noncommunicating chambers, and pierceable piston closures for the two ends of the tube, said tube being of uniform internal cross section from the dividing partition to each end, whereby the pistons may be forced into the tube for ejecting the contents thereof through the pierceable piston that is being forced into the tube.

8. A medicament cartridge of the type comprising a tube which is open at both ends and is provided at its two ends with sealing piston closures that are pierceable by a canula and forcible into the tube to eject the contents thereof through the canula, characterized by the fact that the tube is provided with an imperforate partition intermediate its ends dividing the same into two non-communicating sealed chambers and is imperforate between the partition and the two ends of the tube whereby the contents of a tube may be ejected only through a piston closure that is being forced into the tube.

9. A sealed hypodermic cartridge comprising a tube having a plurality of separate non-communicating medicament containing chambers each permanently closed at one end and having a pierceable piston closure at the opposite end pierceable by a hypodermic needle for discharging the contents of the associated chamber through the needle.

10. A medicine cartridge for use in a hypodermic syringe, comprising a main tubular body, a fixed transverse partition intermediate the ends of the body and dividing the same into two sealed incommunicable chambers, pierceable piston closures at the opposite ends of the tubular body, said piston closures being pierceable by a hypodermic needle and movable into the body for ejecting the contents of the associated chamber through the needle, said tube being imperforate between its two ends, and said partition being constructed and arranged to retain its position in the body during movement of either piston closure, to maintain the two chambers separate.

JACOB A. SAFFIR.

CERTIFICATE OF CORRECTION.

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Patent No. 2,153,594.

April 11, 1939.

JACOB A. SAFFIR.

It is hereby certified that the name of the assignee in the above numbered patent was erroneously described and specified as "Multiple Corporation" whereas said name should have been described and specified as Multipule Corporation, of Chicago, Illinois, a corporation of Illinois, as shown by the record of assignments in this office; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 6th day of June, A. D. 1939.

Henry Van Arsdale

(Seal)

Acting Commissioner of Patents.