

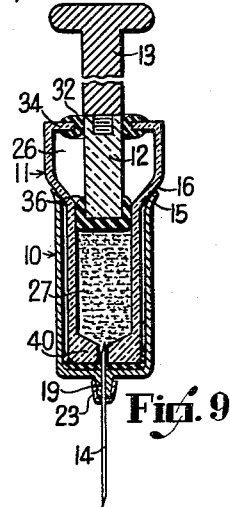
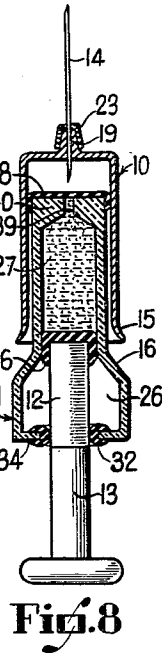
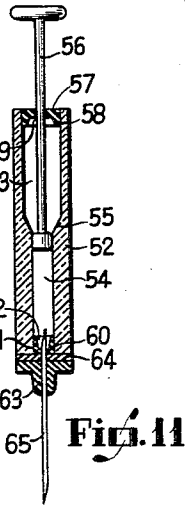
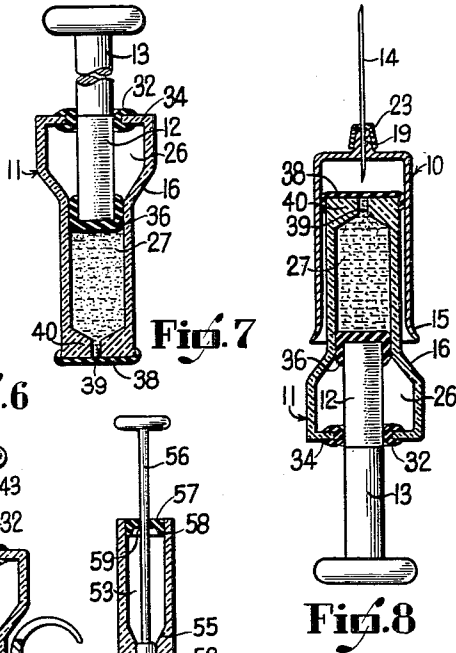
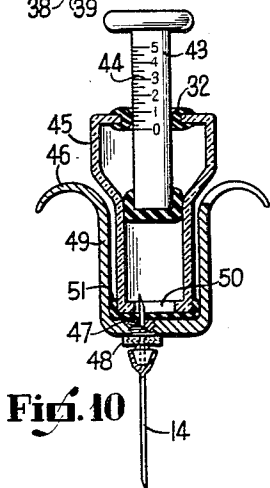
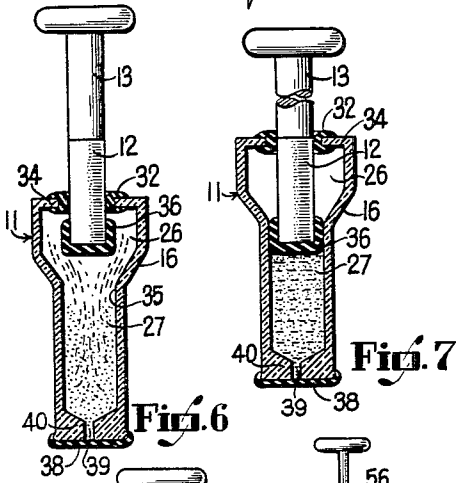
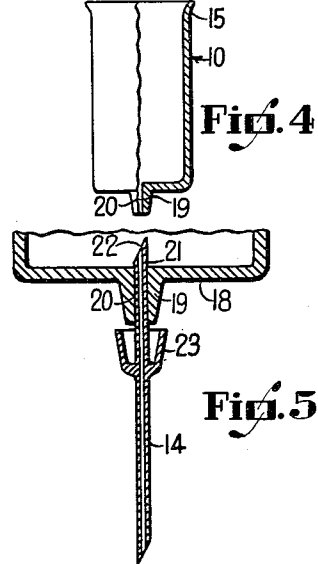
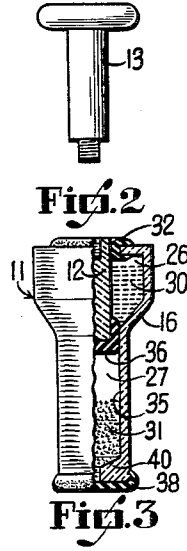
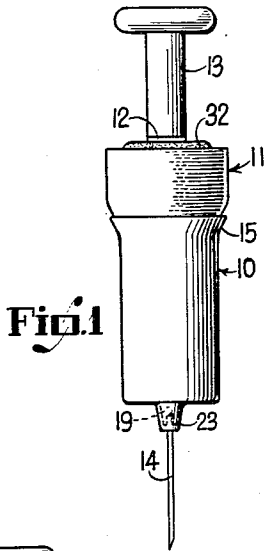
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2,761,447

HYPODERMIC SYRINGE

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2,761,447

HYPODERMIC SYRINGE

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8 Claims. (Cl. 128—218)

This invention relates generally to hypodermic syringes and more particularly to a syringe adapted to mix parenteral medicaments which are relatively unstable in solution.

Ever since the miracle antibiotic penicillin gained prominence as a common drug for the medical profession, its producers have been confronted with several problems. It is of primary importance, of course, to produce a therapeutically superior product but, in addition, it is also important to make administration of the medicament as painless and convenient as possible for the physician and his patient. An answer to the first problem lies in the recent development of a combination penicillin product containing both procaine penicillin and sodium soluble crystalline penicillin together in a ratio of three to one. As for the second problem, certain developments have been made in disposable cartridges or ampules for the hypodermic syringe. With such disposable cartridges it has always been necessary to use medicaments that are already mixed and hence the use of such cartridges has been limited to drugs that are stable in solution. Unfortunately it has never been possible to combine the therapeutically superior penicillin products, which are unstable in solution, with the convenient disposable cartridge type syringe.

The present invention meets the existing need with novel apparatus for combining the convenience of disposable cartridges with the therapeutic advantages of certain types of penicillin or any other parenteral medicament which cannot be stored at length with diluent added.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein preferred forms of embodiments of the invention are clearly shown.

In the drawings:

Fig. 1 is a side elevational view of a syringe formed in accordance with the present invention;

Fig. 2 is a side elevational view of the removable handle for the disposable body member of the present invention;

Fig. 3 is a side view, partially in elevation and partially in section, of a disposable body member formed in accordance with the present invention;

Fig. 4 is a side view, partially in elevation and partially in section, of a casing member utilized in the present syringe structure;

Fig. 5 is a fractional sectional view of a hypodermic needle utilized in a syringe of the present invention;

Fig. 6 is another sectional view of the disposable body member of Fig. 3 showing a plunger rod positioned for mixing the contents of the body member;

Fig. 7 is a sectional view showing the disposable body member of Fig. 3 with the plunger in the sealing position;

Fig. 8 is a side sectional view showing the disposable body member of Fig. 3 partially inserted into the casing member of Fig. 4;

Fig. 9 is a side sectional view of the syringe of the

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present invention with the contents mixed and ready for injection;

Fig. 10 shows a second embodiment of the present invention; and

Fig. 11 shows a third embodiment of the present invention.

Referring to the drawing, and more particularly to Fig. 1, a tubular casing member is indicated generally at 10. A body member indicated generally at 11 is shown carried in the tubular casing member 10. A hypodermic needle 14 is carried by the lower end of the tubular casing member 10.

I prefer to make the body member 11 in a disposable embodiment which may be discarded after use. It should be noted, however, that the invention herein set forth is not limited to such preferred embodiment. A plunger rod 12 is slidably carried in the body member 11 and a handle 13 is shown fastened to the plunger rod. The handle 13 may be of the removable type, as best seen in Fig. 2, or it may be integrally formed with the plunger rod 12 as is shown in Figs. 10 and 11. The removable handle section is preferable where a compact disposable body member such as is shown in Fig. 3, is desired.

The tubular casing member 10 is provided with an open top portion 15 which may be flared outwardly as shown in Fig. 4. Such flared portion serves to engage the shoulder 16 of the body member 11 when it is positioned in the casing member. The flared portion 15 and the shoulder 16 are shown in abutting relationship in Fig. 9. These abutting portions serve to add rigidity to my syringe when the body member has been placed in the casing member and when the plunger rod and handle are being pressed inwardly during an injection.

The needle 14 is best seen in Fig. 5 where it is shown partially inserted into the bottom 18 of the tubular casing member 10. The bottom of the casing member may be provided with a boss 19 through which the hole 20 is formed for receiving the upper needle portion 21. A point such as is shown at 22 may be formed on the upper needle portion to provide means for piercing the body member. A cup 23 is mounted on the needle 14 to mate with the boss 19 which is formed on the lower end of the casing member. The cup 23 and the boss 19 can be tapered at their mating surfaces as shown in the drawing or they can be fastened together by threads in the conventional manner. In either event, however, it is preferable to have the needle 14 easily removable from the casing member 10 so that it can be readily replaced after use.

Fig. 3 shows a disposable body member formed in accordance with the present invention. An upper chamber 26 and a lower chamber 27, which is of lesser diameter than the upper chamber, are shown formed in the body member. These two chambers are separated by the plunger rod 12 which is normally inserted into the upper portion of the lower chamber 27 as shown in Fig. 3. Prior to use, the disposable body members are stored with their plunger rods 12 in the sealing position of Fig. 3. At the same time, in the preferred form, the upper chamber 26 contains only the diluent 30 and the lower chamber contains only the medicament 31. As the plunger rod 12 extends through the upper chamber 26 and outside the syringe, a sealing ring 32 of resilient material such as rubber is provided to slideably mount the plunger rod in the body member and to seal the junction of the plunger rod 12 with the upper end wall 34 of the body member. To seal the junction of the plunger 12 with the inner wall 35 of the lower chamber 27, a tip 36 may be attached to the lower end of plunger rod 12. The tip 36 is formed of rubber or similar resilient material. It should be noted that by providing a close fit between

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the plunger rod 12 and the inner wall 35 of the lower chamber, the tip 36 can be eliminated without departing from the spirit of my invention. In the preferred form, however, I provide the plunger tip 36 for reasons of economy in fabricating the disposable body members.

A pierceable seal 38 is provided on the lower end of the disposable body member as is best seen in Fig. 3. The hole 39 is formed in the lower end 40 of the disposable body member to connect the lower chamber 27 with the inner surface of the membrane 38 and to receive the upper portion 21 of the needle 14 after the needle has pierced the membrane 38.

The disposable body member 11 and the plunger rod 12 are preferably made of glass, but either or both of such members can be made of other suitable materials such as plastics which are not reactive with the particular medications to be administered. The handle 13, the casing member 10 and the needle 14 can suitably be made of metal such as is commonly used for instruments of this type.

A second separate embodiment of the present invention is shown in Fig. 10 of the drawing. This embodiment is adapted to apply successive administrations to different patients from a single disposable body member. Such is possible with the body member 45 of Fig. 10 which is adapted to be resealed after a portion of the contents have been ejected and to be removed and reinserted into the casing member 49 so that the needle 14 can be replaced with a new sterilized needle for the next succeeding patient. To adapt the body member 45 for multiple injections, the pierceable seal 51 formed of a self-sealing material and the hole 50 in the body member is made larger than the corresponding hole 39 of the previously described embodiment. Hence to repierce the seal 51, it is only necessary to withdraw the body member 45 from the casing member 49, change needles, and reinsert the body member into the casing member so that the new needle pierces the seal 51. It should be noted that the needle 14 is mounted to the casing member 47 in a position eccentric with the seal 51. This is done so that the successive needles can be directed to pierce the seal 51 in different places. If the needles were centrally mounted they would repeatedly pierce the seal 51 in the same place, namely the center. In this second embodiment it is preferable to provide the plunger rod 43 with graduations 44 to indicate the amount of medicament that is used during each succeeding injection. A needle mount 48 is shown threaded into the hole 47 in the casing member 49. In addition, Fig. 10 shows finger grips 46 which may be formed on the casing member 49.

A third embodiment of the present invention is shown in Fig. 11. This embodiment provides a simplified syringe in which the outer and inner walls of the body member 52 are formed as cylindrical surfaces. A tapered portion 55 is formed in the inner wall between the upper chamber 53 and the lower chamber 54. Such tapered portion serves to guide the plunger rod 56 into the lower chamber 54. In the embodiment of Fig. 11, the casing members 10 and 49 of the former embodiments have been eliminated and in their place a needle mount 63 is provided for adapting a hollow needle 65 to the lower portion of the body member 52. To seal the junction between the needle mount and the body member, a gasket 64 is provided.

To seal the opening in the top of the body member 52, a stopper 57 is provided having an outer surface 58 adapted to fit snugly into the cylindrical wall of the upper chamber 53. This stopper is also provided with a centrally located hole through which the plunger rod 56 extends to the exterior of the syringe. Such hole is provided with a wall surface 59 to sealingly engage the outer surface of the plunger rod 56. It should be noted that the stopper 57 is preferably formed with a relatively thin center portion so that the wall surface 59 presents a minimum of resistance to movement of the plunger rod 56. At the

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same time the peripheral portion of the stopper is preferably made thick relative to the center portion so that the outer stopper surface 58 is of sufficiently large area to be frictionally retained in position by the inner surface of the upper chamber 53 when the plunger rod is manipulated.

A similar type of stopper construction is utilized in the stopper 60 provided to seal the bottom opening in body member 52. Here the outer wall 61 on the stopper is made of sufficient area to be frictionally retained by the cylindrical inner wall of the lower chamber 54 when pressure is applied to the stopper in piercing it with the needle. The stopper 60 is preferably formed with a curved inner wall 62 to provide a relatively thin central portion which may be readily pierced by the needle.

In operation, a disposable body member is used which will appear as shown in Fig. 3 with the contents of the lower chamber separated from the contents of the upper chamber by the plunger rod which is, at the outset, positioned to extend into the lower chamber to form a seal. The plunger rod is then lifted upwardly to the position shown in Fig. 6, thereby allowing the contents of the upper chamber to flow into the lower chamber. The body member is then shaken to mix the contents. Holding the body member in an upright position, the plunger rod is pushed downwardly to the position shown in Fig. 7. A needle is next attached to the casing member and, with the body member held in an inverted position, such casing member is pushed down over the inverted body member in the manner shown in Fig. 8. As the body member is inserted into the casing member, the needle is caused to pierce the seal and enter the lower chamber. The plunger rod is now adjusted to remove any air that may be present in the lower chamber. The syringe will now appear as shown in Fig. 9 and is ready for administering the medication in the usual manner.

While the forms of embodiments of the present invention as herein disclosed constitute preferred forms, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

I claim:

1. A hypodermic syringe comprising two chambers with the chambers being of different diameters, with the chamber of greater diameter having a cylindrical inner surface extending to an exit port, and a plunger rod slidably engageable with the chamber of lesser diameter and extending through the opening in the top of the chamber of greater diameter outside the syringe, and a stopper frictionally retained by the cylindrical inner surface at the exit port, with the stopper having a hole through a central portion of reduced thickness for receiving the plunger rod with reduced frictional opposition to its sliding therein.

2. A hypodermic syringe comprising a body member having two storage chambers with the chambers being of different diameters and having a connecting port, with the chamber of lesser diameter having a cylindrical inner surface extending to an exit port at an end of said chamber opposite to said connecting port, and a plunger rod normally carried partially inserted in said storage chamber of lesser diameter to form a removable end closure for said chamber and slidably engageable with the chamber of lesser diameter and extending through the other chamber and outside the syringe, a pierceable stopper frictionally retained by the cylindrical inner surface at the exit port, with the stopper having a central portion of reduced thickness to reduce the resistance to piercing, and a hypodermic needle mounted on said body member and adapted to pierce through the stopper and to extend into said chamber of lesser diameter.

3. A hypodermic syringe comprising a body member, a drug chamber and a diluent chamber with the chambers being of different diameters and connected by a port, said chamber of lesser diameter being formed with a cylindrical inner wall portion, a plunger rod extending from outside the syringe through the chamber of greater

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diameter and having an inner end normally insertably positioned in the end of said chamber of lesser diameter adjacent to said port whereby said inner end of the plunger rod forms an end closure for said chamber of lesser diameter, said plunger rod being withdrawable from said normal position to effect removal of said end closure whereby contents normally carried in said chamber of greater diameter can enter the chamber of lesser diameter, and said plunger rod being extendable from said normal position to move said inner end beyond said normal position and in sliding engagement with said cylindrical inner wall portion for ejecting the contents from said chamber of lesser diameter and a hypodermic needle slideably carried by said body member and adapted to pierce and extend into the chamber of lesser diameter at an end of said chamber opposite to said port upon sliding of said needle relative to said body member.

4. A hypodermic syringe comprising a body member, a drug chamber and a diluent chamber with the chambers being of different diameters and connected by a port, said chamber of lesser diameter being formed with a cylindrical inner wall portion, a plunger rod extending from outside the syringe through the chamber of greater diameter and having an inner end normally insertably positioned in the end of said chamber of lesser diameter adjacent to said port whereby said inner end of the plunger rod forms an end closure for said chamber of lesser diameter, said plunger rod being withdrawable from said normal position to effect removal of said end closure whereby contents normally carried in said chamber of greater diameter can enter the chamber of lesser diameter, and said plunger rod being extendable from said normal position to move said inner end beyond said normal position and in sliding engagement with said cylindrical inner wall portion for ejecting the contents from said chamber of lesser diameter, a hypodermic needle slideably carried by said body member and adapted to pierce and extend into the chamber of lesser diameter at an end of said chamber opposite to said port upon sliding of said needle relative to said body member, a needle mount slideably carried by said body member, and a hypodermic needle carried on said mount, an end of said needle being normally positioned in confronting relationship with an end of said chamber of lesser diameter opposite to said port, said needle being thereby adapted to pierce and extend into said chamber of lesser diameter upon sliding of said needle mount relative to said body member.

5. A hypodermic syringe comprising a body member, a drug chamber and a diluent chamber with the chambers being of different diameters and connected by a port, said chamber of lesser diameter being formed with a cylindrical inner wall portion, a plunger rod extending from outside the syringe through the chamber of greater diameter and having an inner end normally insertably positioned in the end of said chamber of lesser diameter adjacent to said port whereby said inner end of the plunger rod forms an end closure for said chamber of lesser diameter, said plunger rod being withdrawable from said normal position to effect removal of said end closure whereby contents normally carried in said chamber of greater diameter can enter the chamber of lesser diameter, and said plunger rod being extendable from said normal position to move said inner end beyond said normal position and in sliding engagement with said cylindrical inner wall portion for ejecting the contents from said chamber of lesser diameter, a hypodermic needle slideably carried by said body member and adapted to pierce and extend into the chamber of lesser diameter at an end of said chamber opposite to said port upon sliding of said needle relative to said body member, a needle mount slideably carried by said body member, a hypodermic needle carried on said mount, an end of said needle being normally positioned in confronting relationship with an end of said chamber of lesser diameter opposite to said port, said

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needle being thereby adapted to pierce and extend into said chamber of lesser diameter upon sliding of said needle mount relative to said body member, and a gasket seal between said body member and said needle mount.

6. A hypodermic syringe for mixing and injecting two separately contained substances, said syringe comprising two storage chambers with the chambers being of different diameters and having a connecting port, a quantity of a drug carried in one of said chambers, a quantity of a diluent carried in the other of said chambers, said chamber of lesser diameter being of sufficient size to hold all of said two quantities of drug and diluent, a plunger rod slidably engageable with the chamber of lesser diameter and carried partially inserted in said storage chamber of lesser diameter, prior to institution of the mixing portion of the cycle of operation, to form a removable closure for sealing the port, said plunger rod extending through the chamber of greater diameter and outside the syringe and said chamber of greater diameter having a portion of its inner surface tapered toward the port to guide the plunger rod into the chamber of lesser diameter.

7. A hypodermic syringe for mixing and injecting two separately contained substances, said syringe comprising a drug chamber and a diluent chamber, said chambers being of different diameters, a quantity of a drug carried in one of said chambers, a quantity of a diluent carried in the other of said chambers, said chamber of lesser diameter being of sufficient size to hold all of said two quantities of drug and diluent, and a plunger rod carried partially inserted in said chamber of lesser diameter, prior to institution of the mixing portion of the cycle of operation, to form a removable seal between said two chambers and slidably engageable with the chamber of lesser diameter and extending through the other chamber and outside the syringe.

8. A hypodermic syringe for mixing and injecting a drug and a diluent comprising a drug chamber and a diluent chamber with the chambers being of different diameters and connected by a port, said chamber of lesser diameter being formed with a cylindrical inner wall portion, a quantity of a drug carried in one of said chambers, a quantity of a diluent carried in the other of said chambers, said chamber of lesser diameter being of sufficient size to hold all of said two quantities of drug and diluent, and a plunger rod extending from outside the syringe through the chamber of greater diameter and having an inner end insertably positioned, prior to institution of the mixing portion of the cycle of operation, in the end of said chamber of lesser diameter adjacent to said port whereby said inner end of the plunger rod forms an end closure for said chamber of lesser diameter, said plunger rod being withdrawable to effect removal of said end closure from said chamber end whereby one of said quantities carried in said chamber of greater diameter can enter the chamber of lesser diameter, and said plunger rod being extendable from said normal position to move said inner end in sliding engagement with said cylindrical inner wall portion for ejecting both of said quantities from said chamber of lesser diameter.

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