

June 8, 1965

S. J. SARNOFF
HYPODERMIC CARTRIDGE

3,187,749

Filed Jan. 4, 1962

3 Sheets-Sheet 1

FIG. 1

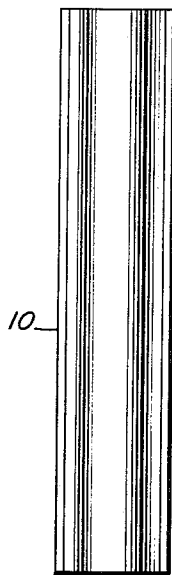


FIG. 2

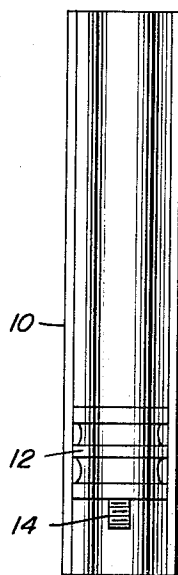


FIG. 3

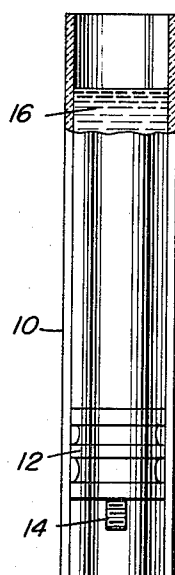


FIG. 6

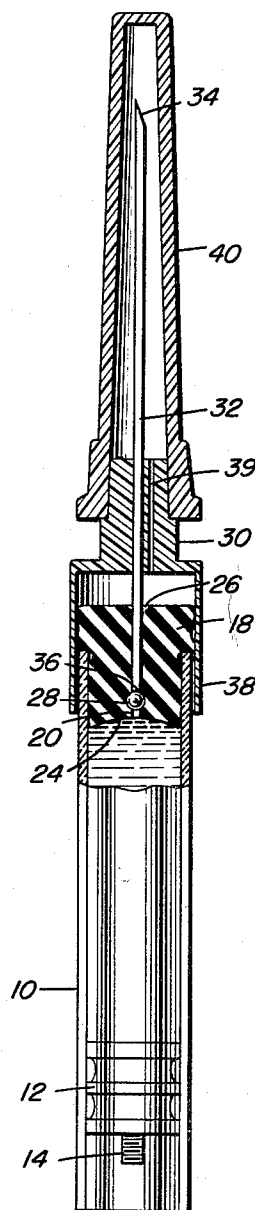


FIG. 4

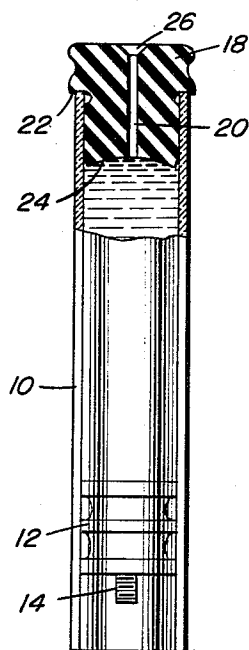
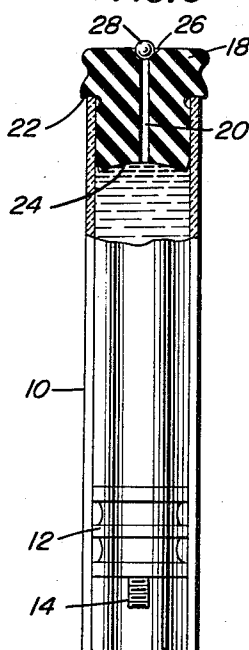


FIG. 5



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3 Sheets-Sheet 2

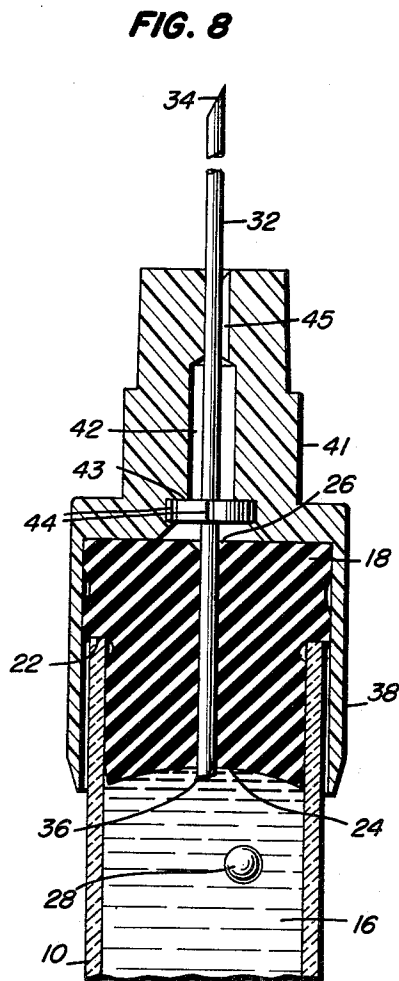
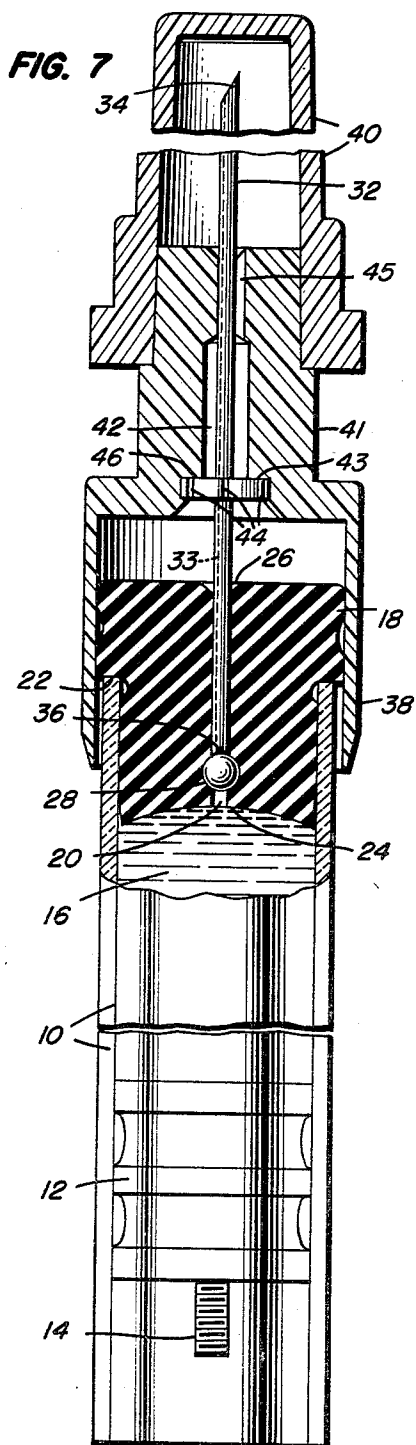
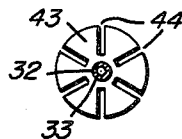


FIG. 9



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3 Sheets-Sheet 3

FIG. 10

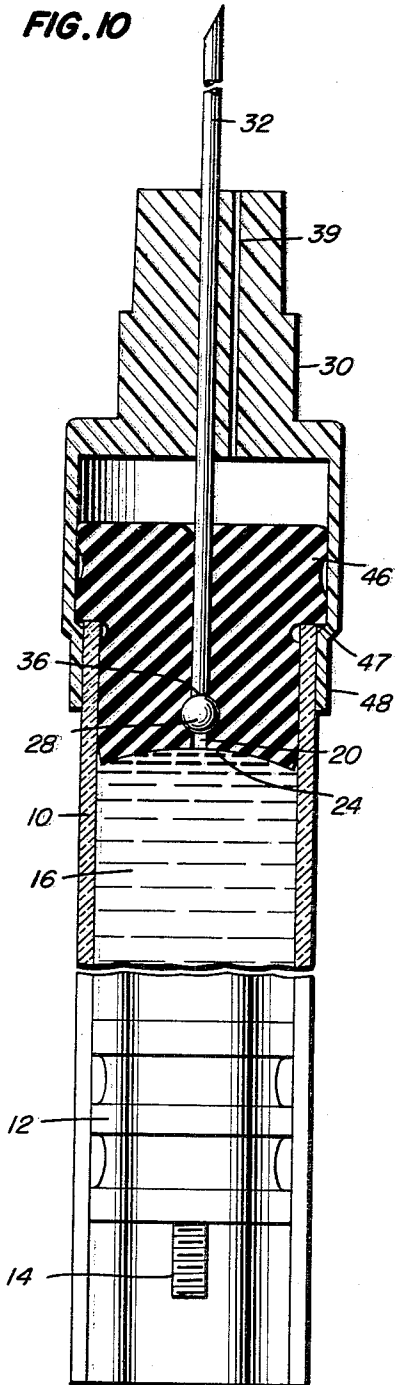


FIG. 11

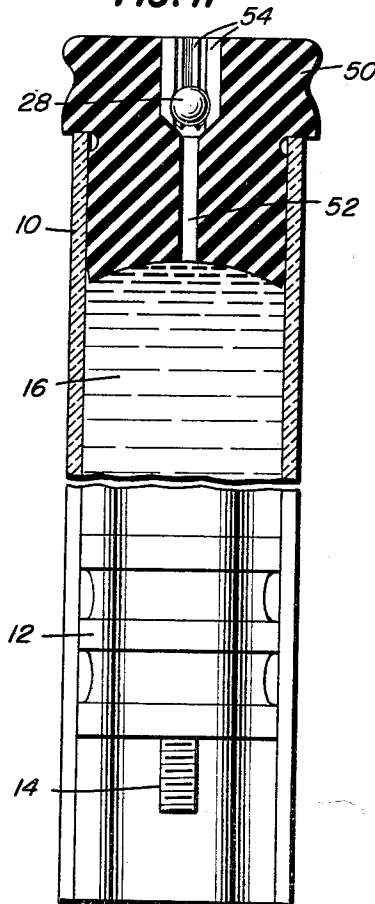
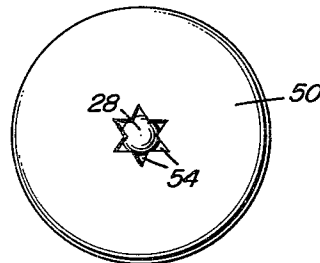


FIG. 12



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3,187,749

HYPODERMIC CARTRIDGE

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3 Claims. (Cl. 128—218)

This invention relates to a cartridge for use with hypodermic syringes.

In particular, the invention relates to a cartridge which is intended to be used but once and then thrown away, the advantage of this type of cartridge being that sterility may be maintained and there is no possibility of contamination being carried over from one patient to another.

In a common type of such a cartridge there is provided an assembly consisting of a barrel or tube filled with medication, one of the heads of the barrel being closed off by a stopper, the stopper having a hypodermic hollow needle partially transversing the same. Immediately before use, the needle is thrust the rest of the way through the material of the stopper in order to obtain communication between the interior of the barrel and the passageway in the needle. In another type of a one-use cartridge, a bore is preformed in the stopper and a ball is placed in the bore at the end of the stopper closest to the medicament. In such a construction, when it is intended to use the cartridge, a needle is thrust into the other end of the bore of the stopper and, after traversal of the bore, against the ball, the ball being then expelled from the stopper, thereby placing the hollow of the needle in communication with the medicament.

These devices of the prior art, while effective to seal off the contents of the cartridge until the cartridge is to be used, may, in use, be ineffective to deliver a proper dose of medication to a patient by reason of clogging of the hollow of the needle with bits of material shaved off or cored from the stopper, as the needle is thrust therethrough or with cores of the diaphragm, as the needle penetrates therethrough. If the material removed from the stopper be very small and of a size insufficient to clog the passageway in the needle, it may, along with the medicament, be injected into the patient with possibility of inducing the formation of carcinoma or other diseases.

It is an object of this invention to provide a cartridge wherein, after the needle is thrust through the stopper, unobstructed communication is obtained between the contents of the cartridge and the passageway in the needle notwithstanding the translation of the needle through the stopper and without danger of introducing undesired foreign bodies into a patient.

Still another object of the invention is to provide a cartridge wherein removal of the medication by removal and replacement of the stopper is not readily effected, and even if effected, is discernible.

These and other objects will be made clear after reading the following specification and claims when taken in conjunction with the accompanying drawing in which:

FIGS. 1 to 6 show diagrammatically the steps in the assembly of a cartridge made in accordance with this invention;

FIG. 7 is a cross section through a cartridge, made in accordance with the assembly procedure of FIGS. 1 to 6, a hub portion of the cartridge being slightly modified;

FIG. 8 is a cross sectional view of the cartridge of FIG. 7, with an end of the hollow needle thrust through the stopper and in communication with the medication in the cartridge;

FIG. 9 is a plan view of a ring or ferrule;

FIG. 10 is a cross sectional view through the stopper end of the cartridge showing a modified form of stopper to hinder and make detectable replacement of the stopper and hub, should they be removed;

2

FIG. 11 is a cross sectional view through a still further modified form of stopper, and

FIG. 12 is a plan view of the stopper of FIG. 11.

Now referring to the drawings in greater detail, at 10 there is indicated a glass or similar storage tube which is of uniform internal cross section and preferably cylindrical. Inserted into the tube, as shown in FIG. 2, is an elastic piston 12 to which is secured a threaded stud 14 for threaded engagement with the plunger of a syringe, as with the plunger disclosed in the patent to Stanley J. Sarnoff 2,956,563.

While the vial thus formed by the tube and piston is held in the vertical position shown in FIG. 3, it is filled with the desired quantity of medicament 16, such as morphine or penicillin, as shown in FIG. 4, after which the stopper 18 is applied to the vial.

The stopper 18 is of resilient material so that it may be held firmly within the tube 10 and has a cylindrical bore 20, extending therethrough parallel to or along the axis of the tube. The stopper may further be provided with a pistonlike flange 22 overlying the upper adjacent edge of the tube to limit the motion of the stopper into the tube. The stopper may be of resilient rubber or any of the well known plastics, as a resilient polyethylene. After the stopper has been inserted in place, the piston 12 is pushed upwardly to vent any air that may be in the vial and to raise the level of the fluid in the vial to the bottom of the stopper. To assist in venting the air from above the fluid, the bottom of the stopper is concaved, as shown at 24. It is to be understood that all of the operations of assembly are performed with sterile materials and under sterile conditions.

After the vial has been filled as described, it is ready to be sealed and have the needle applied thereto to form the completed cartridge. For this purpose, it is desirable to flare out the upper end of the bore, as indicated at 26, to temporarily support a bead 28 of any material not incompatible with the medicament in the tube and harder than the material of the stopper. If desired this bead may be colored. Generally, a colored glass bead has been found to be suitable. The bead should have a diameter much larger than the internal diameter of the bore of the inserted stopper so that, when placed in the flare 26 of the stopper, it will not fall through the bore.

To complete the cartridge there is provided a hub 30 of hard material, as hard rubber or plastic, having rigidly fastened therein a needle 32 with an internal passageway 33 (see FIG. 7). The needle is pointed at the free end 34 and has a blunt end 36, the blunt end preferably being slightly bevelled. The needle is located in a cup formed by the hub 30 and a peripheral cylindrical sleeve 38 tightly telescoping the piston-like flange on the stopper and loosely telescopically engageable with the outer wall of the tube 10. In assembly of the parts, the cylindrical sleeve is applied to the stoppered end of the tube 10 and telescoped down over the stopper and tube to a predetermined height. In this operation, the blunt end of the needle first engages the bead 28 and then thrusts the bead, ahead of the needle, partially through the stopper. The bead, as previously described, is larger in diameter than the bore in the stopper. The needle has an exterior diameter less than that of the bead and of a size to be snugly engaged by the walls of the bore after needle insertion into the stopper. As the needle thrusts the bead through the bore, the bead expands the wall of the bore immediately adjacent the blunt end of the needle, whereby it is impossible for the needle to cut any material from the bore of the stopper; therefore it is impossible for any stopper material to enter within the hollow of the needle.

In the completed assembled cartridge, the bead is near the lower face of the stopper and there is sufficient space between the outer end face of the stopper and the lower

3

face of the hub to permit further displacement of the hub toward the stopper to effect complete dislodgement of the bead from the stopper, by needle actuation. In such displacement the air in the space between the stopper and the hub is forced out through a bleed aperture 39 in the hub leading to a sterile space within a needle guard 40 frictionally held by the hub. The bead in its movement expands the wall of the bore ahead and behind it to provide for free passage of the blunt end of the needle through the bore and without possibility of shaving off or coring any of the stopper material. The appearance of the bead within the medicament is, of course, a signal that the needle has penetrated the stopper.

In FIG. 7 there is shown an enlarged view of the cocked cartridge of FIG. 6 with a slightly modified form of hub. In the modified form of invention, the hub 41 is hollow, as indicated at 42, and a steel ring or ferrule 43 is affixed to the needle 32. The periphery of the ferrule is slotted, as shown at 44 in FIG. 9, the openings afforded by the slots providing communication between the hollow in the hub and the interior of the sleeve. A channel 45 is formed in the hub venting the interior of the hub to the space within the guard. Thus, as the hub is forced toward the stopper, the air in the space therebetween passes out via the slots 44, space 42, and channel 45 to the much larger space within the guard. The ferrule being rigid and less resilient than the material of the hub and its sleeve maintains the needle centralized over the bead. Further, the circumferential portion of the ferrule bears against a shoulder 46 in the hub whereby the ferrule provides support against pulling the needle out of the hub. The sleeve 38 of the hub assists in centralization of the needle in the stopper by telescoping over the tube 10.

In FIG. 8 there is shown the position of the needle 32 and the bead 28 after the needle hub had been operated to bring the hub and stopper into juxtaposition. In this condition of the cartridge, a thrust of the piston 12 toward the needle will force the medication 16 to flow through the unobstructed needle.

In FIG. 10 is shown a further modification of the stoppered end of the cartridge. It may happen, despite all safeguarding of the cartridges against tampering therewith, that the contents of a cartridge may be surreptitiously partially or wholly evacuated and refilled with a substitute, as water. In the prior art this could be effected merely by removing and replacing the stopper of the cartridge. With the form of invention disclosed in FIG. 10 these operations would be extremely difficult. In this form of the invention the stopper of FIGS. 4 to 8 is replaced by a somewhat similar stopper 46, the stopper 46 differing from the stopper 18 by having its flange portion 47 extending sufficiently beyond the outer periphery of the tube 10 so as to provide a definite overhang. The hub sleeve 48 initially is much larger in diameter than the outside diameter of the tube and is just large enough to slide snugly past the flange 47. After the needle has been inserted into the stopper to the cocked position shown in FIG. 10, the free end of the sleeve 48 is formed to telescopically closely fit about the tube 10 and underlie the flange 47. With this construction, withdrawal of the stopper involves displacement of the hub 30, needle 32 and bead 28 as well, since the constricted portion of sleeve 48 will engage beneath the overhanging flange 47 of stopper 46, and remove the whole subassembly as a unit. Now, if an attempt be made to fraudulently replace the subassembly, such attempt would be defeated by reason of the bead 28 being expelled from the bore of the stopper since there would be more resistance to the replacement of the stopper in the tube than to movement of the needle relative to the stopper. Thus even if the stopper could be replaced, the displaced bead in the cartridge would be an indication that there had been previous tampering with the cartridge.

If the bead were to be removed completely from the cartridge assembly and the stopper reapplied, then the

4

pilferage would be made evident by seepage of fluid from out of the needle, particularly when there had been changes in temperature between pilferage and intended use of the cartridge.

In a still further modified form of stopper, shown in FIGS. 11 and 12, air venting of the cartridge is permissible during assembly thereof even after the bead has been placed initially in the bore of the stopper.

In the form of stopper shown in FIGS. 11 and 12, the body of the stopper 50 is provided with a bore 52 which extends all the way through the stopper axially of the length thereof. At the flanged end of the stopper there are provided any suitable number of venting passageways 54 communicating with the bore so as to allow a bead to be placed in the bore and yet permit air to escape through the bore 52 and out of the passageways 54. In a preferred form of the invention, the passageways communicate with the bore along the length thereof for a considerable height of the bore, as shown in FIGS. 11 and 12. This form of venting may, of course, be used with any of the stoppers hitherto described and which stoppers may or may not be provided with wide flanges overlying the tube end. In FIG. 11 there is shown a bead 28 forced part way into the bore 52 but above the lower end of the passageways 54. Thus in this form of construction the bead may initially be placed in the stopper and the stopper then applied to the tube, any air within the tube being forced out through the bore 52 and channels 54. When the hub and needle are applied to the subassembly of tube, piston and stopper with bead therein, the bead will be forced part way through the stopper as before.

While particular embodiments of this invention have been illustrated and described, modifications thereof will occur to those skilled in the art. It is to be understood, therefore, that this invention is not to be limited to the particular arrangements disclosed, and it is intended in the appended claims to cover all modifications within the spirit and scope of this invention.

What is claimed is:

1. A cartridge for use with a hypodermic syringe comprising:
 - a storage tube,
 - a piston within one end of said tube, a fixed resilient stopper having opposing faces and a bore communicating with said opposing faces of the stopper, said bore being cylindrical substantially throughout the length of the stopper and said stopper being within the other end of the tube,
 - a fluid medicament in the tube between the piston and stopper,
 - a bead larger in diameter than any portion of said bore closing off said bore and embedded in the resilient stopper, and
 - a hollow needle smaller in external diameter than the diameter of the bead and larger in diameter than the diameter of the cylindrical portion of the bore and snugly slidably engaged by the walls of said bore, means cooperating between the needle and the tube for guiding the needle for rectilinear movement axially of the bore, one end of the needle contacting to the bead and the other end extending exteriorly of the stopper, said needle, upon movement thereof into the interior of the stopper and tube, displacing the bead from the bore whereby passage of fluid through the needle is unrestricted.
2. A cartridge for use with a hypodermic syringe comprising:
 - a storage tube,
 - a piston within one end of said tube,
 - a fixed resilient stopper having opposing faces and a bore communicating with said opposing faces of the stopper, said bore being cylindrical substantially throughout the length of the stopper and said stopper being within the other end of the tube,
 - said resilient stopper having a flange engaging an end

5

- of the tube, the peripheral wall of the flange extending a considerable extent axially of the stopper, said flange being larger in diameter than said tube,
- a fluid medicament in the tube between the piston and stopper,
- a bead larger in diameter than any portion of said bore closing off said bore and embedded in the resilient stopper,
- a hollow needle in said bore smaller in diameter than said bead snugly slidably engaged by the walls of said bore, one end of the needle contacting the bead and the other end extending exteriorly of the stopper, said needle, upon movement thereof into the interior of the stopper and tube, displacing the bead from the bore whereby unrestricted passage of fluid through the needle is unrestricted,
- a sleeved hub rigid with the needle, the sleeve of said hub telescoping said peripheral wall of said stopper and tube to guide the needle when it is moved, and means venting the space within the sleeve as the needle is moved into the stopper and tube.
3. A cartridge for use with a hypodermic syringe comprising:
- a storage tube,
- a piston within one end of said tube,
- a fixed resilient stopper having opposing faces and a bore therethrough, said bore being cylindrical substantially throughout the length of the stopper and said stopper being within the other end of the tube and said stopper, externally of the tube, being provided with a flange larger in diameter than said tube and having considerable length axially of the stopper,
- a fluid medicament in the tube between the piston and the stopper,
- a bead larger in diameter than said cylindrical bore closing off said bore and embedded in the resilient stopper,

6

- a hollow needle in said bore smaller in diameter than said bead snugly slidably engaged by the walls of said bore, one end of the needle contacting the bead and the other end extending exteriorly of the stopper, said needle, upon movement thereof into the interior of the stopper and tube, displacing the bead from the bore whereby unrestricted passage of fluid through the needle is attained,
- a hub rigid with the needle and extending a considerable extent along the needle, said hub having a sleeve telescopically and frictionally engaged by said flange of said stopper and extending beyond said flange to be guided by the exterior wall of the storage tube, said walls of said bore, flange on the stopper and exterior walls of the tube and engagement of the needle with the bead cooperating to guide the needle through the stopper without shaving off parts of the bore wall of the stopper and without clogging of the hollow of the needle,
- and means venting the space within the sleeve between the sleeve and the stopper as the end of the needle in contact with the bead is moved through the stopper and into the tube.

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