

[54] SYRINGE INJECTOR WITH POP-TOP CAP

[75] Inventors: **Wendell Evert Standley**, Lake Forest; **Glenn Lee Beall**, Gurnee, both of Ill.

[73] Assignee: **Abbott Laboratories**, North Chicago, Ill.

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Primary Examiner—Richard A. Gaudet

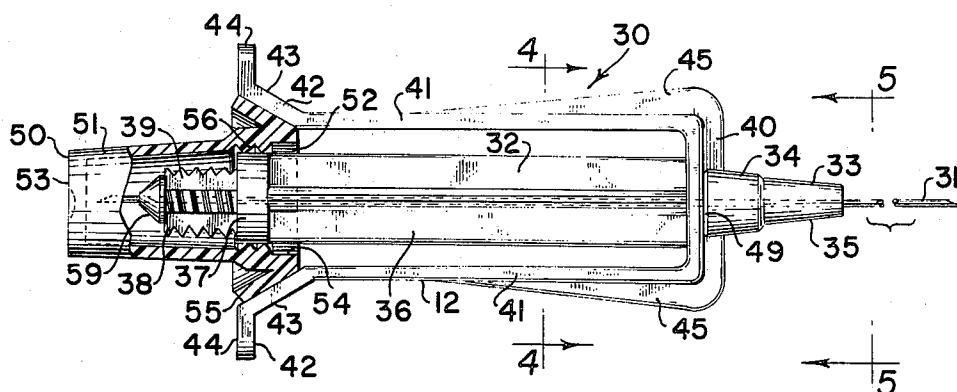
Assistant Examiner—J. C. McGowan

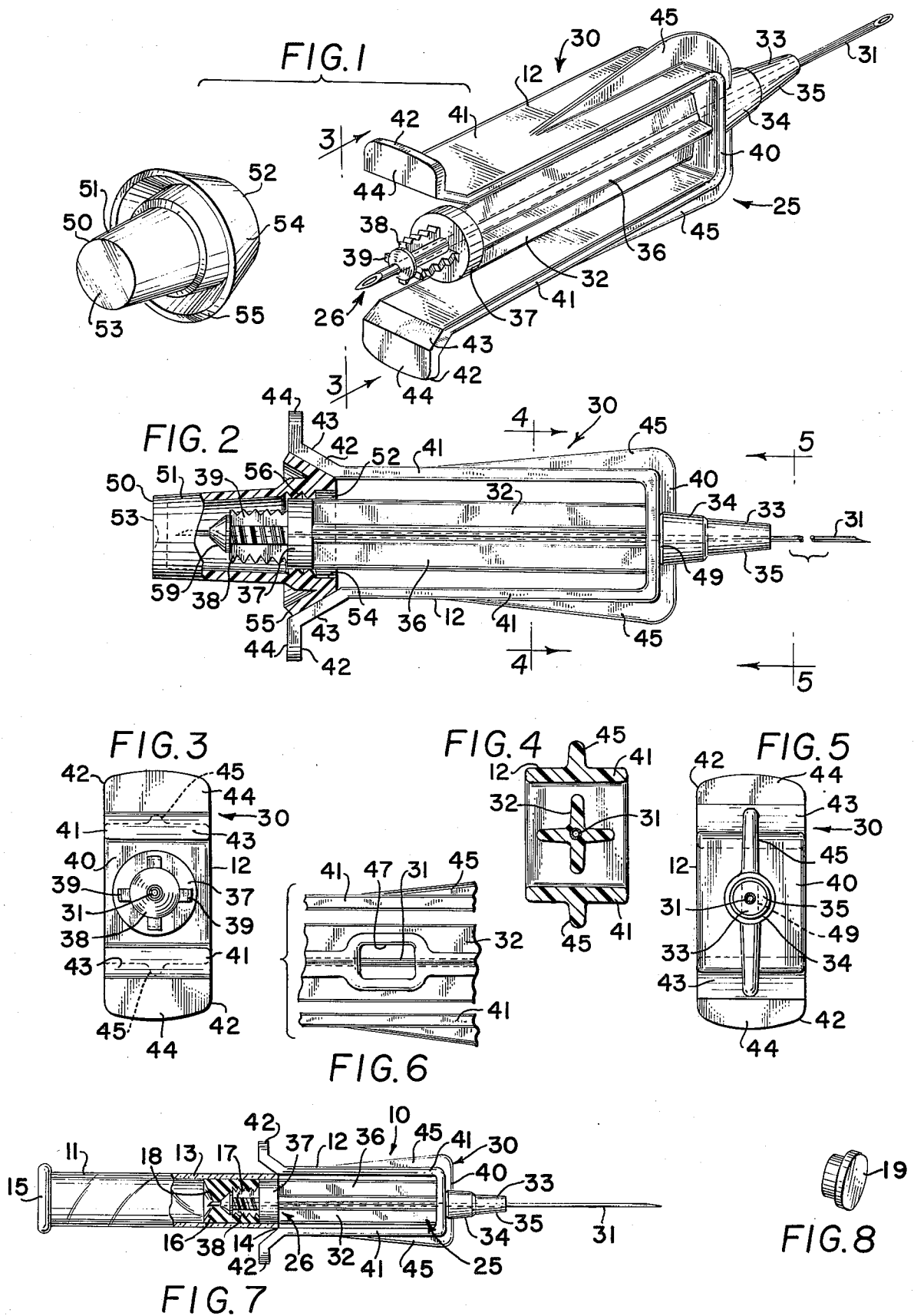
Attorney, Agent, or Firm—Robert L. Niblack; Gildo E. Fato; Neil E. Hamilton

[57] ABSTRACT

A syringe assembly including a vial in which a unit dose of an injectable medicament can be prepackaged and an injector portion comprising a solid post molded along a substantial portion of the cannula to provide support and a pair of longitudinally extending wings projecting from the hub of the injector. A threaded stem extends from the post for receiving the thread stopper of the vial, the threads on the stem being intermittent. A cap for covering the threaded stem prior to use includes a flange which mates with finger grips on the wings whereby the cap can be removed by pressure applied to the wings. Possible contact with the threaded stem or cannula which could contaminate the system is thereby minimized.

7 Claims, 8 Drawing Figures





SYRINGE INJECTOR WITH POP-TOP CAP

BACKGROUND OF THE INVENTION

Injectable medicaments are oftentimes packaged in ampules or other containers from which the injectable fluid is removed as required. For example, at point of use, the ampule is opened, the appropriate amount of injectable fluid is drawn into a syringe and thereafter injected. Prepackaged, injectable medicaments in unit dose form are much more convenient and more importantly, can be injected quickly as needed without the need for removing the medicament from the ampule or other container and loading a syringe with the fluid. U.S. Pat. Nos. 3,376,886 and 3,378,008, issued Apr. 9 and Apr. 16, 1968 respectively, disclose a medicament injector with attached vial and comprising a vial which contains the injectable fluid and which can be filled with the desired injectable fluid, sealed and then stored for use, and an injector for receiving the vial. Likewise, U.S. Pat. Nos. 2,524,362, issued Oct. 3, 1950 and No. 2,568,346, issued Sept. 18, 1951 disclose syringe assemblies employing a separate vial or ampule, however, the injector portions of such devices are somewhat difficult to manufacture. With such devices, the injector body is molded and the cannula is inserted in place through an opening molded in the hub and affixed thereto by means of an adhesive such as epoxy. Additionally, the cannula is supported along only a small portion of its length and consequently, is subject to bending, loosening, coming off center, and the like. Additionally, with some of these devices, since threaded portions are included in the injector, the molded part is difficult to remove from the mold which results in much lower molding rates than optimum.

SUMMARY OF THE INVENTION

The syringe assembly of the present invention includes a vial in which a unit dose of an injectable medicament can be prepackaged and an injector portion comprising a solid post molded along a substantial length of the cannula to thereby provide good support along almost its entire length. A pair of longitudinally extending wings project from the hub of the injector, with finger grips being formed on the end of the wings. A threaded stem extends from the post for receiving the threaded stopper of the vial, the short, proximal end of the double ended cannula extending therefrom, the threads on the stem being intermittent to facilitate removal of the part from the mold. Finger grips for grasping the injector extend angularly from the wings and contact and similarly extending flange of the cap which covers the threaded stem and proximal end of the cannula. To remove the cap prior to use, pressure is applied to the wings to forceably remove the cap from the post and expose the threaded stem and cannula for receiving the vial. Consequently, the cap need not be touched, thereby minimizing the possibility of the fingers contacting the cannula prior to use. Accordingly, since the injector of the present invention can be injection molded using insert molding techniques, since no core pins are required, and since the molded part can be easily removed from the mold; the injector can be manufactured rapidly and economically.

BRIEF DESCRIPTION OF THE DRAWING

Other features and advantages will be apparent from the following specification and drawings in which:

FIG. 1 is a perspective view of the injector of the present invention;

FIG. 2 is a side view, partially in cross-section of the injector illustrated in FIG. 1;

FIG. 3 is an end view as viewed along the line 3—3 of FIG. 1;

FIG. 4 is a cross-sectional view taken along the line 4—4 of FIG. 2;

FIG. 5 is an end view as viewed along the line 5—5 of FIG. 2;

FIG. 6 is a fragmentary view of a portion of the injector illustrating a modification thereof;

FIG. 7 is a side view, partially in section, of the syringe assembly of the present invention including a vial and injector; and

FIG. 8 is a perspective view of a vial cap for sealing the vial after filling.

DETAILED DESCRIPTION

Referring to the drawings, FIG. 7 illustrates a syringe assembly 10 of the present invention including a vial portion 11 and an injector portion 12. The vial 11 comprises a cylindrical body 13 having an open end 14 and a closed end 15. A puncturable stopper 16 is inserted in the open end 14 of the vial 11 and is moveable within the vial 11, the stopper 16 having internal threads 17 formed therein. A diaphragm 18 closes the end of the stopper opposite the threads and receives the cannula as hereinafter described. The vial 11 can be filled with a liquid medicament on conventional filling machines and the stopper 16 inserted in the open end 14 of the vial 11. Thereafter the vial 11 and medicament therein can be sterilized and a cover 19 inserted in the open end 14 of the vial 11 adjacent the stopper 16 to maintain sterility of the stopper 16 and vial 11 during handling and transportation. Preferably, the vial 11 is made of glass. When filled, sealed and sterilized, the vial 11 comprises a self-contained package which can be readily stored and conveniently used in conjunction with the injector 12 as hereinafter described.

Referring to the drawings, particularly FIGS. 1 through 5 and 7 thereof, the injector portion 12 comprises an integral holder 30 having a double-ended cannula 31 molded therein. As best seen in FIGS. 1 and 2, the holder 30 comprises a longitudinally extending post 32 having a hub 33 on the distal end 25 thereof and a threaded stem 38 on the proximal end 26 thereof. The hub 33 is of a tapered configuration and includes a base portion 34 of larger diameter than the luer taper portion 35 extending therefrom. The hub base portion 34 is adapted to receive a needle covering sheath (not shown) while the forward tapered portion 35 is adapted to receive a corresponding female fitting. The post 32, as best seen in FIGS. 1 and 4, includes a crusiform shaped body 36 with a circular stop 37 at the proximal end 26 thereof from which the threaded stem 38 projects. The use of a crusiform shape for the body 36 results in maximum strength with the use of a minimum amount of material but other shapes, such as circular or square, can be used. As illustrated, the threaded stem 38 includes interrupted threads 39. The distal end 26 of the post 32 includes a laterally extending base 40 interconnecting the post 32 and the hub 33. A pair of

longitudinally extending wings 41 project from the base 40 and terminate in finger grips 42. The finger grips 42 include angularly projecting portions 43 which slant from wings 41 and from which extend laterally projecting shoulders 44. To provide additional strength, a stiffener rib 45 can be molded into the holder 30 extending from the hub 33 along the base 40 and along a portion of the wings 41.

The injector 12 can be fabricated using conventional insert molding techniques. The cannula 31 is centered in a mold and the holder 30 is molded thereabout by means of injection molding methods. While various plastic materials can be used, polypropylene is preferred. In the holder 30 of the present invention, the cannula 31 is supported along almost its entire length and therefore cannot get off center. With many prior art devices, the cannula is held at only one place, such as a hub and as a result, due to cooling in the molding process, handling, and the like, the cannula can be displaced from a central position. Hence, during use, the cannula may not properly pierce the stopper 16 in the vial 11. As can be seen, by employing insert molding techniques, an integral holder 30 having a cannula 31 molded directly therein results. With prior art devices, a relatively large diameter opening is molded in the hub of the holder, the cannula is inserted therein and fixed in place by epoxy adhesive. Consequently, additional steps are required and further, there is a possibility that the cannula will not be centrally located. Likewise, by employing an interrupted thread design as illustrated, after the holder 30 is molded, the molded part can readily be removed from the mold simply by separation of the mold. This avoids the necessity of having to unscrew the mold from the threaded stem after it has been molded. As can be seen in the drawings, the distal end 25 of the cannula 31 extends beyond the hub 33 a sufficient distance to facilitate insertion of the cannula 31 into a vein of a patient while the proximal end 26 extends a short distance from the threaded stem 38 sufficient to permit piercing of the diaphragm 18 in the vial stopper 16. For very thin or very long cannulas, to permit adequate support of the cannula 31 in the mold during the molding procedure, openings 47 can be molded directly in the post 32 intermediate the ends thereof as illustrated in FIG. 6. The cannula 31 can thereby be supported intermediate its ends as well as at the ends during the molding procedure. If desired, to prevent reuse of the injector 12, the distal end 25 of the cannula 31 and post 32 can be broken from the holder 30 prior to discarding. To facilitate destruction of the injector 12 before discarding, a notch 49 can be formed in the base 34 of the hub 33 adjacent the base 40 of the holder 30 as illustrated in FIGS. 2 and 5. The hub 33 can then simply be bent to cause a fracture of the hub 33 at the notch 49.

To maintain sterility of the threaded stem 38 and the extending cannula as well as to prevent damage prior to use, a cap 50 is positioned over the threaded stem 38 and cannula 31 as illustrated in FIG. 2. The cap 50 comprises a tubular body portion 51 having an open end 52 and a closed end 53, the open end 52 being defined by a base portion 54 from which extends an obtusely slanted flange 55 adapted to mate with the angularly projecting portion 43 of the finger grips 42 of the holder 30. To assist in retaining the cap 50 in place, ribs or rings 56 can be formed on the inside of base portion 54, which ribs 56 act to grip the stop 37 on the

post 32 of the holder 30. To remove the cap 50 prior to use, the extending wings 41 of the holder 30 are grasped between the thumb and index fingers and pressure applied whereby the angularly projecting portion 43 of the finger grips 42 will press against the mating flange 55 of the cap 50 whereby the cap will slip from the stop 37. As is apparent, in removing the cap 50, the fingers are prevented from contacting the threaded stem 38 or cannula 31 and thereby contaminating the system.

In using the syringe assembly 10, the cap 50 is removed from the injector 12 as previously described. A pre-filled vial 11 containing the medicament desired is selected and the cover 19 is removed. The vial 11 is then inserted on the post 32 of the injector 12, engaging the threaded stem 38 of the post 32 with the threads 17 in the stopper 16 of the vial 11. Referring to FIG. 2, it can be seen that the threaded stem 38 has a cone shaped section 59 located between the interrupted threads 39 and the end of the cannula 31 which projects from the threaded stem 38. The cone shaped section 59 has two functions: (1) to help guide the vial 11 and the vial stopper 16 into position, and (2) to at least partially seal the stopper 18 to the injector 12 at the point before the cannula 31 pierces the stopper diaphragm 18. This allows the injector 12 and vial 11 to be assembled in a sterile condition without actually piercing the stopper diaphragm 18. As the mating threads are engaged, proximal end 26 of the cannula 31 will pierce the diaphragm 18 of the vial stopper 16 as illustrated in FIG. 7 to provide communication between the cannula bore and the interior of the vial 11. Since the vial stopper 16 will be restrained by the stop 37 on the post 32, pressure on the vial 11 will result in the stopper 16 moving rearwardly within the vial 11 causing the injectable medicament to flow through the cannula 31 whereby the medicament can be injected. Likewise, pressure can be relieved by withdrawing the vial 11 so that aspiration will result to either determine whether proper entry into a vein has been made or for drawing other liquids into the vial 11.

As is apparent, the syringe assembly of the present invention can be easily and economically manufactured. Further, the vial 11 and injector 12 can be assembled together with minimum possibility of contamination. Additionally, the injector portions of prior syringe assemblies include two concentric rings. The central ring or cylinder surrounds the cannula with the outer cylinder forming the barrel of the injector. Such a structure dictates that the overall size of the injector must be larger than the vial. In contrast, the structure of the holder 30 is basically rectangular in cross section as shown in FIGS. 3, 4 and 5. In the longitudinal direction, the injector 12 or holder 30 is larger than the vial 11. However, in the short direction of the rectangle, the holder 30 need not be larger than the vial 11. In use, this means that the injector 12 and vial 11 assembly can be positioned at a smaller angle in relationship to the puncture site, thereby facilitating entry into a vein and minimizing the possibility of accidental puncturing of the vein wall.

What is claimed is:

1. A medicament injector for receiving a vial having a stopper therein, said injector comprising an integral holder including a solid post having a double-ended cannula molded

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therein, the post extending along a substantial portion of the length of the cannula, said post having a hub on the distal end thereof from which one end of the cannula projects and a stem on the proximal end for receiving the stopper of the vial, the other end of the cannula projecting from the stem;

a laterally extending base interconnecting the post and the hub;

a pair of opposed, longitudinally extending wings projecting from the base toward the stem and terminating in finger grips, said finger grips including angularly projecting portions extending from said wings in a slanted manner;

a stop member extending from the post at the proximal end thereof; and

a cap member defined by a tubular body portion having an open end and a closed end, the open end being defined by a base portion from which extends an obtusely slanted flange mating with the angularly projecting portion of the finger grips of said wings, said base portion adapted to engage the stop on the post and to be frictionally held on the post whereby said cap can be removed by applying pressure to the extending wings.

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2. The medicament injector of claim 1 wherein said stop is circular and said stem is threaded.

3. The medicament injector of claim 2 wherein the base portion of said cap is adapted to engage the circular stop on the post and has internal gripping means.

4. The medicament injector of claim 3 wherein said post is of cruciform shape and the threads are interrupted to facilitate removal of the holder from the mold in the molding process.

5. The medicament injector of claim 4 including a stiffener rib molded into the holder and extending from the hub along the base and along at least a portion of the wings.

6. The medicament injector of claim 5 including a notch formed in the hub adjacent the base of the holder to facilitate destruction of the injector after use to thereby prevent reuse thereof.

7. The medicament injector of claim 1 wherein the post includes at least one opening intermediate the ends thereof, the opening exposing the cannula whereby said cannula can be supported intermediate its ends as well as at the ends during the molding procedure.

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