

May 14, 1963

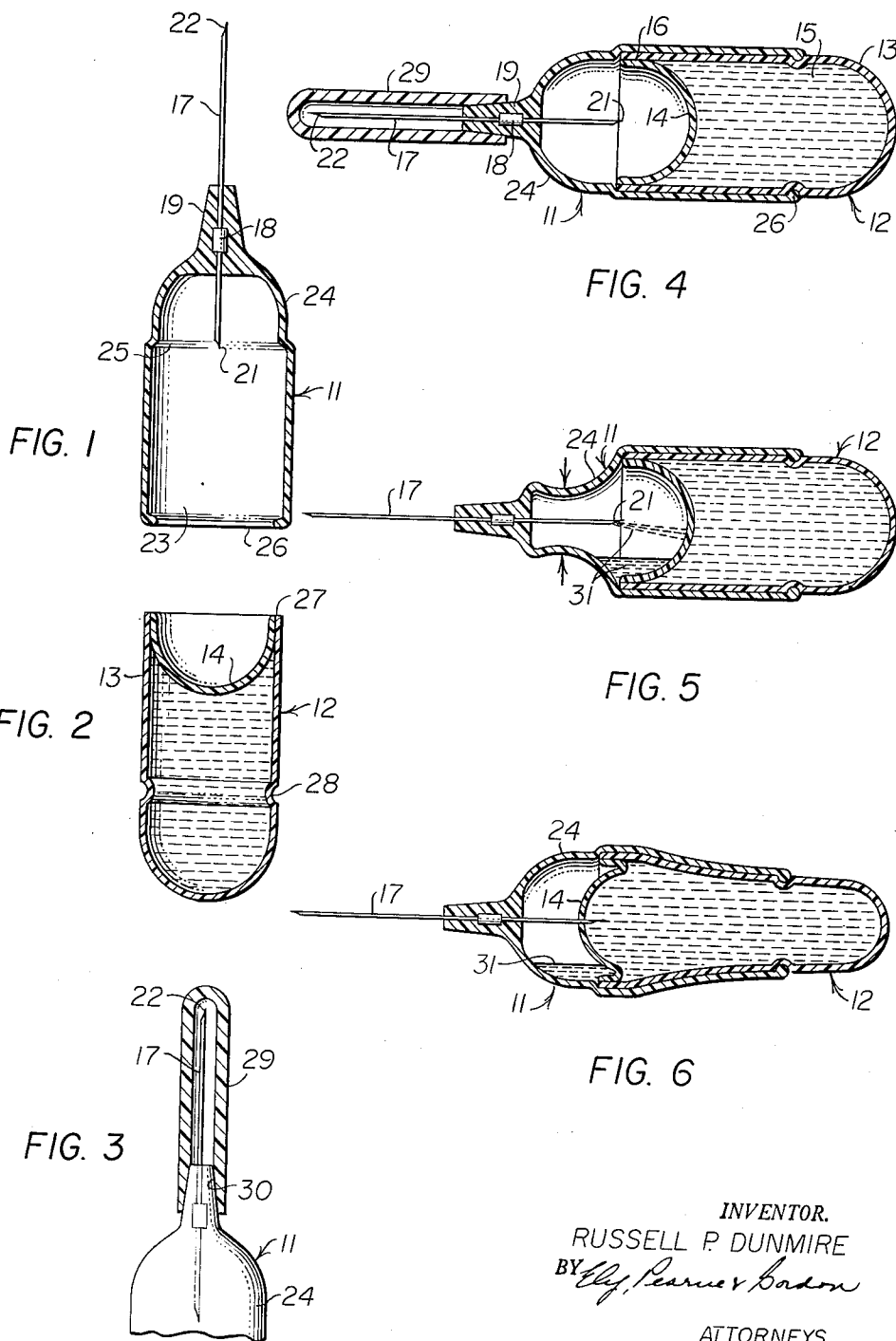
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3,089,489

ASPIRATING TYPE HYPODERMIC SYRINGES

Filed April 27, 1959

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

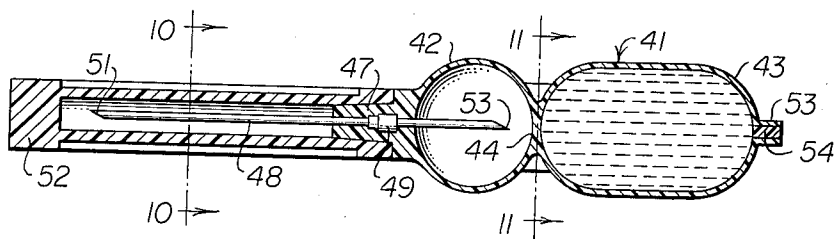


FIG. 7

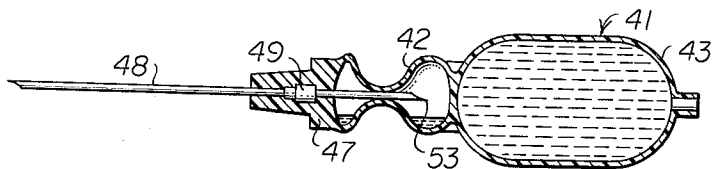


FIG. 8

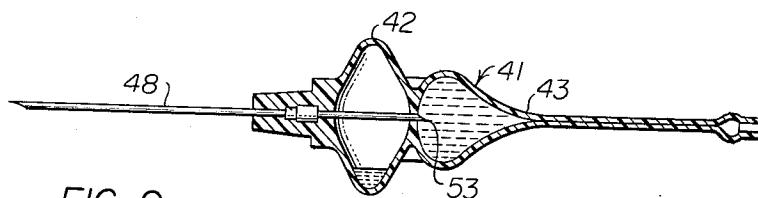


FIG. 9

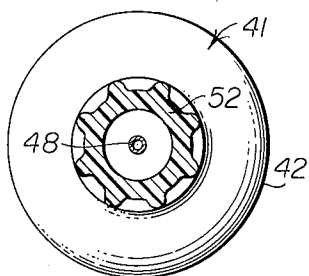


FIG. 10

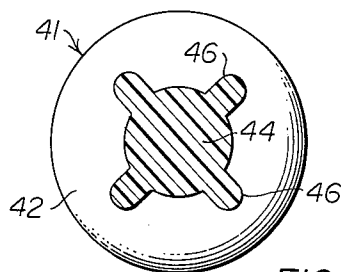


FIG. 11

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3,089,489

ASPIRATING TYPE HYPODERMIC SYRINGES
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9 Claims. (Cl. 128-216)

This invention relates to devices for injecting fluids through membranes and particularly to devices for effecting subcutaneous injections of medicaments and the like into human beings and animals. While especially valuable for injecting medicaments, the devices of the invention have characteristics rendering them useful for a wide variety of other types of injection operations in industry and scientific research.

The invention involves new injection devices of the hypodermic syringe type and, also, new techniques for effecting hypodermic injections, and particularly for effecting intravenous hypodermic injections. Though in no way limited thereto, the invention principally relates to the provision of injection devices having the fluid to be injected sealed therein at the time manufacture of the device is completed. While it is contemplated that the devices will generally be discarded after being used to perform one injection, they may, of course, be saved for salvage of some or all of the component parts for reuse.

The present invention involves hypodermic syringes of the general type described and claimed in my U.S. Patent No. 2,876,771 granted March 10, 1959, and represents improvements rendering such syringes capable of an aspirating action for drawing blood from a patient after the hypodermic needle has been inserted in order to determine whether or not the pointed discharge end of the needle has entered a vein, as is desired when making intravenous injections.

Briefly stated, the principal object of the invention is to render hypodermic syringes of the general type described and claimed in my said prior patent capable of such aspirating action. A further object of the invention is to render blood drawn from a patient by such aspirating action visibly detectable in the syringe. These and related objects of the invention will be readily understood from the following detailed description of illustrative embodiments of the invention shown in the accompanying drawings.

Referring to the drawings,

FIG. 1 is a longitudinal sectional view of one portion of a syringe made in accordance with the invention;

FIG. 2 is a longitudinal sectional view of a second, separable portion of a syringe made in accordance with the invention;

FIG. 3 is a fragmentary view, partly in longitudinal section, of one end of the syringe portion shown in FIG. 1 with a protective sheath enclosing the discharge end of the hypodermic needle and sealed to the body of the syringe;

FIG. 4 is a longitudinal sectional view of the complete syringe of FIGS. 1, 2, and 3 with the several parts thereof disposed in assembled relationship;

FIG. 5 is a longitudinal sectional view of the syringe of FIG. 4 after removal of the sheath for the needle and after insertion of the needle into the patient, the syringe being shown in a condition existing during the aspirating operation;

FIG. 6 is a longitudinal sectional view similar to FIG. 5, but showing the syringe in a subsequent condition of the syringe during the operation of making an injection;

FIG. 7 is a longitudinal sectional view of a modified form of syringe made in accordance with the invention;

FIG. 8 is a longitudinal sectional view of the syringe of

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FIG. 7 after removal of the sheath for the needle and insertion of the needle into the patient, showing a condition of the syringe during the aspirating operation;

FIG. 9 is a similar longitudinal sectional view of the syringe of FIG. 7 showing a subsequent condition of the syringe during the operation of making an injection;

FIG. 10 is a transverse sectional view of the hypodermic needle and sheath of the syringe of FIG. 7, taken as indicated by the line 10-10 in FIG. 7; and

FIG. 11 is a transverse sectional view of the syringe of FIG. 7, taken as indicated by the line 11-11 in FIG. 7.

Referring to the form of the invention illustrated in FIGS. 1-6, the syringe comprises a pair of elastically flexible, transparent or (at least) translucent, hollow, plastic bodies 11 and 12 adapted to be separately produced and assembled in the relationship shown in FIG. 4 by inserting the body 12 into interlocked seated engagement with the body 11. The body 12 may be made in two parts by any conventional molding or casting operation, one part being a cup-shaped member 13 of substantial depth and the other being a much shallower cup-shaped member 14. These two members may be assembled as shown after filling the member 13 with a liquid injection material 15 by inserting the member 14 into the member 13 and sealing the two members together by heat or a suitable solvent or adhesive in the annular region of contact therebetween shown at 16.

The body 11 is a cup-shaped member of the same plastic material as the body 12. A hypodermic needle 17, preferably having an enlarged, integrally formed portion 18 intermediate its ends, is mounted in the body 11. The body 11 may be cast or molded so as to provide a relatively thick and rigid end or bottom portion 19 surrounding and gripping the needle over a portion of its length, including the enlarged portion 18, for securely holding the needle against longitudinal movement relative to the body 11.

The needle 17 is a hollow hypodermic needle having a pointed butt end 21 and a pointed discharge end 22. As shown, the pointed butt end of the needle is disposed within the body 11 and is exposed and directed toward the open end 23 of the body 11. A substantial portion of the opposite end of the needle 17 is exposed and extends beyond the body 11, terminating in the pointed discharge end 22.

The body 11 is shaped to provide a bulbous portion 24 adapted to be collapsed by lateral pressure during the aspirating operation, as hereinafter described. It is also provided with a circumferential interior shoulder 25 adjacent the open end of the bulbous portion 24, and a circumferential, inwardly projecting bead 26 at the open extremity of the body 11 for interlocking engagement with the body 12.

The body 12 has a circumferential edge 27 adapted to abut against the shoulder 25 of the body 11. It also has a circumferential groove 28 molded or otherwise formed therein for receiving the bead 26 of the body 11.

By reason of the elastic flexibility of the plastic material of which the bodies 11 and 12 are formed, the filled body 12 may be forcibly inserted into seated and interlocked engagement with the body 11 in the relationship shown in FIG. 4. When the body 12 is so inserted, the wall 14 thereof is disposed in close proximity to the pointed butt end 21 of the needle 17. The advantage of the separability of the bodies 11 and 12 is that a standard body 11 may be stocked for use with a supply of bodies 12 filled with any of a variety of liquids 15 to be injected. A selected body 12 containing the desired liquid may be assembled with the standard body 11 just prior to making an injection.

In order to protect the pointed discharge end 22 of the needle 17 during handling of the body 11, this end

of the needle may be covered by a sheath 29 molded or cast in any desired manner from a suitable plastic material. As shown, the sheath 29 may have its open end portion internally tapered at 30 with a gradual taper for tight wedging engagement about the correspondingly tapered rigid portion 19 of the body 11. If desired, this tapered joint may be sealed with a breakable seal by a suitable cement.

When the complete assembly shown in FIG. 4 is to be used, it may conveniently be gripped with the thumb and forefinger of one hand engaging opposite sides of the bulbous portion 24 of the body 11 so as to collapse the same substantially into engagement with the sides of the inner end of the needle 17. The sheath 29 may then be twisted with the other hand to free it from the body 11 and permit its removal. While still holding the bulbous portion 24 of the body 11 in its collapsed condition, the needle 17 is inserted into the patient so that the pointed discharge end thereof enters a vein into which an injection is to be made. By then relieving the thumb and forefinger pressure on the bulbous portion 24 of the body 11, this portion thereof will elastically return toward its original uncollapsed condition as indicated by arrows in FIG. 5. This produces a suction in the bore of the needle 17 so as to draw blood 31 from the patient into the bulbous portion 24 of the body 11. Visual detection of the entry of blood into this portion of the syringe is possible by reason of the translucent character of the plastic material of which the bodies 11 and 12 are formed. As soon as this detection is made, the thumb and forefinger pressure on the bulbous portion 24 of the body 11 may be reapplied to permit the syringe to be securely held during the succeeding injection operation.

The injection operation is then performed by squeezing the liquid-containing portion of the syringe to collapse the same and to cause the cup-shaped wall 14 thereof to be turned inside out by internal liquid pressure. This causes the wall 14 to be pierced by the pointed butt end 21 of the needle 17 as shown in FIG. 6, thus providing an outlet through the needle for the liquid contents of the syringe body 12. Continued collapsing of the syringe body 12 between the thumb and the forefinger of one hand while holding the syringe body about the bulbous portion 24 between the thumb and forefinger of the other hand forces the liquid contents through the needle 17 and into the vein penetrated by the needle.

Referring now to the embodiment of the invention shown in FIGS. 7-11, a generally similar syringe is illustrated except that the two collapsible portions of the syringe (made separable in the device of FIGS. 1-6) are integrally formed in the device of FIGS. 7-11, and a slightly different manipulative action is required to perform the final injection operation.

In this case, the syringe may comprise an integrally formed hollow body of elastically flexible, transparent or translucent, plastic material, generally designated 41. This body 41 may comprise a bulbous wall 42 defining an aspirating chamber and an elongated bulbous wall 43 defining a liquid-containing chamber, with an integrally formed common wall 44 that corresponds generally in function to the cup-shaped wall 14 in the device of FIGS. 1-6. In order to provide greater rigidity of the plastic body 41 in the region of the common wall 44, external reinforcing webs 46 may be formed integrally therewith.

The bulbous portion 42 of the syringe includes a relatively thick and rigid end portion 47 that surrounds and grips a hypodermic needle 48 about an enlarged intermediate portion 49 thereof, in a manner similar to the device of FIGS. 1-6. The externally projecting pointed discharge end 51 of the needle 48 may be covered by a sheath 52 having a longitudinally ribbed configuration shown in cross section in FIG. 10. The sheath 52 may be secured over the discharge end of the needle 48 with a tapered fit on the rigid end portion 47 of the body 41, and sealed thereto if desired, in the same manner as in the device of FIGS. 1-6.

The inner, pointed, butt end 53 of the needle 48 is directed axially toward the common wall 44 and is disposed in close proximity thereto for piercing the same during the injection operation hereinafter described.

The device of FIGS. 7-11 is prepared for use by removing the sheath 52 and is manipulated in the same manner as the device of FIGS. 1-6 while inserting the needle 48 into the patient and performing the aspirating operation. The injection operation is thereupon performed while supporting the syringe with the thumb and forefinger of one hand engaging opposite sides of the rigid portion 47 of the syringe while holding the liquid-containing portion 41 between the thumb and forefinger of the other hand. The liquid-containing portion is then manually pushed in the direction shown by arrows in FIG. 8 relative to the bulbous portion 42 so as to force the common wall 44 toward the butt end 53 of the needle 48 and cause this end of the needle to pierce the common wall and provide an outlet through the needle 48 for the liquid contents of the syringe. Thereupon the grip on the rigid portion 47 of the syringe may be released as the liquid-containing portion is manually collapsed to exhaust the liquid therefrom, allowing the bulbous portion 42 of the syringe to assume the shape shown in FIG. 9. The thumb and forefinger released from the rigid portion 47 of the syringe may thus be used to aid in completely collapsing the liquid-containing portion of the syringe, if desired, to facilitate complete discharge of the liquid therefrom.

In this embodiment of the invention, by reason of the integral formation of the entire plastic syringe body 41, the syringe body is most suitably made by centrifugal casting while leaving a filling opening through a small nipple 53 at one end thereof. After the liquid to be injected has been charged into the syringe through the nipple 53, the opening through the nipple may be closed by a plug 54 inserted and sealed therein, preferably by a heat sealing operation.

Any of a wide variety of natural and synthetic, moldable and castable, plastic materials and the like may be used to form the bodies of the syringes of the present invention, and any of a variety of molding, casting, or other forming procedures and apparatus may be employed, as will be appreciated by those skilled in the art. Similarly, any of various known procedures and techniques may be employed for sterilizing and filling the syringes, and for packaging them to maintain them in a sterile condition until ready for use.

From the foregoing description of two illustrative embodiments of the invention, it will be appreciated that the aspirating action described above has been provided in a simple and effective manner in syringes of the general types described and claimed in my prior U.S. Patent No. 2,876,771. While the invention has been described by reference to specific illustrative embodiments thereof, it is contemplated that various modifications thereof may be made without departing from the scope of the invention as defined in the appended claims.

What is claimed is:

1. A hypodermic syringe comprising a body of elastically flexible material defining both a closed fluid ampoule and an adjacent closed aspirating chamber, said body including a partition of elastically flexible material constituting a common wall of said ampoule and said aspirating chamber, said aspirating chamber having a relatively rigid wall portion opposite said partition; a hypodermic needle having a pointed butt end disposed in said aspirating chamber and directed toward said partition in close proximity thereto and having an oppositely directed pointed discharge end, an intermediate portion of said needle passing through said relatively rigid wall portion of said aspirating chamber opposite said partition and being surrounded and gripped by said rigid wall portion in sealed relationship therewith; said aspirating chamber between said common wall and said rigid wall portion being of bulbous configuration and elastically flexible so

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that it may be manually collapsed by external pressure to reduce its volume and will return to its normal configuration when said pressure is released, thereby creating a suction in said needle to draw blood into said aspirating chamber, said partition preventing said blood from mixing with fluid in said ampoule, and the material of said portion of bulbous configuration being translucent to permit visual observation of blood drawn into the aspirating chamber.

2. A hypodermic syringe according to claim 1 in which said fluid ampoule is collapsible to discharge fluid therefrom through said needle when punctured by the butt end thereof.

3. A hypodermic syringe comprising a body of flexible material defining a closed fluid ampoule and an adjacent closed aspirating chamber, said body including a partition of said flexible material constituting a common wall of said ampoule and said aspirating chamber, said aspirating chamber having a relatively rigid wall portion opposite said partition; a hypodermic needle having a pointed butt end disposed in said aspirating chamber and directed toward said partition in close proximity thereto and having an oppositely directed pointed discharge end, an intermediate portion of said needle passing through said relatively rigid end wall portion of said aspirating chamber opposite said partition and being surrounded and gripped by said rigid wall portion in sealed relationship therewith; said aspirating chamber between said common wall and said rigid wall portion being of bulbous configuration and elastically flexible so that it may be manually collapsed by external pressure to reduce its volume and will return to its normal configuration when said pressure is released, thereby creating suction in said needle to draw blood into said aspirating chamber without expressing any fluid from said ampoule through said needle, said partition preventing said blood from mixing with fluid in said ampoule, and the material of said portion of bulbous configuration being translucent to permit visual observation of blood drawn into the aspirating chamber.

4. A hypodermic syringe according to claim 1 in which said fluid ampoule, including said common wall, is a unitary body separable from the aspirating chamber portion, the latter being a cup-shaped body having said needle extending axially through the bottom thereof and having its top end open and proportioned to receive the separable ampoule with a tight fit.

5. A hypodermic syringe according to claim 1 in which said fluid ampoule, including said common wall, is a unitary body separable from the aspirating chamber portion, the latter being a cup-shaped body having said needle extending axially through the bottom thereof and having a cylindrical side wall extending to the top of the cup from the bulbous portion of the aspirating chamber, said cylindrical side wall being of greater internal diameter than the adjacent bulbous portion so as to provide a circumferential shoulder therebetween, and said ampoule body being proportioned to fit snugly into said cylindrical side wall and into engagement with said shoulder.

6. A hypodermic syringe according to claim 1 in which said fluid ampoule, including said common wall, is a unitary body separable from the aspirating chamber portion, the latter being a cup-shaped body having said needle extending axially through the bottom thereof and having a cylindrical side wall extending to the top of the cup from the bulbous portion of the aspirating chamber, said cylindrical side wall being of greater internal diameter than the adjacent bulbous portion so as to provide a circumferential shoulder therebetween, and said ampoule body being proportioned to fit snugly into said cylindrical side wall and into engagement with said shoulder, the top of the cup having an inwardly projecting circumferential bead, and the ampoule body having a circumferential groove located to receive said bead when the ampoule engages said shoulder.

7. A hypodermic syringe comprising a unitary body of

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flexible translucent material defining a closed, fluid ampoule and an adjacent closed aspirating chamber, said body including a partition of said flexible material constituting a common wall of said ampoule and said aspirating chamber, said aspirating chamber having a relatively rigid wall portion opposite said partition; a hypodermic needle having a pointed butt end disposed in said aspirating chamber and directed toward said partition in close proximity thereto and having an oppositely directed pointed discharge end, an intermediate portion of said needle passing through said relatively rigid end wall portion of said aspirating chamber opposite said partition and being surrounded and gripped by said wall portion in sealed relationship therewith; said aspirating chamber between said common wall and said rigid wall portion being of an enlarged bulbous configuration and elastically flexible so that it may be manually collapsed by external pressure to reduce its volume and will return to its normal configuration when said pressure is released.

8. A hypodermic syringe comprising a unitary body of elastically flexible material defining a closed fluid ampoule and an adjacent closed aspirating chamber, said body including a partition of said flexible material constituting a common wall of said ampoule and said aspirating chamber, said aspirating chamber having a relatively rigid wall portion opposite said partition; a hypodermic needle having a pointed butt end disposed in said aspirating chamber and directed toward said partition in close proximity thereto and having an oppositely directed pointed discharge end, an intermediate portion of said needle passing through said relatively rigid end wall portion of said aspirating chamber opposite said partition and being surrounded and gripped by said wall portion in sealed relationship therewith; said aspirating chamber between said common wall and said rigid wall portion being of an enlarged bulbous configuration and elastically flexible so that it may be collapsed laterally by lateral external pressure and released for elastic return to its uncollapsed condition and may be longitudinally collapsed by longitudinal external pressure to cause the pointed butt end of the needle to puncture said common wall and permit collapsing of the closed fluid ampoule to exhaust fluid therefrom through said needle, and the material of said portion of bulbous configuration being translucent to permit visual observation of blood drawn into the aspirating chamber.

9. A hypodermic syringe comprising a unitary body of elastically flexible translucent material defining a closed, fluid ampoule and an adjacent closed collapsible aspirating chamber, said body including a partition of said flexible material constituting a common wall of said ampoule and said aspirating chamber, said aspirating chamber having a relatively rigid wall portion opposite said partition; a hypodermic needle having a pointed butt end disposed in said aspirating chamber and directed toward said partition in close proximity thereto and having an oppositely directed pointed discharge end, an intermediate portion of said needle passing through said relatively rigid end wall portion of said aspirating chamber opposite said partition and being surrounded and gripped by said rigid wall portion in sealed relationship therewith; said aspirating chamber between said common wall and said rigid wall portion being of bulbous configuration and elastically flexible so that it may be manually laterally collapsed by lateral external pressure to reduce its volume and will return to its normal configuration when said pressure is released, and so that it may be longitudinally collapsed by longitudinal external pressure to force the pointed butt end of said needle through said common wall into said fluid ampoule and permit the fluid ampoule to be collapsed to discharge fluid through the needle.

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