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DISPOSABLE DOUBLE-ACTION SYRINGE

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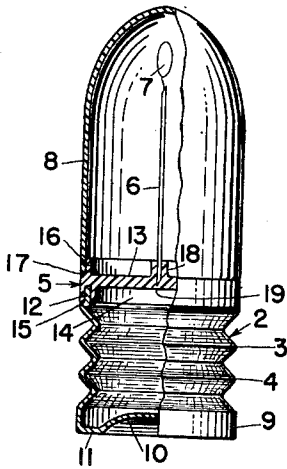


Fig. 1

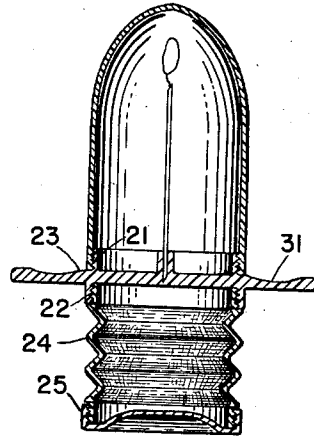


Fig. 2

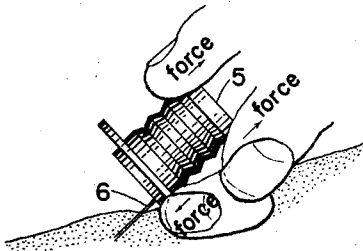


Fig. 3

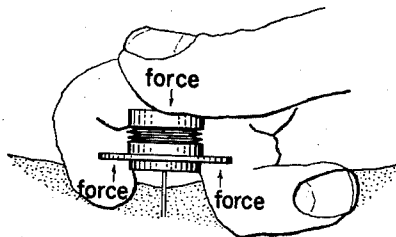


Fig. 4

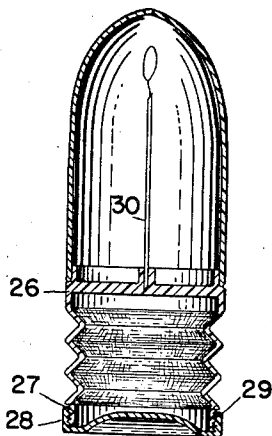


Fig. 5

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DISPOSABLE DOUBLE-ACTION SYRINGE

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8 Claims. (Cl. 128—216)

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This invention relates to a disposable double action syringe or blood specimen receptacle and is concerned particularly with a unit which may be produced at low cost and will perform the functions of a more expensive glass or metal plunger type of syringe.

It is an object of the present invention to provide a disposable double action syringe which includes a resilient bellows or the like which is capable of being expanded or contracted to create either a positive or a negative pressure at the end of the hollow needle associated therewith.

Another object of the invention is to provide a double action syringe having its receptacle portion formed of a resilient transparent or translucent material through which the contents of the receptacle may be readily viewed.

A further object of the invention is to provide a double action syringe including a bellows type receptacle which will perform all of the functions of the conventional plunger type syringe without the necessity for accurately machined, fitted or formed parts.

An additional object of the invention is to provide a double action syringe which may be formed substantially entirely of plastic materials, except for the needle, and thus facilitate rapid manufacture at low cost.

Another object of the invention is to provide a double action disposable syringe which may be actuated in use in essentially the same manner as a conventional plunger type syringe avoiding the necessity for the operator to learn a new technique of use.

Other objects of the invention will become obvious from a consideration of the following detailed description of certain embodiments of my invention which are illustrated in the attached drawing, in which

Figure 1 is a view partly in elevation and partly in section of a disposable double action syringe embodying my invention;

Figure 2 is a longitudinal sectional view of a disposable double action syringe of modified construction;

Figure 3 is a diagrammatic illustration showing the syringe of Figure 2 in use with the bellows extended to provide a negative pressure at the point of the hollow needle;

Figure 4 is a view similar to Figure 3 showing the syringe of Figure 2 in injection position with the bellows collapsed to apply a positive pressure at the point of the hollow needle; and

Figure 5 is a view similar to Figure 2 of a further modification of my invention.

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Referring to Figure 1, the syringe includes a body or receptacle portion 2 of resilient material which is provided with a plurality of pleats or folds 3 and 4 to provide ready compressibility of the body portion 2 along the central axis thereof. A head or closure member 5 is secured to the body portion 2, and it receives a needle 6 which is preferably rigidly and permanently secured to the head member 5. A wire stylet 7 may be inserted within the opening in the needle in the customary manner, and a protective cover cap 8 may be provided to maintain the needle in sterile condition.

The syringe of Figure 1 may be made wholly of moldable plastic materials, except for the needle and stylet. The body or receptacle portion 2 may be formed in a manner similar to the formation of plastic bottles made of polyethylene or similar yieldable and resilient plastic materials. Such materials are frequently formed by processes similar to those employed in glass blowing, the body of polyethylene being blown within a forming mold. The receptacle portion 2 is of a relative thin wall section to facilitate ready action in either compression or expansion during use of the syringe. The base 9 of the receptacle may be of somewhat thicker wall section to prevent collapse of the receptacle portion during expansion in a manner which will be more fully hereinafter described, and a reinforcing effect may be achieved by providing a concave portion 10 in the base. A flat annular surface 11 may be provided upon which the unit may rest in an upright position.

The mouth of the receptacle portion 2 terminates in an annular flange 12 to which the head or closure member 5 is secured. This member may be formed by molding, employing polyethylene or other resinous material. This part is preferably formed with a somewhat heavier wall thickness than the body of the receptacle 2 to provide a measure of rigidity for proper support of the needle and to facilitate the operation of injecting or withdrawing fluids from the body. The closure member 5 may in fact be formed of a hard resinous molding composition such as urea or phenol with formaldehyde. The closure member 5 includes a top portion 13 and a depending flange portion 14. The flange 14 is provided with an annular recess 15 which receives the annular flange 12 of the receptacle portion 2. This provides a structure in which the closure member is firmly secured to the receptacle member with a fluid and airtight seal which may be effected by frictionally fitting the parts together, preferably supplemented by an adhesive bond,

the adhesive being disposed within the recess 15 prior to assembly of the parts.

An annular upwardly projecting flange 16 is provided on the closure 5, the flange being disposed inwardly from the outer circumference of the closure 5 to provide a shoulder 17 for the reception of the plastic protective cover 8. This cover member 8 may be molded of polyethylene, polystyrene, or other moldable material, flexible or rigid.

A central reinforcing and securing projection or boss 18 is molded in the closure 5, and it is preferred to dispose the needle 6 within an opening in the mold disposed centrally of the mold opening in which the boss 18 is formed and to mold the closure member 5 about the needle 6, thus insuring an adequate bond between the two parts. An enhanced bonding action may be secured by providing barbs, ribs or other projections on the outer surface of the needle in the area disposed within the boss 18, although this is not essential for a secure bond may be obtained, particularly where the closure 5 is formed of urea formaldehyde or phenol formaldehyde molding compositions. As an alternative, the boss 18 may be provided with a central opening for the reception of the needle 6 and the same may be frictionally fitted therein or may be adhesively secured in position.

As will be observed by reference to Figure 1, the needle 6 may be disposed a short distance from the inner head surface 19 of the closure 5 so that the closure 5 forms a complete seal for the contents of the receptacle 2. The stylist 7 may be pressed downwardly to perforate the head surface 19. If desired, of course, the needle 6 may extend completely through the top 13 of the closure, in which event no piercing of the head member will be required at the point of use, or a separate sealing diaphragm may be provided, interposed between the needle and the container contents.

Preferably, the cover cap 8 is frictionally held onto the closure 5, but if desired, this may be supplemented by providing interlocking projections 21 on the inside of the cover cap 8 and the outside of the flange 16, such as screw threads, lugs, or the like, as shown in Figure 2.

A permanent liquid-tight and airtight seal should be obtained between the closure 5 and the receptacle 2. By close frictional fitting of the flange 12 within the recess 15, a satisfactory seal may generally be obtained; and, as mentioned above, this may be supplemented by the use of an adhesive. Mechanical securing arrangements such as screw thread projections or the like 22 on the closure member 23 and the receptacle 24, as shown in Figure 2, may also be employed to secure the desired seal. In this embodiment, the receptacle portion 24 is molded as a separate unit as are the closure member 23 and a base member 25. Complementary screw threads are formed on the base member 25 and the lower end of the receptacle portion 24 and the two parts are firmly sealed together by screwing the base member onto the receptacle portion in the same manner as the closure member is secured to the receptacle. The particular method of joining the closure to the receptacle is not critical and many different types of structures may be employed, two simple types of joints being shown for purposes of illustration in Figures 1 and 2.

Figure 5 shows a structure in which the closure member 26 is integral with the body or receptacle portion 27 and a separate base member

28 is secured to the body or receptacle portion 27 by screw thread projections 29 formed on the parts. This unit may be readily formed of polyethylene resin and the needle 30 joined thereto in the formation of the closure and receptacle portions, or it may be otherwise secured in position.

Also as shown in Figure 2, digital members 31 may be provided on the closure portion to assist in the positioning of the device in use.

As shown in Figure 3, the syringe is preferably grasped adjacent to the base portion by the thumb and index finger, and one or more fingers are applied to the digital members or to the closure portion if no digital members are provided. An upward force may then be applied to the receptacle, and because of its plicated structure the capacity of the receptacle will be increased and a negative pressure will result at the needle. This action is essential in the intramuscular injection of certain medicaments which should not be injected into the blood stream. In this operation, the needle is inserted and negative pressure is applied by expanding the receptacle. If the blood stream is disposed at the needle point, blood will be drawn into the receptacle and will be observed there through the transparent or translucent body thereof. In such event a repositioning of the needle will be effected; and, when in proper position, force may be applied, as indicated in Figure 4 where the digital portions are disposed between the index and second finger and force is applied by the thumb to compress the plicated receptacle and thus compress the same, reducing the volume thereof, applying a positive pressure to the contents, and injecting the contents of the receptacle through the needle into the body of the patient.

Where the syringe is to be used as a blood specimen receptacle, the needle 6 will be preferably disposed eccentric with respect to the closure member 5 so that the needle may be inserted with facility into a vein and then negative pressure will be applied in the manner illustrated in Figure 3 to withdraw a specimen of blood into the receptacle 2. The cover cap 8 may then be applied and sealed in position and the specimen transferred to the laboratory for analysis. Where a removable closure is provided as shown in Figure 2, or where the base member is removable as shown in Figures 2 and 5, the removable member may be detached for the discharge of the specimen. Where the parts are integrally formed or adhesively joined, the receptacle portion may be severed with a blade and the contents discharged through the severed opening.

The provision of a removable closure is particularly desirable where the syringe is for use in blood chemistry, for it permits an operator to decant the supernatant portion of the specimen with the receptacle disposed in an upright position on its base. It also facilitates ready removal of clotted blood. Of course, a small quantity of crystals of sodium citrate, sodium oxalate, or other anticoagulant may be disposed within the receptacle prior to use, and under such circumstances the uncoagulated blood may be discharged from the receptacle through the needle. This is not possible, obviously, with clotted or coagulated blood.

The size of the receptacle 2 will vary depending upon the service for which it is intended. For many physiological injections, a volume of 1 cc. will be adequate; whereas, for blood specimens,

a size of 10 cc. or 20 cc. may be required. The size of the unit is not critical and the invention will be applicable to units of all sizes from the smallest for conventional medicament injections to the larger sizes for blood specimen and similar uses.

Should it be desired to utilize the receptacle 2 for retaining a blood specimen without the needle, a separate sealing cover cap may be provided therefor similar to the cap of Figure 2 without the needle and without the digital portions. The cover cap preferably will be provided with screw threads or the like complementary to the elements 22 of Figure 2. However, the unit may be sealed by pinching the needle with a hemostat or forceps or by bending it upon itself to thereby seal off the opening therein.

From the foregoing it will be clear that by this invention there is provided a disposable injection syringe and blood specimen receptacle which may be produced at low cost with conventional equipment. The unit is simple to operate and is extremely compact, facilitating its packaging and shipment. The operator may readily visualize the function of the device and the contents of the receptacle and a completely sterile package may be provided with the contents fully sealed. The device will perform all of the functions of the more complicated and expensive conventional plunger type syringes.

I claim:

1. A double action syringe comprising a hollow receptacle including an impervious body portion of yieldable plicated form which is readily expandible and contractible digitally to increase and decrease the volume thereof, a relatively rigid head portion at one end of said body portion and forming an hermetic seal therewith, a relatively rigid closure member at the other end of said body portion at one end of said body portion and forming an hermetic seal therewith, a relatively rigid closure member at the other end of said body portion, and a hollow needle carried by said closure member and constituting the sole passageway for communication with said body portion, whereby said head portion and closure member may be digitally grasped and axial forces applied therethrough to effect collapse and expansion of said plicated body portion and fluid transfer with respect to said receptacle will be effected solely through said needle.

2. A double action syringe or the like in accordance with claim 1 in which the closure member is joined to the body portion and carries the needle.

3. A double action syringe or the like in accordance with claim 1 in which the closure member is integral with the body portion and the needle is disposed therein and in which a base member is removably secured to the body portion.

4. A double action syringe or the like in accordance with claim 1 in which there are separate base and closure members joined to the body member at opposite ends thereof, one of which carries the needle.

5. A double action syringe in accordance with claim 1 in which the body is formed of translucent plastic material.

6. A double action syringe comprising a hollow receptacle including an impervious body portion of generally cylindrical yieldable plicated form which is readily expandible and contractible generally along the axis thereof by digital forces to increase and decrease the volume thereof, a relatively rigid head portion at one end of said body portion and forming an hermetic seal therewith, a relatively rigid closure member secured to the other end of said body portion and sealed thereto, and a hollow needle carried by said closure member and constituting the sole passageway for communication with said body portion, whereby said head portion and closure member may be digitally grasped and axial forces applied therethrough to effect collapse and expansion of said plicated body portion and fluid transfer with respect to said receptacle will be effected solely through said needle.

7. A double action syringe comprising a hollow receptacle including an impervious outer body wall portion of yieldable plicated form which is readily expandible and contractible digitally to increase and decrease the volume thereof, a relatively rigid reinforcing head portion integral with the outer body wall portion and of greater thickness than the body wall portion and hermetically sealing one end thereof, a separate relatively rigid closure member sealingly attached to the opposite end of said body wall portion, and a hollow needle carried by said closure member and constituting the sole passageway for communication with said body portion, whereby said head portion and closure member may be digitally grasped and axial forces applied therethrough to effect collapse and expansion of said plicated body portion and fluid transfer with respect to said receptacle will be effected solely through said needle.

8. A disposable blood specimen retractor comprising a hollow receptacle including a thin impervious body wall portion of yieldable plicated form which is readily expandible digitally to increase the volume thereof, a relatively rigid reinforcing head portion at one end of said body portion and forming an hermetic seal therewith, a relatively rigid closure member at the other end of said body portion, and a hollow needle carried by said closure member and constituting the sole passageway for communication with said body portion for application of negative pressure to said passageway upon expansion of said plicated body wall portion to effect transfer of blood through said needle to said receptacle upon insertion of said needle into a blood stream.

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