

April 9, 1963

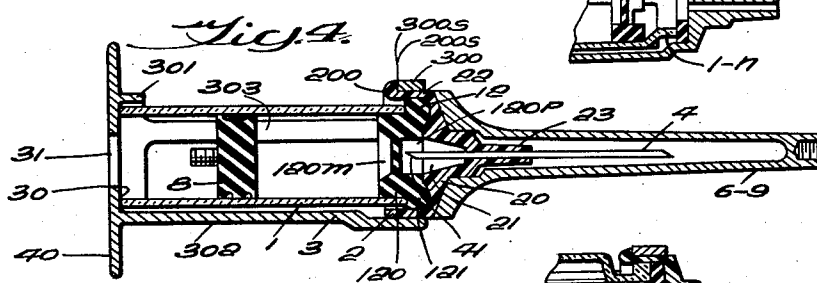
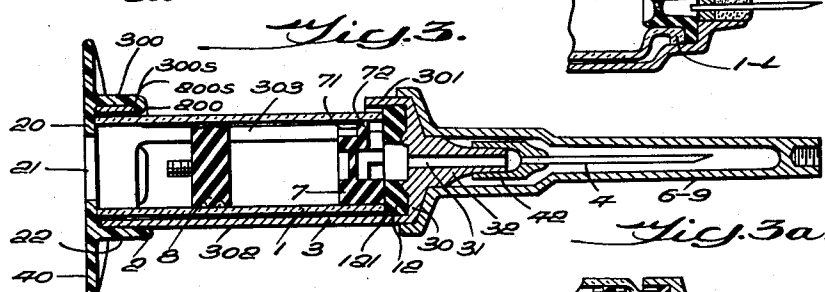
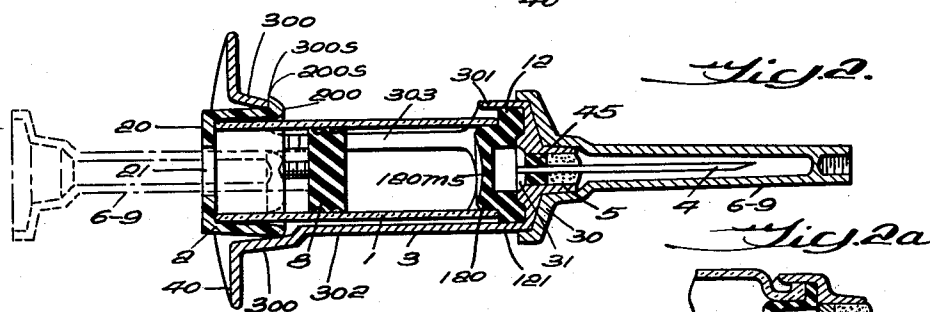
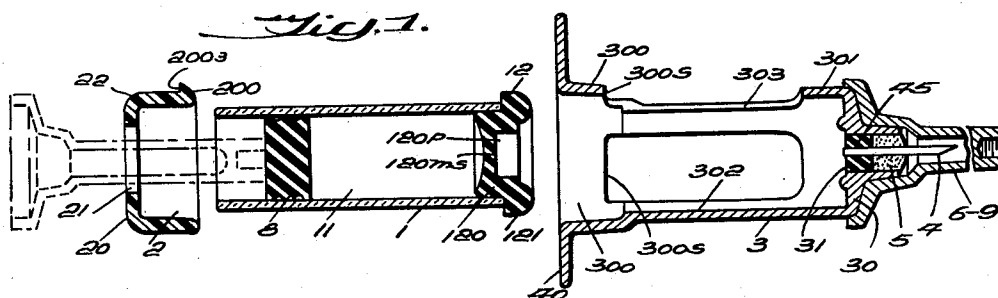
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3,084,688

DISPOSABLE HYPODERMIC SYRINGE

Filed July 15, 1959

5 Sheets-Sheet 1



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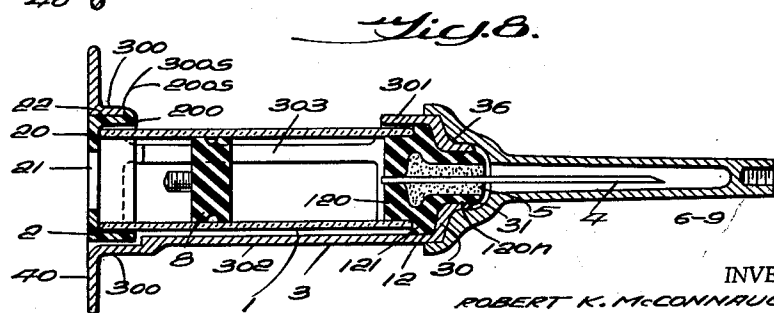
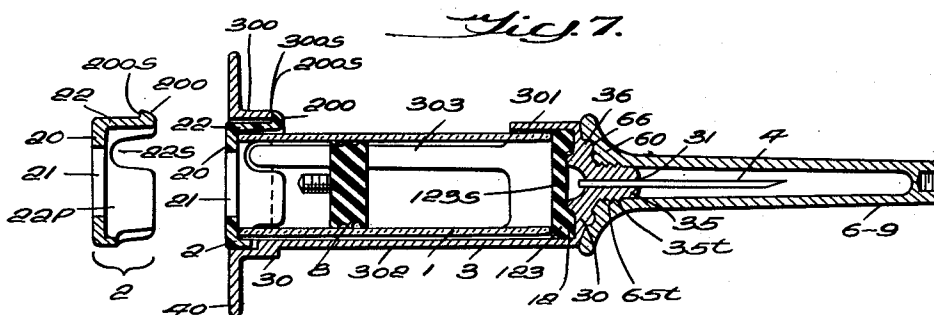
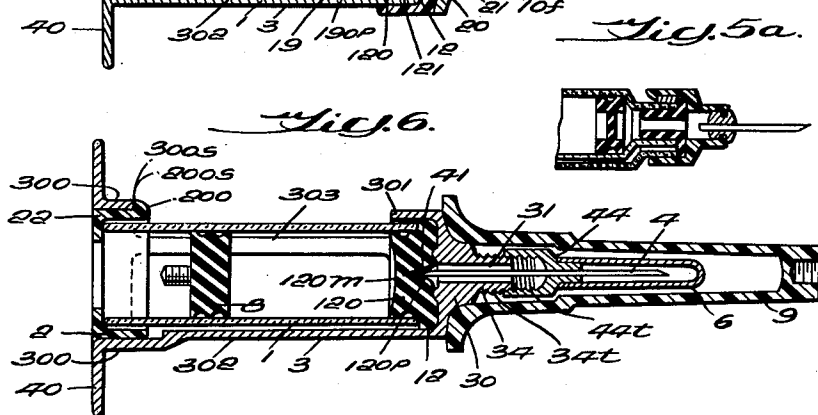
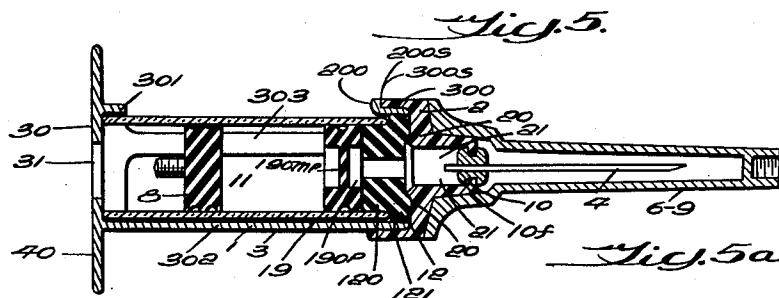
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DISPOSABLE HYPODERMIC SYRINGE

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5 Sheets-Sheet 2



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3,084,688

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5 Sheets-Sheet 3

Fig. 9.

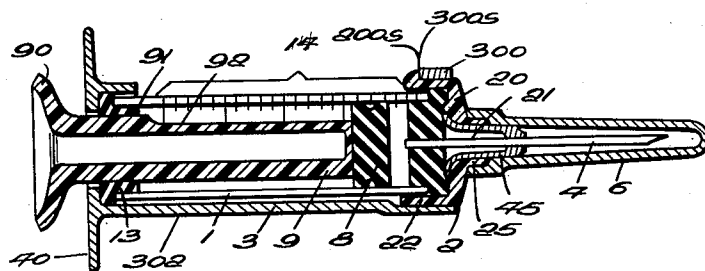


Fig. 10.

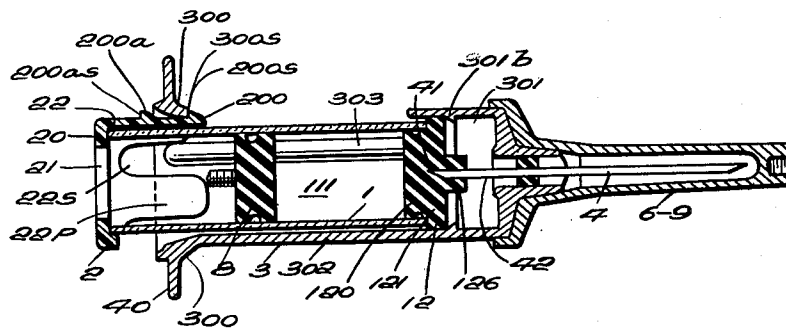
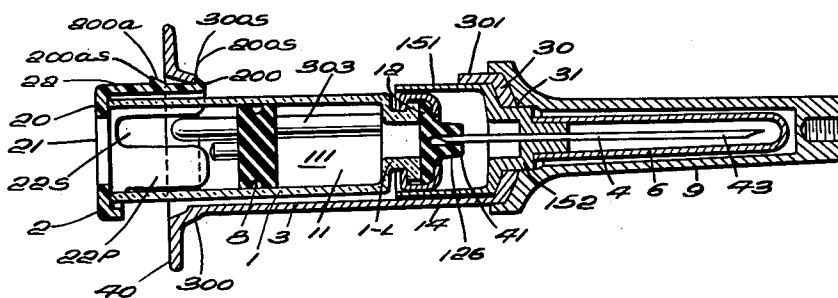


Fig. 11.



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5 Sheets-Sheet 4

Fig. 12.

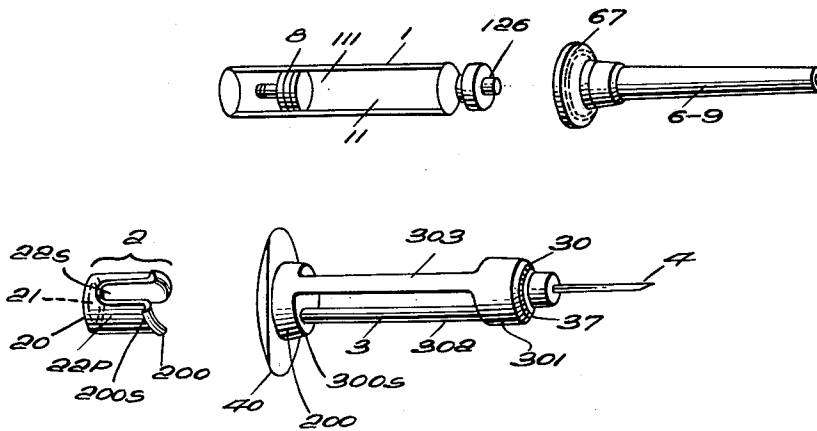
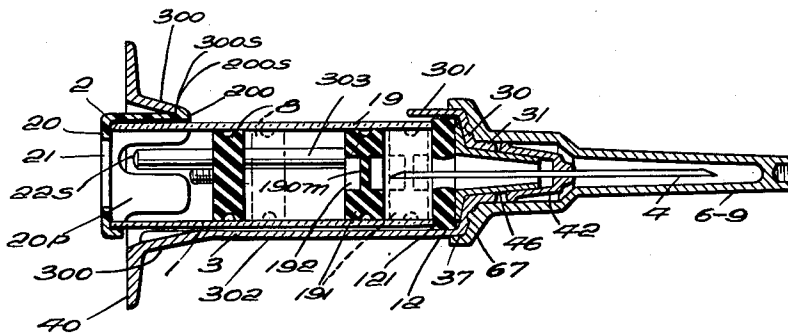


Fig. 13.



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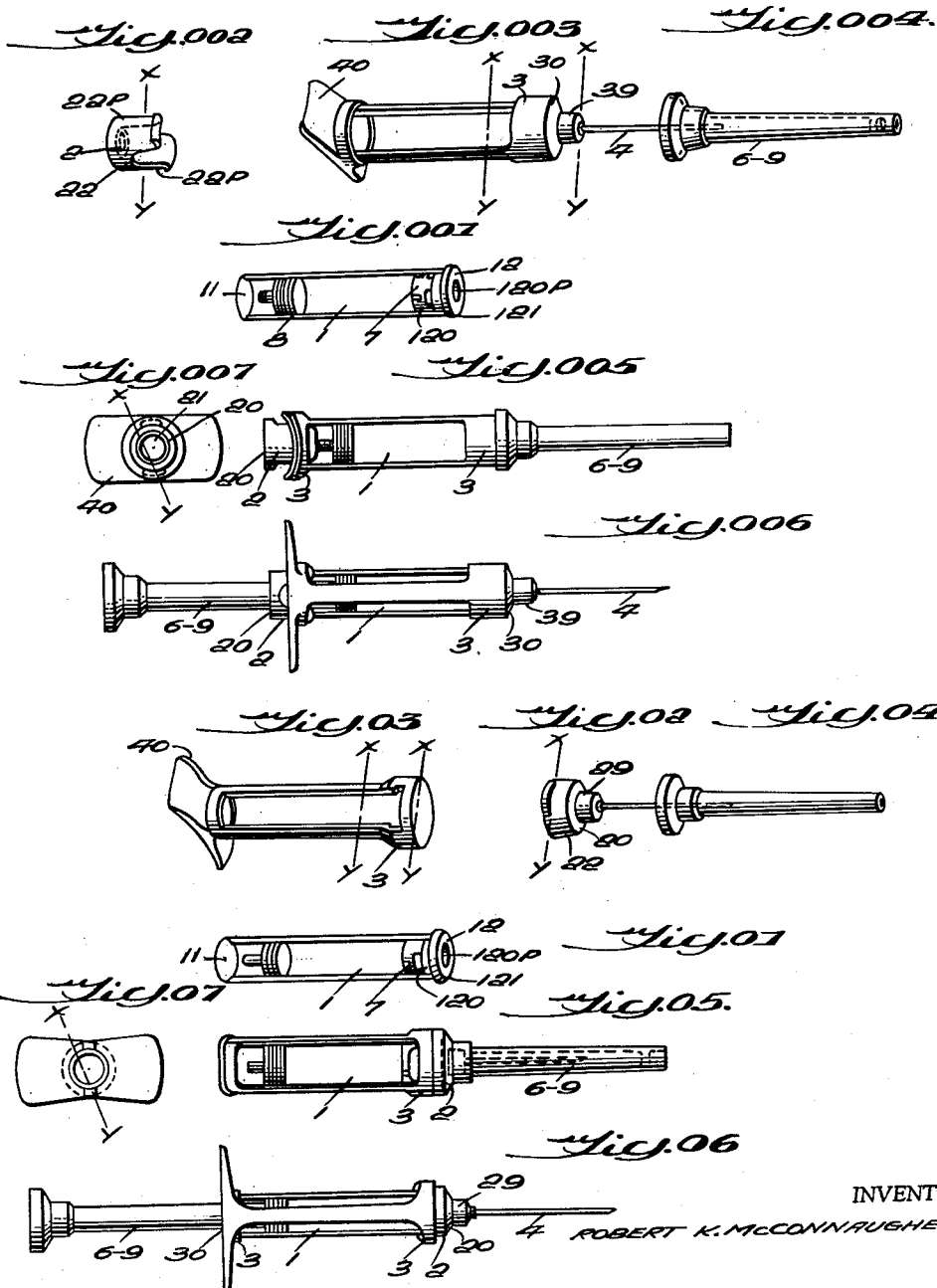
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DISPOSABLE HYPODERMIC SYRINGE

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5 Sheets-Sheet 5



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1

3,084,688
DISPOSABLE HYPODERMIC SYRINGE
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Filed July 15, 1959, Ser. No. 827,196
43 Claims. (Cl. 128-218)

This application relates to disposable hypodermic syringe constructions. Its primary object is to provide a simple and inexpensive disposable hypodermic syringe, which can be cheaply and easily made of low-cost materials, and cheaply and easily assembled by merely pressing the parts together lengthwise, which, when used as a package for medicaments, can be cheaply and easily filled and sealed, and which can be made ready for use and used for administering injections with a minimum of manipulation by the user.

Other objects are to provide a disposable hypodermic syringe:

- (a) The plunger piston of which cannot be withdrawn inadvertently;
- (b) That cannot be tampered with, once it has been filled and assembled, without the fact being evident to the user;
- (c) That provides for visual observation of the results of aspiration at a point in the syringe ahead of the medicament chamber (a feature useful particularly in case the medicament is an opaque or dark colored substance);
- (d) That minimizes the risk of breakage in case the syringe is dropped;
- (e) That permits, although it does not require, the use of a relatively inexpensive barrel of simple cylindrical form instead of the more expensive forms of barrels commonly used in composite disposable syringe structures, in which, in order to attach a hypodermic needle or a sealing gasket, or both, to the cartridge, the basic cylindrical barrel is modified by forming into the material of the barrel an annular groove or neck, or a bead, lip, or flange or some other deviation from the basic cylindrical shape; and
- (f) That utilizes, as the means of holding together components of an enclosed medicament cartridge, a generally cylindrical case composed of a sleeve and a snap cap which snap together and lock when pressed together lengthwise over and around the cartridge so that the end walls of the case bear against the ends of the cartridge, and the case also aids in sealing the cartridge against contaminants, protects it against breakage, provides means of gripping the syringe when it is used and, in some forms of the invention, provides the means for attaching a hypodermic needle to the syringe.

As means for achieving these objects, and other objects which will be apparent from the following description and the accompanying drawings, the invention utilizes what I believe to be novel and useful forms and combinations of syringe components and novel and useful means of fastening such components together into a composite structure adapted to provide all essential elements, and to perform all essential functions, of a disposable hypodermic syringe to be used either as a package for injectable medicaments or as an empty syringe to be filled immediately before use from a separate medicament container.

The accompanying drawings show various embodiments of the invention.

The accompanying drawings show various embodiments of the invention which may be briefly described as follows:

FIGURE 005 shows a side view of a preferred form of the invention, assembled, wherein the snap cap snaps into the case from the rear, the needle is permanently affixed

2

to the barrier at the forward end of the sleeve and the combination needle protective cap and plunger shaft is in position to function as a needle protective cap.

FIGURE 006 shows the form of FIGURE 005 from a position at right angles to that shown in FIGURE 005 and shows the combination needle protective cap and plunger shaft in position to function as a plunger shaft.

FIGURE 007 shows a rear end view of the form of the invention shown in FIGURE 005.

FIGURE 001 shows a cartridge adapted to function in the form of the invention shown in FIGURE 005.

FIGURE 002 shows the snap cap of FIGURE 005 having forward projecting springy prongs adapted to snap inside the rear end of the sleeve.

FIGURE 003 shows the sleeve of FIGURE 005 with the needle permanently affixed.

FIGURE 004 shows the combination needle protective cap and plunger shaft of FIGURE 005.

FIGURE 05 shows a side view of an alternative preferred form of the invention, assembled, wherein the snap cap snaps into the case from the front, and the needle is affixed to the cap instead of to the barrier of the sleeve.

FIGURE 06 shows the form of FIGURE 05 from a position at right angles to that shown in FIGURE 05.

FIGURE 07 shows a rear end view of the form of FIGURE 05.

FIGURE 01 shows a cartridge adapted to function in the form of the invention shown in FIGURE 05.

FIGURE 02 shows the snap cap of FIGURE 05 with the needle affixed to it.

FIGURE 03 shows the sleeve of FIGURE 05.

FIGURE 04 shows the combination needle protective cap and plunger shaft of FIGURE 05.

FIGURE 1 shows in cross section an exploded view of a form of the syringe employing a simple cylindrical barrel wherein the snap cap snaps inside the rear end of the sleeve, the needle is permanently affixed to the sleeve and the sealing means in a hollow elastic stopper with a slit membrane closing its rearward end and adapted to serve as a two way check valve.

FIGURE 2 shows the form of FIGURE 1 assembled.

FIGURE 2a shows a detail of a variant of the form of FIGURE 1 employing a necked barrel.

FIGURE 3 shows in cross section, assembled, a form wherein the snap cap snaps over and around the rear end of the sleeve, the needle is removably attached to the sleeve by means of a tapered Luer type hub, the sealing means is a simple elastic ring gasket and the forward end of the barrel is closed by a reciprocally mounted grooved plug with flexible dams bearing against the wall of the barrel.

FIGURE 3a shows a detail of a variant of FIGURE 3 employing a necked barrel.

FIGURE 4 shows in cross section, assembled, a form wherein the snap cap snaps inside the forward end of the sleeve, the needle is double pointed and permanently affixed to the snap cap by a stretched thin walled nib that grips the needle and the sealing means is a hollow elastic stopper closed at its rearward end by an imperforate membrane adapted to be pierced by the rearward point of the needle when the plunger piston is moved forward.

FIGURE 4a shows a detail of a variant of FIGURE 4 employing a necked barrel.

FIGURE 5 shows in cross section, assembled, a form wherein the snap-cap snaps over and around the outside of the forward end of the sleeve, the needle is permanently affixed to the snap-cap by a rivet, the sealing means is a hollow elastic stopper with an open passage, and the forward end of the barrel is closed by a reciprocally mounted floating separator piston with a perforated membrane closing the central passage through said piston.

FIGURE 5a shows a detail of a variant of FIGURE 5 employing a necked barrel.

3

FIGURE 6 shows, in cross section, assembled, a form in which the snap cap snaps inside the rear end of the case, the needle is double pointed, is removably attached to the forward end of the sleeve by threads, and is adapted to pierce the closure means when the needle hub is screwed fully onto the sleeve

FIGURE 7 shows, in cross section, assembled, a form in which the snap cap snaps inside the rear end of the case, the skirt of the cap has lugs on forward projecting prongs adapted to snap past the rearward end portion of the sleeve and lock the snap cap and the sleeve together, the sealing means is an elastic disk, slit to form a two way check valve, and the needle is permanently molded into the forward end of the case.

FIGURE 8 shows, in cross section, assembled, a form wherein the sealing means is an elastic stopper and the needle is permanently affixed to the stopper, the stopper fitting snugly within a nib projecting forward from the barrier in the sleeve.

FIGURE 9 shows, in cross section, assembled, a form adapted to use as an empty syringe wherein the snap cap snaps inside the forward end of the sleeve, the needle is permanently attached to a separate hub which projects through a hole in the base of the snap cap, and wherein a gasket snugly surrounds a rear segment of the plunger shaft and seals the rear end of the barrel against contamination when the plunger is positioned forward in the barrel, which is calibrated

FIGURE 10 shows in cross section, assembled, a form wherein the snap cap has forward projecting prongs of springy material and is adapted to snap into the rear end of the sleeve, the cartridge is slidably mounted in the case, the needle is double pointed and permanently affixed to the barrel at the forward end of the sleeve in position to puncture the solid elastic closure member when the cartridge is pressed forward in the case of forward pressure against the snap cap

FIGURE 11 shows in cross section, assembled, a variant of the form of FIGURE 10 wherein the barrel is necked and the double pointed needle is permanently affixed to a separate skirted hub, slidably mounted over the forward end of the barrel, the needle being adapted to puncture the closure of the barrel when the cartridge is pressed forward in the barrel by forward pressure against the snap cap.

FIGURE 12 shows in perspective the components of a variant of the form shown in FIGURE 10 having an integrally moulded bead and groove gasket on the forward end of the sleeve and the rearward face of the needle protective cap.

FIGURE 13 shows in cross section, assembled, a form wherein the snap cap has forward projecting prongs and snaps into the sleeve from the rear; the needle is double pointed and removably attached to a tapered Luer type tip projecting from the barrier of the sleeve at the forward end, and is adapted to pierce the membrane of a sliding membrane piston separator that closes the forward end of the barrel, the sealing means being an elastic ring gasket.

A basic and common element of all the forms shown is the arrangement whereby a tubular cartridge having a piston reciprocally mounted therein and elastic sealing means bearing against its forward rim is held clamped within a case composed of (1) a generally cylindrical sleeve, having two cylindrical end portions connected by two or more longitudinal bars or straps, and a barrier or wall at one end, which bears against one end of the cartridge and (2) a cup-shaped cap, the base of which bears against the other end of the cartridge, the cap being telescoped with the sleeve, and snap-fastened to it by the interlocking of shoulders formed by lugs projecting from the skirt of the cap that snap past the adjacent end portion of the sleeve when the sleeve and the cap are pressed together lengthwise and snap-lock behind matching but oppositely facing shoulders on the sleeve formed by seg-

4

ments, between the longitudinal straps, of the inner edge of one end portion of the sleeve, the case thus formed not only holding the cartridge in the case, but also serving as the means of holding firmly together components of the cartridge which otherwise would not be irremovably attached to the cartridge. The skirt of the cap or the end portion of the sleeve, or, preferably, both, are made of springy material and so shaped and dimensioned that when the cap is telescoped with the sleeve they are readily deflected in relation to each other so that the lugs on the cap snap past the end portion of the sleeve and snap-lock behind the inner rim of the end portion of the sleeve between the longitudinal straps.

The variants shown in the drawings include detailed adaptations of the basic structure to accommodate different means of affixing a hypodermic needle to syringes made according to the teachings of the invention; different forms and relative placements of the snap cap that locks the components together; variants in the form of the sealing ring gasket that serves as the basic means of sealing the junction of the barrel and the surrounding case; different means of closing the forward end of the barrel in the case of syringes to be used as a medicament package, as well as different means of opening the closure and brining the channel of the needle into communication with the medicament chamber of the cartridge when the packaged medicament is to be ejected; and alternative provisions for aspiration into a clear space ahead of the packaged medicament.

As will be apparent from the drawings and the description, in all these variants, the components are held together in a composite unit according to the teachings of the invention by a case composed of a cap snapped into or over one end of a generally cylindrical sleeve and fastened to the sleeve by the interlocking of shoulders on the cap with oppositely facing shoulders on the sleeve formed by segments of the inner rim of the end portion of the sleeve between the longitudinal straps of the sleeve.

Each of the drawings shows several of these differing elements combined to make one of the numerous possible variants of the basic structure. These elements are interchangeable and, as will be evident upon study of the drawings and the description, can be used in combinations different from those shown in the several drawings, which are merely illustrative. For example, any of the several forms of needle attachment may be used with any of the four alternative placements of the locking snap-cap which, as will appear, may be telescoped inside the rear end of the sleeve, over and around the rear end of the sleeve, inside the forward end of the sleeve, or over and around the forward end of the sleeve. Similarly, the different forms of sealing means and closure means shown, including the reciprocally mounted slit membrane separator or the reciprocally mounted grooved venting plug, may be used in combination with elements other than those shown in the particular figure in which they are illustrated. Other combinations of the elements shown will be evident to persons acquainted with the art.

In order to facilitate understanding of the drawings, in view of the interchangeability of the elements composing the particular combinations illustrated, the reference hereafter to each of the drawings briefly describes the distinguishing components of the particular combinations illustrated in the drawing and identifies them by their numerical designation in the drawings. Where the same element appears in different figures it is given the same number in all figures in which it appears. Although the sleeve and the interlocking snap-cap may be made either of the same or of different materials, they are consistently identified in the cross section drawings by different material markings, which are used merely to distinguish them from each other and not to indicate or limit the material of which they may be made. Each of them may be made of any material that is capable of being shaped

or fabricated into the forms shown, and sufficiently rigid and flexible to perform the functions described.

In each of the forms shown in the drawings, as functions described.

In each of the forms shown in the drawings, as using a barrel of simple cylindrical form, a barrel having an annular groove 1g adjacent its forward end, forming a neck and a lip 1-L as illustrated in FIGURES 2a and 4a, or having a neck 1-n at its forward end as illustrated in FIGURES 3a and 5a, may be used instead.

As used in this application the "forward end" means the end of the syringe where the sealing means of the cartridge is located and from which the hypodermic needle projects outward from the syringe. The "rearward end" means the opposite end from the forward end as defined immediately above. "Forwardly" and "forward" mean towards the forward end as here defined, and "rearwardly" and "rearward" mean towards the rearward end as here defined.

The general features of the invention are illustrated in the drawings grouped under the designations 001-007 and 01-07. Details of variants of these basic forms are shown in cross section by FIGURES 1-12 and 14 and in an exploded view of one form, FIGURE 13.

The drawings grouped as FIGURES 001-007 show an exploded view and elevations from each side, and the rear, of a preferred form of the invention wherein a snap-cap 2, the skirt 22 of which has prongs 22p, is snapped into the rear end of the sleeve 3, a hypodermic needle 4 is permanently affixed to a nib 39 projecting forward from the barrier 30 of the sleeve, and the cartridge 11 has a simple cylindrical barrel 1, sealing means consisting of a stopper 120 with a flange 121 and an open passage 120p, and closure means consisting of a grooved venting plug 7 similar to that shown in cross section in FIGURE 3. The lines X-Y indicate the approximate plane of the cross section views shown in FIGURES 1-12 and 14.

FIGURE 001 shows the cartridge 11 with the sealing means 12, closure means 7 and plunger piston 8 in place in the barrel 1.

FIGURE 002 shows the locking snap cap 2.

FIGURE 003 shows the sleeve 3 with the needle 4 attached to it.

FIGURE 004 shows the combination needle protective hood and plunger shaft 6-9.

FIGURE 005 shows a side elevation from the open side, with the combination needle protective hood and plunger shaft (6-9) in place as a protective hood over the needle.

FIGURE 006 shows a side elevation at right angles to the view of FIGURE 005. In FIGURE 006 the combination needle protective hood and plunger shaft (6-9) has been removed from its needle protective position and attached to the plunger piston preparatory to operation of the syringe.

FIGURE 007 shows a rear end view of the syringe.

The drawings grouped as FIGURES 01-07 show exactly comparable views of a preferred alternative form of the invention which is similar to that shown in figures of the 000 series just described except that the snap-cap 2 snaps into the forward end of the sleeve 3 instead of into the rear end, and the hypodermic needle 4 is permanently affixed to a nib 29 projecting forward from the base 20 of the forward-mounted snap-cap 2 instead of from the barrier of the sleeve.

FIGURE 1 shows an exploded view of one form of the invention employing a simple cylindrical barrel 1 wherein:

(a) The snap-cap 2 with a passage 21 through its base 20 telescopes inside the rearward end of the sleeve 3, the lugs 200 on the cap being on the outside of the cap skirt 22, and interlocking with shoulders 300s formed by segments, between the longitudinal straps 302 and 303,

of the forward rim of one end portion 300 of the sleeve 3;

(b) The hypodermic needle 4 extends through a cylindrical elastic plug 45 located in the passage 31 of the barrier 30 of the sleeve 3 and is permanently attached to the forward end of the sleeve 3 by an adhesive substance 5 interposed between the needle 4 and the interior wall of the passage 31 through the barrier 30 at the forward end of the sleeve;

(c) The sealing means 12 is a hollow stopper 120 having an outwardly directed flange 121, the passage 120p of the stopper being closed by a slit membrane 120ms adapted to act as a two-way check valve, and;

(d) The needle protective hood 6 is adaptable to use as a plunger shaft 9 as shown by broken lines.

FIGURE 2 shows, in cross section, the form of FIGURE 1 assembled.

FIGURE 3 shows, in cross section, a form which is similar to FIGURE 1 and 2 except that:

(a) The snap-cap 2 telescopes over and around the rearward end of the sleeve 3, the lugs 200 on the cap being on the inside of the cap skirt 22;

(b) A hypodermic needle 4, affixed to an internally tapered hub 42, is removably attached to an externally tapered Luer type tip 32 on the barrier 30 at the forward end of the sleeve 3;

(c) The sealing means 12 is a simple ring gasket 121;

(d) The forward end of the barrel 1 is closed by a reciprocally mounted, longitudinally grooved plug 7 having elastic dams 72 which close the passage formed by the grooves 71 between the plug and the wall of the barrel 1; except when, as shown by the broken lines, the dams are deflected, by pressure generated by activation of the plunger piston 8.

FIGURE 4 shows a form which is similar to FIGURE 1 and 2 except that:

(a) The snap-cap 2 telescopes inside the forward end of the sleeve 3, the lugs 200 on the cap 2 being on the outside of the cap skirt 22;

(b) A double pointed hypodermic needle 4 is permanently attached to the cap 2 by means of a stretched, thin walled nib 23 projecting forward from the base of the cap 2, the stretched walls 231 of the nib gripping and holding the needle 4;

(c) The sealing means 12 is a hollow elastic stopper 120, having an outwardly directed annular flange 121, the passage 120p of the stopper being closed by an impermeate membrane 120m so positioned that the rearward point 41 of the needle 4 will puncture the membrane 120m when forward movement of the plunger piston 8 balloons the membrane 120m forward.

FIGURE 5 shows a form which is similar to FIGURES 1 and 2 except that:

(a) The snap-cap 2 telescopes over and around the forward end of the sleeve 3, the lugs 200 on the cap being on the inside of the cap skirt 22;

(b) A single pointed hypodermic needle 4 is permanently attached to the cap 2 by means of a hollow rivet 10 surrounding and gripping the needle, the outturned flanges 10f of the rivet overlapping and gripping the edges of the passage 21 through the base 20 of the cap 2;

(c) The sealing means 12 is a hollow elastic stopper 120 having an outwardly directed annular flange 121, the passage 120p through the stopper being open;

(d) The forward end of the barrel 1 is closed by a reciprocally mounted floating separator piston 19 with a perforated membrane 190mp closing its central cylindrical passage 190p, the membrane being adapted to function as a two-way check valve;

FIGURE 6 shows a form of the invention which is similar to FIGURES 1 and 2 except that:

(a) A double pointed hypodermic needle 4 is removably attached to a threaded nib 34 projecting forward from the barrier 30 at the forward end of the sleeve 3, by means of a hub 44 which has internal threads 44t;

matching the external threads 34*t* of the nib 34 and which is screwed onto the nib;

(b) The sealing means 12 is a hollow elastic stopper 120 having an outwardly directed annular flange 121, the central passage 120*p* of the stopper being closed by an imperforate membrane 120*m*;

(c) The rearward point 41 of the needle is so positioned that it will pierce the membrane 120*m* of the stopper 120 when the hub 44 is screwed fully onto the nib 34.

FIGURE 7 shows a form of the invention which is similar to FIGURES 1 and 2 except that:

(a) The snap cap 2, which telescopes inside the rearward end of the sleeve 3 as in FIGURES 1 and 2, has longitudinal slots 22*s* in the skirt, which accordingly, consists of prongs 22*p* projecting between the slots, the locking lugs 200 being on the outside of the prongs 22*p*;

(b) A single pointed hypodermic needle 4 is molded permanently into a nib 35 projecting forward from the barrier 30 at the forward end of the sleeve;

(c) The sealing means 12 is an elastic disk 123 with a slit 123*s* through its center, the slit disk being adapted to serve as a two-way check valve.

(d) The rearward face of the thumb button flange 60 on the needle protective hood 6 has an annular groove 66 and the forward face of the barrier 30 has an annular bead 36 that fits snugly in the groove 66 in the hood to form a gasket which seals the junction of the hood and the case;

(e) The nib 35 has external threads 35*t* that match internal threads 65*t* on the hood to provide a screw-on attachment of the protective hood 6 to the syringe.

FIGURE 8 shows a form of the invention which is similar to FIGURES 1 and 2 except that:

(a) The sealing means 12 is an elastic stopper 120 having an outwardly directed annular flange 121 and a tubular nib 120*n* projecting forward beyond the flange 121;

(b) A hypodermic needle 4 extends through the stopper 120 and is fixed therein by an adhesive substance 5 in the passage 120*p* between the wall of the nib 120*n* of the stopper and the segment of the needle 4 surrounded by the nib 120*n*;

(c) The nib 120*n* of the stopper 120 fits snugly within the passage 31 through a forward projecting nib 36 on the barrier 30 of the sleeve 3.

FIGURE 9 shows a form of the invention which is similar to FIGURES 1 and 2 except that:

(a) The snap-in cap 2 telescopes inside the forward end of the sleeve 3 as in FIGURE 4, the locking lugs 200 being on the outside of the cap skirt 22;

(b) A hypodermic needle 4 is mounted in a separate hub 45 which, in turn, projects forward through the passage 21 in the base 20 of the cap 2 and is held firmly in position there;

(c) The plunger shaft 9 is permanently attached to the plunger piston 8 and has a segment 91 adjacent the thumb button 90 that fits snugly within an elastic gasket 13 sealing the rear end of the barrel 1 when the plunger shaft 9 is pushed fully, or almost fully, forward, and is so shaped forward of said segment (as by having a flat surface 92 on one side, as shown in the drawing, or a longitudinal groove, or a reduced diameter), that when the plunger shaft 9 is drawn rearward, the seal between the gasket 13 at the rear end of the barrel 1 and the plunger shaft 9 is vented; and

(d) The barrel 1 is calibrated 14 to show the volume of the chamber within the barrel at various points along its length.

FIGURE 10 shows a form of the invention which is similar to FIGURES 1 and 2 except that:

(a) The sealing means 12 is an elastic stopper 120 having an outwardly directed annular flange 121. A nib 126 projecting forward from the stopper is shown. Such

a nib is useful but not necessary to the effective functioning of this form of the invention;

(b) The cartridge 11 is slidably mounted within the case 3, the forward end of the cartridge 11 fitting snugly but slidably within the cylindrical forward end portion 301 of the sleeve 3;

(c) A double pointed hypodermic needle 4 is permanently affixed to the end of the sleeve adjacent the sealing means 12 of the cartridge 11 with the rearward point 41 of the needle projecting rearward to a position where it is in proximity to but does not pierce through the rearward face of the stopper 120 unless the cartridge is pushed fully forward in the sleeve, whereupon the rearward point 41 of the needle pierces through the stopper 120 and brings the channel 42 of the needle 4 into communication with the medicament chamber 111 inside the cartridge 11;

(d) The snap-cap 2 which telescopes inside the rearward end of the sleeve 3, as in FIGURES 1 and 2, has two sets of lugs 200 and 200*a*, each projecting outwardly from the skirt 22 of the cap 2, each of the forward lugs 200 being so positioned that when the shoulder 200*s* formed by its rearward face is interlocked with the matching shoulder 300*s* at the rear end of the sleeve 3, the rearward point 41 of the needle is in proximity to but does not pierce through, the rearward face of the stopper 120, each of the rearward lugs 200*a* being so positioned that when they are snapped past the rearward end portion of the sleeve so that the shoulders formed by the rearward face of the rearward lugs are interlocked with the matching shoulder 300*s* at the rear end of the sleeve 3, the rearward point 41 of the needle 4 pierces through the stopper 120 into the chamber 111 of the cartridge 11; and

(e) There may be an annular bead 301*b* inside the wall of the forward end portion 301 of the sleeve 3 adapted to impede forward movement of the cartridge 11 except when the cap 2 is pressed forward by the user.

FIGURE 11 shows a form of the invention which is similar to FIGURES 1 and 2 except that:

(a) The barrel 1 of the cartridge 11 is of the kind commonly used for medicament cartridges, having a neck 1-*n* adjacent one end and an elastic sealing means 12 fastened to the barrel, at the end of the barrel adjacent the neck, by a cup-shaped seal 14. A forward projecting nib 126 on the elastic sealing means is shown, surrounding a portion of the hypodermic needle 4. Such a nib is useful but not necessary to the effective functioning of this form of the invention;

(b) A double pointed hypodermic needle 4 is affixed to a skirted hub 15, the skirt 151 of the hub being snugly and slidably mounted over and around the forward end of the cartridge 11, a forward-projecting nib 152 of the hub projecting forward through a passage 31 in the barrier 30 at the forward end of the sleeve 3;

(c) A protective hood 6 is removably mounted on the nib 152 of the hub 15 and covers the forward projection 43 of the needle 4;

(d) The plunger shaft 9 is removably mounted on the case 3 over and around the protective hood 6;

(e) A snap-in cap 2 with a slotted (22-S) skirt 22 is telescoped inside the rearward end of the sleeve 3, and has two sets of outwardly projecting lugs 200 and 200*a* on the prongs 22*p* of the cap, between the slots 22*s*, the forward set 200 of lugs being so positioned that when the cap is snapped into the sleeve to the point where the shoulders 200*s* formed by the forward lugs 200 interlock with matching but oppositely facing shoulders 300*s* on the sleeve 3, the rearward point 41 of the needle 4 is in proximity to but does not pierce through the rearward face of the sealing means 12, the rearward set 200*a* of lugs being so positioned that when they are snapped past the rearward end portion of the sleeve so that the shoulders 200*a*s formed by the rearward lugs 200*a* interlock with the matching shoulders 300*s* of the sleeve, the rear-

ward point 41 of the needle 4 pierces through the sealing means 12 into the chamber 111 of the barrel 1.

FIGURE 12 shows an exploded view of a form of the invention similar to the form shown in FIGURE 10 except that:

(a) There is no rearward set of lugs 200a on the cap skirt 22;

(b) The barrel 1 is necked (1-n) at the forward end; and

(c) The rearward face of the thumb button 60 on the needle protective hood 6 has an annular bead 67 and the forward face of the barrier 30 has an annular groove 37 that fits snugly over the bead 67 to form a gasket that seals the junction of the hood and the case.

FIGURE 13 shows a form of the invention which is similar to FIGURES 1 and 2 except that:

(a) A separate Luer type tapered nib 46 projects through and is affixed to the barrier 30 in the same manner as the hub 45 with needle attached is affixed in FIGURE 9, and a double pointed needle 4, attached to a separate internally tapered Luer type hub 42, is removably attached over the nib 46;

(b) The sealing means 12 is an annular sealing ring gasket 121;

(c) The forward end of the barrel is closed by a reciprocally mounted floating separator piston 19 consisting of an annulus 191 having a central cylindrical passage 192 with an imperforate membrane 190m closing said passage;

(d) The rearward point 41 of the needle 4 is so positioned that when the separator piston 19 is moved fully forward in the barrel 1, the rearward point 41 of the needle will pierce through the membrane 190m.

As will be evident from the drawings and the foregoing summary descriptions, the basic common elements of all forms of the invention shown are (a) a cartridge 11 consisting of a generally cylindrical barrel 1 with a plunger piston 8 reciprocally mounted in it, and an elastic sealing means 12 bearing against its forward rim; (b) a generally cylindrical sleeve 3 surrounding the cartridge, said sleeve having two generally cylindrical end portions 300 and 301 connected by two or more parallel longitudinal bars or straps 302 and 303, the segments of the inner edge of one of such end portions 300, between the connecting straps 302 and 303, forming shoulders 300s which match, but face in the opposite direction from shoulders 200s formed by lugs 200, on the snap cap 2, hereafter described, and said sleeve having also, at the outer end of the other end portion 301, an intumed annular wall or barrier 30 with a central passage 31 through it, said wall or barrier bearing against the adjacent end of the cartridge; and (c) a cup-shaped cap 2 snapped into or over and around the sleeve 3 at the opposite end of the sleeve from the wall or barrier 30, there being a central passage 21 through the base 20 of the cap 2, the base of the cap bearing against the end of the cartridge remote from the barrier and there being two or more lugs 200 on the skirt 22 of the cap adapted to snap past the adjacent end portion of the sleeve when the sleeve and the cap are telescoped together, the face of each lug 200 remote from the rim of the skirt forming a shoulder 200s which interlocks with one of the matching but oppositely facing shoulders 300s formed by the inner edge of the adjacent end portion 300 of the sleeve 3 when the snap-cap is snapped into or over and around the end of the sleeve, thereby fastening the sleeve 3 and the cap 2 together, encasing the cartridge, and, with the barrier 30 of the sleeve 3 and the base 20 of the cap 2 bearing against opposite ends of the cartridge, holding firmly together the cartridge barrel 1 and all components of the cartridge located at the end of the barrel where the elastic sealing means 12 bears against the rim of the barrel.

The snap cap 2 may be telescoped with, and snap-fastened to the sleeve 3 either at the forward end or at the rearward end of the sleeve. Both the barrier of the

sleeve and the base of the cap are adapted to serve as locations for any of the several means shown of attachment of a hypodermic needle. The needle attachment means will always be at the forward end. Accordingly, such means will be located on or adjacent the base of the cap in those forms wherein the cap is snap-fastened to the sleeve at the forward end, whereas, in those forms wherein the cap is snap-fastened to the sleeve at the rearward end, the needle attachment means will be located on or adjacent the barrier of the sleeve.

The passage 21 through the base 20 of the cap 2 or the passage 31 through the barrier 30 of the sleeve 3, whichever is placed at the rearward end, provides for access of the plunger shaft 9 to the attachment means 81 on the plunger piston 8 and the walls of the passage serve as a guide to the plunger shaft, minimizing lateral wobble of the shaft. The barrier 30 of the sleeve 3 or the base 20 of the cap 2, whichever is placed at the rearward end of the syringe, projects inwardly over the rear rim of the barrel 1 and prevents the barrel from moving rearwardly out of the case and may also extend inward beyond the rim of the barrel so as to prevent inadvertent withdrawal of the plunger piston from the barrel when aspirating.

The gripping means 40 projecting laterally from the case, preferably at or towards the rearward end, may be either on the snap-cap 2 (as shown in FIGURE 3), or, on the sleeve 3 (as shown in each of the other figures). The gripping means 40 may, if desired, to save weight or material cost, or for other reasons, be of thin cross section, with the edges turned either forward or rearward to provide stiffness.

The parallel straps or bars 302 and 303 that connect the end portions 300 and 301 of the sleeve 3 need not be either very wide or very thick. Relatively thin and narrow strips perform adequately the function of holding the components together. The cartridge, held firmly between the barrier of the sleeve and the base of the snap-cap, provides adequate stiffness.

The side wall of the forward end of the case (the inner surface of the forward portion 301 of the sleeve when the snap-cap is attached at the rear end of the sleeve, and the inner surface of the skirt 22 of the cap when the cap is attached at the forward end of the sleeve) snugly surrounds the forward end of the cartridge and seals out contaminants from the area adjacent the junction of the case, the needle, and the sealing means of the cartridge, except in the case of the form shown in FIGURE 11 and its variants, wherein the hub skirt 151 performs this function. In all the forms using an elastic sealing ring without a connector seal, the outer perimeter of the elastic sealing ring, or flange, affords a tight seal against the side wall of the case. When a cup-shaped connector seal 14 (FIGURE 11) is used over the sealing means, it is preferable to make the surrounding sleeve of a relatively soft or flexible material, or of thin section if a stiffer material is used, in order to permit the wall surrounding the forward end of the cartridge to adapt itself to the contours of the cartridge and so to form a seal around the end of the cartridge.

One of the advantages of the invention is that the identical sleeve 3, snap-cap 2, and combination needle protective hood 6 and plunger shaft 9 may be used, with different forms of needle attachment and different forms of sealing and closure means, to make a variety of distinctively different syringes. Thus the maker can form those three components with one basic set of molds or dies and, by varying the elements combined with them, meet the differing requirements of users who wish different syringes without multiplication of tooling costs.

For example, using a plain cylindrical barrel 1, a sleeve 3 with the barrier 30 at the forward end, a pronged (22p, FIGURE 7) snap-cap 2 snapped inside the sleeve at the rear (as in FIGURES 1 and 2) and a suitable combination plunger shaft and needle protective hood 6 and 9, syringes with any of the needle attachments shown in

FIGURES 1 and 2, 8, 9, 10 and 13 could be made without change in any of the four components mentioned. In addition, with any of these combinations any of the sealing or closure means shown in FIGURES 1 and 2, 3, 4 (using a double pointed needle) 5, 7, 8, 9 and 13 could be used. By substituting only a longer skirted snap cap with either one or two sets of locking lugs, suitably positioned, the syringes shown in FIGURES 10, 11 and 12 could also be made, still using the same basic sleeve and needle protective hood. This adaptability to wide variation in ultimate product without multiplication of tooling cost for the basic components can be utilized to meet widely varied needs and to reach a broad and diversified market at minimum manufacturing cost. A comparable range of products could be made from basic components so designed that the snap cap would snap over and around the rear end of the sleeve rather than inside of it. Similarly, a comparable variety of products could be made, using a common form of sleeve and a common basic snap-cap, adapted to be snap-fastened to the sleeve at the forward end either inside or outside, with any of the various needle attachments mentioned affixed to the base of the forward mounted cap rather than to the barrier of the sleeve.

Filling and assembly of syringes made in accordance with the invention is very simple, especially so when a simple cylindrical barrel is used. The barrel 1, with the plunger piston 8 in place is filled with the required quantity of medicament. The cartridge may then be closed if desired by applying to or through the open end of the barrel, as a stopper or plug, any of the various closure means shown (except the disk shown in FIGURE 7). Thereafter the sleeve and the snap-cap with the needle attached and covered by the protective hood, may be telescoped together over and around the filled and sealed cartridge until the lugs on the snap-cap snap past the adjacent end portion of the sleeve and interlock with the shoulders formed by the inner rim of the end portion of the sleeve between the longitudinal straps, thereby fastening the parts together and completing the assembly.

As an alternative (except in the case of the reciprocally mounted closure means shown in FIGURES 3, 5 and 13 and in case of the reciprocally mounted cartridges shown in FIGURES 10, 11 and 12), the sealing or closure means may be first placed in the sleeve or cap, adjacent the needle attachment means, being pressed into or against the forward end of the filled but open cartridge as the sleeve and the cap are telescoped together until the lugs on the skirt of the snap-cap snap behind the shoulders of the sleeve and interlock to fasten the parts together.

Ejection of the contents is accomplished merely by removing the protective hood, attaching it to the plunger piston and pressing it forward. The forms shown in FIGURES 1 and 2, 3, 4, 5, 7, 8, 9 and 13 are self-venting and require no preliminary manipulation. In the form shown in FIGURE 6, the hub is screwed fully down to vent the closure, and in forms shown in FIGURES 10 and 11 and 12, the cap 2 is pushed forward to vent the closure.

Once the shoulders on the snap-cap have snapped past the adjacent end portion of the sleeve, and have locked behind the shoulders formed by the segments of the inner rim of the end portion between the longitudinal straps, the syringe cannot be disassembled without evident damage to the interlocked structure. A self-shrinking plastic band, an adhesive wrap, a blown on plastic film seal, or any other suitable sealing means may be used around the juncture of the protective hood 6 and the case to make it impossible to remove the protective hood without the fact that it has been removed being evident.

The barrel is well protected by the surrounding case against damage. Although the relatively narrow straps 302 and 303 leave open for visual observation a large area of the barrel, the ends of the case form annular ridges which, along with the gripping means, projecting laterally at the rear of the case, prevent any direct impact against

the barrel if it is dropped on a flat surface. Moreover, the elastic ring of the sealing means buffers the barrel against shocks. Thus the barrel is well shielded by the case against all impacts except a direct blow against the exposed portion of the barrel by some protruding object.

The elastic sealing ring 121 is adapted to compensate for variations in the length of the barrel within reasonable limits of production tolerances. Thus, even though there may be some variance in the length of the barrels, by making the sealing ring relatively thick, longitudinally, the difference may be absorbed by the elastic material of the sealing ring and a tight seal and a firm assembly of the parts may be achieved using stock components without need for selection of matching parts, or maintaining unduly close tolerances in the dimensions of the parts.

Having thus fully described my invention, what I claim is:

1. A disposable hypodermic syringe construction consisting of a generally cylindrical case surrounding a tubular cartridge, the cartridge having a tubular barrel, a plunger piston reciprocally mounted in the barrel, closing one end thereof, and elastic sealing means bearing against the rim of the barrel at the other end thereof, means for attachment of a plunger shaft to the plunger piston and a plunger shaft which is adapted to attachment to the plunger piston attached to said syringe, the case consisting of (a) a sleeve, having two generally cylindrical end portions connected by two or more longitudinal straps and an internally directed annular wall forming a barrier at one end of the sleeve, there being a passage through the barrier, and (b) a generally cup-shaped cap, having a resilient skirt, telescoped with and snap-fastened to the sleeve at the other end thereof, the sleeve and the cap forming the case and enclosing the cartridge, there being a passage through the base of the cap and two or more lugs projecting laterally from the skirt of the cap, the face of each lug remote from the rim of the skirt forming a shoulder, the cap being attached to the sleeve by means of the interlocking of such shoulders with matching but oppositely facing shoulders, formed by segments, located between the longitudinal straps, of the inner rim of the cylindrical end portion of the sleeve adjacent the cup-shaped cap, said adjacent end portion of the sleeve and said skirt of the cap being adapted to be deflected sufficiently in relation to each other, when telescoped together, to permit said lugs to snap past said end portion of said sleeve and interlock with the shoulders formed by said segments of the inner rim of the sleeve, means for attachment of a hypodermic needle and for removable attachment of a protective hood at the end of the syringe adjacent the sealing means of the cartridge, a protective hood removably attached to the syringe and means for gripping the syringe projecting laterally outward from the case.

2. The construction of claim 1 wherein the lugs on the cap project outward from the skirt of the cap and the cap snaps into the sleeve at the end thereof remote from the sealing means of the cartridge.

3. The construction of claim 1 wherein the lugs on the cap project inward from the skirt of the cap and the cap snaps over and around the sleeve at the end thereof remote from the sealing means of the cartridge.

4. The construction of claim 1 wherein the lugs on the cap project outwardly from the skirt of the cap and the cap snaps into the sleeve at the end thereof adjacent the sealing means of the cartridge.

5. The construction of claim 1 wherein the lugs on the cap project inward from the skirt of the cap and the cap snaps over and around the sleeve at the end thereof adjacent the sealing means of the cartridge.

6. The construction of claim 1 wherein a hypodermic needle is attached to the case at the end thereof adjacent the sealing means of the cartridge.

7. The construction of claim 6 wherein there is reciprocally mounted within the barrel of the cartridge, be-

tween the plunger piston and the sealing means, a floating membrane piston separator consisting of an annulus with a central cylindrical passage, the passage being closed by a membrane, and wherein said hypodermic needle is pointed at both ends, the rearward point of said needle being adapted to pierce through said membrane when said separator is positioned as far forward in said barrel as it will go.

8. The construction of claim 6 wherein said hypodermic needle is pointed at both ends, the forward end projecting beyond the case, the rearward end projecting into the space surrounded by the cylindrical forward end portion of the case, said forward end portion of the case snugly but slidably surrounding the end of the cartridge where the sealing means is located, and wherein the base of said cup-shaped cap bears against the rearward end of the barrel, said shoulders on the cap and said matching shoulders on the sleeve being so positioned in relation to each other and the length of the cartridge and the sleeve that when the cap and the sleeve are telescoped together to the point where the shoulders on the cap and the matching shoulders of the sleeve are interlocked the rearward point of the needle is in proximity to but does not pierce through the inner face of the sealing means of the cartridge and when the cap is pressed forward to the point where the forward end of the cartridge abuts the inner face of the forward wall of the case, the rearward point of the needle penetrates through the sealing means into the chamber of the barrel.

9. The construction of claim 6 wherein the hypodermic needle is permanently attached to the case.

10. The construction of claim 9 wherein the hypodermic needle is molded into the case at the end thereof adjacent the sealing means of the cartridge and projects forward through and beyond the end of the case.

11. The construction of claim 9 wherein the hypodermic needle extends through a longitudinal passage in a thin-walled tubular nib of stiff but moderately elastic material projecting longitudinally forward from the end of the case adjacent the sealing means of the cartridge, the diameter of said passage being less than the diameter of the needle, the wall of the nib surrounding the needle being stretched and gripping and holding the needle firmly in said passage.

12. The construction of claim 8 wherein the hypodermic needle is affixed to a generally cylindrical hub, said hub projecting through the passage in the end of the case adjacent the sealing means of the cartridge and being permanently attached to the case.

13. The construction of claim 9 wherein the means of attachment of the needle to the case consists of a hollow rivet surrounding and gripping the needle, the out-turned flanges of the rivet overlapping and gripping the edges of the passage through the end of the case adjacent the sealing means of the cartridge.

14. The construction of claim 9 wherein the hypodermic needle projects forward through and beyond a passage in the end of the case adjacent the sealing means of the cartridge and is attached to the case by an adhesive substance interposed between the outer surface of the segment of the needle within said passage and the inner surface of said passage.

15. The construction of claim 14 wherein the needle extends through an elastic plug, said plug projecting into the passage in the end of the case.

16. The construction of claim 1 wherein a hypodermic needle is removably attached to the case at the end thereof adjacent the sealing means of the cartridge.

17. The construction of claim 16 wherein the means for attachment of a hypodermic needle consists of a tapered nib projecting longitudinally from the case at the end thereof adjacent the sealing means of the cartridge, said nib being adapted to removable attachment of a

matching, internally tapered hub to which a hypodermic needle is affixed.

18. The construction of claim 16 wherein the means for attachment of a hypodermic needle consists of a threaded nib projecting longitudinally from the case at the end thereof adjacent the sealing means of the cartridge, said nib being adapted to removable attachment of a matching threaded hub to which a hypodermic needle is affixed.

19. The construction of claim 18 wherein the sealing means of the cartridge is an annular elastic flange projecting laterally outward from an elastic stopper, the shaft of which projects into the barrel of the cartridge, said stopper having a central cylindrical passage and a membrane closing said passage, a threaded hub, to which a double pointed hypodermic needle is affixed, attached to the case, one end of the needle being adapted to pierce the membrane when the hub is screwed fully onto the threaded nib on the case.

20. The construction of claim 1 wherein there are two or more longitudinal slots in the skirt of the cap, said skirt consisting of two or more prongs, the lugs being located on said prongs.

21. The construction of claim 1 wherein the sealing means of the cartridge is an elastic sealing ring gasket interposed between the rim of one end of the barrel and the inner face of one end of the case.

22. The construction of claim 21 wherein the sealing ring gasket is an annular flange projecting laterally outward from an elastic stopper, the shaft of which projects into the barrel of the cartridge, said stopper having a central cylindrical passage.

23. The construction of claim 22 wherein an elastic membrane closes the central cylindrical passage in the stopper and one end of a double pointed hypodermic needle, attached to the end of the case adjacent said stopper, projects into the central passage in the stopper in position to penetrate through the membrane when the membrane is ballooned forward by pressure of the contents of the barrel as the plunger piston is moved within the barrel toward the stopper.

24. The construction of claim 22 wherein the stopper has a tubular nib projecting into the passage in the adjacent end of the case and snugly surrounded by the wall of said passage, a hypodermic needle extending through the stopper and affixed to the stopper by means of an adhesive substance interposed between the inner surface of the tubular nib of the stopper and the segment of the needle surrounded by said tubular nib.

25. The construction of claim 22 wherein an elastic membrane closes the central cylindrical passage in the stopper, there being one or more perforations through said membrane.

26. The construction of claim 25 wherein each of the perforations is a slit.

27. The construction of claim 1 wherein there is reciprocally mounted within the barrel of the cartridge, between the plunger piston and the sealing means, a floating membrane piston separator consisting of an annulus with a central cylindrical passage, said membrane being pierced by one or more perforations.

28. The construction of claim 1 wherein there is reciprocally mounted within the cartridge barrel, between the plunger piston and the sealing means, a cylindrical elastic plug having one or more longitudinal grooves in its outer surface, each groove being closed by an elastic dam, the outer edge of each such dam bearing snugly against the wall of the barrel, each such dam being adapted to being deflected away from the wall of the barrel by pressure against said dam, induced by movement of the plunger piston, and forming, when so deflected, a passage between the plug and the wall of the barrel.

29. The construction of claim 1 wherein the protective

hood has an outward projecting annular flange at its rearward end and is adapted to attachment to the plunger piston and to use as a plunger shaft.

30. The construction of claim 29 wherein the rearward face of the flange on the protective hood has a rearward facing annular bead, and the forward wall of the case has an annular groove which matches said bead in contour and size, said bead and said groove being adapted to seal the junction between the flange of said protective hood and said case.

31. The construction of claim 29 wherein the rearward face of the flange on the protective hood has an annular groove and the forward wall of the case has a forward facing annular bead which matches said groove in contour and size, said bead and said groove being adapted to seal the junction between the flange of said protective hood and said case.

32. The construction of claim 1 wherein a hub, to which a double pointed hypodermic needle is affixed, is slidably mounted snugly over and around the end of the cartridge where the sealing means is located, said hub having a rearward projecting cylindrical skirt surrounding the end of the cartridge and a generally cylindrical, forward projecting nib extending through the passage in the barrier at one end of the case, the forward end of the needle extending through and beyond the nib and the rearward point of the needle extending into the space surrounded by the skirt of the hub in proximity to the inner face of the sealing means of the cartridge, and wherein the base of the cup-shaped cap bears against the rearward rim of the barrel and the skirt of the cap has two or more laterally projecting additional lugs between said shoulders and the base of the cap, each additional lug forming an additional shoulder aligned longitudinally with one of said shoulders, said shoulders on the cap and said matching shoulders on the case being so positioned in relation to each other and to the combined length of the cartridge and the skirt of the hub that when the cap and the sleeve are telescoped together to the point where said shoulders on the cap are interlocked with said matching shoulders of the sleeve, the rearward point of the needle is in proximity to, but does not penetrate through, the inner face of the sealing means of the cartridge, and said additional shoulders on the cap and the matching shoulders on the sleeve being so positioned in relation to each other and to the combined length of the cartridge and the skirt of the hub that when said additional shoulders on the cap are snapped past the end portion of the sleeve and interlocked with said matching shoulders on the sleeve, the rearward point of the needle penetrates through the sealing means into the interior of the cartridge barrel.

33. The construction of claim 32 wherein the protective hood is removably attached to the forward projecting nib of the hub.

34. The construction of claim 33 wherein the protective hood is adapted to attachment to the plunger piston and to use as a plunger shaft.

35. The construction of claim 33 wherein the plunger shaft is removably attached to the case and covers and surrounds the protective hood.

36. The construction of claim 1 wherein a hypodermic needle is attached to the case at the end thereof adjacent the sealing means of the cartridge, said hypodermic needle being pointed at both ends, the forward end projecting beyond the case, the rearward end projecting into the space surrounded by the cylindrical forward end portion of the case, said forward end portion of the case snugly but slidably surrounding the end of the cartridge where the sealing means is located, the rearward point of the needle being in proximity to, but not piercing through, the inner face of said sealing means, and wherein the base of the cup-shaped cap bears against the rearward rim of the barrel and the skirt of the cap has two or more laterally projecting additional lugs between said shoulders

and the base of the cap, each such additional lug forming an additional shoulder aligned longitudinally with one of said shoulders, said shoulders on the cap and said matching shoulders on the sleeve being so positioned in relation to each other and to the length of the cartridge and the sleeve that when the cap and the sleeve are telescoped together to the point where the shoulders on the cap and the matching shoulders of the sleeve are interlocked, the rearward point of the needle is in proximity to, but does not pierce through, the inner face of the sealing means of the cartridge, and the additional shoulders on the cap and the matching shoulders of the sleeve being so positioned in relation to each other and to the combined length of the cartridge and the sleeve that when the additional shoulders on the cap are snapped past the rearward end portion of the sleeve and interlocked with the matching shoulders of the sleeve, the rearward point of the needle penetrates through the sealing means of the cartridge into the interior of the cartridge barrel.

37. The construction of claim 36 wherein the sealing means of the cartridge consists of an elastic disk bearing against the forward rim of the cartridge barrel and has a generally cylindrical forward projecting nib, there being a central passage in the forward end of said nib, said passage being of smaller diameter than the needle and being closed by a membrane adjacent the rearward face of said sealing means, said nib snugly but slidably surrounding the rearward end of the needle when the shoulders on the cap are interlocked with the matching shoulders of the sleeve.

38. The construction of claim 36 wherein said cap has two or more forward projecting prongs, said lugs and said additional lugs being located on said prongs and being adapted to snap past said rearward end portion of said sleeve when said cap and said sleeve are telescoped together and to interlock with the shoulders formed by the inner rim of said end portion of the sleeve.

39. A disposable hypodermic syringe composed of, in combination, a generally cylindrical case, a protective hood removably attached to the forward end of said case, said hood being adapted to use as a plunger shaft, and a cartridge consisting of a tubular barrel, a plunger piston reciprocally mounted in said barrel closing the rearward end thereof and an elastic closure member permanently held by said case in compression against the forward rim of said barrel, said closure member being adapted to permit fluent material to pass out of said barrel when said plunger piston is moved forward in said barrel, there being a chamber within said barrel between said plunger piston and said closure member, said syringe being adapted to vent the contents of said chamber through said closure member when said plunger piston is moved forward in said barrel, said case consisting of (a) a sleeve having two cylindrical end portions connected and held in spaced relation to each other by two or more longitudinal straps, there being two or more open spaces in the wall of said sleeve bounded by said straps and said end portions, said open spaces being adapted to facilitate observation of the contents of said sleeve and there being at the forward end of said sleeve an internally directed annular wall forming a barrier, there being a centrally located axially disposed passage through said barrier and means on said barrier for attachment of a hypodermic needle and for removable attachment of said hood, and (b) a generally cup shaped cap, having a resilient skirt, telescoped, skirt forward, into the rearward end of said sleeve, there being a centrally located, axially directed passage through the base of said cap, said passage being adapted to permit the shaft of said hood to extend through the base of said cap and to function as a plunger shaft, and there being as many lugs extending outward laterally from the skirt of said cap as there are said open spaces in the wall of said sleeve, the rearward face of each said lug forming a rearward-facing shoulder, said cap and said sleeve being permanently snap-fastened together by the

17

interlocking of said rearward-facing shoulders with forward-facing shoulders formed by the forward rim of the segments of said rearward end portion of said sleeve between said longitudinal straps, said rearward end portion of said sleeve and said skirt of said cap being adapted to be deflected sufficiently in relation to each other and to said cartridge when said cap is telescoped into said rearward end portion of said sleeve to permit said lugs to snap past said end portion of said sleeve and interlock with said forward facing shoulders, the base of said cap and said rearward facing shoulders being so positioned in relation to said barrier and said forward facing shoulders that the base of said cap bears firmly against the rearward rim of said barrel and said barrier bears firmly against said closure member of said cartridge, there being means on said plunger piston for attachment thereto of a plunger shaft and there being gripping means extending outward laterally adjacent the rearward end of said case.

40. The construction of claim 39 wherein a hypodermic needle is attached to said case at the forward end thereof.

41. The construction of claim 39 wherein there are as many forward extending prongs on the skirt of said cap as there are openings in the wall of said sleeve, said lugs being located on said prongs, said prongs being narrower than said openings.

42. The construction of claim 39 wherein said protective hood has a laterally extending annular flange at the rearward end that bears against the forward face of said

18

barrier, the rearward face of said flange having an annular bead and the forward face of said barrier having an annular groove that matches said annular bead in contour, size and diameter, said bead and said groove being adapted to seal the junction of said case and said hood.

43. The construction of claim 39 wherein said protective hood has a laterally extending annular flange at its rearward end that bears against the forward face of said barrier, the rearward face of said flange having an annular groove and the forward face of said barrier having an annular bead that matches said annular groove in contour, size and diameter, said groove and said bead being adapted to seal the junction of said case and said hood.

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