

Feb. 24, 1970

J. E. BALSON
HYPODERMIC SYRINGE

3,496,937

Filed May 18, 1967

2 Sheets-Sheet 1

FIG. 1.

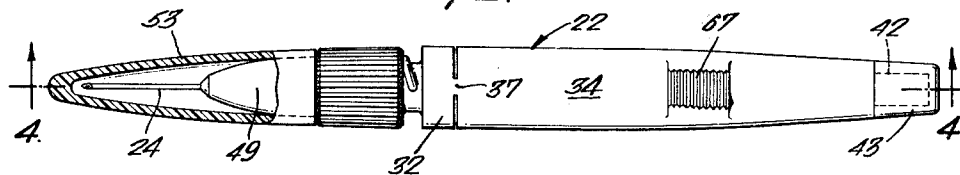


FIG. 2.

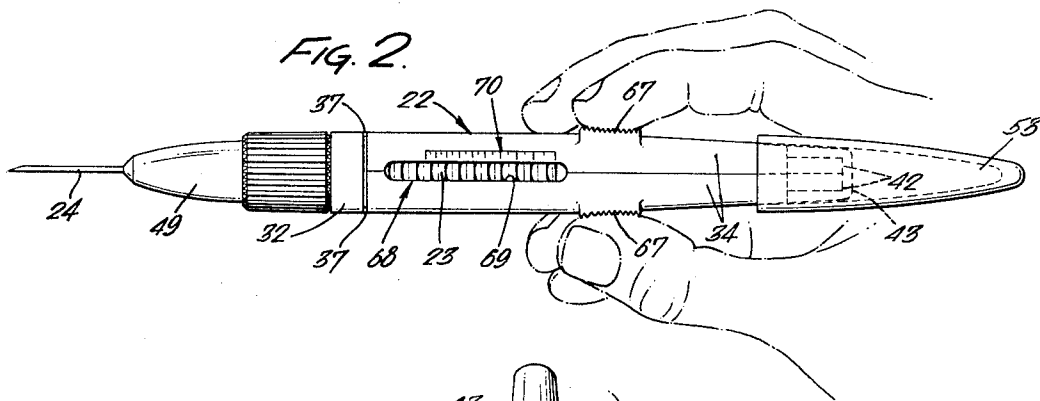
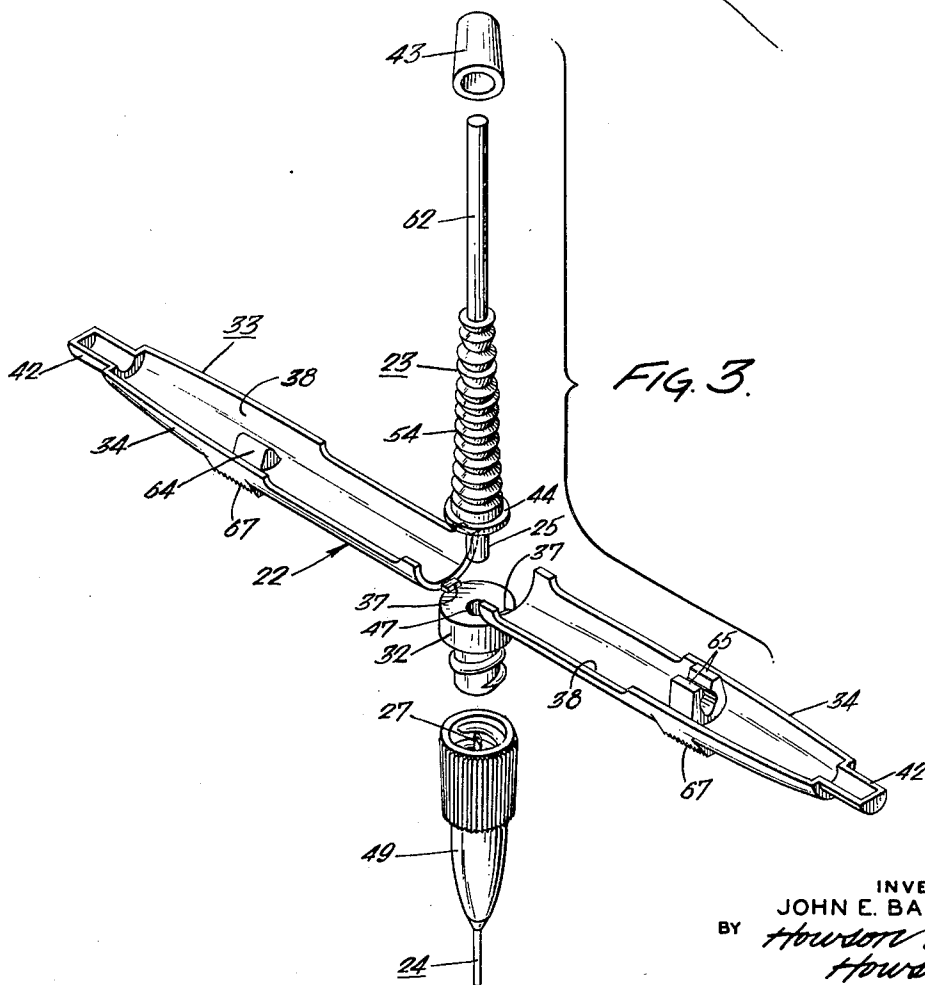


FIG. 3.



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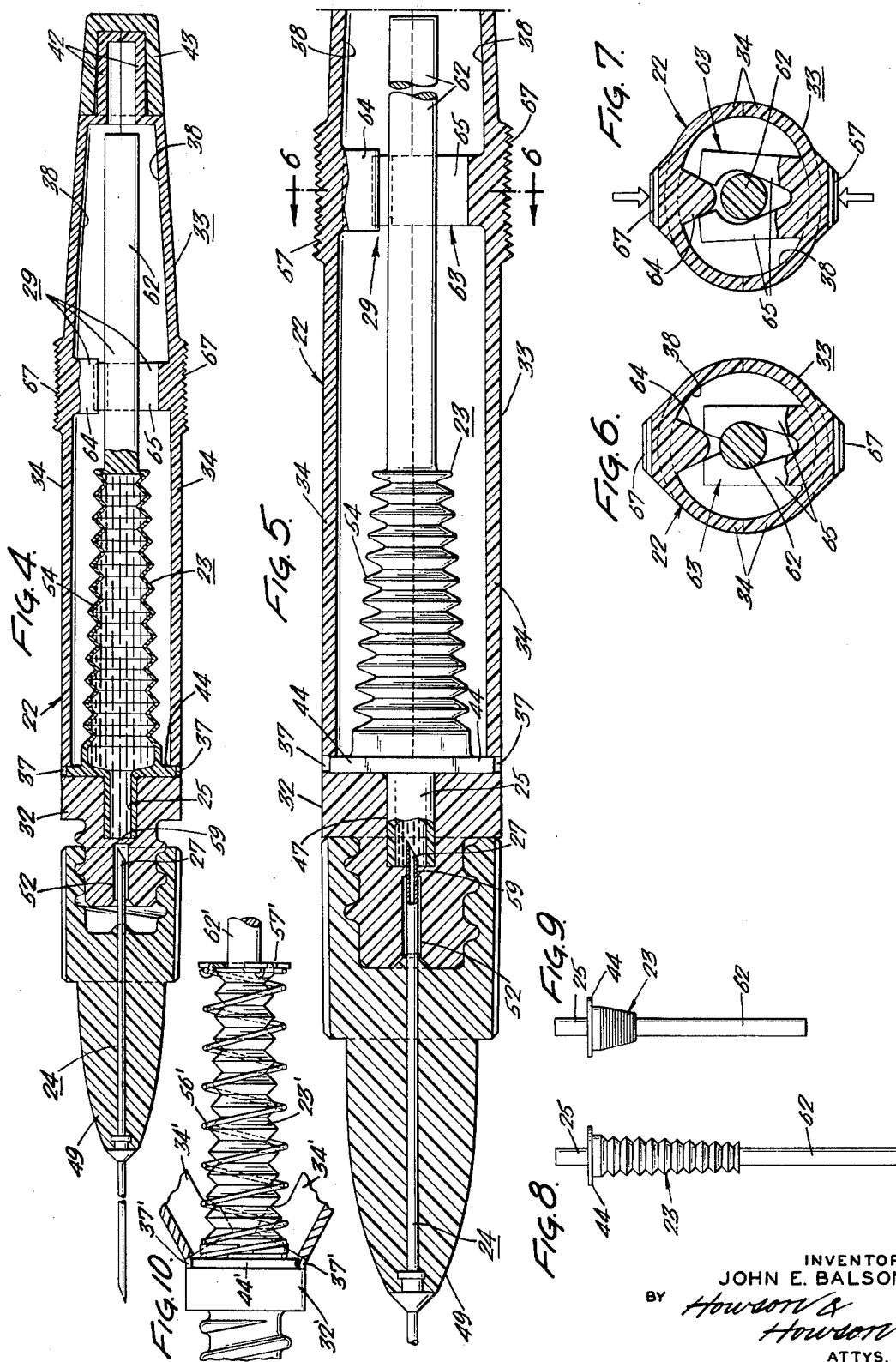
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3,496,937

HYPODERMIC SYRINGE

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U.S. Cl. 128—216

5 Claims

ABSTRACT OF THE DISCLOSURE

A hypodermic syringe having an elongated housing with a needle mounted at one end. The housing has a self-contained liquid expressing means connected to the needle, and a liquid flow control means to variable control the rate and amount of liquid discharged by the expressing means through the needle.

BACKGROUND OF THE INVENTION

The present invention relates to an improved hypodermic syringe and has particular application to hypodermic syringes having self-contained liquid-expressing means.

Hypodermic syringes prior to the present invention had many undesirable characteristics for both the person administering the injection and the person receiving it. The most undesirable characteristic of prior syringes was the means used to express the liquid from the syringe during the injection. In the prior syringes the administrator was required to grasp the body of the syringe by placing his index finger and middle finger on opposite sides of the body in two opposing finger holes or stirrups and position his thumb at the outer end of an axially aligned plunger engaged in one end of the body for telescoping movement therewith. In operation, a needle mounted at the other end of the body opposite the plunger was placed in the usual manner in the flesh of the receiver of the injection and the thumb was pressed forward on the plunger toward the index and middle fingers to cause telescoping movement of the plunger within the body thereby ejecting fluid out of the end of the body through the needle and into the tissue of the receiver.

This characteristic was disadvantageous in that the administrator was required to hold and operate the hypodermic syringe in a position substantially different from the common holding and operating position of most other medical instruments used. In the common position the thumb, index finger, and middle finger grasp the body of the instrument in spaced relationship about its outer circumference. In this position, which is somewhat similar to that used to hold a pen or pencil, the longitudinal axis of the instrument body passes through a point centered between the tips of the three fingers and up the hand past the bridge between the thumb and the index finger. The position is advantageous in that it is easier to manipulate the instrument, and it enables the administrator to achieve a more delicate touch and more precise control of the instrument.

An additional characteristic of prior hypodermic syringes which is disadvantageous to the administrator is the large number of working parts comprised in it. These parts made the prior syringes complicated to operate, made the syringe heavy in weight, and made it difficult to sterilize. In addition, the multiplicity of parts made the instrument expensive to manufacture and subsequently expensive for the administrator to purchase. The weight of

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prior syringes also affected the manipulation, the preciseness of control and the delicateness of touch.

Prior hypodermic syringes had certain disadvantages for the receiver of the injection. A primary disadvantage was the pain experienced by the receiver. Although the pain cannot be entirely eliminated, the prior hypodermic syringes tended to cause additional and unnecessary pain to the receiver when the axial force was placed on the plunger. If the injection was not carefully administered, the force sometimes resulted in the movement of the needle within the flesh of the receiver and the subsequent painful tearing of the receiver's tissue.

Another disadvantage of the prior apparatus was the psychological effect it had upon the receiver. The shape and contour of prior hypodermic syringes caused the receiver so anxiety and the axial plunger action of the syringes connotated to him that the syringe needle was being pressed unnecessarily deeper into his flesh. These disadvantages affected the receiver's acceptance of the injection, his outlook towards the administrator, and tended to hinder the proper practice of medicine.

With the foregoing in mind a principal object of the syringe which is easy to manipulate and which allows a delicate touch and a precise control in the administration of an injection.

Another object of the present invention is to provide a novel hypodermic syringe which is constructed of a minimum of parts, is highly economical to manufacture and assemble, yet which is fully effective and easy to operate and use.

Another object of the present invention is to provide a novel hypodermic syringe which is light in weight and which can be easily held in a position common to other medical instruments, and results in a smooth, comfortable injection.

Still another object of the present invention is to provide a novel hypodermic syringe which is psychologically and aesthetically acceptable to the receiver of the injection.

An additional object of the present invention is to provide a novel hypodermic syringe which has an unbroken chain of sterility from the time of manufacture until the time of use and which is disposable after use thus eliminating sterilization procedures.

Another object of the present invention is to provide a novel hypodermic syringe comprising a housing, a liquid-expressing means positioned within the housing, a double-ended needle mounted longitudinally on the housing, one end of the needle positioned adjacent the expressing means for communication therewith to conduct liquid from the expressing means, and means to control the rate and amount of liquid flow conducted through the needle.

Other objects and a fuller understanding of the invention may be had by referring to the following description and claims taken in conjunction with the accompanying drawings wherein:

FIG. 1 is a plan view with a portion broken away of a hypodermic syringe embodying the present invention,

FIG. 2 is a side elevational view of the structure positioned for injection,

FIG. 3 is an exploded view of the structure as shown in FIG. 1,

FIG. 4 is an enlarged sectional view taken along the line 4—4 of FIG. 1,

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FIG. 5 is an enlarged sectional view of the structure as shown in FIG. 2,

FIG. 6 is a sectional view taken along the line 6—6 of FIG. 5,

FIG. 7 is a sectional view similar to FIG. 6 but showing the fluid control means positioned for injecting fluid from the structure.

FIG. 8 is a reduced side elevational view of the receptacle in the expanded position,

FIG. 9 is a reduced side elevational view of the receptacle in the collapsed position, and

FIG. 10 is a fragmentary side elevational view partly in section showing a modified form of the receptacle.

In accordance with the present invention, the hypodermic syringe generally comprises a housing 22; a self-contained liquid-expressing means 23 positioned within the housing 22; a double-ended needle 24 positionable on the housing 22 to engage the liquid-expressing means 23 and conduct the liquid therefrom; and means 29 to control the liquid flow leaving the expressing means 23 through the needle 24.

In operation the liquid-expressing means 23 is filled with an injection liquid, sealed and enclosed in the housing 22. A double-ended needle is mounted on the housing 22 in a position which places a first end 27 of the needle 24 adjacent an outlet 25 of the sealed expressing means 23. When the hypodermic syringe is to be used for an injection, the first end 27 of the needle 24 is moved into cutting engagement with the sealed expressing means 23. The first end 27 passes into the expressing means and conducts the injection liquid from the expressing means through the needle 24. The liquid flow control means 29 regulates the amount and rate of the injection liquid leaving the expressing means through the needle. The liquid flow may be stopped, started or varied at will and the liquid in the expressing means divided into one or more injections.

More specifically, as shown in FIGS. 3, 4 and 5, the housing 22 in the present instance comprises a tubular wall 33 formed of a flexible material and having a base 32 attached at one end. To allow the expressing means 23 to be placed within the housing 22, the tubular wall 33 is composed of two opposing sidewalls 34 which are fixed at one end to the base 32 in this instance by hinges 37. The hinges 37 permit the sidewalls 34 to swing outwardly from a closed position adjacent each other to an open position exposing their inner walls 38 and base 32. To hold the sidewalls 34 in a closed position, the other ends of the sidewalls 34 close to form a neck portion 42 and a cap 43 is provided to be placed on the neck portion 42 to couple the ends together.

In order to fix the expressing means 23 within the housing, the expressing means 23 is provided with a circumferential projecting flange 44 adjacent the outlet 25. The outlet 25 is telescopically engaged in a bore 47 in the base 32 and held in place by the ends of the sidewalls 34 adjacent the base 32 which are positioned to overly the outer periphery of the flange 44 and thereby clamp the flange 44 between the base 32 and the ends of the sidewalls 34 when the sidewalls are in the closed position. In fixing the expressing means within the housing the outlet 25 is engaged into the bore 47. The sidewalls 34 are folded together to the closed position to clamp the flange 44 between the base 32 and the sidewalls 34, and the cap 43 is placed upon the neck portion 42 to hold the sidewalls 34 closed.

To mount the needle on the housing for engagement with the sealed expressing means a needle hub 49 is provided. In the present instance the hub 49 is cone-shaped and the needle is positioned coaxially within the hub 49. The inside wall of the hub 49 and the outside wall of the base 32 are threaded and the hub 49 may be partially screwed onto the base 32 to place the first needle end 27 within a passage 52 adjacent the outlet 25 of the expressing means 23. When the apparatus is to be used for an injection,

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the hub 49 may be further screwed upon the base 32 to cuttily engage the first needle end 27 with the sealed expressing means 23 and thereby cause the end 27 to enter the expressing means 23 for receiving liquid therefrom. If additional injections through the same needle are desired, the needle may be transferred from a housing having an exhausted expressing means to a housing having a filled expressing means and the procedure repeated.

In order to protect the other end of the needle a sheath 53 is provided as shown in FIG. 1. In this case the sheath 53 is cone-shaped to fit over the needle end and onto the hub 49 to form a tight seal to prevent contamination and other abuse to the needle during storage. When an injection is to be given, the sheath may be removed and temporarily stored on the housing 22 overlying the cap 43 as shown in FIG. 2.

In accordance with the invention, to enable the hypodermic syringe to be held and operated in the common position of most other medical instruments the self-contained liquid-expressing means 23 and the liquid flow-control means 29 are provided. The expressing means 23 and the control means 29 allow the administrator of the injection to achieve a more delicate touch and precise control. They also permit the syringe to be shaped to a contour which is aesthetically and emotionally pleasing to the receiver of the injection.

The liquid expressing means in the embodiment of the invention comprises a liquid-holding receptacle 23 which automatically returns to a closed or empty position after it has been expanded or otherwise deformed. When the receptacle 23 is filled under pressure with a liquid, it is forced to expand to an open or filled position. It is the returning of the receptacle to the closed position which forces the liquid from the receptacle 23 through the outlet 25 and into the needle 24.

In the present instance as shown in FIGS. 3 through 9, the receptacle has a bellows-shaped, collapsible body 54 having an elastic memory to return the receptacle from the open position to the closed position. To obtain the elastic memory, the body in this case is formed of an elastomer material. The term elastomer material as used in this specification and the appended claims is defined as any material, regardless of chemical composition, that possesses the mechanical properties similar to the special properties characteristic of natural rubber—high deformability, rapid recovery from deformation, good mechanical strength, etc. (See "Synthetic Rubber" edited by G. S. Whitby et al., John Wiley and Sons, Inc., 1954, p. 28.) Typical examples of elastomer material for use in this invention are natural and synthetic rubbers including rubbery forms such as polypropylene and any combination thereof.

The choice of elastomer materials for use in the body 54 will depend on the physical and chemical properties of the liquid placed therein. Where the liquid is not affected by contamination of air molecules passing through the porous structure of the body, polypropylene may be used. In this instance, the body may be formed in an open position by the commonly known blow-molding process and heat set to a closed position to establish an elastic memory. The body 54 will then return to the closed position when released after being stretched or expanded.

Where air molecule contamination must be eliminated, the body may be formed entirely of natural or synthetic rubber; or it may be formed of polypropylene and may be coated after it has been heat set by a layer of synthetic or natural rubber, or any other flexible substance which will seal the porous structure but not interfere with the elastic memory.

When the injection liquid has a relatively low viscosity the receptacle may be provided with a spring whose elastic memory moves the receptacle to the closed position; or if the receptacle is provided with a body having an elastic memory, the spring may be provided to assist the body to the closed position. Where the receptacle has a spring,

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the body may be formed on the spring or as shown in FIG. 10 the spring may be placed around the outer circumference of the body 54'. In this instance a helical spring 56' is attached between the flange 44' at one end of the body and a collar 57' mounted on the other end of the body. The elastic memory of the spring 56' provides a bias to urge the body to a closed position whenever the body is expanded or opened.

Where the receptacle has a tubular-shaped body and has an axially aligned plunger engaged in one end of the body for telescoping movement therewith, the receptacle may be provided with a spring to move the plunger from the open to the closed position to express the liquid.

In order to seal the receptacle after filling with the injection liquid, a sealing means 59 is provided. In the present instance as shown in FIGS. 4 and 5, a membrane 59 is provided to separate the bore 47 from the needle passage 52. In operation the receptacle is filled with the injection liquid and its outlet 25 tightly fitted or otherwise fixed in the bore 47 to seal the receptacle in the expanded or open position. The sidewalls 24 are closed, the cap 43 placed on the neck 42 and the hub 49 is screwed onto the base to place the needle end 27 adjacent the membrane 59. When an injection is to be made, the hub 49 is screwed onto the base 32 to cuttingly engage the needle end 27 with the membrane 59. The end 27 passes into the receptacle outlet 25 and the liquid may then flow from the receptacle out through the needle 24.

If desired the membrane may be alternately placed within the outlet 25 by heat sealing or other means after the receptacle is filled. This would allow filled receptacle to be separately stored for placement in the housing at a later time.

The control means in accordance with the invention is provided to control the amount and rate of liquid flow from the liquid expressing means. In the present embodiment, the liquid flow control means comprises a restraining means 29 to govern the movement of the expressing means from its open or filled position to its closed or empty position.

In this case, the restraining means 29 comprises an elongated shaft 62 mounted on the end of the receptacle 23 opposite the outlet 25, a clamp 63 mounted on one sidewall 34 of the housing 22 to frictionally engage the shaft 62, and a clamp release 64 mounted in spaced relationship therewith on the opposing sidewall 34 of the housing. The clamp has two opposing jaws 65 made of flexible material and which in their normal positions are biased against the shaft 62 to frictionally engage it. The clamp release 64 is wedge-shaped and may be moved between the clamp jaws 65 to force them apart to allow the shaft to slip through and the receptacle to move to its closed position.

In order to move the release 64 between the clamp jaws 65, a finger positioner 67 is provided on the outside of each sidewall 34 adjacent the clamp 63 and release 64. When finger pressure is applied to the positioners, as shown in FIGS. 1, 6 and 7, the sidewalls 34 are flexed to move inward causing the release 64 to move between the clamp jaws 65 thereby releasing the shaft 62. Varying the finger pressure on the positioners 67 varies the amount and rate of movement of the shaft 62 through the clamp 63. This in turn controls the amount and rate of liquid passing from the receptacle. The flow of liquid may be thus easily stopped, started, or varied and one or more injections may be made.

In operation, the hypodermic syringe is normally supplied to the user fully sterilized and ready for injection. When the user desires to make an injection, the sheath 53 is removed from the needle hub 49 and placed on the housing over the cap 43. The hub 49 is screwed onto the base 32 to cause the first end of the needle 27 to pierce the membrane 59 and enter the outlet 25. The control means 29 holds the receptacle in its filled position and prevents it from closing. The second end of the needle is

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placed into the flesh of the receiver and the control means 29 is actuated by applying finger pressure to the finger positioners 67 on the sidewalls 34 outside of the clamp 63 and clamp release 64. Pressure on the finger positioners causes the clamp release 64 to engage the jaws of the clamp and allow the shaft 62 to slip therethrough as the receptacle 23 moves from the open to the closed position. By varying the pressure, the degree of engagement of the jaws on the shaft may be varied to control the rate of movement of the receptacle. After the injection, the needle may be removed from the housing and screwed onto a fresh housing for additional injections into the same receiver or the entire apparatus may be discarded.

In order to measure the quantity of liquid which is expressed from the needle 24 into the flesh receiving the injection, a measuring means 68 is provided. In the present instance, the measuring means 68 comprises an opening 69 formed between the sidewalls 34 and a scale 70 adjacent thereto. The amount of movement of the receptacle under the control of the restraining means 29 may be viewed through the opening 69 and measured on the scale 70 to determine the amount of liquid which has been expressed through the needle.

While a particular embodiment of the present invention has been herein illustrated and described, it is not intended to limit the invention to such disclosure, but changes and modifications may be made therein and thereto under the scope of the following claims.

I claim:

1. A hypodermic syringe for injecting a liquid comprising: a housing, a self-containing liquid expressing means positioned within said housing forming a receptacle for said liquid, said receptacle having a body portion formed of an elastomeric material and movable from a filled position to an empty position, said elastomeric material having an elastic memory to normally urge said body from said filled position to said empty position to force said liquid from said receptacle, a needle mounted to said housing adjacent said expressing means to conduct said liquid from said expressing means as said body moves from said filled position to said empty position, and restraining means interconnected with said body to govern movement of said body from said filled position to said empty position and control the rate and amount of liquid flow leaving said expressing means through said needle.

2. A hypodermic syringe as recited in claim 1, wherein said housing has a first and second flexible sidewall, said receptacle is fixed at one end inside said sidewalls, and said restraining means comprises an elongated shaft fixed at one end to said other end of said receptacle, a clamp mounted on said first sidewall to frictionally engage said shaft and a clamp release on said second sidewall adjacent said clamp to disengage said clamp from said shaft to allow said body to return to said empty position.

3. A hypodermic syringe as recited in claim 2, wherein said clamp release is wedge-shaped and is movable between said jaws of said clamp to force them apart to frictionally disengage said shaft.

4. A hypodermic syringe as recited in claim 1, wherein said body is formed of polypropylene in an open position and heat set to a closed collapsed position to establish an elastic memory therein.

5. A hypodermic syringe for injecting a liquid comprising: a housing, said housing having first and second flexible side walls; a liquid-holding receptacle positioned within said housing and having at least one wall movable from a filled position to an empty position; a shaft movable with said wall; means providing an elastic memory to force said wall from said filled position to said empty position to express said liquid from said receptacle; a needle mounted to said housing adjacent said receptacle operable to communicate with said receptacle to conduct liquid from said receptacle; and restraining means to variably govern the flow of said liquid from said receptacle through said needle effected by the force

of said elastic memory, and restraining means comprising a clamp mounted on said first side wall to frictionally engage said shaft and restrain its movement and a clamp release on said second side wall adjacent said clamp to disengage said clamp from said shaft to allow said elastic memory to force said wall to the empty position.

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U.S. Cl. X.R.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,496,937 Dated February 24, 1970

Inventor(s) John E. Balson

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Page 1, column 1, line 13, change "variable" to---variably--
line 54, change "is" (second occurrence) to ---
it ---
column 2, line 16, change "so" to --- some ---
line 22, add after "the" (second occurrence) ---
present invention is to provide a novel hypodermic ---

SIGNED AND
SEALED
JUL 7 1970

(SEAL)

Attest:

Edward M. Fletcher, Jr.

Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents