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MEANS FOR MAKING HYPODERMIC INJECTIONS

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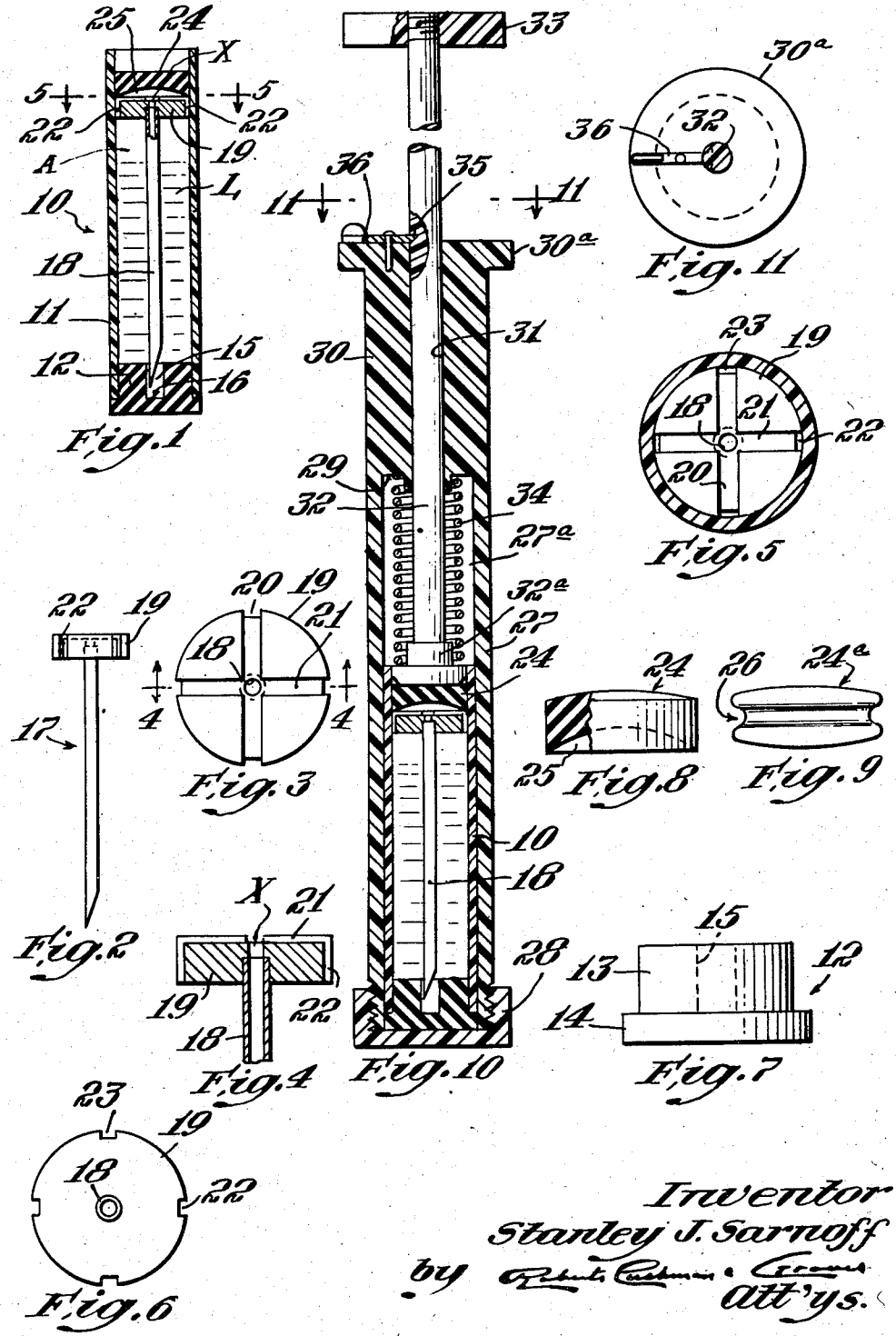

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Fig. 6

Fig. 7

Fig. 8

Fig. 9

Fig. 10

Fig. 11

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MEANS FOR MAKING HYPODERMIC INJECTIONS

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1 Claim. (Cl. 128—218)

The invention pertains to the administering of fluids hypodermically and relates more especially to a novel method of and means for making hypodermic injections.

In times of emergency, for example, when a public water supply has been contaminated as the result of flood or other disaster, or upon the occurrence of an epidemic etc., it may become necessary to give hypodermic treatments in great numbers and with great rapidity and under conditions such that the administering of hypodermic injections must be done by persons unacquainted with the proper use of the customary hypodermic syringe. For further example, in war time, soldiers may be obliged, often under extremely difficult conditions, to administer penicillin, sedatives, or other drugs hypodermically to themselves or to wounded comrades.

In the attempt to provide for the above conditions, small, easily portable, single-dose syringes have been designed and are on the market, but most such syringes require, preparatory to use, the insertion of an ampule of the fluid medicament into the barrel of the syringe, the attachment of the needle to the end of the barrel, and the manual operation of a plunger (after the needle has been inserted into the body tissue) for expelling the contents of the ampule. While these several manipulations may appear to be very simple, most of them involve the use of both hands; and there is always the possibility of the contamination of the initially sterile needle. Moreover, these prior, single-dose syringes do not always provide for the retraction of the plunger, a step which considerations of safety require to be made in the administration of fluid hypodermically. Certain substances, while wholly innocuous when injected into muscle tissue, may have serious effects if injected directly into a vein, and thus it is commonly required of nurses in hospitals, that after first introducing the needle, the plunger of the syringe can be retracted sufficiently to draw blood into view (if the needle has penetrated the vein) thus indicating that the needle should be withdrawn and inserted in a different spot.

The present invention has for one object the provision of a novel method of administering fluids hypodermically such that danger of unintentionally delivering the fluid into a vein is avoided, but without requiring the customary retracting operation; to provide a novel container for the fluid to be administered such that no preliminary handling of the needle for attaching it to other parts is necessary, thus avoiding danger of contamination; and to provide apparatus, designed to use such a container in making hypodermic injections, which may be operated by the use of one hand and which is always ready for instant use and which is of so simple and inexpensive construction as to make it practical to discard it after one use, although, if desired, it may be refilled repeatedly.

Other and further objects and advantages of the invention will be pointed out in the following description and by reference to the accompanying drawings, wherein

Fig. 1 is a diametrical, longitudinal section, to large scale, illustrating a container in accordance with the present invention, wherein the needle and the single dose of the fluid to be administered are held under antiseptic conditions and in readiness for instant use;

Fig. 2 is an elevation of the needle assembly forming a feature of the present invention;

Fig. 3 is a plan of the parts shown in Fig. 2;

Fig. 4 is a fragmentary section on the line 4—4 of Fig. 3;

Fig. 5 is a section substantially on the line 5—5 of Fig. 1, but to larger scale;

Fig. 6 is a bottom plan view of the device shown in Fig. 2;

Fig. 7 is an elevation of the bottom closure plug for the container in Fig. 1;

Fig. 8 is a side elevation, partly in transverse section, illustrating the movable, leak-tight piston which initially closes the opposite end of the container of Fig. 1;

Fig. 9 is a side elevation illustrating a modification of the plunger of Fig. 8;

Fig. 10 is a fragmentary, diametrical, longitudinal section, illustrative of one form of syringe useful for expelling the contents from a container such as shown in Fig. 1; and

Fig. 11 is a horizontal section substantially on the line 11—11 of Fig. 10.

Referring to the drawings, and particularly to Fig. 1, the numeral 10 designates a novel container, in accordance with the present invention, designed to hold a single dose of a fluid to be administered hypodermically, and also to hold the needle preparatory to its insertion into the body tissue. This container, as herein illustrated, comprises a cylinder 11 of any appropriate material, for example, glass, hard rubber, or a synthetic plastic which does not react with the fluid which is to be administered. The lower end of the cylinder, as viewed in Fig. 1, is closed by means of a plug 12. This plug is preferably of soft rubber or similar material, comprising the stem portion 13 which fits snugly and leak-tight within the lower end of the cylinder 11, and a head portion 14, of larger diameter than the stem 13 and preferably of an external diameter like that of the cylinder 11, and which engages the lower edge of the cylinder 11. The stem portion 13 is provided with an axially arranged guide passage or well 15, extending down from the upper end of the stem but having its bottom 16 spaced from the under surface of the plug to leave an imperforate body of the material of the plug, for example of the order of 1/16 of an inch thickness, below the well bottom. The well forms a guide for the end of the hypodermic needle when the latter is being projected. Preferably the top of the needle is normally within the well, although this is not necessary. At its opposite end the needle 18 is fixed in a guiding disk 19 of some rigid material, for example, hard rubber or a synthetic plastic such as that from which the cylinder 11 is formed. This disk 19 is of an external diameter such as to add a free sliding fit within the cylinder 11, and the upper end of the needle is fixedly within this disk so firmly that pressure applied to the upper surface of the disk will force the needle downwardly and out through the material of the plug 12 at the bottom of the well 15. The upper surface of the disk 19 is provided with diametrical channels 20 and 21, here shown as intersecting at right angles at the center of the disk. The upper end of the needle 18 is coaxial with the disk, the latter having a central passage X (Fig. 1) which is enlarged at its lower part to form a socket for the end of the needle. The disk also has marginal grooves 22 and 23, extending from its lower surface to its upper surface, thus providing free passage for fluid from the space below the disk to the space above the disk.

The upper end of the cylinder 11 is initially closed after receiving its contents by means of a piston 24, desirably of soft rubber or material having similar characteristics and which is of an initial external diameter such as to fit snugly within the cylinder 11 and thus provide a leak-tight closure. Desirably, this piston 24 is hollowed out at its underside as shown in 25 so that its under surface is upwardly convex, the result being that when pressure is being applied in the downward direction (Fig. 1), the lower edge portion of the piston tends to increase in diameter and thus increase the resistance to leakage past the plug. In Fig. 9, a modified form of piston 24^a, has a circumferential groove 26, providing a fluid seal if any liquid leaks up between the piston and the wall of chamber 27^a.

In preparing this container for use and assuming that the bottom plug 12 has been inserted and makes leak-tight contact with the cylinder 11 (a condition which may be assured if desired by the introduction of some ad-

hesive substance between the plug and the inner surface of the cylinder) the liquid L which is to be administered hypodermically is placed in the container and then the needle assembly, comprising the needle 18 and the disc 19, is introduced into the cylinder 11. Desirably the liquid L does not completely fill the space beneath the disc 19, in order to provide space for a body of gaseous material, for example air, which is easily compressible and which facilitates the initial downward movement of the needle as hereafter described. Assuming that the liquid L and the needle assembly have been placed within the container, the leak-tight movable piston 24 is then put in place and the container is ready for shipment, storage and use.

When the container is to be used, the lower surface of the plug 12 is placed against that portion of the body into which the liquid is to be injected, and then pressure is applied to the upper surface of the piston 24 in a downward direction. The first effect, upon application of pressure to the piston 24 is to compress the air in the space above the liquid L. As the plunger 24 continues to move downwardly in cylinder 11, it pushes the disc 19 ahead of it, with the result that the needle is forced through the material of the plug 12 below the point 16 and into the body tissue of the patient. As already noted, during this initial operation the air above the liquid L has been compressed and this air now acts, in conjunction with the continued downward movement of the piston 24, to force the liquid out of the end of the needle as the needle enters the muscular tissue. The fluid is thus forced out of the end of the needle slightly in advance of the needle point and creating a pressure which is sufficient to close and push aside any vein which may lie in the path of the needle so that danger of intravenous injection of the fluid is avoided. The pressure on the piston 24 is continued until the contents of the container has been injected into the body tissue, whereupon the container, emptied of its contents, may be discarded.

It is obvious that various instrumentalities may be employed for applying the requisite pressure to the upper surface of the piston 24 as above described. Figs. 10 and 11 illustrate one form of apparatus useful for the purpose. Thus, in Fig. 10, there is illustrated a syringe-like instrument having a barrel portion 27 which may be made of any desired rigid material, for example glass, hard rubber, synthetic plastic or the like and which has a cylindrical interior chamber 27^a which is open at the lower end but which may be closed by means of a removable cap 28 which may be screw threaded to the lower end of the barrel 27, as here illustrated, or which may merely have a slip connection to the barrel. The chamber 27^a terminates at point 29, above which the barrel 27 comprising a portion 30, having an axial bore 31 of smaller diameter than chamber 27^a which forms a guide for an axially movable rod 32 provided at its lower end with a plunger 32^a of an external diameter such as to have a free-sliding fit within the cylinder 11 of the container in Fig. 1. The actuating rod 32 extends upwardly above the upper end of the barrel 27 and is provided with a suitable handle 33, here shown as a disc which is fixed in any desired way to the upper end of the rod. As herein illustrated, the upper end of the syringe barrel is provided with an enlargement 30^a which is a convenience in gripping the device during the manipulation of the plunger handle 33.

In the embodiment herein specifically illustrated, a compression spring 34 is arranged within the upper part of the chamber 27^a, the lower end bearing against the plunger 32^a, and the upper end against the surface 29, the spring thus tending to force the plunger 32^a downwardly. As here illustrated, the rod 32 is provided with a circumferential notch 35 at a point above the head portion 30^a of the syringe barrel and this notch receives a latch 36, pivotally secured to the head 30^a of the barrel and which, in the normal position of the parts, engages the notch 35, thus preventing the spring 34 from moving the plunger 32^a downwardly. However, by swinging the latch out of the notch the rod 32 is released thus allowing the spring 34 to propel the plunger 32^a forcibly downward.

When the parts are in the position illustrated in Fig. 10, there is sufficient space within the chamber 27^a beneath the plunger 32^a, to receive a container such as that illustrated in Fig. 1. The container may be introduced into this space by first removing the cap 38, pushing the container endwise up into the chamber 27^a in the barrel 27 until the upper surface of the piston 24 is engaged by the lower surface of the plunger 32^a and then replacing the cap 28. When it is desired to use the device, the cap 28 is unscrewed, the lower end of the plug 12 is placed against the part of the body into which the injection is to be made, and the latch 36 is manually retracted, whereupon the spring 34 drives the plunger 32^a downwardly and thus suddenly forces the piston 24 down, projecting the needle through the plug 12 and concomitantly forcing the liquid L out of the cylinder 11 and into the body tissues. This operation may be performed by the use of one hand, since it is only necessary to hold the syringe in a position such that the bottom surface of the cap 12 of the container presses against the surface of the body, and then to push the latch 36 away from the notch 35.

The syringe in Fig. 10 is refillable, that is to say, by pulling upwardly upon handle 33, the plunger 32^a may be withdrawn to its initial position and the latch 36 reengaged with the notch 35. A new container may now be introduced into the barrel 27 and the cap 28 replaced, thus placing the device in readiness for making another injection.

While as specifically illustrated in Figs. 10 and 11, a spring 34 and a detent latch 36 are provided, these parts may be dispensed with in the interest of simplicity and low cost, and the application of pressure to the piston 24 of the container may be accomplished manually, merely by pushing down on the handle 33 with pressure sufficient to cause the plunger 32^a to force the piston 24 downwardly in the cylinder 11, thus manually projecting the needle and ejecting the liquid.

While one desirable embodiment of the invention is herein illustrated by way of example, it is to be understood that the invention is broadly inclusive of any and all modifications falling within the scope of the appended claim.

I claim:

A package comprising a cylinder having at one end a liquid impervious closure of a material which is easily penetrable by a hypodermic needle, a hypodermic needle within the cylinder having its end adjacent to the inner surface of said end closure, a body of liquid within the cylinder sufficient to constitute a single dose but which does not fill the entire space within the cylinder, and a leaktight piston normally closing the upper end of the cylinder and adjacent to the latter, and means whereby inward movement of the piston projects the point of the needle through the end closure and projects the liquid through the needle, a rigid disk being fixed to the upper end of the needle, the upper end of the needle being open and the disk being of a diameter to slide inwardly within the cylinder and having its upper surface adjacent to the under surface of the plunger, the disk having channels leading from its lower surface to the open upper end of the needle.

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