

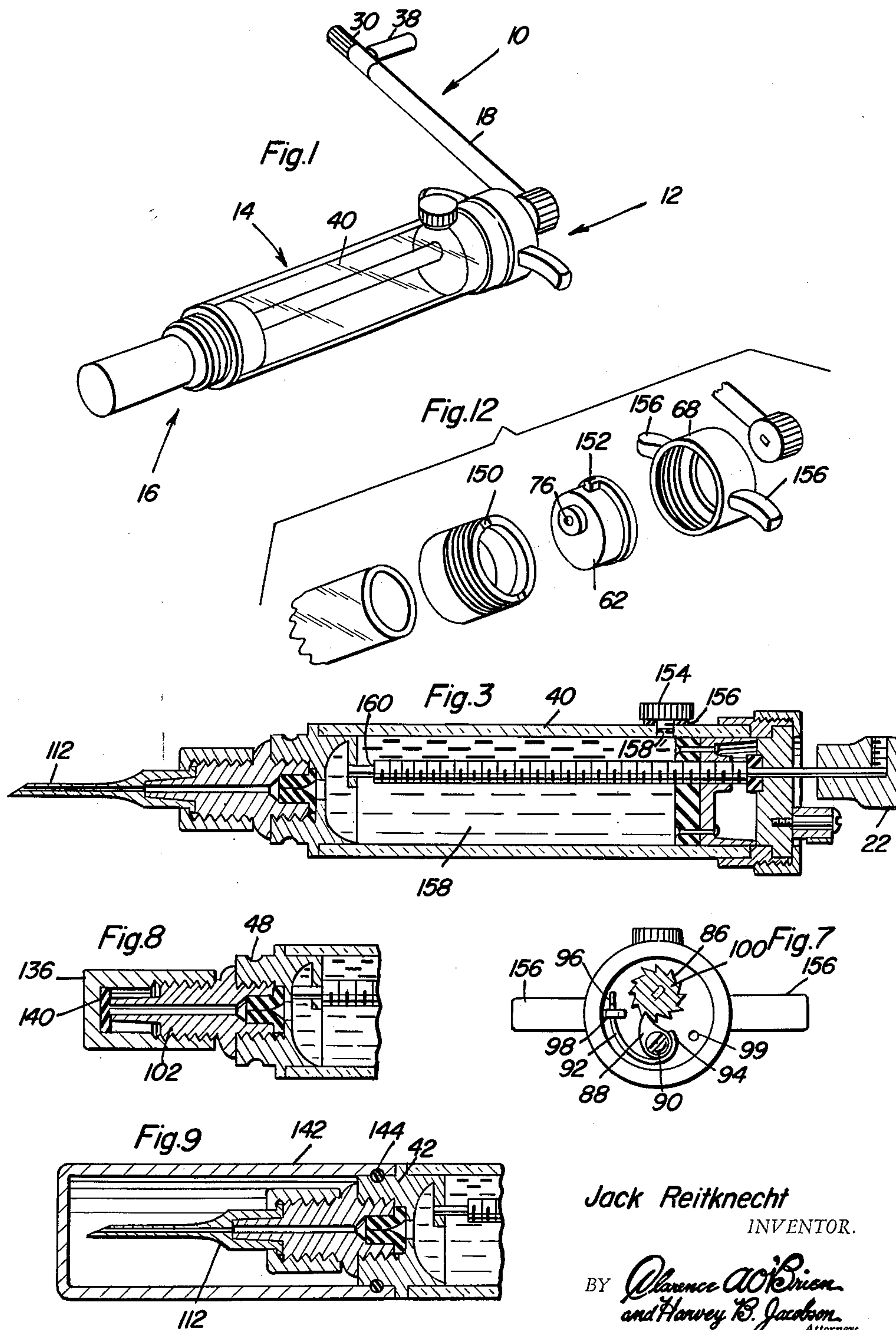
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J. REITKNECHT
AUTOMATIC HYPODERMIC UNIT

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Filed Dec. 16, 1960

2 Sheets-Sheet 1



Jack Reitknecht
INVENTOR.

BY *Clarence A. O'Brien*
and *Harvey B. Jacobson*
Attorneys

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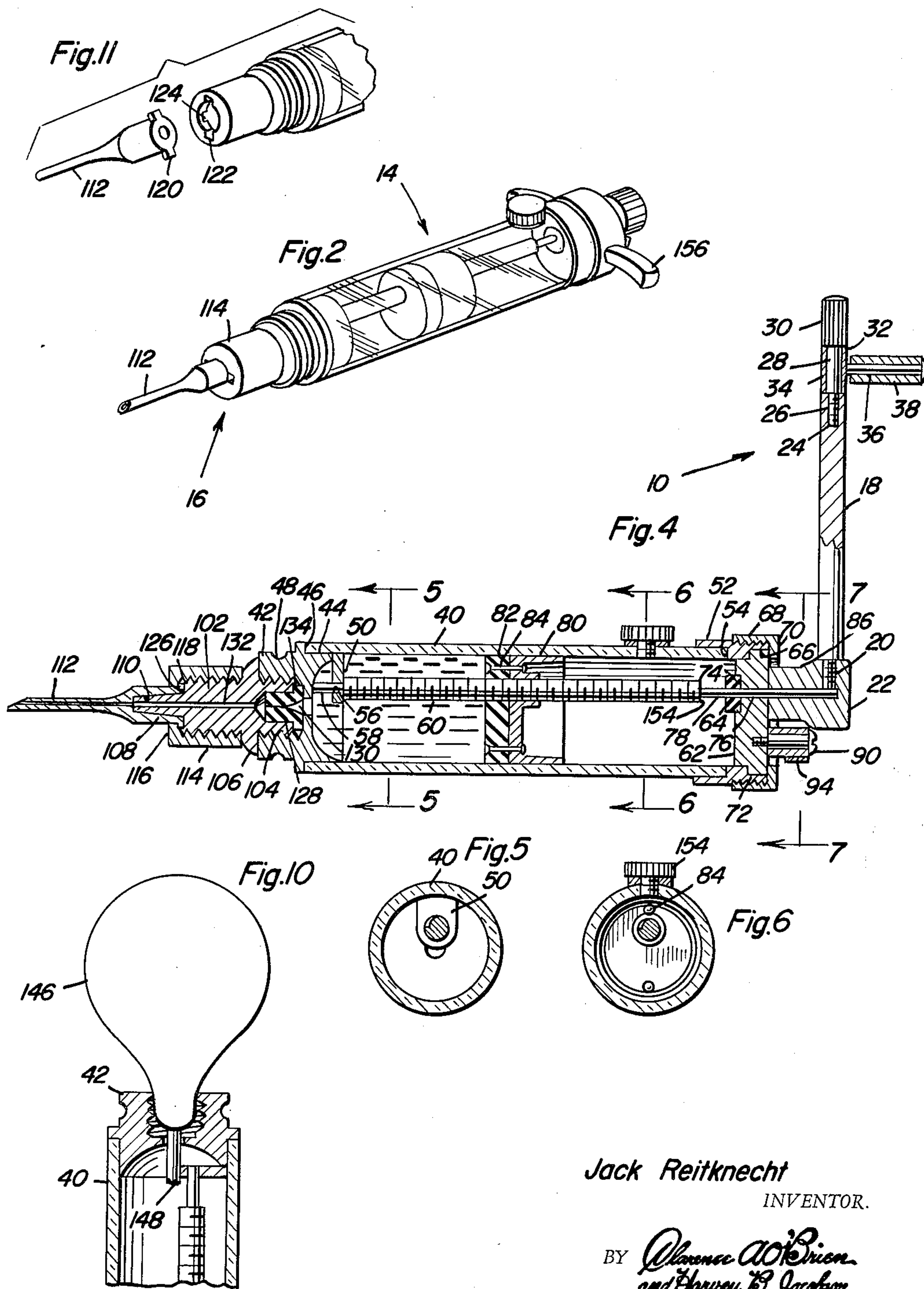
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Jack Reitknecht

INVENTOR.

BY *Alvanee A. O'Brien*
and *Harvey E. Jacobson*
Attorneys

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3,101,711

AUTOMATIC HYPODERMIC UNIT

Jack Reitknecht, 475 F.D.R. Drive, New York 2, N.Y.

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This invention relates to hypodermic units and particularly to hypodermic units suitable for use by diabetics and the medical profession.

Accordingly, it is an object of this invention to provide a new and useful hypodermic unit which will be useful on the battlefield, in clinics, in epidemic areas and in other places where inoculation of a great many people is necessary in a very short time.

It is another object of this invention to provide a hypodermic unit that has an injection needle that may be rapidly and easily removed and replaced.

It is another object of the invention to provide a hypodermic unit which is made of materials which are corrosion resistant, long lasting, and easily sterilized.

Another object of the invention is to provide a hypodermic unit having a large fluid capacity whereby many inoculations may be given without refilling the same.

Another object of the invention is to provide a hypodermic unit having a large reservoir which may be easily and rapidly refilled when necessary.

It is yet another object of this invention to provide a hypodermic unit which has a transparent reservoir whereby the amount of fluid therein may be observed at all times.

It is still another object of this invention to provide a hypodermic unit having automatic sealing means at the base of the ejection needle thereof.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIGURE 1 is a view in perspective of the hypodermic assembly with the needle removed and the sealing cap thereon;

FIGURE 2 is a perspective view similar to FIGURE 1 but showing a sealing cap removed and the injection needle installed;

FIGURE 3 is an enlarged cross sectional view taken substantially on a vertical longitudinal plane through FIGURE 2, and showing the reservoir filled with the liquid;

FIGURE 4 is a cross sectional view similar to FIGURE 3 but showing the reservoir partially empty and the position of the piston after an injection has been completed;

FIGURE 5 is a cross sectional view taken substantially on the plane of line 5—5 of FIGURE 4;

FIGURE 6 is a cross sectional view taken substantially on the plane of line 6—6 in FIGURE 4;

FIGURE 7 is a view taken substantially on the plane of line 7—7 in FIGURE 4;

FIGURE 8 is a cross-sectional view taken substantially on a longitudinal vertical plane through the lower end of FIGURE 1;

FIGURE 9 is a longitudinal cross sectional view through the needle end of the hypodermic unit showing the protective cover installed over the needle;

FIGURE 10 is a view partially in cross section showing the manner in refilling the hypodermic reservoir;

FIGURE 11 is an exploded perspective view illustrating the manner of installing the needle; and

FIGURE 12 is an exploded perspective view showing the rear portion of the hypodermic unit.

Referring to FIGURE 1, it can be seen that the hypodermic unit comprises four sub-assemblies; namely the

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handle or operating assembly 10, a ratchet and refilling assembly 12, a reservoir assembly 14 and a needle and sealing unit 16.

Referring particularly to FIGURES 1 and 4, it can be seen that the handle assembly 10 comprises a lever 18 having a threaded reduced portion 20 screwed into a threaded recess in rotatable knob 22. A bearing pin 28 has a threaded reduced inner end 26 screwed into the threaded recess 24 in the end of lever 18. The outer end of the bearing pin 28 has a knurled portion 30 which is larger in diameter than the bearing portion 28 and forms an inner shoulder 32. Rotatable on bearing portion 28 is a sleeve 34 having a headed pin 36 fixed thereto. The pin 36 has a rotatable gripping handle 38 rotatable thereon.

Reservoir assembly 14 includes a hollow tubular member 40 preferably proposed of a transparent material easily sterilized such as Pyrex glass. The inner end of the cylinder 40 snugly receives a highly finished reduced portion 44 of end plug 42 and abuts against the radial flange 46 thereon. The outer end of cylinder 40 is snugly received within an enlarged portion of sleeve 52 and abuts against the annular flange 54 thereof. The fit between the ends of cylinder 40 and plug portion 44 and sleeve 52 is tight and due to the highly finished surfaces where the members overlap, a substantially liquid tight seal is thereby formed between these members. However, a sealing cement may be placed on the end of cylinder 40 before it is attached to plug 42 and sleeve 52.

The plug 42 has an integral support 50 extending radially inward from one end thereof.

The inner end of sleeve 52 has an enlarged bore 66 which snugly receives the flange 72 of end 62. Threaded on the inner end of sleeve 52 is a collar 68 having a radially inwardly extending annular flange 70 which overlaps the flange 72 for holding end 62 within sleeve 52. The end 62 has a circular recess 74 offset from the center thereof and containing a seal member 64 preferably formed of an elastic material such as rubber. The end 62 also has a smaller bore 76 therethrough in axial alignment with the larger bore 74.

The bore 76 is also in axial alignment with the bore 56 in support 50 and these bores rotatably receive reduced end portions 58 and 78 of threaded piston rod 60. While the threaded piston rod 60 is rotatable on its supports, it is also reciprocable therein since the threaded portion 60 is shorter than the distance between the support 50 and end 62, preferably by about one-quarter of an inch. Piston 80 is slidable within cylinder 40 and has an off-center threaded bore in alignment with bores 56 and 76 of end ports 42 and 62, the piston 80 receiving the threaded piston rod 60. Elastic seal member 82 is secured to the face of piston 80 by means of rivets 84. Since seal member 82 has a relatively tight fit within cylinder 40, it effectively seals the piston. The piston cannot rotate and is restricted to lateral sliding motion due to its eccentric pivoting on rod 60.

The inner reduced end 78 of the piston rod 60 extends into a bore within knob 22. Knob 22 is fixed to reduced portion 78 by friction fit. In assembly, portion 20 of lever 18 is screwed tightly against portion 78, further fixing knob 22 to reduced portion 78.

The inner reduced portion of the knob 22 has ratchet teeth 86 thereon as shown in FIGURES 7 and 4. The extreme outer end of reduced portion 78 is rectangular in cross section and fitted within a rectangular recess within knob 22 for preventing relative rotation therebetween. Pivotaly mounted on the outer surface of end 62 by means of screw 90 is a detent or pawl 88 having a part engageable with ratchet teeth 86. Leaf spring 92 has one end 94 fixed to detent 88 and urging it into engagement with the teeth 86. The other end of leaf spring

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92 extends under a hook 98 which is also fixed to end 62 as shown in FIGURE 7. The spring 92 has a projecting lug 96 overlapping the hook 98 and preventing separation of the hook and spring. The ratchet device permits the knob 22 and piston rod 60 to be rotated in such a direction as to drive the piston 80 toward plug 42.

Threadedly received within plug 42 is a reduced portion 104 of nozzle 102. Flange 106 frictionally grips the outer surface of plug 42. The nozzle 102 has a conical portion 108 on its outer end which frictionally receives the conical recess of needle 112. Threaded on nozzle 102 is a sleeve 114 having an annular flange 116 overlapping flange 118 of the needle for holding the same firmly on the nozzle.

Referring to FIGURES 11, 2 and 4, it can be seen that the needle 112 is installed on the nozzle 102 by inserting the ears 120 of the needle through recesses 122 in flange 116 and then rotating the needle substantially ninety degrees until the ears 120 fit into recesses 124 on the inner side of flange 122. Collar 114 is then screwed onto the nozzle 102 for tightly locking the needle ears 120 in recesses 124 and against annular flange 126. The needle is removed simply by reversing the process.

Nozzle 102 has a central bore 132 aligned with the bore of the needle 112. The inner end of the bore 132 is enlarged and receives a flanged annular resilient sealing member 128. The member 128 has an axial slit through its central portion. The inner end of this slit is enlarged into a conical recess 130. The seal or valve member 128 has a flange 134 which is retained between the inner end of nozzle 102 and a flange within end plug 42.

When the hypodermic assembly is not used or is stored for long periods, the needle 112 is removed and replaced by a sealing cap 136 having a rubber or resilient gasket 140 therein for sealing the end of the nozzle 102 as shown in FIGURE 8.

For temporary protection of the needle 112 without removing the same, a cylindrical sealing cap or disk 142 may be snapped on the outer surface of end member 42. The cap 142 has an annular resilient seal 144 affixed to a groove within its inner surface and which snaps into the annular groove on the surface of end member 42.

FIGURE 10 shows a method of filling the reservoir. When this is desired, the nozzle member 102 is removed from end 42 and the hollow tubular extension 148 of elastic bulb member 146 is inserted into the reservoir cylinder 40 by means of the central aperture in end 42. Reservoir 40 is filled simply by pressing and collapsing bulb 146 and thereby squeezing the contents thereof into the reservoir while it is in a vertical position with 146 on top.

Referring to FIGURE 12, it can be seen that the bore 76 in end member 62 is properly aligned with the bore in support 50 by inserting detents 152 into recesses 150 and retaining them in this position by screwing on collar 68 over sleeve 52. Bore 99 (FIG. 7) is an air vent for the chamber between piston 80 and member 62.

As shown in FIGURE 3, a knurled cap 154 having a gasket 155 is threaded into a recess in cylinder 40. This cap may function as an auxiliary filling means simply by removing it from the cylinder and threading a filling nozzle in the threaded aperture 158'. Another function of this cap, for example, is that once the hypodermic unit has been loaded with fluid, and dated, it may be desired to remove the fluid at a later date if it is too old or stale. This may be easily accomplished by removing nozzle 102, and unscrewing or removing the cap 154 so as to allow atmospheric pressure to enter through port 158' to assist in emptying chamber 158.

In operation, the end 96 of spring 92 is pushed downwardly and radially inwardly as shown in FIGURE 7 so as to release the spring from hook 98 and thereby permit pawl 88 to become disengaged from ratchet teeth 86. Then the operator holding cylinder 40 in one hand and handle 38 in the other rotates lever 18 so as to retract piston 80 to the position shown in FIGURE 3.

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This causes a drop in pressure in chamber 158 whereby it may be refilled by inserting needle 112 in a filling fluid and sucking the fluid into the chamber. Cylinder 40 may also be filled by means illustrated in FIGURE 10, after which the needle is replaced as illustrated in FIGURES 4 and 3. Ratchet spring 92 is then reinserted into hook 98 and knob 22 is rotated clockwise by thumb, index and middle fingers at which time it moves rearwardly until abutment 154 on rod 60 is stopped by seal 64 as shown in FIGURE 3. The operator may remove handle assembly 10 and then inserts two fingers under handle 156 with his thumb lightly pressed against the outer end of knob 22 and thrusts needle 112 into the patient. The operator then presses the knob 22 so as to inject fluid 158 into the patient. The injection terminates when abutment 160 on piston rod 60 contacts support 50. It can be seen that the piston 80 and rod 60 are moved a predetermined amount during the injection process whereby a measured amount of fluid is inserted into the patient. By varying the distance between abutments 160 and 154, it can be seen that any desired amount of fluid can be injected at one time.

After the above mentioned injection, the hypodermic is prepared for the next patient by replacing needle 112 with a sterile one as explained above and rotating knob 22 (by gripping between thumb, index and middle fingers) a sufficient distance to force piston rod 60 and knob 22 rearwardly until abutment 154 of the rod again strikes seal 64. Further rotation of the knob causes the piston 80 to move toward needle 112 causing liquid to fill bore 132 and the entire bore of the needle. The apparatus is then all set and cocked so to speak for the next patient. When cocking or resetting the apparatus, the proper distance in which handle 18 is moved can be determined by several means such as the number of clicks caused by a ratchet 88 moving over teeth 86, or by the resistance created by liquid 158 against piston 80 when abutment 152 strikes seal 64. Also, by observing needle 112 it can be seen that fluid will begin to flow out of the end thereof once the device is fully cocked and knob 22 or lever 18 is continued to be rotated.

During the injection process, the fluid 158 enters the conical recess 130 and seal 128 thereby expanding and stretching the flexible seal so as to open up the slitted portion so as to permit fluid to enter nozzle 102 and needle 112. After the injection is completed, the flexible seal 128 automatically closes itself. The automatic closing of the seal prevents leakage of the device during non-use.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. A hypodermic comprising a cylinder having one end sealed and the other end containing an apertured plug adapted to be connected to a needle, a piston reciprocal within the cylinder having a threaded aperture therein, a threaded piston rod radially offset from the axis of the cylinder received in said aperture and rotatable in a sealed bore in said one end, means connected to said one end of said rod for rotating same, said piston rod being axially slidably mounted within said cylinder whereby axial movement of said rod and piston toward said plug will force fluid therethrough, and abutment means cooperating with each end of the threads on said rod limiting axial movement thereof to a predetermined fixed distance.

2. A device as recited in claim 1 wherein said apertured plug contains a self-closing valve member opened by fluid pressure.

3. A device as defined in claim 1 wherein said aper-

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tured plug has the nozzle of a flexible bulb inserted therein.

4. A device as defined in claim 1 wherein the apertured plug has a flanged collar threaded thereon, notches through the collar flange for receiving attaching ears on the base of a hypodermic needle, and recesses in the inner surface of said flange for receiving and holding said ears in fixed position.

5. A hypodermic comprising a cylinder having one end sealed and the other end containing an apertured plug adapted to be connected to a needle, a piston reciprocal within the cylinder having a threaded aperture therein, a threaded piston rod radially offset from the axis of the cylinder received in said aperture and rotatable in a sealed bore in said one end, said piston rod being axially slidably mounted within said cylinder whereby axial movement of said rod and piston toward said plug will force fluid therethrough, said rod having a portion extending beyond said one end, a crank connected to said portion for rotating same and abutment means cooperating with each end of the threads on said rod limiting axial movement thereof to a predetermined fixed distance.

6. A hypodermic comprising a cylinder circular in cross-section having one end sealed and the other end containing an apertured plug connected to a needle, a piston reciprocal within the cylinder having a threaded aperture therein, a threaded piston rod radially offset from the axis of the cylinder received in said aperture and rotatable in a sealed bore in said one end, said piston rod being axially slidably mounted within said cylinder whereby axial movement of said rod and piston toward said plug will force fluid therethrough, said rod having a portion extending beyond said one end, a crank connected to said portion for rotating same, said crank comprising a lever extending normal to said portion, a sleeve rotatable on the free end of said lever, a pin on said sleeve and perpendicular thereto, and a winding handle rotatable on said pin and abutment means cooperating with each end of the threads on said rod limiting axial movement thereof to a predetermined fixed distance.

7. A hypodermic comprising a cylinder having one end sealed and the other end containing an apertured plug adapted to be connected to a needle, a piston reciprocal within the cylinder having a threaded aperture therein, a threaded piston rod radially offset from the axis of the cylinder received in said aperture, said rod axially slidable and rotatable in a sealed bore in said one end, said rod having a portion extending beyond said one end, a crank connected to said portion for rotating same, a knob connected to said portion having ratchet teeth therearound, a pawl pivotally connected to said one end resiliently urged into engagement with said teeth for preventing rotation of said piston rod in one direction and abutment means cooperating with each end of the threads on said rod limiting axial movement thereof to a predetermined fixed distance.

8. A device as defined in claim 7 wherein said knob

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and teeth are axially movable relative to said pawl.

9. A hypodermic comprising a cylinder having one end sealed and the other end containing an apertured plug connected to a hollow needle, a piston reciprocal within the cylinder having a threaded aperture therein, a threaded piston rod radially offset from the axis of the cylinder received in said aperture and rotatable in a sealed bore in said one end, said rod being reciprocable within said cylinder, and means on said rod for rotating and reciprocating same whereby the rod and piston may be axially moved toward said plug for forcing fluid out of said cylinder, and abutment means cooperating with each end of the threads on said rod limiting axial movement thereof to a predetermined fixed distance.

10. A hypodermic comprising an elongated reservoir having a chamber therein of constant cross-sectional size and shape, one end of the reservoir being sealed and the other end having an outlet opening, a piston having a threaded aperture radially offset from the axis of the cylinder slidably mounted in said reservoir and having sealing engagement therewith, a threaded rod extending longitudinally through said aperture and having threaded engagement with the piston, means mounting said rod in said reservoir spaced from said opening for rotation and axial movement with respect to the reservoir, means extending through said one end and connecting said rod with an operator whereby the rod may be rotated in one direction for forcing it away from said opening and the rod may then be reciprocated toward said opening for forcing a measured amount of fluid therethrough and abutment means cooperating with each end of the threads on said rod limiting axial movement thereof to a predetermined fixed distance.

11. The combination of claim 10 wherein ratchet means are connected between said rod and reservoir for preventing it from rotating in a direction reverse to said one direction.

12. The combination of claim 11 wherein a hypodermic needle is connected to the other end of said reservoir and in communication with said outlet opening.

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