

April 1, 1952

H. F. MAYNES

2,591,457

SYRINGE OPERATING DEVICE

Filed Sept. 15, 1948

4 Sheets-Sheet 1

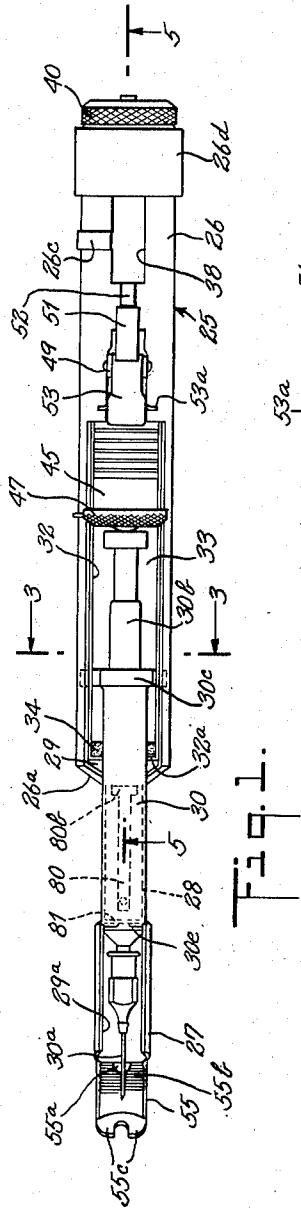


Fig. 1.

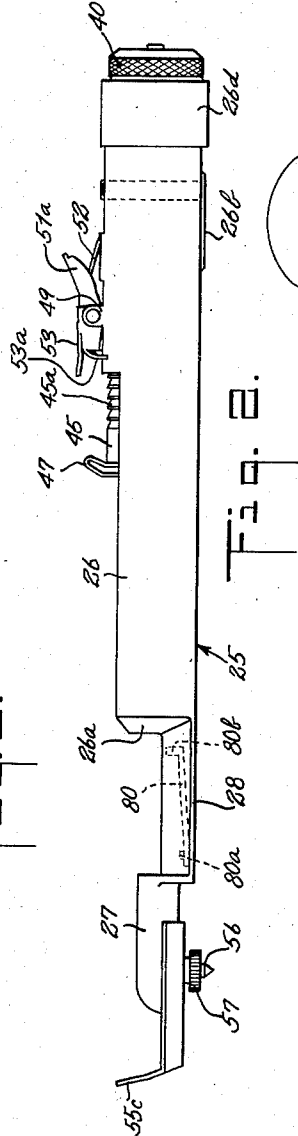


Fig. 2.

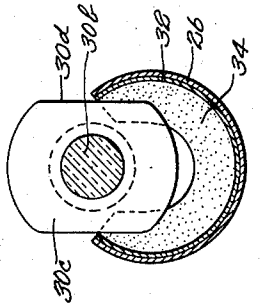


Fig. 4.

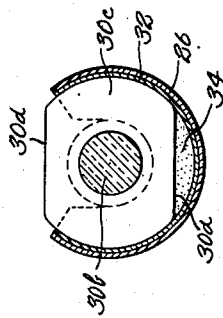


Fig. 3.

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4 Sheets-Sheet 2

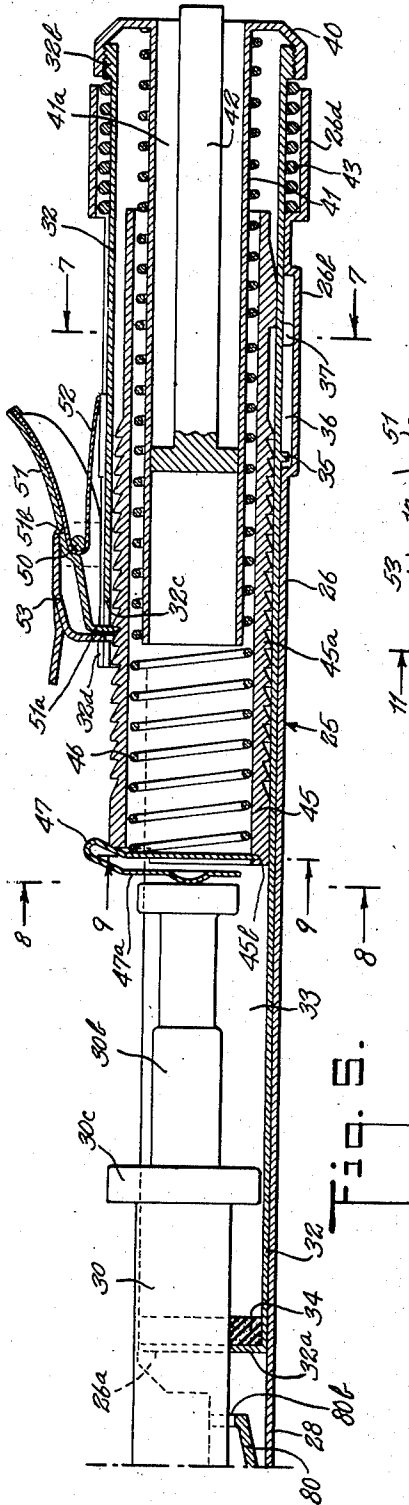


Fig. 6.

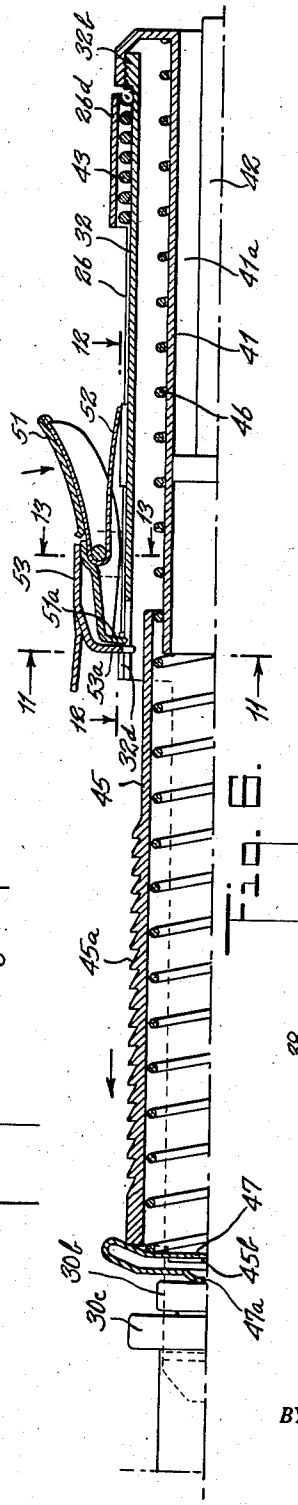


Fig. 7.

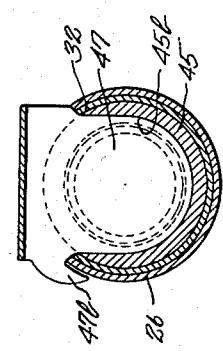


Fig. 8.

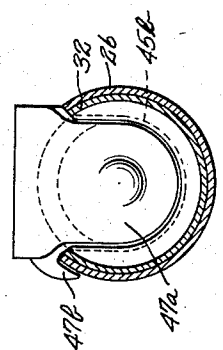


Fig. 9.

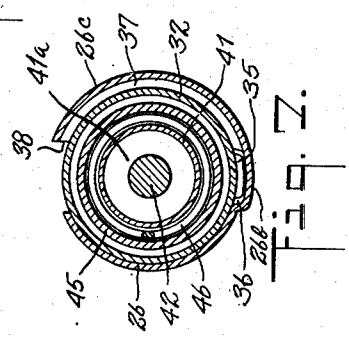


Fig. 10.

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4 Sheets-Sheet 3

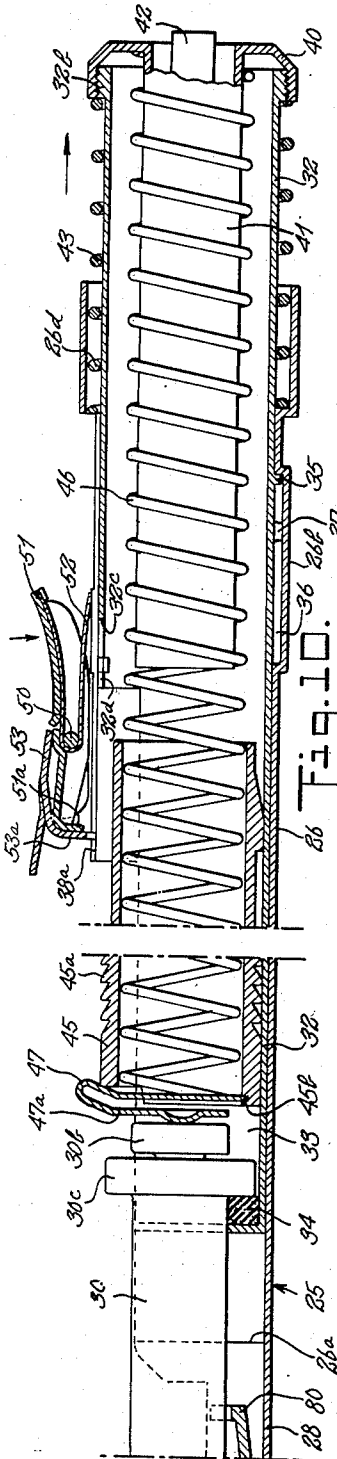


Fig. 10.

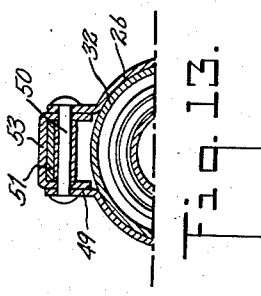


Fig. 13.

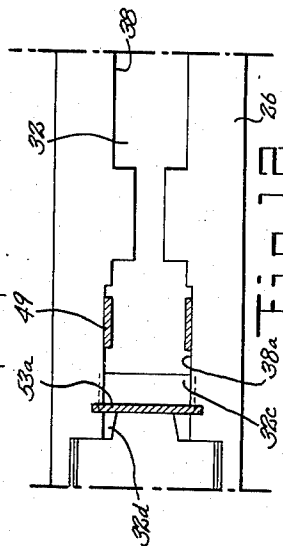


Fig. 12.

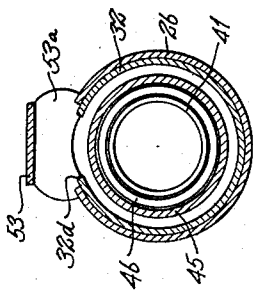


Fig. 11.

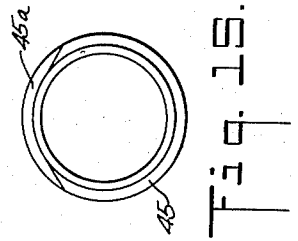


Fig. 15.

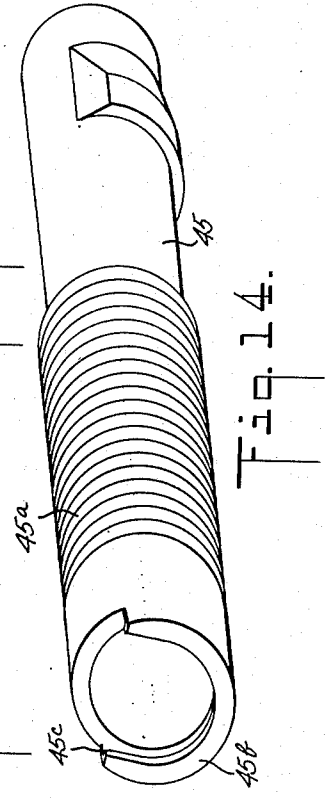


Fig. 14.

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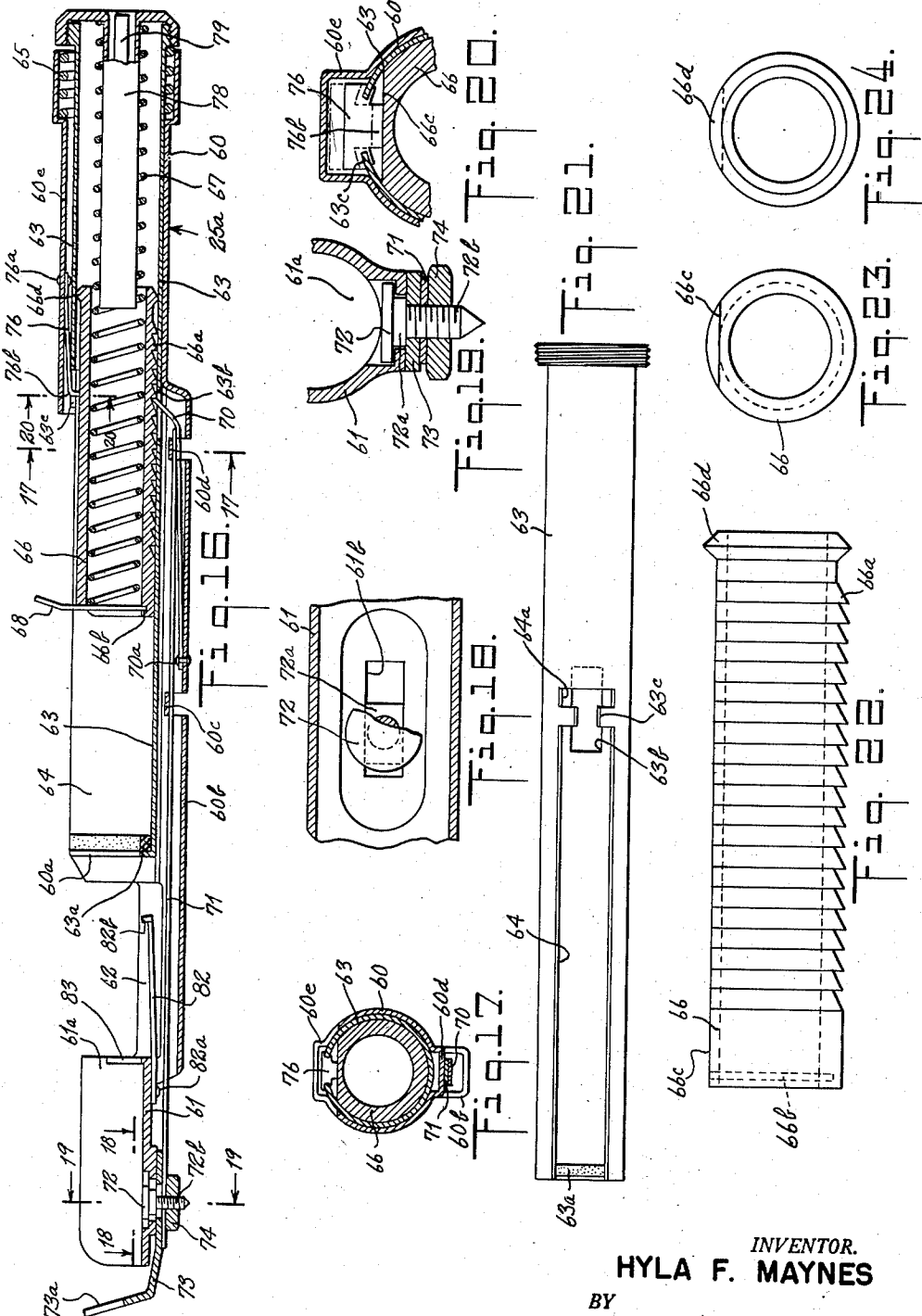
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SYRINGE OPERATING DEVICE

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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

2,591,457

SYRINGE OPERATING DEVICE

Hyla F. Maynes, Miami, Fla., assignor of one-half to Emma C. Maynes, Miami, Fla.; Emma C. Maynes, executrix of said Hyla F. Maynes, deceased

Application September 15, 1948, Serial No. 49,353

28 Claims. (Cl. 128—218)

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This invention relates to devices for operating hypodermic syringes, and more particularly to an improved device for this purpose which facilitates the syringe operation.

In my co-pending application Serial No. 623,085, filed October 18, 1945 (now Patent No. 2,472,116), of which this application is a continuation-in-part, I have disclosed a syringe-operating device which first inserts the syringe needle and then moves the plunger into the syringe cylinder to inject the dose. The device of the present invention is adapted to carry out these functions but in addition is capable of performing certain other functions to make the syringe operation easier and more automatic.

One object of the invention is to provide an improved syringe-operating device which not only inserts the hypodermic needle into the patient but also withdraws it.

Another object is to provide a device of this character by which withdrawal of the needle is effected automatically when the dose injection is completed.

A further object is to provide an improved syringe-operating device in which pressure of the device against the patient automatically projects the syringe bodily along a stationary trough by a force directed against the syringe plunger, to insert the needle.

A device made according to the invention comprises a holder for the syringe, and an actuator movably supported by the holder and urged forward relative to the holder to advance the syringe bodily therein and project the needle. A needle withdrawing member is also movably supported by the holder but is urged rearward relative thereto for retracting the syringe bodily in the holder. The holder is provided with a releasable catch for latching the actuator in a retracted position relative to the holder, and also with a second releasable catch for latching the withdrawing member in an advanced position relative to the holder. Accordingly, the needle is inserted by forward movement of the actuator upon release of the first catch, and the needle is withdrawn by rearward movement of the withdrawing member upon release of the second catch. In one form of the invention, the actuator, after inserting the needle, continues its advance movement to force the syringe plunger into its cylinder and thereby inject the dose, and at the end of its dose-injecting movement the actuator automatically releases the catch holding the syringe withdrawing member.

In the preferred construction, the holder has

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a trough-shaped portion for supporting the syringe and forming a longitudinal guide for bodily movement of the syringe along the holder. The space between the trough edges is sufficiently wide to receive the syringe so that it can readily be inserted into the trough. The actuator is slidable in the trough portion and by engagement with the syringe plunger first slides the syringe bodily along the trough to insert the needle, and then presses the plunger into its cylinder to displace the dose through the needle. Release of the actuator can be effected automatically by a presser foot slidable on the front portion of the holder and engageable with the skin of the patient. By pressing the foot against the patient, the foot is moved rearward relative to the holder and operates through a connection to the actuator catch to release the latter.

For a better understanding of the invention reference may be had to the accompanying drawings, in which:

Fig. 1 is a plan view of one form of the new device, showing the hypodermic needle resting in the holder, with the parts of the device positioned for operating the syringe;

Fig. 2 is a side elevational view of the device shown in Fig. 1, but with the syringe omitted, the parts being in the same positions as shown in Fig. 1;

Fig. 3 is a sectional view on the line 3—3 in Fig. 1, showing how the syringe is secured in the holder;

Fig. 4 is a view similar to Fig. 3 but showing the manner of inserting the syringe in the holder;

Fig. 5 is an enlarged longitudinal sectional view on the line 5—5 in Fig. 1, showing the parts positioned for operating the syringe;

Fig. 6 is a partial sectional view similar to Fig. 5 but showing the positions of the parts after the actuator has inserted the needle and injected the dose;

Figs. 7, 8 and 9 are sectional views on the lines 7—7, 8—8 and 9—9, respectively, in Fig. 5;

Fig. 10 is a view similar to Figs. 5 and 6 but showing the positions of the parts after the syringe withdrawing member has retracted the needle;

Figs. 11, 12 and 13 are sectional views on the lines 11—11, 12—12 and 13—13, respectively, in Fig. 6;

Fig. 14 is a perspective view of the actuator;

Fig. 15 is a rear end view of the actuator;

Fig. 16 is a longitudinal sectional view of a

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modified form of the device, showing the parts positioned for operating the syringe;

Figs. 17, 18, 19 and 20 are sectional views on the lines 17—17, 18—18, 19—19 and 20—20, respectively, in Fig. 16.

Fig. 21 is a plan view of the syringe withdrawing member shown in Fig. 16;

Fig. 22 is a side elevational view of the actuator shown in Fig. 16, and

Figs. 23 and 24 are front and rear end views, respectively, of the actuator.

Referring to the device illustrated in Figs. 1 through 15, it comprises a holder 25 having a main barrel portion 26, a front end portion 27 somewhat narrower than the barrel portion, and a still narrower shank 28 connecting the parts 26 and 27. The barrel 26 is trough-shaped at its front portion to form a receptacle 29, and the front portion 27 is likewise trough-shaped to form a receptacle 29a. The space between the edges of the troughs or receptacles 29 and 29a is sufficiently wide to receive the syringe, which may be of the usual form having a cylinder 30, a hypodermic needle 30a projecting from the front end of the cylinder, and a plunger 30b extending from the rear end of the cylinder.

Slidable longitudinally within the barrel 26 is a syringe withdrawing member 32 which is likewise barrel-shaped. At its front portion, the withdrawing member 32 has a longitudinal slot so that the member forms a trough 33 for receiving the syringe plunger 30b and the rear portion of the syringe cylinder 30. The space between the edges of trough 33 is of the same width as the space between the edges of the trough 29 of barrel 26. The syringe is slidable bodily along the trough 33—29a, the trough forming a guide for longitudinal movement of the syringe relative to the holder 25 and the withdrawing member 32. Forward movement of the syringe along the trough is limited by an external flange 30c at the rear end of the syringe cylinder, which is engageable with a resilient stop 34 secured in the withdrawing member against an internal flange 32a at its front end. Forward movement of the withdrawing member 32 in the barrel is limited by a shoulder 26a at the front end of the barrel.

As shown particularly in Figs. 3 and 4, the flange 30c of the syringe cylinder has diametrically opposed flats 30d, the distance across the flats being somewhat less than the width of the space between the edges of trough 33. When inserting the syringe in the holder, the syringe is positioned with the flats 30d aligned with the trough edges, as shown in Fig. 4, so that the flats will just clear the trough edges. After the syringe, thus positioned, is inserted into the trough 33—29a, the syringe is rotated approximately 90°, as shown in Fig. 3, so that the flange 30c underlies the inwardly curved edge portions of the trough. In this way, the syringe is held against accidental removal from the trough. If desired, an external bead 30e at the front end of the syringe cylinder may be provided with similar opposed flats, aligned with the flats 30d, to supplement the locking action of flange 30c. The syringe is held against accidental sliding movement longitudinally of the trough by the friction or gripping action of the rubber stop 34, which closely engages the syringe cylinder.

The withdrawing member 32 is provided intermediate its ends with an external lug 35 slidable in a longitudinal recess 36 in the barrel 26. The recess 36 is formed by a raised portion 26b of the barrel. At its ends, the recess 36 is closed so as

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to limit the longitudinal sliding of member 32 in the barrel. A transverse passage 37, which opens into recess 36 intermediate its ends, extends circumferentially of the barrel 26 and opens into a longitudinal slot 38 in the barrel. The passage 37 is formed by a raised portion 26c of the barrel. At its rear end, the longitudinal slot 38 opens into an annular enlargement 26d at the rear end of the barrel. Accordingly, in assembling the withdrawing member 32 into barrel 26, the front end of the member is inserted into the enlarged rear end of the barrel with the lug 35 aligned with slot 38. The parts are then telescoped together until the lug 35 is opposite the raised portion 26c, whereupon the withdrawing member 32 is rotated in the barrel to move lug 35 through passage 37 into the longitudinal recess 36.

When the withdrawing member and the barrel 26 are thus assembled, the rear end of member 32 projects through the rear end of the barrel, as shown in Fig. 5. At its rear end, the member 32 has an external flange 32b which is threaded to receive an end cap 40 on the barrel. The cap 40 carries an axial tube 41 forming a re-entrant opening or recess 41a extending into the barrel. An axial rod 42 is secured at one end in recess 41a and extends rearward along the recess in spaced relation to the tube 41, the free end of the rod being exposed from outside the holder.

A compression spring 43 is coiled around the rear portion of withdrawing member 32 and is held under compression between the shoulder or flange 32b and the front end of the barrel enlargement 26d. By reason of the compression in spring 43, the withdrawing member 32 is urged rearward in barrel 26.

An actuator 45 is slidable longitudinally in the withdrawing member 32. The actuator is in the form of a hollow cylinder open at both ends. Intermediate its ends, the actuator is formed externally with circumferential ratchet teeth 45a. The actuator is urged forward in the holder barrel 26 by a compression spring 46 coiled around the central tube 41, which extends into the actuator from its rear end when the actuator is in a retracted position, as shown in Fig. 5. At its rear end, the actuator spring 46 is seated against the end cap 40, and at its front end it is seated against a detent 47 projecting laterally from the actuator through the space between the edges of trough 33. The outer portion of detent 47 can be engaged by the thumb of the operator to retract the actuator against the force of its spring 46. The detent 47 fits into a groove 45b in the front end portion of the actuator, and it can be removed from the actuator, to permit disassembly of the parts, by simply lifting it from the groove 45b, the detent being of less width than the space between the trough edges. A leaf spring 47a extends inwardly from the projecting part of detent 47 and is disposed in front of the detent in spaced relation thereto, in position to engage the syringe plunger 30b. The flexibility of the spring 47a absorbs the shock incident to engagement of the actuator with the syringe plunger when the actuator is released, as will be described presently.

The holder barrel 26 has a longitudinal slot 38a forming an extension of the slot 38. At opposite sides of slot 38a are outwardly extending ears 49, which may be struck from the metal of the holder barrel. Pivotally mounted between the ears 49, as by means of a transverse pin 50, is a lever 51 which may be pressed by the thumb of the operator to release a catch 51a at the front

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end of the lever. The catch 51a is urged inwardly through the slot 38a into engagement with the ratchet teeth 45a on the actuator, the catch being thus urged by means of a leaf spring 52. A second catch 53 is pivotally mounted on the pin 50 above the catch 51a. The free end of catch 53 extends inwardly in front of catch 51a through the slot 38a and is adapted to enter a slot 32c in the withdrawing member 32, as shown in Figs. 5 and 12. The member 32 has projections 32d extending into slot 38a at its forward end. Accordingly, when the member 32 is fully retracted, as shown in Figs. 5 and 6, the catch 53 extends into slot 32c into engagement with the projections 32d, so as to latch the withdrawing member against rearward movement relative to barrel 26. Catch 53 is urged toward its latching position by an ear 51b on lever 51, the ear engaging the rear end of catch 53.

At its front end, the holder 25 has a presser element 55 formed with a longitudinal slot 55a. A screw 56 extends from the holder part 27 through slot 55, and a nut 57 threaded on screw 56 clamps the presser element against the holder. The free end of screw 56 is pointed to serve as a means for puncturing the cap of a vial containing the dose to be injected, as described in my co-pending application Serial No. 49,352, filed September 15, 1948, and now Patent No. 2,565,081. The presser element 55 is generally trough-shaped to conform to the contour of the holder part 27, and its inner surface is provided with transverse corrugations 55b to prevent the presser from slipping on the holder when nut 57 is tightened. At its free end, the presser has a transverse forked portion 55c, the space between the fork tines being aligned with the syringe needle 30a, so that when the syringe is projected by the actuator, the needle passes between the fork tines into the patient. It will be understood that the forked end of presser 55 is pressed against the skin of the patient when the device is to be operated.

The operation of the device is as follows: The syringe 30 is filled with a dose of the desired amount. In some instances, serums and the like are stored in a vial formed by a cylindrical tube closed at one end by a metal cap covering a rubber seal and at the other end by a piston. In transferring the serum from the vial to the syringe, the metal of the vial cap is first punctured by the pointed end of screw 56. Then, with the needle inserted through the cap opening and through the rubber seal into the vial, the latter is positioned so that rod 42 engages the vial piston, the rod being sufficiently small to enter the vial cylinder. The vial is then forced into the axial recess 41a, so that rod 42 forces the piston into the vial cylinder so as to displace the serum through the needle into the syringe, expelling plunger 30b. In this way, the device facilitates filling of the syringe, as disclosed in my co-pending application Serial No. 49,352, filed September 15, 1948, in which I have claimed a syringe operating device including means for facilitating the filling of the syringe from a vial, and also a syringe operating the device comprising a pair of telescoping members movable longitudinally relative to each other to adjust the overall length of the members, one of the members having an elongated stationary receptacle forming a guide for longitudinal movement of the syringe cylinder and accommodating such movement relative to both telescoping members, a cylinder and plunger actuator supported by

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the members and slidable forward along the members while in engagement with the syringe plunger to slide the cylinder forward relative to both members and thereby project the needle, a stop on said first member for limiting the forward movement of the syringe cylinder by the actuator, whereby continued forward movement of the actuator serves to move the plunger into the cylinder, a releasable catch on the second member engageable with the actuator to hold it in a retracted position, and interlocking retaining elements on the respective telescoping members for holding the members against relative longitudinal movement during said forward movement of the cylinder by the actuator.

The syringe is then inserted in the holder 25, as previously described, the withdrawing member 32 being latched in its advanced position by catch 53, as shown in Fig. 5. The actuator 45 is retracted against its spring 46 a distance corresponding to the amount of the dose in the syringe. This distance is indicated by a pointer 47b on a scale (not shown) marked on the holder barrel 26, the scale being preferably in terms of dosage amounts. As the actuator is retracted, due to manual pressure against detent 47, the catch 51a rides over the ratchet teeth 45a. When the actuator is in the proper position as indicated by pointer 47b, and the detent 47 is released, the actuator is held in that position by engagement of catch 51a with the corresponding ratchet tooth 45a.

With the presser foot 55 held against the patient's skin, the lever 51 is depressed to raise the actuator catch 51a so as to disengage the ratchet tooth 45a. The actuator 45 is then projected forward by its spring 46 and, due to engagement with syringe plunger 30b, slides the syringe bodily along trough 33—29a so as to insert the needle into the patient. This forward movement is arrested when the syringe flange 30c engages stop 34. During this needle-inserting operation, the liquid in the syringe cylinder 30 acts as a dash-pot to transmit the actuator pressure from plunger 30b to the syringe cylinder and the needle. When forward movement of the syringe is arrested by stop 34, the continued advance of the actuator by spring 46 forces plunger 30b into the syringe cylinder so as to inject the dose through the needle and into the patient. Upon completion of the dose injection, the lever 51 is further depressed so that catch 51a in its upward movement engages the overlying part of catch 53, thereby raising the latter. This results in release of the withdrawing member 32, whereupon spring 43 moves it rearward in the holder barrel 26 to a retracted position, as shown in Fig. 10. In this rearward movement of the withdrawing member, the hypodermic needle is withdrawn from the patient by reason of the engagement of stop 34 with the syringe flange 30c.

It will be observed from the foregoing that pressure on lever 51 first releases the actuator catch 51a and then releases the withdrawal catch 53a. In order to prevent premature releasing of the withdrawal catch, the latter may be held down by the thumb of the operator while depressing the lever 51.

The form of the device illustrated in Figs. 16 through 24 differs from that previously described in that the actuator catch is released by pressure on the presser foot, and the withdrawal catch is released automatically by the actuator. Referring to Figs. 16 through 24, the holder 25a comprises a barrel 60, a front portion 61 and

an intermediate shank 62, the front portion 61 and the forward part of the barrel being trough-shaped, as described in connection with the previous embodiment. The syringe withdrawal member 63 is slidable longitudinally in barrel 60 and has at its front end a rubber stop 63a engageable by the flange at the rear of the syringe cylinder when the syringe is projected forwardly in the trough receptacle 64—61a. The withdrawal member 63 projects through the rear end of barrel 60 and is urged rearward relative to the barrel by a spring 65.

An actuator 66 is slidable longitudinally in the withdrawal member 63 and is urged forward by a spring 67 coiled between the end of the withdrawing member and the actuator. A detent 68 projects outward from the front part of the actuator and can be engaged by the thumb of the operator to retract the actuator against its spring 67. The detent 68 projects through the space between the edges of the trough 64 extending along the front portion of the withdrawing member. The detent 68 is removable from a groove 66b in the actuator, to permit disassembly of the parts.

A catch 70 is secured in the barrel 60, as shown at 70a, and is adapted to extend through an opening 63b in the withdrawing member into engagement with ratchet teeth 66a on the bottom of the actuator. The catch 70 is disposed in an elongated raised portion 60b of the holder barrel. A trip rod 71 extends along the passage formed in the raised portion 60b, with the rear end of the rod engaging the catch 70. The rod 71 is guided by transverse members 60c and 60d formed in longitudinally spaced notches in the raised portion 60b, the transverse member 60d being disposed adjacent the free end of catch 70 so as to limit inward movement thereof. The catch 70 is normally urged inward into engagement with the actuator, by reason of the inherent spring action of the catch. The trip rod 71 is connected at its front end to a slide 72 in the front portion 61 of the holder. As shown particularly in Figs. 18 and 19, the slide 72 has a rectangular portion 72a movable in a longitudinal slot 61b in the holder. A presser foot 73 is interposed between the trip rod 71 and the holder part 61, and a screw 72b on the slide extends through the presser foot and the trip rod, these parts being held together by a nut 74. At its free end, the presser foot has a forked portion 73a adapted to be pressed against the skin of the patient.

A second catch 76 is secured to the barrel 60 in a raised portion 60e thereof which is diametrically opposed to the raised part 60b. The catch 76 is secured at one end, as shown at 76a, and its free end 76b is adapted to extend through a slot 64a (Fig. 21) in the withdrawal member 63. The latter is provided with opposed projections 63c extending inwardly at the front end of slot 64a, so that when the withdrawing member 63 is in its advanced position (Fig. 16) the catch 76b engages projections 63c so as to latch the withdrawing member against rearward movement relative to the holder. The actuator 66 is formed with a flattened portion 66c at the top, which terminates at its rear end in a cam 66d engageable with catch 76b.

In the operation of the device, the presser foot 73 is pressed against the skin of the patient, causing the foot to move rearward on slide 72 relative to the holder, this movement being opposed somewhat by friction between the presser foot and the holder part 61. As a result, trip rod 71

is moved rearwardly and, by a cam action against the rear or curved part of catch 70, forces the catch outwardly to disengage the ratchet tooth 66a. The actuator is then projected forward by spring 67 to project the syringe, insert the needle and inject the dose, as described in connection with the first embodiment. As the actuator reaches the end of its travel, incident to completing the dose injection, the cam 66d engages catch 76b to release the withdrawing member 63, which is then retracted by spring 65. Consequently, the syringe needle is withdrawn from the patient by engagement of stop 63a with the syringe flange.

Rearward sliding of the withdrawing member 63 in the holder barrel 60 may be limited by a suitable stop arrangement similar to the parts 35, 36 in the embodiment first described. Forward sliding of member 63 is limited by engagement of the front end of this member with shoulder 60a at the front of the barrel.

As in the first embodiment, the withdrawing member 63 may be provided in its rear portion with an axial tube 78 for receiving a vial containing the dose, and with a central rod 79 mounted in the tube to force the vial piston into its cylinder when the vial is pressed forward in tube 78. Also, the free end of screw 72b may be pointed so that it can serve to puncture the vial cap for insertion of the hypodermic needle before the vial is forced into the tube 78.

While the device is shown in Figs. 16 through 24 as being fully automatic, it will be understood that a manually operated catch, such as the catch 51a or catch 53a in Figs. 5 and 6, may be substituted for either of the automatically operated catches, so that the device is semi-automatic.

It will be observed that in both forms of the invention, as illustrated, forward pressure of the vial piston against the axial rod (42 or 79) will slide the syringe withdrawing member forward a short distance until it is latched in its advanced position by its catch. Thus, the withdrawing member is automatically set for operation incident to transferring the dose from the vial to the syringe. Also, in both forms, the depth of penetration of the syringe needle into the patient is adjustable by loosening the nut (57 or 74) which clamps the presser foot and adjusting the presser foot longitudinally relative to its mounting, that is, relative to the holder part 27 in Fig. 1 and to the slide 72 in Fig. 16. In the Fig. 16 form, after the presser foot is withdrawn from the patient it is returned manually to its forward position.

The assembly of the device in either form can be effected easily by inserting the actuator and its spring through the rear end of the syringe withdrawing member, with its end cap removed, and screwing the end cap in place to hold the parts in the withdrawing member. The retracting spring (43 or 65) is then slipped over the front end of the withdrawing member and moved back against its shoulder on which the end cap has been screwed. Then the withdrawing member is inserted through the enlarged rear end of the holder barrel and rotated therein to engage its lug in the longitudinal recess in the barrel. The detent (47 or 63) is then inserted in its groove at the front end of the actuator.

While I have shown a rubber member 34 (63a) which serves to engage and hold the syringe against accidental rotation and longitudinal sliding in the holder, the rubber member may be supplemented or replaced by a leaf spring 80 which, as shown in Figs. 1 and 2, is secured at

its front end in a depression in the bottom of the shank 28, as shown at 80a. At its front end, the spring has a saddle 80b (Fig. 5), the upper surface of which is curved to receive the syringe cylinder. The saddle is urged upwardly against the syringe cylinder by the inherent spring action of leaf 80, thus clamping the beads 30c and 30e against the overhanging edges of the trough portions 32 and 27, respectively. In addition, rearward movement of the syringe is positively limited by an internal shoulder 81 located in the rear end of trough section 27 and engageable by the bead 30e on the front end of the syringe cylinder. In Fig. 16, the leaf spring is shown at 82 and extends partly through the raised portion 60b and through an opening in the front end of shank 62 where it is depressed. The spring 82 is secured at its front end to the bottom of trough portion 61, as shown at 82a, and its rear end is located in a depression in the bottom of shank 62 and carries the saddle 82b. The limiting shoulder for the syringe is shown at 83 and is engageable by the bead 30e (Fig. 1) on the syringe.

In my copending application Ser. No. 623,085 (now Patent No. 2,472,116), I have claimed a hypodermic syringe operating device comprising a holder having an elongated stationary trough for engaging and supporting the syringe cylinder and forming a guide for longitudinal movement of the syringe cylinder along the trough, the space between the trough edges being sufficiently wide to receive the syringe, an actuator in the trough movable therealong in engagement with the syringe plunger to slide the syringe cylinder forward along the trough and project the needle, and a stop on the holder for limiting said forward sliding of the cylinder by the actuator, to cause the plunger to be moved in the cylinder by continued movement of the actuator.

I claim:

1. A device for operating hypodermic syringes having a syringe cylinder, a needle projecting from the front end of the cylinder, and a plunger extending from the rear end of the cylinder, the device comprising a holder for the syringe, an actuator movably supported by the holder and urged forward relative thereto for advancing the syringe bodily relative to the holder to project the needle, said holder including a needle withdrawing member movably supported by the holder and urged rearward relative thereto for retracting the syringe bodily relative to the holder, a releasable catch on the holder for latching the actuator in a retracted position relative to the holder, and a second releasable catch on the holder for latching the withdrawing member in an advanced position relative to the holder.

2. A device according to claim 1, in which the withdrawing member includes a longitudinally movable stop in the holder for limiting said bodily advance of the syringe.

3. A device according to claim 1, in which the withdrawing member is mounted in the holder and slidable longitudinally thereof, the actuator being mounted in the withdrawing member and slidable longitudinally thereof.

4. A device according to claim 1, in which the holder has a trough-shaped portion forming a receptacle for the syringe, the space between the trough edges being sufficiently wide to receive the syringe.

5. A device according to claim 1, in which the holder has a trough-shaped portion forming a receptacle for the syringe, the space between the

trough edges being sufficiently wide to receive the syringe, the withdrawing member being mounted in the holder and having a trough-shaped portion aligned with said first portion and adapted to receive part of the syringe.

6. A device according to claim 1, in which the holder and the withdrawing member together form a receptacle for the syringe.

7. A device according to claim 1, in which the holder and the withdrawing member together form a receptacle for the syringe, the actuator being slidable in the part of the receptacle formed by the withdrawing member.

8. A device according to claim 1, in which the holder and the withdrawing member together form a longitudinal guide for the syringe in said advancing movement thereof, the withdrawing member having a stop engageable by the syringe to limit its advancing movement.

9. A device according to claim 1, comprising also a stop on the holder for limiting forward movement of the withdrawing member relative to the holder.

10. A device according to claim 1, comprising also a spring in the holder acting upon the actuator to urge it forward relative to the holder, and a second spring in the holder acting upon the withdrawing member to urge it rearward in the holder.

11. A device according to claim 1, comprising also a cam on the actuator operable on the second catch to release it.

12. A device according to claim 1, comprising also a presser foot movably mounted on the front end portion of the holder and engageable with the skin of the patient, and an operative connection between said foot and the first catch for releasing the first catch.

13. A device according to claim 1, comprising also a presser foot movably mounted on the front end portion of the holder and engageable with the skin of the patient, an operative connection between said foot and the first catch for releasing the first catch, and a cam on the actuator operable on the second catch to release it.

14. A device according to claim 1, comprising also a manually operable element on the holder for releasing the catches in succession.

15. A device according to claim 1, comprising also a manually operable element connected to the first catch for releasing it, the first catch having a part engageable with the second catch to release said second catch.

16. A device according to claim 1, comprising also a detent removably mounted on the actuator and projecting laterally from the holder for retracting the actuator therein.

17. A device according to claim 1, in which the actuator is slidable in the withdrawing member, and the withdrawing member is slidable in the holder, said member projecting through the rear end of the holder, and a spring coiled around said member and compressed between the rear end portion of the member and the holder, to urge said member rearward relative to the holder.

18. A device according to claim 1, in which the withdrawing member is slidable in the holder and is exposed through the rear end of the holder, a central tube in said member forming an axial recess opening through the rear end of the member, and an axial rod extending along said recess in spaced relation to the side wall thereof, the rear end of the rod being exposed from outside the holder.

19. A device according to claim 1, in which the

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withdrawing member is slidable in the holder and is exposed through the rear end of the holder, a central tube in said member forming an axial recess opening through the rear end of the member, and a spring coiled around the tube and compressed between the rear end of said member and the actuator.

20. A device according to claim 1, comprising also a spring compressed between the actuator and the withdrawing member for urging the actuator forward relative to the holder.

21. A device according to claim 1, comprising also a detent on the actuator projecting laterally from the holder for retracting the actuator therein, and a flexible element supported by the detent and engageable with the syringe plunger.

22. A device according to claim 1, comprising also a detent on the actuator projecting laterally from the holder for retracting the actuator therein, and a pointer on the detent overlying the outer surface of the holder for indicating the extent of retraction of the actuator.

23. A device according to claim 1, in which the actuator is slidable in the withdrawing member, and the withdrawing member is slidable in the holder, said member having an external lug, the holder having a longitudinal recess for receiving the lug and in which the lug is movable to accommodate longitudinal movement of said member relative to the holder, the ends of said recess being closed to limit said longitudinal movement.

24. A device according to claim 1, in which the actuator is slidable in the withdrawing member, and the withdrawing member is slidable in the holder, said member having an external lug, the holder having a longitudinal recess for receiving the lug and in which the lug is movable to accommodate longitudinal movement of said member relative to the holder, the ends of said recess being closed to limit said longitudinal movement, the holder also having a longitudinal recess open at one end to receive the lug in moving said member into the holder, the holder also having a transverse passage connecting said recesses and through which the lug is movable by rotation of said member in the holder.

25. A device for operating hypodermic syringes having a syringe cylinder, a needle projecting from the front end of the cylinder, and a plunger extending from the rear end of the cylinder, the device comprising an elongated holder having a

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trough-shaped portion for receiving the syringe and forming a longitudinal guide for bodily movement of the syringe along the holder, the space between the trough edges being sufficiently wide to receive the syringe, an actuator in the holder urged forward along said trough portion and engageable with the syringe plunger to project the syringe and insert the needle, a releasable catch on the holder for latching the actuator in a retracted position, a presser foot movably mounted on the holder at the front portion thereof and engageable with the patient's skin, an operative connection between the presser foot and the catch for releasing the catch upon rearward movement of said foot relative to the holder, a syringe withdrawal member movably supported by the holder and urged rearward relative thereto, and a second catch on the holder for latching said member in advanced position relative to the holder.

26. A device according to claim 25, in which the presser foot has a forked end, the space between the fork prongs being aligned with said trough-shaped portion and adapted to receive the syringe needle.

27. A device according to claim 25, comprising also a slide on the holder movable longitudinally thereof, and a releasable element holding the foot on the slide and releasable to permit adjustment of the foot relative to the slide.

28. A device according to claim 25, in which said connection includes a trip rod movable longitudinally of the holder, the rear end portion of the rod having a part engageable with the catch.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,991,103	King -----	Feb. 12, 1935
2,101,140	Hege -----	Dec. 7, 1937
2,316,095	Mead, Jr. -----	Apr. 6, 1943
2,409,656	Austin -----	Oct. 22, 1946

FOREIGN PATENTS

Number	Country	Date
214,232	Great Britain -----	Dec. 18, 1924