Aug. 21, 1951 H. F. MAYNES 2,565,081

DEVICE FOR OPERATING HYPODERMIC SYRINGES

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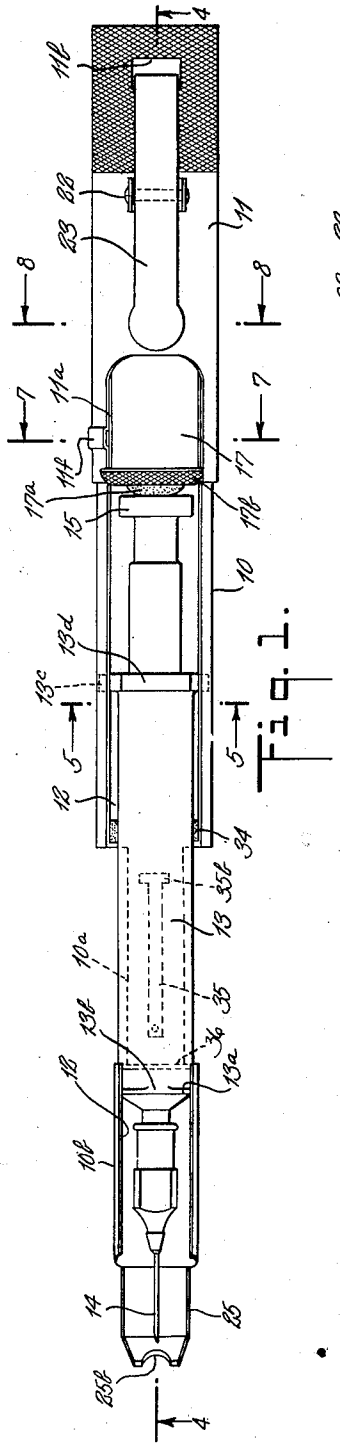

Fig. 1.

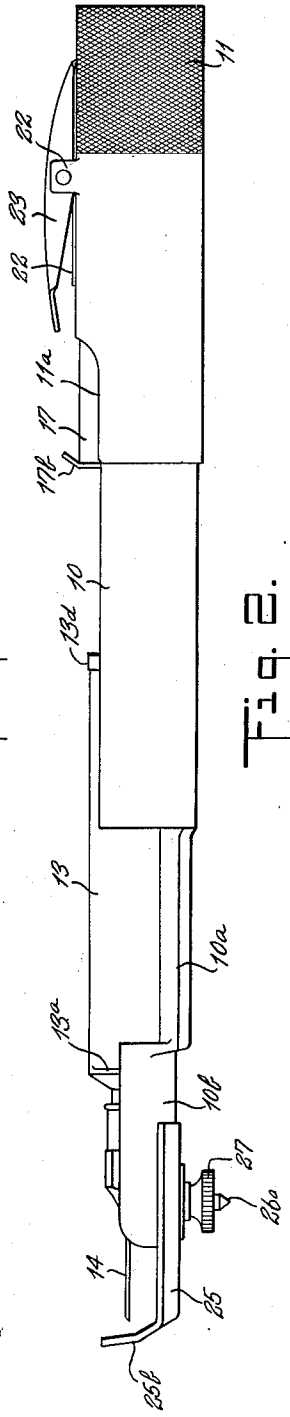

Fig. 2.

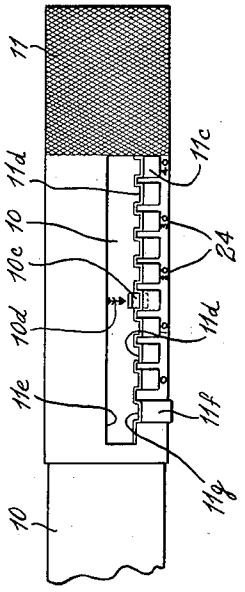

Fig. 3.

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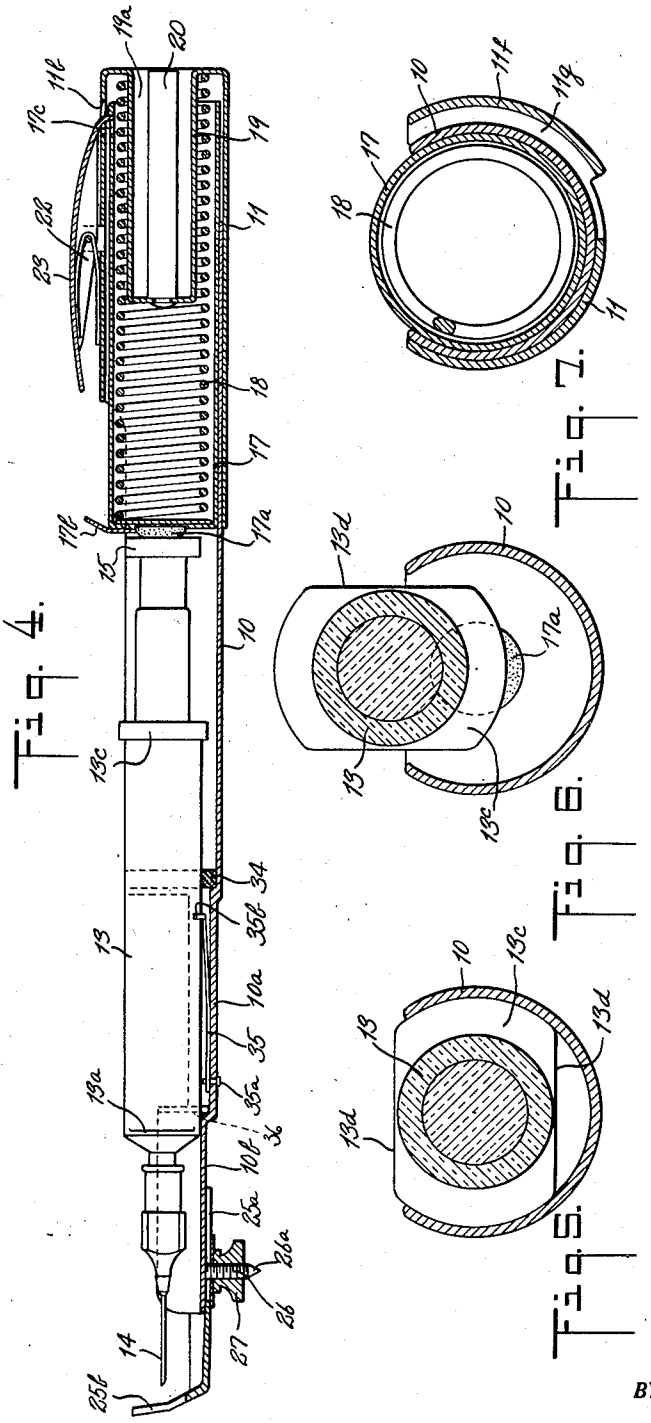

Fig. 4.

Fig. 7.

Fig. 6.

Fig. 5.

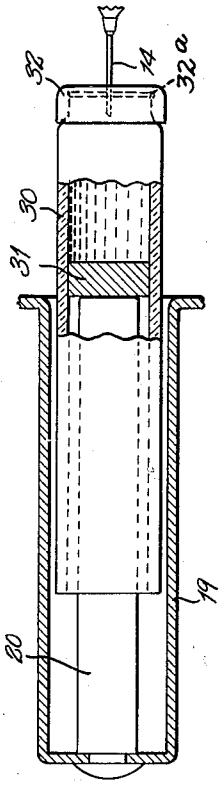

Fig. 9.

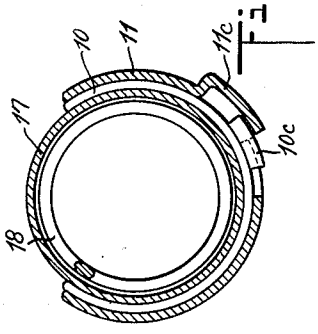

Fig. 8.

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DEVICE FOR OPERATING HYPODERMIC SYRINGES

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Application September 15, 1948, Serial No. 49,352

19 Claims. (Cl. 128—218)

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This invention relates to syringe operating devices. More particularly, it relates to an improved device for inserting the needle of a hypodermic syringe into the patient and then actuating the syringe plunger to inject the dose through the needle.

In my co-pending application Serial No. 623,085, filed October 18, 1945 (now Patent No. 2,472,116), of which the present application is a continuation-in-part, I have disclosed a syringe operating device comprising a holder having a stationary trough for supporting the syringe cylinder and forming a guide for longitudinal movement of the syringe bodily along the trough. The space between the trough edges is sufficiently wide to receive the hypodermic syringe, which can therefore be inserted laterally into the trough. An actuator, which may be spring-pressed, is movable along the trough in engagement with the syringe plunger, so as to slide the syringe forward along the trough to insert the needle. This forward movement is then arrested by engagement of the syringe cylinder with a stop on the holder, whereupon continued movement of the actuator in the trough presses the plunger into the syringe cylinder to inject the dose. In this way, the dose in the cylinder initially acts as a dash-pot through which pressure of the actuator on the syringe plunger is transmitted to the needle to insert it, and a single actuator suffices for both the needle insertion and the dose injection. The actuator can be retracted a selected distance in the trough, depending upon the amount of the desired dose, and held by a catch adapted to release the actuator and initiate the operation.

An object of the present invention is to provide a device of the character described having improved facilities for adjustment to accommodate doses of different amounts.

Another object is to provide a device of this character which is of simple construction and is adapted for use to expedite filling of the syringe with the desired dose.

A syringe operating device made in accordance with the present invention comprises a pair of telescoping members movable longitudinally relative to each other to adjust the overall length of the members. One of the members forms an elongated receptacle for the syringe, the receptacle being preferably trough-shaped and formed in the inner telescoping member with the space between the trough edges sufficiently wide to receive the syringe. The two telescoping members constitute a casing which supports an actuator slidable forward along the receptacle to operate the syringe, as by pressing the syringe plunger first to advance the syringe bodily along the receptacle for the needle insertion and then to inject the dose when the syringe movement is arrested. The casing member which telescopes with the receptacle member has a releasable catch engageable with the actuator to hold it in a rearward retracted position. Interlocking retaining elements on the respective telescoping members hold them releasably against relative longitudinal movement to maintain the members at an adjusted overall length.

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With the new construction, the device can be readily adjusted to accommodate doses of different amounts in the syringe, by simply moving the telescoping members together or apart to vary the length of the receptacle which receives the syringe, it being understood that the overall length of the syringe increases with the amount of the desired dose according to the extent of withdrawal of the plunger in the syringe cylinder incident to filling it. Thus, in preparing the device for operation, the actuator is always retracted a predetermined amount relative to the telescoping member on which the releasable catch is mounted, and the catch will engage the same part of the actuator to retain it, regardless of the amount of the dose. Since adjustment of the device for different amounts of the dose is independent of the actuator, it can be made even after the actuator is retracted and held by the catch in preparation for the operation. By means of the releasable interlocking elements on the telescoping members, these members can be adjusted and held to accommodate a predetermined amount of a dose in the syringe, so that whenever the actuator is retracted and latched by the catch, it is always set for just that amount of dosage. Retraction of the actuator may be effected manually by means of a detent projecting outward from the actuator through the casing wall, the detent being movable along the space between the trough edges, if the receptacle is formed in a trough shape.

In the preferred construction, the interlocking elements on the respective telescoping members include an external lug on the inner member, and projections on the outer member forming longitudinally spaced transverse recesses each adapted to receive the lug. To facilitate longitudinal adjustment of the telescoping members, the member having the transverse recesses is provided with a longitudinal recess or slot com-

municating with the transverse recesses, so that the lug is movable along the longitudinal recess to position it adjacent a selected transverse recess. One of the members is then rotated relative to the other to insert the lug in the transverse recess and thus lock the members against relative longitudinal movement. The front end of the longitudinal recess is closed to prevent complete separation of the telescoping members. Their assembly into telescoping relation is effected by sliding the lug along a second longitudinal slot or recess extending from the telescoping or front end of the member having the transverse recesses, and then rotating the members relatively to slide the lug along a transverse passage connecting the two longitudinal recesses.

In some instances, the dose to be injected into a patient is stored in a vial which is closed at one end by a cap end at the other end by a piston. The dose is transferred to the syringe cylinder by puncturing the cap to insert the hypodermic needle, and then forcing the piston into the vial to displace the dose as it flows through the needle into the syringe cylinder by withdrawal of the syringe plunger. To expedite this syringe loading operation, I provide my device with an axial recess opening through the rear end of the casing and sufficiently wide to receive the vial. An axial rod is secured at one end in the bottom of the recess and extends into the recess with a clearance between the rod and the side wall of the recess, the free end of the rod being exposed and sufficiently small to enter the vial. With the needle inserted through the cap end of the vial, the piston in the opposite end of the vial is engaged with the free end of the rod and the vial forced into the axial recess, thus moving the piston to displace the dose. The vial cap may be punctured by a pointed projection on the front portion of the casing forming part of a releasable connection between the casing and a positioning element engageable with the patient's skin to determine the depth of the needle insertion.

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

Fig. 1 is a plan view of the preferred form of the new device, showing the syringe in its receptacle and the actuator latched in its retracted position ready for operation;

Fig. 2 is a side elevational view of the device shown in Fig. 1;

Fig. 3 is a bottom view of the rear portion of the device, showing the interlocking elements on the telescoping members;

Figs. 4 and 5 are sectional views on the lines 4—4 and 5—5, respectively, in Fig. 1;

Fig. 6 is a sectional view similar to Fig. 5 but showing the manner of inserting the syringe into the receptacle;

Figs. 7 and 8 are sectional views on the lines 7—7 and 8—8, respectively, in Fig. 1, and

Fig. 9 is an enlarged longitudinal sectional view of part of the rear portion of the casing, showing how it coacts with the vial to assist in transferring the dose to the syringe.

The device as illustrated comprises a pair of telescoping members 10 and 11 forming an elongated casing. The inner member 10, constituting the front part of the casing, is trough-shaped and forms an elongated receptacle 12 for the hypodermic springe 13. There is sufficient space between the trough edges of member 10 to receive the syringe 13, as shown in Figs. 5 and 6, so that the syringe can be inserted laterally into the trough receptacle 12 with the needle 14 extending forward. The trough forms a guide for longitudinal sliding movement of the syringe along the member 10, as will be described presently. The rear or telescoping portion of the receptacle member 10 is of considerably greater width than the intermediate or shank portion 10*a*, which is somewhat narrower than the front end portion 10*b*.

The syringe 13, which may be of conventional form, has a hypodermic needle 14 projecting forward from the cylinder, and a plunger 15 extending from the rear end of the cylinder. The front part of cylinder 13 has a circumferential bead 13*a* interrupted by a pair of diametrically opposed flats 13*b*. Similarly, the rear or plunger end of cylinder 13 has an enlarged annular flange 13*c* which is flattened at diametrically opposite sides, as shown at 13*d*, the flats 13*b* and 13*d* being aligned. When inserting the syringe into the trough receptacle 12, the syringe is held with the flats 13*b* and 13*d* aligned with the trough edges of the corresponding front portion 10*b* and rear portion, respectively, of member 10, in which position (Fig. 6) the flats will just clear the edges to allow the syringe to be laid in the trough. Then the syringe is rotated (Fig. 5) so that the bead and flange underlie the opposite edges of the corresponding trough sections, which curve slightly inwardly at their edge portions. In this way, the trough edges prevent the syringe cylinder from falling out of the trough, while allowing the syringe to slide longitudinally in the trough.

The outer telescoping member 11, constituting the rear part of the casing, contains an actuator 17 sildable in the rear portion of the trough receptacle 12. The actuator is of cylindrical shape to conform to the contour of the interior of member 10. It is hollow and closed at its front end, which supports a cushion 17*a* engageable with the end of syringe plunger 15. The actuator is spring-pressed toward the syringe and the front end of the casing by a compression spring 18 coiled within the actuator and seated against the rear end of the casing member 11. Retraction of the actautor against the spring is effected manually by pressure of the thumb on a knurled detent 17*b* projecting laterally from the front end of the actuator through the space between the trough edges. The rear telescoping member 11 has a slot 11*a* extending from its front or telescoping end and aligned with the space between the trough edges of member 10, for a purpose to be described presently.

At its rear end portion, the member 11 has a central hollow tube 19 forming an axial recess 19*a* opening through the rear end of the casing. The tube 19 may be integral with member 11 so as to form the recess 19*a* as a reentrant opening. Secured to the closed front end of tube 19 is an axial rod 20 extending into the recess in spaced relation to the side wall of the recess, so that the free end of the rod is exposed at the rear end of the casing. The tube 19 extends into the coils of the biasing spring 18.

Pivotally mounted between outwardly projecting ears 22, struck from the outer telescoping member 11, is a releasable catch 23 for holding actuator 17 in its retracted position against spring 18. The catch is pivoted intermediate its ends and is biased so that its rear end is urged inwardly through an opening 11*b* in member 11. As the actuator is retracted, its rear end engages

and lifts the rear end of the catch, which then slides along the periphery of the actuator until the catch snaps into an opening 17c in the rear portion of the actuator, as shown in Fig. 4, thus holding the actuator when its detent 17b is released. When the front end portion of the catch is pressed manually, the catch disengages the actuator, which is then projected forward by spring 18.

The telescoping members 10 and 11 are rotatable relative to each other and are also slidable longitudinaly relative to each other to adjust their overall length, that is, the length of the casing. The members are held releasably against relative longitudinal movement by means of interlocking retaining elements on the respective members, to maintain them at an adjusted overall length. The retaining elements comprise an external lug 10c on the periphery of the inner member 10 near its rear end, and a series of raised projections 11c on outer member 11 forming longitudinally spaced transverse recesses 11d each adapted to receive the lug. Each recess 11d is closed at one end and at the other end opens into a longitudinal recess or slot 11e in member 11, in which the lug is slidable. The longitudinal recess 11e is closed at both ends, its closed rear end serving as a stop for lug 10c to prevent accidental removal of the inner telescoping member from the outer member 11 when the lug is in the longitudinal recess. The outer member 11 is provided with indicia 24 adjacent certain of the projections 11c to indicate the amount of the dosage for which the device is set. The inner member 10 has an arrow 10d which, when the lug is in any of the recesses 11d, is visible through the longitudinal recess 11e to indicate the particular transverse recess and therefore the setting of the device.

The outer member 11 has a transverse raised portion 11f spaced slightly to the rear of the front end of longitudinal recess 11e. It forms a transverse passage 11g extending between the slot 11a and the longitudinal recess 11e, which are spaced transversely or circumferentially from each other. In assembling the telescoping members, the inner member 10 containing the actuator is inserted in outer member 11 with the lug 10c aligned with slot 11a. Then the members are pushed together against the force of spring 18 until lug 10c is aligned transversely with passage 11f, whereupon the member 10 is rotated in the outer member 11 so that the lug passes through passage 11f into longitudinal recess 11e.

At its front end, the inner or receptacle member 10 has a longitudinally adjustable positioning element 25. It is releasably secured to the front portion 10b of the receptacle member by a lateral projection 26 having a puncturing point 26a at its free end, and a nut 27 threaded on the projection. The positioning element 25 is trough-shaped to conform to the contour of the casing part 10b, and it has a longitudinal slot 25a through which the screw projection 26 extends. Accordingly, when the nut 27 is tightened, the positioning element is held securely in its adjusted position. At its front end, the positioning element has a fork 25b which is pressed flat against the skin of the patient, and when the device is operated to project the syringe, the needle 14 passes between the tines of the fork and into the skin.

In the use of the new device, the point 26a and the rod 20 serve to facilitate transfer of the dose to the syringe from a vial 30 of the type commonly used to store the liquid to be injected. As shown in Fig. 9, the vial is a hollow cylinder containing a piston 31 which normally closes one end of the vial. The other end is closed by a metal cap 32 covering a rubber seal, through which the needle must be inserted into the contents of the vial. In order to prevent damage to the needle, as might occur if it is used to puncture the cap, a small opening is made in the cap by the puncturing point 26a. With the needle inserted through this opening and through the rubber seal 32a, the vial is then placed so that the piston 31 engages the free end of rod 20, which is sufficiently small to enter the vial. By pressing the vial into the axial recess 19a, which is large enough to receive the vial freely, the piston 31 is forced into the vial so as to displace the liquid from it through the needle into the syringe cylinder 13, as plunger 15 is expelled. The transfer is continued until the desired amount is in the syringe, as indicated by the usual markings (not shown) on the syringe. The rod 20 is of sufficient length to expel all of the liquid from the vial before the vial reaches the bottom of recess 19a.

The telescoping members 10 and 11 are adjusted to an overall length depending upon the desired amount of the dose. That is, the greater the amount, the greater will be the overall length of the syringe due to withdrawal of the plunger 15, and so with increasing amounts the members 10 and 11 will be moved apart to increase the length of the trough receptacle 12 for receiving the syringe. The adjustment of the receptacle length is effected when the lug 10c is in the longitudinal recess 11e, by sliding the inner member 10 in the outer member 11 until the lug is opposite the transverse recess 11d corresponding to the desired amount of the dose, as indicated by the indicia 24. The inner member 10 is then rotated in outer member 11 to move the lug into the selected transverse recess 11d and thereby lock the members at the adjusted overall length. The arrow 10d then indicates the setting on the scale 24, in terms of the amount of dosage.

With the device thus adjusted, the actuator 17 is retracted from a U-shaped rubber stop 34 secured at the front end of the relatively large diameter portion of member 10, the actuator being normally urged against the stop 34 by spring 18. When the actuator is fully retracted into the rear or outer member 11, as shown in Fig. 4, it is automatically latched by the catch 23. Then the loaded syringe is inserted into the trough receptacle 12, in the manner previously described, and slid back until plunger 15 engages cushion 17a on the actuator. The syringe will be held against accidental axial displacement from this position, because of the friction between syringe cylnder 13 and the rubber stop 34. With the parts so positioned, the end of needle 14 is slightly in back of the positioning fork 25b, and the syringe shoulder or flange 13c is a greater distance behind the stop 34, as shown in Fig. 1. The fork 25b is then pressed against the patient's skin and the catch 23 released.

Upon release of catch 23, the spring 18 advances the actuator 17 which, by pressure against plunger 15, projects the syringe forward so that it slides bodily along the trough receptacle 12. The liquid in the syringe cylinder 13 acts as a dash-pot to transmit the thrust of the actuator from the plunger 15 to the syringe cylinder and its needle. Accordingly, the needle passes between the tines of fork 25b and is driven into the patient until the syringe flange 13c engages stop 34, which yields to reduce the impact. There-

upon, the continued forward movement of actuator 17 pushes the plunger 15 into the syringe cylinder to inject the dose into the patient, after which the device is moved away from the patient to withdraw the needle.

It will be observed that the device can be adjusted quickly and easily to accommodate doses of different amounts, by simply positioning the lug 10c in a different transverse recess 11d. This adjustment of the parts can even be effected when the actuator is latched in its retracted position, since the adjustment does not require movement of the actuator in its casing. The catch 23 will always engage the same part of the actuator to latch it, regardless of the setting of the telescoping members 10 and 11. With any given setting of these members, they will always accommodate the syringe with a corresponding amount of dosage, when the actuator is fully retracted to its latched position.

The depth of penetration of the needle can be varied by longitudinal adjustment of the positioning element 25.

While I have shown a rubber member 34 closely engaging the syringe cylinder 13 to prevent accidental rotation and longitudinal sliding of the syringe in the holder, the member 34 may be supplemented or replaced by a leaf spring 35 secured at one end in a depression in the bottom of shank 10a, as shown at 35a. At its rear end, the spring 35 has a transverse saddle 35d, the upper surface of which is curved to receive the syringe cylinder 13. The saddle is urged upwardly against the syringe cylinder by the inherent spring action of leaf 35, thus clamping the beads 13a and 13c against the overlying edges of the trough portions 10b and 10, respectively. In addition, rearward movement of the syringe in the holder may be positively limited by an internal shoulder 36 located in the rear end of trough portion 10b and engageable by the bead 13a on the front end of the syringe cylinder.

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 a hypodermic syringe having a cylinder, a plunger projecting from the rear end thereof, and a needle at the front end of the cylinder, the device comprising a pair of telescoping members movable longitudinally relative to each other to adjust the overall length of the members, one of said members having an elongated stationary receptacle forming a guide for longitudinal movement of the cylinder and accommodating said cylinder movement relative to both members, a cylinder and plunger actuator supported by said members for movement relative to both members and slidable forward along said 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 said 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 rearward 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.

2. A device according to claim 1, comprising also a spring in the second member biasing the actuator to advance it along the receptacle upon release of the catch.

3. A device according to claim 1, comprising also a spring compressed between part of the second member and the actuator for advancing the actuator along the receptacle upon release of the catch.

4. A device according to claim 1, in which the second telescoping member receives the adjacent end portion of the receptacle member, the actuator being supported in said adjacent end portion.

5. A device according to claim 1, in which the receptacle is trough-shaped, the space between the trough edges being sufficient to receive the syringe.

6. A device according to claim 1, in which the receptacle is trough-shaped, the actuator being supported within said members, the device comprising also a detent on the actuator projecting outwardly between the trough edges for retracting the actuator.

7. A device according to claim 1, in which said retaining elements include a lug on one of the telescoping members, and projections on the other member forming longitudinally spaced transverse recesses each adapted to receive the lug.

8. A device according to claim 1, in which said retaining elements include an external lug on the inner telescoping member, and projections on the outer telescoping member forming longitudinally spaced transverse recesses each adapted to receive the lug.

9. A device according to claim 1, in which said retaining elements include a lug on one of the telescoping members, and projections on the other member forming longitudinally spaced transverse recesses each adapted to receive the lug, said last member having a longitudinal recess communicating with the transverse recesses and forming a guide for longitudinal movement of the lug adjacent the transverse recess, said members being rotatable relative to each other to move the lug into a selected transverse recess from the longitudinal recess.

10. A device according to claim 1, in which said retaining elements include a lug on one of the telescoping members, and projections on the other member forming longitudinally spaced transverse recesses each adapted to receive the lug, said last member having a longitudinal recess closed on its front end and communicating intermediate its ends with the transverse recesses to form a guide for longitudinal movement of the lug along the transverse recesses, said members being rotatable relative to each other to move the lug into a selected transverse recess from the longitudinal recess.

11. A device according to claim 10, in which said member having the recesses is formed with a longitudinal slot spaced laterally from the

longitudinal recess and extending to the telescoping end of the member, said last member also having a transverse passage extending between the slot and the longitudinal recess and through which the lug is moved from the slot to position it in the longitudinal recess.

12. A device according to claim 1, in which the telescoping end portion of the receptacle member is rotatable in the second member and has an external lug forming one of said retaining elements, the other retaining elements being projections on the second member forming longitudinally spaced transverse recesses each adapted to receive the lug.

13. A device according to claim 1, in which the telescoping end portion of the receptacle member is rotatable in the second member and has an external lug forming one of said retaining elements, the other retaining elements being projections on the second member forming longitudinally spaced transverse recesses each adapted receive the lug, the second member having two transversely spaced longitudinal slots one of which is closed at its front end and communicates intermediate its ends with the transverse recesses, thus forming a guide for longitudinal movement of the lug adjacent the recesses, the other slot extending from the telescoping front end of the second member and being adapted to receive the lug by relative longitudinal movement of the members, the second member also having a transverse passage between the slots and through which the lug is movable into the first slot by relative rotation of the members.

14. A device according to claim 13, in which said receptacle is trough-shaped with the space between the trough edges sufficiently wide to receive the syringe, said second longitudinal slot forming a continuation of the space between the trough edges.

15. A device according to claim 1, for use in transferring a dose from a vial into the syringe by movement of a piston in the vial, the device being characterized by said second member having an axial recess opening through the outer end of the member and of sufficient size to receive the vial, and a rod mounted at one end at the bottom of the recess and extending into the recess in spaced relation to its side wall, the free end of the rod being sufficiently small to engage the piston and force it into the vial by movement of the vial into the recess.

16. A device according to claim 15, comprising also a hollow tube in the second member forming said axial recess, and a compression spring in the second member coiled around the tube and engaging the actuator to urge it along the receptacle.

17. A device according to claim 1, comprising also a positioning element projecting from the front end of the receptacle member and engagable with the skin of the patient, and a releasable connection between the positioning element and the receptacle member including a projection having a vial-puncturing point at its free end.

18. In a device for operating a hypodermic syringe and comprising an elongated casing for holding the syringe with the hypodermic needle extending toward the front end of the casing, and an actuator supported by the casing and engagable with the syringe to operate it, the improvement which comprises an axial rod secured at its inner end in the rear end portion of the casing, the casing having an axial recess opening through said rear end and containing the rod with a clearance between the rod and the side wall of the recess and with the free end of the rod exposed from outside the casing, whereby the recess is adapted to receive a vial containing a dose to be transferred to the syringe, and the rod is operable to force a piston into the vial by movement of the vial into the recess, in effecting said transfer.

19. The improvement according to claim 18, comprising also a hollow tube in the rear end portion of the casing and forming said recess, the tube being spaced from the side wall of the casing, and a compression spring in the casing coiled around the tube and engaging the actuator to urge it axially along the casing.

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REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
938,597	Lombardo	Nov. 2, 1909
1,320,536	De Falco et al.	Nov. 4, 1919
1,718,596	Smith	June 25, 1929
1,921,034	LaMarche	Aug. 8, 1933
2,047,010	Dickinson	July 7, 1936
2,295,849	Kayden	Sept. 15, 1942
2,347,179	Gorman	Apr. 25, 1944

FOREIGN PATENTS

Number	Country	Date
214,232	Great Britain	Dec. 18, 1924
505,931	France	Aug. 10, 1920
539,092	France	June 21, 1922
579,240	France	Oct. 13, 1924
770,998	France	Sept. 27, 1934