Dec. 4, 1951 A. PIECHACZEK 2,577,481

SURGICAL INJECTION APPARATUS

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Fig. 1.

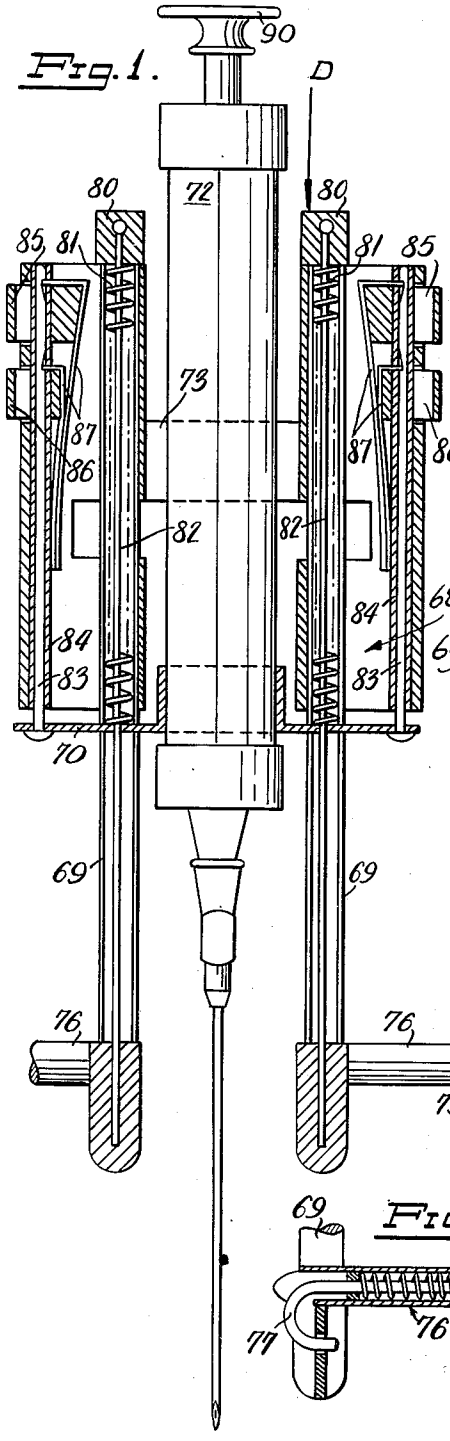

Fig. 2.

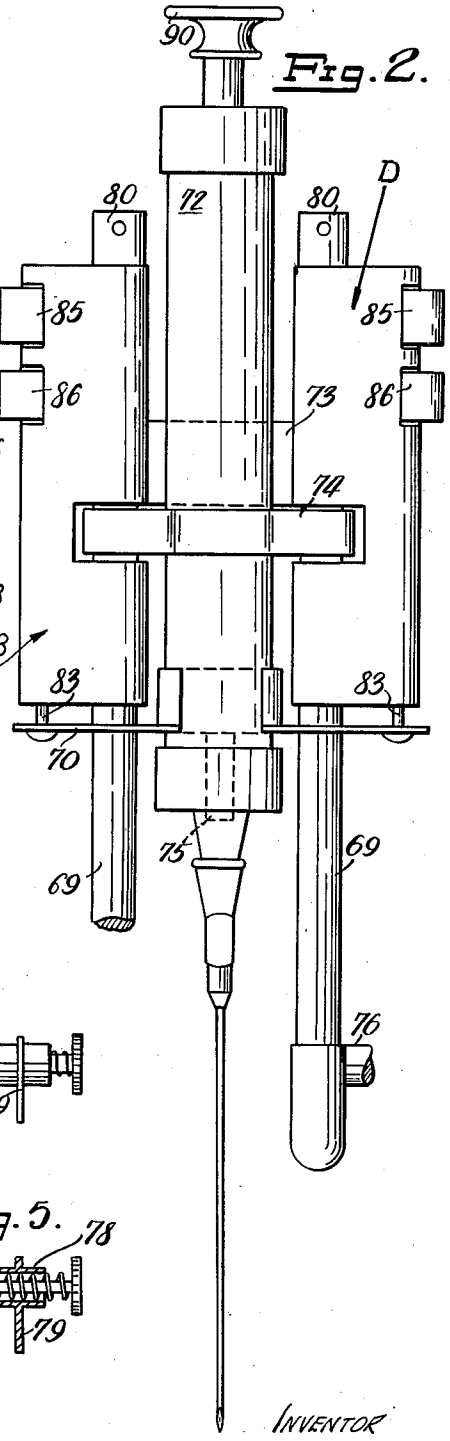

Fig. 5.

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SURGICAL INJECTION APPARATUS

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Fig. 3.

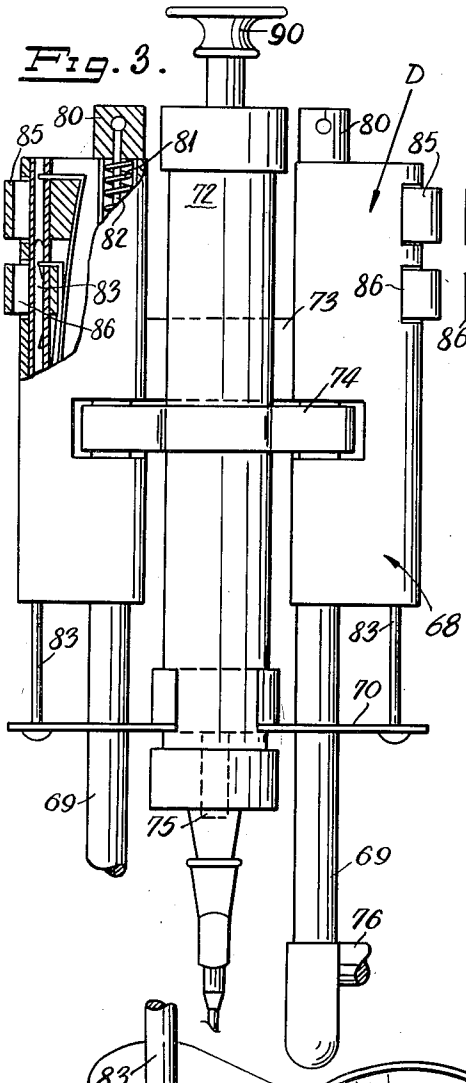


Fig. 4.

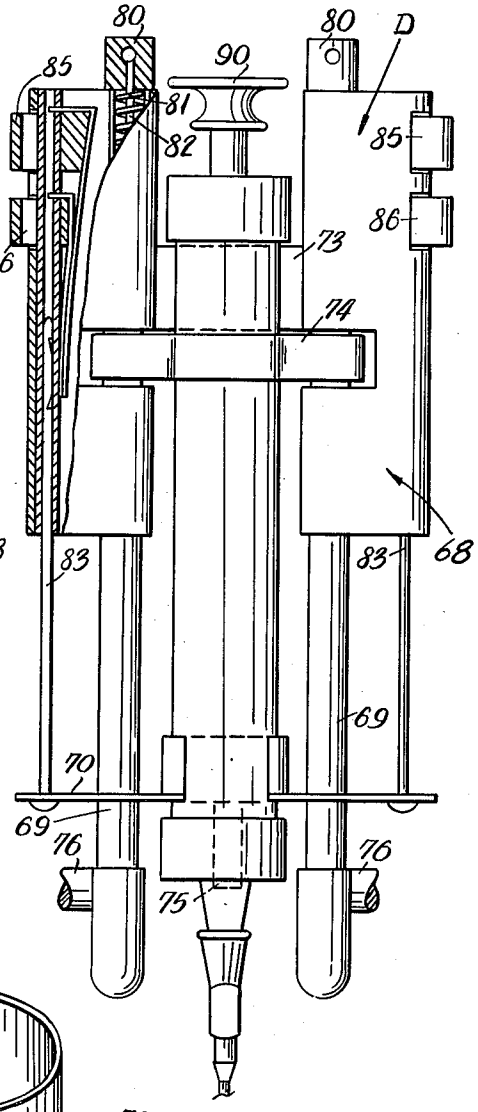
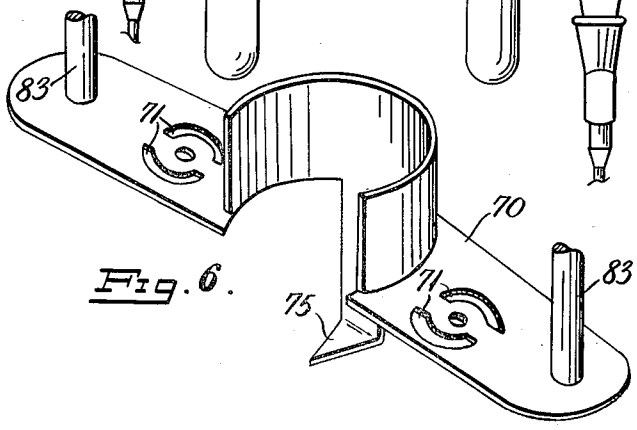


Fig. 6.



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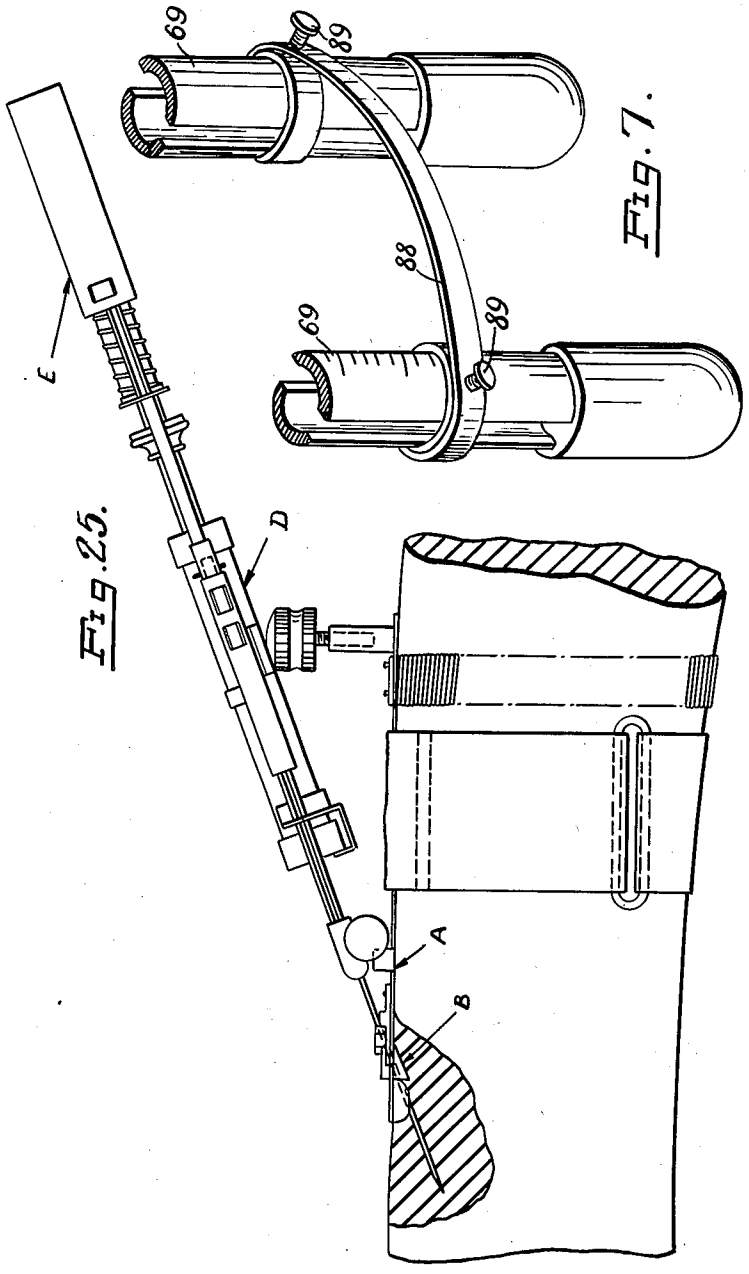

Fig. 7.

Fig. 25.

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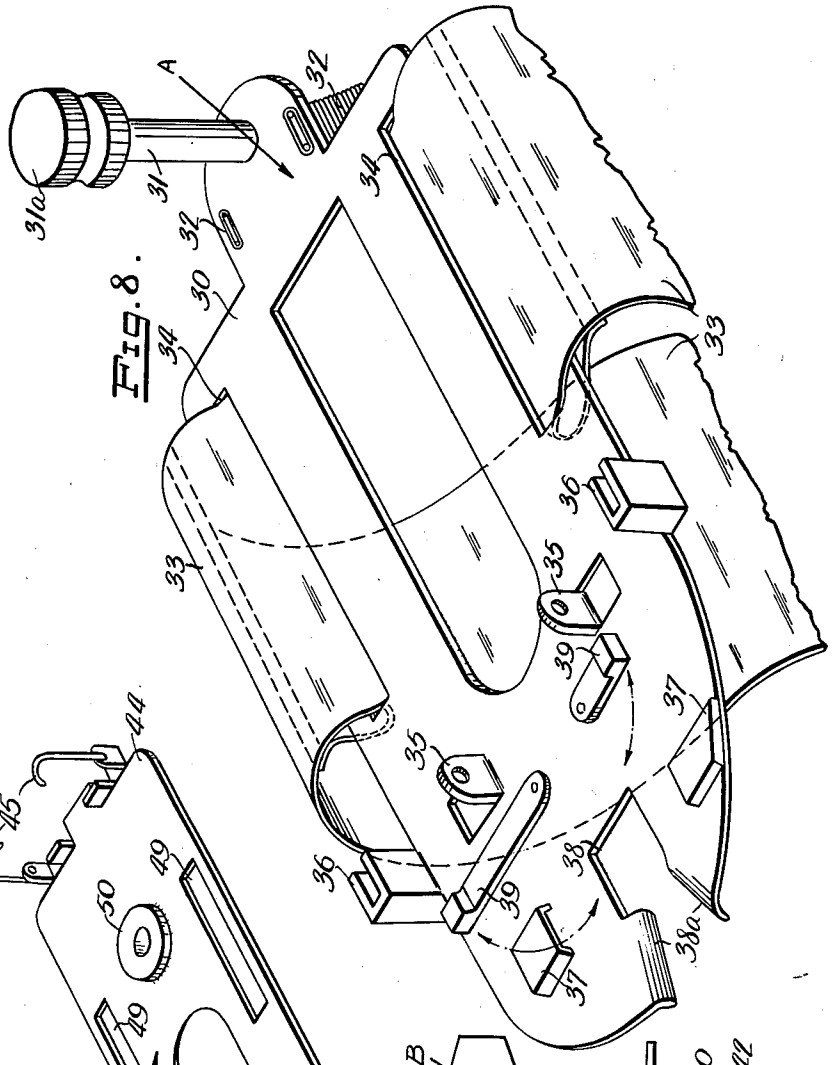

Fig. 8.

Fig. 12.

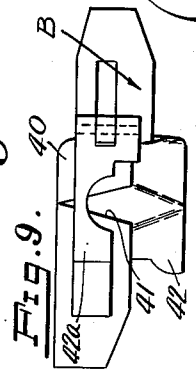

Fig. 9.

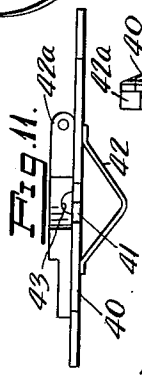

Fig. 11.

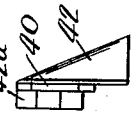

Fig. 10.

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Fig. 13.

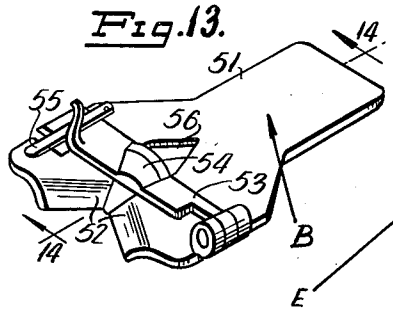

Fig. 14.

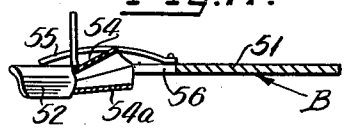

Fig. 15.

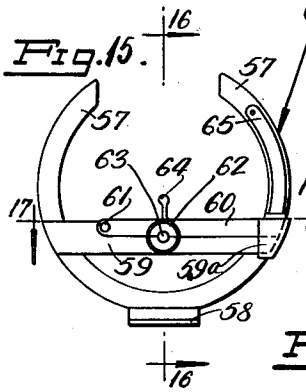

Fig. 16.

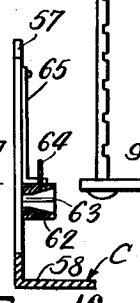

Fig. 17.

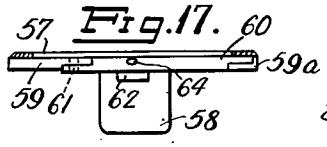

Fig. 19.

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SURGICAL INJECTION APPARATUS

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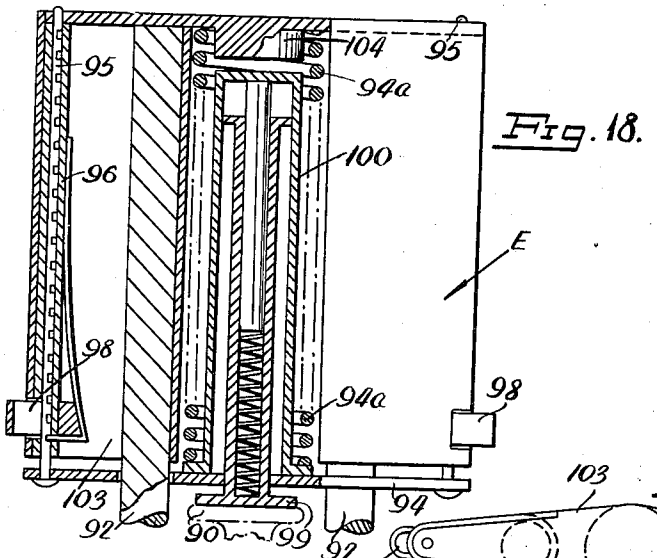

Fig. 18.

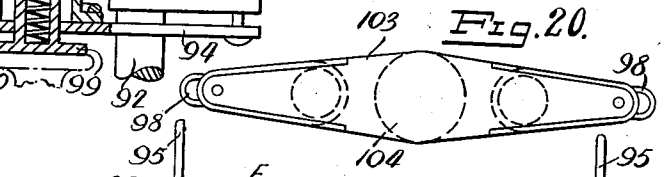

Fig. 20.

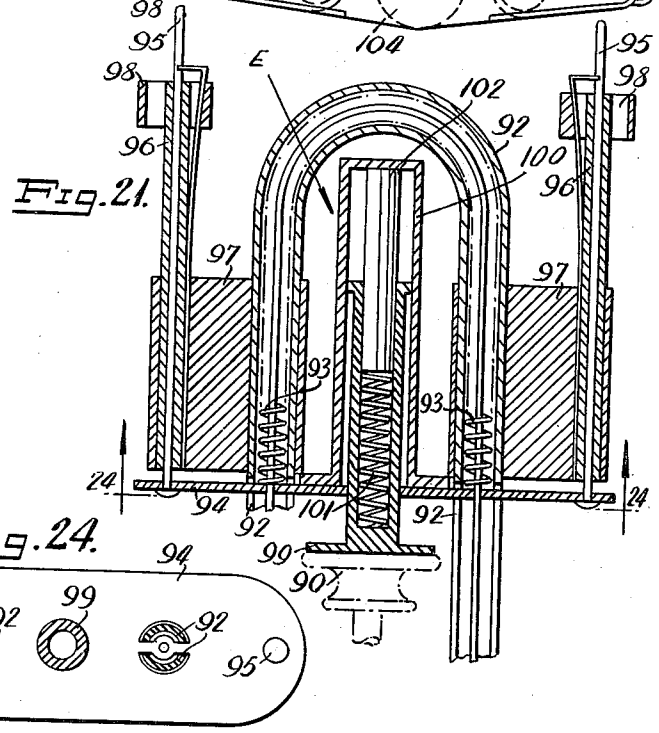

Fig. 21.

Fig. 24.

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Fig. 23.

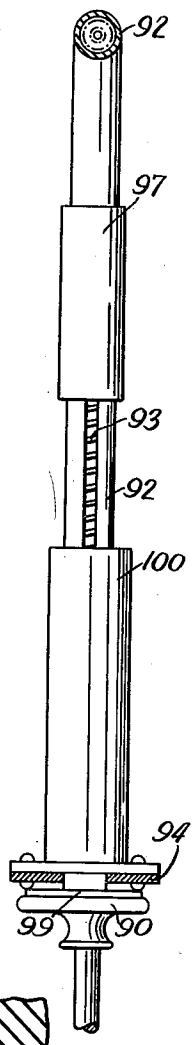


Fig. 22.

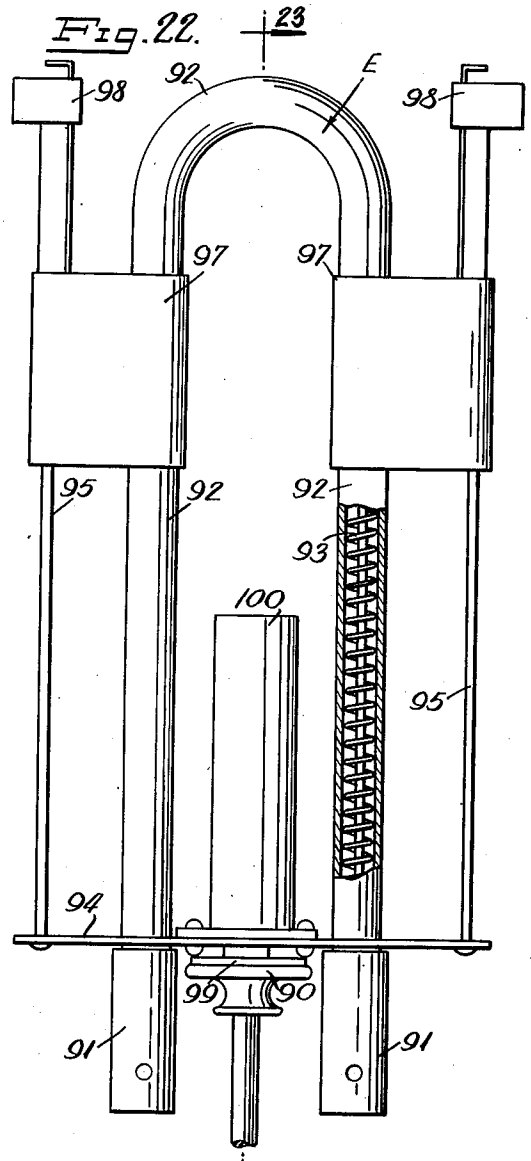
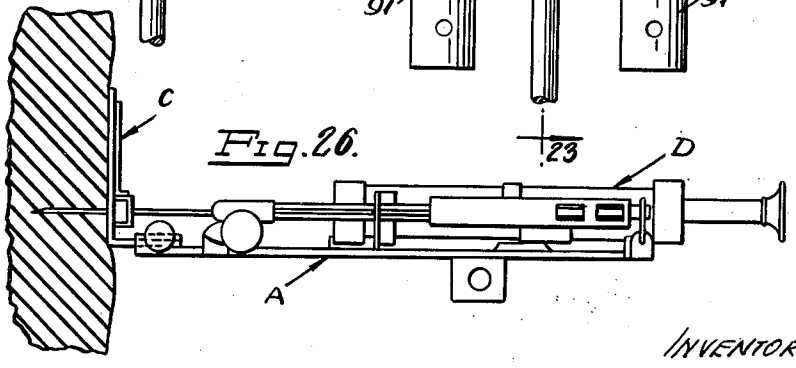


Fig. 26.



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Patented Dec. 4, 1951

2,577,481

UNITED STATES PATENT OFFICE

2,577,481

SURGICAL INJECTION APPARATUS

Alojzy Piechaczek, Glasgow, Scotland

Application February 2, 1950, Serial No. 141,969
In Great Britain February 19, 1949

12 Claims. (Cl. 128—218)

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This invention has reference to apparatus for enabling subcutaneous or intra-muscular injections to be effected single-handed, by the patient himself or any other unskilled operator, by means of a syringe and attached hypodermic needle, the object of the present invention being to provide an apparatus including a syringe holder with means for attaching the syringe holder to the limb of the patient in such a manner that the needle can be automatically inserted under the skin at the required angle of incision, and automatic injection of liquid from the syringe can be effected.

The main advantages of the automatic injection made possible by my invention, over the ordinary injection are that injection can be effected by the patient himself or by any unskilled attendant and that the precise and rapid puncture of the skin by the automatically inserted needle renders the injection itself less painful, and in the majority of cases quite painless.

The apparatus effects needle insertion under the pressure of a spring or springs released either by the patient or by an attendant, and it is a further object of the invention to enable needle insertion to be effected, if desired, in two stages, in the first stage of which the needle is caused rapidly to puncture the skin, whereupon the needle can be caused slowly to travel under the skin. The apparatus also enables the injection of the serum or other liquid to be effected either by hand pressure on the plunger knob of the syringe or automatically under spring pressure. Means may also be provided for controlling or regulating the depth of insertion of the needle.

The apparatus of the present invention comprises a syringe holder having means for attachment to a base piece which may have means for strapping or otherwise clamping it to the limb of the patient, a detachable sterilizable needle guide carried by the said base piece, spring means on the syringe holder for urging the syringe towards the needle guide to effect insertion of the needle by movement thereof through the needle guide, and one or more spring catches for holding the syringe and needle in retracted position.

The syringe holder is preferably hingedly attached to the base piece to which alternative forms of needle guide may be attached, according to whether sub-cutaneous or intra-muscular injections are to be performed. The base piece may be supported at an adjustable inclination by the provision of an adjustable stay or support between the syringe holder and the base piece. This enables the angle of incision of the needle

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to be varied as desired. The adjustable stay or support may be removable to enable the syringe holder to be laid flat on the base piece when intra-muscular injections are to be performed. The syringe holder may be removably attached to the base piece for convenience of attachment of the needle to the syringe or insertion of the syringe in or its removal from the holder. The detachability of the syringe holder also enables the needle to be quickly withdrawn when injection has been completed, while the base piece may be detached later i. e. independently of the syringe itself.

The base piece may be a plate of metal or other suitable material and may have one or more straps or arm bands for securing the base piece in position on the limb of the patient. The needle guide may be an apertured eye piece or a divided hinged eye-piece through which the needle is movable, and a V-shaped notch may be provided on the eye piece to assist in guiding the point of the needle into and through the aperture of the eye piece. The eye piece detachably engages the base piece to enable the needle guide to be held removably in position. The said V-shaped notch overlies and exposes the skin of the patient at the point of injection, and in order that the skin may be stretched and held in a stretched condition in the form of a bulge protruding into the said notch, the inclined edges of the said notch are rolled over towards the underside or formed with rolled or beaded edges.

The syringe holder may be in the form of a frame including a pair of parallel guide members on which a cradle is slidable, the cradle being designed to removably receive and hold a standard hypodermic syringe which is held in position at its upper end by resting in a U-shaped guide connecting the said parallel rods and being held in the said guide from above by means of a hinged clamping bar hinged to one of the said rods.

To effect needle insertion, the cradle is acted on by a pair of helical springs conveniently housed in tubes forming the guide members on which the cradle is slidable. Attached to the cradle, at each side of the syringe holder or frame, is a guide rod or guide member, the upper end of which is formed as a catch which can be engaged with either of two spring detents mounted on the associated tubular guide. These detents are releasable by thumb or finger pressure in pairs either separately or together, the arrangement being such that if the two uppermost detents, one at each side of the syringe holder, are de-

pressed, the catches are released and the springs which act on the cradle press the latter downwards, inserting the needle rapidly into and a short distance under the skin. The catches then engage the second pair of detents, thus arresting the cradle, syringe and needle in a semi-retracted position. Depression of the second pair of detents, fully releases the catches, thus permitting the springs to press the cradle, syringe and needle further downwards, and pressing the needle deeper and slowly under the skin. This arrangement enables the needle to be gently inserted and avoids possible injury to the patient should the needle strike a bone.

If desired, both pairs of detents may be depressed simultaneously, when the needle will make a full stroke and will be inserted more rapidly.

Where the syringe is of extra capacity, for instance, of two inch stroke, one or more additional catches may be provided for regulating the length of stroke and consequent depth of needle insertion, particularly when injections other than sub-cutaneous are to be performed.

On the insertion of the needle, liquid injection is effected, either by the patient or by an attendant, on depressing the plunger of the syringe.

My invention also consists in the provision of means for effecting automatic injection, that is to say, under the release of spring pressure. For this purpose a spring-operated plunger presser is combined with and preferably detachable from the syringe holder. The plunger presser comprises an extension frame detachably fitted to the upper end of the frame forming the syringe holder. The extension frame may be constituted by a pair of connected tubes, each of which houses a helical spring pressing downwards upon a crosshead or pressure plate slidable on the tubes, the crosshead being provided, in a similar manner to the cradle for the syringe, with a pair of side rods movable through tubular guides on the extension frame and formed at their proper ends as catches engaged by a pair of spring detents, one at each side of the extension frame, these detents engaging the catches when the croshead is fully retracted. The crosshead is so positioned, when fully retracted and when the syringe and needle are in the fully retracted position, that the crosshead is just clear of the plunger knob of the retracted plunger of the syringe. In consequence thereof, when needle insertion takes place and the plunger knob moves downward with the syringe, the plunger knob is spaced from the crosshead. In order that the crosshead may act on the plunger rod to effect injection, I provide a spacing member for insertion beneath the crosshead. In this latter position, depression of the detents on the extension frame releases the crosshead which, under the action of the springs presing thereon, urges the spacing member downwards upon the plunger knob, so that injection then takes place.

The spacing member is preferably made resilient in order to absorb shock when the detents on the extension frame are released and the crosshead makes initial impact on the spacing member. Preferably, the extension frame is provided with two pairs of spring detents operative successively, so that release of the first pair of detents permits the crosshead to be pressed against the resilient spacing member, thus taking up the initial shock, whereupon release of the second pair of detents permits the crosshead to press the plunger of the syringe slowly inwards through the medium of the intermediate spacing member.

To provide for cases where only a fraction of the volume of the syringe is required for injection, in which case the plunger of the syringe is not fully retracted, an adjustable screw or other adjustment member may be provided, for example, on the crosshead, to screw down upon the resilient spacing member, in order that downward movement of the crosshead, when released, will transmit movement to the partially retracted plunger of the syringe.

The invention will be more readily understood by reference to the accompanying drawings in which:

Fig. 1 is a vertical longitudinal sectional view of a syringe holder according to the invention, with the syringe and needle in a retracted position.

Fig. 2 shows the syringe holder and syringe of Fig. 1 in elevation, in the position shown in Fig. 1.

Fig. 3 shows the syringe holder and syringe of Fig. 1 in elevation and part section, with the needle in a partly retracted position.

Fig. 4 is a view similar to Fig. 3 with the needle fully projected.

Fig. 4 (sheet 1) is a sectional view of a form of spring-loaded catch hereinafter mentioned.

Fig. 6 is a perspective view of the syringe cradle shown in Figs. 1 to 4.

Fig. 7 is a perspective view of a needle-insertion regulating clamp.

Fig. 8 is a perspective view of a base piece for the syringe holder.

Figs. 9, 10 and 11 are plan, front and side views respectively of a detachable needle guide for use with the base piece shown in Fig. 8.

Fig. 12 is a perspective view of an alternative construction of base piece.

Fig. 13 is a perspective view of a needle guide for use with the base piece seen in Fig. 12.

Fig. 14 is a vertical cross-sectional view on the line 14—14 in Fig. 13.

Figs. 15, 16 and 17 are rear, side and plan views respectively of a further form of needle guide for use with the base piece shown in Fig. 12 for intra-muscular injection.

Fig. 18 is a front and part sectional view showing a syringe plunger presser in a fully retracted position.

Fig. 19 is a front view showing the plunger presser according to Fig. 18 in a fully extended position and connected tc a syringe holder of the form shown in Fig. 1.

Fig. 20 is a plan view of the presser shown in Fig. 18.

Fig. 21 is a vertical sectional view of an alternative form of syringe plunger presser in a fully retracted position.

Fig. 22 is a front view showing the presser according to Fig. 21 in a fully extended position.

Fig. 23 is a cross-sectional view on the line 23—23 in Fig. 22.

Fig. 24 is a cross-sectional view on the line 24—24 in Fig. 21.

Fig. 25 is a side view of a general assembly of base piece, inclined needle guide, syringe holder and connected syringe presser, in position on a limb for effecting sub-cutaneous injection.

Fig. 26 is a side view of a general assembly of base piece, needle guide and syringe holder, in position adjacent a part of the body for effecting intra-muscular injection.

Referring now to the drawings, the main com-

ponent parts of the injection apparatus illustrated are indicated by the following general references: Base piece A, inclined needle guide B, intra-muscular injection needle guide C, syringe holder D, and syringe plunger presser E.

The base piece A shown in Fig. 8 comprises a substantially flat base member 30 having a stay or support 31 vertically extensible by the provision of an adjustable screw-threaded head 31*a*. The support 31 may be removably secured to the base member 30. An expanding or adjustable arm band 32 may be fitted to the end of the base member 30 adjacent the support 31, and an adjustable band or strap 33 may be passed through slots 34 in the base member 30 in order to enable the base piece A to be secured in position on a limb of the patient as shown, for example, in Fig. 25. A pair of upstanding apertured lugs 35 and a pair of guide slots 36 are provided on the base member 30 and permit the syringe holder D to be detachably secured thereto. Means are provided for detachably securing the inclined needle guide B to the base member 30 and may comprise a pair of slotted guide members 37 secured to the upper surface of the base member 30, one on each side of a recess 38 formed in the end of the base member 30. The edges of the recess 38 may be bent downwards, as shown at 38*a*, to provide skin-contacting lips on the base member 30. A pair of pivoted lugs 39 are also provided for retaining the inclined needle guide B in position on the base member 30.

The inclined needle guide B, as shown in Figs. 9 to 11, may comprise a flat plate 40 adapted to slide into position between the slotted guide members 37. A centrally disposed V-shaped recess 41 is formed in the plate 40 and a trough member 42 is secured to the plate 40 beneath the recess 41. A needle guide member, in the form of a bridge-piece 42*a*, is pivotally mounted on the plate 40 and a small recess 43 is formed in the bridge-piece 42*a*. When the needle guide B is attached to the base member 30, the trough member 42 will overlie a part of the recess 38, and the lugs 39 may be moved into a position to prevent displacement of the needle guide B. When the syringe holder D is fitted in an inclined position on the base member 30, the hypodermic needle is entered in the recess 43 in the bridge-piece 42*a* and thus will be guided for movement therein. The trough member 42 prevents the needle entering any part of the skin of the patient other than that confined beneath the skin-contacting edges of the recess 38 in the base member 30.

An alternative form of base piece A is shown in Fig. 12 and comprises a base plate 44 having a pair of pivoted hooks 45 at one end and a slotted guide bracket 46 at the other end, in which is received an inclined needle guide B such as shown in Figs. 13 and 14, or an intra-muscular injection needle guide C such as shown in Figs. 15 and 16. A clamping device, such as a screw 47, is provided for securing the needle guide in the bracket 46, and a pair of upstanding apertured lugs 48 is positioned adjacent the bracket 46 to provide means for detachably securing the syringe holder D to the base piece 44. Clamps (not shown) may be provided on the plate 44 for holding the syringe holder flat thereon in the position shown in Fig. 26 and finger pieces may be provided on the underside of the plate 44 for enabling the plate 44 to be held in one hand during injection operations. Slots 49 in the base plate 44 permit an adjustable strap to be secured thereto, and an internally screw-threaded boss 50 is provided on the base plate 44 for the reception, if desired, of a vertically adjustable support, such as 31 in Fig. 8.

The inclined needle guide B shown in Figs. 13 and 14 is provided at one end with a tongue 51 which is received in the slotted guide bracket 46. The other end of the guide is notched and the edges of the notch are bent downwards to form skin-contacting lips 52. A bridge piece 53 is pivoted on the body portion of the needle guide and is provided with a tapered needle-receiving groove 54 adjacent a corresponding needle-receiving groove 54*a* on the body portion of the needle guide. A clip 55, pivoted to the body portion of the needle guide, serves to retain the bridge-piece 53 in position, and a slot 56 is formed in the body portion to permit the needle to enter between the grooves 54 and 54*a*.

The needle guide B is designed for use when it is desired to effect sub-cutaneous injection and to make an incision in the skin at an angle inclined to the surface of the limb or body of the patient. For this purpose the syringe holder D is secured to the base piece A in an inclined position, as shown, for example, in Fig. 25.

To effect intra-muscular injections substantially at right angles to the surface of the limb or body of the patient, a needle guide C such as shown in Figs. 15 and 16 is provided. Moreover, when the needle guide C is used, the syringe holder D may be secured to the base piece A in a substantially flat position as shown, for example, in Fig. 26.

The needle guide C (Figs. 15 and 16) may comprise a skin contacting bifurcated member 57 extending from a tongue 58 at right angles to the member 57 and adapted to be received in the bracket 46 on the base plate 44. The arms of the bifurcated member 57 each carry the lower half 59 of a divided bridge piece, the upper part 60 of which is hinged to the lower part at 61. A boss 62 is formed on the bridge piece 60 and is provided with a tapered aperture 63 for the reception of the injection needle which is guided for movement therein. 64 is a means of facilitating the opening and shutting of the bridge 60 with forceps or fingers. Bridge piece 59 (Fig. 15) will be permanently attached on both sides of the bifurcated piece 57 so that only one bracket 59*a* is necessary for receiving the opening part of the bridge 60 and is secured by 65. It has been found unnecessary to remove the bridge 60 as the whole guide C will be sterilised.

It will be seen that thet needle guides B and C are easily removable from the base piece A, thus permitting the needles guides to be sterilised. The hinged bridge pieces on the needle guides facilitate insertion and removal of the needle in the needle guides and permit these operations to be performed without removing the needle guide from the base piece.

Referring now to the syringe holder D which is shown in Figs. 1 to 6, a frame 68 is provided with a pair of parallel tubular guide members 69 secured thereto and on which a cradle 70 is mounted for sliding movement. As shown in Fig. 6, the cradle 70 is provided with arcuate apertures 71 for receiving the guide members 69. The cradle 70 removably receives and retains a standard hypodermic syringe 72 which rests in a U-shaped support member 73 connecting the side members of the frame 68. A clamp 74 is hinged at one end to one of the guide members 69, and is adapted to overlap the syringe 72 and

to be engaged with the other guide member 69 to prevent displacement of the syringe 72. A projecting toe piece 75 on the cradle 70 prevents axial movement of the syringe 72 when clamped in the syringe holder.

Means are provided permitting the syringe holder D to be detachably secured to the base piece A and may comprise, as shown in Fig. 5, spring urged catches 76 secured to the lower end of each of the guide members 69. A hooked sliding member 77 is housed in a tubular casing 78 forming the spring housing of the catch 76. In order to secure the syringe holder D to the base piece A, the sliding members 77 are drawn out and then allowed to engage in the apertured lugs 35 or 48 provided for this purpose on the respective base pieces A. A web 79 on each of the tubular casings 78 is positioned in the guide slots 36 when the syringe holder D is secured to the base piece A shown in Fig. 8. The upper ends of the guide members 69 are provided with ferrules 80 which, when the syringe holder D is secured to the base piece A shown in Fig. 12, may be inserted beneath the pivoted hooks 45. The vertically adjustable support 31 on the base piece A may be retained thereon, or removed, according to whether it is desired to effect subcutaneous, or intra-muscular injection.

To effect needle insertion, the cradle 70 is acted on by a pair of helical springs 81 housed in the tubular guide members 69 and arranged to move over a fixed guide rod 82 secured in the guide members 69. Attached to the cradle 70, at each side of the syringe 72, is a catch rod 83 movable through a tubular guide 84 secured to the frame 68. The upper end of each catch rod 83 is provided with a recess which can be engaged with either an upper detent 85, or a lower detent 86, mounted on or forming part of springs 87 secured at their lower ends to the tubular guide 84 or to the frame 68. The detents 85 and 86 are releasable by thumb or finger pressure in pairs, either separately or together, the arrangement being such that, if the upper pair of detents 85 is depressed, the catch rods 83 are released and the springs 81 act on the cradle 70 and press it downwards until arrested, as shown in Fig. 3, by the lower pair of detents 86 engaging the recesses in the catch rods 83. This initial movement of the cradle 70 serves rapidly to insert the hypodermic needle into and a short distance under the skin, as illustrated in Fig. 25. Depression of the lower pair of detents 86 again releases the catch rods 83, thus permitting the springs 81 to urge the cradle still further downwards to press the needle deeper and slowly under the skin until the cradle 70 reaches the fully extended position shown in Fig. 4.

The arrangement described permits the needle to be gently inserted, and avoids shock and possible injury to the patient should the needle encounter a bone. If desired, both pairs of detents 85 and 86 may be depressed simultaneously, when the needle will make a full unimpeded stroke and will thus be inserted more rapidly.

In certain cases it may be desirable to limit the length of the stroke of the injection needle and, as illustrated by way of example in Fig. 7, means may be provided to control or regulate the depth of insertion of the needle. As shown in Fig. 7, the tubular guide members 69 are provided with an adjustable clamp 88 adapted to be secured, as by clamping screws 89, in any desired position on the guide members 69. The clamp 88 may be detachable from the guide members 69 which, as shown, may be inscribed with index markings indicating the depth of insertion of the needle. In operation, the clamp 88 acts as a stop against which the cradle 70 rests when extended, thus limiting the stroke of the needle. Any other suitable means may be provided for regulating the length of the outstroke of the cradle. Where depth of needle insertion is regulated by means additional to the catch rods 83, the latter may be employed to effect initial insertion of the needle into the skin. One or both pairs of detents 85 and 86 may be mounted for slidable movement on the tubular guides 84 and adapted to engage in a recess in the catch rods 83, or one pair of detents may be dispensed with.

On the insertion of the needle, injection is effected, either by the patient or by an attendant, by depressing a plunger 90 in the syringe 72 in known manner.

My invention further provides means for effecting automatic injection, that is to say, under the release of spring pressure, urging the syringe plunger 90 downwardly to inject serum or some other fluid into the body of the patient after an incision has been made. For this purpose the spring-operated plunger presser E is fitted to the syringe holder D.

One form of detachable plunger presser E is shown in Figs. 21 to 24 and comprises an extension frame detachably fitted, as by means of sleeves 91, to the ferrules 80 on the syringe holder D. Locking pins (not shown) may be inserted in holes provided for the purpose in the ferrules 80 and sleeves 91, or the ferrules 80 and sleeves 91 may be detachably connected together in any other manner. The extension frame comprises a pair of connected tubes 92 housing a helical spring or springs 93 pressing downwards upon a crosshead or pressure plate 94 mounted for slidable movement on the tubes 92, the crosshead 94 being provided, in a similar manner to the syringe cradle 70, with a pair of side catch rods 95 movable through tubular guides 96 secured to wing members 97 on the extension frame and provided at their upper ends with recesses engaged by a pair of spring detents 98, one at each side of the extension frame, these detents 98 engaging the recesses in the catch rods 95 when the crosshead 94 is fully retracted, as shown in Fig. 21. The crosshead 94 is so positioned, when fully retracted and when the syringe 72 and needle are in the fully retracted position, that the crosshead 94 is just clear of the head of the plunger 90 of the syringe 72. In order that the crosshead 94 may act on the plunger 90 to effect injection, a resilient spacing member 99 is provided. The spacing member 99, in the example illustrated, is in the form of a sleeve having an enlarged head for contacting the head of the plunger 90. A sleeve guide 100 is secured to the crosshead between the tubes 92 and receives the spacing member 99 which is mounted for slidable movement therein. A helical spring 101 is housed in the spacing member 99 and conveniently abuts at one end against a spring pad in the form of a rod 102 secured to the upper end of the sleeve guide 100. The resiliently urged spacing member 99 forms a resilient buffer or shock absorber between the crosshead 94 and the head of the plunger 90 to absorb shock when the detents 98 are disengaged from the catch rods 95 and the crosshead 94 makes initial contact with the spacing member 99. As the action of the spring 101 is normally to urge the spacing member 99 away from the crosshead 94, the spacing

member 99 effectively provides a resilient buffer between the crosshead 94 and the head of the plunger 90. A second pair of detents 98 may be provided on the extension frame to be operative after the first pair, so that release of the first pair of detents permits the crosshead 94 to be pressed against the head of the spacing member 99, thus taking up the initial shock, whereupon release of the second pair of detents permits the crosshead 94 to press the plunger 90 of the syringe 72 slowly inwards through the medium of the intermediate spacing member 99. Where only a fraction of the volume of the syringe 72 is required for injection, in which case the plunger 90 of the syringe 72 is only partly retracted, the head of the spacing member 99 may be screw threaded to the sleeve thereof to screw down upon the head of the plunger 90, thereby transmitting movement to the plunger 90 and at the same time acting to absorb the shock on initial release of the catch rods 95.

In Figs. 18 to 20 a modified form of plunger presser E is illustrated. In this instance the crosshead 94 is slidable on tubes 92 connected together by an extension frame 103, and side catch rods 95 are provided slidable in tubular guides 96 secured to the extension frame 103. The catch rods 95 may be provided with a number of recesses, any one of which may be engaged by the spring detents 93. By providing a number of recesses in the catch rods 95, the crosshead 94 may be allowed to move outwards to any desired extent to make contact with the head of the plunger 90. The crosshead 94 is acted on by a helical spring 94*a* on the sleeve guide 100 and bearing at its upper end against a spring pad 104 connecting the tubes 92. The sleeve guide 100 receives the spacing member 99 in a manner similar to that already described with reference to Figs. 21 and 22. Furthermore, two pairs of detents 98 may be provided for the purpose of permitting the crosshead 94 to move and contact the head of the spacing member 99, and, when the second pair of detents 93 is released, to press the head of the plunger 90 downwards. The several recesses in the catch rods 95 permit the action of the plunger presser E to be arrested at any instant merely by engaging the detents 93 in the desired recesses.

In Fig. 25 the plunger presser E is shown connected to the syringe holder D in an inclined position relative to the base piece A and limb of the patient.

In Fig. 26 the syringe holder D is in position on the base piece A for effecting intra-muscular injection. In either case, the plunger presser E may be attached to the syringe holder D to provide automatic injection of serum.

The detents on the syringe holder D may be interconnected, by any convenient means, with the detents on the plunger presser E so that, on releasing the former detents, the detents on the plunger presser E will also be released to effect automatic injection.

It will be understood that the invention is not limited to the actual detailed construction of the parts illustrated in the accompanying drawings, which are given only as example. For instance, the base piece A may be of any convenient construction adapted to detachably receive and support a syringe holder and a detachable needle guide; also the base piece may or may not be provided with means for attachment to the limb of a patient; moreover, the support 31 holding the syringe holder in an inclined position may be of any suitable construction either fixed or detachably fitted to the base piece A. Likewise, the construction of the syringe holder and the means for moving the syringe and needle relatively to the holder and regulating such movement may be varied within the scope of the appended claims. Also, any suitable form of needle guide may be provided. The construction of the resilient plunger presser E may also be varied within the scope of the appended claims, and in place of the spring-operated spacing member 99 which is provided to act as a buffer or shock absorber, the spring-operated spacing member may be replaced by a pneumatic or hydraulic shock absorbing device. Instead of the rods 83 sliding in tubes 84 and having recesses engaged by spring catches 85 and 86, the members 83 may be tubular sleeves slidable on guide rods, ratchet teeth on the tubular sleeves being engaged by the spring catches 85 and 86.

I claim:

1. Surgical injection apparatus comprising a base plate adapted for attachment to the limb of a patient, a syringe holder in the form of a pair of parallel interconnected frame members spaced apart, parallel guide members extending one from each of said frame members, means for detachably attaching said guide members to said base plate, a syringe-supporting cradle mounted for sliding movement on said guide members, means mounted on said frame members for retaining a syringe in a supported position in said cradle, spring means arranged to urge said cradle outwards away from said frame members, finger-operable detent means for releasably retaining said cradle in a fully retracted position, additional finger-operable detent means for releasably retaining said cradle in a partially retracted position, and a separate needle guide detachably carried on the base plate and positioned thereon to receive and guide the needle of a syringe supported in said cradle during movement of said cradle towards or away from its fully retracted or partially retracted positions.

2. Apparatus according to claim 1 including an extension frame detachably fitted to said frame members, a spring-operated plunger presser mounted on said extension frame and positioned to coact with the plunger of a syringe supported in said cradle, and finger-operable detent means on said extension frame for releasably retaining said presser against pressure on said plunger.

3. Apparatus as claimed in claim 1 including means for detachably hinging the syringe holder to the base plate, and means for supporting said holder upon said plate in an adjustably inclined position.

4. Apparatus as claimed in claim 1 including means for detachably hinging the syringe holder to the base plate, and means for supporting said holder upon said plate in an adjustably inclined position, said last-mentioned means being removable to permit said holder to be laid flat on said base plate.

5. Apparatus as claimed in claim 1 wherein the needle guide is constituted by a diametrically divided eye-piece, one half of which is carried by a member detachably attached to the base plate, and the other half of which is carried by a bridge hinged at one end to said member and having means for releasably locking it at the other end to said member.

6. Apparatus as claimed in claim 1 wherein the needle guide comprises a tongue for detachable engagement with the base plate, a notched ex-

tension of said tongue, the edges of the notch in said extension being bent downwards, a needle-receiving groove in said extension adjacent said notch, a bridge piece bridging said groove and having a complementary needle receiving groove therein, means for hinging said bridge piece at one end to said extension, and means for releasably locking said bridge piece in position.

7. Apparatus as claimed in claim 1 wherein the needle guide comprises a bifurcated member, a tongue extending from said member at right angles thereto for detachable engagement with the base plate, and a divided bridge-piece constituted by a lower bar extending across said bifurcated member, an upper bar hinged to said lower bar, and a diametrically divided eye-piece, the halves of which are carried by said bars.

8. Surgical apparatus comprising a syringe holder in the form of a pair of parallel frame members spaced apart, a yoke connecting said members, a pair of parallel guide members extending one from each of said frame members, a syringe-supporting cradle mounted for sliding movement on said guide members, a hinged clamp coacting with said yoke to slidably retain a syringe therebetween, locating means on said cradle for preventing axial movement of the syringe with respect to the cradle, spring means arranged to urge said cradle outwards away from said frame members, finger-operable detent means for releasably retaining said cradle in the fully retracted position, and additional finger-operable detent means for releasably retaining said cradle in a partially retracted position.

9. Apparatus according to claim 8 including means for regulating the length of the stroke of the cradle and consequent depth of needle insertion.

10. Apparatus according to claim 8 including an extension frame detachably fitted to the syringe holder, a crosshead slidably mounted in said extension frame, spring means urging said crosshead towards said holder, finger-operable detent means for releasably holding said crosshead in a retracted position, a resilient spacing member carried by said crosshead and positioned

to coact with the plunger of a syringe mounted in said holder, and means for guiding axial movement of said spacing member in said crosshead.

11. Apparatus according to claim 8 including an extension frame detachably fitted to the syringe holder, a crosshead slidably mounted in said extension frame, a resilient spacing member carried by said crosshead and positioned to coact with the plunger of a syringe mounted in said holder, and means for guiding axial movement of said spacing member in said crosshead, spring means urging said crosshead towards said holder, finger-operable detent means for releasably holding said crosshead in a fully retracted position in which said spacing member is out of contact with the syringe plunger, and additional finger-operable detent means for releasably holding said crosshead in a position in which said spacing member makes initial contact with the syringe plunger.

12. Apparatus according to claim 8 including an extension frame detachably fitted to the syringe holder, a crosshead slidably mounted in said extension frame, spring means urging said crosshead towards said holder, finger-operable detent means for releasably holding said crosshead in a retracted position, a resilient spacing member carried by said crosshead and positioned to coact with the plunger of a syringe mounted in said holder, and means for guiding axial movement of said spacing member in said crosshead, said spacing member being of axially adjustable length.

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