

Oct. 3, 1944.

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2,359,574

MAGAZINE TYPE SUTURING CLIP APPLICATOR

Filed Nov. 22, 1941

2 Sheets-Sheet 1

Fig. 1

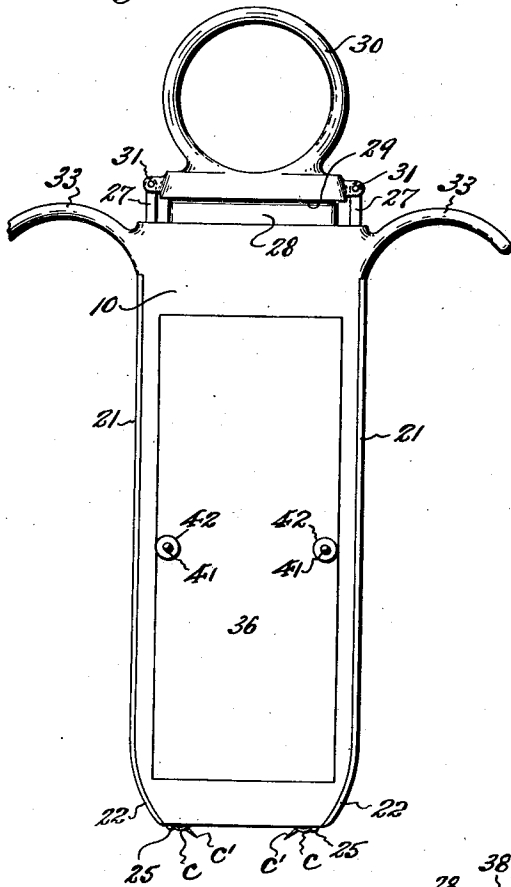


Fig. 2

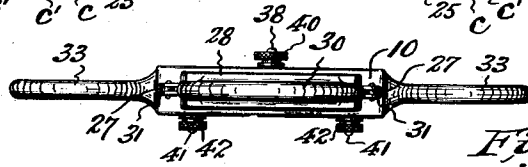
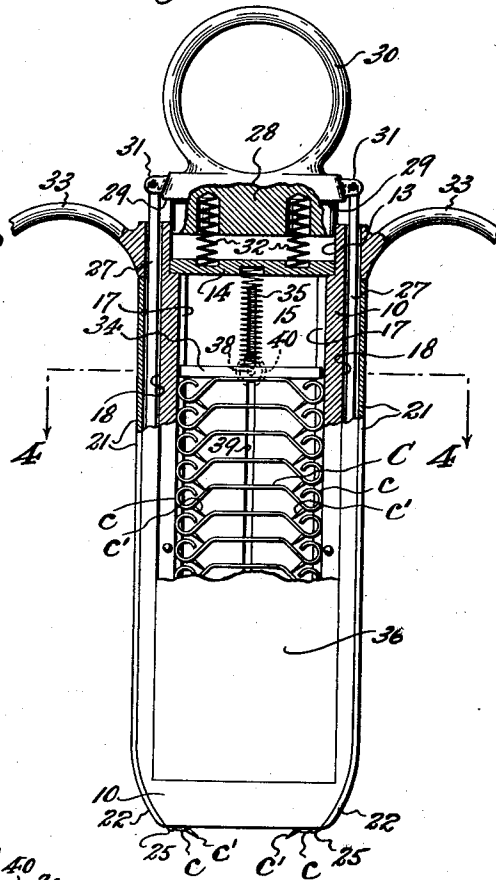


Fig. 3

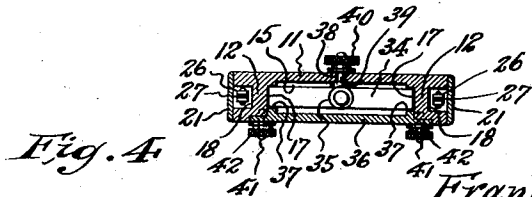


Fig. 4

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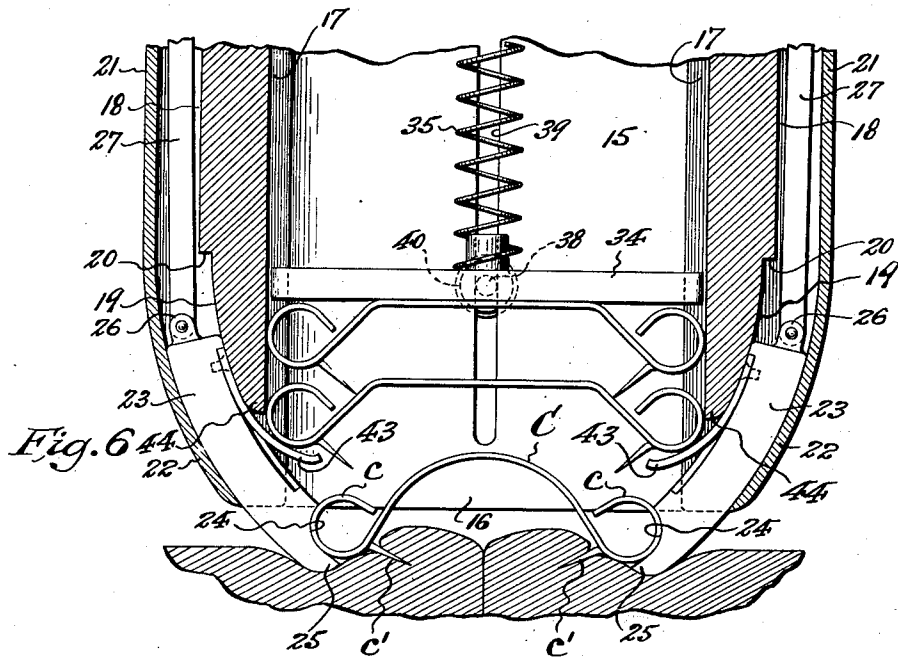
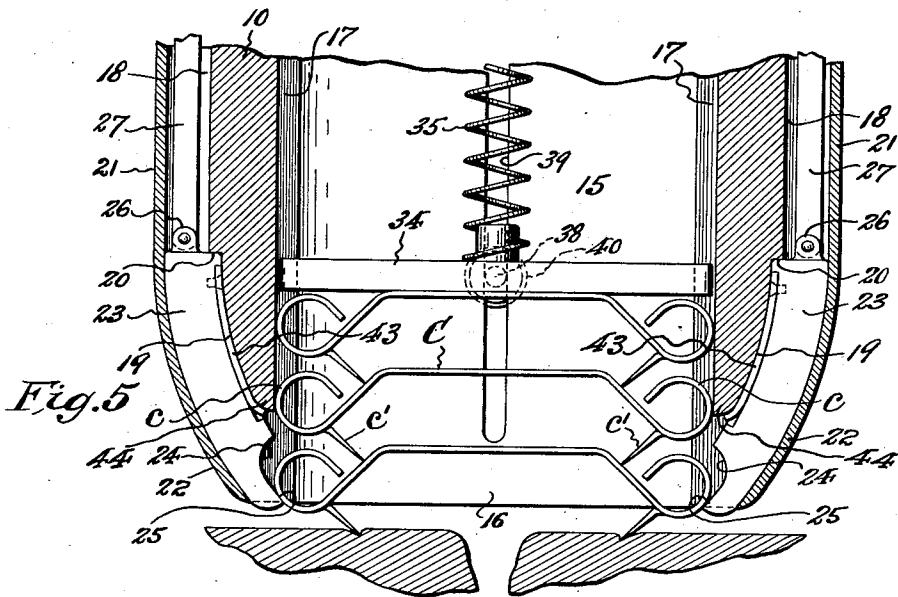
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2 Sheets-Sheet 2



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MAGAZINE TYPE SUTURING CLIP
APPLICATOR

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Application November 22, 1941, Serial No. 420,051

17 Claims. (Cl. 1—49.1)

This invention relates to a novel construction of suturing clip applicator of the self-feeding or magazine type.

This invention has for an object to provide a simple, compact and easily actuable appliance for suturing incisions or wounds in the flesh of a patient by means of surgical skin clips.

The invention has for another object to provide an improved construction of suturing clip applicator device having a magazine to hold a supply of surgical skin clips, and manipulatable clip applying means to which the clips are automatically fed from the magazine.

The invention has for a further object to provide in a surgical skin clip applicator, a pair of opposed clip engaging and applying jaw elements, together with novel manipulatable means for transmitting operative movement to said jaw elements, whereby to quickly thrust a clip engaged thereby into the skin and thereupon bend the clip into operative attached relation to the latter and across an incision or wound opening desired to be closed thereby.

Other objects of this invention, not at this time more particularly enumerated, will be understood from the following detailed description of the same.

An illustrative embodiment of this invention is shown in the accompanying drawings, in which—

Fig. 1 is a front face elevational view of the novel magazine type suturing clip applicator according to this invention; Fig. 2 is a similar view, showing the upper portion of the applicator in transverse vertical section; Fig. 3 is a top end view of the applicator; and Fig. 4 is a horizontal cross sectional view thereof, taken on line 4—4 in Fig. 2.

Fig. 5 is a fragmentary transverse vertical sectional view of the lower part of the applicator, showing the applying jaw elements thereof retracted to normal initial position, said view being drawn upon a greatly enlarged scale; and Fig. 6 is a similar view, but showing the applying jaw elements as actuated and advanced for operative manipulation and application of a clip to a patient's skin for closing an incision in the patient's flesh.

Similar characters of reference are employed in the above described views, to indicate corresponding parts.

Referring to the drawings, the reference character 10 indicates the main body of the clip applicator device, the same having a back wall 11 and side walls 12. Provided in the upper end of

said body 10 is an upwardly open socket 13, the bottom of which is closed by a transverse partition plate 14, the latter being suitably affixed in place. Below said partition plate 14, the interior of said body 10 provides a downwardly extending clip magazine compartment or chamber 15, the mouth 16 of which opens outwardly from the lower end of said body. Formed in the interior sides of the body side walls 12, for extension along the magazine chamber 15, are descending clip guide channels 17 which lead to the mouth 16 of said magazine chamber. Formed in the exterior sides of the body side walls 12, to extend along the same, are passages or ways 18, parts of the outer sides of which are open. At their lower ends, said passages or ways 18 terminate in inwardly and downwardly inclined, and preferably curved, slideway portions 19, the lower ends of which intersect and communicate with the lower ends of said clip guide channels 17, at points adjacent to the mouth 16 of said magazine chamber 15. Said slideway portions 19 are somewhat deeper than are the passages or ways 18, whereby to provide stop shoulders 20 at the upper ends of the former; the outer sides of said slideway portions 19 being likewise open. The open outer sides of said passages or ways 18 and slideway portions 19 are closed by cover plates 21 which are suitably affixed to the body 10. The lower ends of the sides of the body 10 and the lower portions 22 of the cover plates 21 are conformably shaped to correspond to the inclination and curvature of the slideway portions 19, whereby said cover plate lower portions 22 cooperate in the formation and completion of said slideway portions 19.

Slidably mounted within the slideway portions 19 are jaw blocks 23, the lower ends of which are provided with inwardly open clip end receiving sockets 24, which are shaped to conform to the ends of the surgical skin clips to be manipulated thereby. The lower terminal portions of said jaw blocks are shaped to provide clip stop projections 25 below said sockets 24. At their upper ends, said jaw blocks 23 are provided with coupling ears 26, to which are pivotally connected the lower ends of connecting rods or links 27. These connecting rods or links 27 extend upwardly from the jaw blocks 23 through the passages or ways 18, until their upper ends project exteriorly from the latter at the upper end of the body 10.

Vertically slidable in the socket 13, with which the upper end of the body 10 is provided, is a thrust member 28, having at its upper portion

an enlarged part adapted to provide a stop shoulder 29 which, when caused to abut the upper end of the body 10 upon downward movement of the thrust member 28, serves to limit the operative downward thrusting movement thereof. Said thrust member 28 is provided, in connection with its outer end, with a thumb receiving ring or push piece 30. Extending laterally from opposite sides of said thrust member 28 are coupling ears 31, to which are pivotally connected the upper ends of the connecting rods or links 27. Arranged intermediate the thrust member 28 and the partition plate 14 are one or more compression springs 32 which yieldably urge said thrust member 28 to its normal upraised position. Rigidly connected with the sides of the upper end portion of the body 10 are oppositely and outwardly projecting finger pieces or abutments 33.

As urged by its control springs 32 to normal upraised position, the thrust member 28 draw upwardly the connecting rods or links 27, whereby to upwardly retract the jaw blocks 23 to normal initial positions as determined by the abutment of their upper ends against the stop shoulders 20 (see Fig. 5). When the jaw blocks 23 occupy such retracted normal initial position, the clip stop projections 25 are disposed in alignment with and across the lower ends of the clip guide channels 17, whereby to engage and arrest outward movement or displacement of the lowermost skin clip contained in the magazine chamber 15 (see Fig. 5).

The skin clips C are deposited in the magazine chamber 15 so as to form a vertical column or stack thereof, having their opposite terminal eyes c entered in the clip guide channels 17, whereby the same are held against displacement from their stack or column forming relation, and their downward movement through the magazine chamber 15, and toward the discharge mouth 16 of the latter, is properly guided and controlled. The clips C are thus stacked in the magazine chamber 15 in such disposition that their prongs c' are downwardly directed. As above indicated, downward movement of the column or stack is limited by the abutment of the terminal eyes c of the lowermost clip against the clip stop projections 25 of the jaw blocks 23. Although the clips C will feed down to the jaw blocks 23 by gravity, it is preferable to assist such downward movement by means which will at the same time function to retain the clips against accidental displacement from their column or stack forming relation. To this end, there is applied to the top end of the clip column or stack a follower or presser plate 34, the ends of which also ride in the clip guide channels 17. Arranged between said follower or presser plate 34 and the partition plate 14 is a compression spring 35, which is preferably of comparatively light tension. Said spring 35 is operative to exert a continuous downward thrust upon the follower or presser plate 34 and through it upon the clip column or stack, so as to both hold the clips making up the latter against displacement, as well as to feed down the clips as the lowermost clips are successively removed by the operation of the applicator device in use.

Any suitable arrangement may be provided whereby a plurality of skin clips C can be filled into the magazine chamber 15 in the desired column or stack forming relation, for movement downwardly therethrough as guided by the clip guide channels 17. An illustrative arrangement adapted to serve the foregoing purpose,

as shown, comprises the provision, in connection with the front wall of the body 10, of a removable cover plate 36, so formed as to provide, on its internal sides, vertical guide ribs 37 which, when the cover plate is in place, are contiguous to and form removable side portions of the clip guide channels 17, but which, when the cover plate is removed, laterally open said guide channels to access. To fill the magazine chamber with a stack or column of clips C, the cover plate is removed, whereupon the follower or presser plate 34 is raised and held up against the tension of its control spring 35, so as to give unimpeded access to the magazine chamber interior. Any suitable means may be provided for releasably holding said follower or presser plate 34 in said uplifted inactive position. Illustrative of one means operative to such purpose, the follower or presser plate 34 is provided with a rearwardly extending screw-threaded stud 38, and the back wall 11 of the body 10 is provided with a longitudinal slot 39 through which said stud 38 exteriorly projects. Threaded on the exteriorly projecting end portion of said stud 38 is a thumb nut 40. When the follower or presser plate is raised to uplifted position, it may be releasably held therein by tightening home said thumb nut 40, whereby to frictionally bind said follower or presser plate against downward movement. The magazine chamber interior being thus unimpededly exposed, the clips C may be deposited therein so that their respective terminal eyes c are lodged in the opposite guide channels 17. The lowermost clip, when thus entered in the guide channels 17, is allowed to slide down therethrough until stopped by engagement with the stop portions 25 of the jaw blocks 23, whereupon successively deposited clips C are allowed to build or stack up one upon another until a desired stack or column thereof is formed and sufficiently fills the magazine chamber 15, whereupon the cover plate 36 is applied to close the latter, and then the follower or presser plate 34 is released, by loosening the thumb nut 40 to free it subject to the operative downward thrust of the spring 35 whereby it is caused to operatively bear upon and thrust against the upper end of the formed clip stack or column.

Said cover plate 36 may be secured in closed relation to the magazine chamber 15 and its guide channels 17 in any suitable manner, as, for example, by providing suitably disposed screw-threaded studs 41 outwardly projecting from the body 10 to extend through openings in marginal portions of said cover plate, whereby to receive fastening nuts 42 for holding the latter against displacement.

The applicator device having been charged with its content of clips C, the same is ready for use, and is manipulated and operates in use as follows:

The operator grasps the applicator by placing the index and middle fingers respectively under the respective oppositely extending finger pieces or abutments 33, while inserting the thumb through the ring or push-piece 30. Having thus grasped the applicator by one hand, the operator by the other hand pinches together the lips or edges of the incision desired to be sutured, and thereupon applies the lower end of the applicator to the skin in bridging relation to and across the incision, so as to engage the points of the prongs c' of the lowermost clip C with the skin (see Fig. 5). The applicator being thus operatively positioned, the operator presses

down the thrust member 28 by the thumb which engages its ring or push-piece 30. The downward movement of the thrust member 28 is transmitted through the connecting rod or links 27 to the jaw blocks 23, whereby said jaw blocks are slid downwardly and inwardly along the slideways 19 with a composite movement toward each other and outwardly from the discharge opening 16 until the terminal eyes c of the lowermost clip are engaged by the sockets 24, whereupon continued downward movement of the jaw blocks 23 causes the clip prongs c' to pierce and enter the skin, while at the same time, owing to the accompanying inward thrust of the jaw blocks, the body of the clip C is bent or upwardly bowed so as to retain said prongs c' against withdrawal, and so as to hold the incision closed at the point thus bridged by the applied clip.

In order to segregate the lowermost clip C from the remainder of the stack or column of clips, when said lowermost clip is engaged and manipulated by the downwardly and inwardly moving jaw blocks 23, or, in other words, to hold back and detain the clip column or stack so as to prevent risk of the same impeding the manipulation and bending of the operatively engaged clip, the jaw blocks may optionally be provided with automatically acting clip stack or column detent means. An illustrative embodiment of means for such purpose, as shown comprises leaf-spring type detent elements 43, which are affixed by their upper ends to the inner sides of the jaw blocks, so as to extend along said sides, but so as to terminate short of the clip receiving sockets 24 of said jaw blocks. Said detent elements 43 possess an inherent tension tending, when unrestrained, to deflect them outwardly and away from the inner sides of the jaw blocks, so that their free end portions will be projected between the lowermost clip and the following clip, which upon separation of said lowermost clip, defines the bottom of the remainder of the clip stack or column. These detent elements 43 are opposed to the slideway surfaces 19, so that, when the jaw blocks 23 are upwardly retracted to normal initial positions, said detent elements 43 will be pressed back against their tension by the engaging slideway surfaces 19, and their free end portions thus withdrawn from projection across the clip guide channels 17 and so as not to obstruct downward movement of clips therethrough (see Fig. 5). When, however, the jaw blocks 23 are moved down to engage the lowermost clip, the free end portions of the detent elements 43 carried therewith, as they pass the terminal portions or shoulders 44 of the slideway surfaces 19, which are located above the point where the jaw block slideways intersect the clip guide channels 17, flex outwardly under the urge of their inherent tension, so as to pass between the terminal eyes c' of the lowermost clip which is operatively engaged by the jaw blocks and those of the next clip above. The tensional force or thrust of said detent elements 43 being stronger than that of the follower or presser plate actuating spring 35, the engagement of said detent elements beneath the clip stack or column, from which the lowermost clip is removed by operation of the jaw blocks, is effective to restrain and hold back the clip stack or column against downward movement while said lowermost clip is being operatively manipulated by the jaw blocks (see Fig. 6). Return of the jaw blocks to normal initial positions, after operative

manipulation of the lowermost clip and application thereof in suturing relation to an incision being treated, not only releases the applied clip but also carries back said detent elements 43 so as to return the same behind the slideway surfaces 19, and thus withdraws their free ends from engagement with the clip stack or column, whereupon the latter may descend to carry a succeeding clip into normal initial position as stopped by the stop projections 25, and thus disposed for operative engagement by the jaw blocks upon repetition of the above described operative manipulation of the applicator device.

While the use of the above described detent elements 43 may be desirable in many cases and with some designs of skin clips, in other cases use thereof is not essential for the reason that the inward and downward inclination of the paths of movement of the opposed jaw blocks is such that portions of the latter above their receiving sockets 24 may be caused to directly engage and thrust back the remainder of the clip stack or column while the lowermost clip is being operatively manipulated and applied in suturing relation to an incision under treatment.

I am aware that various changes could be made in the above described constructions, and that widely different embodiments of this invention could be made without departing from the scope thereof as defined in the following claims. It is therefore intended that all matter contained in the foregoing description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. In a device for the purposes described, a body formed to provide an axially extending magazine chamber to hold a stack of clips for downward feeding movement toward the discharge mouth of said chamber, said body having at its sides downwardly and inwardly inclined slideways to communicate with the lower end of said chamber adjacent to its discharge mouth, jaw blocks slidably housed for longitudinal movements through said slideways, opposed ends of said jaw blocks having means to engage ends of a clip disposed at the discharge mouth of said chamber, vertically reciprocable means for actuating said jaw blocks to discharge and operatively apply the engaged clip in suturing relation to an incision to which the device is applied, said latter means and said body respectively having finger engageable means for manipulation thereof.

2. In a device for the purposes described, a body formed to provide an axially extending magazine chamber to hold a stack of clips for downward feeding movement toward the discharge mouth of said chamber, said body having at its sides downwardly and inwardly inclined slideways to communicate with the lower end of said chamber adjacent to its discharge mouth, jaw blocks slidable in said slideways, opposed ends of said jaw blocks having means to engage ends of a clip disposed at the discharge mouth of said chamber, a spring raised thrust member slidably mounted in the upper end portion of said body, links interconnecting said thrust member with said jaw blocks, and said thrust member and body having finger engageable means whereby to actuate the former for transmitting operative sliding movement to said jaw blocks to discharge and operatively apply

the engaged clip in suturing relation to an incision to which the device is applied.

3. In a device for the purposes described, a body formed to provide an axially extending magazine chamber to hold a stack of clips and having guide channels at its sides in which the clip ends ride for downward feeding movement toward the bottom discharge mouth of said chamber, said body having at its sides downwardly and inwardly inclined slideways disposed to intersect said clip guide channels adjacent the discharge mouth of said chamber, jaw blocks slidable in said slideways, said jaw blocks having at their lower free ends clip end receiving sockets and clip stop projections extending therefrom whereby to engage the ends of a clip disposed at the discharge mouth of said chamber, a spring raised thrust member slidably mounted in the upper end portion of said body, links interconnecting said thrust member with said jaw blocks, and said thrust member and body having finger engageable means whereby to actuate the former for transmitting operative sliding movement to said jaw blocks to discharge and operatively apply the engaged clip in suturing relation to an incision to which the device is applied.

4. In a device for the purposes described as defined in claim 3 including, a spring actuated follower plate within said body chamber and having its ends guidingly engaged in the guide channels thereof, said follower plate being adapted to engage and feed downward the clip stack deposited within said chamber.

5. In a device for the purposes described as defined in claim 1 including, spring detent means carried by said jaw blocks adapted to be inwardly projected during downward movements of the latter intermediate the lowermost clip and the remainder of the clip stack, whereby to restrain downward movement of the latter while the former is operatively engaged and manipulated by said jaw blocks.

6. In a device for the purposes described as defined in claim 3 including, detent means carried by said jaw blocks and adapted to be projected upon operative movements of the latter intermediate the lowermost clip and the remainder of the clip stack, whereby to restrain downward movement of the latter while the former is operatively engaged and manipulated by the jaw blocks.

7. In a device for the purposes described, a body formed to provide an axially extending magazine chamber to hold a stack of clips for downward feeding movement toward the discharge mouth of said chamber, said body having a removable cover plate which when removed gives access to said chamber for depositing clips therein, a spring actuated follower plate within said chamber to engage and feed downward the clip stack deposited within the latter, releasable means to hold said follower plate in upraised inactive position while clips are being stacked in said chamber, said body having at its sides downwardly and inwardly inclined slideways to communicate with the lower end of said chamber adjacent to its discharge mouth, jaw blocks slidable in said slideways, said jaw blocks having at their lower free ends clip end receiving sockets and clip stop projections extending therefrom whereby to engage the ends of a lowermost clip disposed at the discharge mouth of said chamber, and manipulatable means for actuating said jaw blocks to discharge and operatively apply the engaged clip in suturing rela-

tion to an incision to which the device is applied.

8. In a device for the purposes described, a body formed to provide an axially extending magazine chamber to hold a stack of clips for downward feeding movement toward the discharge mouth of said chamber, said body having a removable cover plate which when removed gives access to said chamber for depositing clips therein, a spring actuated follower plate within said chamber to engage and feed downward the clip stack deposited within the latter, releasable means to hold said follower plate in upraised inactive position while clips are being stacked in said chamber, said body having at its sides downwardly and inwardly inclined slideways to communicate with the lower end of said chamber adjacent to its discharge mouth, jaw blocks slidable in said slideways, said jaw blocks having at their lower free ends clip end receiving sockets and clip stop projections extending therefrom whereby to engage the ends of a lowermost clip disposed at the discharge mouth of said chamber, a spring raised thrust member slidably mounted in the upper end portion of said body, links interconnecting said thrust member with said jaw blocks, and said thrust member and body having finger engageable means whereby to actuate the former for transmitting operative sliding movement to said jaw blocks to discharge and operatively apply the engaged clip in suturing relation to an incision to which the device is applied.

9. In a device for the purposes described as defined in claim 7 the addition of spring detent means carried by said jaw blocks adapted to be inwardly projected during downward movements of the latter intermediate the lowermost clip and the remainder of the clip stack, whereby to restrain downward movement of the latter while the former is operatively engaged and manipulated by said jaw blocks.

10. In a device for the purposes described as defined in claim 8, the addition of spring detent means carried by said jaw blocks and adapted to be inwardly projected during downward movements of the latter intermediate the lowermost clip and the remainder of the clip stack, whereby to restrain downward movement of the latter while the former is operatively engaged and manipulated by the jaw blocks.

11. A clip applicator comprising two relatively reciprocable parts each of which has finger engageable means for manipulation thereof, one of said parts also having a clip-holding magazine provided with a discharge opening at one end, a pair of jaws mounted on one of said parts at opposite sides of said discharge opening for composite movement toward each other and longitudinally outwardly beyond said discharge opening to remove a clip from said discharge opening and clinch the clip, and means for actuating said jaws upon relative reciprocation of said parts.

12. A clip applicator comprising two relatively reciprocable parts each of which has finger engageable means for manipulation thereof, one of said parts also having a clip-holding chamber provided with a discharge opening at one end, a pair of jaws mounted on said one of said parts at opposite sides of said discharge opening for reciprocation toward each other and longitudinally outwardly from said discharge opening and away from each other and longitudi-

nally inwardly toward said discharge opening, the juxtaposed ends of said jaws being formed to grip and remove a clip from said discharge opening and then clinch said clip and to release said clips as said jaws move toward and from each other respectively, and an operative connection between said jaws and the other of said parts for reciprocating said jaws upon reciprocation of said parts.

13. A clip applicator comprising an elongate body having a longitudinally extending clip-holding magazine chamber therein provided with a discharge opening at one end, a pair of jaws mounted on said body at opposite sides of said discharge openings for composite movement toward each other and longitudinally outwardly beyond said end of said body, the juxtaposed ends of said jaws being formed to grip and remove a clip from said discharge opening and then clinch said clip as said jaws move toward each other, a thrust member mounted for reciprocation upon said body, and operative connections between said thrust member and said jaws for actuating the latter upon reciprocation of said thrust member.

14. A clip applicator comprising an elongate body having a longitudinally extending clip-holding chamber therein provided with a discharge opening at one end, a pair of jaws mounted on said body at opposite sides of said discharge opening for reciprocation longitudinally outwardly beyond said discharge opening and toward each other and longitudinally inwardly toward said discharge opening and away from each other transversely of said opening to engage the ends of and remove a clip from said discharge opening and then clinch said clip and to release said clip as said jaws move toward and from each other respectively, a thrust member mounted on said body for reciprocation longitudinally thereof, and operative connections between said thrust member and said jaws for

actuating the latter upon reciprocation of said thrust member, said body and said thrust member having finger engageable means for relative reciprocation thereof.

15. A clip applicator comprising an elongate body having a longitudinally extending clip-holding magazine chamber therein provided with a discharge opening at one end, a pair of jaws mounted on said body at opposite sides of said discharge opening for composite movement toward each other and outwardly beyond said end of said body, the juxtaposed ends of said jaws being formed to grip and remove a clip from said discharge opening and then clinch said clip as said jaws move toward each other, a thrust member mounted for reciprocation upon said body and a link connecting each of said jaws with said thrust member, said body and said thrust member having finger engageable means whereby said thrust member can be reciprocated.

16. A clip applicator comprising a body having a clip-holding magazine chamber provided with a discharge opening, said body having a slideway at each of two opposite sides of said discharge opening in convergent relation to each other and intersecting said discharge opening, a jaw longitudinally slidable in each said slideway for composite movement toward the other jaw and outwardly from said discharge opening to grip and remove a clip from said opening and clinch said clip upon movement of said jaws toward each other, and means for actuating said jaws.

17. The clip applicator defined in claim 16 wherein said slideways and said jaws are longitudinally arcuately curved, and the last-mentioned means includes a thrust member reciprocable on said body and links connecting said thrust member to said jaws whereby reciprocation of thrust member will reciprocate said jaws.

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