April 22, 1952 L. VOLLMER 2,594,102

AUTOMATIC INSERTER FOR SUTURING CLIPS

Filed May 3, 1950 2 SHEETS—SHEET 1

Fig. 1

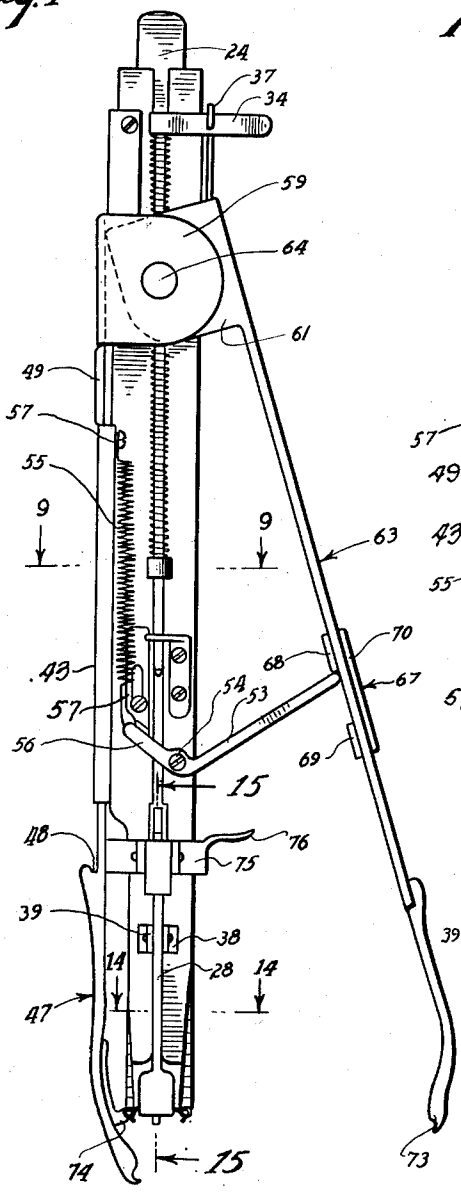


Fig. 2

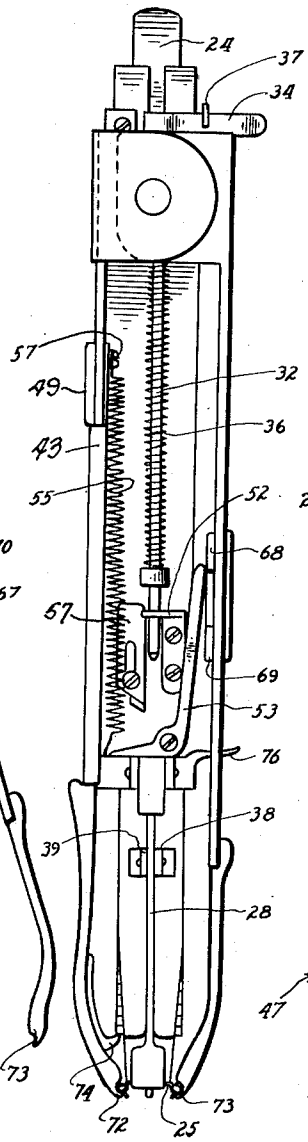


Fig. 14

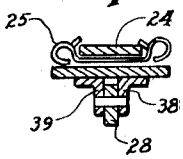


Fig. 3

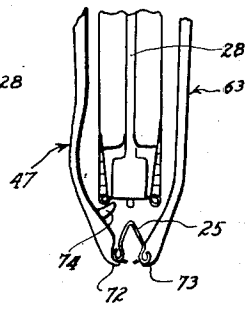


Fig. 4

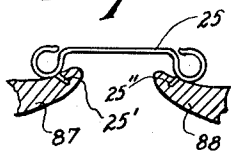
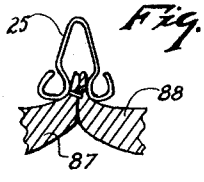


Fig. 5



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AUTOMATIC INSERTER FOR SUTURING CLIPS

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Fig. 6

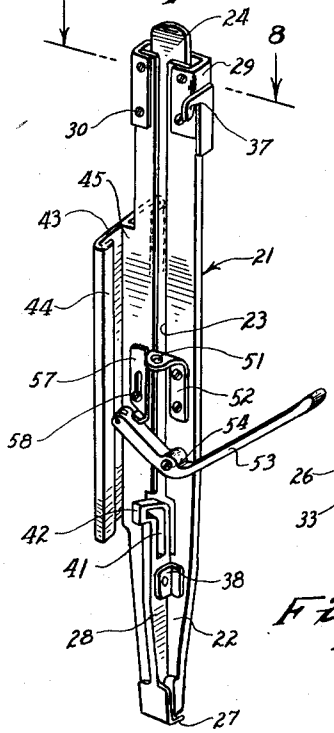


Fig. 7

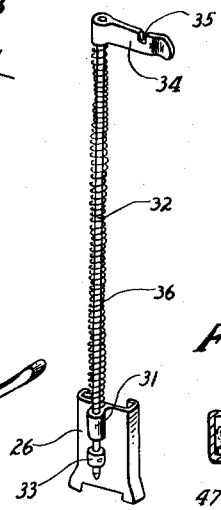


Fig. 8

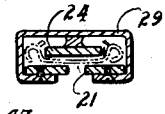


Fig. 9

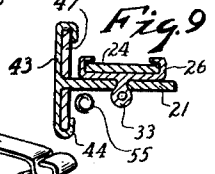


Fig. 10

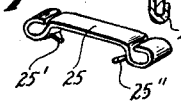


Fig. 15

Fig. 16

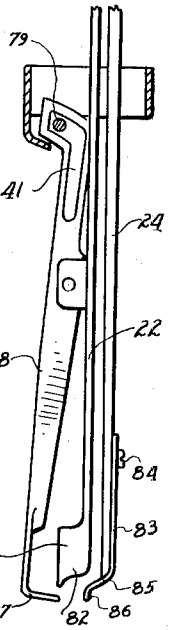


Fig. 11

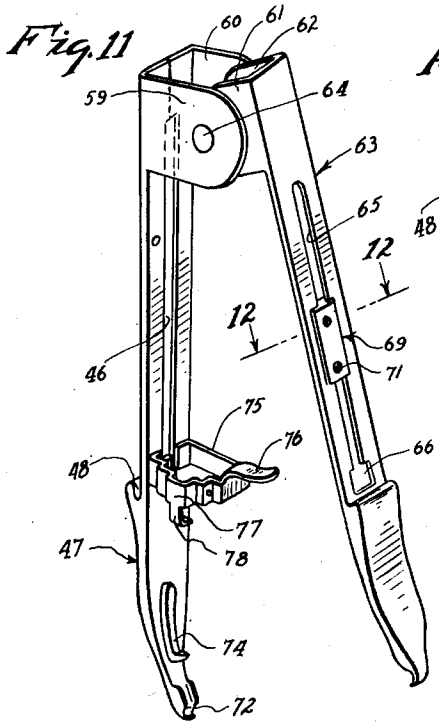


Fig. 13

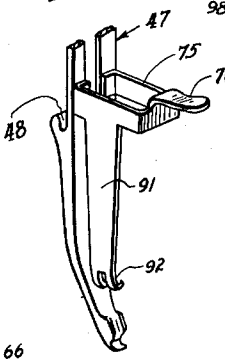


Fig. 12

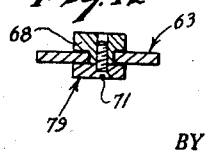


Fig. 17

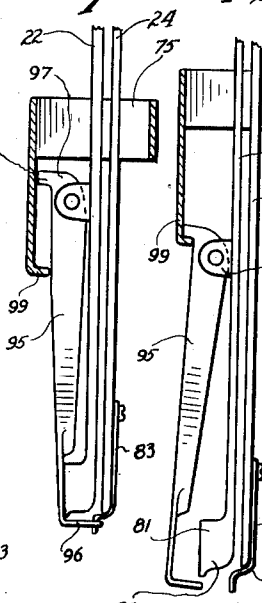
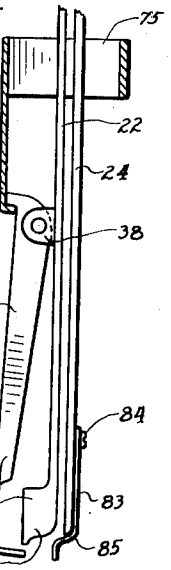


Fig. 18



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2,594,102

AUTOMATIC INSERTER FOR SUTURING CLIPS

Leonhard Vollmer, New York, N. Y.

Application May 3, 1950, Serial No. 159,693

5 Claims. (Cl. 1—49.1)

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This invention relates to an automatic inserter for suturing clips.

It is an object of the present invention to provide a suturing clip inserter which automatically feeds the suture ring clips from a guide into position and grasping engagement between spaced retaining members for squeezing action to bring the skin portions together and wherein the discharging end of the guide is automatically released with the squeezing action of the parts being effected.

It is another object of the present invention to provide in a suturing clip inserter automatic feeding mechanism for the clips wherein the action of the member normally holding the end clip is fast timed for release automatically and instantly upon the ends of the operating parts being drawn to the proper spaced relationship to receive the clip so that control of the clip is not lost prior thereto, and wherein there is adequate means acting upon the opposite sides of the suceeding clip and those behind it to retain the group of clips free of the clip being worked.

It is another object of the present invention to provide an actuating lever operable upon the slidable parts resulting from a squeezing movement of two tong-like parts being squeezed together and wherein the lever, as the parts are brought closer together, releases from the operable tong part and a spring acting upon the lever automatically as the lever is released causes the return of the slide which carries the supply of clips.

Other objects of the present invention are to provide an automatic inserter for suturing clips which is of simple construction, relatively inexpensive to manufacture, has a minimum number of parts, easy to operate between the forefinger and the thumb of the surgeon's hand, compact, of pleasing appearance and efficient in operation.

For other objects and for a better understanding of the invention, reference may be had to the following detailed description taken in connection with the accompanying drawing, in which

Fig. 1 is a side elevational view of the clip inserter embodying the features of the present invention with the operating arm extended.

Fig. 2 is a side elevational view with the operating arm drawn inwardly to receive the clip from the slide.

Fig. 3 is a fragmentary view of the ends of the arms retaining the clip and with the clip having been bent and the slide released.

Fig. 4 is a fragmentary sectional view of portions of the skin with the clip applied to them before the clip has been bent.

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Fig. 5 is a fragmentary sectional view of portions of the skin and with the clip having been bent to retain the skin portions together.

Fig. 6 is a perspective view of the slide removed from the other parts.

Fig. 7 is a perspective view of the clip feeding element, the guide shaft and the operating spring therefor.

Fig. 8 is a transverse sectional view taken on line 8—8 of Fig. 6.

Fig. 9 is a transverse sectional view taken on line 9—9 of Fig. 1.

Fig. 10 is a perspective view of the suturing clip.

Fig. 11 is a perspective view of the operating parts with the slide assemblies removed.

Fig. 12 is a transverse sectional view taken on line 12—12 of Fig. 11.

Fig. 13 is a fragmentary perspective view of a modified form of clip retaining arm.

Fig. 14 is a transverse sectional view taken on line 14—14 of Fig. 1.

Fig. 15 is a vertical sectional view taken on line 15—15 of Fig. 1.

Fig. 16 is a fragmentary elevational view similar to Fig. 13 but with the retainer for the clip having been released in order for the clip to be received by the ends of the tong parts.

Fig. 17 is a fragmentary elevational view of a modified form of retaining arm which is adapted for quick release at the end of the stroke of the slide.

Fig. 18 is an enlarged view similar to Fig. 17 illustrating the manner in which the clip retaining arm has been actuated to release the clip.

Referring now to the figures, 21 represents a slide assembly serving as a clip magazine, which comprises an elongated body member 22 which has a central slot 23 extending for a substantial distance throughout the length thereof. Disposed on the under side of the member 22 is a longitudinally extending guide bar 24 Figs. 6 and 15 over which suturing clips 25 are placed and slid forwardly by a follower 26 when in place. The clips come to a stop at the forward end of the body 22 against a bent end 27 Fig. 15 of a release lever 28. The guide bar 24 is secured to the body 22 by a box-like frame 29 and screws 30. By this frame 29, the bar 24 which receives the clips 25 is held slightly spaced from the rear face of the elongated body member 22.

The follower 26 has a guide bearing projection 31 which extends through the slot 23 and to

which is connected a follower guide rod 32 having a set collar 33 on its lower end to prevent the separation of the follower from the rod. On the upper end of the follower rod is a retaining arm 34 that is notched at 35. A spring 36 on the rod 32 urges the follower along the rod 32 and along the slot 23 to cause the clips to be advanced through the slide assembly. The arm 34 of the rod 32 cooperates through its notch with a stop projection 37 on the box frame 29. By swinging the arm 34 away therefrom, the rod 32 and the follower 26 can be removed from the bar 21 to permit the assembly of the clips 25 upon the bar 24. Thereafter the follower can be placed thereon and the arm 34 of the rod connected to the projection 37, the spring 36 on the rod 32 urging the follower and the clips forwardly against the bent end 27 of the release lever 28 (Fig. 15).

The release lever 28 (Figs. 15 and 16) is pivotally connected to the body member 22 by brackets 38 and 39. The upper end of the release lever 28 has a dog leg slot 41 and an upwardly extending end projection 42, the purpose of which will be explained later.

Extending to one side of the body member 22 (Figs. 6 and 9) is a T-shaped guide plate 43 having inwardly bent side flanges 44, and a web portion 45. The web portion 45 lies in a slot 46 of a stationary tong part 47 (Fig. 11). The flanges 44 lie over the outer sides of the part 47 whereby the slide assembly 21 will be guided in its sliding movement along the tong part 47. The guide projection 43 will abut a stop projection 48 at the bottom of the tong to limit the forward movement of the slide assembly 21. The rearward movement of the slide assembly is limited by a stop member 49 (Fig. 1) secured to the tong part 47.

The end of the follower rod 32 is supported in an opening 51 in a bracket 52 (Figs. 2, 6, and 7) secured by screws to the front face of the elongated body part 22. Pivotally supported on and connected to the front face of the body part 22 (Fig. 1) is an L-shaped trip lever and pusher 53, that operates to push the slide assembly forward, when the tong arms are closed. A pivot pin 54 secures the lever to the body 22. A tension spring 55 connected to short end 56 of the lever 53 urges the short arm 56 of the lever against an adjustable stop 57 (Fig. 6) which is held in place by a screw 58. The lever comes to rest against this stop. The tension spring 55 is anchored to the tong part 46 by a screw 57. The tong part 47 has inwardly extending parallel projections 59 and 60 to which inwardly extending projections 61 and 62 of a movable tong part 63 are respectively pivotally connected by pins 64. The slide assembly 21 is longitudinally movable between the projections of the tong parts 47 and 63. The movable tong part 63 has an elongated slot 65 with an enlargement 66 at the lower end thereof and in which there is adjustably connected an assembly 67 (Figs. 1, 2, and 11) comprising an abutment plate 68 and a release plate 69 lying on the under side of the tong part and spaced from one another and a top clamping plate 70 to which the plates 68 and 69 are secured by screws 71. When the tong arms are open, the long arm of the cam pusher lever 53 engages tong arm 63 just under the abutment plate 68, in response to biasing action of spring 55. When the tong part 63 is moved toward the tong part 47 and the slide assembly 21 to close the tongs, the slide assembly will accordingly be advanced by a component of the force acting on pusher lever 53 and the pivot pin or screw 54 on the slide assembly so that the assembly 21 must move forwardly. As the tong part 63 comes inwardly, to close the tongs, release plate 69 will abut the side of the long arm of the pusher lever 53, in the manner as shown in Fig. 2, to cause the end of the longer arm of the lever to be dislodged from the abutment plate 68. A clip 25 will already have been delivered to specially formed hook ends 72 and 73 on the respective tong part 47 and 63 and the clip release lever 28 (Figs. 6 and 16) will have been lifted in the manner to be presently described. The stack or succeeding clips will have been retained against forward sliding movement on the bar 24 by stop projection 74 acting upon one side of the clip column. Since the cam lever 53 will have cleared the abutment plate 68, the slide assembly will be rearwardly returned by the tension spring 55 acting between the tong part 47 and the end of the short arm 56 of the cam lever and pusher 53, to impress a lifting force on the pivot arm 54 on bar 22. The view in Fig. 2 shows pusher lever 53 in its position immediately before the return movement of the slide assembly 21. When the tong arm 63 reaches final closing position, the end of lever arm 53 clears abutment plate 68, whereupon spring 55 raises the entire assembly 21 to original top, terminal position, as limited by the upward movement of the T-shaped slide plate 43 (Figs. 1, 6 and 11) and the stop member 49 against the under side of the front projection 59 of the tong arm 47.

As the assembly 21 is advanced toward the hook end 72 and 73 on the tongs 47 and 63, the release lever 28 is moved from below the lowermost clip to release it. Such release occurs simultaneously with the grasping of the clips by the hook ends 72 and 73, at which time the lever 53 on the slide assembly is moved clear of the abutment plate 68 releasing the assembly 21, which will return to its raised position under the action of spring 55.

Surrounding the slide assembly and fixed to the tong part 47 is a box frame 75 (Fig. 11) having a laterally extending guide projection 76 thereon which is received in the enlarged portion 66 of the slot 65 of the tong part 63 to hold the tong part 63 against possible casual lateral displacement of its lower end as it nears the end of the stroke from open position, as in Fig. 1, to closed position as in Fig. 2, when the ends 72 and 73 are to receive the clip 25. This frame 75 has a raised portion 77 on one side thereof through which the upper end of the clip release lever 28 slides (Figs. 11, 15 and 16) as the assembly 21 moves downwardly. From the portion 77 extends a hook projection 78 that receives the turned up end 42 of the lever 28 at the end of the downward stroke of the slide assembly, so that the lever 28 is depressed at its upper end to free the lower end 27 from the clip and in the manner as shown in Fig. 16. A pin 79 is carried by the portion 77 of the box frame 75 and which extends through the dog leg slot 41 of the lever 28 to normally hold the lever 28 against outward movement at its lower end during the initial part of the movement of the slide assembly 21 and at times when the instrument is not in use whereby to prevent the loss or discharge of the clips.

On the lower end of the body member 22 of the slide assembly 21 is an enlargement 81 having a curved end surface 82, Figs. 6, 15 and 16, under which the clips 25 will pass and be guided and

turned for the proper presentation of the clip to the skin portions being joined. When the clip is on the surface 82, it is held astride the bent end 27 of the release lever 28. A spring plate 83 is attached by screw 84 to the end of the guide bar 24. This spring plate 83 is bent inwardly toward and parallel to the curved surface 82 of the enlargement 81, as indicated at 85, to effect the turning of the clips 25 as they are moved downwardly off their supporting and guide bar 24, and the plate 83 has a downward projection 86 that enters a notch in the bent end 27 of the release lever 28.

With the slide assembly 21 released and returned and with the clip 25 held between the ends of the tong parts, the clip can be placed between the skin portions and squeezed in the manner shown in Figs. 3 and 5 to secure the skin portions. The skin portions in Figs. 4 and 5 are indicated at 87 and 88 and fine sharp points 25' and 25'' enter the skin portions and pull the same together to the positions shown in Fig. 5. The instrument can then be used again to insert a second clip 25 and so on until the wound is finally closed by the skin portions.

Referring now particularly to Fig. 13, there is shown a slight modification directed particularly to means for holding the column of clips while clip which has been advanced is being worked. This means comprises a long projection 91 having a bifurcated or double hook formation 92 thereon adapted to straddle the sides of the guide bar 24 at the lower end thereof so that its portions respectively engage the opposite ends of a clip and so that the clip will be engaged evenly and on both ends thereof instead of upon one end as with the projection 74. This finger projection 91 replaces the projection 74.

In Figs. 17 and 18, there is shown a modified form of a release lever. This lever is indicated at 95 and has an inwardly turned end 96 for engaging the clip and retaining the same in place under the surface 82 of the enlargement 81 and a short rear lever arm 97 with an elevated cam projection 98 which is engaged by a long hook projection 99 in the manner shown in Fig. 18 to give a quick release action of the lever 95.

It should now be apparent that there has been provided an automatic inserter for suturing clips wherein by the same continued motion of a movable and operating part which advances the clip to the ends of the tong parts also serves to effect the bending of the clip to make the connection of the skin portions. A single cam lever 53 is used to effect the operation or forward movement of the slide assembly and the release of this cam lever from the abutment plate 68 releases the slide assembly, the clip 25 having been delivered to the ends 72 and 73 of the respective tong parts. Once the clip has been attached to the skin portions, a release of the tong part 63 for engagement again of the end of the cam lever 53 with the abutment plate 68 will immediately place the instrument or inserter in readiness for the next insertion of the suturing clip.

It will be apparent that the clips can be easily disposed upon the guide bar 24 upon the follower 26 being removed. The follower is easily locked in place by extending the arm 34 of the rod 32 under the projection 37.

The operation of the modification in Fig. 1 is briefly as follows: When the follower 26 (Figs. 6 to 9) is removed from magazine bar 24, clips are introduced to straddle bar 24, as in Fig. 8, follower 26 is then replaced (Figs. 1, 2, 6 and 7),

and bias spring 36 forces follower 26 to push the clips forward, to advance and raise the leading clip to the ready position shown in Figs. 1 and 15, ready to be delivered to the concave tips 72 and 73 of the tong arms 47 and 63. In that ready position, in Fig. 1, the lowermost clip at the end of the guide bar 24 is held by the projection 74 which is in the same vertical plane as the column of clips and in position to be advanced to the bent end 27 of the release lever 28 when the slide assembly 21 has returned to its raised position. The stop projection then engages the column of clips, as in Fig. 2, to limit their movement while the magazine assembly 21 is advanced to transfer the ready clip to the tips of the tong arms. When the ready clip is transferred to and engaged by the tong tips, the back of pusher lever 53 is engaged by release plate 69 to push lever 53 out of nested engagement with abutment plate 68, and return bias spring 55 pulls on short arm 56 of push lever 53, to impress pulling tension force on pivot pin 54, and thus on the sliding assembly 21, to pull that slide assembly back from advanced position of Fig. 2 to initial position of Fig. 1.

While various changes may be made in the detail construction, it shall be understood that such changes shall be within the spirit and scope of the present invention as defined by the appended claims.

I claim:

1. An automatic inserter for suturing clips comprising tong parts hingedly connected together at one end and having specially formed opposite ends adapted to receive the ends of a suturing clip, a magazine slide assembly slidably mounted on one of the tong parts, means acting between the slide assembly and the other of the tong parts and operative by said other tong part to cause the advancement of the slide assembly, said magazine slide assembly being adapted to contain a column of suturing clips, holding means on one of the tong parts for retaining the column of the suturing clips while permitting the advancement of the lowermost clip on the slide assembly to be positioned and hold the clips for engagement by the specially formed ends of the tong parts, and automatic release means including the means carried by the slide assembly and acting against said other tong parts and operative when the slide assembly has advanced to forward position to release the lowermost clip to the specially formed ends of the tong parts, said automatic release means arresting the advance of the slide assembly relative to the other tong part, said tong parts then retaining the clip and being operative with further closing pressure to add pressure upon the clip and serving to bend the clip for the fixing of the same to the skin portions being joined together.

2. An automatic inserter for fixing suturing clips as defined in claim 1, and said means for advancing the slide assembly through the tong parts comprising a cam lever having short and long arms, a pivot element pivotally connecting the lever to the slide assembly, tension means connected between one of the tong parts and the short arm of the lever to bias the assembly to retracted position, said means between the slide assembly and the other of the tong parts comprising a first abutment member on the second tong part and engageable by the long arm of the cam lever as the tong parts are angularly brought together, whereby to force the cam lever and the slide assembly forwardly, said automatic release

means comprising a second abutment member on the second tong part acting upon the cam lever to dislodge the cam lever from the first abutment member on the movable tong part and thereby release the slide assembly, whereupon the tension means may be effective to return the slide assembly to its raised or retracted position.

3. An automatic inserter for suturing clips as defined in claim 1 wherein said automatic release means further includes a release lever for retaining momentarily the lowermost suturing clip having an end bent to overlie the end of the assembly and the under face of the suturing clip, said lever being pivotally connected to the slide assembly, said lever having a dog leg slot in the upper end thereof, a frame carried by the tong part to encircle the slide assembly, a pin carried by the frame and extending through the dog leg slot whereby to normally hold the lever against pivotal movement throughout a selected portion of the stroke of the slide assembly in its advancement, a cam projection on the lever said frame having a hook projection engageable with the cam projection of the lever whereby at the end of the stroke of the slide assembly, the bent end of the lever will be outwardly displaced to free the suturing clip to the specially formed ends of the tong parts.

4. An automatic inserter for suturing clips as defined in claim 1, and said slide assembly including an elongated body member having an enlargement on the lower end thereof with a curved end edge surface, to guide the clips as they are advanced, said clips on being advanced being forced under the curved end edge surface and turned to be held in position for insertion into external skin portions, clip release means adapted to retain said clips momentarily against forward displacement, a spring cover secured to the lower end of the slide assembly and bent inwardly at its lower end to guide the clips under the curved end edge surface on the enlargement, said spring having a forwardly extending projection, said clip release means having a recess for receiving the projection of the spring cover whereby the clip release means will be held against lateral displacement under the clip until the clip release means is tripped to release the clip.

5. A suturing clip application comprising a pair of tong members pivoted at the back ends and provided with clip-receiving front ends, a clip magazine including a center bar to support the clips, a support slidably mounted on the first of said tong members and movable reciprocally on said tong member to permit the clip magazine to be moved reciprocally between the two tong members, actuating means for advancing the clip magazine in forward direction, said means comprising a lever arm pivoted at one end to the movable clip magazine and releasably engaged at its other end to the second of said tong members to form an obtuse angle therewith as a toggle in the open position of that tong member, whereby closure of the tongs stretches the toggle and causes the lever arm to push against its pivoted end to move the clip magazine forwardly, means on said tong member for releasing the engagement between said lever and the second tong member when the magazine reaches its forward position, and a return spring for pulling the magazine back to its initial position, when said engagement is broken between said lever and the second tong member.

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