

July 23, 1963

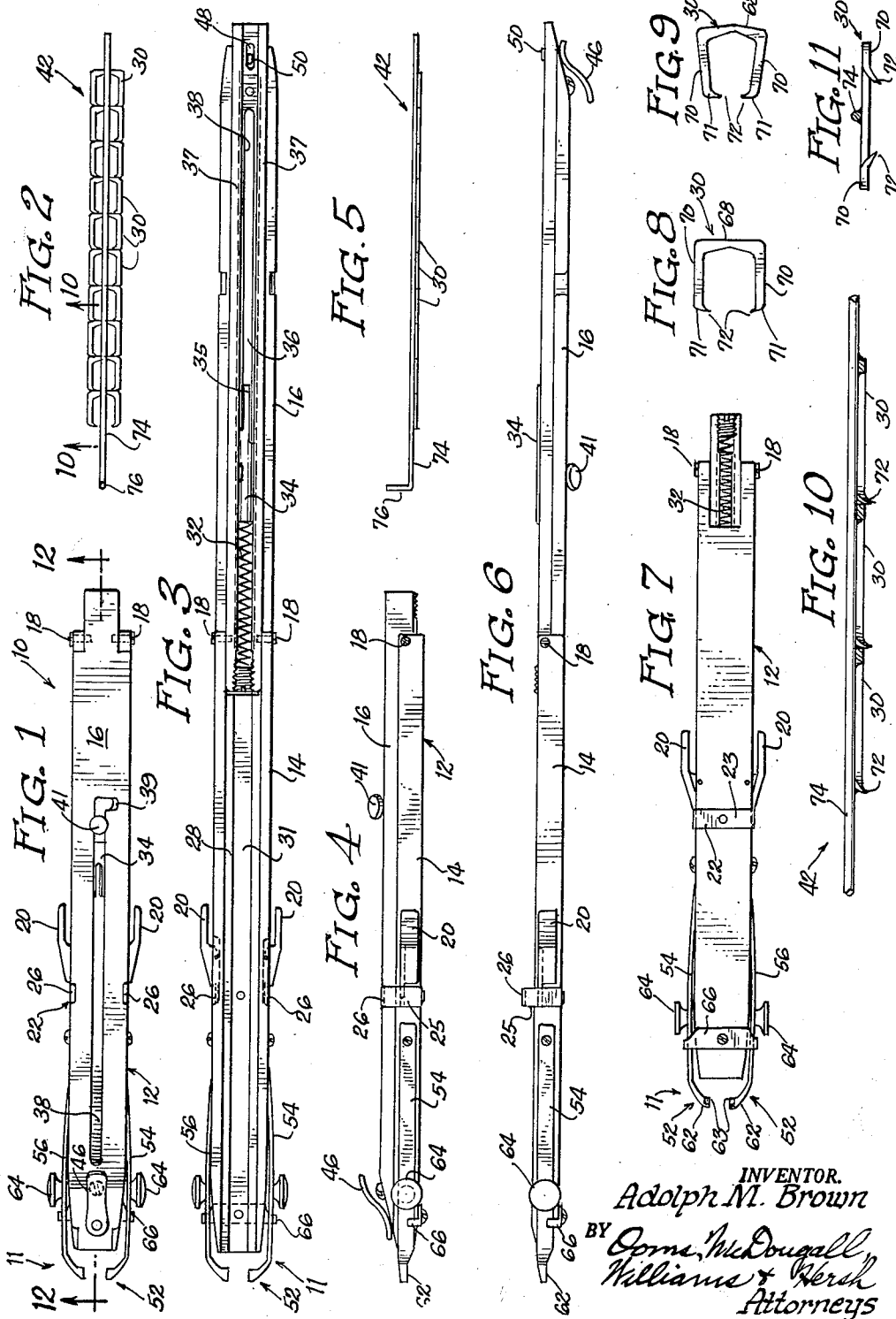
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3,098,232

SURGICAL CLIP APPLICATOR

Filed Feb. 24, 1960

3 Sheets-Sheet 1



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SURGICAL CLIP APPLICATOR

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3 Sheets-Sheet 2

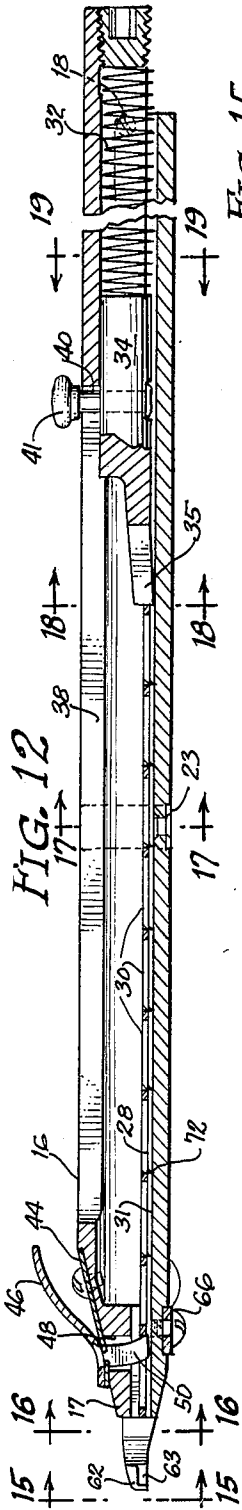


FIG. 15

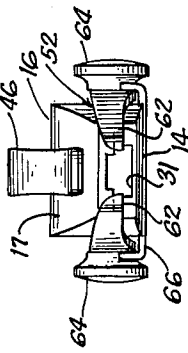


FIG. 16

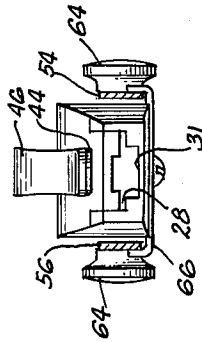


FIG. 20

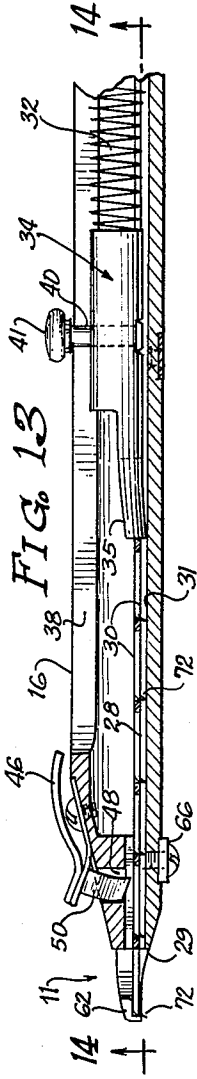
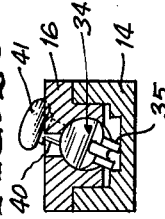


FIG. 14

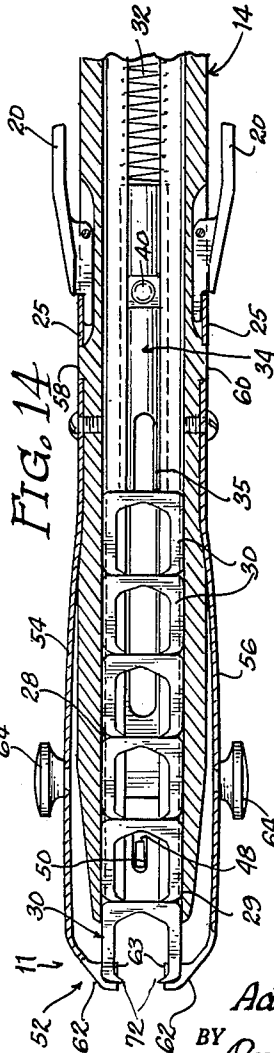


FIG. 19

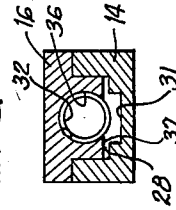


FIG. 18

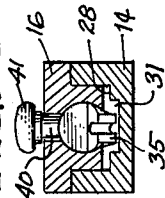
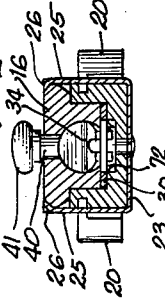


FIG. 17



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3 Sheets-Sheet 3

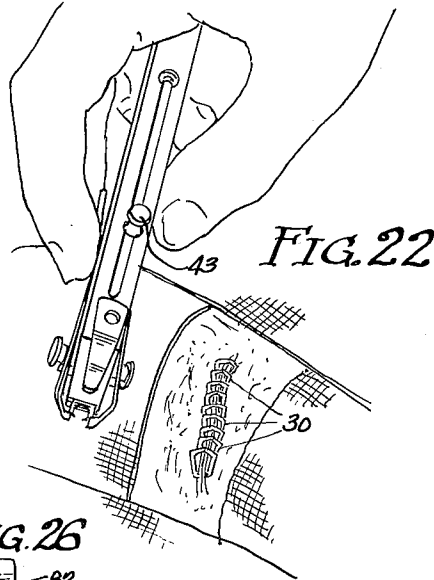
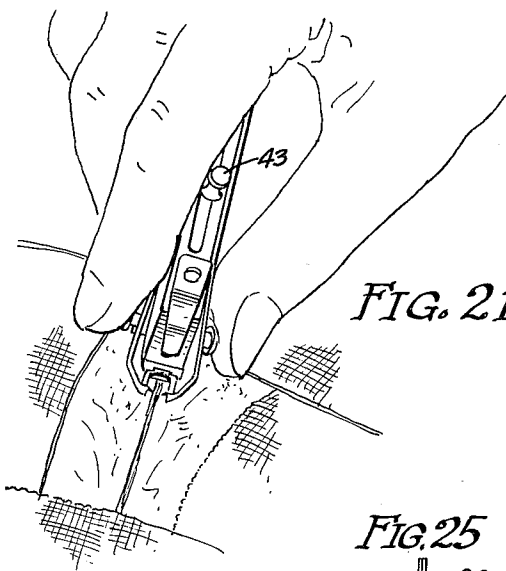
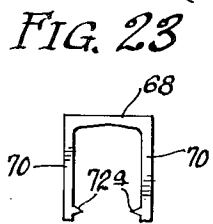
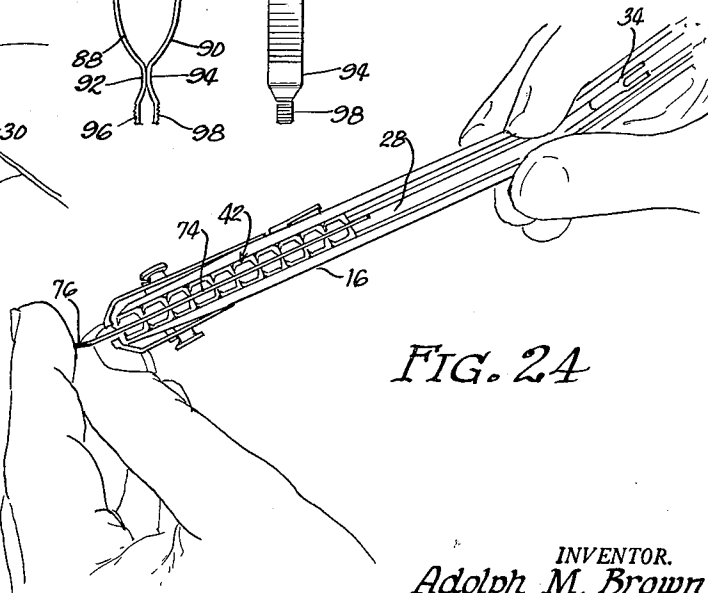
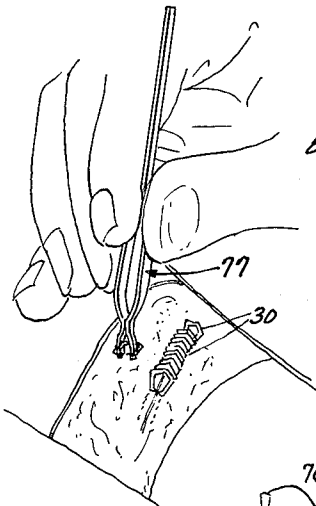
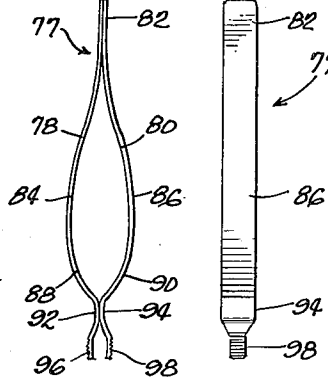


FIG. 25 FIG. 26



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SURGICAL CLIP APPLICATOR

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5 Claims. (Cl. 1-349)

This invention relates to a means for bringing together separated sections of skin heretofore achieved by taking stitches into the skin, and it relates further to elements for use in the practice of same.

To the present, when laceration or incision of a skin layer occurs in wounds or the like, it has been the practice to stitch the separated sections of the skin together for the purpose of reducing scar formation and to accelerate healing of the wound. Such stitching operation constitutes a surgical operation wherein the separated sections of the skin are brought together and then stitched, as by a needle and thread, to hold the separated sections together until the wound has healed. When sufficient time has elapsed, such as from 5-7 days, the stitches are removed by pulling the stitches from the wound after the threads have been severed.

Such stitching operation constitutes a rather painful procedure which lasts a considerable period of time. In addition, it requires the services of both hands of one or more physicians to hold the separated sections of the skin together, to thread the needle, to pass the needle through adjacent edge portions of the severed skin layer, to tie the thread with the desired tension to close the stitch, and then to sever the loose ends of the threads when the stitch has been completed. All of this leads to the utilization of considerable time in the surgical operation, coupled with interferences of a bleeding wound. Time is a factor in a bleeding wound, and freedom of the hands of the physician is a factor in the best care of the wound.

It is therefore an object of this invention to provide a means for achieving the equivalent of a stitching operation to close a wound but in considerably less time and with markedly less occupation of the physician's hands by comparison with conventional stitching techniques.

Another object is to provide a means for quickly and efficiently bringing the adjacent edge portions of severed sections of the skin together for closing wounds and for holding the sections together until healed, and it is a related object to provide a simple and efficient means for removing the holders from the skin when the desired amount of healing has been achieved.

A further object is to produce skin clips and an applicator for use with the same in clipping the skin together to close a wound.

These and other objects and advantages of this invention will hereinafter appear and for purposes of illustration, but not of limitation, embodiments of the invention are shown in the accompanying drawings, in which—

FIG. 1 is a plan view of the improved semi-automatic clip applicator embodying the features of this invention;

FIG. 2 is a plan view of a magazine of clips designed to be used with the clip applicator shown in FIG. 1;

FIG. 3 is a plan view of the clip applicator shown in FIG. 1, but with the body opened for loading with a magazine of clips and for exposure of the interior thereof;

FIG. 4 is a side view of the clip applicator shown in FIG. 1;

FIG. 5 is a side view of the magazine of clips shown in FIG. 2;

FIG. 6 is a side view of the clip applicator shown in FIG. 1, but opened for loading as in FIG. 2;

FIG. 7 is a bottom view of the clip applicator shown in FIG. 1;

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FIG. 8 is a plan view of a clip adapted to be used with the clip applicator;

FIG. 8A is a plan view of a modification of a clip adapted to be used with the clip applicator;

FIG. 9 is a plan view of a clip as shaped when applied to a wound;

FIG. 10 is an enlarged side view of a portion of the magazine of clips showing the downwardly extending points on the ends of the clips;

FIG. 11 is a front view of a clip employed in the practice of this invention;

FIG. 12 is a sectional view taken along the line 12-12 of FIG. 1;

FIG. 13 is a side sectional view of the front portion of the clip applicator with the clip release lever out of clip-retaining position;

FIG. 14 is a sectional view taken on the line 14-14 of FIG. 13;

FIG. 15 is an elevational view taken on the line 15-15 of FIG. 12;

FIG. 16 is a sectional view taken on the line 16-16 of FIG. 12;

FIG. 17 is a sectional view taken on the line 17-17 of FIG. 12;

FIG. 18 is a sectional view taken on the line 18-18 of FIG. 12;

FIG. 19 is a sectional view taken on the line 19-19 of FIG. 12;

FIG. 20 is a view similar to that of FIG. 18, but with the spring-biased plunger locked in a retracted position;

FIG. 21 is a perspective view showing the clip applicator in position to apply a clip to a wound;

FIG. 22 is a perspective view of a modified clip applicator and a series of clips in position of use to close a wound;

FIG. 23 is a view of the clip remover employed in the practice of this invention;

FIG. 24 is a perspective view of the modified clip applicator opened to receive a magazine of clips;

FIG. 25 is a front elevational view of a clip remover, and

FIG. 26 is a side elevational view of the clip remover shown in FIG. 25.

Referring now to FIG. 1 of the drawing, the instrument or semi-automatic clip applicator indicated generally by the reference numeral 10 comprises a body 12. In this particular embodiment, the body is formed from two sections 14 and 16 pivotally connected together on trunnions 18. With this arrangement, the body sections can be pivoted apart so the instrument can be loaded with clips.

As best seen in FIG. 4, when in use the body is arranged so section 16 overlies section 14, and these sections are releasably held together by a spring clamp assembly. This spring clamp assembly includes pivotally mounted lever members 20 and a spring clamp 22, see FIGS. 1, 7, and 14.

The spring clamp 22 is a generally U-shaped member including a web portion 23 and upwardly extending leg portions 25 terminating in inturned flanges 26. The web portion is riveted to the base of section 14 and the leg portions 25 embrace the sides of sections 14 and 16, see FIGS. 4 and 6. As seen in FIG. 1 the inturned flanges 26 embrace the top surface of body section 16, and this is what holds the body sections together. To open the body, levers 20 are pressed, and as seen in FIG. 14, this forces leg portions 25 apart until flanges 26 no longer embrace the top surface of section 16, whereupon sections 14 and 15 can be pivoted open and the instrument can be loaded with clips.

The body 12 is provided with a magazine for receiving a number of clips. This magazine includes a recess or

guideway 28 formed in the upper surface of section 14, see FIGS. 3, 12, and 19. As seen in FIGS. 14 and 17, the guideway 28 slidably supports the sheet surface of the body of the clips.

The body also has means for urging the clips through the guideway toward the front end 11 of the instrument. In this particular embodiment, this comprises a spring 32 and a push member 34 slidably mounted in a groove 36 formed in surface 37 of section 16, see FIGS. 3 and 19. As seen in FIGS. 14 and 18, the front end 35 of the push member is bifurcated for reasons to be described below. In addition, as seen in FIGS. 12, 13, and 14, the front end 35 of push member 34 abuts against the rear edge of the rear clip in the magazine and spring pressure forces the clips toward the front of the instrument.

Section 16 of body 12 is provided with an elongated slot 38 extending along a substantial portion of the length of section 16 with a small bent portion 39 at the rear. A pin 40 with an enlarged head 41 extends through slot 38 and is rigidly secured to push member 34, see FIGS. 12 and 13. In the embodiment shown in FIGS. 1-20, this structure provides a means for holding the push member 34 in a retracted position out of contact with the clips. This is done by pushing pin 40 to the rear end of slot 38 and rotating it into the bent portion 39, as seen in FIGS. 3 and 20.

With the push member 34 held in a retracted position, the instrument can be loaded by opening the body of the instrument as shown in FIG. 3. Then a magazine 42 of clips, see FIG. 2, is dropped into guideway 28 and the body is closed. Finally, pin 40 is rotated out of the bent portion 39 of slot 38 and is released to move under pressure of spring 32 against the rear edge of the last clip in the magazine, as shown in FIG. 12.

In the embodiment of the instrument shown in FIG. 22, the bent portion 39 of slot 38 has been omitted, and a knurled nut 43 in threaded engagement with the end of pin 40 has been substituted for pin head 41. With this arrangement, to hold push member 34 in a retracted position, it is only necessary to push the pin 40 back a desired amount and screw nut 43 tightly on pin 40. To release push member 34, nut 43 need only be loosened.

The front of the top surface 17 of section 16 is beveled slightly and a spring-biased lever assembly, including a flat spring 44 and a connected clip release lever member 46, is mounted thereon, see FIGS. 12 and 13. An opening 48 extends through section 16 from top surface 17 and an abutment 50 depending from lever member 46 extends therethrough to a point in the path of clips 30 moving along guideway 28. As seen in FIG. 13, pressure on lever member 46 causes the abutment 50 to rise out of the path of the clips 30 in a guideway for reasons to be described below. When pressure on lever member 46 is removed, spring pressure forces lever 46 and abutment 50 back to the position shown in FIG. 12.

A pair of forceps, indicated generally by the reference numeral 52, is mounted on the body 12 extending out beyond the front end thereof, see FIGS. 3 and 14. The forceps include a pair of resilient metal strips 54 and 56 mounted on the opposite sides 58 and 60 of the body section 14. The front ends of these strips are bent toward each other to form jaw abutments 62. These jaw abutments have an upwardly extending recess forming seats 63, as seen in FIG. 12. These seats function to support and engage the front edge of the clip next to be applied by the instrument, see FIGS. 13 and 14. The jaw abutments are positioned in advance of the front end of the guideway a distance substantially equal to the length of the individual clips, for reasons to become apparent below.

Oppositely extending cylindrical press members 64 are secured to the sides of strips 54 and 56 whereby pressure can be conveniently exerted on the forceps. A channel-shaped member 66 secured to the under surface of section 14 embraces the sides of strips 54 and 56 and pre-

vents the jaw abutments 62 from moving more than a fixed distance apart against the pressure exerted by the resilience in the strips 54 and 56, see FIGS. 7, 15, and 16. As seen in FIG. 14, the fixed distance is equal to the width of an individual clip. This permits the forceps to hold the clip when the instrument is not in use.

An important feature of this invention resides in the clips 30 used with the clip applicator 10. As seen in FIGS. 8, 9, and 11, the clip is formed from sheet material, preferably metal, and in this particular embodiment the body is planar and generally U-shaped, with a rear web portion 68 and forwardly extending leg portions 70. This arrangement is desirable because it is simple and inexpensive. It is to be understood, however, that the body of the clip need not be planar, and in fact, it could be arcuate in cross-section. Furthermore, the clip need not be exactly U-shaped. For example, under some circumstances a V-shaped clip might be useful. It is important, however, for the clip to have forwardly extending leg portions, as will become apparent below.

A pair of points 72 are inclined downward and toward each other from the front edge 71 of each clip. In a preferred embodiment, shown in FIG. 8A, the prongs 72 are spaced a short distance from the ends of the leg portions 70. In this construction the prongs are bounded by spaced shoulders which operate more effectively to guide the prongs upon insertion into the skin. With these arrangements, pressure on the sides of the clip sufficient to bend the leg portions 70, see FIG. 9, would cause points 72 on the legs to move toward each other. When the clip is pressed onto a wound, pressure on the sides of the clip causes the points to penetrate the skin to bring the margins together, see FIGS. 22 and 23. While in position of use, the body of the clip is free of the skin. This is important because it permits a suitable clip remover to be inserted between the leg portions 70 for separation of the legs and removal of the clips from the skin without exerting any pressure on the wound.

The clips are assembled together to form a magazine 42. As seen in FIGS. 2, 5 and 10, the clips are positioned in a straight line in end-to-end relationship, with the ends of the legs of one clip abutting against the rear of the web portion of the next clip. The clips in this particular embodiment are all secured as by gluing to a common connecting rod 74 with an upturned handle member 76. The magazine 42 is placed as a unit in the guideway 28 inside the clip applicator 10, as shown in FIG. 24. The housing is then again closed and since the push member 34 is retracted there is sufficient room for the rod 74, which upon exertion of a gentle pulling force by means of the handle 76, will be pulled away from the clips and out through the opening at the front end 11 of the instrument. It is to be understood, however, that other means can be used for holding the clips together to form a magazine.

In operation, after the clips are inserted inside the instrument, the pressure exerted by the spring 32 on push member 34 forces the train of clips toward the front of the instrument until the front of the web portion of the first clip in the train engages abutment 50. Then a momentary pressure on lever member 46 is sufficient to move abutment 50 out of the guide path of the clips, permitting the push member to move the clips forwardly until the front edge 71 of the clips engage seats 63, see FIG. 13. At the same time, it is noted that the rear edge of the web portion 68 is supported on the front end 29 of the guideway 28. This arrangement, when coupled with the pressure exerted on the front clip by spring 34, is sufficient to hold the body of the clip in advance of the body of the instrument, see FIG. 14. In this position, the margin of the wound is clearly visible between the legs 70, see FIG. 21, so that the clips can be positioned more accurately.

In applying the clips, the instrument is placed against the wound with the points 72 of the clips 30 properly

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positioned. Then pressure is exerted on press members 64. This forces jaw abutments 62 toward each other, bending the legs 70 of the clip as shown in FIG. 9. The points 72 which are downwardly inclined and which extend toward each other, penetrate the skin around the wound. Then when pressure on press members 64 is removed, the abutment jaws 62 move apart due to the resilience in strips 54. This leaves the clips 30 embedded in the skin to hold the wound margins together and out of the instrument, as shown in FIG. 22.

It is noted that after a clip has been used, the remainder of the clips in the magazine are prevented from moving along guideway 28 because of the abutment 50 in their path. Consequently, in order to permit the next clip to advance into engagement with the seats 63 on the jaw abutments 62, lever member 46 must again be pressed. This is a useful feature because it keeps all the clips enclosed in the housing 12 until they are to be used. Otherwise, the next clip in the magazine would automatically advance to the front position, as shown in FIG. 14, where it could be dislodged from the instrument or damaged by accidental jars or blows, while the instrument is not in use.

When the last clip in the instrument is to be used, lever member 46 is again momentarily pressed and the push member 34 can then force this last clip into seating position on the jaw abutments. Because the front end 35 of the push member 34 is forked, lowering of the abutment upon release of lever member 46 does not prevent the front end of the push member 34 from moving to the front end 29 of the guideway in order to maintain enough pressure on the last clip to keep it seated in the jaw abutments and ready for use.

As seen in FIG. 11, the points 72 of the clips 30 extend downward from the surface of the body of the clip. Since the clips slide along guideway 28 on the surface of their body, the guideway must be shaped so the points do not rub against any surface of the guideway or any other part of the body of the instrument as the clips are pushed along. This is done by forming a groove 31 in guideway 28 designed to keep the points 72 out of rubbing contact with the guideway, see FIG. 17.

The fact that the points 72 of the clips 30 are downwardly inclined from the body of the clip and the instrument, see FIGS. 12 and 13, is important because when the instrument is used to apply clips to the wound, the instrument need only be held at a comparatively small angle with the surface of the wound. This substantially eliminates the application of pressure on the wound which might otherwise be necessary if the points were generally in the plane of the body of the instrument so that the instrument would have to be applied to the wound at a substantial angle, e.g., in excess of 45°.

The removal of the clips is made easy, both by the shape of the clips and by the use of a specially designed clip remover, indicated generally by the reference numeral 76, see FIGS. 25 and 26. As best seen in FIG. 25, the clip remover 77 comprises two elongated strips of metal 78 and 80 secured together at end 82. The portions 84 and 86 of the strips adjacent end 82 diverge from each other over a substantial portion of the length of the strips. The diverging portions terminate in bent portions 88 and 90 which lead portions 92 and 94 of the strips into engagement with each other. It is apparent, however, that the clip remover could be made so portions 92 and 94 are separated from each other when the clip remover is in rest position.

Portions 92 and 94 of the strips are bent again to form spaced jaws 96 and 98, which in this particular embodiment happen to be generally parallel to each other, although that is not essential. These jaws are small in length in comparison to the length of the diverging portions 84 and 86. Portions 92 and 94 of the strips are shaped so that squeezing pressure on diverging portions 84 and 86, causing them to move against each other,

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deforms them in such a way as to cause jaws 96 and 98 to move apart. In addition, there is a lever action involved because a comparatively small squeezing pressure exerted on the long diverging portions will result in a larger force moving the smaller jaws apart.

With this instrument, in order to remove the clips from a wound, the jaws 96 and 98 are inserted between the legs 70 of the clip, which it is again noted are not pressed tightly against the skin. Then a comparatively gentle squeezing pressure on the diverging portions 84 and 86 forces the jaws 96 and 98 to push legs 70 apart and thereby causes the points 72 to move out of engagement with the skin without exerting any pressure on the wound. As seen in FIG. 25, the outer surface of jaws 96 and 98 may be serrated to provide a better contact between the jaws 96 and 98 and the legs 70.

The invention may be embodied in other forms without departing from the spirit or essential characteristics thereof as set forth in the claims, and the present embodiment is therefore to be considered as illustrative and not restrictive and it is intended to include all changes which come within the scope and range of the claims.

I claim:

1. An instrument for applying clips of U-shape having a rear bail portion and a pair of spaced parallel side arms extending forwardly from said bail with spicules extending inwardly and downwardly from the forward edge portion of the spaced parallel side arms, comprising a magazine for receiving a number of said clips in said instrument aligned in end-to-end relation, said magazine including a clip-receiving guideway in said body, means in said guideway for urging clips therethrough, said guideway engaging and slidably supporting the lateral edge portions of the side arms of said clips, and means for sequentially applying the clips in the magazine to the work including jaws and positioned in advance of said guideway a distance substantially equal to the length of an individual clip, said jaws having seats for receiving and supporting the front edge of the side arm of said clip while the adjacent end of said guideway is designed to support the rear edge of the clip, whereby the area between the arms of said clip is unobstructed and the points of the clip can be easily observed and movable abutment means movable to one position with the abutting surface thereof normally located within said guideway a distance substantially equal to the length of comprising an individual clip from the end of said guideway and movable from its normal position out of said guideway whereby the body of the clip following the clip next to be applied may be normally restrained and whereby said following clip may be released to effect urging thereof into application position.

2. The instrument described in claim 1 wherein said means for applying the clips to the work comprises a device for applying pressure to the sides of the clip and squeezing them so their points move toward each other, whereby the points may penetrate the work and hold the clips thereto.

3. An instrument for applying clips which have a flat sheet body formed to U-shape comprising a pair of laterally spaced apart substantially parallel side arms and a bail interconnecting the rearward end portions of said side arms into a unitary rectangularly shaped clip and spicules extending inwardly and downwardly from the forward end portion of said side arms to a level below the plane of the flat sheet body of the clip, said instrument comprising an elongated body, a magazine for receiving a number of said clips aligned in end-to-end relation in said instrument, said magazine including a clip-receiving guideway in said body dimensioned to have a height corresponding to the thickness of the body portion of the clip and a width corresponding to the outer edge to edge dimension between the parallel side arms of said clip so that the outer edge portions of the clip arms are slidably received within said guideway with the spicules extending

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out of the plane of said guideway, means in said guideway for urging clips therethrough, said guideway engaging and slidably supporting the surface of the clips and having a groove overlying the inclined spicules of the clip so that the spicules do not rub against the body of the instrument as they are moved along the guideway, and means for sequentially applying the clips in the magazine to the work including a pair of forceps mounted on the end of said body, said forceps including a pair of strips, each strip mounted on one side of the body of the instrument and having a free end with seats formed thereon, said seats positioned in advance of the end of the guideway a distance substantially equal to the length of the clip and adapted to engage and support the front edge of the side arms of the clip while the rear edge of the clip is supported by the adjacent end of the guideway, said forceps having portions engaging the lateral edges of the side arms of the clips whereby pressure thereon squeezes the sides of the clips forcing the points together, whereby the points may penetrate the work and hold the clips thereto.

4. A clip applicator for applying clips of U-shape having a pair of laterally spaced apart parallel side arms and an interconnecting rear edge comprising an elongated body, a clip-receiving guideway in said body dimensioned to have a width corresponding to the width of the clips for receiving said clips in aligned end-to-end relation, means in said guideway for urging the clips therethrough, jaws associated with said body and positioned in advance of said guideway a distance substantially equal to the length of an individual clip, seats on said jaws for receiving the front edge of the side arms of the clip while the adjacent end of said guideway is designed to support the rear of the clip so that the position of the points of the clip can be easily determined and the clips can be positioned more accurately, means for applying manually applied pressure to the sides of the clip for squeezing them whereby the points move toward each other as they penetrate the work, and abutment means movable to one position with an abutting surface thereof normally located within said guideway a distance substantially corresponding to the length of an individual clip from the end of said guideway and movable from its normal posi-

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tion out of the guideway whereby the following clip will be released for movement thereof into position for application and to normal position whereby the clip following the clip next to be applied will be normally restrained.

5. A clip applicator for applying clips having a front and rear edge comprising an elongated body, a clip-receiving guideway in said body, a spring-urged push member mounted in said body and communicating with said guideway for pushing the clips therethrough, and a pair of forceps mounted on said body, said forceps extending beyond an end thereof a distance substantially equal to the length of an individual clip and positioned to engage the sides of the clip and squeeze it whereby it may be applied to the work, seats formed on the end of said forceps for receiving and supporting the front edge of said clip while the adjacent end of said guideway supports the rear edge of the clip, whereby the body of the clip next to be applied is held in advance of the end of the instrument so that the position of the points of the clip can be easily determined and the clips can be positioned more accurately, abutment means movable to one position with an abutting surface thereof normally located within said guideway a distance substantially corresponding to the length of an individual clip from the end of said guideway and movable from its normal position out of said guideway whereby the clip following the clip next to be applied will be normally restrained and whereby said following clip will be released for movement thereof into position for application.

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