

- [54] CLIP APPLICATOR
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- [22] Filed: Aug. 24, 1971
- [21] Appl. No.: 174,501

Related U.S. Application Data

- [62] Division of Ser. No. 817,496, April 18, 1969, abandoned.
- [52] U.S. Cl..... 29/212 D
- [51] Int. Cl..... B23q 7/10
- [58] Field of Search..... 29/212 D, 211 R, 29/211 C, 212 P

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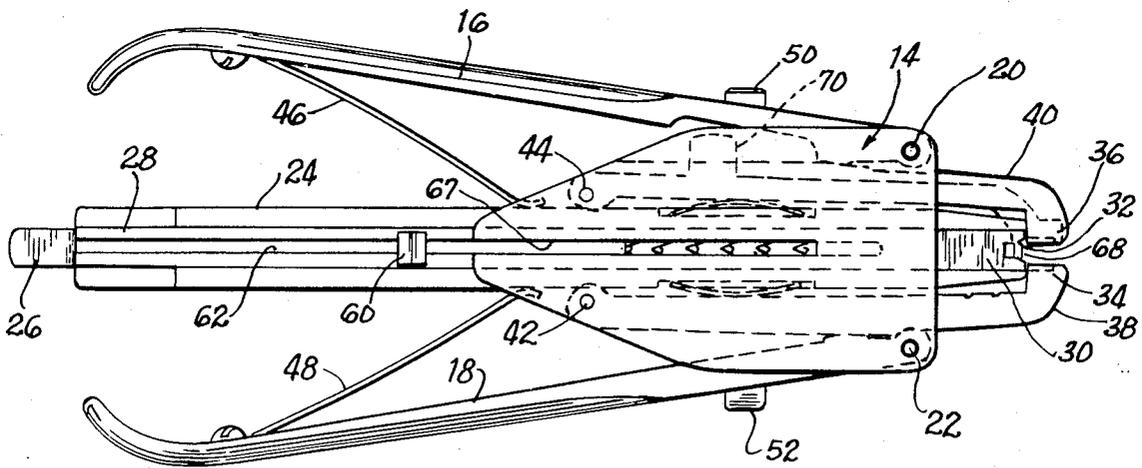
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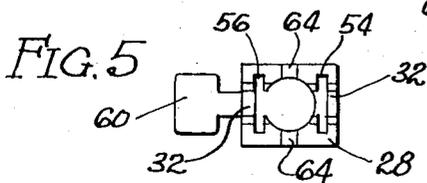
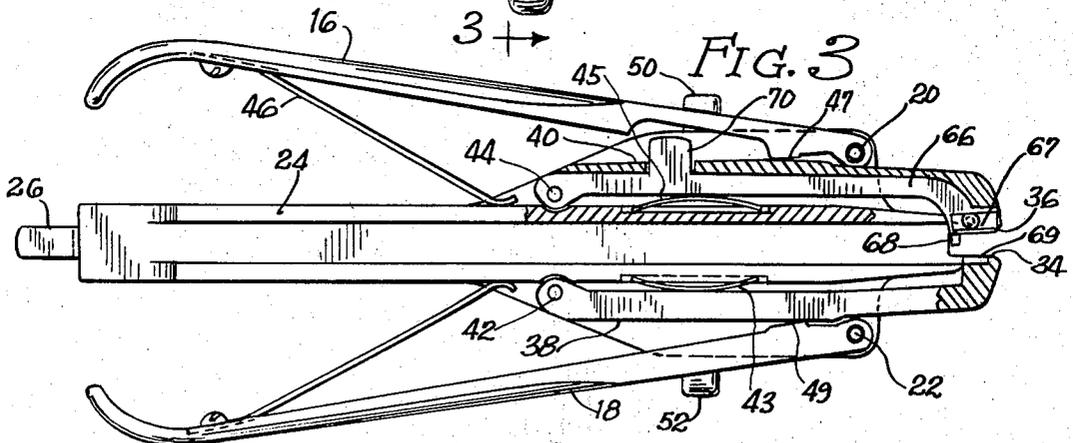
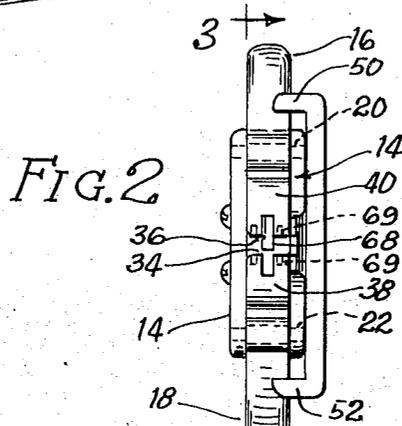
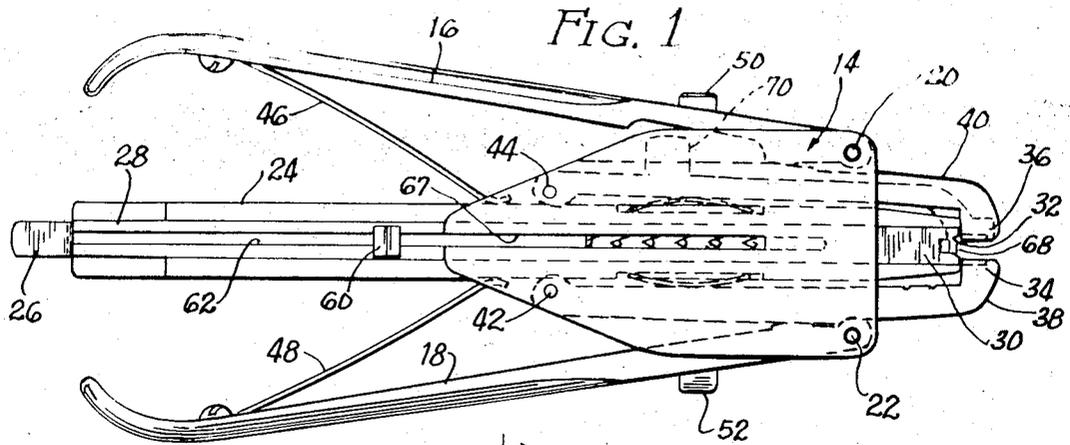
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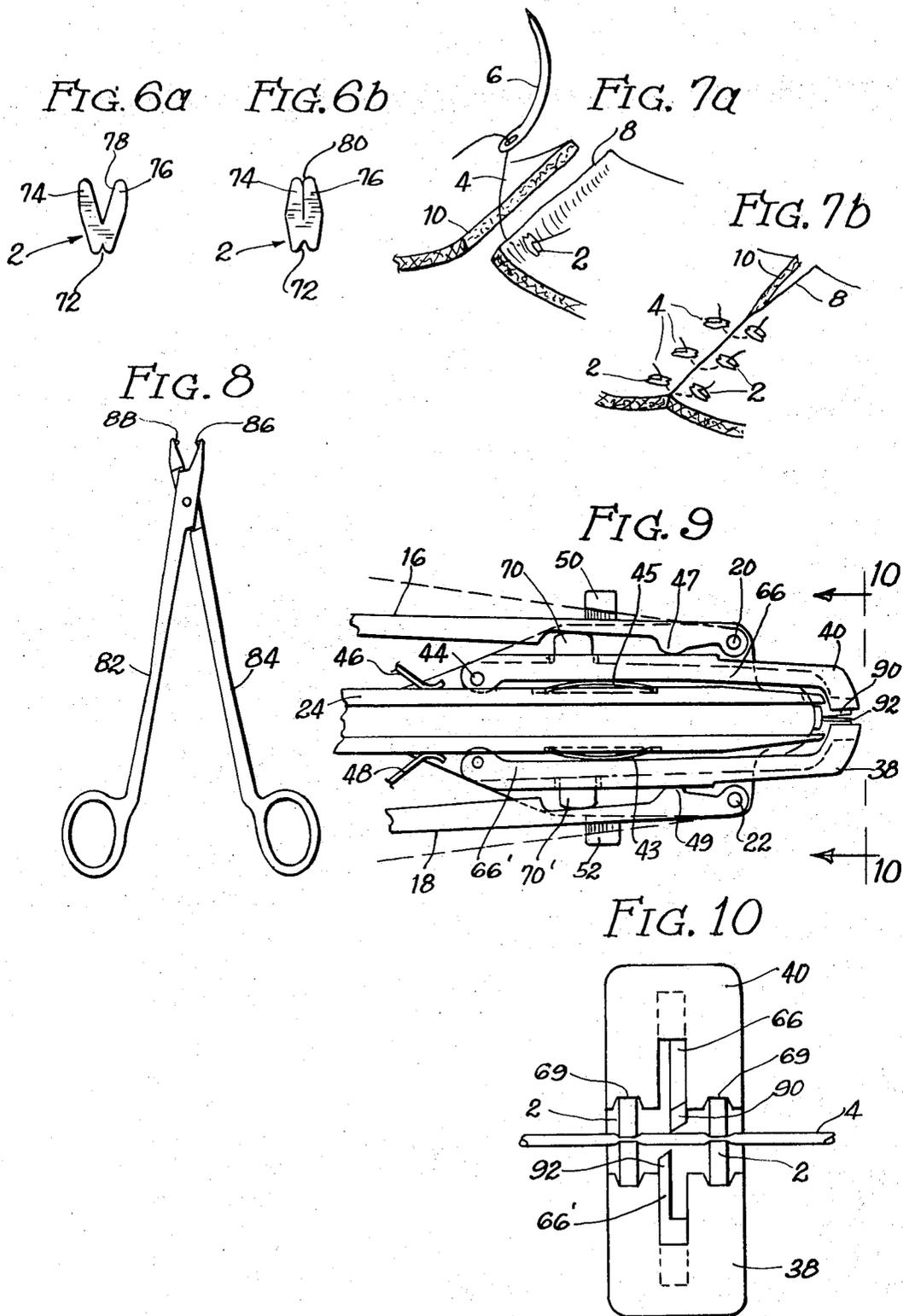
[57] **ABSTRACT**

This application discloses apparatus for applying spaced clips to a filament and severing the filament between the clips so as to provide clips secured on the free ends of the severed filament. The apparatus is disclosed in the context of a method of suturing skin wounds wherein a suture is drawn through an edge of the wound and the clip applicator applies the spaced clips and severs the suture so as to provide one clip holding the suture at the edge of the wound and another clip to the thread so that it may be used to start the next suture.

9 Claims, 12 Drawing Figures







CLIP APPLICATOR

This application is a division of application Ser. No. 817,496, now abandoned.

This invention relates to surgical devices. More specifically, it relates to a apparatus for the suturing of skin wounds.

The conventional method of closing skin wounds consists of sewing the edges of the wound together with thread. Threads are placed and tied separately along the wound and are termed "interrupted sutures". Alternately, wounds may be closed by a continuous thread anchored by tying the thread at either end of the wound. Very frequently wounds sutured in accordance with these techniques tend to have the edges inverted so that when healed a noticeable scar may remain. Also, it is not uncommon that the healing may be uneven to such an extent as to delay complete healing and to further aggravate the scarring situation.

Therefore, it is an object of this invention to provide a novel apparatus for closing skin wounds in which the possibility of scarring of the wound is minimized.

It is another object of this invention to provide a novel apparatus for suturing skin wounds which promote even healing.

It is still a further object of this invention to provide a novel apparatus for suturing skin wounds which eliminates any encircling thread over the wound, thus eliminating the possibility of a cross-hatched scar.

These and other objects are achieved by the provision of a novel applicator tool carrying a supply of clips which are applied to a thread used to suture a wound and at the same time is capable of severing the thread.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other objects and advantages of this invention will hereinafter appear and for purposes of illustration, but not of limitation, an embodiment of the invention is shown in the accompanying drawings in which:

FIG. 1 is a plan view of an applicator tool embodying the invention;

FIG. 2 is an end view of the tool shown in FIG. 1;

FIG. 3 is a view along the line 3—3 of FIG. 2;

FIG. 4 is a plan view of a cartridge holding a supply of clips in accordance with the invention;

FIG. 5 is an end view of the cartridge of FIG. 4;

FIG. 6a is a plan view of a clip in accordance with the invention shown prior to its assembly on a thread;

FIG. 6b is a view of a clip in accordance with the invention showing the position assumed upon its assembly on a thread;

FIG. 7a is a diagrammatic illustration showing the use of a thread on which a clip has been secured in suturing a wound;

FIG. 7b is a diagrammatic figure similar to FIG. 7a in which several sutures have been completed using the method and apparatus of the invention;

FIG. 8 is an illustration of a tool suitable for removing clips from a thread in accordance with the invention;

FIG. 9 is a side view, partially in section, of an alternative embodiment of an applicator tool in accordance with the invention; and

FIG. 10 is a front view along the line 10—10 of the embodiment of FIG. 9.

DETAILED DESCRIPTION

The method in this application is practiced by applying a flat clip to the end of a thread and passing the

thread through the skin, using a surgical needle, until the clip lies flat against the surface of the skin at one edge of the wound. This is illustrated in FIG. 7a where a clip 2 has been clamped to a thread 4 and the thread, in turn, threaded through a suitable surgical needle 6. The thread 4 has been drawn through the surface of the skin at one edge 8 of a wound and the clip 2 lies flat against that surface of the skin. The needle 6 is then used to penetrate the surface of the other edge 10 of the wound from the underside and emerge from the upper side of that edge. At that point another clip 2 is applied to the thread 4 and the thread is then severed. In order to facilitate the suturing an applicator tool in accordance with the invention is constructed to apply two clips simultaneously to the thread and to sever the thread between the two clips. In this manner, the emerging end of the thread is clipped and the suture secured, and at the same time the thread is provided with a clip at its free end to commence the next suturing operation. This sequence of operations is repeated to the extent necessary to close the wound, as may be seen in FIG. 7b wherein several sutures of the interrupted variety have been applied, each suture consisting of a pair of clips 2 and a thread 4. During each suturing operation the thread is pulled sufficiently tight to bring the edges of the wound together and to evert them slightly. If desired, a continuous suture could be applied with a clip at each end.

It has been found that in addition to fixing the thread in place the clips spread the pull exerted at the skin edge by the thread over the entire surface of the clip and thus spread the pressure at the point of engagement of the clip with the skin over the entire clip, thus relieving the pressure from a restricted area. It has also been found that the clips tend to assume a position parallel to each other, thus contributing to the eversion of the skin edge. By resisting the natural tendency of the skin edge to turn inward, even healing is promoted and scarring is minimized. Another advantage of this method results from the tendency of the clips to immobilize the skin beneath them, that is, they, in effect, splint the skin edge and prevent its movement. This "splinting effect" also helps to minimize scarring of the wound by allowing healing to proceed with the wound immobilized.

Since the practice of this method eliminates threads overlying the wound, there is no cross-hatched scar as is seen in wounds sutured by the prior art methods. In addition, the absence of a circular suture relieves the wound of any circumferential compression.

In accordance with the invention, there is provided a clip applicator tool illustrated in FIGS. 1 through 3. As seen in FIG. 1, the clip applicator comprises a body portion 14 on which the remaining elements of the applicator are mounted for use. These elements comprise a pair of handle portions 16 and 18 pivoted at points 20 and 22, respectively, on the forward end of the body portion. Passing through the body portion is a channel guide 24 which is provided at its rearward end with a spring clip 26 which is normally urged upward from the bottom of the channel guide 24 to hold a cartridge 28 in the channel guide. The cartridge 28 extends through the body portion and has a front end 30 which terminates in a pair of V-shaped openings 32 adjacent the confronting ends 34 and 36 of a pair of jaws 38 and 40, respectively, which are pivoted on the body portion at the points 42 and 44, respectively. A pair of outwardly

bowed leaf springs 43 and 45 urge the jaws 38 and 40 outwardly from the body portion 14. The handle 16 has secured to its undersurface a leaf spring 46 which slides at its inner end on the surface of the channel guide 24 to normally urge the handle 16 in an outward direction. A similar leaf spring 48 is secured to the handle 18 for the same purpose. The handles 16 and 18 are provided with enlarged portions 47 and 49, respectively, which bear on the jaws 38 and 40 and function as camming surfaces to cause inward movement of the jaws when the handles are forced inwardly. A pair of stops 50 and 52 may be provided on the body portion, engaging with the handles 16 and 18, respectively, to limit their outward movement.

The cartridge 28 is illustrated in greater detail in FIGS. 4 and 5. As illustrated, it takes the form of an elongated rectangular member provided with a pair of slots 54 and 56 extending along its length into which clips to be applied to a thread may be stored and from which they may be fed for compression by the jaws 38 and 40 as required. A means to force the clips forward in the slots 54 and 56 is constituted by a slide 58 having a handle portion 60 extending through an elongated opening 62 extending over a major portion of the length of the cartridge 28. A notch 64 is formed in the end of the cartridge 28 to permit passage of a thread-severing means in a manner to be described in greater detail hereinafter. Instead of using a handle to urge the slide forward, a spring feed could be provided.

The thread-severing means is constituted by an arm 66 pivoted coaxially with the jaw 40 at 44 but capable of independent movement and carrying at its free end a cutting edge 67 and a projection 68 which acts to maintain a thread in position to be cut. Extending from the arm 66 through an opening in the jaw 40 is a projection 70 engageable with the pivoted handle 16.

The operation of the applicator tool 14 in conjunction with the cartridge 28 is as follows. After the cartridge 28 is caused to be filled with an appropriate number of clips in the slots 56 and 54, the cartridge is inserted into the channel guide 24 until its forward motion is stopped by virtue of its contact with the confronting surfaces 34 and 36 of the jaws 38 and 40. It is retained in this position by the engagement of the spring clip 26 with its rear end. In order to feed clips to a position to be applied to a thread, the slide 58 is moved forward by applying pressure to the handle 60 so as to feed clips forward to a position between the jaws. As may be seen in FIG. 1, the forward movement of the slide 58 is permitted by the provision of a slotted opening 67 in the body portion 14. The forward motion of the clips is limited by their engagement in cut-out portions 69 formed in the confronting surfaces 34 and 36 of the jaws 38 and 40.

Referring to FIGS. 6a and 6b, it may be seen that each clip 2 is formed as a thin, flat member having notch 72 formed at its lower end and a pair of spread-apart legs 74 and 76 forming a wider notch 78 at its upper end. When inserted into the slots 54 and 56, the clips nestle within each other, i.e., the narrow part of a clip with the notch 72 rests within the wider notch 78 of each adjacent clip. Thus, when the clips are moved forward in the cartridge 28 by the action of the slide 58, they are positioned in the cut-out portions 69 with the notch 78 exposed between the confronting portions 34 and 36 of the jaws 38 and 40. With the clips so positioned, a thread is laid between the confronting por-

tions in the notches 78 of the clips. The handles 16 and 18 are then squeezed together about their pivots 20 and 22. By virtue of their engagement with the forward ends of the jaws 38 and 40 these jaws are caused to rotate inwardly about their pivots 42 and 44 moving the confronting ends 34 and 36 together.

The pressure caused by the inward motion of the confronting ends 34 and 36 causes the legs 74 and 76 of the clips to be moved toward each other securing or clamping the clip about the thread in what was the notch 78. The dimensions are such that the legs 74 and 76 move into substantial contact with each other and are securely fastened to the thread leaving a small notch 80 in the upper end of the clip, as may be seen in FIG. 6b. Further compression of the handles 16 and 18 causes the inner side of the handle 16 to bear against the projection 70 on the arm 66 so that it continues to move inwardly, whereby the severing edge 68 on the end of that arm cuts the thread in between the two clips. When the thread has been severed there results an arrangement where two clips have been applied, one to each end of the severed thread. In practice, it has been found desirable to dimension the clips and the applicator tool 14 so as to apply them to the thread approximately one centimeter apart.

The clipped ends of the thread are now ready for use in the practice of the method described above. The clipped thread which has been severed from a longer piece may be discarded and the first suturing operation begun using the clipped thread remaining. In the execution of the suturing operation after the thread has been drawn through both edges of the wound and the wound drawn together, the applicator tool may again be used by first feeding forward another pair of clips to a position between the confronting ends 34 and 36, then using the applicator tool in the manner described above. This results in a clip being applied to the emerging end of the thread, such a clip being designated by reference numeral 12 in FIG. 7b, and a clip has been secured to the free end of the thread so that another suturing operation may be commenced.

After the wound has healed and it is desired to remove the sutures, the invention provides a removing tool or opener illustrated in FIG. 8. This is constituted by a pair of pivoted handles 82 and 84 which are provided at their free ends with a pair of pointed projections 86 and 88, respectively. These projections may be engaged in the notches 72 and 80 of a clip and the handles brought together to force the projections into those notches and spread apart or open the clip to remove it from the thread. When the clips on each side of the wound are removed, the suturing thread may be withdrawn in the usual manner.

FIGS. 9 and 10 illustrate an alternative embodiment in which the cutting of the surgical thread extending between the clips is accomplished by the provision of a scissors action. In these figures those elements which correspond to the embodiment of FIGS. 1 through 3 have been given the same reference numerals.

In this embodiment the applicator tool has a pair of arms 66 and 66' pivoted coaxially with the jaws 40 and 38, respectively. The arms are identical and each is provided at its forward end with sharpened confronting scissor edges 90 and 92. Each arm 66 and 66' is provided with projections 70 and 70' which extend through openings in their associated jaws for engagement with the handles 16 and 18, respectively.

As may be seen in FIG. 10, a thread 4 has been placed between a pair of clips 2 positioned between the cut-out portions 69 of the jaws 38 and 40. As the jaws are moved toward each other when the handles 16 and 18 are pressed together, the clips are clamped to the thread 4. Continued compression of the handles causes them to lean on the projections 70 and 70' moving the arms 66 and 66' inwardly about their pivots until the scissor edges 90 and 92 cut the thread between the two clips. As with the previously described embodiment, the two clips have now been applied to the thread between them severed.

The novel apparatus of this invention, thus provides a simple method of suturing skin wounds with the advantages of promoting even healing and minimizing scarring.

It is to be understood that changes may be made in the details of construction, arrangement, and operation without departing from the spirit of the invention, especially as defined in the following claims.

What we claim and desire to secure by Letters patent of the United States is:

1. A device for applying clips to thread comprising: a body portion; means mounted in said body portion for storing clips to be applied to thread; a pair of normally spaced-apart jaws mounted on said body portion for relative movement toward each other to engage portions of a clip and move them to locking engagement around a thread; means for moving clips stored in said first-mentioned means to the space between said jaws and cutting means on said body portion for severing a thread after a clip has been locked thereon.

2. A device for applying clips to thread comprising: a body portion; a pair of normally spaced-apart jaws pivotally mounted on opposite sides of said body portion extending forwardly thereof and provided with confronting portions extending toward each other for engaging portions of a clip to be applied to a thread; an elongated cartridge having a pair of longitudinal slots formed therein in which clips may be stored mounted in said body portion and extending to a point adjacent

said confronting portions of said jaws; a slide movable in said slots to force clips inbetween said confronting portions of said jaws; cutting means pivoted coaxially on said body portion with one of said jaws and extending to said confronting portions of said jaws and disposed between said slots in said cartridge; and a pair of handles pivoted on opposite sides of said body portion, each handle having a connection to said jaws to close said jaws in response to movement of the handles, and a projection on said cutting means engaging one of said handles so that continued movement of said handles after said jaws are closed causes said cutting means to sever the thread between the clips which have been secured thereto.

3. The device of claim 1 including cutting means on said body portion for severing a thread after a clip has been locked thereon.

4. The device of claim 1 wherein said first-mentioned means comprises an elongated cartridge having a slot extending along its length in which clips may be stored.

5. The device of claim 4 wherein said second-mentioned means comprises a slide movable in said slot to force clips toward the end thereof.

6. The device of claim 1 wherein said first-mentioned means comprises an elongated cartridge having a pair of parallel slots extending along its length in each of which slots clips may be stored.

7. The device of claim 6 wherein said second-mentioned means comprises a slide movable in said slots to force clips toward the end thereof.

8. The device of claim 1 wherein said first-mentioned means extends from the body portion to a point adjacent said jaws and is provided with an opening at one end from which clips may be moved by said second-mentioned means and means on said jaws to limit the movement of the clips.

9. The device of claim 8 including cutting means carried by said jaws for severing a thread after a clip has been locked thereon.

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