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Wood et al.

[11] **3,753,438**

[45] **Aug. 21, 1973**

[54] **SUTURE CLIP**

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[22] Filed: **Apr. 25, 1972**

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Related U.S. Application Data

[63] Continuation of Ser. No. 817,496, April 18, 1969, abandoned.

[52] **U.S. Cl.** **128/335**, 128/346

[51] **Int. Cl.** **A61b 17/04**

[58] **Field of Search** ..... 128/334 R, 335, 337, 128/326, 346

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[57] **ABSTRACT**

In order to promote even healing and minimize scarring, this application discloses a flat clip to be applied to each end of a thread drawn by a needle through the edges of the wound until the clip lies flat against the surface of the skin. The application also discloses a tool carrying a cartridge holding a supply of clips for securing the clips on the thread and severing it. In addition, there is shown a tool for removing the clips from the thread so that the sutures may be removed when the wound has healed.

2 Claims, 8 Drawing Figures

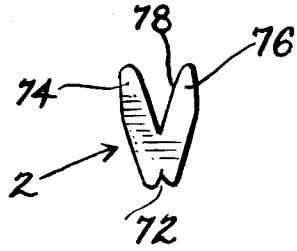


FIG. 1

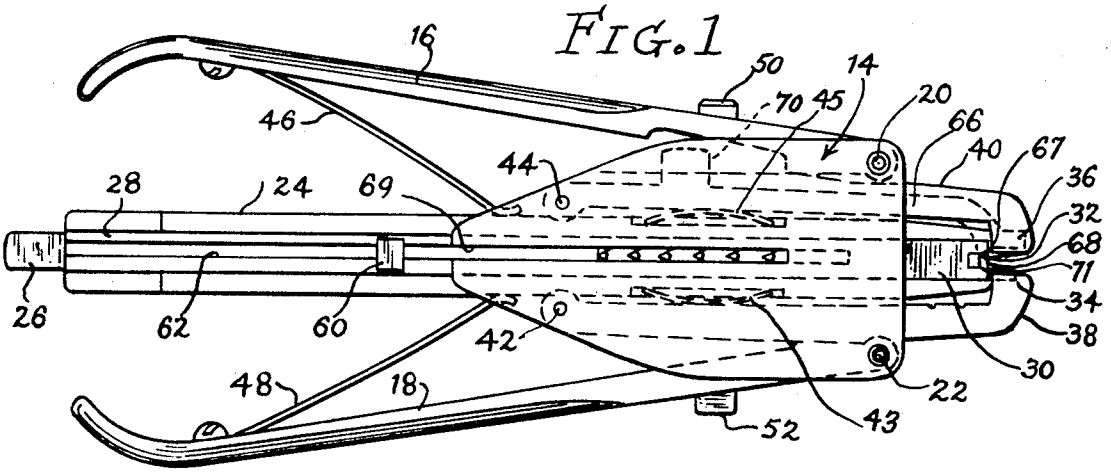


FIG. 2

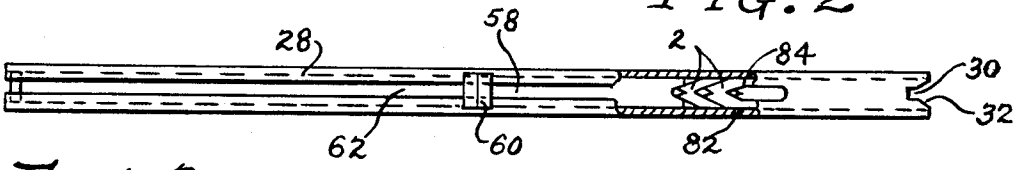


FIG. 3

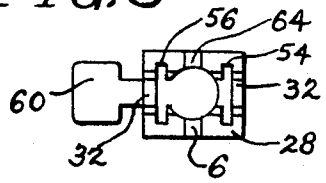


FIG. 4a

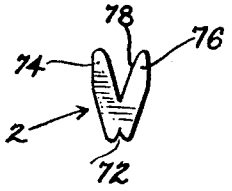


FIG. 4b

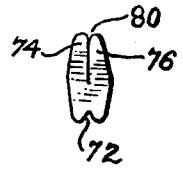


FIG. 6

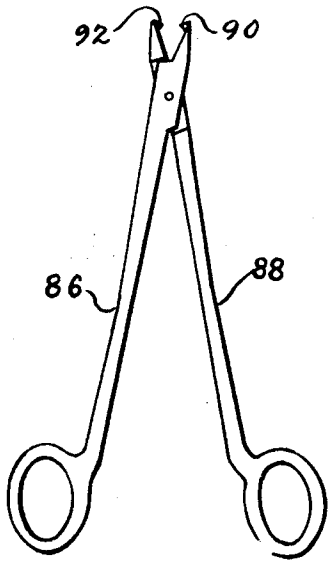


FIG. 5a

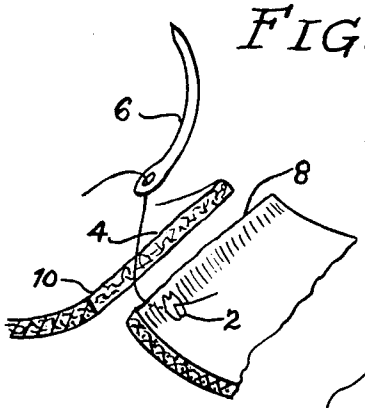
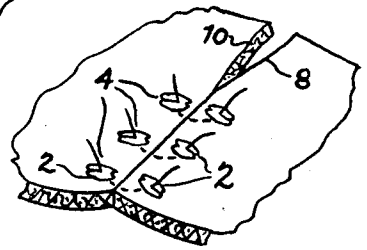


FIG. 5b



SUTURE CLIP

This application is a continuation of our co-pending application, Ser. No. 817,496 filed Apr. 18, 1969, now abandoned.

This invention relates to surgical devices. More specifically, it relates to devices useful 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." Alternatively, 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.

It is an 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 novel clips secured to the free end of a thread which is then drawn through the edges of the wound until the clip contacts the surface of the skin at one edge, permitting the edges of the wound to be drawn together, at which time another clip may be applied to the thread to secure the thread in the wound.

In an important aspect of the invention there is provided a novel clip formed as a flat member out of a material with sufficient resiliency and strength so that it can be clamped about a suturing 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 and suitable for carrying out the inventive method;

FIG. **2** is a plan view of a cartridge holding a supply of clips in accordance with the invention;

FIG. **3** is an end view of the cartridge of FIG. **2**;

FIG. **4***a* is a plan view of a clip in accordance with the invention shown prior to its assembly on a thread;

FIG. **4***b* is a view of a clip in accordance with the invention showing the position assumed upon its assembly on a thread;

FIG. **5***a* is a diagrammatic illustration showing the use of a thread on which a clip has been secured in suturing a wound;

FIG. **5***b* is a diagrammatic figure similar to FIG. **5***a* in which several sutures have been completed using the method and apparatus of the invention;

FIG. **6** is an illustration of a tool suitable for removing clips from a thread in accordance with the invention.

DETAILED DESCRIPTION

This invention 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. **5a** 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 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. **5b** 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 order to practice the invention, the clip applicator tool illustrated in FIGS. **1** through **3** may be used. 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. 2 and 3. 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 66 in the body portion 14. The forward motion of the clips is limited by their engagement in cut-out portions 71 formed in the confronting surfaces 34 and 36 of the jaws 38 and 40.

Referring to FIGS. 3*a* and 3*b*, 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 nest 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. As may best be seen in FIGS. 2 and 4*a*, the outer surfaces 82 and 84 extending from the end of the wide notch are substantially parallel to each other to engage and be aligned by the straight sides of the slots 54 and 56 when the clips are placed in the cartridge 28. 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 71 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 portions 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. 4*b*. 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. 5*b*, 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. 6. This is constituted by a pair of pivoted handles 86 and 88 which are provided at their free ends with a pair of pointed projections 90 and 92, 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.

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 clip for holding thread in position on sutured wounds comprising: a thin flat member having a first end; a second end constituted by a pair of spaced apart

legs forming a relatively wide notch; the outer sides of each of said spaced apart legs having a first surface extending from the outer ends of said legs spaced from said first end to a point intermediate the length of said legs, said first surfaces of each leg being substantially parallel to each other whereby said clips may be aligned in an elongated clip holder having straight parallel sides and having a second surface continuing from the termination of said first surface, said second surfaces converging toward each other to form said first end, whereby said first end is relatively narrow with respect to said second end so that the first end of one clip can be positioned within a clip holder, the relatively wide notch of a second clip for storage purposes; and a relatively narrow notch formed in said first end to facilitate the bending toward each other of said spaced apart legs.

2. A clip as set forth in claim **1** in which said spaced apart legs are shaped at their outer ends to form a relatively narrow notch when they are bent toward each other to provide a narrow notch at each end of the clip for engagement by elements of a clip removing tool.

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