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3,068,870

WOUND CLIP

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Fig. 1

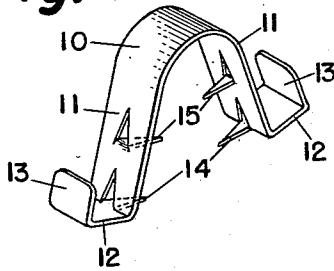


Fig. 2

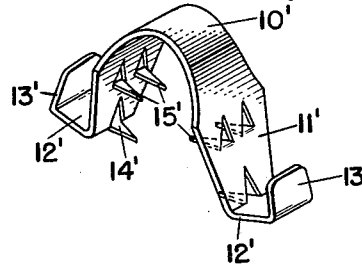


Fig. 3

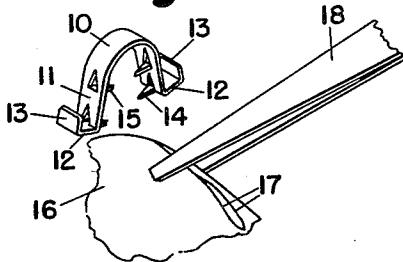


Fig. 6

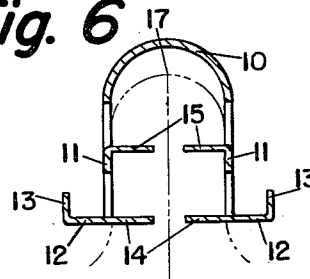


Fig. 4

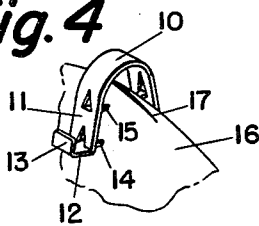


Fig. 7

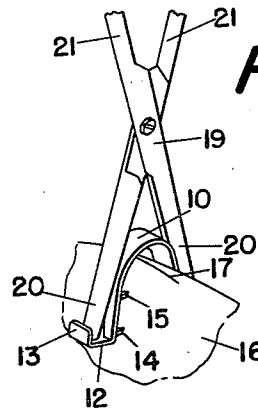
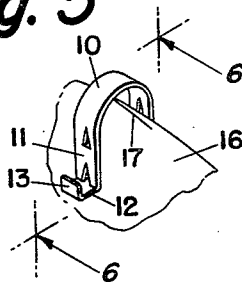


Fig. 5



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WOUND CLIP

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12 Claims. (Cl. 128—337)

This invention relates generally to wound clips for closing the edges of wounds or incisions in the flesh. More particularly, this invention relates to a wound clip which accurately approximates the cut skin edges of a wound or incision by applying a force directly to the juxtaposed skin edges to hold them in extremely close approximation. In general, the fundamental concept of the invention contemplates the provision of a wound clip having two pairs of apposed prongs spaced apart along the clip so that one pair of prongs engages the tissue very close to the wound edges on opposite sides to provide very accurate approximation thereof, while the other pair of prongs engages the tissue at points more remote from the wound edges to provide a non-tissue-tearing clip anchor function.

The fundamental difference between the wound clip according to the present invention and wound clips known in the past, is that the use of the latter, without exception, result in what is known as healing by first intention or healing by second intention, whereas use of the novel wound clip to be described hereinafter results in what is known as healing by immediate union. The pathological aspects of the differences between healing by immediate union and healing by first intention may be found in medical texts, as for example "A Text-book of Pathology" by Dr. Alfred Stengle and Herbert Fox, which describes the differences in the following manner,

"If the lips of a clean, incised wound are drawn together at once and kept closely apposed, rapid healing occurs, which is called healing by immediate union. In these cases a microscopical examination shows slight fluid and cellular exudation from the surfaces of the wound, an increase of endothelial cells busy in the re-establishment of capillaries across the defect, and proliferated connective tissue cells. The epithelial continuity is restored by proliferation of the old epithelial cells. If the various cells are uninterrupted in their work, no vestige of the wound may remain after healing. Should apposition be less immediate or less accurate, the amount of exudation is greater. If the wounded surfaces are examined twenty-four hours after the injury, they are found red and swollen and soon they become glazed in appearance. The microscopical features here are the same as in the case of healing by immediate union, excepting the amount of exudation is greater. Healing proceeds in the same way, but more slowly, and is called healing by first intention."

Thus, it will be appreciated that healing by immediate union is most desirable from several standpoints. Firstly, the much more rapid and more secure healing produced by immediate union permits ambulating of a patient at a much earlier time than has heretofore been possible, the rapidity of healing being forty to fifty percent faster than has been known in the past.

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Secondly, healing by immediate union results in an extremely fine scar line vastly superior in a visual sense to scars resulting from healing by first intention, so that a marked cosmetic advantage is realized. By way of illustration, it has been found that in thyroidectomy surgery, or in fact in any surgery where the skin is incised in the loose area of the neck, the clips according to the invention can be removed the day immediately after application. After infant or child surgery, the clips according to the invention can be loosened the next day and be left in place for five additional days without fear of the occurrence of skin necrosis. Similarly, in older persons where a malignancy or other debilitating condition exists which retards the healing process, the clips may be left in position for ten days following a loosening procedure if deemed necessary by the surgeon.

In addition to the positive benefits of healing by immediate union realized by the use of the novel wound clip according to the invention, the avoidance of skin necrosis is obtained because the closing pressure applied by the clip in an attempt to approximate the edges of the wound may be materially less than when a conventional type of wound clip is used. Accordingly, it is a primary object of this invention to provide a novel wound clip which when utilized promotes healing by immediate union as differentiated from healing by first intention.

Another object of this invention is to provide a novel wound clip which produces more rapid and secure healing than has been heretofore realizable when wound clips of known types are employed.

Still another object of this invention is to provide a novel wound clip the use of which results in the healing of a wound so that at most only an extremely fine line scar remains, the scar being frequently all but invisible.

Still another object of this invention is to provide a novel wound clip which achieves extremely close approximation of the edges of the wound by providing novel wound edge positioning elements engageable with the flesh at points very close to the wound edge.

The foregoing and other objects of the invention will become apparent from a reading of the following specification in conjunction with an examination of the appended drawings, wherein:

FIGURE 1 is a perspective view of one form of the novel wound clip according to the invention;

FIGURE 2 is a perspective view of a modified form of the novel wound clip according to the invention;

FIGURES 3, 4 and 5 are a series of perspective views which illustrate the application of the novel wound clip to an incision to bring the edges thereof into close approximation;

FIGURE 6 is a cross-sectional view through the wound clip applied to a wound as would be seen when viewed along the lines 6—6 of FIGURE 5;

FIGURE 7 illustrates in perspective view the method of removing the wound clip from an incision after the latter has healed sufficiently to hold the wound together without the aid of the clip.

In the several figures like elements are denoted by like reference characters.

Turning now to an examination of FIGURE 1 which illustrates one form of the novel wound clip according to the invention, it is observed that the wound clip is

of generally inverted U-configuration and is formed from an originally elongated rectangular strip of metal which has been shaped to provide a centrally arched main body portion 10 which extends downward at opposite sides and merges into a pair of facing legs or side wall portions 11, which side walls 11 each turn laterally outward at the bottom end thereof to form a base wall 12. Each base wall 12 is in turn provided at its outer edge with an upturned portion 13 disposed in facing relationship to the outer surface of the proximate side wall 11 so as to form with that side wall and the bridging base wall 12 a channel shaped lower end structure. Punched and turned inward from each of the legs or side walls 11 is a lower triangular anchor prong 14 and an elevated triangular edge approximating prong 15, the prongs 14 and 15 of each side wall 11 being oriented in apposition to the corresponding prongs 14 and 15 turned in from the opposite wall.

The embodiment of the wound clip illustrated in FIGURE 2 is generally similar to that just described in connection with the showing of FIGURE 1. As will be observed, the wound clip illustrated in FIGURE 2 includes an arched main body portion 10', a pair of facing straight side wall portions 11', out-turned base walls 12', upturned ends 13', and prongs 14' and 15', all of which corresponds to their unprimed counterparts designated by the same numbers in the showing of FIGURE 1. The difference between the wound clips of FIGURES 1 and 2 resides in the fact that the clip illustrated in FIGURE 2 includes a pair of edge approximating triangular prongs 15' turned inwardly from each of the straight side wall portions 11', and that the side wall portions 11' are somewhat broadened in the region of the prongs 15' in order to provide proper physical support for these latter prongs. The arch 10' is retained at the same width as the arch 10 in the showing of FIGURE 1 because bending takes place through the arch and it is desired that the amount of force required to produce inward motion of the side wall portions 11' toward one another by bending the arch 10' shall not be increased. Functionwise, the two clips are identical element for element and the reason for the provision of the double approximating prongs 15' in the structure illustrated in FIGURE 2 will become apparent hereinafter.

Typically, the prongs 14, 15, 14' and 15' may each be approximately three millimeters in length; the vertical spacing between the prongs 14 and 15 or the prongs 14' and 15' may be approximately four millimeters; the point to point apposed spacing between the prongs 14 or the prongs 14' may be approximately five millimeters when the clip is opened as illustrated prior to use; the length of the body of the wound clip as measured between opposite base walls 12 and including the lengths of both side wall portions 11 and the intermediate arch 10 may be approximately sixteen to twenty millimeters; the width of the rectangular metal strip from which the clip is formed may be approximately two millimeters in the case of the clip illustrated in FIGURE 1, whereas this same width may be three millimeters through the broadest portion of the side wall portions 11' of the clip illustrated in the showing of FIGURE 2; and the clips may be made of twenty-five gauge stainless steel or german nickel.

The fundamental distinction between the wound clips according to the present invention and those formerly known in the art which brings about the advantages previously described resides in the provision of the edge approximating prongs 15 or 15'. Wound clips known and used by the medical profession in the past and at the present time all include a pair of prongs which would correspond to the prongs 14 or 14' illustrated in the figures, and, as in the case of the present invention perform an anchoring function which hold the wound clip in place over the wound. In using the known types of wound clips the prongs are forced into the skin at a distance of at least one-quarter of an inch below the

incised wound edges, and generally at a distance of approximately three-eighths of an inch below the cut edges. This is necessary because the insertion of such prongs at a lesser distance from the wound edge would cause the prongs to tear through the flesh, pull out of the wound and allow the wound to open. Tearing, of course, occurs because at distances closer than one-quarter of an inch from the edge of the wound there is insufficient prong-surrounding tissue to physically withstand the pressure exerted by the applied clip, and the prongs tear through the flesh. For this reason, the clip prong must be located as aforesaid, namely, between one-quarter inch and three-eighths of an inch from the edges of a wound. The prongs thus provide a flesh anchor for the clips, and the clip side walls are forced inward toward one another to provide the actual force which holds the wound together. The relatively large amount of clamping pressure exerted by the clip side walls can readily cause necrosis if care is not taken to loosen the clips within a proper time after application. Additionally, the application of pressure by the clip side walls cannot be controlled to provide that degree of approximation of the wound edges which is required to provide healing by immediate union, so that the type of healing which is realizable at best is healing by first intention.

This invention, by providing the approximating prongs 15 or 15', makes it unnecessary to attempt to reapproximate the wound edges by blunt pressure applied through the medium of the side walls of the clip. In use, the clips according to the invention are applied so that the wound edge approximating prongs 15 or 15' enter the skin about one-eighth of an inch from the incised edges, the anchor prongs 14 or 14', of course, entering the skin at points more remote from the wound edges where there is sufficient surrounding tissue to provide a secure and non-tearing anchor. Thus, the lower prongs 14 or 14' provide the anchoring function while the upper prongs 15 or 15' provide a wound edge approximating function and allow the edges of the wound to be very closely approximated to one another, thereby eliminating the need for the former practice of attempting to obtain edge approximation by the application of blunt pressure through the medium of the clip side walls. The elimination of this side wall pressure, of course, permits better blood circulation in the injured region and avoids the possibility of skin necrosis, while at the same time, the far superior wound edge approximation achieved provides the ability for healing to take place by immediate union.

Understanding now the basic concept of the invention and the incorporation of such concept into the wound clip structures illustrated in the showings of FIGURES 1 and 2, attention should be now directed toward the showings of FIGURES 3, 4 and 5 which illustrate the application of the wound clip according to the invention to an incision. It is, of course, to be understood that the drawings are directed primarily toward clarity of showing and are not necessarily to be considered as scale representations of an actual clip application.

To apply the skin clip to a wound, the skin clip is placed in the lower end of a plier or pincer-like instrument, such as a Kocher clamp, and held firmly but gently so that the apposing teeth face the area of the skin that is to be approximated. When the clip is in a hovering position above the wound, an assistant pulls the cut skin edges up away from the rest of the skin with a pair of rat-tailed forceps so that a small mound of tissue is then available for skin clip application. While the skin edges are raised and held in proper approximation by the forceps, the clip is lowered under direct visualization and the eye is focused on the wound edge approximating prongs 15 or 15' as the clip is gently lowered over the skin until the approximating prongs are one-eighth of an inch below the wound edges. Closing pressure is then applied to the anchor prongs 14 or 14' by means of the

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clip holding clamp which forces the entire clip into position at the same time, bringing the wound edges and subcutaneous tissue into approximation simultaneously. The pressure being applied by the surgeon can be stopped at any time at his discretion as he observes the skin edges being approximated. Thus, the edge approximating prongs 15 or 15' may be very accurately inserted into the skin accompanied by only very slight trauma.

FIGURE 3 shows the ends of one pair of rat-tailed forceps 18 drawing the wound edges 17 together into close approximation and mounding up the tissue just prior to application of the wound clip. FIGURE 4 shows the wound clip in position with the prongs 14 and 15 about to enter the tissue, and FIGURE 5 illustrates the clip fully applied. The cross-sectional view of FIGURE 6 representationally shows the wound edges 17 brought perfectly together and the mounded tissue being held in place by the fully applied wound clip.

To loosen or remove the skin clip, a hemostat 19, such as is illustrated in the showing of FIGURE 7, or a similar action type thin blunt-bladed instrument may be opened and applied in arm open position so that the lower ends 20 of the hemostat 19 are disposed within the wound clip channels formed by the side wall portions 11, base walls 12 and up-turned ends 13 as previously described. Opening pressure exerted upon the hemostat upper arms 21 causes the side walls of the clip to be spread apart to thus withdraw the prongs from the tissue, the spreading action being stopped at any desired point to achieve mere loosening of the clip or continued to completely remove the clip from the tissue. The opening action provided by the hemostat in no way destroys or mutilates the skin clips so that if desired they may be reused repeatedly after sterilization.

The embodiments of the invention illustrated in FIGURES 1 and 2 are intended merely as being illustrative. Thus, while the illustrated clips show only one pair of anchor prongs 14 or 14' the invention is not intended to be so limited, so that it may well occur that particular applications will dictate the use of a clip having additional anchor prongs. Similarly, whereas the embodiments of FIGURES 1 and 2 illustrate the provision of a single pair of wound edge approximating prongs 15 or a double pair 15', it is not intended that the invention be restricted to such. Neither is it intended that the typical dimensions set forth hereinbefore shall be construed as mandatory. In general, the fundamental concept of the invention resides in the provision of a wound clip having two pairs of apposed prongs spaced apart so that one pair of prongs provides a non-tissue-tearing anchor function while the other provides an accurate non-traumatic wound edge approximating function for the purpose of promoting healing by immediate union.

Having now described my invention in conjunction with particularly illustrated embodiments thereof, it will be appreciated that various modifications may occur from time to time to those persons normally skilled in the art without departing from the essential spirit or scope of the invention, and accordingly, it is desired to claim the same broadly as well as specifically as indicated by the appended claims.

What is claimed as new and useful is:

1. A wound clip for holding the edges of a wound in accurate approximation to one another comprising, an elongated strip of metal formed to the general shape of an inverted U, said inverted U-shaped strip having an arched central body portion and a pair of generally straight facing side walls, one end of each side wall merging into and depending from one end of the arch, and at least two prongs projecting inward from spaced points along the length of each side wall so that one of said prongs projecting from each side wall lies closer to said arched portion than another of said prongs projecting from the same side wall, the facing sidewalls being of such length that the prongs projecting therefrom which

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lie closest to said arched portion are insertable into the flesh on opposite sides of a wound at points close to the wound edge to provide accurate wound edge approximation, while the prongs projecting from the sidewalls and which are remote from the said arched portion are insertable into the flesh on opposite sides of the wound at points sufficiently remote from the wound edge to provide non-flesh-tearing anchors for the wound clip and thereby prevent the wound edge approximating prongs from tearing through the edges of the wound.

2. The wound clip according to claim 1 wherein the prongs projecting inward from opposite side walls and lying closest to said arched portion are disposed in spaced point to point apposed relation to one another.

3. The wound clip according to claim 1 wherein the prongs projecting inward from opposite side walls and lying most remote from said arched portion are disposed in spaced point to point apposed relation to one another.

4. The wound clip according to claim 1 wherein the prongs projecting inward from opposite side walls and lying closest to said arched portion are disposed in spaced point to point apposed relation to one another and are of equal length.

5. The wound clip according to claim 1 wherein the prongs projecting inward from opposite side walls and lying most remote from said arched portion are disposed in spaced point to point apposed relation to one another and are of equal length.

6. The wound clip according to claim 1 wherein the prongs projecting inward from one side wall are disposed in spaced point to point apposed relation to the prongs projecting inward from the opposite facing side wall so as to provide two apposed pairs of prongs, one pair of said prongs lying closer to said arched portion than the other pair.

7. The wound clip according to claim 1 wherein the prongs projecting inward from one side wall are disposed in spaced point to point apposed relation to the prongs projecting inward from the opposite facing side wall so as to provide two apposed pairs of prongs, one pair of said prongs lying closer to said arched portion than the other pair, and both prongs of each apposed pair are of equal length.

8. The wound clip according to claim 1 wherein said inwardly projecting prongs are punched from the body of the side walls and bent inwardly out of the side walls plane.

9. The wound clip according to claim 1 further including an additional prong projecting inward from each side wall lying at substantially the same distance from said arched portion as said one prong and being laterally disposed relatively to the latter, said additional prongs being disposed in spaced point to point apposed relation to one another.

10. The wound clip according to claim 1 further including a base wall turned outward from the lower end of each of said side walls, and an end wall upturned from the outer extent of each said base wall, whereby a pair of channel structures are formed at the lower ends of said clip.

11. A wound clip for holding the edges of a wound in accurate approximation to one another comprising in combination, a first pair of parallel-extending prongs and first means carrying said first pair of prongs in fixed spaced-apart relationship to one another, a second pair of parallel-extending prongs and second means carrying said second pair of prongs in fixed spaced-apart relationship to one another, said first pair of prongs being adapted for penetration of the flesh on one side of a wound at different distances from the wound edge and said second pair of prongs being adapted for penetration of the flesh on the opposite side of the wound also at different distances from the wound edge, the prongs of said first and second pairs located most remote from the wound edges providing a non-flesh-tearing anchoring function for the

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wound clip and the prongs of said first and second pairs located proximate the wound edges providing a close approximating function for the facing edges of the wound, and means bridging across the wound for securing together and holding said first and second prongs carrying means in a desired proximity to one another.

12. The wound clip according to claim 11 wherein said first pair of prongs are spaced apart the same distance as are said second pair of prongs, and wherein said first and second prong carrying means are so secured together relatively to one another by said bridging means that one prong of said first pair is disposed in spaced point to point apposition with one prong of the second pair.

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