

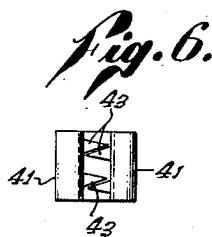
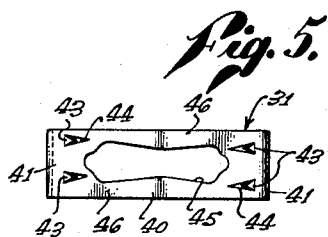
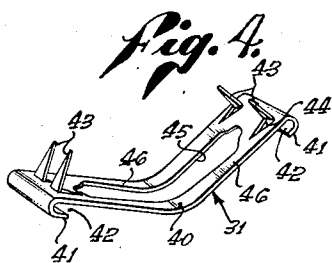
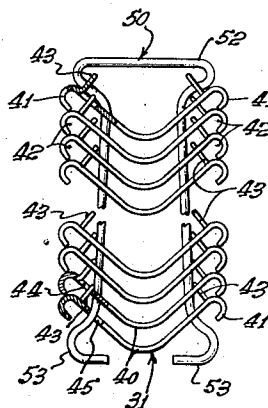
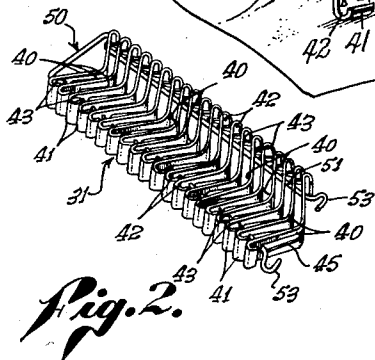
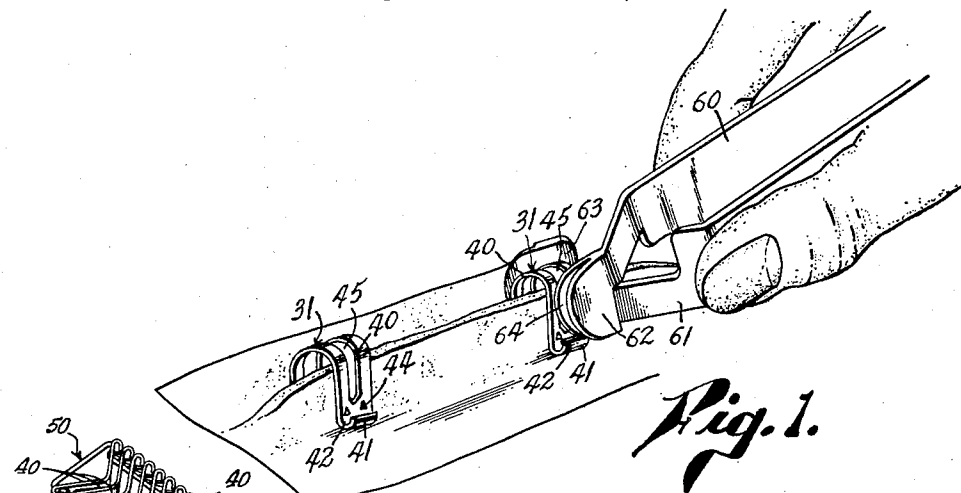
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2,910,067

WOUND CLIP AND EXTRACTOR THEREFOR

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2,910,067

WOUND CLIP AND EXTRACTOR THEREFOR

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Original application October 13, 1952, Serial No. 314,499,
now Patent No. 2,758,302, dated August 14, 1956.
Divided and this application August 9, 1954, Serial
No. 448,574

9 Claims. (Cl. 128—334)

My invention relates generally to wound clips for closing incisions or lacerations in the flesh, and to extraction means for removing the clips. This application is a division of my co-pending application, Serial No. 314,499, filed October 13, 1952, for Wound Clip and Extractor Therefor, now Patent Number 2,758,302. The clips herein disclosed are designed for use with the magazine-type applicator of my application Ser. No. 278,221, filed March 24, 1952 for Wound Clip and Applicator, now Patent Number 2,733,441, of which the first-mentioned applications is a continuation-in-part.

At the present time, wound clips are generally designed with a single tooth or prong on each end to engage the flesh aside the incision as the clip is collapsed inwardly. These clips are of uniform and relatively narrow width, and have an edge profile characterized by a substantially flat central portion. The accepted surgical tool for applying clips is a pair of tweezers or forceps in which the clips are grasped one at a time and applied. The procedure involved is at best slow, and because of the nature of the clips the resulting closure is imperfect.

On account of the uniform sectional width and flat edge profile of present clips, they do not offer uniform resistance to a collapsing force applied to the ends of the clip, but at first resist stubbornly and then buckle or yield suddenly. Controlling the collapse of the clips is therefore difficult, and it is practically impossible to stop a clip in a partially closed position. Furthermore, when positioned, the clip may rock from side to side because of the use of a single holding prong at each end, and the fact that the face of the clip is relatively narrow.

My improved wound clip is of approximately double width, and is provided with a double tooth or prong at each end. When collapsed into the flesh, the engagement of the double tooth and the larger bearing surface of the wider face prevents the clip from rocking or tearing the flesh or becoming loose. The shape of the clip has been changed in such a manner that the sectional area varies from the center to the ends of the clip, and the central portion is pre-formed into a shallow curve. By doing this, I have obtained a clip having a uniform yield rate so as to close under a constant pressure. Thus closing control is easily maintained, and the clip may be partially closed to any desired position.

I have also provided clips which may be stacked or nested together in front-to-back relationship with the prongs of one clip engaged in a complementary opening provided by the formation of the prongs on an adjacent clip. Thus, a stack of clips forms a relatively rigid unit of minimum size with the clips supporting each other to prevent premature collapse.

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Another problem connected with the use of prior types of wound clips arises from the nature of the clips, and the kind of tool or extraction means used for releasing the clips from the wound. In order to release the clip it is necessary to spread the ends apart and flatten the collapsed back section of the clip into its original shape. To accomplish this the extracting tool presently in use has a pair of cooperating jaws shaped to remove the curvature from the back of the clip by bending the clip in opposition to the direction of curvature or, in effect, break the back of the clip. One of these jaws overlies the back section of the clip while the other jaw is inserted longitudinally between the flesh and the under-surface of the clip back. Upon closing of the jaws the aforementioned result occurs.

Two major disadvantages result from the use of this type of extractor. The first is that the insertion of the tool jaw between the wound and the clip creates a serious danger of damaging the freshly healed wound because of the limited working space, and the fact that the flesh is pressured upwardly towards the back of the clip where it can be easily damaged. The second disadvantage is that there is very little or no control of the opening of the clip since the back of the clip flattens by yielding suddenly. Therefore, it is very difficult for the surgeon to partially loosen the wound clips as may be desirable while the wound is healing.

I have overcome these disadvantages by provision of a clip which is designed for specific cooperation with a novel extracting tool. Briefly, the end portions of the clip are shaped to provide rearwardly open notches or grooves which are adapted to be engaged by the jaws of the extracting tool. When the tool jaws are spread, the ends of the clip are spread, flattening the back of the clip, and releasing the prongs from the skin. The tool jaws are never positioned between the clip and the wound, and there is no possibility of re-opening the wound by the use of the extracting tool. Also, the nature of the extractor design permits the operator to have complete control over the opening of the clip so that the clip may be partially opened to the extent desired.

With the foregoing in mind, it is a major object of my invention to provide an improved wound clip having a uniform yield rate upon collapse and provided with a double holding prong at each end for achieving proper closing control and greater holding power.

It is an equally important object of my invention to provide a wound clip having rearwardly open jaw-engaging notches adapted to be engaged by an extracting tool for removing the clip.

An additional object of my invention is to provide clips adapted to nest or stack together in a minimum amount of space and in mutually supporting relationship.

These and other objects and advantages of my invention will become apparent from the following detailed description of preferred and modified forms thereof and from an inspection of the accompanying drawings in which:

Figure 1 is a perspective view of wound clips closed along a flesh wound, and the engagement of one form of extractor tool with a clip for removal thereof;

Figure 2 is a perspective view of a unit of wound clips shown stacked together and secured in place on a rack;

Figure 3 is an enlarged detail showing the nesting

relationship of the clips in the stack and the position of the clip rack;

Figure 4 is a perspective view of the preferred form of clip;

Figure 5 is an enlarged front elevation of the clip in open position;

Figure 6 is a front elevation of the clip in completely closed position showing the intermeshing of the holding prongs.

Referring now to the drawings, and particularly to Figures 2 to 6, clips 31 comprise essentially rectangular flat strips having a rearwardly bowed central portion 40. Preferably, clips 31 are stamped from a thin sheet of deformable and non-septic material such as nickel silver. The end portions of clips 31 are turned rearwardly to form jaw-engaging ends 41 which define with the body of the clip rearwardly open notches or grooves 42 that are used in releasing the clips from the closed position. The front portions of jaw-engaging ends 41 provide a smooth bearing surface for seating against the skin when the clip is engaged in the flesh, while the rear portions initially serve as stops or spacers to insure proper nesting of clips 31 when stacked together.

Clips 31 are made approximately twice as wide as the conventional clip of the same length in order to provide sufficient material for the formation of double prongs or teeth at each end. The use of a double prong combined with the greater bearing surface of the wider ends 41 makes a much firmer engagement in the flesh aside the wound than in the case with a conventional clip, and accordingly holds the clips against rocking from side to side and tearing the flesh. Also, the greater holding power of clips 31 makes feasible the use of fewer clips at greater spacing, and the time needed for application and removal of the clips is reduced as well as providing a cleaner healed wound.

For engagement in the flesh, both clip ends 41 are provided with upper and lower prongs 43 of sharp triangular shape outstruck from the clip body to project forwardly. Prongs 43 extend convergently forwardly and form opposed pairs with the corresponding prongs at the opposite end of the clip. By striking prongs 43 from the body of the clip, a small complementary triangular opening 44 is defined in the wall of the clip extending inwardly from the base of the prong, as is best seen in Figure 6. When clips 31 are stacked together, the prongs 43 of a succeeding rear clip nest in the complementary openings 44 of a forward clip and allow the respective clip ends 41 to rest firmly upon each other. The rearward length of ends 41 is selected so that prongs 43 project only a short distance through openings 44 and there is no danger of jamming the clips together. However, it can be appreciated that the engagement between prongs 43 and openings 44 holds the clips from sliding endwise or twisting laterally, and a plurality of clips stacked in the manner shown in Figures 3 and 4 is a relatively stable unit.

Preferably, I stagger prongs 43 as is best seen in Figure 6, so that the pairs of prongs at the opposite ends of the clip are laterally offset from each other. Thus, as clip 31 is bent into the fully closed position shown in Figure 6, the opposed prongs 43 may slide by each other without contact, and there is no danger of the prongs being bent out of shape.

As will be remembered, one of the important objects of my clip design is to provide a clip having a uniform yield rate so that the clip closes under a constant pressure. Closing control can therefore be maintained and the clips may be partially closed to any desired position. To this end, I first provide an elongated opening 45 which extends along the central clip portion 40 and divides the latter into upper and lower connecting webs 46 of reduced sectional area. As can be understood, the relative size of opening 45 determines the size and strength of webs 46, and accordingly, the pressure needed

to close the clip. As illustrated, clip 31 is designed to have a closing pressure approximately the same as that of a conventional narrow clip.

Since the closing pressure is exerted inwardly against jaw-engaging end 41 with substantially a straight thrust, the bending moment acting at any section of clip 31 increases towards the center of the clip and the greatest pressure is exerted at the center line of the clip. For this reason, conventional clips of uniform sectional area and flat center section at first stubbornly resist bending, and then yield or buckle suddenly in a sharp angular bend at the center, causing a loss of closing control. I have overcome this difficulty by providing a clip 31 having a sectional area which is the greatest at the center and decreases toward the end of the clip. Thus, the yield resistance of clip 31 varies in proportion to the bending moment exerted throughout the sections of the clip, and the clip closes under a uniform pressure which is easily controlled.

Preferably, I make the upper and lower edges of clip 31 parallel and change the sectional thickness of connecting webs 46 by cutting the inner edge walls of opening 45 in outwardly divergent directions from the center of the opening. Webs 46 thus have the greatest thickness at the center and taper outwardly toward the end in proportion to the distance from the bend axis. To overcome the initial resistance of the clip to any bending, I preform webs 46 into a rearwardly bowed curvature as shown in Figure 4 rather than with the conventional flat central portion. These changes in the sectional area of webs 46 and the edge profile thereof, are made by engineering calculations and tests so that the resultant structure has the desired uniform resistance to closing for any particular size and style of clips.

For the purpose of securing a group of clips 31 in a stack of convenient size, I have provided a holding or rack means 50 which extends through a number of clips and holds them against separation.

Rack means 50 is the subject matter of my aforementioned application Serial No. 314,499, and reference is made thereto for a complete description of its functions and purposes. Briefly, rack 50 is formed as a U-shaped member having side legs 51 connected by a flanged or outwardly projecting enlarged head 52. The free ends of legs 51 are bent arcuately to provide outwardly projecting flanges 53. The stack of clips 31 may be mounted on rack 50 between head 52 for insertion and removal from the applicator.

Having thus considered the specific nature of clips 31, the operation by which the clips are applied may be appreciated. Applicator housing 30 is held adjacent to the wound with head 35 extended across generally perpendicular to the length of the wound. As forceps 32 are pressed inwardly, jaws 33 engage the clip ends 41 and apply inward pressure tending to force the ends together. This inward movement of the clip ends 41 causes the central clip portion 40 to bend or buckle into a short radius turn so that the clip ends extend generally parallel to each other as is best seen in Figure 8. During the closing of the clip, the flesh aside the wound is engaged by prongs 43 and is drawn together closing the wound.

As should be noted in Figure 1, the closing of clip 31 tends to draw the flesh upwardly towards the back portion 40 of the clip. After the wound has been properly healed, it is, of course, necessary to remove clips 31, and it may also be desirable to loosen the clips somewhat during the healing process for diminishing the tension on the skin. The conventional type of extracting tool which has been previously described, is provided with a pair of complementary jaws which are pressed together under and over the back portion of the clip to re-bend or flatten this portion to its original shape. The insertion of a tool jaw between the central clip portion 40 and the flesh therebeneath creates a serious

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danger of opening or otherwise injuring the freshly healed wound. Furthermore, with an extracting tool of this kind it is very difficult to loosen the clip a slight amount as may be desired during the healing process.

While I have thus described in detail my improved wound clip, it can be understood that changes in design and construction may be made by those skilled in the art without departing from my invention. Therefore, I do not wish to be restricted to the foregoing description except as defined in the appended claims.

I claim:

1. A wound clip comprising a strip of thin deformable material having enlarged jaw-engaging ends, a rearwardly bowed central portion having an elongated central opening therein defining with the adjacent clip edges spaced connecting webs of non-uniform sectional width tapering from a maximum width at the center of said clip to a reduced width at the ends of said opening, whereby said clip closes under a uniform closing pressure applied inwardly to said ends, and flesh-engaging prongs projecting forwardly from said clip ends.

2. A wound clip comprising a strip of thin deformable material having enlarge jaw-engaging ends, a rearwardly bowed central portion having an elongated central opening therein defining with the adjacent clip edges spaced connecting webs of non-uniform sectional width tapering from a maximum width at the center of said clip to a reduced width at the ends of said opening, whereby said clip closes under a uniform closing pressure applied inwardly to said ends, and flesh-engaging prongs outstruck forwardly from the clip material at said ends and forming complemental openings therein, with said prongs being adapted to nest in said complemental openings of the next adjacent clip when said clips are stacked in front-to-back relationship.

3. A wound clip comprising a strip of thin deformable material having rearwardly turned ends, flesh engaging prongs spaced apart in pairs at each of said ends and projecting forwardly, a rearwardly bowed central portion having an elongated central opening therein defining with the adjacent clip edges spaced connecting webs of non-uniform sectional width tapering from a maximum width at the center of the clip to a reduced width at the ends of said opening, whereby said clip closes under a uniform closing pressure applied inwardly to said ends, and rearwardly open notches defined by said ends and said central portion for engagement with extractor jaws to spread said ends apart and release said prongs.

4. A wound clip comprising a strip of thin deformable material having rearwardly turned jaw-engaging ends, a rearwardly bowed central portion having an elongated central opening therein, said ends defining with said central portion rearwardly open notches for extracting said clips, and flesh-engaging prongs spaced apart in pairs at each of said ends, said prongs being outstruck forwardly from the material of said clip to create complemental openings therein, with said prongs being adapted to nest in said complemental openings of the next adjacent clip when said clips are stacked in front-to-back relationship with the ends of said clips bearing against each other.

5. A wound clip comprising a strip of thin deformable material having rearwardly jaw-engaging ends, a rearwardly bowed central portion having an elongated central opening therein defining with the adjacent clip edges spaced connecting webs of non-uniform sectional width tapering from a maximum width at the center of said clip to a reduced width at the ends of said opening, whereby said clip closes under a uniform closing pressure applied inwardly to said ends, said ends defining with said central portion rearwardly open notches for engagement with an extracting tool to open said clip, and flesh-engaging prongs spaced apart in pairs at each of said ends, said

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prongs being outstruck forwardly from the material of said clip to create complemental openings therein, with said prongs being adapted to nest in said complemental openings of the next adjacent clip when said clips are stacked in front-to-back relationship with the ends of said clips bearing against each other.

6. A wound clip comprising a strip of thin deformable material having rearwardly turned jaw-engaging ends, a rearwardly bowed central portion having an elongated central opening therein defining with the adjacent edges of said clip spaced connecting webs of non-uniform sectional width tapering from a maximum width at the center of said clip to a reduced width at the center of said clip to a reduced width at the ends of said opening, whereby said clip closes under a uniform closing pressure applied inwardly to said ends, and flesh-engaging prongs spaced apart in pairs at each of said ends, said prongs being outstruck forwardly from the material of said clip to create complemental openings therein, with said prongs being adapted to nest in said complemental openings of the next adjacent clip when said clips are stacked in front-to-back relationship with the ends of said clips bearing against each other.

7. A wound clip comprising a strip of thin deformable material having rearwardly turned jaw-engaging ends, a rearwardly bowed central portion having an elongated central opening therein defining with the adjacent edges of said clip spaced connecting webs of non-uniform sectional width tapering from a maximum width at the center of said clip to a reduced width at the ends of said opening, whereby said clip closes under a uniform closing pressure applied inwardly to said ends, said ends and said central portion defining rearwardly open notches for engagement with an extracting tool to open said clip, and flesh-engaging prongs spaced apart in pairs at each of said ends, said prongs being outstruck forwardly from the material of said clip to create complemental openings therein and the corresponding prongs at opposite ends being laterally offset from each other whereby to slide past each other when said clip is fully closed, and said prongs being adapted to nest in said complemental openings of the next adjacent clip when said clips are stacked in front-to-back relationship.

8. A wound clip comprising: a strip of thin deformable material having rearwardly turned jaw-engaging ends, a rearwardly bowed central portion having an elongated central opening therein defining with the adjacent edges of said clip spaced connecting webs, said webs acting as a wide-based hinge upon closing deformation of said clip, and tending to maintain said ends in parallel relationship, flesh-engaging prongs outstruck forwardly from the material at the ends of said clips and extending substantially perpendicularly thereto for entering the flesh upon closing deformation of said clip along a line of entrance extending along the length of said prongs, and said end portions being bent rearwardly and inwardly in substantially a 180° turn to define rearwardly open notches having an open width substantially equal to the depth thereof for receiving the jaws of a parallel jawed extracting tool therein and permitting a rocking motion of said jaws relative to said clip whereby said clip can be uncollapsed without deformation of the walls of said notches and said prongs removed from said flesh in a direction along the line of entrance therein.

9. A wound clip comprising a strip of thin deformable material having rearwardly turned jaw-engaging ends, a rearwardly bowed central portion having an elongated central opening therein defining with the adjacent edges of said clips spaced connecting webs, said webs acting as a wide-based hinge upon closing deformation of said clip and tending to maintain said ends in parallel relationship, flesh-engaging prongs outstruck forwardly from the material at the ends of said clip and extending substantially perpendicularly thereto for entering the flesh

upon closing deformation of said clip along a line of entrance extending along the length of said prongs, and said end portions being bent rearwardly and inwardly to define rearwardly open, round bottom notches, having an open width substantially equal to the depth thereof and of greater than twice the thickness of the material of said clips, said notches being adapted to receive the jaws of a parallel jawed extracting tool therein with substantial side clearance and permitting a rocking motion of said jaws relative to said clip upon outward movement of said jaws to uncollapse said clip whereby to prevent deformation of the walls of said notches and relative movement of said prongs for removal of said prongs from said flesh in a direction along the line of entrance.

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