

[54] **SURGICAL TUBING CLIP CLENCHING TOOL**

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[51] Int. Cl. **B23q 7/10, B23p 11/00**

[58] Field of Search **29/200 H, 200 HM, 29/212 R, 212 D, 243.56; 72/410; 81/313**

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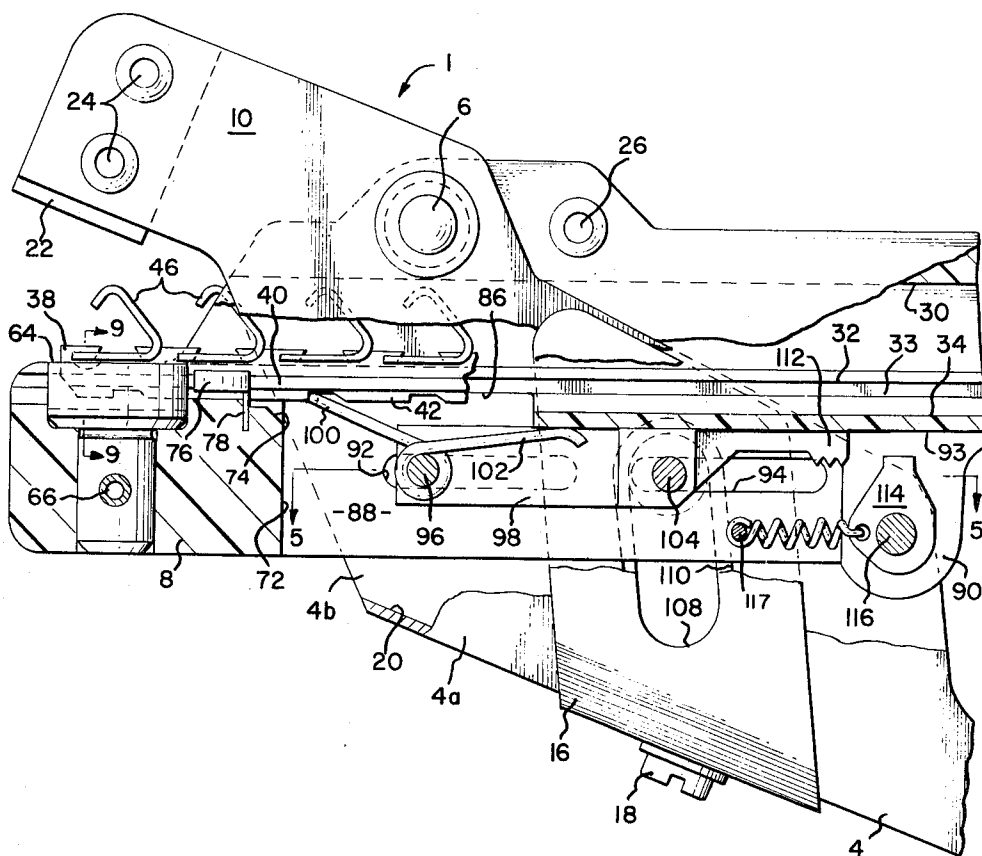
Attorney—Allan B. Osborne

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ABSTRACT

A hand operated tool having means for storing a carrier strip provided with a plurality of serially mounted clips, an anvil for receiving a clip thereon with a length of tubing received within the confines of the clip. A jaw is closed to flatten the tubing and simultaneously compress and clench the clip in encircling engagement over the flattened tubing portion. Upon opening of the jaw, the clenched clip may be removed from the carrier strip and anvil of the tool, and an indexing mechanism will serially advance another clip in position on the anvil.

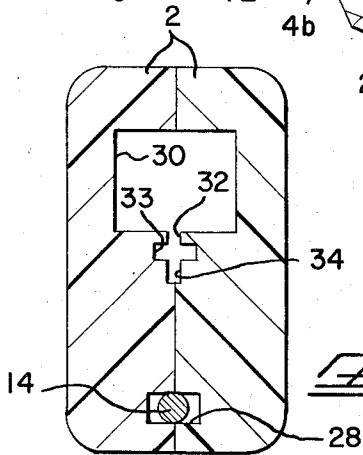
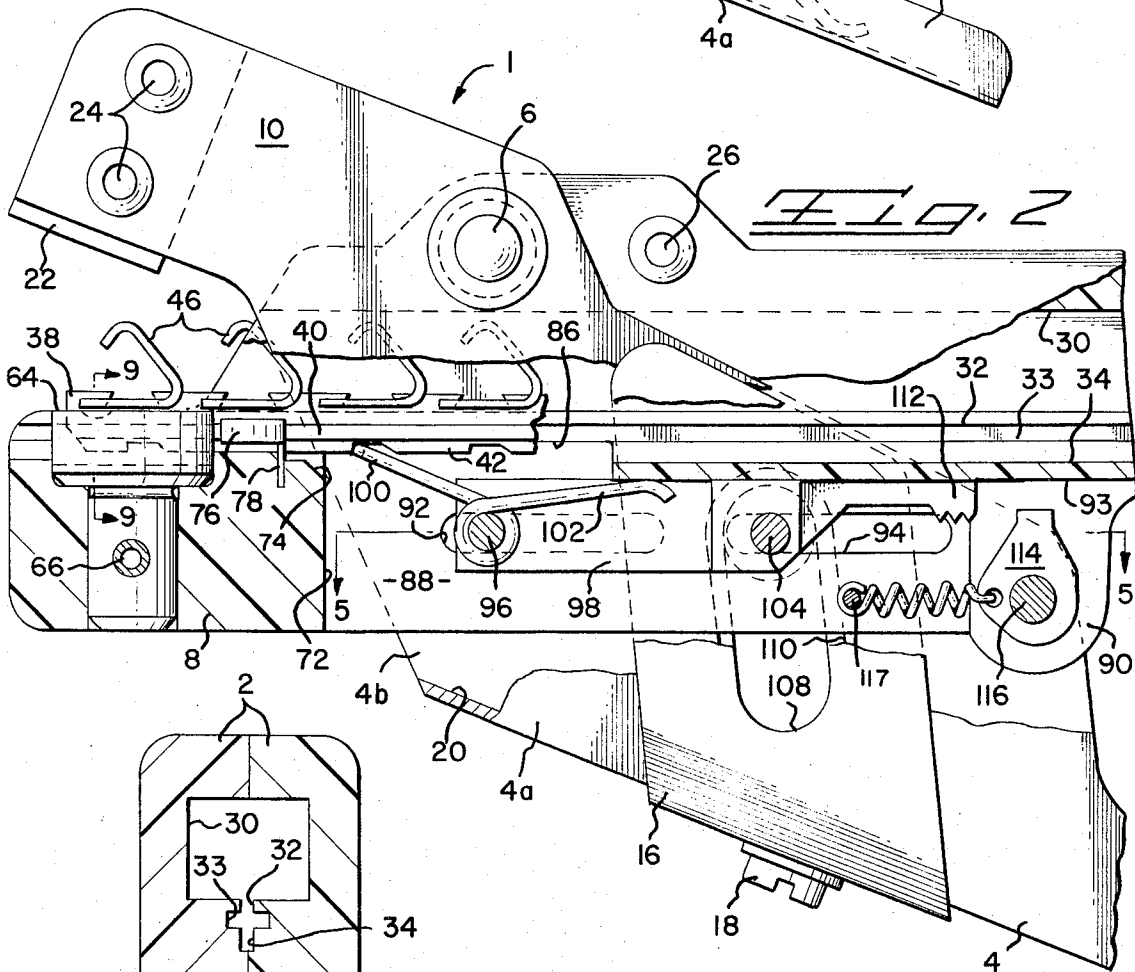
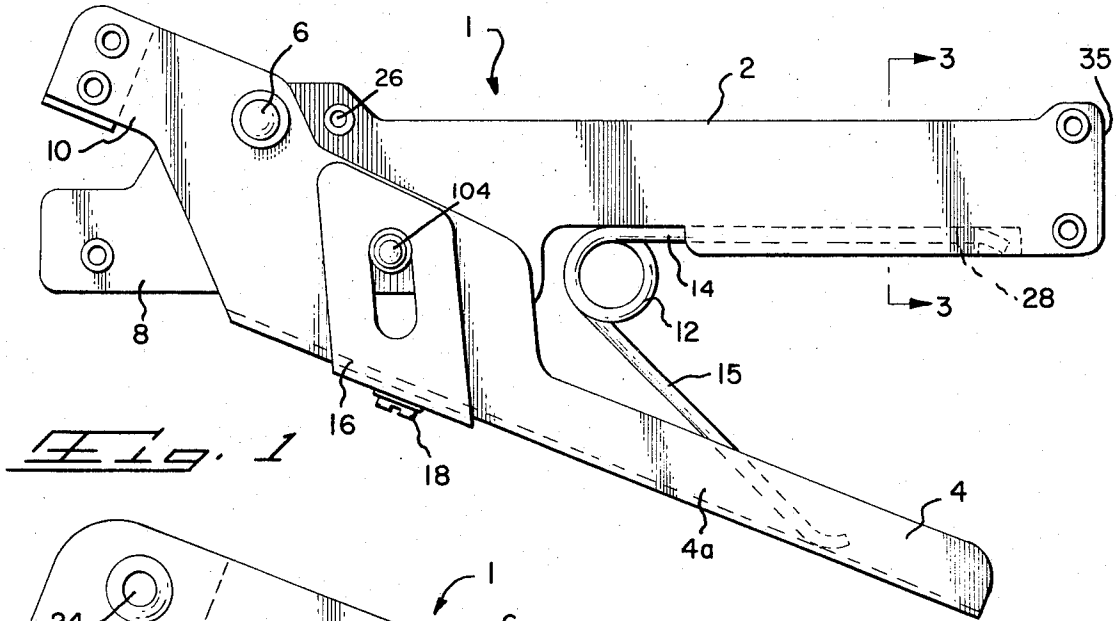
1 Claim, 10 Drawing Figures



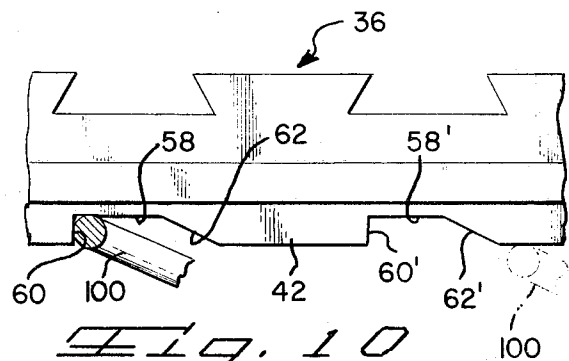
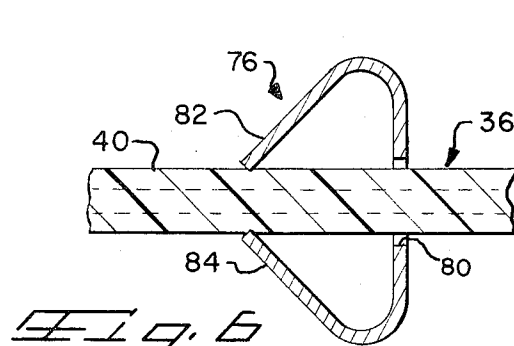
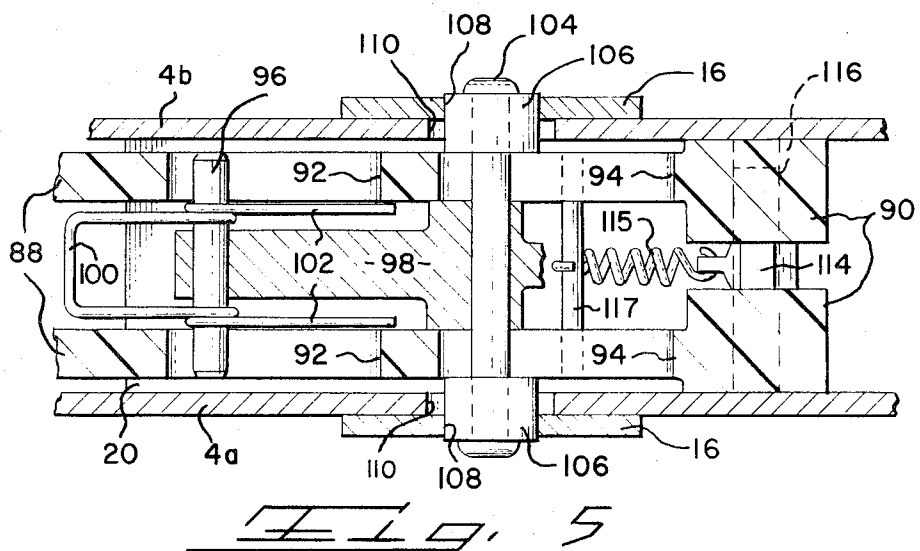
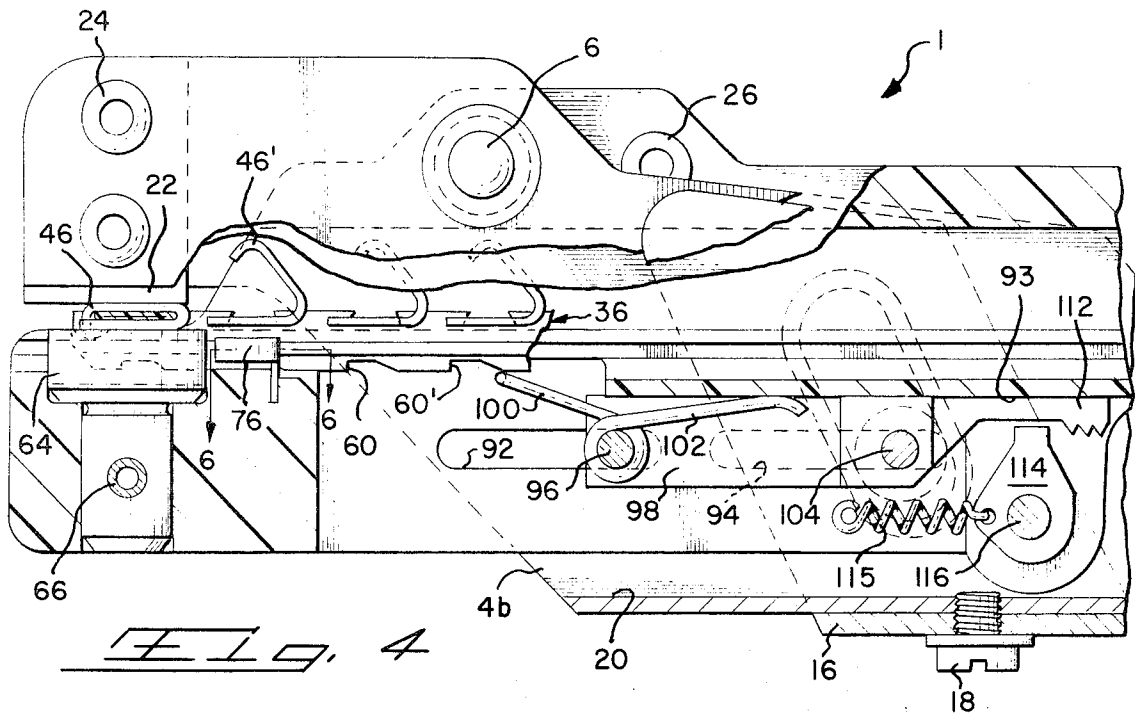
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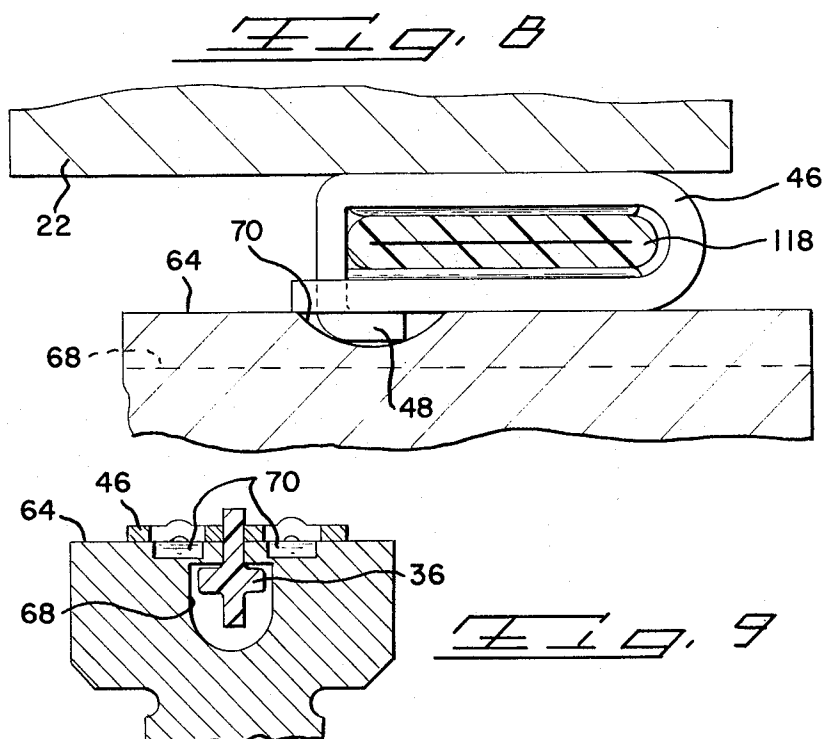
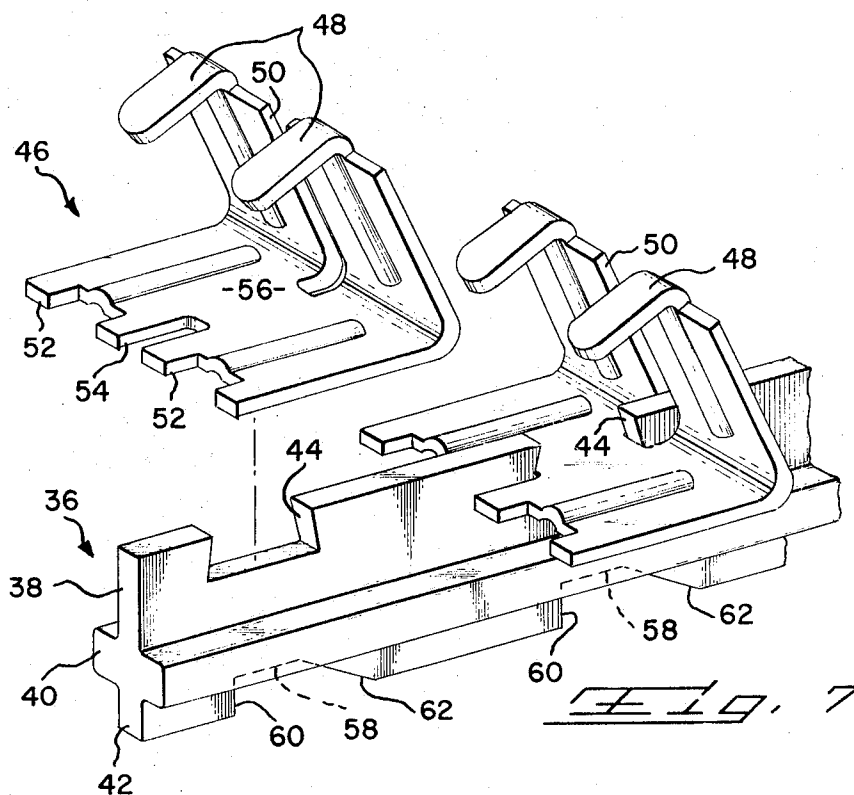
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SHEET 1 OF 3



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SURGICAL TUBING CLIP CLENCHING TOOL

This application is a continuation of Ser. No. 67,172, filed Aug. 26, 1970, now abandoned.

FIELD OF THE INVENTION

The present invention relates generally to a hand tool, and, more specifically, to a hand tool for automatically applying individual clips in compressed clenched relationship over a pinched closed length of tubing.

BACKGROUND OF THE PRIOR ART

Medically administered or collected fluids are typically transferred through flexible surgical tubing. Fluid flow through the tubing is readily shut off by pinching closed the tubing at a desired location along its length thereof.

Heretofore, one practice of pinching closed a length of surgical flexible tubing involves the use of a clip which is clenched over a flattened portion of the tubing. Such practice is more specifically described in patent application, Ser. No. 812,811, filed Apr. 2, 1969, now U.S. Pat. No. 3,612,475, the disclosure of which is hereby incorporated by reference into the present application. The present invention relates to a hand tool for storing a plurality of such clips and for serially advancing the same to an indexed position and for individually clenching the clips in encircling relationship over a length of surgical tubing.

BRIEF DESCRIPTION OF THE PREFERRED EMBODIMENTS

According to the preferred embodiments, a hand tool is provided with a pair of elongated handles, one of the handles being provided with a recess and a groove track for storing and guiding a carrier strip longitudinally of the tool. The carrier strip has removably mounted thereof a plurality of serially arranged clips. The groove track extends through an anvil enabling the carrier strip to position a first clip on the anvil. The other tool handle is pivotally attached to the first handle and is provided at one end thereof with a jaw carrying a platen. In use, a length of surgical tubing is suitably positioned in the clip. Upon closure of the handles in scissor-like operation, the platen is pivotally displaced to compress the clip between the anvil and the platen. The tool will simultaneously flatten a portion of the tubing and compressibly apply the clip over the flattened portion of the tubing. Upon opening, or reverse scissor-like operation, of the tool handles from fully closed positions, the platen will be pivoted away from the applied clip, permitting removal thereof from the carrier strip and the anvil. Additionally, such opening of the tool handles will actuate an indexing mechanism which incrementally advances the carrier strip along the groove track in order to serially position another clip on the anvil. Once another clip is fully indexed into position, a clasp grips the carrier strip and prevents displacement thereof, thereby insuring the clip is maintained in position on the anvil. According to another feature of the present invention, a double acting ratchet provided on the preferred embodiment prevents opening of the tool handles until the handles first attain fully closed position, thereby insuring a completed application of a clip over the tubing. Conversely, closing of the tool handles is prevented until they have first been fully opened and a clip is fully indexed into position on the anvil.

OBJECTS OF THE INVENTION

Accordingly, it is an object of the present invention to provide a hand tool for storing, serially positioning and simultaneously flattening a portion of a length of flexible surgical tubing and applying a clip thereover.

Another object of the present invention is to provide a hand tool for receiving a carrier strip provided thereon with a plurality of serially mounted clips, with indexing apparatus on the tool for serially positioning a series of clips for individual assembly over flexible surgical tubing.

A further object of the present invention is to provide a hand tool with a groove track for guiding a carrier strip carrying a plurality of serially mounted clips, an indexing mechanism on the tool for serially positioning the clips on an anvil and a clasp for preventing displacement of the carrier strip once a clip is suitably positioned on the anvil.

Still another object of the present invention is to provide a hand tool which receives a carrier strip provided thereon with a plurality of serially mounted clips, and wherein the tool includes an indexing mechanism which incrementally advances the carrier strip upon opening of the tool handles, and which indexing mechanism provides a "lost motion" displacement to allow opening of the tool jaws before a clip is indexed into position on the anvil.

Other objects and many attendant advantages of the present invention will become apparent upon perusal of the following detailed description taken in conjunction with the description of the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an elevation of a preferred embodiment of the present invention;

FIG. 2 is an enlarged fragmentary elevation of the portion of the preferred embodiment shown in FIG. 1, with portions shown broken away and with portions partially in section to illustrate details thereof;

FIG. 3 is an enlarged section taken along the line 3—3 of FIG. 1;

FIG. 4 is an enlarged fragmentary elevation, with parts shown partially in section and with parts broken away to illustrate the details thereof, with the preferred embodiment shown in fully closed position;

FIG. 5 is a section taken along the line 5—5 of FIG. 2;

FIG. 6 is an enlarged section taken along the line 6—6 of FIG. 4;

FIG. 7 is a fragmentary perspective of a carrier strip provided thereon with a plurality of serially mounted clips;

FIG. 8 is an enlarged fragmentary section of the platen and anvil according to a preferred embodiment of the present invention, and further illustrating a clenched clip in assembled configuration over a flattened portion of a flexible surgical tubing;

FIG. 9 is an enlarged section taken along the line 9—9 of FIG. 8, and

FIG. 10 is a fragmentary elevation of a carrier strip and a portion of an indexing mechanism according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

With more particular reference being made to FIG.

1, there is generally indicated at 1, a blood pack clip clenching tool according to the present invention. The tool is provided with a pair of handles 2 and 4 pivotally secured to each other at a rivet 6. The handle 2 is provided with a first jaw 8, and the handle 4 is provided with a second jaw 10. An enlarged coil spring 12 is disposed between the handles 2 and 4 and includes elongated leg portions 14 and 15 which operate to bias the handles 2 and 4 to opened positions.

With reference being made to FIGS. 1, 2 and 5, the handle 4 is generally of inverted U-shaped configuration with leg portions 4a and 4b. An inverted U-shaped flange 16 is secured by a bolt 18 to the base 20 of the U-shaped handle 4. The jaw 10 of the tool is provided thereon with a depending platen 22 secured to the jaw 10 by rivets 24.

With more particular reference to FIGS. 1, 2 and 3, the handle 2 is fabricated from two laterally adjacent, longitudinal sections which are secured together by rivets, one of which is shown at 26. Each segment defines one half of a longitudinally extending recess 28 receiving therein the elongated leg 14 of the spring 12. Additionally, the segments define therebetween a longitudinally extending recess 30 generally of rectangular configuration and a groove track having a cross sectional configuration generally corresponding to a "plus" symbol and extending longitudinally of and in communication with the recess 30. More particularly, the recess 30 includes a horizontal projecting portion 33 and a depending vertical projecting portion 34. The recess 30 and the groove track 32 emerge from the end 35 of the tool as shown in FIG. 1, and emerge additionally at a position generally between the jaws 8 and 10 as shown in FIG. 2.

With more particular reference to FIG. 7, taken in conjunction with FIGS. 1, 2 and 3, there is shown an elongated carrier strip 36 having a cross section corresponding to that of the groove track 32. The carrier strip "plus" symbol cross section is characterized by an upstanding projecting flange 38 integral with a horizontally projecting flange portion 40 and a depending flange portion 42. The flange portion 38 is provided with a plurality of serially spaced trapezoidal notches 44. Each notch 44 carries therein a removable mounted, generally V-shaped clip 46. The particular structural features of each clip 46 is more particularly described in the disclosure of copending patent application Ser. No. 812,811, filed Apr. 2, 1969, now U. S. Pat. No. 3,612,475 which disclosure is specifically incorporated by reference herein. Thus it is sufficient that the clip be described as having two clenching tabs 48 separated by an elongated notch 50, with opposed spaced notches 52 separated by an elongated notch 54. Together, the notches 50 and 54 define therebetween a web portion 56 which is received removably in a corresponding trapezoidal notch 44 of the carrier strip 36, with the projecting flange portion 38 extending into one notches 50 and 54 as shown in FIG. 7. The depending flange portion 42 of the carrier strip is provided with a plurality of serially spaced inverted notches 58 located generally in adjacent alignment with corresponding trapezoidal notches 44. Each of the notches 58 is defined by a generally vertical end wall 60 and an opposed inclined end wall 62.

With reference to FIGS. 1, 2 and 3, the carrier strip 36 is initially inserted into the terminal end 35 of the handle 2 with the "plus" symbol configuration carrier

strip 36 being received in the groove track 32. Such track guides the carrier strip 38 entirely through the handle 2 until the carrier strip emerges from between the jaws 8 and 10 as shown in FIG. 2. The carrier strip is advantageously stored in the handle 2 of the tool during periods of nonuse thereof.

As shown in FIGS. 2, 8 and 9, a first clip 45 is initially positioned on the anvil 64 secured to the jaw 8 by a rivet 66. As shown in FIGS. 8 and 9, the anvil is provided therethrough with a channel 68 extending longitudinally of the handle 2 and receiving therethrough the carrier strip 38. The first clip 46, initially positioned on the anvil 64, overlies a pair of shallow arcuate recesses 70 provided generally on either side of the channel 68 for a purpose to be described hereinafter.

With more particular reference to FIGS. 2 and 6, there is shown the jaw 8 provided with a generally inverted rectangular end wall 72 provided with a chamfer 74 thereon. Adjacent to the chamfer is located a generally C-shaped retaining spring 76 mounted on a stem 78 which is secured in the jaw 8. As shown in FIG. 6, the carrier strip horizontal portion 40 extends through a recess 80 provided in the spring 76 and is gripped between a pair of legs 82 and 84 of the retaining spring, which legs bite into and resiliently grip the horizontal carrier strip portion 40 preventing displacement thereof. Accordingly, such resilient biting action of the spring legs 82 and 84 prevents undesired displacement of the clip 46 from its position on the anvil 64.

With reference now to FIGS. 2 and 5, the handle portion 2 is shown provided with an inverted recess, defined at one end by the end wall 72 of the jaw 8 and by an inverted surface 86 which is disposed adjacent to the groove track horizontal portion 33. Thus as shown in FIG. 2, the depending carrier strip flange portion 42 projects into the recess through the surface 86 for a purpose to be described.

The recess is further defined between laterally spaced sidewalls 88 which terminate respectively in enlarged spaced arcuate lugs 90. The lugs 90 depend from a horizontal planar web 93, which extend longitudinally between the spaced sidewalls 88 and immediately below the groove track portion 34. The web terminates adjacent the recess defined by the planar surface 86.

As shown in FIGS. 2 and 5, the sidewall portions 88 are each provided with aligned elongated slots 92 and 94 extending longitudinally of the handle 2. A pin 96 is secured at one end of a reciprocating piston 98, which pin extends between the sidewall portions 88 and projects into the recesses 92 thereof. A generally U-shaped resilient spring 100 has a central portion provided with a few turns around the pin 96. Extended leg portions 102 of the spring 100 engage resiliently against the web 93. The spring 100 is also provided with a loop portion which engages in a notch 58 of the carrier strip portion 42 that projects from the inverted bearing surface 86.

With reference yet to FIGS. 2 and 5, another pin 104 is secured generally centrally of the piston 98. The pin 104 is slidably disposed within each of the slots 94 and extends through the spaced sidewalls 88 of the handle 2 and additionally through the space sidewalls 4a and 4b of the handle 4. Each end of the pin 104 is provided with an enlarged diameter, rotatably mounted cam roller 106. The cam rollers 106 are each received in an inclined slot 108 provided in each side of the U-shaped flange 16. Each of the sidewalls 4a and 4b is provided

with a clearance opening 110 to freely receive a corresponding cam roller 106 therethrough. The remaining end of the piston 98 is provided with a double acting ratchet 112 with depending teeth. A pawl 114 is pivotally mounted on a pin 116 spanning between the side-
walls 4a and 4b. A bias spring 115 is connected between the pawl and a pin 117 connected between the sidewalls 88.

As shown in FIGS. 1 and 2, the tool handles 2 and 4 are shown in their fully opened positions. As shown in FIGS. 2 and 10, the spring 100 is initially engaged against the vertical end wall 60 of the notch 58 provided in the carrier strip portion 42. Other embodiments and modifications of the present invention will become apparent from the scope of the appended claims.

In operation, a length of surgical tubing 118 is inserted in the V-shaped clip 46 on the anvil 16. With reference to FIGS. 4 and 8, the handles according to the present invention are shown in a fully closed position occasioned by manually actuating the handles 2 and 4 toward each other in scissor-like fashion against the action of the spring 12. The jaws 8 and 10 will thus be displaced to close positions with the clip 46 compressed between the platen 22 and the anvil 64. Additionally, the clip 46 will become flattened from its characteristic V-shape to a flattened configuration folded back over itself. Additionally, as shown in FIG. 8, the tabs 48 will be pressed into corresponding recesses 70 of the anvil and will be thus clenched over to retain the folded and flattened configuration of the clip 46. As shown in FIGS. 4 and 8, the flattened clip 46 pinches closed a flattened portion of the flexible surgical tubing, in accordance with the disclosure of application Ser. No. 812,811, filed Apr. 2, 1969, now U.S. Pat. No. 3,612,475. As described, the tubing is simultaneously flattened upon closing the handles and applying the clip in clenched relationship thereover.

With reference to FIGS. 2 and 4, operation of the handles from fully opened to a fully closed positions will be explained in further detail. Upon manually moving the handles 2 and 4 to closed positions, the flange 16 on the tool handle 4 will translate angularly counterclockwise about the rivet 6. Such action will thus result in forcing the pin 104 to translate along the slots 94 in a direction away from the tool jaws 8 and 10. The cam rollers 106, rotatably mounted on the pin 104, will translate along the respective slots 108 of the flange 16, from their positions shown in FIG. 2 to the positions shown in FIG. 4. The piston 98 will additionally be displaced generally slidably along the web 93 and longitudinally of the tool in a direction away from the jaws 8 and 10. Such action will force the ratchet 112 to translate past the pawl 114. For example, the pawl 114 will engage in the teeth of the ratchet 112 to prevent opening of the tool handles until the ratchet 112 completely passes the pawl 114 as shown in FIG. 4. Accordingly, when the ratchet completely passes the pawl, the tool handles will be in fully closed positions, thereby insuring complete and positive flattening of the clip 46 between the anvil 64 and the platen 22. The described action of the ratchet and pawl is a feature having the trademark CERTI-CRIMP, a trademark of AMP Incorporated, Harrisburg, Pennsylvania.

With reference to FIGS. 4 and 10, it is shown that the described displacement of the piston 98 will force the pin 96 to translate longitudinally of the slots 92 and in

a direction away from the jaws 8 and 10. The spring 100 will thus be retracted from its position against the vertical end wall 60 of the notch 58, along a path following the inclined sidewall 62, along the carrier strip portion 42 and into the next immediate, serially located notch 58', as shown in FIG. 10. The spring will further be retracted to a position both removed from the notch 58' and slightly beyond the location of the inclined sidewall 62' of the notch 58'. Such retraction will not move the carrier strip which is gripped by the clasp 78.

As the tool handles 2 and 4 are pivoted from their fully closed positions toward fully opened positions, the piston 98 will translate toward the anvil 64. At the same time the spring 100 will translate from its position shown in FIG. 4 to a position engaged against the vertical end wall 60' of the notch 58' shown in FIG. 10. Such action of the spring provides a lost motion displacement enabling the jaws 8 and 10 to separate and allow removal of the applied and flattened clip 46 from between the anvil 64 and the platen 22. Additionally, such lost motion insures that the jaws 8 and 10 pivotally separate sufficiently before the next serially positioned clip 46' is indexed into position on the anvil 64. The clip 46' is positioned on the anvil upon further opening of the handles 2 and 4. Such further opening forces the piston 98 to translate further toward and anvil 64. The spring 100, engaged against the end wall 60', will also be displaced toward the anvil, with the result that the carrier strip is incrementally advanced a sufficient amount to locate the clip 46' in position on the anvil. With the clip 46' in position, the resilient spring legs 82 and 84 will bite into and grip the carrier strip portion 40 to prevent displacement thereof. Additionally, the ratchet 112 will pass over the pawl 114 such that their relative positions as shown in FIG. 2 are attained. If the handles 2 and 4 are only partially opened, the pawl will engage in the ratchet teeth and prevent closure of the handles until they are fully opened and the clip 46' is accordingly indexed into position on the anvil 64.

Other embodiments and modifications of the present invention will become apparent from the scope of the appended claims.

I claim:

1. A hand operated tool useful for clenching clips onto surgical tubing and the like, such clips being removably mounted on a carrier strip having a generally "plus" symbol cross-sectional configuration and further having serially spaced inverted notches on its lower edge, which tool comprises:

- a. a pair of jaw members movable toward each other into clenching position, one of said members having a platen mounted thereon and another of said members having an anvil mounted thereon, said platen and said anvil being in facing relation;
- b. a pair of handles, pivotally mounted to each other, each of said handles attached to one of said jaw members and operable for urging said members toward or away from each other;
- c. storage means in one of said handles for slidably receiving said carrier strip, said storage means having a generally "plus" symbol cross-sectional configuration;
- d. track means adjacent said storage means for guiding said carrier strip from said storage means toward said anvil;
- e. indexing means housing in one of said handles for incremental advancement of said carrier strip, said

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indexing means including a u-shaped spring member adapted to engage said notches in said carrier strip;
f. a piston member positioned on another of said handles and operable to actuate said indexing means upon the pivotal opening and closing of said han-

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dles; and
g. a generally c-shaped spring positioned transverse of said track means and operable to retain said carrier strip against movement away from said anvil.
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