April 23, 1957 J. W. WHITE 2,789,288

MAGAZINE TYPE WOUND CLIP APPLICATOR

Original Filed Nov. 24, 1952

Fig. 1

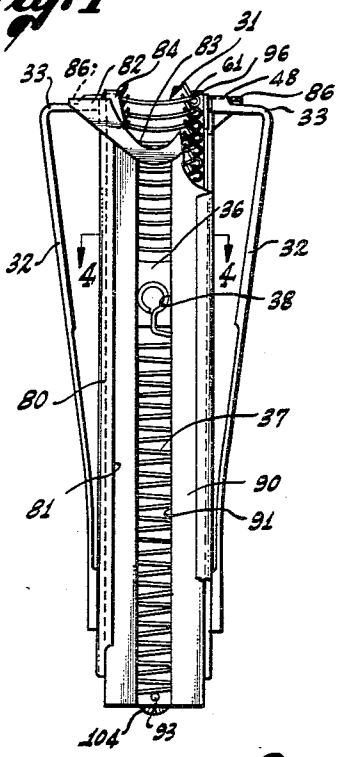


Fig. 2

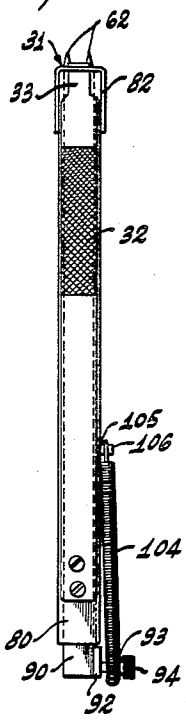


Fig. 3

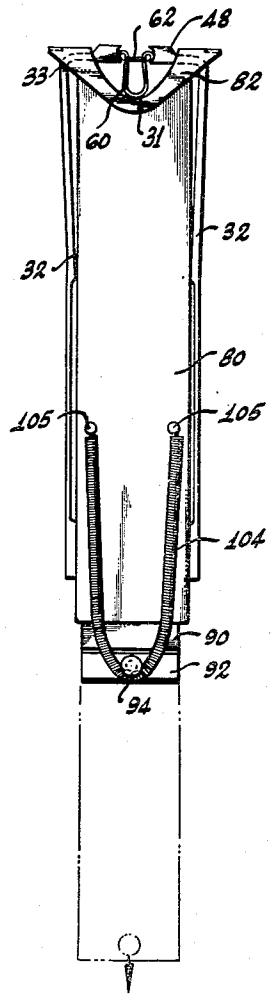


Fig. 5

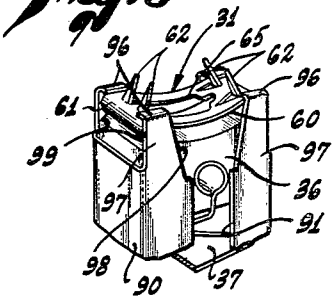
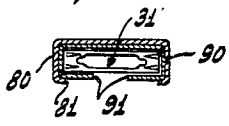


Fig. 4



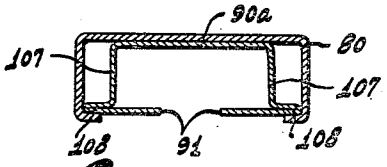


Fig. 6

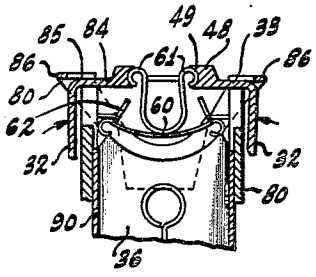


Fig. 7

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MAGAZINE TYPE WOUND CLIP APPLICATOR

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Original application November 24, 1952, Serial No. 278,221, now Patent No. 2,733,441, dated February 7, 1956. Divided and this application February 3, 1956, Serial No. 563,380

5 Claims. (Cl. 1—49.1)

This application is a divisional application of my application Serial No. 278,221, filed March 24, 1952, for Wound Clip Applicator, and issued as U. S. Letters Patent No. 2,733,441 on February 7, 1956, and relates particularly to a form of applicator having a separate magazine or slide for holding the wound clips.

Improvements in both conventional wound clips and forcepts for applying the clips are greatly wanted, and I have found that changes in clip design can be correlated with a new kind of applicator in such a manner as to provide numerous advantages. 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.

The conventional forceps used in applying clips must be gripped with a constant and tiring hand pressure in order to hold a clip therein, and many clips are either collapsed improperly or dropped. Furthermore, the surgeon must load each clip from a separate holding device and a great amount of time is required for applying clips in even a simple operation. While magazine type applicators have been proposed to overcome the obvious disadvantages of present forceps, none of them has ever been sufficiently reliable nor durable to be acceptable to the medical profession. This has been partially due to the nature of conventional clips and mainly due to the nature of the applicators themselves.

It can be appreciated that as present clips are not capable of proper stacking, their use in a multiple load device is very difficult. In order to feed clips through the applicator, it is desirable to provide a feed spring or the like, and therefore it is necessary to hold the leading clip against release and in an applying position. It is also highly desirable to hold the leading clip independently of any closing pressure on the applicator jaws or forceps so that the hand need not be held closed. Therefore, the only practical and safe way to hold a clip in applying position is by side lips or lugs which overhang the face of the clip at each end.

If the present narrow clip is used, the forceps jaws must be approximately equal to the clip width, and it is necessary that the holding edges must be pushed or retracted out of the way. This kind of structure is very delicate, difficult to make, and cannot be maintained in proper adjustment. The forceps jaws for my improved clip may be less than clip width and yet sufficiently wide to clamp properly. The forceps jaws can then swing through the holding edges positioning a clip without contact, and a very simple and durable form of head construction is possible.

It is a major object of my invention to provide a clip applicator having a forceps head structure adapted to securely hold the leading clip in applying position, and to control and guide the movement of the forceps jaws.

Another object of my invention is to provide a clip applicator having feeding and holding means formed to provide a uniform and smooth feed and adapted to be easily reloaded.

It is a still further object of my invention to provide an applicator having a separable magazine slide for rapid reloading and accommodation of different size clips.

Still another object of my invention is to provide an embodiment of my applicator having yieldable magazine retracting means for accurate and positive clip feeding.

These and other objects and advantages of my invention will become apparent from the following detailed description of a form thereof having a separate magazine slide, and from an inspection of the accompanying drawings, in which:

Figure 1 is a front elevation of a form of applicator having a separate magazine;

Figure 2 is an edge elevation of the applicator;

Figure 3 is a back elevation of the applicator with the forceps in closed position;

Figure 4 is a cross section taken along the line 4—4 of Figure 1;

Figure 5 is a perspective detail of the front magazine structure on the applicator;

Figure 6 is a cross section of the applicator head showing the magazine slide retracted therein; and

Figure 7 is a cross sectional detail of an alternate form of the magazine slide.

In Figures 1 to 7 I have shown a form of applicator which is designed to take a separate magazine slide. The use of a separate magazine for holding a supply of clips permits the most rapid reloading of the applicator, and has several other desirable features, as will be described. Clips 31 identical to those described in connection with the form of applicator disclosed in my co-pending application Serial No. 278,221 are applied by this applicator, and the clip rack described therein may also be advantageously used for loading the clip slide.

An applicator housing 80 is of elongated rectangular shape and is formed with a wide central slot 81 extending along the front face thereof for inspection of the clip supply. Both ends of housing 80 are open, and a modified collar or yoke 82 is mounted at the head of the applicator. Collar 82 overlaps the end of housing 80 and is formed with generally U-shaped side plates which are cut back centrally to provide side openings 83. The end wall of collar 82 has an enlarged clip dispensing opening 84 therein which is completely free of obstructions.

Forceps or tweezer arms 32 are mounted on the sides of housing 80 and are provided with forwardly positioned inturned jaws 33 which are guided and limited in movement by collar 82. As is best seen in Figure 6, jaws 33 have enlarged heads 48 formed with inner gripping surfaces 49 for engagement with clip ends 61. Extending outwardly beyond the ends of collar opening 84 are reduced slots 85 which have a width equal to the width of jaw heads 48 and guide the movement thereof during the initial closing of clips 31. At the outer ends of guide slots 85, stop bars 86 are formed on collar 82 to limit the outward movement of jaw heads 48. As can be understood, this portion of the applicator structure is quite similar to the form disclosed in my co-pending application Serial No. 278,221, and the aforementioned advantages again exist.

In order to contain clips **31**, I provide a rectangular magazine **90** which is similar in shape to housing **80** and is of a size to fit slidably therein. The front face of magazine **90** is slotted at **91** and the back face carries an enlarged stop bar **92** extending laterally across the rear end of the magazine and adapted to abut against the rear end of housing **80**. The engagement between stop bar **92** and housing **80** limits the forward travel of magazine **90** within the housing and the length of the magazine is such that the head end of the magazine normally extends slightly beyond the end of housing **80**, as is best seen in Figure 1.

Clips **31** are stacked within magazine **90** in front-to-back relationship and may be inserted in a unit through the use of a clip rack, as has been described in my co-pending application. Behind the stack of clips **31** is a plunger or follower block **36** which is urged forwardly by a feed spring **37**. The forward end of spring **37** is secured to plunger **36** as by a coiled end engaged in a plunger aperture **38**. The rear end of spring **37** is fixed within magazine **90** by engagement against the inner end of a threaded screw **93** which extends through stop bar **92** into the interior of the magazine. As seen in Figure 2, screw **93** carries a knurled head **94** on its end away from bar **92** and has an elongated undercut shank so that head **94** is spaced considerably from bar **92** even when screw **93** is extended into magazine **90** to hold spring **37**. To reload magazine **90**, screw **93** is threadedly retracted out of the magazine so that spring **37** and plunger **36** may be withdrawn through the rear end of the magazine.

Plunger **36** urges the stack of clips **31** ahead within magazine **90** and the leading clip is held at the head end by holding lugs **96** which are formed on the end of the magazine. As is best seen in Figure 5, the end of magazine **90** is formed with reduced fingers **97** that extend forwardly beyond the main body of the magazine and define front and back recesses **98** together with side openings **99** adjacent the ends of clips **31**. The tips of fingers **97** are turned inwardly to form the holding lugs **96** which overlie the front face of the leading clip **31**. Thus it can be appreciated that magazine **90** forms an independent container for a stack of clips **31** and properly positions the leading clip in an applying position within the applicator housing **80**. By having a number of filled magazines **90** on hand, reloading of the applicator can be accomplished in a minimum amount of time since the reloading requires merely the removal of the magazine and the insertion of another in its place.

Magazine **90** is held against rearward movement in housing **80** by a yieldable retraction spring means which normally holds the magazine in the forward position, but permits retraction of the magazine as the leading clip **31** is elongated and displaced rearwardly during the closing operation. Thus, in this form of the invention, the stack of clips **31** is not displaced relative to magazine **90** upon deformation of the leading clip, but rather the entire magazine is retracted rearwardly. Because of this mode of operation, the feed of the clips is more positive, and there is less chance that the clip stack will become disarranged or jammed during the use of the applicator.

The retraction spring means urging magazine **90** forwardly is preferably a relatively weak coil spring **104** which is looped around the undercut inner portion of screw head **94** and has the free ends extended forwardly and secured to housing **80**. As is best seen in Figures 2 and 3, a pair of anchor posts **105** projects outwardly from the back of housing **80** and is provided with annular grooves **106** in which book ends formed on spring **104** may be removably secured. When a complete cleaning or overhaul of the instrument is desired, spring **104** may therefore be easily removed. It is important to note that the yield strength of retraction spring **104** is made substantially less than the strength of feed spring **37** in order that magazine **90** will retract rearwardly before the stack of clips **31** is pushed rearwardly within the magazine.

As is best seen in Figure 6, when forceps arms **32** are pressed together, jaws **33** drive inwardly and engage the clip ends **61**, causing the central clip portion **60** to buckle and be displaced rearwardly in the manner previously described for the preferred form. Because of the reduced width of jaw heads **48**, they enter into magazine **90** through the side openings **99** behind holding lugs **96** and then pass freely between the holding lugs as the magazine is retracted rearwardly. The pressure of the leading clip center **60** upon the face of the next succeeding clip **31** forces magazine **90** to be retracted rearwardly against retraction spring **104** during the closure of the clip. Thus the importance of spring **104** being softer than feed spring **37** is seen, for if the feed spring yielded first, magazine **90** would not retract, but the stack of clips **31** would merely move rearwardly and force the feed spring to compress.

As previously pointed out, by retracting magazine **90** I insure that the stack of clips **31** will not jam and the operation of the applicator is made more positive. Another advantage of using a separate magazine in the applicator is that a single applicator may be adapted to take different size clips by merely changing magazines. For normal surgical use there are several sizes of wound clips used. As an example, clips of 14, 18, and 22 millimeter length are quite common.

In order that clips of such varying size may be applied by a single application, I have provided modified magazines **90*a*** as is seen in Figure 7. Magazine **90*a*** is internally dimensioned to take a smaller clip that that normally used in housing **80** and is yet externally dimensioned to fit slidably in the housing with normal clearance. As illustrated, edge walls **107** are brought forwardly from the back face of magazine **90*a*** in a position spaced inwardly from the corresponding edges of housing **80** and at such a distance apart as to take the desired smaller clip. Walls **107** are then bent outwardly and returned inwardly to provide side flanges **108** which have a normal sliding fit within housing **80**. By this type of construction I am therefore able to supply different size clip magazines for a single applicator and a considerable economy in instrument costs may be achieved.

While I have thus shown and described a specific form of my invention having a separate magazine, it can be understood that other modifications and variations can be made without departing from the scope of the invention. Therefore, I do not wish to be limited to the foregoing except as defined in the appended claims.

I claim:

1. A wound clip applicator comprising: an elongated rectangular housing open at both ends adapted to slidably receive therein a rectangular magazine formed to slidably receive a plurality of wound clips in stacked relationship and provided with spring plunger means for urging said clip stack forwardly and with holding lugs formed on the front end of said magazine and adapted to override the front face of the leading clip to limit the forward movement thereof; a collar secured to the front end of said housing and having a central opening therein with guide slots extending outwardly at the ends of said opening and terminated by transversely extended stop bars formed on the ends of said collar; a pair of spring forceps arms extending divergently outwardly from the front portion of said housing; means securing said arms to the sides of said housing at the rear end thereof; inturned forceps jaws formed on the forward ends of said arms and normally positioned to bracket the ends of said leading clip, said jaws being fitted within said guide slots and limited in outward movement by said stop bars, and said jaws being movable inwardly upon compression of said arms to drive said clip ends inwardly and of lateral width such as to pass freely between said holding lugs; and spring means urging said magazine for-

wardly in said housing and yieldable rearwardly upon rearward closing deformation of said leading clip to retract said magazine and of less strength than said plunger means whereby said plunger means remains relatively stationary in said magazine.

2. A wound clip applicatior comprising: an elongated rectangular housing open at both ends adapted to slidably receive therein a rectangular magazine formed to slidably receive a stack of wound clips nested in front-to-back relationship, the rear end of said magazine carrying means for limiting the forward movement of said magazine in said housing and the forward end being substantially open; a plunger slidably mounted within said magazine at the rear of said clip stack; an internal stop removably secured to the rear end of said magazine; a feed spring confined between said stop and said plunger for urging the latter forwardly; holding lugs formed on the front end of said magazine adapted to override the front face of the leading clip to limit the forward movement thereof; a pair of spring forceps arms extending divergently outwardly from the front portion of said housing; means securing said arms to said housing at the rear end thereof; inturned forceps jaws formed on the forward ends of said arms and normally positioned to bracket the ends of said leading clip, said jaws being fitted within said guide slots and limited in outward movement by said stop bars, and said jaws being movable inwardly upon compression of said arms to drive said clip ends inwardly and of lateral width such as to pass freely between said holding lugs; and a retraction spring secured to said housing and engageable with said magazine for urging said magazine forwardly, said retraction spring being of less strength than said feed spring, whereby said magazine is retracted rearwardly from said housing upon rearward closing deformation of said leading clip.

3. A wound clip applicator comprising: an elongated rectangular housing open at both ends and slotted along the front face thereof adapted to slidably receive therein a magazine formed to slidably receive a plurality of wound clips in stacked relationship, the rear end of said magazine having a stop bar thereon for limiting the forward movement of said slide in said housing, the front face of said magazine being slotted for inspection of the clip supply, and the forward end thereof being substantially open; a plunger slidably mounted within said magazine at the rear of said clip stack; an internal stop removably secured to the rear of said magazine; a feed spring confined between said stop and said plunger for urging the latter forwardly; forwardly projecting fingers formed on the front end of said magazine and defining cut back face and side openings; small inturned lugs formed on said fingers and overhanging the opening of said magazine, said lugs being disposed in pairs at the ends of said magazine opening spaced apart a substantial distance and adapted to hold the leading clip in applying position; a collar secured to the front end of said housing and having a central opening therein with reduced guide slots extending outwardly at the ends of said opening and terminated by transversely extended stop bars formed on the ends of said collar; a pair of spring forceps arms extending divergently outwardly from the front portion of said housing; means securing said arms to the sides of said housing at the rear end thereof; inturned forceps jaws formed on the forward ends of said arms and normally positioned to bracket the ends of said leading clip, said jaws being fitted within said guide slots and limited in outward movement by said stop bars, and said jaws being movable inwardly upon compression of said arms to drive said clip ends inwardly and of lateral width such as to pass freely between said holding lugs; and a retraction spring secured to said housing and engageable with said magazine for urging said magazine forwardly, said retraction spring being of less strength than said feed spring, whereby said magazine is retracted rearwardly from said housing upon rearward closing deformation of said leading clip.

4. A wound clip applicator comprising: an elongated rectangular housing open at both ends and slotted along the front face thereof adapted to slidably receive therein a magazine formed to slidably receive a plurality of wound clips in stacked relationship, the rear end of said magazine having a stop bar thereon for limiting the forward movement of said magazine in said housing, the front face of said magazine being slotted for inspection of the clip supply, and the forward end thereof being substantially open; a plunger slidably mounted within said magazine at the rear of said clip stack; a threaded hand screw mounted in said stop bar to project inwardly within said magazine; a feed spring having the forward end secured to said plunger and the rear end abutting said screw to urge said plunger forwardly, said spring being formed of flat strip material bent into flat-sided coils to provide a uniform rate and maximum compressibility; corner fingers formed on the front end of said magazine and defining cut back face and side openings; small inturned lugs formed on said fingers and overhanging the opening of said magazine, said lugs being disposed in pairs at the ends of said magazine opening spaced apart a substantial distance and adapted to hold the leading clip in applying position; a collar secured to the front end of said housing and having a central opening therein with reduced guide slots extending outwardly at the ends of said opening and terminated by transversely extended stop bars formed on the ends of said collar; a pair of spring forceps arms secured to the sides of said housing thereof and being pretensioned to extend divergently outwardly from the front portion of said housing, the rear portions of said arms being relatively thick for rigidity and the forward portions being thinner for spring action; inturned forceps jaws formed on the forward ends of said arms and normally positioned to bracket the ends of said leading clip, said jaws being fitted within said guide slots and limited in outward movement by said stop bars, and said jaws being movable inwardly upon compression of said arms to drive said clip ends inwardly and of lateral width such as to pass freely between said holding lugs; and a retraction spring secured to said housing and engageable with said magazine for urging said magazine forwardly, said retraction spring being of less strength than said feed spring, whereby said magazine is retracted rearwardly from said housing upon rearward closing deformation of said leading clip.

5. A wound clip applicator comprising: an elongated rectangular housing open at both ends and slotted along the front face thereof adapted to slidably receive therein a magazine formed to slidably receive a plurality of wound clips in stacked relationship, the rear end of said magazine having a stop bar thereon for limiting the forward movement of said magazine in said housing, the front face of said magazine being slotted for inspection of the clip supply, and the forward end thereof being substantially open; a plunger slidably mounted within said magazine at the rear of said clip stack; a threaded hand screw mounted in said stop bar to project inwardly within said magazine; a feed spring having the forward end secured to said plunger and the rear end abutting said screw to urge said plunger forwardly, said spring being formed of flat strip material bent into flat-sided coils to provide a uniform rate and maximum compressibility; corner fingers formed on the front end of said magazine and defining cut back face and side openings; small inturned lugs formed on said fingers and overhanging the opening of said magazine, said lugs being disposed in pairs at the ends of said magazine opening spaced apart a substantial distance and adapted to hold the leading clip in applying position; a collar secured to the front end of said housing and having a central opening therein with reduced guide slots extending outwardly

at the ends of said opening and terminated by transversely extended stop bars formed on the ends of said collar; a pair of spring forceps arms secured to the sides of said housing thereof and being pre-tensioned to extend divergently outwardly from the front portion of said housing, the rear portions of said arms being relatively thick for rigidity and the forward portions being thinner for spring action, with raised knurled surfaces extended along the center portion of said arms for hand gripping; forceps jaws formed on the forward ends of said arms and turned right-angularly to extend inwardly and bracket the ends of said leading clip, said jaws having enlarged heads fitted within said guide slots and limited in outward movement by said stop bars, the inner surfaces of said heads being arcuately recessed for gripping engagement with the ends of said clips when said jaws are moved inwardly by compression of said arms, and said heads being of a width less than the lateral

spacing of the holding lugs at each end of said collar opening whereby to pass freely therebetween; and an elongated coiled retraction spring having the ends secured forwardly to said housing and the center portion looped rearwardly over said hand screw for urging said magazine forwardly, said retraction spring being of less strength than said feed spring, whereby said magazine is retracted rearwardly from said housing upon rearward closing deformation of said leading clip.

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