

Aug. 7, 1962

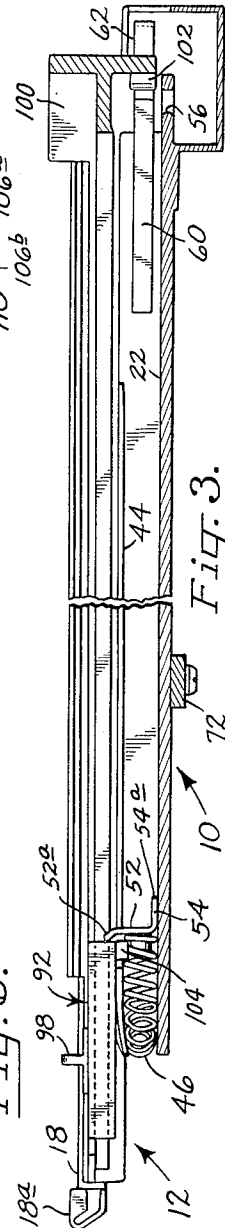
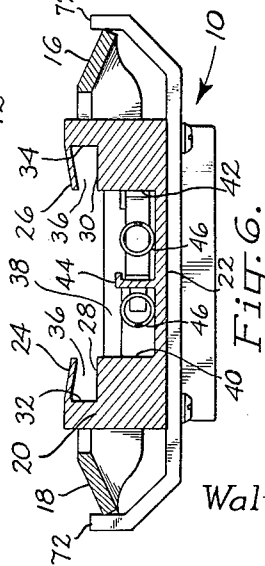
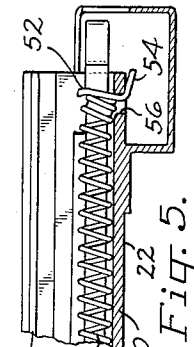
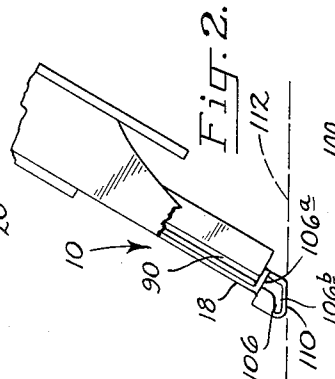
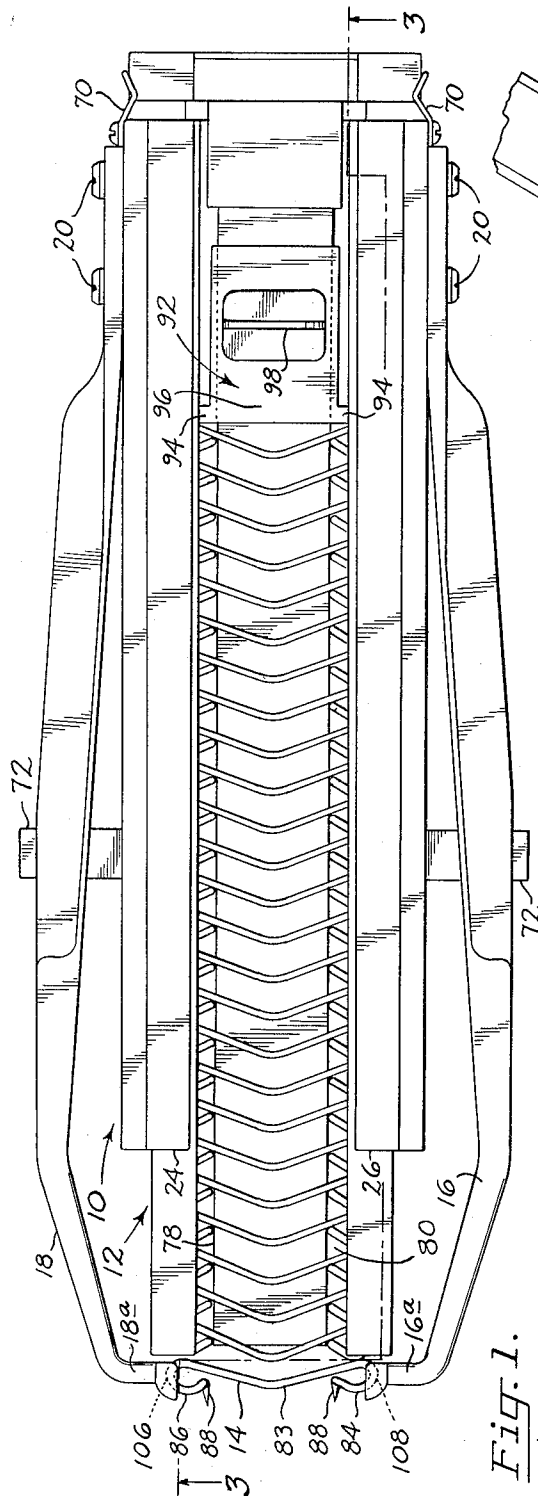
W. L. KELSEY

3,047,874

MAGAZINE-TYPE CLIP FORCEPS

Filed Oct. 17, 1960

2 Sheets-Sheet 1



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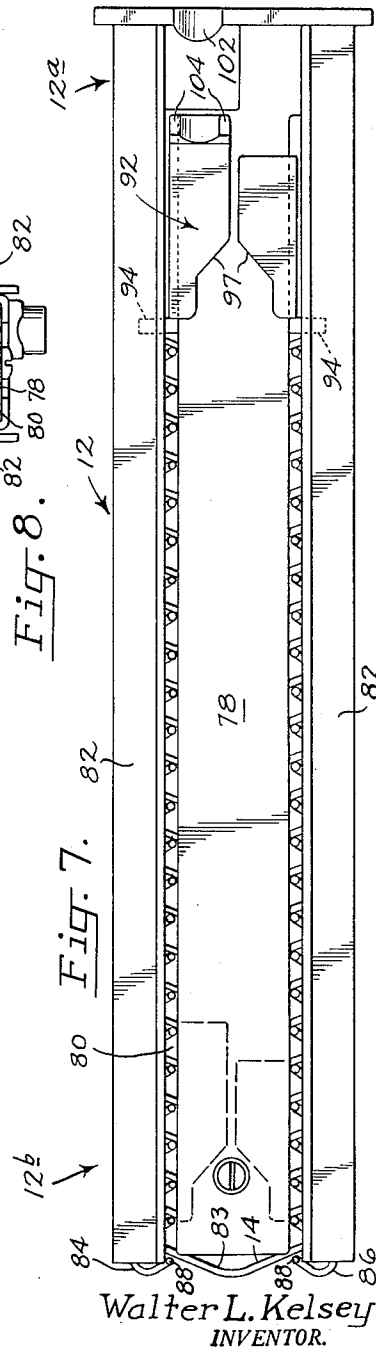
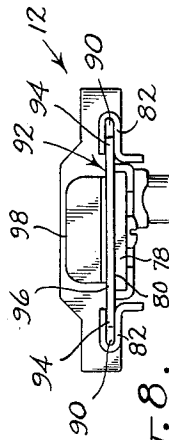
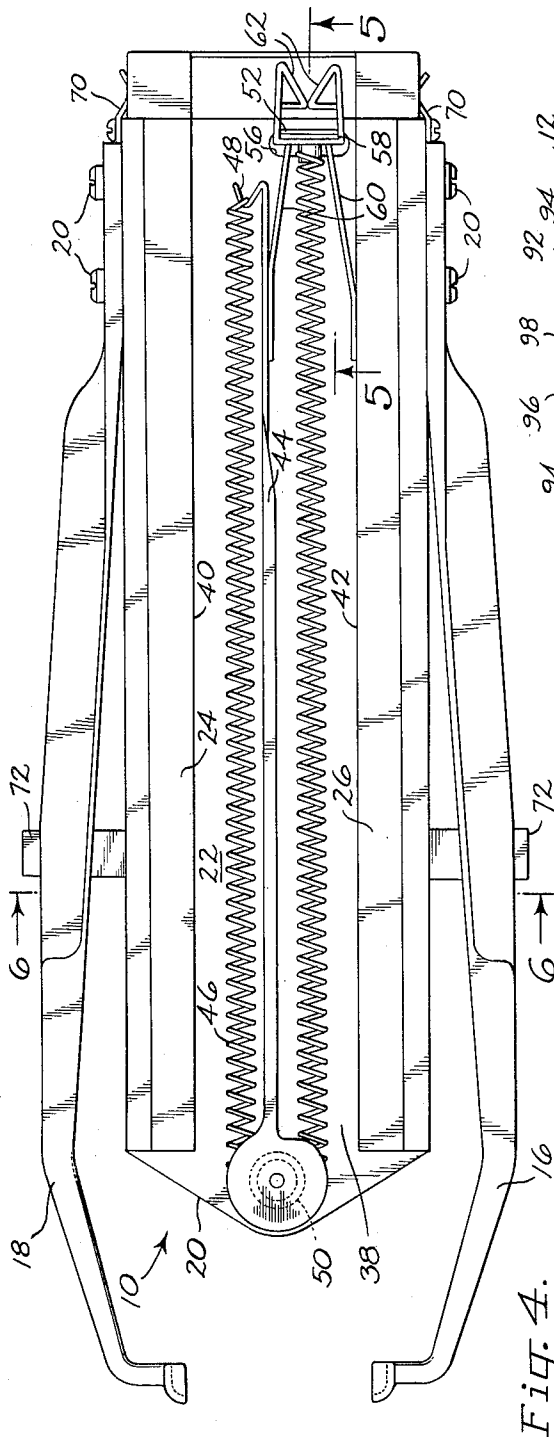
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3,047,874

MAGAZINE--TYPE CLIP FORCEPS

Filed Oct. 17, 1960

2 Sheets-Sheet 2



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3,047,874

MAGAZINE-TYPE CLIP FORCEPS

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9 Claims. (Cl. 1—349)

This invention relates to clip applicators, and more particularly to applicators for suturing clips that are used in binding together the margins of cut tissue. Such clips are employed by surgeons, for instance, in lieu of sewn stitches, and have the advantages of being relatively easily removed, better holding the tissue margins on either side of a cut, relative ease of application, etc.

Among the general objects of the invention are to provide an applicator for clips that is easy to use, provides good visibility of the area to which the clip is to be applied, and is rapid and sure in operation.

In general terms, the applicator of the invention comprises an applicator body, and removably mounted on the body a clip holder with walls defining an elongated magazine for holding a series of clips disposed in a row. The holder is removed from the applicator body by sliding it longitudinally off one end. The holder has a clip-discharging end that is disposed, when the clip holder is in operative position on the applicator body, in feeding relation with respect to the ends of a pair of pincer arms provided for holding a clip immediately prior to its application. The means for feeding clips to the arms, and the arms themselves, are constructed in a novel way whereby the applicator body may be held at an oblique angle relative to the surface being clipped together, with the clips disposed to one side of the applicator and in full visibility of a surgeon.

Thus, an object of the invention is a novel construction for an applicator where clips may be fed one after another into gripping or holding portions of a pair of pincer arms with the clips as they are held by such arms for application to a surface in full visibility of one using the applicator.

The invention contemplates a novel construction for the clip holder whereby clips may easily be inserted to load it. A plunger is provided in the holder to aid in discharging clips therefrom as they are needed, and such plunger is spring biased when the holder is assembled with the applicator body. A feature and object of the invention is the provision of novel means for connecting the biasing means to the plunger only when the holder is mounted in operative position on the applicator body, whereby biasing is applied to the plunger when needed, but with the holder removed from the applicator body, the plunger is free of any biasing means acting thereon and the holder is easily loaded.

A further feature and object is the provision of a novel construction whereby the bias means for the plunger is locked in an energized position automatically on removal of the clip holder from the applicator body.

The entire organization of the applicator contributes to easy, trouble-free operation and reliability. This is an important consideration, as it frees a surgeon's attention for the more important task of properly treating his patient. The applicator, its features and advantages, are discussed hereinbelow in conjunction with the accompanying drawings, wherein:

FIG. 1 is a top plan view of an applicator constructed according to this invention, such including an applicator body provided with pincer arms for clinching clips by pinching together their ends, and a clip holder mounted on the applicator body;

FIG. 2 is a view of the left end of the applicator

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illustrated in FIG. 1, with portions removed to illustrate details;

FIG. 3 is a cross-sectional view corresponding to a view taken along the line 3—3 in FIG. 1, with portions of the applicator intermediate its ends removed to shorten the drawing, the clip holder differing from the one shown in FIG. 1 in that clips have been removed from the holder;

FIG. 4 is a plan view of the applicator body with the clip holder removed and illustrating bias means provided for actuating a plunger in the clip holder;

FIG. 5 is a cross-sectional view of one end of the applicator body, taken along the line 5—5 in FIG. 4;

FIG. 6 is a cross-sectional view taken along the line 6—6 in FIG. 4;

FIG. 7 is a view looking at the bottom of the clip holder with the clip holder removed from the applicator; and

FIG. 8 is an end view of the clip holder in FIG. 7 with clips removed therefrom.

Referring now to the drawings, the applicator of the invention comprises an elongated applicator body, indicated generally in the drawings at 10, and mounted on applicator body 10 with the parts in operative position, but removable from the applicator body, an elongated clip holder 12. As will be described in more detail below, the clip holder is removed from applicator body 10 by sliding it off from one end, which readies the clip holder for loading with a new supply of clips, such clips being indicated generally at 14. With the clip holder in operative position on body 10, as in FIG. 1, clips are ejected from the clip holder into the offset ends of a pair of elongated, opposed, pincer arms mounted on body 10 and indicated at 16 and 18.

Considering first of all the construction of applicator body 10, and with reference now to FIGS. 4, 5, and 6, body 10 comprises an elongated casing 20 made of metal or the like. The casing has a back 22, and along the sides elongated and opposed, inwardly turned flanges 24, 26. Beneath flanges 24, 26 are elongated shoulders 28, 30 and side walls 32, 34 that define, with the under surfaces of flanges 24, 26, elongated grooves or guides 36 extending longitudinally of the applicator body. Guides 36 are for slidably receiving clip holder 12.

Between guides 36, viewing the casing as in FIG. 6, is an elongated channel 38 defined by side walls 40, 42 and the upper surface of back 22. With reference now to FIG. 4, channel 38 is divided by a vertical flange 44 extending along the middle thereof.

Referring to FIG. 4, extending within channel 38 on one side of flange 44 toward one end of the casing and then returning on the other side of flange 44, so as to define an elongated loop, is an elongated coiled tension spring 46. Anchoring one end of the spring is a hook 48 integral with flange 44. A guide 50 trains the spring as it travels around the forward end of flange 44, and thus defines the shape of the loop of the spring. The other end of the spring is secured to a catch 52.

As can be seen with reference to FIG. 3, catch 52 has a lower lip 54. Also as can be seen in FIG. 3, back 22 of casing 20, adjacent the right end of the casing in FIG. 3, is provided with a slot 56. In FIG. 3, catch 52 is adjacent the end of casing 20 opposite the end of the casing having slot 56, and the catch rests on the upper surface of back 22.

The catch, together with the end of spring 46 secured thereto, is shiftable to and fro along the length of the casing. The catch may be shifted to the right in FIG. 3, to place the catch over slot 56. It should be noted that catch 52 has an upper portion 52a disposed above the connection of the spring with the catch. A plunger 92

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(to be described in greater detail later) is provided to shift the catch from left to right in FIG. 3.

Plunger 92 in FIG. 3 is shown bearing against upper portion 52a of the catch. With continuing reference to FIG. 3, when the plunger is used to move the catch from left to right, the catch moves under urging of the plunger, which is pushing on the top or upper portion 52a of the catch.

Because the plunger pushes against upper portion 52a of the catch when it is used to move the catch, and because the spring is connected to the catch at a point below upper portion 52a, during movement of the catch by the plunger a force is exerted on the catch which would result in end 54a of the lip dropping downwardly in FIG. 3, were it not prevented by backing 22 that underlies the catch. However, when catch 54 starts to move over slot 56, then end 54a of the lip is over an opening (provided by slot 56). When this occurs, end 54a is enabled to drop downwardly into the opening provided by slot 56, and an actual twisting of the catch in a clockwise direction occurs. This results in the catch finally positioning itself as shown in FIG. 5, when the catch is moved to the far right end of the casing.

Spring clips 60 are provided for holding the catch at the right end of the casing as shown in FIG. 5. The sides of the catch are held within corners 58 of the spring clips. One of the clips 60 is secured to flange 44 and the other one is secured to side wall 42. Spring 46 as shown in FIG. 4 is in an energized condition, and spring clips 60 and slot 56 constitute releasable hold means holding the spring in its energized condition. Springs 60 have opposed inclined ends 62 that may be wedged apart by the insertion of a member therebetween to free notches 58 of catch 52. When the catch is so freed, the end of the spring connected to the catch is released freeing the spring so that it can contract.

Pincer arms 16, 18 are secured to opposite sides of casing 20. The arms are resilient, and have a tendency to spread outwardly against stops 72 secured to the casing, and disposed intermediate the ends of the arms. Inturned ends 16a, 18a of the arms are constructed to hold a clip immediately prior to its insertion into tissue, as will be described later.

At the right end of the casing and secured thereto are spring clips 70, disposed one on one side and one on the other side of the casing. These are to hold clip holder 12 in operative position on the applicator body, while enabling it to be moved out of position when it is desired to remove the holder.

Considering now details of clip holder 12, and with reference now to FIGS. 1, 7, and 8, the holder comprises an elongated forked member having a center fork 78, and on either side outer forks 82. The center and outer forks are joined together at end 12a of the holder. The ends of the forks at end 12b of the holder are unjoined. Between the forks there are elongated slots 80 that are open at end 12b of the holder opposite end 12a. End 12b is the clip discharging end of holder 12.

The embodiment of the invention illustrated is designed to handle suturing clips of the type described in applicant's Patent 2,684,070. Each comprises a middle portion 83, loops 84, 86 and bent prongs extending to one side of the plane of the middle portion and indicated at 88. For a more complete description of such clips, reference is made to the patent referred to.

The clips fit within slots 80 with bent prongs 88 of the clips extending normally of the slots. Forks 82 of the holder are provided with grooves 90 (see FIG. 8) that receive the loops of the clips. Viewing the underside of the holder, as in FIG. 7, the bent prongs extend upwardly from the page. Grooves 90 define a path for clips along the holder that is substantially straight whereby binding of the clips is prevented, and the clips are held by the grooves in such a manner that they will not become disarranged therein. The grooves and slots constitute means

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defining a magazine for clips in the holder, such magazine being loaded with clips through the expedient of moving them inwardly past the unjoined ends of the forks.

Plunger 92 is slidably mounted on the clip holder. Plunger 92 has divergent ears that extend into grooves 90, and a front side 96 (see FIG. 1) and rear flaps 97 (see FIG. 7) that slide over opposite faces of middle fork 78. The ears of the plunger during use of the applicator contact rear portions of the rearmost clip in the holder and urge this clip and the row in front of it forwardly toward the clip discharging end of the holder. A thumb rest for the plunger is indicated at 98. Such is provided for retracting the plunger along the middle fork of the holder prior to removing the holder from applicator body 10. A stop 100 (part of the center fork of the clip holder) limits rearward movement of the plunger on the holder.

As already indicated, spring clips 60 and slot 56 constitute releasable hold means for holding spring 46 in an extended or energized condition. The clip holder and plunger are provided with means whereby (1) the releasable hold means is actuated to release the spring, and (2) the catch engages the plunger so as to urge it toward the clip-discharging end of the holder with the holder occupying the operative position illustrated in FIG. 1.

Specifically, a lug 102 integral with end 12a of the holder projects out from the bottom side of the clip holder. With the clip holder in operative position on body 10, lug 102 of the holder positions itself between spring clips 60 and spreads them apart. This releases catch 52 from the spring clips.

Plunger 92 has a finger 104, that with the holder slid into operative position on body 10, and for all positions of the plunger is in front of catch 52. Finger 104 is in the path of catch 52 when the catch is drawn toward the clip-discharging end of the holder, and thus on release of catch 52 and after some contraction of spring 42, the catch engages finger 104 to transmit the bias of spring 46 to plunger 92. The catch and finger 104 constitute disengageable connecting means in the applicator connecting spring 46 and the plunger.

As will be seen in FIG. 3, with holder 12 on body 10, the lower end of finger 104 has an elevation slightly above the top of spring clips 60. This same relationship is true when the holder is being slid onto and off of body 10. Thus, finger 104 never engages spring clips 60, to spread them apart, etc.

As can be seen in FIG. 5, with catch 54 in slot 56 and as already discussed, the catch has dropped into the slot, which means that the catch is at a lower elevation than when it is out of the slot, and in the position, for instance, shown for the catch in FIG. 3. With the catch dropped into slot 56 (which, as will be explained, is the position of the catch during removal and replacement of holder 12 on body 10) as shown in FIG. 5, the top of the catch is below the bottom of finger 104. This means that finger 104 may move freely over the catch during removal and replacement of the holder. It is only after the holder is in place on body 10, and after the catch is released from spring clips 60 and out of slot 56, that the top of the catch moves upwardly to be in a position to engage finger 104 on movement toward and against the finger.

A strong bias is exerted by spring 46 on plunger 92 throughout movement of the plunger along the entire length of the holder because of the looped shape of the spring. The spring undergoes only a portion of total possible contraction of the spring in moving the plunger the length of the holder. It is an important feature of the invention that the spring is mounted on the applicator body and the holder on removal from the applicator body is separated from the spring. This makes the clip holder easier to handle when it is removed from the applicator body, and eliminates any chance of inadvertently deener-

gizing the spring with the spring out of the holder thus to complicate reassembly of the parts. Also important is that biasing of the plunger is only with the parts assembled. The plunger with the holder removed from the applicator body is free of any bias, which makes the holder easier to load. Clips do not tend to be forced out the end of the holder during loading, and the plunger stays in any position it is set. It is only with assembly of the holder on the applicator body that forward urging of the plunger is produced through the tension spring described.

As already indicated grooves 90 direct clips toward the clip discharging-end of the holder with the clips traveling in substantially a straight line. In using the applicator, however, it is important that each clip immediately prior to its being inserted into tissue be moved out and to one side of the plane of the clips in the holder, so that the clip and the tissue to which it will be applied will be exposed to the eyes of the person using the applicator. Further, it is important that the clip be held in such a position that the holder can be inclined at an oblique angle relative to the clip and the tissue beneath it. This enables a surgeon to hold the applicator conveniently while applying a clip and to draw arms 16, 18 together easily while bending a clip.

With the clip holder mounted in place, grooves 90 of the holder terminate directly adjacent inturned ends 16a, 18a of the pincer arms, as can be seen in FIG. 1. The arms (see FIGS. 1 and 2) contain grooves 106, 108 that have opened ends such as end 106a, of groove 106 directly in front of the ends of grooves 90. The grooves, progressing from their opened ends, turn and then extend at an oblique angle relative to grooves 90 and the path they define for the clips down the clip holder. This portion of groove 106 is indicated at 106b.

Further, it will be noted, that the inturned ends 16a, 18a of the arms have surface portions (indicated at 110 for end 16a) that extend at an oblique angle relative to the plane of grooves 90, in the same direction as do the oblique portions of the grooves. By reason of the oblique positioning of the surface portions of the inturned ends, and the oblique positioning of portions of grooves 106, 108, a clip, on traveling from the clip holder into the pincer arms, turns at an angle. The clip positions itself with the body thereof more or less occupying the plane of the oblique portions of the groove. The prongs of the clip extend out at an oblique angle, as illustrated generally in FIG. 2. The dashed line 112 indicates generally the level of a tissue surface that is to have a clip applied thereto. By inspecting FIG. 2, it will be seen that a surgeon holding the applicator and looking down on the tissue can readily see the clip that is to be applied, as well as the tissue underneath it. Further, the holder is at an angle that promotes easy gripping of the applicator and the pincer arms.

Explaining the operation of the applicator, to load the clip holder the operator places his thumb over thumb rest 98 and pulls plunger 92 backwardly against stop 100. This places catch 52 close to but not directly over slot 56. The operator then removes the holder by continuing to pull on plunger 92 using the thumb rest, with the result that the holder snaps out of springs 70 and slides out of applicator body 10. As the holder is removed, the catch moves over slot 56 (and drops downwardly into the slot as shown in FIG. 5) and between spring clips 60. The catch drops downwardly, since when the plunger is pulled against the catch, it bears against an upper portion of the catch, and spring 46 is pulling on a lower portion. The spring clips latch onto the catch, and function to hold the spring in an energized, extended condition. With the holder completely withdrawn, the plunger is freely slidable on the holder, and clips may easily be inserted into the holder with the plunger out of the way.

To replace the holder, the same is fitted within the grooves 90. On the holder being advanced into operative

position, finger 104 moves freely over the catch (as the catch is dropped in slot 56) and on further movement of the holder lug 102 moves between spring clips 60 and frees the catch. On release of the catch it moves out of slot 56 and then forwardly against finger 104 and the bias of the released spring is now exerted on the plunger. Clips just loaded in the clip holder are urged down the magazine and into the grooves provided the ends of the pincer arms for holding a clip immediately before its insertion.

To apply a clip, the ends of the pincer arms are rested on tissue as described, and the pincer arms are then drawn together against their tendency to spread apart. This bends the clip held by the arms, with the clip embedding itself in tissue. On release of the pincer arms, the arms spread apart to place grooves 106, 108 in receiving position for another clip. The clip behind the one just applied is shifted into place under the urging of the plunger, and a new clip is now ready to be applied.

I claim:

1. In an applicator for clips, said applicator having an applicator body with means for clinching clips, a clip holder removably mounted on said applicator body with walls defining an elongated magazine for clips and with a clip-discharging end adjacent said means for clinching clips, a plunger slidably mounted on said clip holder for movement toward and away from said clip-discharging end, spring means mounted on the applicator adjacent said clip holder, releasable hold means for holding said spring means in an energized condition, means interposed between said spring means and plunger whereby said plunger is urged toward said clip-discharging end on release of said releasable hold means and means on said clip holder for releasing said releasable hold means when said clip holder is moved into operative position on said applicator body.

2. The applicator of claim 1 wherein said means interposed between said spring means and plunger comprises a catch secured to said spring means, and said releasable hold means comprises spring-operated holding means mounted on said body for latching said catch, said means on the clip holder engaging said spring-operated holding means to release said catch when said clip holder is moved into its operative position on said applicator body.

3. In an applicator for clips, said applicator having an applicator body with means for clinching clips, a clip holder removably mounted on said applicator body with walls defining an elongated magazine for clips and with a clip-discharging end adjacent said means for clinching clips, a plunger slidably mounted on said clip holder for movement toward and away from said clip-discharging end, elongated spring means mounted on said applicator body extending alongside said clip holder, means interposed between the spring means and plunger whereby the spring means is operable to urge the plunger toward said clip-discharging end, and releasable hold means mounted on said applicator body for holding said spring means in an energized condition.

4. In an applicator for clips, said applicator having an applicator body with means for clinching clips, a clip holder removably mounted on said applicator body with walls defining an elongated magazine for clips and with a clip-discharging end adjacent said means for clinching clips, a plunger slidably mounted on said clip holder for movement toward and away from said clip-discharging end, a tension spring formed in an elongated loop substantially paralleling said holder and mounted on said applicator body alongside said holder, said applicator body including means defining the shape of the loop of the spring, means anchoring one end of said spring to said applicator body, means interposed between the other end of said spring and said plunger whereby said spring is operable on contraction to urge said plunger toward said clip-discharging end of said holder, the latter means accommodating tensioning of the spring by shifting of the

plunger to the end of said holder opposite its clip-discharging end, and releasable hold means mounted on said applicator body for holding said spring in an energized condition with the clip holder removed from said applicator body.

5. In an applicator for suturing clips, said applicator having an applicator body with means for clinching clips, a clip holder removably mounted on said applicator body with walls defining an elongated magazine for clips and with a clip-discharging end adjacent said means for clinching clips, a plunger slidably mounted on said clip holder for movement toward and away from said clip-discharging end, elongated spring means mounted on said applicator body extending alongside said clip holder, means interposed between said spring means and plunger whereby the spring means is operable on deenergizing thereof to urge said plunger toward said clip-discharging end, said spring means being energized on shifting of the plunger to the end of said holder opposite said clip-discharging end, releasable hold means mounted on said applicator body for holding said spring means in an energized condition with the clip holder removed from said applicator body, and means interposed between said clip holder and body operable to release said releasable hold means on said clip holder being moved into operative position on said applicator body.

6. In an applicator for suturing clips, an elongated applicator body, means for clinching clips at one end of said applicator body, an elongated clip holder, guide means extending longitudinally of said applicator body providing a mounting for the clip holder on said body, said clip holder being slidable on said mounting in a direction away from said means for clinching clips to remove it from said applicator body, said clip holder having walls defining an elongated magazine for clips extending longitudinally of the holder and a clip-discharging end adjacent said means for clinching clips, a plunger slidably mounted on said clip holder for movement toward and away from said clip-discharging end, an elongated spring mounted on said body extending longitudinally of said clip holder, means anchoring one end of said spring on said applicator body, releasable hold means mounted on said applicator body for holding the other end of said spring with said spring in an energized condition, means interposed between the spring and plunger whereby the plunger is urged toward said clip-discharging end on deenergizing of said spring, said spring being energized through the expedient of shifting said plunger to the end of said holder opposite said clip-discharging end, and means interposed between said clip holder and applicator body for releasing said releasable

hold means on said clip holder being moved into operative position on said applicator body.

7. In an applicator for suturing clips, said applicator having an elongated applicator body and elongated opposed pincer arms on opposite sides of said body for clinching clips, means on the ends of the arms for holding clips prior to clinching them with the applicator extending obliquely of the clips, said means comprising oppositely disposed inturned end portions, said inturned end portions having supporting surface portions on corresponding sides that extend obliquely of and in the same direction with respect to the longitudinal axis of said applicator body, and complementing slots in said end portions for receiving the ends of clips with the clips between the arms, said slots having an open set of ends for the feeding of clips thereinto, said slots having portions away from said open set of ends extending obliquely in the same direction relative to the longitudinal axis of said body as do the supporting surface portions of said end portions.

8. The applicator of claim 7 and in addition means for feeding clips to said slots comprising a clip holder removably mounted on said applicator body with walls defining an elongated holder for clips, said holder having a clip-discharging end disposed in feeding relation with respect to the open ends of said slots.

9. An applicator for suturing clips comprising an elongated applicator body, means for feeding clips to one end of said applicator body, elongated opposed arms mounted on said body on opposite sides thereof for clinching clips by pinching opposite ends of the clips together, said arms having a set of ends adjacent said one end of the applicator that have means for holding clips prior to clinching them with the clips between the arms, said means for holding clips comprising means defining complementing slots in said set of ends of the arms that substantially parallel each other and that extend obliquely and in the same direction to one side of the applicator, said slots having an open set of ends for the feeding of clips thereinto positioned in receiving relation to said means for feeding clips, the obliquely extending portions of said slots being to one side of said open set of ends.

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**UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION**

Patent No. 3,047,874

August 7, 1962

Walter L. Kelsey

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

In the grant, lines 2 and 11, and in the heading to the printed specification, line 4, for "W. D. Dailey", each occurrence, read -- W. O. Dailey --.

Signed and sealed this 1st day of January 1963.

(SEAL)

Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
Commissioner of Patents