Sept. 30, 1958 A. G. JUILFS 2,853,707

STAPLE SUPPORTER TO ENABLE THE PIERCING OF METAL

Filed May 28, 1954

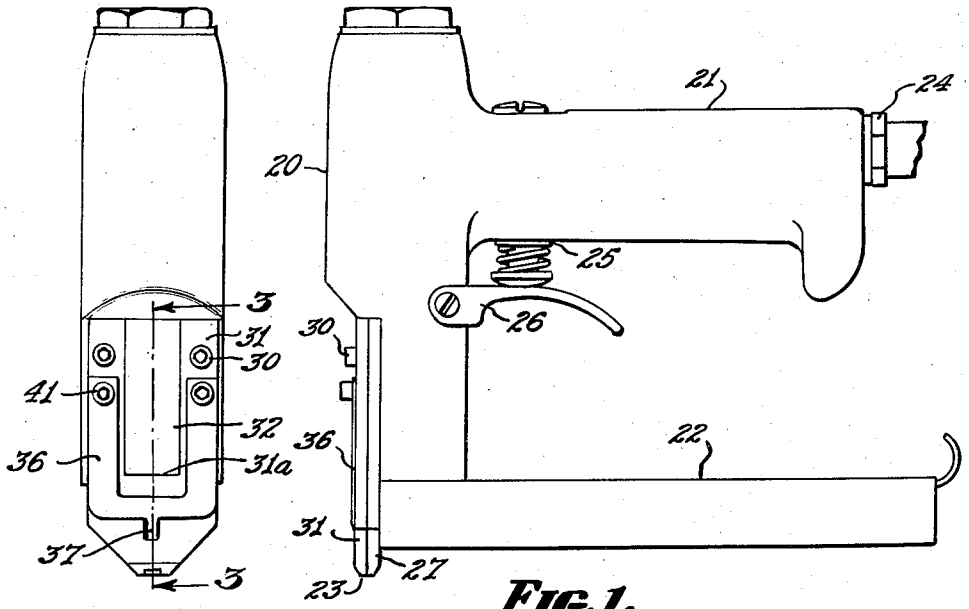

FIG. 2.

FIG. 1.

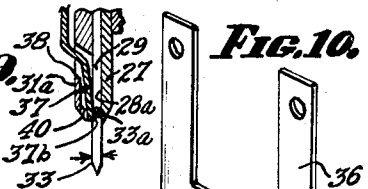

FIG. 9.

FIG. 10.

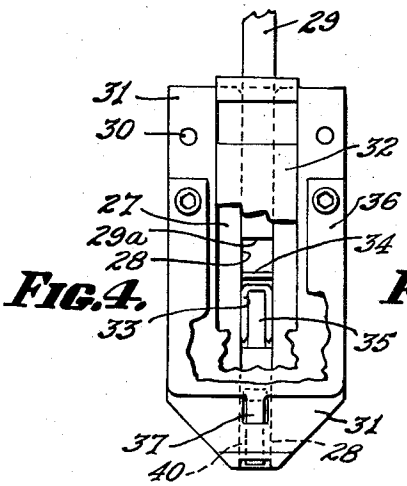

FIG. 4.

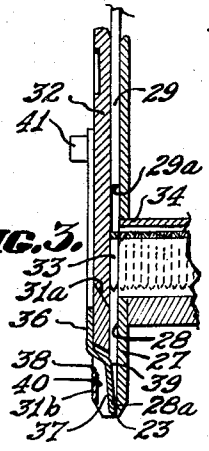

FIG. 3.

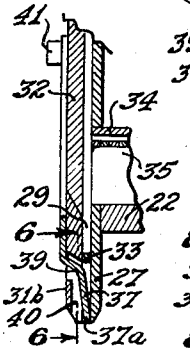

FIG. 5.

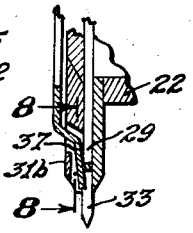

FIG. 7.

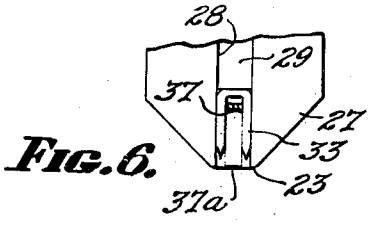

FIG. 6.

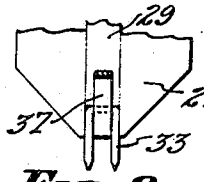

FIG. 8.

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STAPLE SUPPORTER TO ENABLE THE PIERCING OF METAL

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Application May 28, 1954, Serial No. 433,056

4 Claims. (Cl. 1—49)

My invention resides in the provision of means by which the legs of a staple may be supported on all sides throughout their full length as the staple is driven into or through a piece of wood, metal or other very hard substance.

In recent years pneumatic tackers and stapling machines have come to be very popular in production line work in many industries. With this great increase in the popularity of these pneumatic tackers has come a corresponding increase in demands for tackers that will perform an even greater number of jobs.

One of the demands most often expressed has been for a tacker or stapling machine that would drive a staple through metal and other hard substances. Such a machine, however, in order to be successful, must not be of unusual weight or cost.

Accordingly, it is an object of my invention to provide a stapling machine which will drive a staple through metal and similar hard substances, which stapling machine is substantially no heavier nor more difficult to use than those popular tackers now on the market but which are presently incapable of driving staples through metal.

It is also an object of my invention to provide a stapling machine of the type described which does not require the use of special, heavy staples nor extra high air pressures.

Another and important object of my invention is to provide means which may easily be made as an attachment for some of the stapling machines already on the market, such attachment enabling the machine to drive staples into hard materials which could not formerly be so stapled.

A further object of my invention is to provide a staple supporter of the type described which may be made a part of a pneumatic stapling machine without adding materially to its cost.

These and other objects of my invention will become apparent to those skilled in the art during the course of the following description and from reference to the accompanying drawing, in which drawing like numerals are employed to designate like parts throughout, and in which

Figure 1 is a side elevation of a pneumatic tacker employing the instant invention,

Figure 2 is a front elevation as seen from the left of Figure 1,

Figure 3 is an enlarged section taken on the line 3—3 of Figure 2,

Figure 4 is a view taken from the left of Figure 3 with parts in section and parts broken away,

Figure 5 is a view similar to that of Figure 3 but showing the position of the parts during a different stage in the driving of a staple,

Figure 6 is a view taken on the line 6—6 of Figure 5,

Figure 7 is a view similar to that of Figures 3 and 5 but showing a more advanced stage in the driving of a staple,

Figure 8 is a view taken on the line 8—8 of Figure 7,

Figure 9 is a view similar to that of Figures 3, 5 and 7 but showing a still more advanced stage in the driving of a staple, and

Figure 10 is an enlarged perspective view of the principal member of this invention.

My invention is particularly suited for application to stapling machines of the general type shown in Figures 1 and 2. Pneumatic stapling machines to which this invention might also be applied are shown in my Patents 2,585,939; 2,585,940; 2,585,941; Re. 23,756; 2,671,214; and in my copending applications Serial Numbers 345,489 and 346,595.

Referring now to Figures 1 and 2 there is shown a pneumatic tacker comprising a main body portion **20**, a handle **21**, a staple feed magazine **22** and a nose generally indicated at **23**. A swivel assembly **24** connects the tacker with a suitable air supply and the admission of the air into the body of the tacker is controlled by a valve mechanism **25** actuated by a trigger assembly **26**.

As shown throughout the figures the nose **23** comprises a base plate **27** having a staple drive track **28** formed therein. This drive track or groove **28** extends through the full length of the base plate **27** and is adapted to just nicely receive a staple driver **29**.

Bolted or otherwise secured to the base plate **27**, as indicated at **30** is a top or cover plate **31**. The plate **31** is generally U-shaped and receives between the legs of the U a removable plate **32**. The plate **32** extends within the body **20** of the tacker where it abuts a spring, not shown, which normally serves to wedge the plate **32** against the inner edge **31***a* defining the lower edge of the bridge of the U of the member **31**.

It will be understood that staples are fed by any suitable means located within the mazagine **22** to a position wherein each successive staple lies within the passageway **28** and against the removable cover plate **32**. Upon actuation of the tacker the end **29***a* of the driver **29** will contact the crown of a staple **33** and drive it through the passageway **28** into the work to be stapled, the nose **23** being held against such work,

As shown in the figures the base plate **27** is provided with an opening adjacent which the base of the magazine **22** will abut and through which a cover **34** for the magazine will extend to a position flush with the bottom of the drive track **28**. The staples **33** straddle a bar **35** and are urged by a spring-urged follower, not shown, to a position within the drive track **28** before the driver **29**.

It is to be understood that the various mechanisms so far described do not constitute a critical limitation on this invention. Rather, I have shown a preferred arrangement for the provision of a suitable drive track to receive the staples and the staple driver. Actually the passageway may be provided in other ways. The particular means for urging the driver also do not constitute a limitation on this invention. And, of course, any suitable means **22** for feeding staples into the drive track ahead of the driver may be employed.

The chief feature of this invention resides in providing proper support for the staple legs throughout their full length as the staple is driven. This distinguishes from the known prior art devices wherein attempts have been made to provide stapling devices which would drive a staple through hard materials. These earlier attempts endeavored to support either the crown of the staple or the points thereof at the moment of piecing. None provided means for supporting the staple legs on all sides throughout their full length during the complete driving of the staple. This, however, I have done and have found extremely successful and desirable.

Referring now to Figures 2, 4 and 10, I shall describe a specific means by which the principal object of this invention may be accomplished. I may provide a

U-shaped member **36** having a finger **37** extending outwardly from the center of the bridge of the U. The member **36** overlies the top plate **31** and the finger **37** extends through an opening **38** provided in the upper plate **31**.

The member **37** is of sufficient width to just nicely be received between the legs of the staples. Also, this member will extend to a position flush with the end of the nose **23**.

The finger **37** is so shaped that when the member **36** lies flush against the cover member **31** this finger will extend through the opening **38** and the end thereof will not only be flush with the end of the nose **23** but also it will lie against the bottom **28***a* of the drive track **28** as best seen in Figures 3 and 5. In addition there must be provided a proper configuration of the member **37** so that when the crown of the staple is adjacent this finger the forward end thereof will still lie against the bottom of the drive track **28** between the staple legs. This is perhaps best illustrated in Figures 5 and 6.

In Figures 5 and 6 it will be observed that the staple **33** has been moved to a position wherein the points are just short of the end of the nose **23**. Since the member or finger **37** does not lie flat against the base **27** or drive track botom **28***a* throughout its full length, it being particularly pointed out that the end **37***a* of the member **37** lies against the base **27** while the major length thereof slants in the direction of the member **36** away from the drive track bottom **28***a*, the staple **33** may be moved to a position wherein its points are flush with the end of the nose **23** without deflecting the finger **37**. This is true at least for the particular length staple shown wherein the distance from point to crown is at least as great as the distance from the point **37***a* to the bend **39** of the finger **37**. Shorter staples, however, may be used with the same finger **37** with good results and this will be explained shortly.

In the position of the staple **33** last mentioned the crown of the staple will be right at the bend **39** in the member **37** when the points are at the end of the nose **23**. In this manner I insure that some portion of the finger **37** will in fact lie between the legs of the staple throughout their full length at the instant the points thereof are first driven into the work. Also, this central or lateral support given the staple legs by the finger **37** will be continued during the further driving of the staple into the work. In this connection it should be pointed out that it is not necessary that the full thickness of the finger **37** lie between the legs of the staple in order to give them the proper support. Rather, it is necessary only that a portion of the finger **37** extend between the staple legs throughout their full length, that is, throughout substantially the full length of the staple leg portions not yet driven into the work. Thus, considering the width of an individual staple leg as being defined by the arrows applied to the staple shown in Figure 9, it is not necessary that the finger **37** extend throughout this full staple leg width. So long as any portion of the finger **37** lies between the two legs and within the width of the legs as determined by the arrows in Figure 9, such legs will be prevented from collapsing toward one another.

By having the finger **37** slanted with respect to the plane of the staple as driven and by having the actual pivot or hinge point for the finger **37** considerably removed from the portions which must lie between the staple legs, the staple crown may move under the finger **37** almost to the very end of the nose **23** without so moving the finger **37** as to force it and the tip **37***a* completely from between the staple legs.

As stated, so long as the finger **37**, throughout the length of the staple legs not yet driven into the work, lies between these staple legs, even if only for a slight portion of the width of the staple legs, buckling of such legs towards one another will be prevented.

It will be apparent that as the staple is driven into the work it will be necessary for the member **37** to clear in some manner so that the crown of the staple does not get hung up in any way and so that some slant of the plane of the finger **37** with the plane of the staple as driven will be maintained. This I accomplish by providing a channel **40** in the member **31** which has a depth of about twice the thickness of the finger **37**. Also, the aperture **38** is sufficiently large to permit a swinging movement of the member **37**. The deep portion of the channel **40** must be adjacent this aperture. Thus, as the driver **29** forces the staple **33** out of the nose **23**, the crown passing beneath the finger **37**, this finger may move upwardly to a position within the channel **40** provided in the upper plate **31**. This position is illustrated in Figure 7.

It is pointed out that the slot or channel **40** could extend clear through the nose piece **31** thus eliminating the portion **31***b*. This would, however, weaken the structure and is not desirable. From the standpoint of function, however, especially as applied to the principle of maintaining the finger **37** or at least a portion thereof between the staple legs at all times while driven, the important thing is that the channel **40** and orifice **38** be sufficiently large and deep to permit the finger **37** to clear as the staple crown passes thereunder. And, because the finger does slant as stated and because it is desired to keep a portion of the finger and its tip **37***a* between the legs of the staple in the manner explained, the depth of such channel and orifice must be somewhat more than merely the actual thickness of the finger. If this were not so the crown would force the finger against an abutment whereupon further movement of the crown would act to straighten out the finger and force it into a plane parallel with that of the staple as driven; this would be disastrous. Obviously, when the finger **37** is forced into a plane parallel with that of the staple as driven, no portion of the finger could extend between the legs and there would be an absence of the support for the legs which I have found to be so desirable.

In order to enable movement of the finger **37** in the manner just described it is necessary that this finger have its pivot or hinge point considerably removed from the point of first contact of the staple crown with the finger. Were this not so such first contact would almost immediately cause the finger to pivot to a plane parallel with that of the staple as driven thus removing the desired support. In the particular form of the invention herein shown I form the member **36** of a tough resilient metal and secure it to the plate **31** by means **41** located towards the ends of the legs of the U-shaped member **36** itself. This arrangement provides a flexing movement of the finger **37** when the driver **29** and staple **33** pass therebeneath. It is pointed out that the arrangement of parts is such that normally the member **36** will lie flush against the member **31** and the member **37** will take the position shown in Figure 3.

I have also found, in order to insure that the end **37***a* of the finger **37** will lie between the staple legs at the instant the staple is driven into the work, and so that some portion of the finger **37** will also remain between the legs for substantially the full distance the staple is driven, that making the finger **37**, between the bend **39** and the tip **37**a, normally define an angle with respect to the plane of the staple as driven, is most important. As stated, it is desired to maintain this angular relationship during the entire driving of the staple. This insures full support of the staple legs at all times. Further insurance of this relationship may be obtained by arranging the member **37** and the finger **36** so that when the member **36** is fastened to the plate **31** by the means **41** the tip **37***a* of the finger **37** will bear against the bottom **28***a* of the passageway **28** formed in the base member **27**.

The slight resiliency of the member **36**, the securing of the member **36** as at **41**, this being remote from the

finger 37, the size of the aperture 38 and the clearance provided by the channel 40 make it possible for the finger 37 to clear so as to permit the crown of the staple 33 and the staple driver 29 to pass thereunder as the staple is driven completely into the work, and at the same time maintain at least a portion of the thickness of the finger 37 between the legs of the staple.

It is important that the plane of the finger 37 extend diagonally through the plane of the staple as driven, that considerable clearance be provided adjacent the finger 37 where it will first be contacted by the staple crown, and that the true pivot point for this finger be located considerably removed from this point of first contact of the crown with the finger. Such arrangement insures a maximum angle of the finger with respect to the plane of the staple as driven. Such an angle is necessary in order for some portion of the finger 37 to remain between the staple legs up to the moment the last portion of the staple is driven into the work. Obviously, the steeper the angle the greater will be the chance of keeping some portion of the finger 37 between the staple legs up to the final moment. On the other hand, however, if the angle is too great then initially there would be no support for those portions of the staple legs which are adjacent the crown and this is undesirable. As emphasized throughout the specifications, there must be some support throughout the full length of the staple legs and not just at the points or crown.

The relationships just discussed are perhaps best brought out in Figure 9 wherein the staple is shown as almost driven completely from the nose 23 by the driver 29. Even at this stage in the driving of the staple 33, however, it will be observed that the corner 37*b* of the finger 37 still lies between the staple legs within the width thereof as defined by the arrows in this figure. The interposition of this corner between the staple legs is sufficient to keep them from buckling towards one another. In addition it must be remembered that by this time the major portions of the legs are embedded in the work and initial piercing has been accomplished.

It is contemplated that this invention may be applied to staples of varying lengths. The instant illustration employs a staple 33 in which the distance between the points and crown is substantially the same as the distance between the tip 37*a* of the finger and the bend 39 imparted therein. A shorter staple, however, could be employed with this same finger. Although it is true that the staple crown would strike the finger 37 before the points reached the work, because of the angular relationship above explained in detail portions of the finger 37 would still lie between the staple legs. Thus, such support would extend from the corner 37*b* to the point of contact of the crown with the finger 37. Thus the legs would still be supported substantially throughout their full length as the staple is driven. To repeat by way of emphasis in this connection, it is not necessary that each staple leg 33 be supported throughout its full width as defined by the arrows shown in Figure 9. Rather, it is of primary importance only that the support extend between the staple legs within the region of these arrows. However slight this penetration may be it will be sufficient, due to the inherent strength of the staple wire, to prevent collapse of the legs towards one another. Such inherent strength is sufficient to prevent the individual staple leg from folding about the corner 37*b* of the finger 37.

Referring particularly to Figures 3, 4, 5 and 7 my invention operates as follows. A staple 33 is moved against the closure plate 32 to a position before the end 29*a* of the staple driver 29 and within the drive track 28 provided in the base plate 27. The particular means of so positioning the staple does not constitute a part of this invention. Also the exact arrangement of the base plate, cover plate and drive track does not constitute a limitation. Any means for positioning a staple within a drive track in which a staple driver operates will suffice, subject only to the limitations emphasized below.

In this form of my invention the nose of the tacker must be so configured that a member 36 may be fastened to the outside thereof and so that the finger 37 may extend through a suitable aperture to a position wherein the tip 37*a* lies flush with the bottom of the staple drive track 28. This drive track must be of a size to just nicely receive the staple. The finger 37 must be of a size, and must be positioned with respect to the drive track, to just nicely fit between the legs of the staple as moved in the drive track.

Also, in my invention the nose must be provided with a second channel or similar clearance of a width to just nicely receive only the member 37 and of a depth at least about twice the thickness of the finger 37. This not only makes it possible for the member 37 to clear so as to permit the crown of the staple 33 and the staple driver 29 to pass thereunder, but it also insures that the point of the staple is supported on all sides at the moment it must pierce the work and that the legs are similarly supported throughout the driving of the staple. The channel should not be so wide as to permit the staple to go into the channel also for this would eliminate support for the legs on the side opposite the bottom of the drive track.

After the staple 33 has been initially positioned within the drive track 28, the staple driver is actuated in some manner, which manner does not constitute a limitation of this invention. As the driver 29 moves within the drive track 28 the end 29*a* of the driver will contact the crown of the staple, break it from the staple strip and force it from the end of the nose. As the staple approaches the end of the nose 23 as seen in Figures 5 and 6, the finger 37 will remain between the legs of the staple, slanting from a deep penetration of the tip 37*a* within the widths of the staple legs to a lesser degree adjacent the crown. This is insured by the angle defined by that portion of the finger 37 extending between the point 39 and the tip 37*a* and the plane of the staple as driven. Further movement of the staple 33 by the driver 29 will bring the points of the staple in contact with the work. At this instant the staple is supported about all sides of its pointed legs. This support is provided by the plate 27, the finger 37 and the member 31. The slot 40, which is formed in the member 31, is wide enough only to receive the member 37, thus insuring complete support of the staple legs in the manner described.

As the staple 33 is then driven through the work in the manner shown in Figure 7, the member 37 is pushed within the channel 40 so that the crown of the staple and the driver 29 may pass therebeneath. The forward part of the finger 37, however, will still be between the staple legs even when the crown contacts the rear part of this finger. This is insured by the angle the finger makes with the plane of the staple as driven. Even as the crown approaches the tip 37*a* the lower corners 37*b* thereof will lie between the legs, see Figure 9. Upon completion of the setting of the staple and return of the driver 29 to the position indicated in Figure 3, the member 36 and finger 37 will, due to their resilient construction and pivoted mounting as at 41, again take the position indicated in Figures 3 and 5.

It will be understood that certain modifications may be made in my invention without departing from the scope and spirit thereof. It will also be understood that while I have shown my invention as embodied in certain specific structures, I do not intend to be limited by such structures except insofar as they are specifically set forth in the subjoined claims.

Having thus described my invention, what I claim as new and what I desire to protect by United States Letters Patent is:

1. In a stapling device comprising nose structure defining a staple drive track having a bottom along which staples are moved, a staple driver, means to actuate said driver, and means to position a staple in said track to be driven by said driver, the improvement which comprises: a staple supporter comprising a finger to extend between the legs of the staple to be driven, said finger extending from a position substantially flush with the staple discharge end of the nose structure and with the drive track bottom rearwardly a distance at least as great as the length of the staple to be driven and away from the track bottom by an amount about equal to the width of a staple leg, means pivotally mounting said supporter to said device, and said nose structure defining a clearance for said finger only, said clearance being located opposite said track bottom.

2. A staple supporter for stapling devices of the type comprising a nose piece defining a staple drive track having a bottom along which staples are moved, a staple driver, means to move said driver in said track, and means to position a staple in said track in the path of said driver, said staple supporter comprising: a flat finger of a width substantially equal to the distance between the legs of the staple; said finger normally being in a plane angularly disposed with respect to the plane of the staple as driven, the forward end of said finger abutting the bottom of said drive track adjacent the forward end of said nose piece, said finger extending rearwardly towards the crown of said staple; means to pivotally mount said finger on said stapling device at a place relatively remote from the place at which said crown first contacts said finger when moved forwardly by said staple driver; and said nose piece defining a clearance for said finger only into which said clearance said finger may move without obstruction as the crown of the staple and the staple driver pass beneath said finger, said clearance being located opposite said track bottom; said finger being at least as long as the said staple to be driven; whereby a portion of the supporter lies between the staple legs throughout substantially the full length thereof during such time as the staple remains in the stapling device.

3. In a stapling device comprising nose structure defining a staple drive track having a bottom along which staples are moved, a staple driver, means to actuate said driver, and means to position a staple in said track to be driven from said device by said driver, the improvement which comprises: a staple supporter comprising a flat finger substantially as wide as the distance between the legs of the staple to be driven and substantially as thick as the width of a staple leg and at least as long as the staple legs, said track being substantially only as deep as the width of a staple leg, said supporter extending from a position adjacent the forward end of the device and flush with the drive track bottom rearwardly towards the crown of the staple to be driven and away from said track bottom by an amount about equal to the width of a staple leg,

said nose structure defining a clearance opposite said track bottom and wide enough to receive said supporter only, said clearance being greater than the thickness of said finger, whereby upon movement of said staple in said track to a position wherein the points of the staple legs are flush with the forward end of the device said supporter will extend between the staple legs throughout their full length, and means to pivot said supporter in said device at a place relatively remote from the place at which the staple crown will engage the supporter upon further movement of the staple, whereby a portion of said supporter will remain between the staple legs throughout substantially the full length thereof within the device during complete driving of the staple into work.

4. In a stapling machine having a nose member defining a staple drive track having a bottom along which staples are moved and having means to feed a succession of staples into said drive track and having a staple driver movable in said drive track to drive a staple through said nose member into work to be stapled; the improvement which comprises a support member flexibly mounted on the outside of said nose member, a finger on said support member, said finger being substantially of the same width as the distance between the legs of a staple, said nose member having an aperture to receive said finger, said finger extending through said aperture to a position in which at least the forward end of said finger normally abuts the bottom of said drive track flush with the forward end of said nose member, said nose member defining a channel opposite said track bottom and of such size to receive said finger only, and said finger normally slanting back from its forward end to a bend therein, the distance between said forward end and said bend being about the same as the length of the staple legs, and said bend being spaced from the bottom of said drive track a distance slightly less than the thickness of the staple crown, whereby said finger may be moved out of said drive track into said channel when said staple driver drives a staple through said nose member.

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