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STAPLE SUPPORTER FOR STAPLING MACHINES

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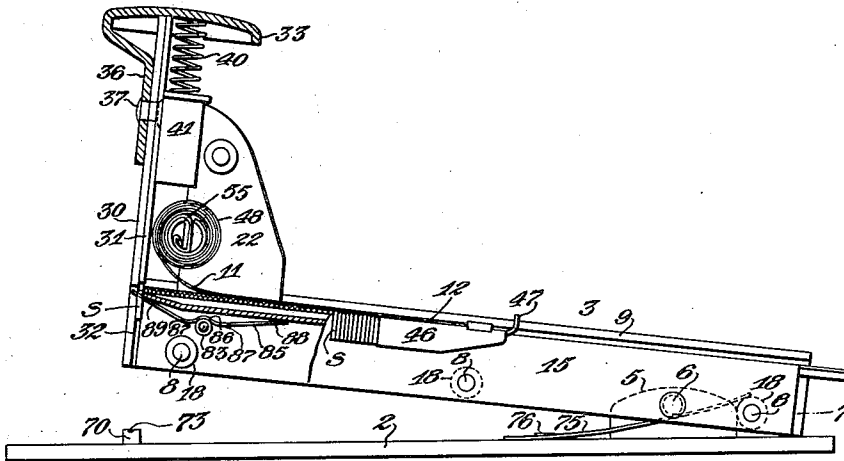


Fig. 1.

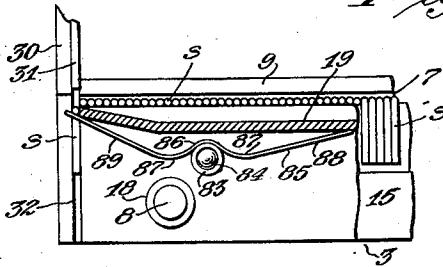


Fig. 2.

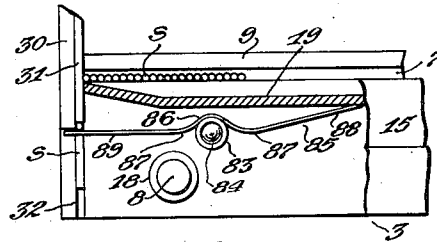


Fig. 3.

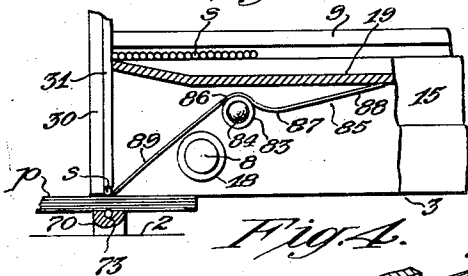


Fig. 4.

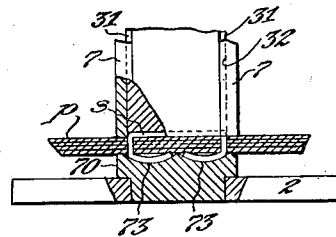


Fig. 6.

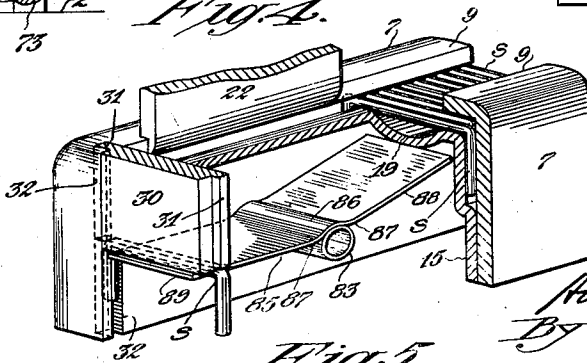


Fig. 5.

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STAPLE SUPPORTER FOR STAPLING MACHINES.

Application filed June 10, 1922. Serial No. 567,304.

This invention relates to stapling-machines for fastening together sheets of paper or the like, and consists in improvements in the means for controlling the delivery of the staples to the work.

One object of the improvement is to provide means for preventing the feeding of a new staple into position to be operated upon before the previously fed staple has been inserted and clinched through the work.

Another object of the improvement is to provide means for maintaining the staples in predetermined relation with the staple-driver during the stapling operation so that they may be properly driven through the work without danger of their becoming misaligned and jammed in the machine.

Another object of the improvement is to prevent the staples from accumulating in the guideways beneath the driver to cause one staple to be driven on top of another or to result in clogging the machine.

Further objects of the improvement are set forth in the following specification which describes a preferred embodiment of the invention as illustrated in the accompanying drawings.

In the drawings:

Fig. 1 is a side elevation of one type of stapling-machine illustrating my improvements applied thereto, the machine being shown with one of the side-plates of the stapling-arm removed, and its fore part in vertical section to disclose the arrangement of the staple-feeding and staple-driving mechanisms;

Fig. 2, an enlarged, vertical sectional view of the fore part of the stapling-arm showing the arrangement of the staples in the magazine thereof;

Fig. 3, a similar view illustrating the staple-driver at the beginning of its descent to drive the staple through the work and showing the cooperative relation of the staple-supporter therewith;

Fig. 4, a similar view illustrating the staple-driver at the bottom of its descent and showing the manner in which the staple-supporter is released from the staple as the latter is clinched through the work;

Fig. 5, an enlarged perspective view of the fore part of the stapling-arm showing it partly in section to more clearly illustrate the action of the staple-supporter; and

Fig. 6, a front view of the lower portion of the machine showing the staple-clincher or anvil in section.

My present improvements are adapted for use with practically all types of wire-stitchers or stapling-machines, but I have preferred to herein illustrate them as applied to a hand-operated device such, for instance, as that shown and described in my copending application, Serial No. 567,303, filed concurrently herewith. As shown in Fig. 1, this type of apparatus comprises essentially a relatively flat base 2, to which is hinged a stapling-arm 3 having a magazine for carrying a supply of staples *s*. The base 2 is preferably constructed from sheet-metal in the form of a flat strip having an opening at its rearward end with two integral ears 5 projecting from the sides thereof and bent upwardly at right-angles to adapt them to receive the cross-pin 6 on which the arm 3 is pivoted between the ears. The arm 3 comprises two opposite side-plates 7 provided with inturned flanges 9 extending along the top. The side-plates 7 abut the lower sides of a hollow core 15 which is constructed of sheet-metal bent into inverted U-shaped in cross-section. Extending between the side-plates 7 are a plurality of rivets 8 which are inserted through suitable hubs or sleeves 18 bridging the space between the sides of the core 15. The ends of the hubs 18 abut the inner walls of the core 15 to hold the latter against the side-plates 7, and the ends of the rivets 8 are headed over on the outside of the plates, as shown in Fig. 1, to secure the parts together to form the hollow arm 3.

As shown in Fig. 5, the core 15 has its upper sides offset inwardly away from the walls of the side-plates 7 to provide relatively deep slots or guideways in which the legs of the staples *s* slide. The top of the core 15 is recessed or depressed at the center in the concaved portion 19 which provides that when the staples are straddled across it they will rest on its two opposite raised points so that less friction is encountered in sliding them along the core. Toward the forward end of the core 15 the recess is gradually decreased in depth and finally disappears.

At the forward end of the arm 3 the opposite side-plates 7 are formed with vertical uprights 22 extended from the inwardly-

bent flanges 9 and spaced apart in parallel relation a distance equal to the space between the edges of the flanges. The up-
rights 22 are provided with vertical guide-
ways for supporting the reciprocable staple-
driver 30 which is adapted to slide down-
wardly through opposite grooves 32 at the
forward end of the side-plates 7. The ar-
rangement of the upper guideways for the
driver 30 is not herein shown or described
in detail as this part of the mechanism may
be of any usual construction, see for instance
the disclosure in my copending application
above referred to. Suffice it to state that the
driver 30 consists essentially of a flat plate
of hardened metal having its vertical edges
provided with relatively narrow flanges or
fins 31 which slide in the grooves 32 at the
forward end of the arm 3. Resting against
the upper edge of the driver 30 is a presser
or hand-knob 33 which has a depending ex-
tension or front-plate 36 riveted to the front
face of the driver at 37. Held between the
uprights 22 is a socket 41 in which is pock-
eted a helical spring 40 which bears against
the under side of the knob 33 to normally
maintain the driver 30 in raised position, as
shown in Fig. 1. Suitable stops on the
front-plate 36 of the knob 33 are adapted to
engage with ears on the uprights 22 to limit
the upward movement of the driver 30, but
these elements are not herein shown as they
are fully described in the copending applica-
tion before referred to.

Adapted to slide on the core 15 within the
sides of the arm 3 and beneath the overhang-
ing flanges 9 is a staple-pusher 12 for feed-
ing the staples forward in the magazine.
The pusher 12 is formed of sheet-metal bent
into inverted U-shape to provide opposite
parallel legs or runners 46 for straddling
the sides of the core 15. At the rearward
end of the pusher 12 is an upwardly-bent T-
shaped ear 47 which serves as a finger-piece
for drawing the pusher back in the arm 3
whereby it may be removed from the end
thereof to permit the insertion of the staples
in the magazine.

Mounted between the uprights 22 at the
forward end of the arm 3 is a spring 11 com-
prising a volute coil 48 wound from a flat
band or ribbon which is attached at its free
end to the top of the pusher 12. The coil
48 is held between the uprights 22 on a tubu-
lar hub 55 seated in notches in the edges of
the uprights, and the outer free end of the
spring 11 extends rearwardly therefrom be-
tween the edges of the top-flanges 9 on the
side-plates 7. The tension of the spring 11
causes it to wind itself up to draw the pusher
12 forward on the arm 3 to feed the staples
successively into position beneath the driver
30. That is to say, after the leading staple
has been driven down and clinched through
the work the raising of the driver 30 allows

the next staple to be fed forward by the
pusher in the manner as more fully herein-
after explained.

At the forward end of the base 2 is an
anvil or clincher-block 70 which cooperates
with the staple-driver 30 to clinch the sta-
ples through the work. As shown in Figs.
4 and 6, the anvil 70 is provided with
grooves 73 in its upper face for receiving
the legs of the staples *s* as they are driven
through the sheets *p*. The bottom of the
grooves 73 are preferably of arcuate con-
tour whereby they act to force the legs of
the staples inwardly toward each other and
to then bend their points upwardly against
the under side of the work, as shown in Fig.
6, to effect a firm clinch.

The stapling-arm 3 is normally held in
raised position above the base 2, to allow the
work to be inserted beneath it, by means of
a spring 75. As shown in Fig. 1, the spring
75 is anchored to the base at 76 and extends
upwardly between the sides of the arm 3 to
bear against the under side of the pivot-
pin 6 with its free end acting against the
top of the hub 18 on the end rivet 8. The
spring 75 is thereby caused to exert a down-
ward pressure on the rivet 8 to raise the for-
ward end of the arm 3 until its rearward
end strikes against the top of the base 2.

The above described details of construc-
tion comprise the essential mechanism of
the stapling-machine which is disclosed in
my copending application before referred to,
and the additional features of improvement
forming the subject-matter of the present ap-
plication will now be described as applied
to use in connection therewith. Referring
to Fig. 2 of the present drawings, it will be
observed that as the staples *s* are fed along
the core 15 the leading one will be pushed
off from the end of the core into the vertical
guiding-grooves 32 formed in the ends of
the side-plates 7 of the arm 3. In most
cases it has heretofore been the practice to
depend upon the snug fit of the staples in
the guiding-grooves to prevent them from
sliding downwardly before the staple-driver
is brought down against them. It has been
found, however, that the wire from which
the staples are made varies somewhat in
diameter so that if it is too large the staples
will be apt to bind or stick in the grooves;
whereas, if the wire is undersize the staples
will slide too freely in the grooves so that
they will drop out of position. To prevent
these conditions I have devised means for
providing that the guiding-grooves shall be
amply large to permit free movement of
staples of oversize wire while also prevent-
ing the unwarranted dropping of staples of
smaller wire. Stated briefly, my present
improvement contemplates the provision of
a staple-supporter which is adapted to re-
tain each staple fed off from the core 15

in raised position until it is acted upon by the staple-driver. Moreover, the staple-supporter also acts automatically to return the staple to raised position after it has
 5 been pressed down part way by the driver when the action of the latter is uncompleted to clinch the staple through the work.

In its simplest form the staple-supporter 85 consists of a relatively flat strip of tempered metal bent into a leaf-spring having somewhat the shape of an archery-bow in edge view, see Fig. 2. At its center the spring 85 is bent into arcuate shape to adapt it to overlie and seat upon a tubular
 10 strut 83 which extends between the side-plates 7. The strut or tube 83 is held in place between the side-plates 7 by projections or teats 84 formed on the inner faces of the plates by indenting them on the out-
 15 side with a punch or similar tool. The teats 84 project into the bore of the tube 83 as illustrated in Figs. 2, 3 and 4. From the central arched portion 86 the spring 85 is continued in reverse bends 87 merging into
 20 the two oppositely-extending flat leaves 88 and 89. The rearward leaf 88 reaches upwardly with its end bearing against the under side of the depressed trough 19 of the core 15; while the forward leaf 89 extends
 25 upwardly across the front raised end of the trough and projects therebeyond across the side-grooves 32 in which the legs of the staples *s* slide. The spring 85 is of a width to adapt it to be inserted between the top-
 30 sides of the core 15, see Fig. 5, and is maintained in position therein by its inherent tension which causes its central arched portion 86 to rest securely on the bridge or support provided by the tube 83. The forward
 35 end of the leaf 89 of the spring is thus caused to project between the legs of the staple *s* to support the latter by its upper cross-bar, as shown in Fig. 2. When the staple-driver 30 is brought down against the
 40 staple *s* to slide it downwardly in the grooves 32 the forward leaf 89 of the spring or supporter 85 yields, as illustrated in Fig. 3, and is finally depressed sufficiently to release the staple as the latter is clinched
 45 through the work in the manner as shown in Fig. 4. The method of operation of the complete machine is as next explained:

Referring first to Fig. 1, in preparing the machine for operation the staple-pusher 12
 55 is withdrawn from the rearward end of the stapling-arm 3 and the staples *s* inserted in the magazine thereof with their legs straddling the core 15. The pusher 12 is then replaced upon the core 15 with its runners
 60 46 sliding in the guideways between the sides of the core and the walls of the arm 3, and with its impeller-spring 11 tending to draw it forward against the staples. The aligned staples *s* are thus caused to be pushed
 65 forward until the leading one is fed off from

the end of the core 15 into the grooves 32 beneath the lower edge of the driver 30. As the leading staple delivers from the end of the core 15 it is caught by the staple-supporter 85 and held from dropping down
 70 in the grooves 32, see Fig. 2. In this manner the first-delivered staple *s* is maintained in raised position with its legs holding the next staple from being pushed forward off from the end of the core 15.

To apply a staple to the work the sheets or pages to be fastened together are placed above the anvil 70 beneath the forward end of the arm 3. The operator then presses on the knob 33 to force the arm 3 down against
 80 the work and as the pressure is continued the driver 30 will be brought down against the forward staple *s* to slide the latter downwardly in the grooves 32 to drive its legs through the sheets *p*. As the points of the
 85 staple impinge upon the grooves 73 in the top of the anvil 70 the legs of the staple will be bent inwardly and clinched against the under side of the work, as shown in Fig. 6. As the staple *s* slides downwardly in the
 90 grooves 32 the forward leaf of the spring or supporter 85 is bent downwardly, as shown in Fig. 3, while still being maintained beneath the cross-bar of the staple so that it acts as a resilient retainer or follower for
 95 the staple. As the staple-driver 30 reaches the bottom of its descent to clinch the staple through the work the end of the supporter 85 is depressed to such an extent that it rides out from under the staple so as to release
 100 it therefrom.

Now when the knob 33 is released the staple-driver 30 will be raised under the action of the spring 40 and the forward end of the arm 3 will be lifted above the base 2 by
 105 the spring 75. As the driver 30 slides upwardly in the grooves 32 the forward end of the supporter 85 follows its movement under the retroactive force of its spring tension. As the lower edge of the driver 30 is
 110 raised above the foremost staple in the magazine this staple will be pushed off from the end of the core 15, but it is prevented from dropping down in the grooves 32 by the end of the supporter 85 which projects beyond
 115 the end of the core. The delivered staple *s* is thus suspended by the supporter 85 in position in advance of the next staple in the series on the core 15 so that the overlapping of their legs prevents a second staple from
 120 delivering from the magazine into the guiding-grooves 32. As the driver 30 descends again, at the next operation of the machine, it slides in front of the forward staple on the core 15 and holds it from feeding after
 125 the previously fed staple has been pushed downwardly out of the way. Should the stroke of the driver be incomplete, however, that is to say, should the knob 33 not be pressed down far enough to apply the staple
 130

to the work, then the staple beneath the driver in the guiding-grooves 32 will not be released from the supporter 85 but will be returned to raised position as the driver is raised. Stated briefly, the function of the supporter 85 is to normally maintain the delivered staple in raised position to block the feeding of a new staple into the guiding-grooves and to prevent the delivered staple from being released from the machine until it has been properly applied to the work. The staple-supporter also acts to maintain the staple in correct position in the guiding-grooves 32 by preventing it from being tilted or canted. In other words, the straddling of the staple across the end of the supporter 85 holds its legs in alinement with the guiding-grooves 32 so that there is no tendency for it to become tilted and cramped in the grooves to clog the machine.

Another most important advantage results from the improved method of supporting the staple by its head or crossbar throughout the complete driving operation so that it is prevented from buckling across its top. That is to say, the resistance encountered by the legs of the staple as they pierce through the material will not cause the wire to buckle across the top of the staple as is the case where no support or spreader for the staple is employed. With the present improved arrangement of the staple-supporter it has been demonstrated that double the usual thickness of work may be stitched without buckling the staple.

It will be seen that my present improvement provides a simple and ingenious means for insuring the proper delivery of the staples to the work without permitting the unwarranted release of the staples from the machine; while also preventing one staple from being driven on top of another and further guarding against the staples buckling during the driving operation or clogging the machine by becoming misaligned therein.

While I have herein described and illustrated my improvement in its preferred form, and shown it as applied to a certain type of machine, it is obvious that its structure and mode of application may be varied without departing from the spirit or scope of the invention. Therefore, without limiting myself in this respect, I claim:

1. In a stapling-machine, the combination of a staple-carrying arm, a staple-driver re-

ciprocable on the arm, means for feeding the staples along the arm to deliver them successively into position beneath the driver, and a supporter for sustaining the delivered staple in close relation to the bottom of the driver during its reciprocation, said supporter consisting in a leaf-spring projecting forwardly from the arm to engage beneath the staple and constructed and arranged to flex as the staple is carried downwardly and to release said staple at the end of the descent of the driver.

2. In a stapling-machine, the combination of a staple-carrying arm, a staple-driver reciprocable on the arm, means for successively delivering the staples into position beneath the staple-driver, and a staple supporter consisting in a resilient element projecting forwardly from the arm beneath the lower edge of the driver in position to maintain the delivered staple thereagainst, said supporter constructed and arranged to flex along its length to cause it to follow the movement of the driver and to release the staple at the end of the stroke thereof and also acting automatically during its recoil to return the staple to raised position when the driver does not complete its stroke.

3. In a stapling-machine, the combination of a hollow arm for carrying a supply of staples, a staple-driver reciprocable on said arm, means to feed the staples along the arm to deliver them successively beneath the staple-driver, a cross-strut extending between the sides of the arm, and a bow-shaped spring seated on the strut with its forward end projecting beneath the lower edge of the driver to adapt it to sustain the delivered staple in position thereagainst.

4. In a stapling-machine, the combination with a staple-carrying arm comprising opposite side-plates, a cross-strut extending between the side-plates, an inverted U-shaped core arranged within the sides of the arm to adapt it to receive the staples in straddled relation thereon, a staple-driver reciprocable at the end of the arm, and a bow-shaped spring having an arched portion seated on the cross-strut within the sides of the arm with its rearward end bearing against the top of the core and its forward end projecting beneath the lower edge of the staple-driver.

In testimony whereof I affix my signature.

ARTHUR H. MAYNARD.