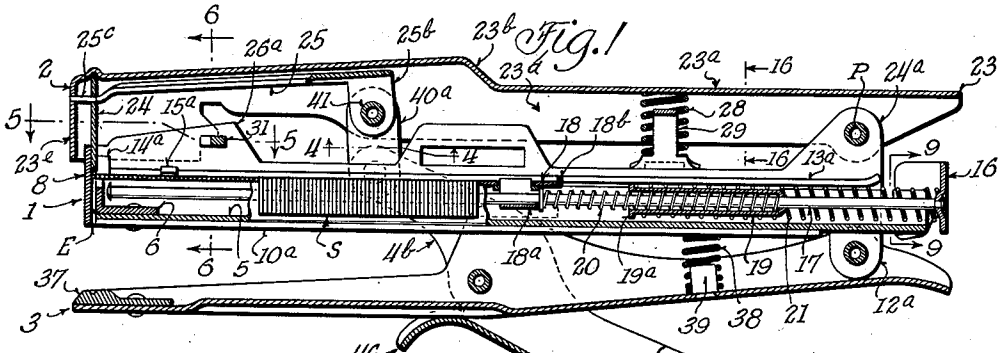
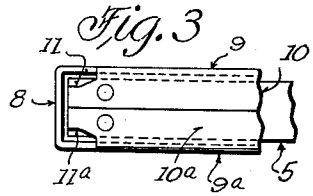
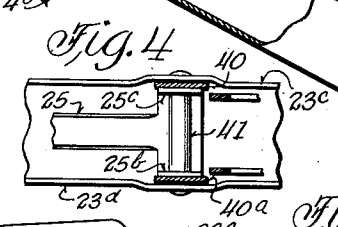
July 11, 1939. W. G. PANKONIN 2,165,572

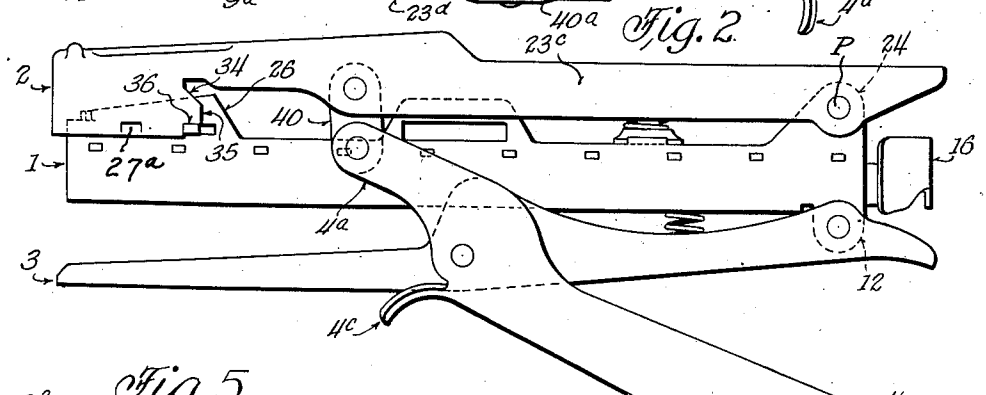
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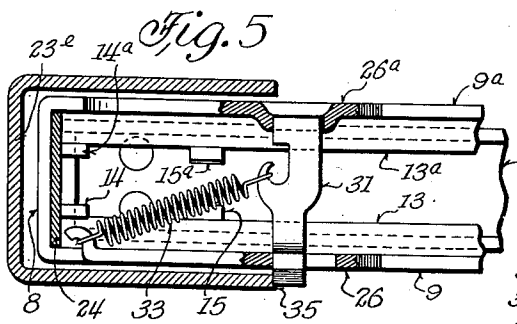
Original Filed Oct. 31, 1935 2 Sheets-Sheet 1

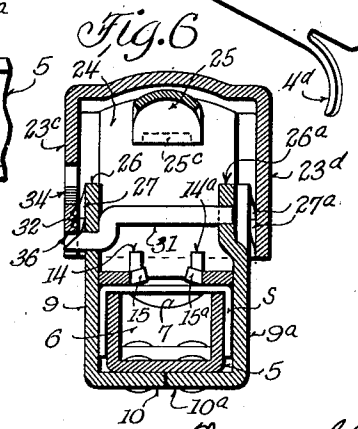


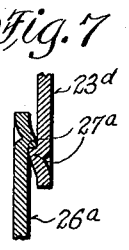


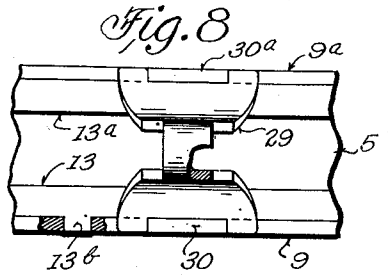












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July 11, 1939. W. G. PANKONIN 2,165,572

STAPLING DEVICE

Original Filed Oct. 31, 1935 2 Sheets-Sheet 2

Fig. 9

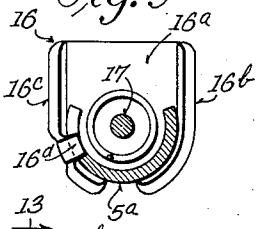


Fig. 10

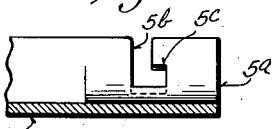


Fig. 11

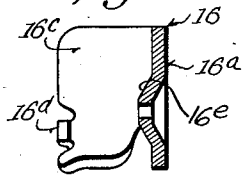


Fig. 12

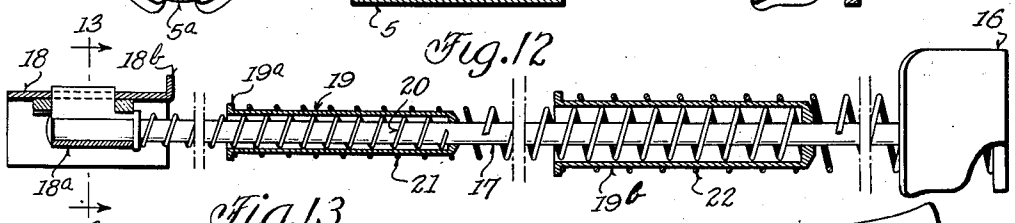


Fig. 13

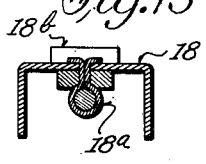


Fig. 14

Fig. 15

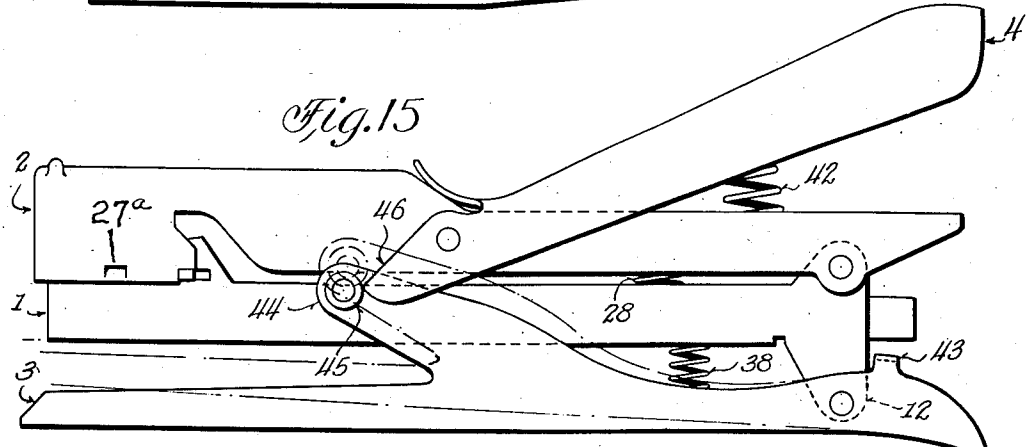


Fig. 16

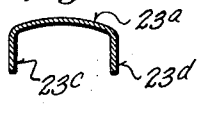
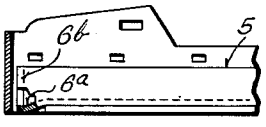


Fig. 17



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Patented July 11, 1939

2,165,572

UNITED STATES PATENT OFFICE

2,165,572

STAPLING DEVICE

William G. Pankonin, Chicago, Ill.

Application October 31, 1935, Serial No. 47,596
Renewed August 31, 1938

27 Claims. (Cl. 1—49)

This invention relates generally to improvements in stapling machines. In some of its features it relates particularly to the type of stapling machine held and supported in the hand of the operator and actuated by a gripping movement thereof.

One of the objects of the invention is to provide a stapling machine having a magazine and feeder mechanism for preformed staples with increased staple storage capacity in proportion to the size thereof.

Another object of the invention is to provide a stapling machine having a magazine for staples, means for holding and clamping the work to be operated upon and means for driving the staples through the work and clinching them on the underside thereof, so compact in arrangement and light in weight as to be conveniently held and easily operated by the hand of the operator.

Another object of the invention is to provide a stapling machine having opposed operating members adapted to be held in and actuated by a gripping movement of the hand of the operator and in which a constant movement of said members toward each other first causes the machine to speedily effect a clamping of the work and then to slowly and under multiplied resultant force effect a driving and clinching of staples in the work.

Another object of the invention is to provide a stapling machine of the type indicated which is capable of inserting and clinching the staple in material at a point substantially removed from the edges thereof.

A still further object of the invention is to provide a stapling machine of the type indicated in which each staple must be completely ejected from the machine before a succeeding staple can be fed from the magazine, thus eliminating jamming and clogging.

Other objects and advantages reside in certain novel features of the construction, arrangement and combination of parts which will be hereinafter more fully described and particularly pointed out in the appended claims, reference being had to the accompanying drawings forming part of this specification, and in which:

Figure 1 is a sectional view in side elevation showing a stapling machine embodying the present invention;

Figure 2 is a view in side elevation showing a stapling machine embodying the present invention;

Figure 3 is a fragmentary bottom plan view of the ejection chute end of the staple magazine and associated parts thereof;

Figure 4 is a fragmentary view in section taken on line 4—4 of Figure 1;

Figure 5 is an enlarged fragmentary view in section taken on line 5—5 of Figure 1 showing the arrangement of the ejection chute end of the magazine and associated full stroke mechanism;

Figure 6 is an enlarged view in section taken on line 6—6 of Figure 1 showing the construction of the ejection chute end of the staple magazine, associated parts of the staple driver, and full stroke mechanism;

Figure 7 is an enlarged fragmentary view in section of the abutments for limiting the upward stroke of the staple driver, as illustrated in Figure 6;

Figure 8 is an enlarged fragmentary plan view of the support bracket and guide for the staple driver spring;

Figure 9 is an enlarged view in section taken on line 9—9 of Figure 1 showing the locking device for the staple feeder mechanism;

Figure 10 is an enlarged fragmentary view in section of the loading end of the core of the staple magazine;

Figure 11 is an enlarged view in section of the handle of the feeder mechanism;

Figure 12 is an enlarged view in section of a modification of the feeder mechanism;

Figure 13 is a view in section taken on line 13—13 of Figure 12 showing the staple follower of the feeder mechanism;

Figure 14 is a view in side elevation showing a stapling machine embodying a modification of the present invention;

Figure 15 is a similar view showing a further modification;

Figure 16 is a view in section taken on line 16—16 of Figure 1 showing the outline form of the rear or handle portion of the staple driver arm; and

Figure 17 is a fragmentary view in section of the ejection chute end of the staple magazine showing a modified form of construction of the core of the magazine.

Referring now to the drawings, the stapling machine comprises generally a member 1 which defines the magazine and ejection chute for staples, a staple driver or upper arm 2 including an associated driving blade, movable toward the member 1 to drive the staples from the magazine out through the ejection chute, a staple clincher or lower arm 3 movable toward the member 1 and cooperable therewith and with the driver 2

to hold the material in which the staple is being inserted and to clinch the legs of the staple thereunder and an operating lever 4 operatively reacting upon the driver 2 and clincher 3 and movable relative to the member 1 to cause the clincher 3 and driver 2 to move toward the member 1 in the performance of their respective and correlated functions.

The stapling machine is designed to be constructed from sheet metal parts stamped out or struck up in dies to render the machine light in weight and economical to manufacture, although the various parts may be otherwise constructed.

The magazine

The member or magazine 1 comprises an elongated, U-shaped in cross section, channel member or core 5, the upper edges of the sides thereof forming the staple track upon which the staples S ride in straddle fashion (see Figure 6). At the forward end of the core 5 and in between the side walls is positioned by rivets or other suitable means a right angle member 6. One leg of the member 6 lies flush with the inside surface of the bottom of the channel 5 and is secured thereto. The upright leg of the member 6 has its forward face flush with the forward edges of the channel member 5 and with them defines the rear wall of the staple ejection chute E. In order that the upper edge of the upright leg of the member 6 will not interfere with or obstruct the passage of staples along the track formed by the core 5, it is cut downwardly in a dished-out fashion as indicated at 7 (see Figure 6).

In Figure 17 is illustrated a modified form of the ejection chute end of the core 5. The member 6 is omitted and in its place the bottom of the core is provided with a downward flare 6^a and a projecting tongue 6^b. The projecting tongue 6^b is die-pressed upwardly to vertical position with its outer face flush with the forward edges of the walls of the core 5. The outer face of the tongue and the edges define the rear wall of the ejection chute in a like manner as the upright leg of the member 6. It is to be noted that the juncture or bending point between the tongue 6^b and the flared down bottom portion 6^a of the core is formed on the outside thereof with a substantial right angle in order that the wall of the ejection chute will extend for all practical purposes to a point level with the bottom of the magazine. The tongue 6^b at its upper end may be provided with tabs (not shown) which fit into appropriate slots (not shown) in the walls of the core 5. Such a dowel interlock will aid in preventing the tongue 6^b from being misplaced rearwardly. In place of forming the tongue 6^b so that it fits within the sides of the core 5, it may be made sufficiently wide so that it flatly abuts against the forward edges of the sides of the core 5, its edges being flush with the outer faces of said walls. Such construction will also aid in preventing the rearward displacement of the tongue 6^b.

To provide for the forward wall of the ejection chute E and the side guides for staples on the core 5 there is folded longitudinally about the core from the front end thereof an elongated piece of metal. The central or connection portion 8 of this piece is spaced from the forward end surface of the core 5 and member 6 to form the forward wall defining the ejection chute E. Elongated wings extending rearwardly from the portion 8 along the sides of the core provide the side walls 9 and 9^a of the magazine. The walls 9 and 9^a have portions 10 and 10^a projecting below the bottom of the core 5 which bend inwardly under the core so that the edges thereof face each other while their inner surfaces lie flatly against the bottom of the core. The portions 10 and 10^a are secured to the bottom of the core to provide support for accurately spacing the side walls 9 and 9^a from the sides of the core thereby providing the side guides for staples riding on the core and defining the magazine. The forward edges of portions 10 and 10^a are cut flush with the forward edges of core 5 and form a part of the rear wall of the ejection chute (see Figure 3). At the forward corner junctures of the portions 10 and 10^a with the side walls 9 and 9^a there are provided in the portions 10 and 10^a notches 11 and 11^a (see Figure 3) which extend inwardly and rearwardly a sufficient amount to provide openings in the bottom of the magazine through which staples with bent or deformed legs entering the ejection chute may be discharged and which will also permit of the removal from the magazine of foreign substances.

When the modified form of the ejection chute end of the core, illustrated in Figure 17, is used, the forward edges of the portions 10 and 10^a extend only to a point substantially in alinement with the point on the core where the downward flare 6^a commences. This construction eliminates the necessity of the notches 11 by automatically providing the necessary openings.

From the foregoing description, it will be seen that the structure of the ejection chute E and magazine 1 provides no positive rear guide for the legs of a staple as it is being ejected. However the next succeeding staples in the magazine under the influence of the feeder mechanism provide a flexible rearward guide for the legs of a staple in the ejection chute E and direct them until they start to penetrate material to be stapled.

The rearward ends of the portions 10 and 10^a terminate short of the rearward edge of the side walls 9 and 9^a to provide for lower extensions 12 and 12^a formed integral and parallel with the side walls 9 and 9^a and projecting from the rearward end thereof below the bottom level of the magazine. The general upper level of the side walls 9 and 9^a is sufficiently raised from the top edges of the core to provide a support for the top staple guides 13 and 13^a of the magazine. These guides extend longitudinally of the magazine and are spaced above the upper edges of the core 5 sufficiently to permit clearance for the bridge portion of the staples as they ride along the core. The oppositely and inwardly facing edges of the guides 13 and 13^a are sufficiently spaced from each other to provide clearance for an abutment formed on the staple follower. The method of securing the guides in proper relation to their respective side wall is disclosed in the application of William G. Pankonin, the inventor herein, Serial No. 586,914, filed January 15, 1932, and consists of the provisions of rivets 13^b formed integral with the guides, and which penetrate appropriately spaced holes in the walls and are swaged over to form a secure lock (see Figure 8).

At the forward ends thereof and projecting upwardly from the inner edges of the guide members 13 and 13^a are positioned lugs 14 and 14^a forming rearward guides for the staple driving blade. The forward edges of these lugs are in alinement with the forward edges of the core 5 and form therewith an upper extension of the ejection chute E. These lugs acting with the connecting portion 8, accurately aline the driving blade with respect to staples fed from the maga-

zine into the ejection chute. Rearwardly of the lugs 14 and 14a are positioned projecting abutments 15 and 15a, which, by reason of their projection into the clearance space formed between the inner edges of the guides 13 and 13a, provide means for limiting the forward movement of the staple feeder, thereby preventing any portion of the latter from entering into the ejection chute.

It will be noted that the rearward end of the core 5 projects beyond the rearward end of the magazine to provide means for detachably connecting the stapler feeder mechanism in position. As indicated at 5a, Figures 9 and 10, the rearward end of the core is of circular form as in contrast to the U-shaped form of the intermediate portion of the core. The circular formation at this point permits of a rotational movement of the feeder mechanism handle 16 with respect thereto.

The feeder mechanism

The feeder mechanism comprises a rod 17 of substantially the same length as the core 5 and adapted to extend within the confines thereof. A staple follower 18 (Figures 12 and 13) of inverted U-shaped construction straddles the core 5 and is slidable therealong within the magazine. By means of a bracket 18a projecting downwardly from the center of the follower and adapted to ride between the walls of the core 5, which bracket is pierced to have a slidable and rotatable fit on the rod, the follower and the rod are slidably and rotatably interconnected. Extending upwardly from the rear edge of the follower 18 is an abutment 18b which loosely operates within the space between the guides 13 and 13a. The forward movement of the follower is arrested so that its forward or staple contacting end is prevented from entering the ejection chute E by the contact between the abutments 15 and 15a, Figure 6 and abutment 18b, Figure 13. Hence, the driving blade is prevented from encountering the follower and causing damage. The forward end of the rod is headed to prevent the follower from being disconnected therewith.

The feeder mechanism handle 16 has a rear plate 16a (Figures 9 and 11) of U-shaped outline, which is secured in suitable fashion to the rear end of the rod 17. Projecting forwardly from the sides of the plate 16a are side walls 16b and 16c, the lower portion of which are curved inwardly in the arc of a circle, the center of which is substantially in alinement with the rod 17. With the follower 18 placed in position on the core 5, the rod 17 may be inserted into the interior of the core which will permit the side walls 16b and 16c of the handle 16 to overlap the circular shaped end portion 5a of the core 5. In this position, due the circular shape of the core and wall (see Figure 9), the handle 16 can be rotated with respect to the core. To securely lock the handle in overlapping relation to the end of the core the wall 16c of the handle is provided with an inwardly projecting tab 16d which is slidable in a slot 5b (Figure 10) cut in the adjacent wall of the portion 5a of the core and seatable in a notch 5c formed in the rear edge of the slot 5b. To position the handle in place it must first be rotated so that the tab 16d lies above the top edge of the core 5. The handle may then be advanced forwardly until the tab is in alinement with the slot 5a. In this position the handle is rotated clockwise, the tab 16d sliding in the slot until it is opposite the notch 5b. Slight rearward movement of the handle will lock the tab in the notch and the handle will be properly positioned and locked. The follower spring supplies the necessary tension to maintain the handle thus positioned.

In feeder mechanisms having a compression type of spring for urging the follower through the magazine, the space occupied by the spring when compressed is lost space insofar as the effective storage capacity of the magazine is concerned. By utilizing a plurality of springs which telescope one within the other when compressed, the space occupied by the compressed springs is lessened without lessening the effective total compressive force of the springs when the magazine is being finally emptied. Thus, the storage capacity of the magazine is increased without any change in its overall size. To provide for this feature an elongated tube 19 is slidably mounted on the rod 17 between the follower 18 and handle 16. One end of the tube 19 is closed except for an opening through which the rod 17 is slidably fitted, the other end being open and having projecting laterally therefrom a collar 19a. The inside diameter of the tube 19 is sufficiently larger than the outside diameter of the rod 17 to provide appropriate clearance for a spring 20 coiled about the rod and having one end abutting against the rear of the bracket 18a, or, as is sometimes preferable, against a small washer interposed on the rod between the bracket and the spring, and the other end extending into the tube and abutting against the inside of the closed end. Coiled about the outside of the tube 19 and rod 17 is a second spring 21, which has one end abutting against the collar 19a and the other end abutting against the inner surface of the wall 16a of the handle 16. To more positively center this latter end of the spring the wall 16a may be formed with a projecting centering seat 16e, in the center of which the rod 17 is secured (see Figure 11). The springs 20 and 21 are of the coiled compression type, the outside diameter of spring 20 being smaller than the inside diameter of spring 21. The compression force of one spring is communicated to the other spring by reason of their oppositely reacting abutment with the tube 19. The total compressive force of both springs reacts between the handle 16 and the follower 18 and continually urges the latter forward along the rod 17. With the magazine charged with staples and the follower inserted therein and resting against the rearmost staple of the charge, it will be seen that in order to force the rod 17 into the magazine and to position the handle 16 in its locked position relative to the core 5, it will be necessary to compress the springs 20 and 21. The number of coils in each spring is so proportioned that when fully compressed each spring will occupy a space approximately equal in overall length to the length of the tube 19. As the tube allows the springs to be telescoped one within the other the total overall length of the space occupied by the springs when compressed will be the length of the tube. However, the total effective compressive force in the springs 20 and 21 when extended to force the follower to the ejection chute end of the magazine will remain practically the same as a single spring of the same characteristics having twice the overall compressed length as the length of the tube. Hence, a great saving in the storage capacity of the magazine is effected without lessening the successful operation thereof.

As indicated by the view shown in Figure 12, a third tube 19b with an additional spring 22

may be interposed on the rod 17 between the spring 21 and the handle. Tube 19b differs only from tube 19 in the dimensions of its inside and outside diameter, it being dimensioned so as to telescope over the tube 19 and spring 21. The effect is to further lessen the amount of lost space in the magazine in proportion to its length without diminishing the effective compression force behind the follower when advanced to the end of its discharging run.

While the tubes and springs have been shown and described as circular in cross section; it is to be understood that the tubes can be formed in rectangular, triangular or irregular cross section so long as they properly telescope and provide support for the springs. The springs need not be coiled in circular cross section; any form will do provided they will compress and provide adequate compressive force.

The staple driver and full stroke mechanism

The staple driver 2 comprises two main elements, namely, an elongated beam or arm 23 and a driving blade 24. The blade 24 is made of hardened metal and is adapted for reciprocal action in the ejection chute E of the magazine 1, being guided by the front wall 8 and the lugs 14 and 14a when it is in raised or staple receiving position and also being guided by the forward face of the core 5 during its downward stroke after engagement with the staple. To impart to the blade 24 its reciprocal action, to limit the length of its stroke and to normally maintain it in raised or staple receiving position is the function of beam 23 and associated parts.

The beam 23 is co-extensive with the magazine 1 and overlies the same in substantial parallel relation thereto. In cross section the beam is U-shaped in form (see Figure 16), the top rear half being straight longitudinally and forming a handle-like portion 23a adapted to be positioned in the palm of the operator's hand. Forwardly of the portion 23a, the top is offset upwardly as at 23b a slight amount to provide a clearance space for the driving blade support and other associated parts. The offset portion 23b also acts as an abutment to more accurately position the portion 23a in the palm of the hand. Extending downwardly from the top of the beam 23 are side places 23c and 23d which are sufficiently spaced to overlap the sides of the magazine 1. At the forward end of the beam, the side plates project downwardly below the general level to provide for an element of the full stroke mechanism and an abutment means for the upward stroke limit stop. In the raised position of the beam 23 the forward portions of the side plates 23c and 23d overlap the forward end of the staple magazine 1. A front wall 23e connects the side plates 23c and 23d. At the rear of the magazine 1 there is provided upright members 24 and 24a which are extensions of the side members 9 and 9a. These extend into the beam 23 between the sides 23c and 23d and are pivotally connected thereto by means of an appropriate pivot. By this means the beam 23 is supported so that its forward end is movable toward and away from the forward end of the magazine 1 in proper alinement with the ejection chute E. Within the confines of the forward half of the beam is positioned the driving blade supporter 25. At the rear end of the supporter 25 there is provided two spaced downwardly projecting portions 25a and 25b which are provided with openings to receive a pivot pin extending between the side plates 23c and 23a thereby securing the supporter in position. The main body of the supporter 25 extends along the inner surface of the forward top of the beam 23. At its forward end the supporter is provided with a tongue 25c which penetrates through an opening in the driving blade and thence is held by fitting into an opening provided in the forward wall 23e. Thus, the driving blade 24 is held by the supporter 25 so that it is constrained to move with the forward end of the beam. The top of the blade 24, however, fits in a complemental depression formed at the top of the beam 23 and thereby the main driving force is directly placed upon the top of the blade without depending upon the action of the supporter 25. Due to the fact that the beam 23 rotates about a fixed pivot point P as the forward end thereof moves up and down with respect to the magazine there will arise a minute forward and rear motion of the beam with respect to the forward end of the stapling magazine. This fore and aft motion, however, is so slight that the inaccuracies in the diminishing of the various parts will provide sufficient clearance space for any lateral motion imparted to the driving blade by reason thereof.

The effective lateral displacement of the driving blade 24 may be further minimized by positioning the pivot point of the beam 23 in substantially horizontal alinement with the center of the arc through which the top of the driving blade might be caused to travel during a complete driving stroke.

In order to limit the relative movement of the forward end of the beam 23 with respect to the magazine and also to provide for the inclusion of a full stroke mechanism, the sides 9 and 9a of the magazine 1 are provided with upward extensions 26 and 26a at their forward ends. Struck inwardly from the forward portions of the sides 23c and 23d and struck outwardly from the lower portion of the extensions 26 and 26a are oppositely related abutments 27 and 27a as illustrated in Figures 6 and 7. Contact between these abutments arrests the upward movement of the beam with respect to the magazine. It will be seen that the abutments on the sides 23c and 23d slidably contact the sides of the extensions 26 and 26a while the abutments on the extensions 26 and 26a slidably contact the sides 23c and 23d. This relationship provides an accurate slidable guide for maintaining the forward end of the beam 23 in proper lateral alinement with the magazine without causing excessive frictional resistance to the relative movement therebetween. On the downward movement of the beam 23 with respect to the magazine the upper edge of the extensions 26 and 26a will contact the underside of the top of the beam and limit its downward movement with respect thereto. It is proposed to provide depressed portions in the top of the beam and in alinement with the extensions 26 and 26a to prevent the binding action which might arise due to the fact that the top of the beam is slightly curved.

Located within the handle portion 23a of the beam and reacting between the top of the beam and the top of the magazine is a coiled compression spring 28 which urges the beam to its raised position. To support the lower end of the spring 28 with respect to the magazine, there is provided a bridge member 29 which has a central portion extending up within the spring to guide the same and two spaced leg portions which rest upon the sides 9 and 9a of the beam. The bridge member

29 is accurately positioned with respect to the magazine by the provision of notches in the legs thereof fitting around small projections protruding from the top edge of the sides of the magazine as clearly illustrated at 30 and 30a in Figure 8.

To insure the non-clogging of staples in the ejection chute as they are driven therefrom by the driving blade, means is provided to prevent the blade 24 from returning to its raised or staple receiving position until it has finally expelled from the ejection chute any staple therein. This means or full stroke mechanism comprises generally a detent 31, ratchet teeth 32 and operating spring 33 (see Figures 5 and 6). The ratchet teeth 32 are formed on the inner surface of the forward portion of the side 23c and face toward the overlapping extension 26. The detent 32 is supported for in and out movement relative to the magazine by the extensions 26 and 26a. The base end of the detent is slidably maintained in an opening pierced in an inwardly projecting depression formed in the extensions 26a. The teeth engaging end or tongue of the detent is slidably supported in an elongated slot provided in the extension 26. This slot is wider than the tongue end of the detent to permit that end to have forward and rearward movement with respect to the magazine. The elongated slot is positioned slightly below the level of the opening in extension 26a and the tongue is offset downwardly from the main body of the detent and extends through the elongated slot an amount sufficient to properly engage with the ratchet teeth 32. The spring 33 extends between the central portion of the detent and the forward inside corner of the extension 26 and urges the tongue of the detent forwardly and outwardly in the slot. The offset portion of the detent will abut against the inner surface of the extension 26 to prevent the spring from urging the detent so far outwardly towards its tongue end as to release the base end from the opening in the extension 26a.

In order that the tongue will engage the teeth 32 during the driving stroke and be out of engagement therewith after the completion of the driving stroke and during the return stroke, the side 23c of the beam is provided with a cut-away portion which provides above the ratchet teeth a rearwardly and downwardly sloping edge 34, to the side of the ratchet teeth a vertical edge 35 joining with the edge 34 and below the ratchet teeth a horizontal edge 36 intersecting the edge 35. With the beam raised to the staple receiving position, the tongue of the detent under the influence of the spring 33 will be urged outwardly and forwardly into position immediately underlying the horizontal edge 36. Because of the chisel-like formation of the tongue, downward movement of the beam will cause the edge 36 to force the tongue inwardly where it will come into immediate and successive contact with the teeth 32, thereafter preventing the beam from again assuming its staple receiving position until it has been sufficiently depressed to eject a staple from the ejection chute. At this point, the teeth 32 and tongue of member 31 are not in contact, and the sloping edge 34 will have passed beneath the tongue permitting it to again be urged outwardly under the influence of the spring 33. As the beam moves away from the magazine on its return stroke, the sloping edge 34 will cause the tongue to move backwardly in the slot and to the side of the teeth and the vertical edge 35 will cause it to remain in this position free of contact with the teeth until the beam has been raised to its staple receiving position, where the horizontal edge 36 will permit the tongue to again move forwardly in the slot and rest beneath the teeth 32.

The staple clincher and operating lever

To clinch the legs of the staple as they are driven through material a clinching member 3 is provided. The clinching member 3 consists of an elongated bar having side walls provided with extensions which overlap the sides of the magazine. The rear end of the clinching member is pivoted to the projections 12 and 12a formed at the rear of the magazine. The forward end of the clinching member contains the clinching anvil 37 of customary design. The anvil end of the clinching member is swingable to and from the bottom of the ejection chute of the magazine, the anvil 37 being in alinement with the ejection chute E. A compression spring 38 extends between the clinching member and the bottom of the magazine at a point substantially adjacent the pivotal connection between these members. A lug 39 riveted to the clincher member accurately guides and allocates the spring 38. The spring 38 has less compressive force than the spring 28 and when pressure is exerted against the top of the staple driver 2 and the bottom of the clincher member 3, the clincher member will be first urged toward the ejection chute of the magazine and engage and hold therebetween material to be stapled, before the pressure reacting upon the staple driver will cause it to move toward the magazine to eject the staple and clinch it against the anvil member. To properly correlate and multiply the force reacting between the clincher member 3 and the staple driver 2 there is provided an operating lever 4 which is pivoted to the clincher member intermediate the ends thereof. The member 4 has two spaced projections 4a and 4b overlapping the clincher member and underlying the sides 23c and 23d of the beam 23. Links 40 and 40a join the upper ends of the projection portions 4a and 4b of the lever 4 to the sides 23c and 23d of the beam. A pivot 41 extends between the sides 23c and 23d to anchor the downward projections 25b and 25c of the blade supporter 25 and to pivotally hold the upper ends of the links 40 and 40a. It is proposed to form offset portions on the sides 23c and 23d to accommodate the upper ends of the links 40 and 40a, as illustrated in Figure 4. The lower ends of the links 40 and 40a are respectively held in pivoted connection to the ends of the projections 4a and 4b by rivets therebetween. In order to provide the lever 4 with a suitable surface to be grasped by the fingers of the hands of the operator curved extensions 4c and 4d are provided on the free end thereof. The normal angularity between the free end of lever 4 and the handle portion 23a of the beam 23 is so arranged that with the handle portion 23a positioned in the palm of the hand, the free end portion of the lever 4 will be readily grasped by the fingers of the hand. Thusly held, a tightening of the grip of the hand will cause the free end of the lever 4 to swing toward the magazine and staple driver. This sets up a force reacting between the clincher arm and stapler driver arm which, as previously described, will first cause the anvil 37 to advance toward the ejection chute and grip between said anvil and the bottom of the magazine the material to be stapled and then cause the driver arm to advance the driving blade through the ejection chute, thereby driving the staple through the material and clinching the legs thereof beneath the material. The links 40 and

40ª provide for relative movement between the projections 4ª and 4ᵇ and the driving arm 2 while maintaining a positive operating connection therebetween. The lever 4 operates to multiply the effective force causing the clincher arm 3 and driving arm 2 to move toward the magazine 1, while still being substantially removed from the ejection chute E, thus permitting an increase in the length of the material receiving space between the magazine and the clincher arm.

In the modification illustrated in Figure 14 the lever arm 4 instead of being pivoted to and underlying the clincher arm 3 is pivoted to and overlies the driver arm 2. This change makes no difference in the functioning of the device. It merely changes the normal angle assumed by the machine when held in the hand of the operator. The lever 4 being positioned in the palm of the hand, the magazine and material receiving opening will normally have an upward slope as compared to the horizontal position assumed by the modification shown in Figures 1 and 2. This is advantageous in some instances where the machine is used as a production tool.

In the modifications previously described the operating lever 4 is continually connected with both the clincher member 3 and staple driver 2 during the entire operation of the device. By establishing a relationship between the operating lever, the clincher member and the staple driver such as will permit movement of the clincher member with respect to the ejection chute for the purpose of gripping and holding material prior to any movement of the operating lever about its pivotal connection, the total operating time of the machine is decreased and its efficiency thereby increased. This is accomplished by establishing a breakable fulcrum connection between operating lever and clincher member or staple driver (depending upon whether the operating lever is pivoted to the clincher member as illustrated in Figures 1 and 2 or to the staple driver as illustrated in Figure 14) which breakable connection will not become effective until after the clinching member has moved to within a predetermined distance from the ejection chute, such distance being approximately the maximum thickness of material which the device will effectively staple.

One modification of this principle is embodied in the machine illustrated in Figure 15. In this modification the operating lever 4 is pivoted to the staple driver 2. An additional compressive type spring 42 is interposed between the handle portion of the lever 4 and the staple driver 2 to maintain the former in raised position relative to the latter. The spring 42 is secured in position by means similar to that for securing spring 38 in position as previously described. The compressive force of spring 42 is sufficiently greater than that of spring 38 so that with the device positioned with the handle portion of lever 4 resting in the palm and the handle portion of the clincher member 3 resting in the fingers of the hand of the operator, a gripping of the hand will cause spring 38 to compress, allowing the anvil portion of the clincher member to advance toward the ejection chute on member 1, before the lever 4 is moved about its pivot.

The clincher member 3 at its rearward end is provided with inwardly directed lugs 43 and 43ª (43ª not shown) which will abut against the lower extensions 12 and 12ª of the magazine, to limit the movement of the anvil portion of the clincher member away from the magazine. Intermediate the ends of member 3 and spaced so as to be movable into overlapping relation with the sides of the magazine 1 and staple driver 2, are positioned on the member 3, upwardly extending projections 44 and 44ª (44ª not shown). These projections have extending laterally therefrom rollers 45 and 45ª (45ª not shown) suitably secured by rivets or other conventional means. The engaging end of lever 4 is bifurcated and has lips 46, 46ª (46ª not shown) extending in overlapping relation to the side of the member 1 and positioned so as to move into overlapping relationship with the projections 44 and 44ª. The upper surface of the lips 46 and 46ª provide a straight edge which extends from the tip of the lip rearwardly toward the pivot point of the lever 4. The rollers 45 are positioned and adapted to ride along the edges of the lips. With the lever 4 in its fully raised position, the rollers 45 and 45ª are swingable with the clincher member 3 from a point below and out of contact with the lips 46 and 46ª upwardly past the tips of those lips to a point slightly thereabove, as indicated by the dotted lines on Figure 15. By moving the lever 4 clockwise about its pivot the tips of the lips 46 and 46ª are raised upwardly and forwardly with respect to the rollers 45 and 45ª, thereafter creating an engagement between the rollers and the edges of the lips to form a slidable fulcrum contact or connection between lever 4 and clincher 3. Further movement of the lever 4 about its pivot will cause a multiplied force to react between the clincher 3 and the driver 2 causing the driver to drive a staple and clinch it against the anvil the same as in the other modification. Upon movement of the lever 4 to its fully raised position, the lips 46 and 46ª will be swung downwardly and rearwardly permitting the rollers 45 and 45ª to move downwardly past the tips of the lips and out of engagement therewith.

From the foregoing description, it will be seen that with the device positioned in the hand as described, the first portion of the gripping action will cause the clincher to rapidly swing through a wide arc until the material is gripped in stapling position at which point the lever 4 will commence to rotate about its pivot and, with the exception of a certain amount of slack movement necessary to allow for variations in the thickness of material being stapled, immediately begin the stapling action. The stapling action is of course slower due to the force multiplying effect of the lever 4. In all other respects the machine embodying this modification operates like the machine illustrated in Figures 1 and 2.

While constructions in which this invention may be embodied have been shown and described, it is to be understood that these constructions have been selected merely for the purpose of illustration or example and that various changes in the size, shape and arrangement of the parts may be made without departing from the spirit of the invention or the scope of the subjoined claims.

The invention claimed is:

1. In a stapling machine, a member comprising a magazine and an ejection chute, a staple driver arm pivotally mounted on and movable towards said member for driving staples from said magazine and through said ejection chute, a staple clincher arm pivotally mounted on and movable towards said member to engage therebetween material to be stapled, a force multiplying lever pivotally mounted upon one of said

arms, and means whereby the force multiplying effect of said lever cooperatively reacts on both of said arms.

2. In a stapling machine, a member comprising a magazine and an ejection chute, a plurality of arms pivoted to said member, said arms being cooperably movable toward said member to drive staples from said magazine through said ejection chute and clinch the same, and a lever connected with said arms forward of the pivotal connections between said arms and member and movable to cause said arms to operate.

3. In a stapling machine, a member providing a magazine and ejection chute for staples, a staple driver pivoted to said member and operable to drive staples from said magazine, a staple clincher pivoted to said member and cooperable with said driver to clinch staples driven from said magazine, and a lever pivoted to said staple clincher forward of the pivotal connection between said clincher and said member and operably connected with said staple driver.

4. In a stapling machine, a member providing a magazine and ejection chute for staples, a stapler driver pivoted to said member and operable to drive staples from said ejection chute, a staple clincher pivoted to said member and cooperable with said driver to clinch staples driven from said magazine, and a lever pivoted to said driver forward of the pivotal connection between said driver and said member and engageable with said staple clincher.

5. In a stapling machine of the type specified, a magazine for staples, an ejection chute through which staples are driven from said magazine, a pair of elongated arms pivotally mounted and having free ends movable toward and away from said ejection chute, means on said free ends for driving and clinching staples, said arms being closely related and confining therebetween said magazine and ejection chute, one of said arms having a portion shaped to be held in the palm of the hand, and a lever engageable with said arms intermediate the ends thereof and having a free end portion oppositely related to said first-mentioned portion and adapted to be grasped in the fingers of the hand whereby the operator by compressing the hand can operate said machine.

6. In a stapling machine, a magazine for staples comprising an elongated core formed with a bottom and spaced upright sides, the upper edges of said sides forming a track upon which staples ride in straddle fashion, a plate interposed between said sides at the forward end of said core and forming with the forward edges of said core the rear wall of an ejection chute, a member folded longitudinally about said core from the forward end thereof, said member having a central portion spaced from the forward end of said core and forming the front wall of the ejection chute and wing portions paralleling the sides of said core, inwardly projecting flanges formed on the bottom of said wing portions and abutting each other, said flanges being secured to the bottom of said core to properly space said wing portions from the sides of said core, and guide members projecting from the inner sides of said wing portions and overlying and being spaced from the upper edges of the sides of said core.

7. The invention set forth in claim 6 and further characterized by upright members formed on the forward ends of the guide members, said upright members forming an extension of the rear wall of the ejection chute above the path of staples in the magazine.

8. In a stapling machine, a first member comprising a magazine and ejection chute for staples, a second member overlying said first member and movable toward and away therefrom, said second member having a portion in overlapping relation to said first member throughout the relative movement therebetween, ratchet teeth formed on said portion and a detent carried by said first member, said detent being urged to engaging relation with said teeth, and means on said portion for shifting said detent out of engagement with said teeth, said second member being provided with a driving blade reciprocal in said ejection chute.

9. In a stapling machine, a core, walls adjacent said core and defining therewith a magazine and ejection chute for staples, said walls adjacent said ejection chute being provided with spaced uprights, slots in said uprights, a detent slidably carried by said slots, a spring urging said detent to operative position, a staple driving member movable toward and away from said ejection chute to drive staples successively from said magazine, said member having a portion overlapping said spaced uprights, said portion having teeth formed thereon engageable with said detent, and means on said member to shift said detent to inoperative position with relation to said teeth.

10. The invention set forth in claim 9 and further characterized by outwardly formed protuberances on the spaced uprights and inwardly formed similar protuberances on the overlapping portion of the driving member, said protuberances being in alinement and abutting each other to limit the movement of the driving member way from the ejection chute.

11. In a stapling machine including a magazine adapted to store staples in row formation, means for advancing the staples through said magazine comprising a staple follower, and a series of coiled compression springs for urging said follower forwardly in said magazine, a preceding spring fitting within a succeeding spring.

12. In a stapling machine including a magazine adapted to store staples in row formation, a follower in said magazine for urging the staples therethrough, a coiled compression spring having one end reacting against said follower, a tube having an inner abutment and an outer abutment, said spring extending within said tube and having its other end reacting against said inner abutment, and a second coiled compression spring encircling said tube and having one end reacting against said outer abutment and the other end reacting against said magazine, said abutments being spaced so that said springs overlap.

13. In a stapling machine including a magazine adapted to store staples in row formation and having at one end an ejection chute and at the other end a loading opening, means for advancing staples toward said ejection chute comprising a rod adapted to extend within said magazine, a follower slidable along said rod and adapted to engage staples in said magazine, a handle on said rod, said handle being engageable with the loading end of said magazine to hold the rod within said magazine, and a series of coiled compression springs on said rod between said handle and said follower, a preceding spring fitting within and being overlapped by a succeeding spring, and connecting means between said springs whereby the compressive force in one spring is communicated to an adjacent spring.

14. In a magazine for staples, means in the

magazine interposed between one end thereof and the staples stored in said magazine and exerting a force urging said staples toward the other end, said means comprising a plurality of coiled compression springs, one of said springs having an outside diameter smaller than the inside diameter of another of said springs and fitting therein, and means communicating the compressive force in said one spring to said other spring.

15. In a stapling machine, a core forming a staple track, walls formed about said core and defining therewith a magazine for staples having an ejection chute at one end and a loading opening at the other end, an upper arm pivoted to said magazine at said loading end and overlying said magazine, said arm having side and forward end portions in overlapping relationship to the walls of said magazine, a driving blade within said portions and reciprocal in said ejection chute, said blade being maintained in abutting relation to said upper arm, means limiting the relative movement between said upper arm and said magazine, a spring urging said upper arm away from said magazine, a lower arm pivoted to said magazine at said loading end and underlying said magazine, said arm having a clinching anvil in operative relation to said ejection chute, and a spring between said lower arm and said magazine urging said lower arm away from said magazine with less force than said first-mentioned spring urges said upper arm away from said magazine.

16. In a stapling machine, a magazine for staples having a loading opening at one end and an ejection chute at the other end, a pair of arms pivoted to said magazine at the loading end thereof, said arms being oppositely related and having free ends movable toward and away from said ejection chute, a driving blade carried by the free end of one of said arms and reciprocal in said ejection chute, a clinching anvil carried by the free end of the other arm and cooperable with said driving blade to clinch staples driven out from said ejection chute, a lever pivoted to one of said arms between the free end thereof and the point of pivotal connection with said magazine, and a link pivotally connected to said lever and to the other of said arms.

17. In a stapling machine, a magazine for staples including side walls, an ejection chute for said magazine at one end thereof, an arm pivoted to the other end thereof, a blade carried by said arm and reciprocal in said ejection chute, a coiled spring between said arm and said magazine, a bracket having a central portion extending within said spring and spaced flanges resting upon the upper edges of said walls, and interlocking means between said walls and said flanges for locating said bracket.

18. In a stapling machine, a magazine for staples including an ejection chute, an arm pivoted to said magazine and having a free end, a forward wall depending from said free end, a driving blade abutting against said arm and reciprocal in said ejection chute, alined openings in said driving blade and said wall, and a supporting member having one end removably secured to said arm and the other end extending through the opening in said blade and resting in the opening in said wall.

19. In a stapling machine, a member comprising a magazine and an ejection chute, a plurality of arms carried by said member, one of said arms being movable toward said member to grip material to be stapled therebetween, another of said arms being movable toward said member to drive staples from said ejection chute into said material, and an operating lever carried by one of said arms and movable to engage with the other of said arms after said first named arm has moved into material gripping position.

20. In a stapling machine, a magazine for staples comprising an elongated core formed with a bottom and spaced upright sides, the upper edges of said sides forming a track upon which staples ride in straddle fashion, a member folded longitudinally about said core from the forward end thereof, said member having a central portion spaced from the forward end of said core and forming the front wall of an ejection chute and wing portions paralleling the sides of said core, inwardly projecting flanges formed on the bottom of said wing portions, said flanges being secured to the bottom of said core to properly space said wing portions from the sides of said core, and guide members projecting from the inner sides of said wing portions and overlying and being spaced from the upper edges of the sides of said core.

21. In a stapling machine, a magazine for staples comprising an elongated core formed with a bottom and spaced upright sides, the upper edges of said sides forming a track upon which staples ride in straddle fashion, the forward end of the bottom of said core being bent upwardly and positioned adjacent the forward edges of said upright sides and forming therewith a rear wall of an ejection chute, a member folded longitudinally about said core from the forward end thereof, said member having a central portion spaced from the forward end of said core and forming the front wall of the ejection chute and wing portions paralleling the sides of said core, inwardly projecting flanges formed on the bottom of said wing portions, said flanges being secured to the bottom of said core to properly space said wing portions from the sides of said core, and guide members projecting from the inner sides of said wing portions and overlying and being spaced from the upper edges of the sides of said core.

22. In a stapling machine, a core forming a staple track, walls formed about said core and defining therewith a magazine for staples having an ejection chute at one end and a loading opening at the other end, an upper arm pivoted to said magazine at said loading end and overlying said magazine, said arm having side and forward end portions in overlapping relationship to the walls of said magazine, a driving blade within said portions and reciprocal in said ejection chute, a spring urging said upper arm away from said magazine, a lower arm pivoted to said magazine at said loading end and underlying said magazine, said arm having a clinching anvil in operative relation to said ejection chute, and a spring between said lower arm and said magazine urging said lower arm away from said magazine with less force than said first-mentioned spring urges said upper arm away from said magazine.

23. In a stapling machine, a member comprising a magazine and an ejection chute, a staple driver reciprocal in said chute, a staple clincher positioned opposite said chute, said member and said staple clincher being movable toward each other to grip material to be stapled therebetween, a force multiplying lever operatively connected to said staple driver, and means for establishing an operative connection between said lever and said staple clincher when said staple clincher and

said member are moved into material gripping position.

24. In a stapling machine, an elongated member comprising a magazine and an ejection chute, a staple driver reciprocal in said chute, and an arm pivoted to said member and having a driving connection with the top of said staple driver, said arm being movable about said pivot to impart reciprocal movement to said staple driver, said pivot being positioned substantially in a plane vertical to and bisecting a straight line passing between the upper and lower points of travel of the top of said driver.

25. In a magazine for staples, means in the magazine interposed between one end thereof and the staples stored in said magazine and exerting a force urging said staples toward the other end, said means comprising a plurality of compression springs, and connective means communicating the compressive force in one spring to another spring, said connective means so relating said springs that when compressed the overall longitudinal space required will be less than the sum of the individual longitudinal space required for each spring.

26. In a magazine for staples, means in the magazine interposed between one end thereof and the staples stored in said magazine and exerting a force urging said staples toward the other end, said means comprising a plurality of compression springs, and connective means communicating the compressive force in one spring to another spring and permitting said springs to have an overlapping relationship when compressed whereby the overall space required will be lessened.

27. In a stapling machine, a magazine for staples, means for urging staples along said magazine comprising a staple follower, a plurality of springs for operating said follower, said springs being interrelated so that the tension in one is transferred to another and so arranged that when the pressure of said follower is greatest against said staples said springs are approximately the same overall distance in length.

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