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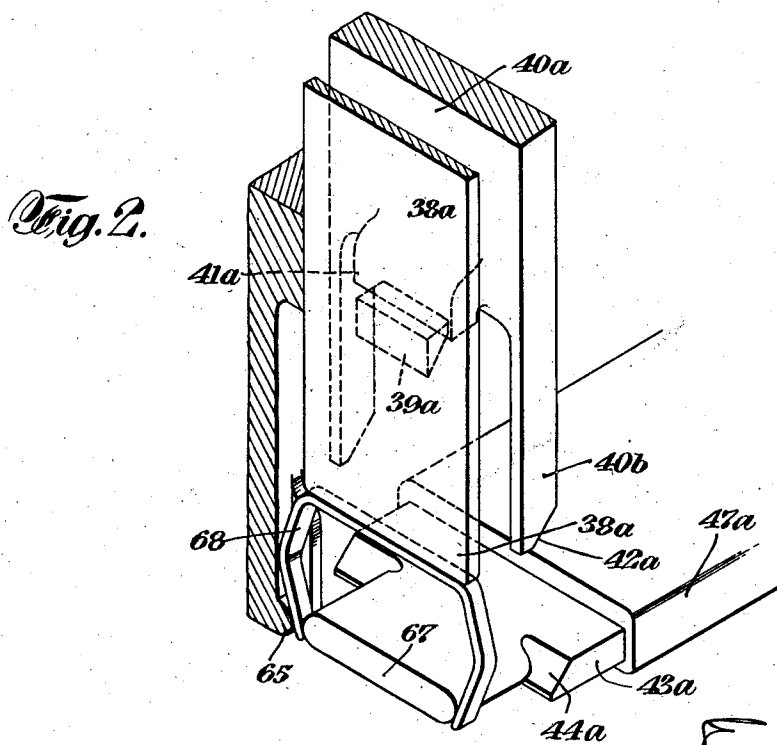
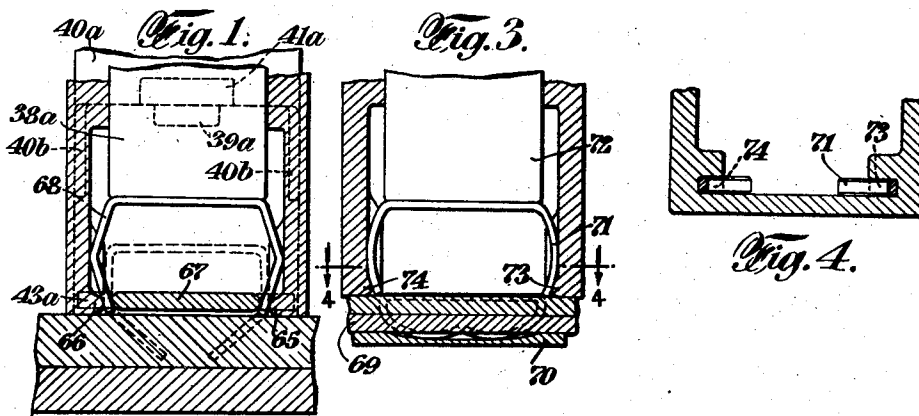
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2,185,518

STAPLING DEVICE AND METHOD

Filed May 23, 1938

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

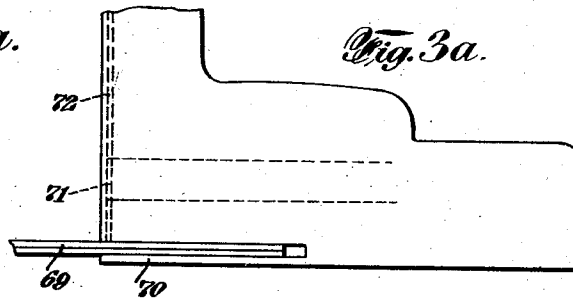
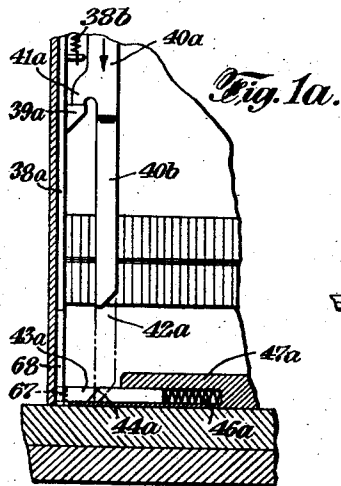


Fig. 6a.

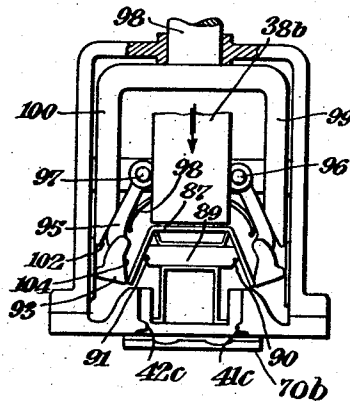


Fig. 8a.

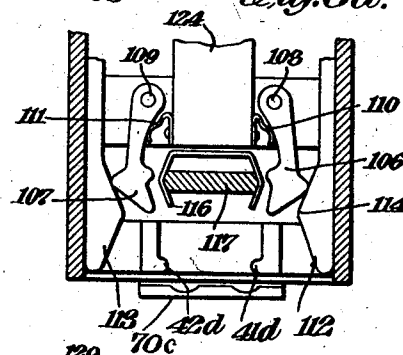
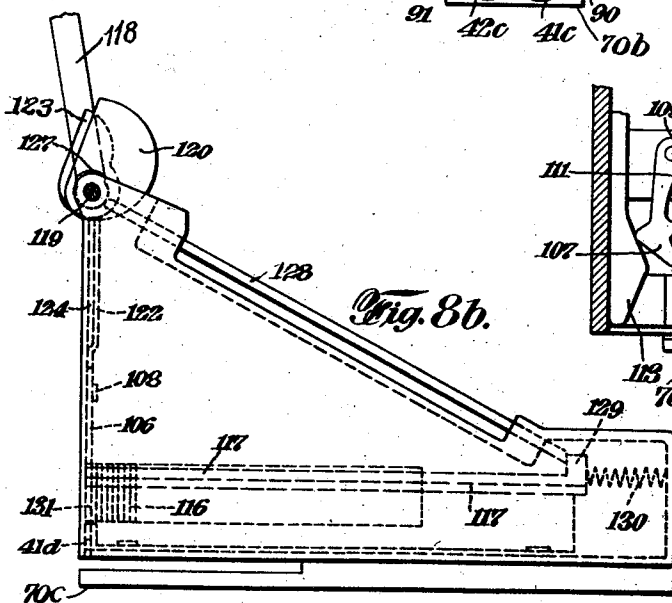


Fig. 8b.



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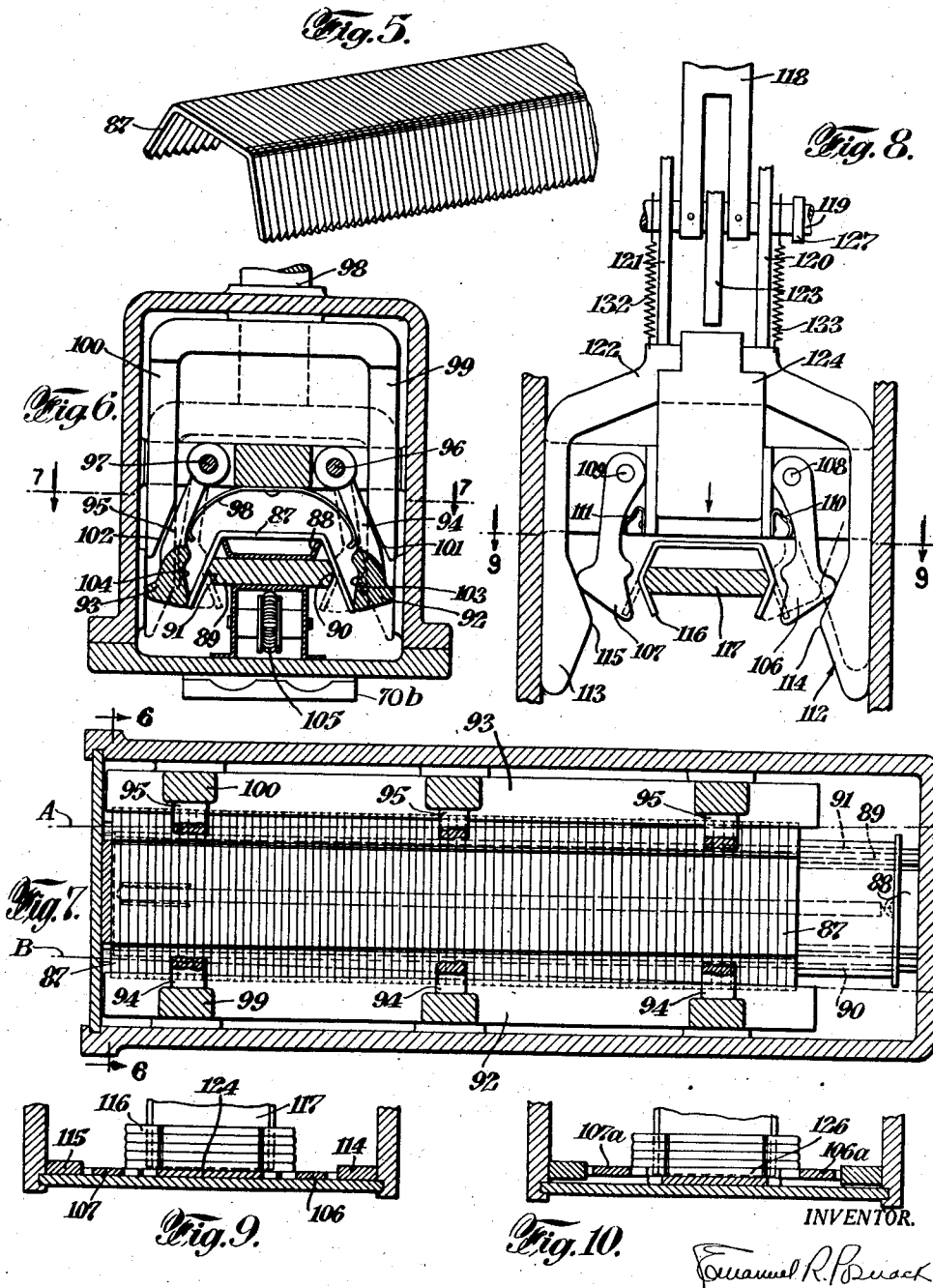
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STAPLING DEVICE AND METHOD

Filed May 23, 1938

3 Sheets-Sheet 3



UNITED STATES PATENT OFFICE

2,185,518

STAPLING DEVICE AND METHOD

Emanuel R. Posnack, Brooklyn, N. Y.

Application May 23, 1938, Serial No. 209,457

14 Claims. (Cl. 1—2.1)

This invention relates to stapling methods and machines for the sealing of containers made of corrugated board, cardboard and the like, and for securing together several sheets of paper or other material, and for tacking, wire-tying and binding purposes,—this application being a continuation in part of my application filed November 6, 1936, Serial No. 109,425. As in the parent case the method and apparatus of this invention are both primarily intended for use in ultimately driving staples having either angulated or arcuate legs.

It is one of the objects of my invention to enable staples to be driven into various kinds of work with or without the employment of an underlying anvil, and to effect an operative drive with staples that are of simple design and relatively inexpensive to fabricate.

It is also within the contemplation of this invention to simplify stapling operations, and to enable them to be efficiently performed with a minimum of effort.

Another object of my invention is to enable straight-legged staples to be fed into the device constituting one of the several forms of this invention, and formed into staples with angulated or arcuate legs either before or simultaneously with the driving operation, thereby permitting relatively cheap and simple staples to be employed in a manner heretofore not possible.

And it is also within the contemplation of this invention to permit all of the foregoing functions to be performed by a simple and readily manipulated machine.

Other objects, features and advantages will appear from the drawings and the description hereinafter given.

Referring to the drawings,

Figure 1 is a fragmentary sectional front view illustrating one form of this invention employing a central retractable guiding element positioned between the legs of the staple near the base of the machine,—this view showing two positions of the staple during the driving operation.

Figure 1a is a fragmentary side sectional view of the device shown in Figure 1.

Figure 2 is a fragmentary perspective of the device of Figure 1.

Figure 3 illustrates a structure of my invention similar to that of Figure 1, except that the machine is shown driving a staple with arcuate legs, and an anvil is shown underlying the work being stapled instead of above the work as illustrated in Figure 1,—this view also showing two

positions of the staple during the stapling operation.

Figure 3a is a fragmentary side view of the device shown in Figure 3.

Figure 4 is a fragmentary sectional plan of Figure 3 taken along line 4—4.

Figure 5 represents a strip of U-shaped staples with diverging legs adapted for employment in a form of this invention.

Figure 6 is a fragmentary semi-diagrammatic sectional view of a modified form of this invention adapted to reshape a strip of staples similar to that of Figure 5 into staples having angularly bent legs, the section being taken along line 6—6 of Figure 7.

Figure 6a is a fragmentary semi-diagrammatic view of the device shown in Figure 6, illustrating the position of the staple driving and deflecting means with respect to the other elements of the machine.

Figure 7 is a sectional plan view of Figure 6 taken along line 7—7.

Figure 8 is a semi-diagrammatic fragmentary front section of another form of this invention illustrating the mechanism for reshaping a single staple in a strip such as shown in Figure 5 into one having angulated legs,—the deflecting and clenching elements being omitted.

Figure 8a is a semi-diagrammatic fragmentary section of the device shown in Figure 8 illustrating the position of the staple driving, deflecting and clenching elements.

Figure 8b is a side view of the device of Figure 8, showing the means to retract the central die 117.

Figure 9 is a partial sectional plan of Figure 8 taken along line 9—9, and

Figure 10 is a view similar to Figure 9 showing an arrangement for reshaping the second staple in the strip instead of the foremost staple.

In the drawings, it will be noted that the method and machine constituting this invention are adapted to drive staples that preferably have substantially flat tops, and legs of either angular form such as staple 68 (see Figure 1) or arcuate shape such as staple 70 (Figure 3). Just as in the invention described in my said patent application, Serial No. 109,425, the forward portion of the frame of the machine of each of the forms illustrated contains a conventional chamber for accommodating a staple and driving plunger, the lateral walls of the chamber containing inwardly protruding portions or deflecting elements in the path of the legs of the staples and engageable therewith to deflect them inwardly during the

downward drive of the staple, whereby a clinch is formed within the work. In this respect the driving mechanism and the operations performed thereby are substantially similar to that described in the parent patent application, and need not be repeated in fullest detail here. It should be noted, however, that for best operative results the distance between the said deflecting elements such as those identified by the numerals 65 and 66 in Figure 1, and 73 and 74 in Figure 3, is no less than the width of the plunger so that there can be no restrictive engagement of the plunger and said deflecting elements. The staple is preferably, though not necessarily, so proportioned that the distance between the terminal points of the legs is substantially equal to the flat top portion of the staple, and the width of the plunger is preferably no wider than the said flat top portion of the staple.

In the forms of my invention set forth in my said patent application, Serial No. 109,425, no anvils or guides other than the deflecting elements above referred to were employed to coact with the plunger in order to effectuate a clenching operation, the convergent direction of the legs being effectuated solely by their shape, the coaction between the plunger and the deflecting elements, and the resistance afforded by the material being stapled. In the forms of my invention illustrated in this application, however, I employ certain additional guiding and supporting means for obtaining a more positive clench and deflection of the staple legs within the work. For example, in Figures 1, 1a and 2 is shown the retractible guide or anvil 67 which coacts with the deflecting elements 65 and 66 and the plunger 38a to cause an inward deflection of the legs of the staple; and in Figures 3, 3a and 4 is shown the anvil 70 cooperating with the deflecting elements 73 and 74 and the plunger 72 to effect an inward deflection and ultimate clench of the legs.

In the above mentioned forms, it will hence be noted that a more positive means for effecting deflection is employed than that disclosed in my said patent application, Serial No. 109,425, inasmuch as the plungers and deflecting elements have as an assisting factor an anvil or staple leg guiding member. And, just as in the structure of the parent application, another deflecting factor frequently is the material that is being stapled; and if this material is sufficiently dense and offers a substantial resistance to penetration, it will cause a further bending of the legs of the staple to form a closer clench.

By referring specifically to Figures 1, 1a and 2, it will be seen that a structure is illustrated where the deflecting elements 65 and 66 are positioned at the base of the machine, although it is also within the contemplation of this invention to employ deflecting elements lifted a predetermined distance above the base as in the parent application. And, as aforesaid, the device shown in these figures is provided with the horizontally disposed retractible support and/or guide member 67 positioned between the said deflecting elements to permit the legs of the staple 68 to pass therebetween. Hence it is apparent that in this form of my invention the legs of the staple are reinforced (during their operating movement) against lateral buckling; and it will furthermore be seen that the said element 67 also serves as a guide for the downwardly moving legs. In the operation of this structure, the guide 67 remains in its foremost or operative position until the top of the staple is brought either in proximity to

or against its upper surface, whereupon it is retracted to permit the staple to be further projected downwardly through the base of the machine and against the work.

The retraction of guide 67 may be effectuated by providing the plunger 38a with a lug 39a at the rear thereof, said lug being adapted for engagement by the extension 41a on the driving member 40a adapted to be reciprocatingly actuated in any conventional manner. The said driver 40a contains preferably two downwardly extending arms 40b the terminal portions 42a of which are bevelled. As the said driver 40a is moved downwardly, it actuates the plunger 38a, against the action of spring 38b, to enable it to operatively engage the foremost staple 68. When the said terminal portions 42a reach the bottom of the stroke, said portions engage the shoulders 44a of the anvil 43a joined to the forward portion 67 thereof. Inasmuch as said shoulders 44a are also bevelled, the engagement of the terminal portions 42a therewith will cause a retraction of the member 67 against the action of spring 46a contained within the housing 47a. As soon as the driver 40a is returned upwardly, under the action of spring 38b, the said spring 46a will actuate the member 67 forwardly to its normal position.

In the device hereinabove described, that form of my invention has been shown which employs an anvil or guide overlying the work. In Figures 3, 3a and 4, however, is shown a structure where the work 69 is positioned between the machine proper and an underlying anvil 70. The staple 71, shown as one with arcuate legs merely for the purposes of illustration, is being driven downwardly by the plunger 72, the legs of the staple entering the material and being deflected inwardly by the deflecting elements 73 and 74, the terminal portions of the legs passing through the material and striking the anvil 70 to be clenched upwardly thereby against the undersurface of the work, as illustrated. One of the advantages of such a construction over the usual stapling device employing a conventional parallel-legged U-shaped staple is that it affords less resistance to clenching. In the usual conventional device, the legs strike the anvil practically perpendicularly, whereas in the device of Figure 3 the legs, during the downward drive thereof, are first deflected inwardly, so that they strike the anvil 70 obliquely thereby reducing the magnitude of their impact against the anvil and of their frictional engagement therewith, consequently effecting a reduction in stapling effort. This form of the invention is particularly adaptable for office stapling purposes where the application of relatively little pressure to effect the stapling operation obviously constitutes a decided advantage. Furthermore, with the use of an underlying anvil, a greater upward deflection is obtainable and a firmer stitch procurable than is otherwise possible.

It will thus be seen that in the various forms above described an initial deflection of the staple legs is effectuated by elements which are operatively stationary with respect to the machine; and as the staple progressively enters the work, the legs thereof are bent inwardly towards each other to form either a fully or partially closed clench, in accordance with the specific design of the device. If, during the downward and lateral movement of the legs, there should be some plowing through of the material being stapled, the entire top portion of the staple will cover any

holes caused thereby inasmuch as the width of said top portion is substantially equal to the outlet opening at the base of the machine.

By employing this invention in the forms thereof herein described, not only can several sheets of paper be stapled together and containers of cardboard or other material efficiently sealed, but various types of tacking operations can also be performed. A staple can be driven into solid material, such as wood for example, to form a fully or partially clenched "blind" stitch, useful for attaching tags, securing window shades to their rollers, attaching insulation or waterproofing sheets to wall boards or the like, and for other building purposes. And still another use is for binding together a group of wires passed through the machine, or clamping a light display article to a flat cardboard for producing window displays and the like.

In the practical application of this invention the staple can be inserted preformed as illustrated in the drawings above referred to. However, it is within the further contemplation of this invention to employ straight-legged staples, particularly those having divergent legs as shown in Figure 5, a strip of such staples 87 being inserted into the machine and the legs bent into the required shape during or before the driving operation, in a manner to be hereinafter explained.

By referring to Figures 6, 6a and 7, the strip of staples 87 is mounted on the staple rail 88, a central die or bar 89 with angulated (or curved) lateral sides 90 and 91 underlying said rail and extending longitudinally of the machine and positioned intermediate the legs of the staples. The lateral forming dies 92 and 93, also extending longitudinally of the machine, are carried by a plurality of arms 94 and 95 pivotally mounted at 96 and 97 respectively, the springs 98 being positioned between the said arms 94 and 95 and normally actuating them outwardly. A slidably movable plunger or rod 98 is suitably attached to the vertically disposed actuators 99 and 100 the lower terminals 101 and 102 of which are adjacent the said arms 94 and 95 respectively and adapted for operative engagement therewith.

When the plunger 98 and consequently the actuators 99 and 100 are forced downwardly, the said extremities 101 and 102 of the actuators will engage the arms 94 and 95 to cause an inward pivotal movement thereof, resulting in a corresponding movement of the dies 92 and 93 to produce an inward bending of the lower portions of the legs of the staple about the lateral sides 90 and 91 of the bar 89, thereby producing angulated legs as shown by dotted lines in Figure 6. The shape of the dies 92 and 93, particularly the forming faces 103 and 104 thereof, are angulated in accordance with the desired angle and shape of the legs. The strip of staples 87 is constantly being urged forwardly by any conventional spring feed mechanism such as the rotatably mounted spring 105 suitably associated with the strip in a manner not shown, but in accordance with conventional practice well known in this art.

The structure of Figure 6 may also contain at the forward portion thereof driving, deflecting and clenching means similar to those hereinbefore described, these means being operable subsequent to the above-described stapling-forming operation. By referring to Figure 6a, it will be seen that the plunger 38b, suitably operated manually or by any other independent

means, is adapted to move downwardly past the deflecting elements 41c and 42c near the base of the device towards the anvil 70b. When the staples are operatively inserted in the machine, the said plunger 38b, the deflecting elements 41c and 42c and the anvil 70b will coact to drive, deflect and clench the staple in the manner hereinabove described.

The lateral forming dies, such as 92 and 93, can, within the contemplation of this invention, be normally at a slight inclination to the longitudinal axis of the machine, as indicated by the dot-dash lines A and B in Figure 7. If then these dies are actuated inwardly to bring them into parallel relation to said axis and into operative engagement with the staple strip, the staples will be progressively reshaped, from one end of the machine to the other. With this arrangement, less effort will be required to reshape the staples into the required form than would be necessary where all the staples were reshaped simultaneously.

It is thus apparent that the relatively inexpensive staples such as 87 can be employed in this device whereby they may be readily transformed into those having flat tops and bent or angulated legs, whereafter they are driven by a suitable stapling mechanism in the manner hereinbefore described.

In Figures 8, 8a and 8b is shown a mechanism similar to that of Figure 6, except that a single staple (rather than a group of staples) of the strip is deformed,—and simultaneously with the driving operation. The dies 106 and 107 are pivotally mounted at 108 and 109 respectively, the arms of these dies being normally urged outwardly by the springs 110 and 111. The die actuators 112 and 113 contain the cams 114 and 115 which, upon the downward movement of the said actuators, engage the said dies to move them inwardly and bend the legs of the staple 116 about the lateral sides of the central die or bar 117, in a manner similar to that described with reference to the structure of Figure 6.

A manually or power operated lever 118, affixed to the shaft 119 suitably mounted on the machine, causes a rotation of the shaft during its operative movement, thereby actuating the two lateral cams 120 and 121 engageable with the yolk 122, and thereafter the central cam 123 engageable with the driving plunger 124. The cams are so designed that upon an operative movement of the lever 118, the yoke 122 and consequently the actuators 112 and 113 are moved downwardly, against the action of springs 132 and 133, to cause an operative inward movement of the forming dies 106 and 107 to reshape the legs of the adjacent staple; and after the cams 114 and 115 of the said actuators have completed their operative engagement with the said dies, the cam 123, during the continued operative rotation of shaft 119, actuates the plunger 124 downwardly to effect its driving operation in a manner similar to that hereinabove described, the staples 116 being deflected inwardly by the members 41d and 42d and clenched by the anvil 70c.

The position of the forming dies 106 and 107 may, if preferred, be in the plane of the plunger at the front of the machine to engage the foremost staple, as shown in Figure 9. After the staple is deformed the springs 110 and 111 force the dies 106 and 107 outwardly out of the path of the plunger, the bar 117 is slightly retracted in a manner to be hereinafter described, and the plunger, during its downward drive as above de-

scribed, continues its operative engagement with the staple 131. Thereafter the parts are retracted to their normal inoperative positions by the springs 132 and 133 mounted on the shaft 119 and affixed to the yoke 122.

The said shaft 119 has affixed thereto the cam 127, slidably engageable with the obliquely disposed rod 128 the lower terminal of which is engageable with the lug 129 at the end of the bar 117. As the shaft 119 is caused to rotate under the influence of the driver 118, the said cam 127 will, at a predetermined point, actuate said rod 128 downwardly and rearwardly to cause a retraction of the entire bar 117 against the action of spring 130. Upon a continued operative movement of the cam 127, the rod 128 will return to its normal position under the influence of said spring 130 to bring the parts back in their normal inoperative position.

If desired, the dies 106a and 107a, similar to those identified by the numerals 106 and 107, can be positioned adjacent and in the plane of the second staple 126 as shown in Figure 10, so that there will be no interference with the plunger 124 during its downward drive, thereby obviating the necessity of retracting the said dies and bar before the completion of the stroke.

In either of the last two forms above described, it will thus be seen that straight-legged staples can be inserted in a machine embodying my invention, and one of the staples simultaneously reshaped into a staple with bent legs to enable it to be driven by the method and mechanism constituting my invention.

It is of course understood that other additional forms and modifications of the apparatus and adaptations of the method constituting this invention can be employed beyond and in addition to those hereinbefore described, all within the scope of the appended claims.

It should be noted that in the claims hereinafter set forth, the term "bent" legs is employed to denote legs of both angular and arcuate configuration containing intermediate portions extending out of the vertical planes through the upper corners at the extremities of the top of the staple.

What I claim is:

1. In a stapling machine for driving a staple having a substantially flat top and bent legs, a plunger adapted for operative engagement with the top of the staple, two deflecting elements positioned above the work to be stapled and interposed in the path of the legs of the staples for engagement therewith to operatively deflect the legs during the downward movement of the staple, and leg-engaging means coacting with said deflecting means for supporting therebetween and guiding the legs of the staple during its operative movement.

2. In a method of operatively driving a staple having a substantially flat top and bent legs with outwardly extending intermediate portions, the steps of applying driving force to the top of the staple, partially obstructing the path of the staple during its downward course to deflect the legs inwardly and simultaneously supporting the legs on two sides thereof.

3. In a stapling machine for driving a staple having a substantially flat top and bent legs with outwardly extending intermediate portions, a plunger adapted for operative engagement with the top of the staple, a chamber for accommodating the plunger, two deflecting elements extending inwardly from the lateral walls of the cham-

ber and interposed in the path of said intermediate portions of the staple for engagement with the outer surfaces thereof to operatively deflect the legs inwardly during the downward movement of the staple, and a retractable guide positioned between said deflecting elements and spaced therefrom a sufficient distance to enable the legs of the staple to pass therebetween during a predetermined portion of the driving stroke.

4. In a stapling machine for driving a staple having a substantially flat top and bent legs with outwardly extending intermediate portions, a plunger adapted for operative engagement with the top of the staple, two deflecting elements interposed in the path of said intermediate portions of the staple for engagement with the outer surfaces thereof to operatively deflect the legs inwardly during the downward movement of the staple, a retractable guide positioned between said deflecting elements and spaced therefrom a sufficient distance to enable the legs of the staple to pass therebetween during a predetermined portion of the driving stroke, and means cooperatively associated with the plunger and engageable with said guide for operatively actuating said guide during a predetermined part of the plunger stroke.

5. In a stapling machine for driving a staple having a substantially flat top and bent legs with outwardly extending intermediate portions, a plunger adapted for operative engagement with the top of the staple, two deflecting elements interposed in the path of said intermediate portions of the staple for engagement with the outer surfaces thereof to operatively deflect the legs inwardly during the downward movement of the staple, a retractable guide positioned between said deflecting elements and spaced therefrom a sufficient distance to enable the legs of the staple to pass therebetween during a predetermined portion of the driving stroke, yieldable means urging the guide to its normal unretracted position, and means cooperatively associated with the plunger for operatively retracting the guide against the action of said yieldable means during a predetermined part of the plunger stroke.

6. In a stapling machine for driving a staple having a substantially flat top and bent legs with outwardly extending intermediate portions, a plunger having a substantially flat driving surface adapted for operative engagement with the top of the staple, the extent of said driving surface being no greater than and engageable only with the flat top portion of the staple, two deflecting elements positioned above the work being stapled, the plunger being adapted to clear said deflecting elements during its operative stroke, and an anvil in fixed predetermined relation to said elements and adapted to underlie the said work, the said elements being interposed in the path of said intermediate portions of the staple for engagement therewith to operatively deflect the legs inwardly and towards the anvil during the downward movement of the staple whereby the legs will operatively engage the anvil at an inclination.

7. In a stapling machine for driving a staple having a substantially flat top and bent legs with outwardly extending intermediate portions, a plunger having a substantially flat driving surface adapted for operative engagement with the top of the staple, the extent of said driving surface being no greater than and engageable only with the flat top portion of the staple, two stationary deflecting elements positioned above the

work being stapled, and an anvil containing two oppositely directed surfaces in fixed predetermined relation to said elements and adapted to underlie the said work, the said elements being interposed in the path of the legs of the staple for engagement therewith to deflect them inwardly and towards the anvil during the driving stroke whereby each of the legs will operatively engage one of the said two oppositely directed surfaces of the anvil at an inclination thereto.

8. In a stapling machine for driving a staple having bent legs with outwardly extending intermediate portions, means for reshaping divergent straight-legged staples fed into the machine into those with legs of the required bent configuration, including a staple rail for operatively supporting a plurality of said straight-legged staples, coacting bending die means in the plane of a selected one of said staples and operatively engageable with the inner and outer surfaces of the legs thereof, and means for actuating certain of the die means into operative engagement with said legs and towards the other of said die means, whereby the legs will be bent between said die means.

9. In a stapling machine for driving a staple having bent legs, means for reshaping straight-legged staples fed into the machine into those with legs of the required bent configuration, including a staple rail for operatively supporting a plurality of straight-legged staples, a central die positioned between the legs of the staples and engageable with intermediate portions thereof, two lateral dies positioned in the plane of a selected one of the staples and outside thereof and being engageable with the lower portions of the legs of said selected staple, and means for actuating the lateral dies towards the central die whereby the staple legs therebetween are bent inwardly.

10. In a stapling machine for driving a staple having bent legs with outwardly extending intermediate portions, means for reshaping straight-legged staples fed into the machine into those with legs of the required bent configuration, including coacting bending die means positioned in the region of the forward portion of the machine and operatively engageable with the inner and outer surfaces of the legs of a predetermined staple correspondingly positioned, a plunger for operative engagement with the top of an underlying staple, actuating means coactively connected with certain of said die means and said plunger for actuating first said latter die means towards the coacting die means and then the plunger whereby said legs are operatively bent between said die means and the plunger caused to drive the said underlying staple downwardly; and two deflecting elements positioned above the work being stapled and interposed in the path of the driven staple for engagement therewith during the driving stroke.

11. In a stapling machine for driving a staple having bent legs with outwardly extending intermediate portions, means for reshaping straight-legged staples fed into the machine into those with legs of the required bent configuration, in-

cluding a staple rail for operatively supporting a plurality of straight-legged staples, a central die positioned between the legs of the staples and engageable with intermediate portions thereof, two lateral dies positioned in the region of the forward portion of the machine and in the plane of a selected one of the staples correspondingly positioned, said lateral dies being outside of the said staple and engageable with the lower portions of the legs thereof, a plunger for operative engagement with the top of an underlying staple, actuating means coactively connected with said lateral dies and said plunger for actuating first said lateral dies and then the plunger whereby the lateral dies are moved towards said central die to produce a bent configuration of the staple legs therebetween and the plunger caused to drive the said underlying staple downwardly; and two deflecting elements positioned above the work being stapled and interposed in the path of the driven staple for engagement therewith during the driving stroke.

12. In a stapling machine for driving a staple having bent legs with outwardly extending intermediate portions, means for reshaping divergent straight-legged staples fed into the machine into those with legs of the required bent configuration, including a staple rail for operatively supporting a plurality of said straight-legged staples, a plunger in the front of the machine for operative engagement with the top of an underlying staple, yieldable feeding means urging said staples towards the plunger, coacting bending die means positioned in the plane of the plunger and operatively engageable with the inner and outer surfaces of the legs of the staple underlying the plunger, actuating means coactively connected to certain of said die means and said plunger for actuating first said latter die means towards the coacting die means to reshape the staple and then the plunger for driving the underlying reshaped staple, and means for retracting said die means during the operative stroke of the plunger.

13. In a stapling machine, the combination according to claim 12, wherein the coacting bending dies include a central die normally underlying the plunger in its raised position and positioned between the legs of the foremost staple, and two lateral outside dies having staple-leg-engaging portions in the plane of said foremost staple; and further provided with means cooperatively connected with the plunger for retracting said central die, and means for retracting said lateral dies, the said retracting means being operable during the operative stroke of the plunger.

14. In a method of stapling, providing a strip of staples with straight legs, bending the legs of a staple, of the strip other than the foremost one thereof to form outwardly extending intermediate portions while applying driving force to the top of the foremost staple of said strip, and forcing the legs of the staple being driven towards each other by engaging said intermediate portions thereof during the downward movement of the latter staple.

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