April 3, 1951 G. P. WOODBURY 2,547,514

APPARATUS FOR MANUFACTURING BOX CONSTRUCTIONS

Filed March 3, 1947 2 Sheets-Sheet 1

Fig. 4

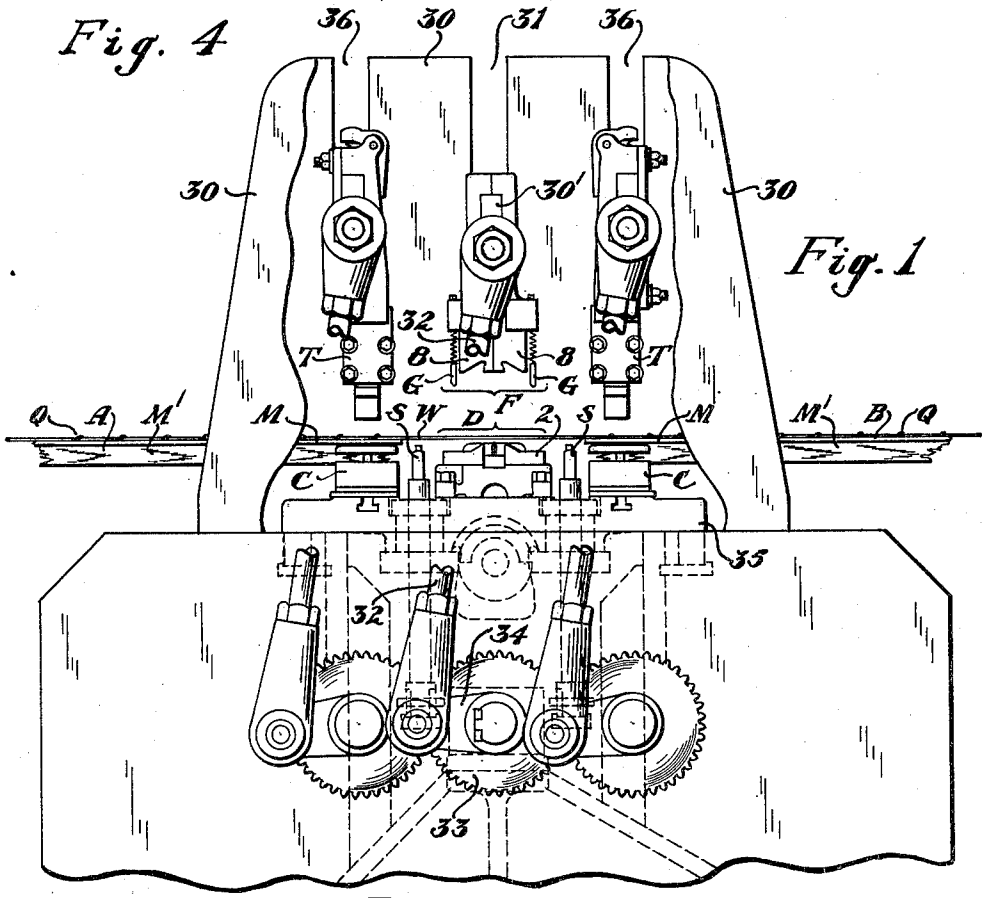

Fig. 1

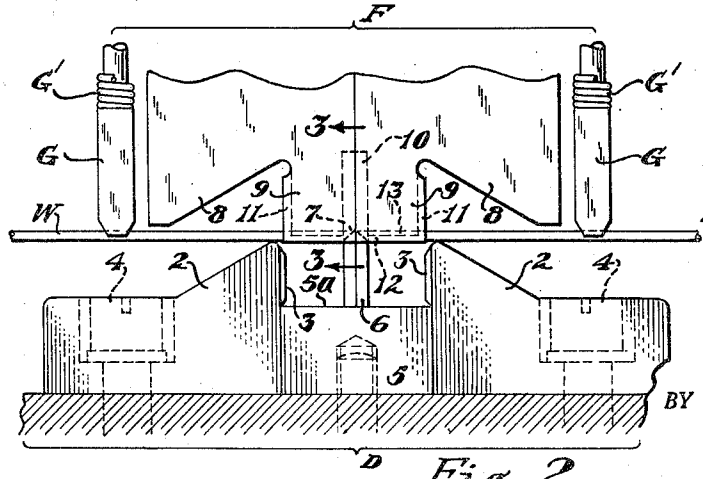

Fig. 2

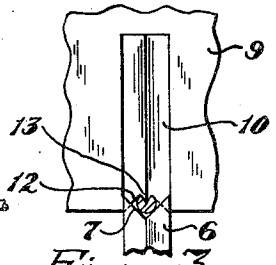

Fig. 3

INVENTOR.
Glen P. Woodbury.
BY Blair Curtis & Hayward
ATTORNEYS.

April 3, 1951 G. P. WOODBURY 2,547,514

APPARATUS FOR MANUFACTURING BOX CONSTRUCTIONS

Filed March 3, 1947 2 Sheets-Sheet 2

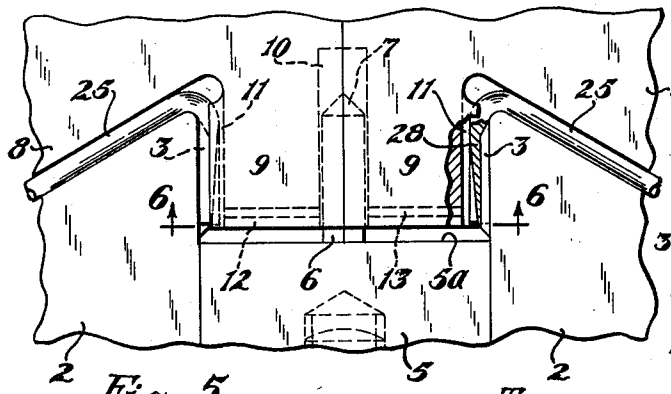

Fig. 5

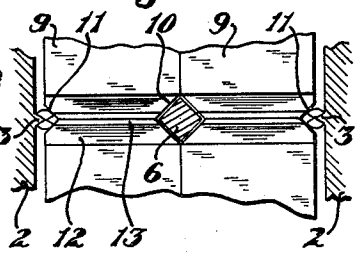

Fig. 6

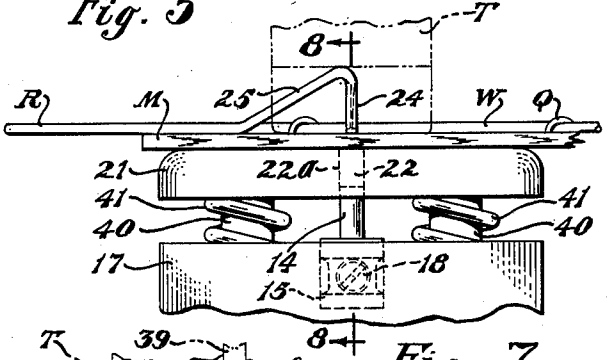

Fig. 7

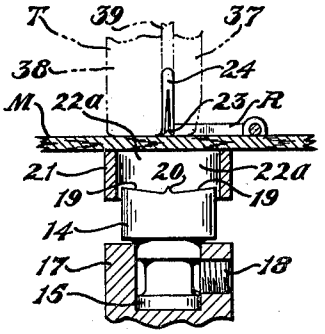

Fig. 8

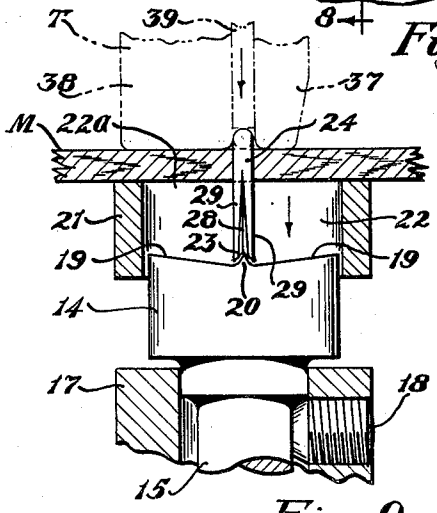

Fig. 9

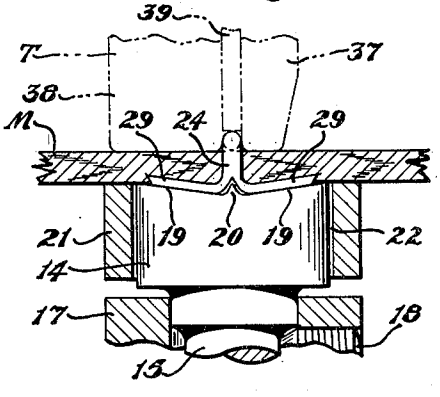

Fig. 10

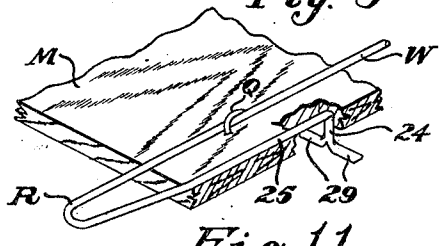

Fig. 11

INVENTOR.
Glen P. Woodbury.
BY Blair Curtis & Hayward
ATTORNEYS.

Patented Apr. 3, 1951

2,547,514

UNITED STATES PATENT OFFICE

2,547,514

APPARATUS FOR MANUFACTURING BOX CONSTRUCTIONS

Glen P. Woodbury, Reading, Mass., assignor to Stapling Machines Co., Rockaway, N. J., a corporation of Delaware

Application March 3, 1947, Serial No. 731,953

8 Claims. (Cl. 140—93)

1

This invention relates to machines for forming into interengageable fasteners the ends of wires binding wirebound boxes and particularly to improved means for forming a clinching prong on a wire end and for clinching such prong.

It is an object of the invention to provide certain improvements in machines disclosed in United States Patents 1,933,031, October 31, 1933; 2,024,188, December 17, 1935; 2,161,200, June 6, 1939; 2,191,684, February 27, 1940; and 2,228,304, January 14, 1941. These machines serve to form the ends of the wires of wirebound box blanks into detachable fastening means before the box blank is folded into box form. When folded into box form, the box cover and other parts of the box may be secured by the fastening means. The fastening means comprise opposing loops or bights at the wire ends, which loops may be passed through one another and bent over to complete the fastening operation. Each loop is formed by forming a prong on the wire end, bending the body of the wire end to swing the prong onto the box blank to form a bight, driving the prong through the side material of the box blank and clinching the end of the prong on the under side of the material. One side of each bight or loop is the wire that is stapled to and holds the side sheets and cleats of the box together, and the other side of the bight is secured to the side material forming the box sides.

The wirebound box blanks usually consist of four separate sections of side material and cleats connected together in foldable relationship by binding wires which are stapled to the side material and cleats. The box blanks as made on the conventional box blank-forming machine are connected together by the binding wires. The continuous succession of joined box blanks is fed to the machines of the above mentioned patents, which machines sever the lengths of binding wires joining the box blanks, and form each resulting wire end into a bight.

In the mechanisms disclosed in the aforementioned patents, the end of the bight is secured in the side material by a single prong formed at the end of the wire, and clinched in the direction of the pull exerted on the bight when fastened. This construction has the disadvantage that if the bight is bent back from the face of the side material the clinch may be at least partially opened and extended into the box when the bight is subsequently fastened.

It is an object of the present invention to strengthen the end of the bight that is secured in the side material so that the fastener formed

2

by one bight passing through another and being bent over has greater strength.

It is another object to provide a device for securing the wire end so that no matter how the bight is manipulated the clinch securing the end does not become loosened.

It is another object to provide a dependable compact double-pronged clinch from a single wire, for fastening the end of the wire to the side material of a wirebound box. It is another object to provide mechanism for converting the end of a binding wire of a wirebound box into a prong which may subsequently be divided to form a two-legged, two-directional clinch.

Other objects will be in part obvious and in part pointed out hereinafter.

In the drawings:

Figure 1 is a partial side elevation of interengageable-fastener forming mechanism shown in United States Patent 2,024,188 changed to embody the present invention;

Figure 2 is a view of prong-forming and scoring elements embodying the invention, in position about to sever the wire joining adjacent box blanks after having scored one side of each of the wire ends to be formed;

Figure 3 is an enlarged fragmentary vertical sectional view taken on the line 3—3 of Figure 2;

Figure 4 is a top plan view of the severed wire, showing each end scored and provided with a V-notched end;

Figure 5 is an enlarged fragmentary view of the elements of Figure 2 after they have moved together and formed the prongs and scored the other side of the wire ends. Part of one element and part of one prong are shown in cross-section to show the web section joining the two sides of the scored prong;

Figure 6 is a sectional view taken on the line 6—6 of Figure 5, showing the ends of the scored prongs;

Figure 7 is a fragmentary side elevation of a clinching unit shown in Patent No. 2,024,188, changed to embody the present invention. A prong formed by the machine of Figure 2 is shown about to be driven into the side material;

Figure 8 is a sectional view taken on the line 8—8 of Figure 7. The scored driving point of the prong is shown aligned with a clinching anvil below;

Figure 9 is a view similar to Figure 8, showing the prong driven through the side material and about to contact a parting ridge of the clinching anvil;

Figure 10 is a view similar to Figure 9, but

showing the driving and clinching elements moved together to part the scored driving point into separate legs and to clinch each leg in the side material; and

Figure 11 is a fragmentary perspective view showing a bight or loop perpetuated by the two directional clinch shown in Figure 10.

Referring to Figure 1, the rearward end of a box blank A is shown at the left joined to the forward end of a box blank B by a wire strand W running the length of each box blank. Each box blank consists of four separate sections of joined side material M and cleats M' connected together in foldable relationship by a plurality of parallel binding wires W suitably stapled to the side material and cleats by staples Q (Figure 11). The box blank-making machines staple the binding wires to an indefinite succession of side material and cleats to fabricate an indefinite succession of box blanks. Although the nature of the view of Figure 1 permits showing only one wire W, it is understood that there are several such parallel wires stapled to the side material, and spaced across the width of the box blank as required for the particular box blank being manufactured.

The mechanism of Figure 1 automatically and continually takes the successive joined box blanks from the box blank-making machine and positions each of the adjoining box blanks successively in the position shown in Figure 1. While the mechanism holds the box blanks stationary in this position, it performs the following operations: It severs the wire W connecting the leading and following box blanks. It forms prongs on each of the two wire ends; bends the body of each wire end to swing its prong around above the side vertical its respective box blank to form a bight; drives the prongs through the side material; and, clinches the prongs on the under side of the side material. The bight thus formed is shown at R in Figure 11. The mechanism which intermittently feeds the box blanks to and positions them with respect to the mechanism of Figure 1, is described in Patents 2,161,200 and 2,228,304, and does not form a part of the present invention which deals solely with the box blanks after they are positioned as shown in Figure 1.

As described in the patent, vertical reciprocating former units F (one is shown in Figure 1) are mounted on a vertically reciprocated cross-bar 30' extending across the width of the machine. One former unit is positioned above each wire strand W. The cross-bar is mounted for reciprocation in side castings 30, one on each side of the machine. The cross-bar supporting the former unit travels in vertical tracks 31 in the casting 30, and is supported and reciprocated by drive rods 32 driven by gears 33 through cranks 34. Below each former unit F is a die unit D mounted on a base 35. Each die unit cooperates with its respective former unit to sever the wire W and to form the prongs on the ends of the wire.

Referring to Figure 2, each die unit has two die members 2 suitably secured by screws 4 to the base plate D of the die unit and to the base 35. Spacing the two die members and secured to the base plate D is a spacer block 5 carrying an upright shear member 6, shown in cross-section in Figure 6 and in enlarged front elevation in Figure 3. Referring to Figure 3, the top of shear member 6 is provided with a V-notch whose apex extends in the direction of the wire W.

The shear member cooperates with the former unit F to sever the wire W by cutting out a portion thereof and, because of the rectangular shape of the shear member, the shearing action forms desired V-notches 23 in the ends of the wire (Figure 4).

Each die member 2 has a face opposing the shear member 6. Each face has a sharp vertical scoring ridge 3 which, as will be explained, serves to score one side of the wire end operated on by that face. The opposing ridges 3 are shown in cross-section in Figure 6.

Each former unit F comprises two former members 8 secured together back to back and provided with recesses which form the recess 10, shaped to receive the shear member 6 as the former unit descends onto the die unit. Each former member 8 has a projection 9 having a V-groove 11, aligned with the opposing ridge 3 as shown in cross-section in Figure 6. The sides of the projections 9 and the ridges 3 are spaced sufficiently to receive and score the wire ends therebetween as shown in Figures 5 and 6, as will be described.

The under side of each projection 9 has a notch 12 (Figure 3) running in the direction of the wire W, and at the apex of the notch is a downwardly projecting ridge 13 which, like ridges 3, has a sharp scoring edge which serves to score the wire end at the time of the severing operation (see Figure 4).

The former unit carries guides G on either side of the former members 8, urged downwardly by springs G' but movable with respect to the former unit against the action of the springs. The guides G are notched at their ends to receive the wire W and to position and align it with respect to the notches 12 and ridges 13 of the projections 9 in advance of their contact with the wire W.

As each former unit descends, driven by the drive rods 32, the guides G first contact the stationary wire strand connecting the box blanks and align it with respect to the scoring ridges 13 and shearing member 6. As the former unit continues to descend, the wire is pressed into notch 7 of shear member 6, whereupon further descent forces the scoring edges 13 into the upper surface of the wire to score it as shown in Figure 4, and simultaneously forces the projections 9 past the shear member 6, shearing the wire and forming the end notches 23 shown in Figure 4. Further descent bends the now severed wire ends about the upper corners of the die members 2 forming the wire ends into prongs. Continued descent forces the wire prongs, properly aligned by the notches 11, into the ridges 3, thereby scoring each wire prong on the side opposite that scored by the scoring ridge 13.

Each shearing operation cuts out a section of wire, the length of shear member 6, which section falls to top surface 5a of spacer block 5 when former unit F raises. Top surface 5a may be provided with a slope to cause the wire section to move to and fall from the open side or sides of member 5; or any other suitable means may be utilized to dispose of the loose wire section.

Simultaneously the upper and outer surfaces of the die members 2 coact with corresponding surfaces of the former members 8 to provide a bent portion 25 for holding the scored prong 24 during the prong driving operation. Each prong has two potential legs 29, joined by a web portion 28 left by the scoring actions. The end of the prong has two sharp points separated by the sloping side which forms the V-notch 23. Later,

in the subsequent prong driving operation, the sharp points assist in the penetration of the prong through the side material. The web 28 holds the two legs together but is severed by the clinching operation to free the two legs 29. The prong is now ready for positioning for driving.

At the bottom of the motion of the former unit F, it is immediately withdrawn and simultaneously two spindles S rise; each grasps its wire at a point between the prong 24 and the end of the side material M, and bends the body of the wire to swing the prong over onto the box blank side material M to form the bight R and positions the prong as shown in Figure 5. The spindles and the mechanism by which the spindles are operated are shown in Patent No. 2,024,188. Thus positioned the prong 24 is now ready for driving and clinching, which operation is carried out by driving units T (Figure 1) and clinching units C located below the driving units.

At the moment the prong is positioned as shown in Figures 7 and 8, the driving units T are ready to descend to align and to drive the prong through the side material as shown in Figure 9. The construction and operation of the driving units T are described in the Patent 2,024,188. They are mounted on reciprocating cross-beams which reciprocate vertically in channels 36 in the side castings 30. There are two driving units T for each wire strand, so that the severed and pronged ends of each wire strand are driven simultaneously. As described in the patent and as shown in Figure 9, each driving unit is provided with side guides 37 and 38, and with a driving hammer 39, which descends upon and drives the prong after the side guides 37 and 38 have moved against the side material, have closed on and aligned the prong, and after the driving unit has forced the side material against the top of rectangular plate 21, which plate is part of clincher unit C.

Plate 21 is supported by posts 40 which project upwardly from openings in the clincher body 17. The posts are free in the openings, and springs 41 urge the plate 21 and posts upwardly, the upward motion being limited by stops (not shown) operating in conjunction with the guide posts 40.

Plate 21 has an elongated opening 22 with which prong 24 is aligned before driving, as shown in Figures 7 and 8. The length of open- 22 is shown in Figure 8, its width in Figure 7. As the driven prong enters opening 22, the left face 22a of opening 22 (Figure 7) may serve to guide prong 24 to insure its pointing directly downward after driving; i. e. making the angle between prong 24 and wire length 25 substantially a right angle after driving.

After being driven through the side material, prong 24 is clinched by the combined action of drving unit T and clincher unit C. Each clincher unit C is mounted on a base plate extending between side castings 30, and includes a clinching anvil 14, having a base 15, secured against rotation in clincher body 17 by set screw 18. Clinching anvil 14 is received by opening 22, and has the same shape in horizontal cross-section as has opening 22.

After the driving operation is completed, the driving unit T continues to descend, forcing the plate 21 downwardly against the action of the springs 41 and causing the prong to move downwardly against the stationary clinching anvil 14 to divide and clinch the prong.

To this end the anvil 14 has a ridge 20 aligned with the V-notch 23 at the end of the prong.

The sides of the ridge 20 blend with upwardly and outwardly sloping surfaces 19 of anvil 14. As the prong descends against the anvil 14, the apex of the V-notch 23 meets the ridge 20, with the result that as the two sides 29 of the prong ride over the respective sides of ridge 20, the web 28 connecting the two sides 29 of the prong is torn, and the prong is divided into separate sides (legs 29). The ends of the legs move outwardly over the anvil as the prong continues to descend, and finally meet, enter and bed in the side material M. The shape of the point of each leg 29 is such that as it moves outwardly from the ridge 20 and finally contacts the side material M, it enters and embeds in the under side of the side material.

By this operation, the single prong is converted into a double prong, and is securely clinched and set into the side material in such manner that subsequent bending of the bight R does not loosen the clinched prong, even though the side material be relatively thin.

The construction of the engageable fastener in combination with the double-legged two-directional clinching prong is covered in a copending application.

As many possible embodiments may be made of the above invention and as changes may be made in the embodiments described without departing from the scope thereof, it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

I claim:

1. In a machine having instrumentalities for forming and perpetuating a bendable fastening bight at the end of a binding wire securing box parts together in the form of a box blank, in combination, mechanism for forming a prong at the end of the wire extending from said box blank including a shearing member having a convex shearing edge and a forming member having a shearing edge conforming to that of said shearing member and adapted to move past the shearing member while said wire is on said shearing member to cut a section from said wire and leave a V-notch across the wire end, said forming member having a channel extending from its shearing edge parallel to said wire and having a knife-shaped ridge extending into the channel from the apex thereof for scoring an end portion of said wire simultaneously with the shearing action, the scoring extending to the apex of the notch of said wire end, a die member having a knife-shaped ridge, said forming member having a second channel adapted to bend and force said end portion against the ridge of said die member to score the end portion on the side opposite the first scoring and to leave a web connecting the two sides of the end portion separated by the scoring, and said forming member and die members having coacting surfaces for bending the end portion into a prong.

2. In a machine having instrumentalities for forming and perpetuating a bendable fastening bight at the end of a binding wire securing box parts together in the form of a box blank, in combination, mechanism for forming a prong at the end of the wire extending from said box blank including a shearing member having a convex shearing edge and a forming member having a shearing edge conforming to that of

said shearing member and adapted to move past the shearing member while said wire is on said shearing member to cut a section from said wire and leave a V-notch across the wire end, said forming member having a channel extending from its shearing edge parallel to said wire and having a knife-shaped ridge extending into the channel from the apex thereof for scoring an end portion of said wire simultaneously with the shearing action, the scoring extending to the apex of the notch of said wire end, a die member having a knife-shaped ridge, said forming member having a second channel adapted to bend and force said end portion against the ridge of said die member to score the end portion on the side opposite the first scoring and to leave a web connecting the two sides of the end portion separated by the scoring, said forming member and die members having coacting surfaces for bending the end portion into a prong, and said shearing member having a V-notch at the end thereof to hold and align the wire during contact by the forming member.

3. In a machine having instrumentalities for forming and perpetuating a bendable fastening bight at the end of a binding wire securing box parts together in the form of a box blank, in combination, mechanism for forming a prong at the end of the wire extending from said box blank including a shearing member having a convex shearing edge and a forming member having a shearing edge conforming to that of said shearing member and adapted to move past the shearing member while said wire is on said shearing member to cut a section from said wire and leave a V-notch across the wire end, said forming member having a channel extending from its shearing edge parallel to said wire and having a knife-shaped ridge extending into the channel from the apex thereof for scoring an end portion of said wire simultaneously with the shearing action, the scoring extending to the apex of the notch of said wire end, a die member having a knife-shaped ridge, said forming member having a second channel adapted to bend and force said end portion against the ridge of said die member to score the end portion on the side opposite the first scoring and to leave a web connecting the two side of the end portion separated by the scoring, said forming member and die members having coacting surfaces for bending the end portion into a prong, said shearing member having a V-notch at the end thereof to hold and align the wire during contact by the forming member, and resilient guides extending beyond the first channel of said forming member for contacting and aligning said wire with respect to said shear member and the ridge in advance of contact by the forming member.

4. In a machine having instrumentalities for forming and perpetuating a bendable fastening bight at the end of a binding wire securing box parts together in the form of a box blank, in combination, mechanism for forming a prong at the end of the wire extending from said box blank including a shearing member having a convex shearing edge and a forming member having a shearing edge conforming to that of said shearing member and adapted to move past the shearing member while said wire is on said shearing member to cut a section from said wire and leave a V-notch across the wire end, said forming member having a channel extending from its shearing edge parallel to said wire and having a knife-shaped ridge extending into the channel from the apex thereof for scoring an end portion of said wire simultaneously with the shearing action, the scoring extending to the apex of the notch of said wire end, a die member having a knife-shaped ridge, said forming member having a second channel adapted to bend and force said end portion against the ridge of said die member to score the end portion on the side opposite the first scoring and to leave a web connecting the two sides of the end portion separated by the scoring, said forming member and die members having coacting surfaces for bending the end portion into a prong, driving means for driving the prong through side material of the box blank and a clinching member for tearing the web portion and dividing the prong into two legs and for clinching the two legs against the side material, said clinching member having a ridge aligned with the V-notch of the wire end for entering said V-notch, and having the clinching surface extending from said ridge for causing the legs of the prong to spread outwardly as the prong and clinching member move together, and finally to clinch the legs of the prong against the side material.

5. In a machine having instrumentalities for forming and perpetuating a bendable fastening bight at the end of a binding wire securing box parts together to form a box blank, in combination, a cooperating pair of compound die members having complementary V-shaped shearing edges for cutting said wire so as to leave a V-notch across the wire end, surfaces extending at an angle to the line of said wire for bending the end portion of said wire to form a prong, and projections associated with said bending surfaces for scoring said prong along opposite sides; a rotatable member adapted for engagement with said wire to turn the end portion back to form a bight and position the prong over a box part; a driving member for driving the prong through the box part; and a clinching member having a ridge adapted for engagement with said V-notch to divide said wire along the scoring into two legs, and surfaces extending from said ridge at either side for clinching said legs against the underside of the box part.

6. In a machine having instrumentalities for forming and perpetuating a bendable fastening bight at the end of a binding wire securing box parts together to form a box blank, means for severing said binding wire between adjacent box blanks and simultaneously notching the two wire ends thus formed to prepare said ends for splitting to form bifurcated prongs, said means comprising a projecting shear member having at its opposite sides along the line of said binding wire, a pair of relatively sharply convex shearing edges, and a forming member having an opening conforming to the shape of said shearing member, said two members being arranged for reciprocation relatively to each other across the line of said binding wire to move said shearing member into the opening in said forming member to sever from said binding wire a short length of loose wire, and leave V-notches in the two binding wire ends thus formed.

7. The mechanism as claimed in claim 6 wherein the fact of the projecting end of said shear member is concavely shaped to cradle said binding wire and align it on said shear member.

8. In a machine having instrumentalities for forming and perpetuating a bendable fastening bight at the end of a binding wire securing box

parts together to form a box blank, means for scoring the end portions of said binding wires to prepare said ends for splitting to form bifurcated prongs, said means comprising a forming member having a channel adapted to receive said wire and having a relatively sharp ridge projecting from said channel for scoring one side of the end portion of a wire in said channel, a die member having a projecting corner, said two members being movable relatively to each other for bending the end portion of said wire around said corner to form a prong, said die member having a relatively sharp projecting ridge for scoring the other side of the end portion of said wire, and said forming member having a second channel arranged to guide the end portion of said wire against the latter said ridge.

GLEN P. WOODBURY.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
438,712	Painter	Oct. 21, 1890
1,933,029	Rosenmund	Oct. 31, 1933
1,933,031	Rosenmund	Oct. 31, 1933
1,963,306	Maynard	June 19, 1934
2,191,684	Rosenmund	Feb. 27, 1940
2,338,204	Rosenmund	Jan. 4, 1944