June 13, 1950 P. A. CHAMBERLAIN 2,511,769

APPARATUS AND METHOD FOR CONNECTING STAPLES INTO STICKS

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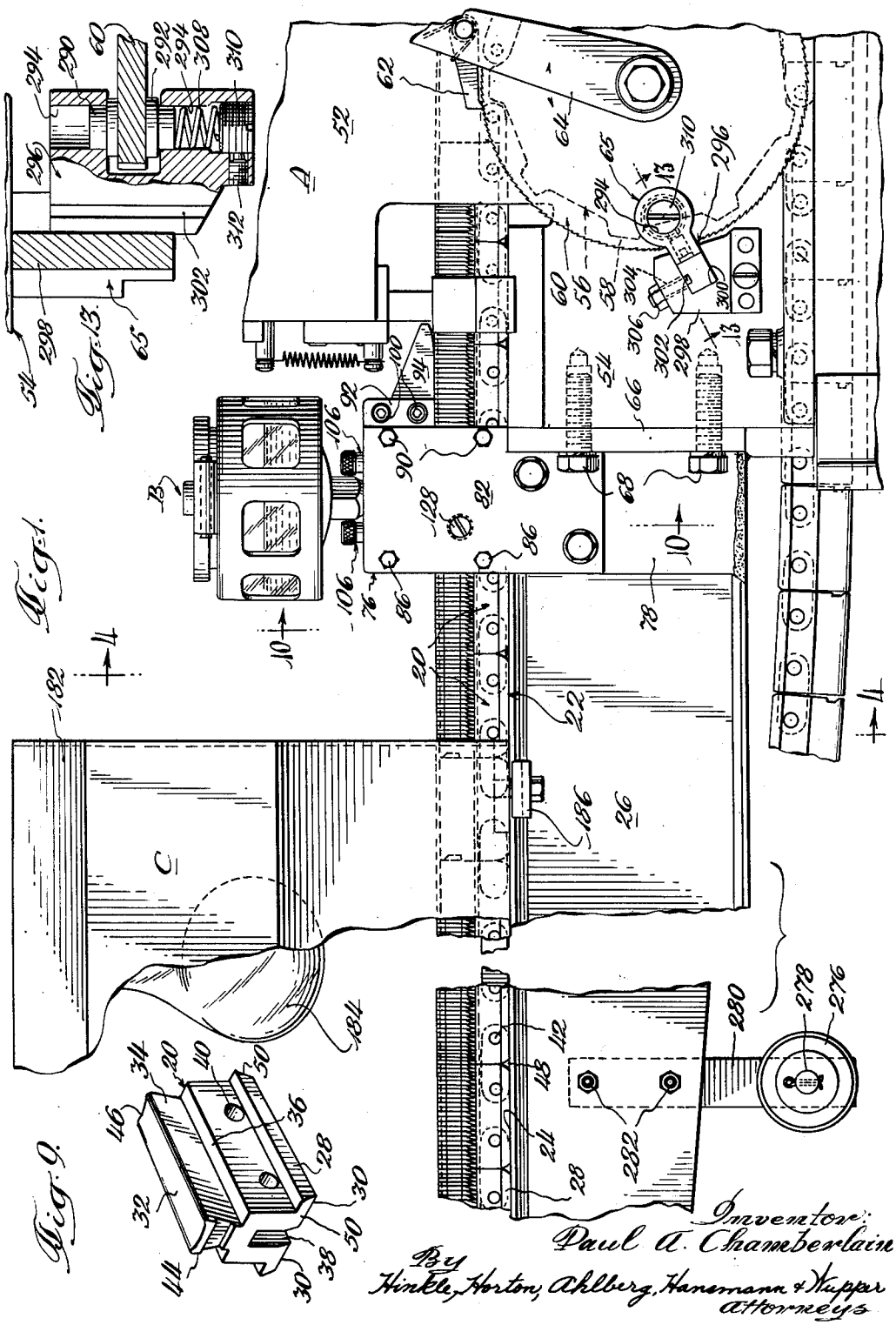


Fig. 13.

Fig. 1.

Fig. 9.

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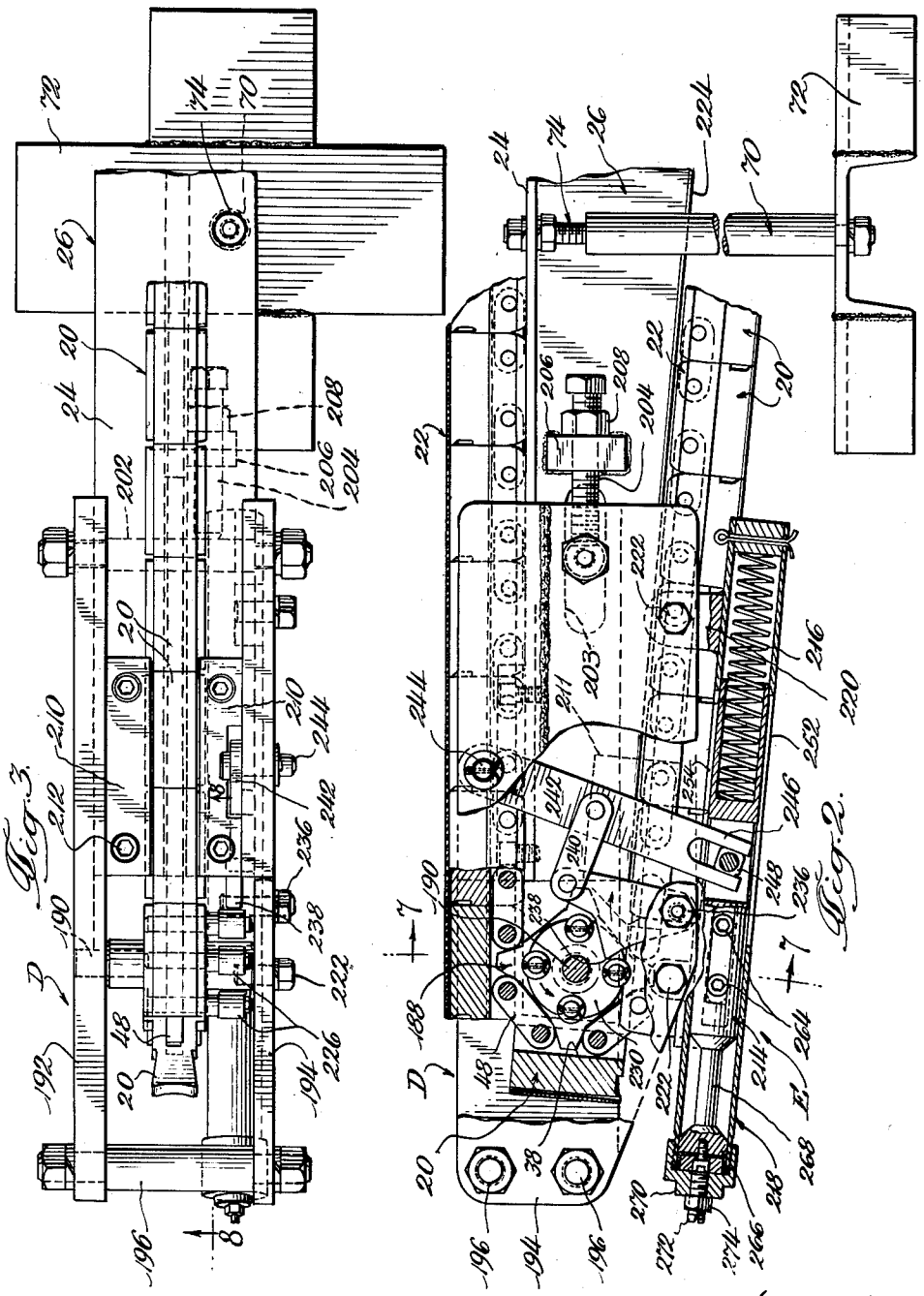


Fig. 3.

Fig. 2.

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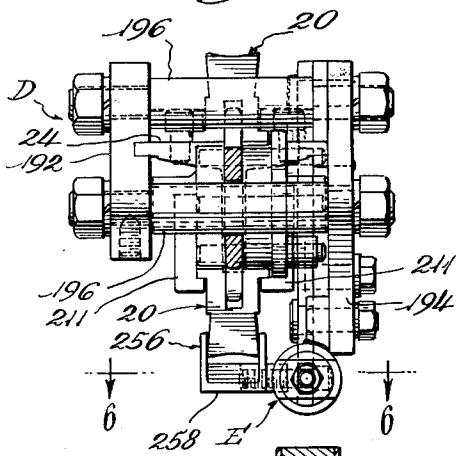
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APPARATUS AND METHOD FOR CONNECTING STAPLES INTO STICKS

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Fig. 5.



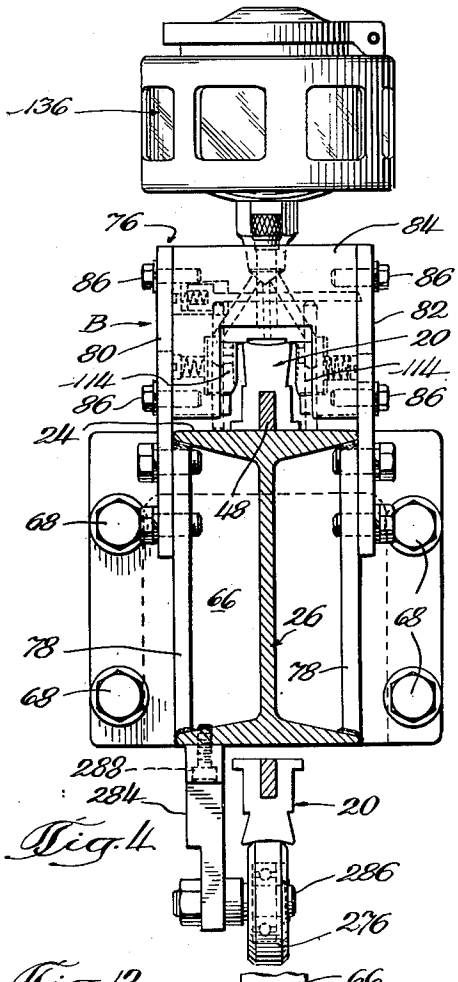


Fig. 4.

Fig. 6.

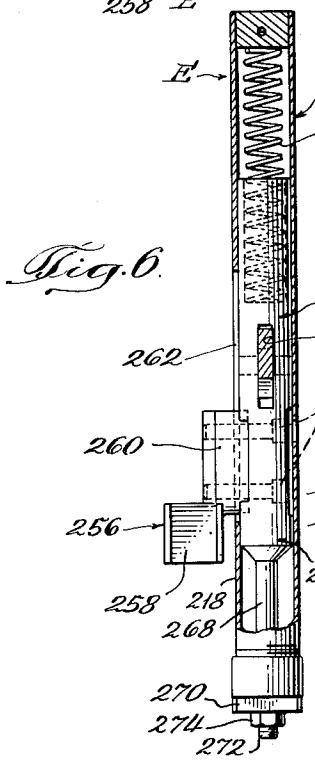
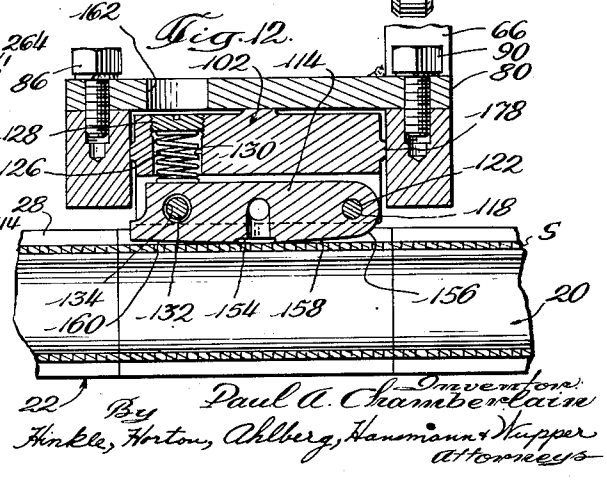


Fig. 12.



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APPARATUS AND METHOD FOR CONNECTING STAPLES INTO STICKS

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Fig. 7.

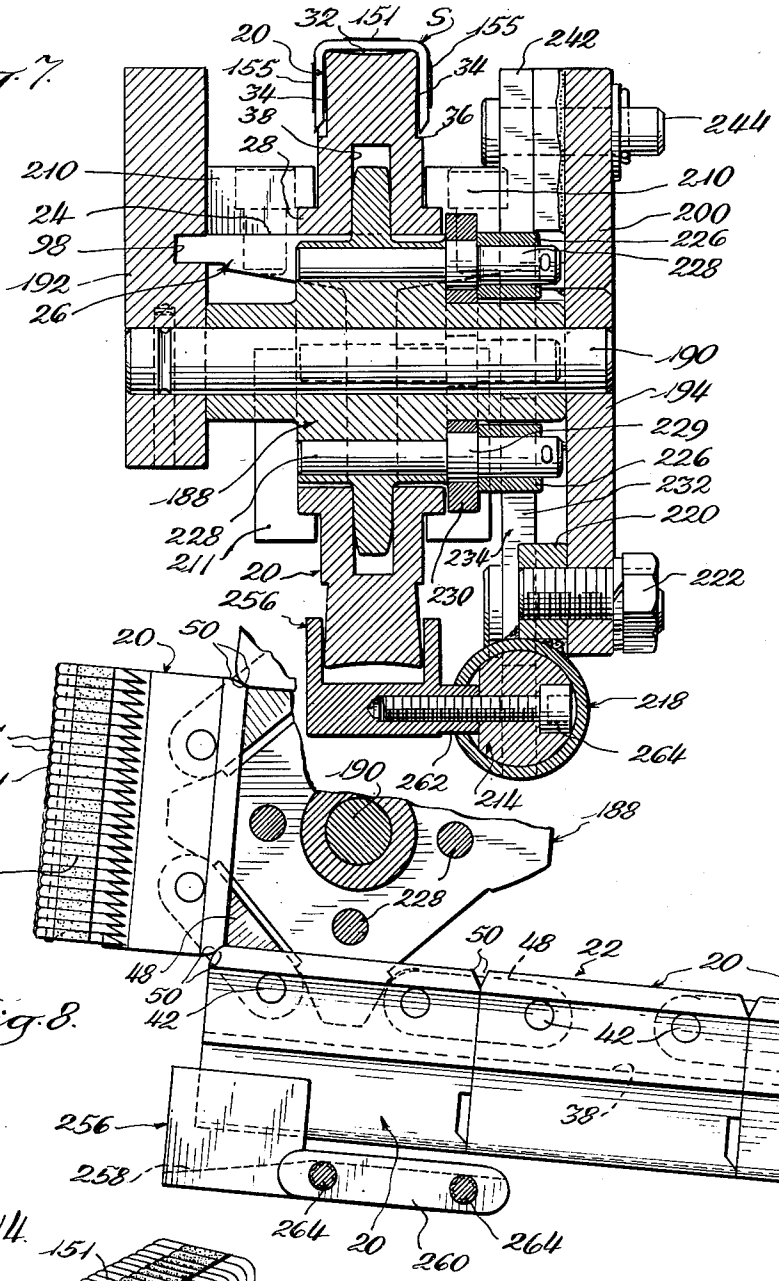
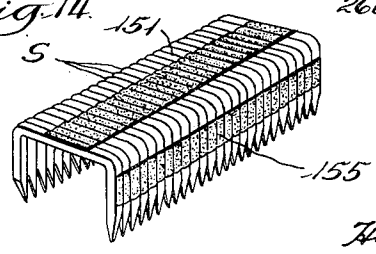


Fig. 8.

Fig. 14.



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APPARATUS AND METHOD FOR CONNECTING STAPLES INTO STICKS

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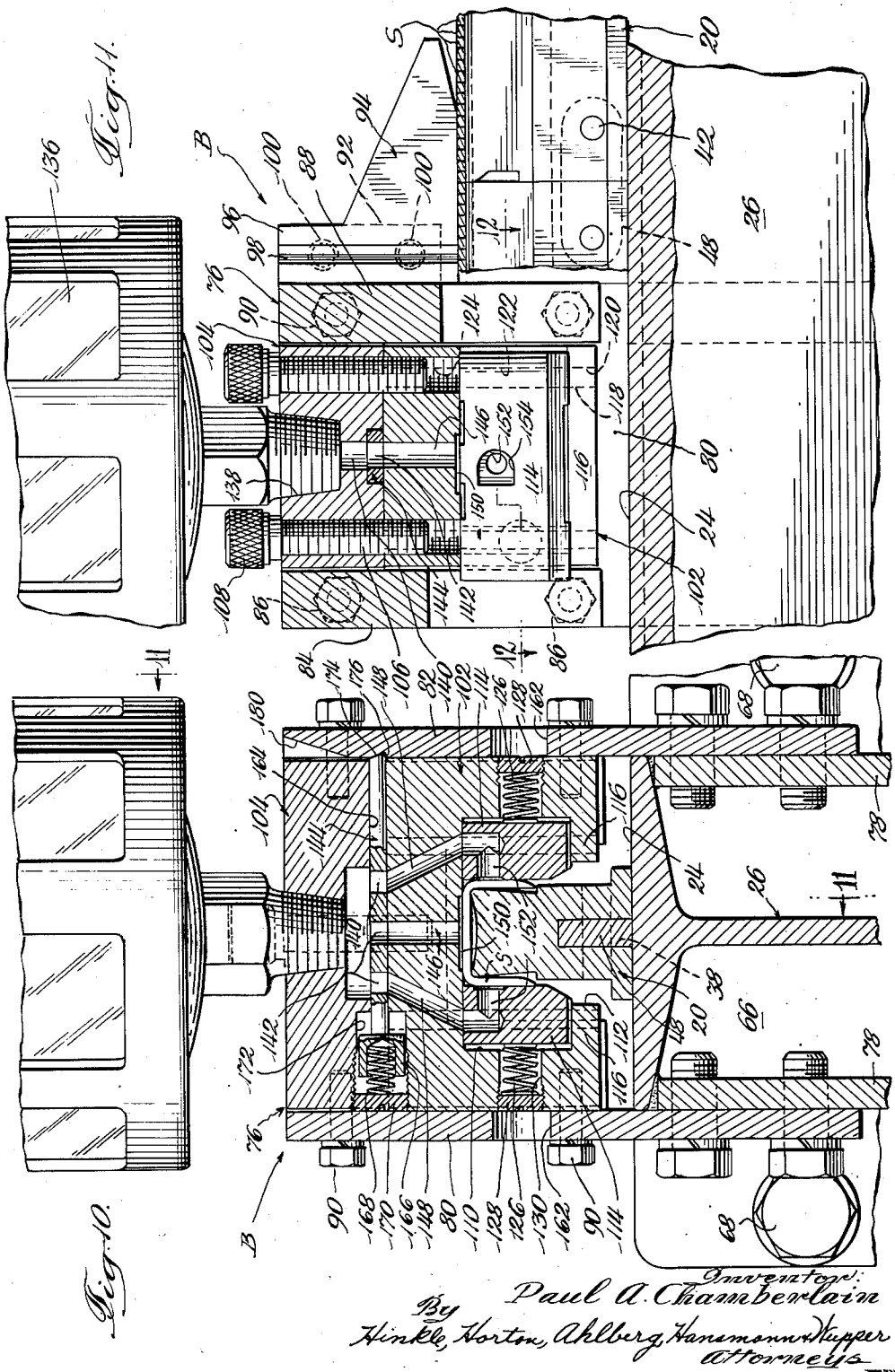


Fig. 10.

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UNITED STATES PATENT OFFICE

2,511,769

APPARATUS AND METHOD FOR CONNECTING STAPLES INTO STICKS

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Application April 18, 1946, Serial No. 663,121

23 Claims. (Cl. 59—72)

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This invention relates to an apparatus and a method for manufacturing U-shaped staples and particularly that portion of the apparatus and method for connecting cut and formed staples into adhering groups, or as they are commonly called "sticks"—each stick having a substantially definite and predetermined number of staples. In some situations, such as, for example, as stapling machines, it is decidedly advantageous to be able to handle the staples in groups or sticks (e. g., inserting them into the stapling machine magazine) rather than individually.

The principal object of the present invention is to provide a novel apparatus and method for forming U-shaped staples into sticks in which adjacent staples are bonded to each other but are readily detached in a stapling machine.

Another object is to provide a novel apparatus for automatically forming sticks of staples each of which will include a substantially definite predetermined number of staples.

Another object is to provide a novel apparatus for bonding U-shaped staples into a long continuous moving stick and for breaking that stick into small, convenient to use sticks of a size readily packaged and including a substantially definite predetermined number of staples.

A further object is to provide a new method of forming U-shaped staples into sticks wherein the medium which bonds adjacent staples to each other is applied and dried while the staples remain on the forming anvils.

Another object is to provide an improved apparatus for automatically ejecting finished sticks of staples to a packaging station.

A further object is to provide a unique forming anvil from which a stick of staples is readily removed without breaking the stick.

Still another object is the provision of a novel apparatus possessing the above advantage and characteristics, the movements of which may be readily synchronized with those of the staple-forming machine.

Other objects and advantages will become apparent from the following description taken in conjunction with the accompanying drawings in which:

Fig. 1 is a side elevational view of a part of the apparatus of the present invention illustrating the device for applying the bonding medium, the drier, and the timing mechanism;

Fig. 2 is a side elevational view of a further part of the apparatus which is a continuation of that part of the apparatus shown in Fig. 1, and which illustrates the means for breaking a

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continuous moving stick into small sticks and for ejecting the sticks to a packaging station;

Fig. 3 is a top plan view of that part of the apparatus illustrated in Fig. 2;

Fig. 4 is a sectional view taken substantially on the line 4—4 of Fig. 1, looking in the direction of the arrows;

Fig. 5 is an end elevational view of the stick breaking and ejecting mechanisms looking at the apparatus from the left side of Fig. 2;

Fig. 6 is a sectional view taken substantially on the line 6—6 of Fig. 5, looking in the direction of the arrows;

Fig. 7 is an enlarged sectional view taken substantially on the line 7—7 of Fig. 2, looking in the direction of the arrows;

Fig. 8 is an enlarged sectional view taken substantially on the line 8—8 of Fig. 3, looking in the direction of the arrows;

Fig. 9 is a perspective view of an anvil on which the staples are formed and which forms a link in the anvil chain;

Fig. 10 is an enlarged sectional view taken substantially on the line 10—10 of Fig. 1;

Fig. 11 is a sectional view taken substantially on the line 11—11 of Fig. 10, looking in the direction of the arrows;

Fig. 12 is a sectional view taken substantially on the line 12—12 of Fig. 11, looking in the direction of the arrows;

Fig. 13 is a sectional view taken substantially on the line 13—13 of Fig. 1, looking in the direction of the arrows; and

Fig. 14 is a perspective view of a stick of staples formed on the apparatus and according to the method of the present invention.

The apparatus for connecting or bonding the formed U-shaped staples is illustrated generally in Figs. 1 to 3 and is shown in conjunction with a staple forming machine A. This machine is of the type which receives a continuous length of wire, cuts the wire and forms it into staples S over an anvil. Inasmuch as this invention is not concerned with the forming machine per se, and since its construction and mode of operation are well known to those skilled in the art of staple-making, no detailed description thereof will be made herein. The present invention relates to the apparatus for bonding the cut and formed staples into sticks and includes a device B for applying a bonding medium to the staples, a drier C, means D for breaking a continuous moving stick of staples into small sticks, and an ejector mechanism E.

The staples S are formed over an anvil 20, a

number of which are connected together and form one-half of the links in an endless chain 22. While moving in one direction the anvils ride on a track 24 formed by the upper flange of an I-beam 26. In cross section, each anvil 20 has generally the shape of an inverted U, the outer extremities of which are flanged at 28 and provided with machined surfaces 30 for riding on the track 24 with a minimum of friction (Fig. 9). The upper surface 32 is slightly concave, and the side walls 34, which depend from the upper surface, are inclined inwardly toward the mid-point of the anvil to facilitate forming the staples with their legs at right angles to the base. The inclined side walls 34 terminate in a stepped portion 36 which is adjacent the pointed extremities of the staples S. The lower portion of the anvil is provided with a longitudinal rectangular recess 38, and the walls opposite the recess 38 are bored at 40 to receive connecting pins 42. The forward end of the anvil 20 is slightly wider across its top edge 44 than across its rear edge 46, for a purpose which will appear hereinafter.

As seen in Figs. 1, 2 and 8, the anvil chain 22 is composed of a plurality of anvils 20 whose adjacent faces are abutting when the anvils ride on the track 24. The adjacent anvils are connected by links 48 which have holes near their extremities for the reception of the connecting pins 42. Each anvil 20 is beveled at 50 so that the chain 22 may be looped and pass around the driving and idling sprockets.

The staple-forming machine A includes a housing 52 and a base or stand 54 which enclose and support the mechanism for forming the staples S from a continuous wire which is fed to the machine from the right rear (Fig. 1). The anvil chain 22 is driven by a sprocket 56 having widely spaced teeth 58 which engage the chain between adjacent links 48 in the recesses 38 in the anvils 20. The sprocket 56 is keyed to and driven by a ratchet drive wheel 60 which is advanced by a spring-pressed pawl 62 carried on a reciprocating arm 64. The arm 64 is driven by a crank (not shown) connected to the main drive shaft of the staple forming machine A. The anvil chain 22 is advanced the distance of one staple width for each complete revolution of the drive shaft and for each complete reciprocation of the arm 64. Reverse movement of the drive wheel 60 and sprocket 56 is inhibited by a brake 65, the function of which will be described hereinafter. The movements of the anvil chain 22 are thereby synchronized with the action of the staple-forming machine.

The I-beam 26 which projects outwardly to the left (Fig. 1) is welded at its right end to a plate 66 which is fixed to the support 54 by bolts 68. Near its outer end, the I-beam 26 is supported by a standard 70 upstanding from a floor-engaging base 72. The standard 70 has a threaded adjustment 74 at its upper end whereby the height of the outer end of the track 24 may be adjusted to relieve cantilever stresses from the I-beam and to compensate for the unevenness of the floor.

As the staples S are formed on the anvil 20, they are arranged in face-to-face relationship so as to place the greatest number of staples in the smallest lineal space so that they may be detachably connected into sticks. Referring primarily to Figures 1, 10 and 11, it will be seen that as the staples S leave the forming machine A they are carried on the anvils 20 through the applicator B for laying a film of the bonding medium on the outer surfaces of the staples. The applicator includes a housing 76 which bridges the track 24 forming a tunnel-like structure thereover.

Adjacent the plate 66 there is welded to the upper and lower flanges of the I-beam 26 a pair of plates 78 to which are bolted a second pair of plates 80 and 82, forming the side walls of the housing 76. A plate 84, having a rectangular opening at its lower edge to pass the anvil chain 22, forms the front wall of the housing and is connected to the side walls 80 and 82 by bolts 86. A similarly shaped wall 88 is provided at the rear of the housing and is secured to the walls 80 and 82 by bolts 90. The rear wall 88 carries a pair of outwardly directed flanges 92 which are adapted to hold therebetween a guilding foot 94 having a portion 96 cut with a V-shaped notch 98 on one face thereof in which engage set screws 100 threaded into one of the flanges 92.

The walls 80, 82, 84 and 88 form a shell which encloses and supports a pair of superimposed blocks 102 and 104. The blocks 102 and 104 are secured together in abutting relationship by a pair of machine screws 106 having knurled heads 108. The block 102 has a longitudinal rectangular opening 110 and is cut away at 112 to permit passage of the anvil chain 22 therethrough, thereby giving the block 102 a C-shaped cross-section with the open side of the C facing down (Fig. 10). Two wiper and spreader elements 114 are positioned in the rectangular recess 110 above flanges 116 and are pivotally connected to the block 102 by dowels 118. The dowels 118 are secured in bores 120 in the flange 116, 122 in the wiper element 114, and 124 in the block 102. The elements 114 are biased toward the center of the track 24 by springs 126 confined by retaining screws 128 in bores 130 in the block 102.

The pivotal movement of the wiper and spreader elements 114 is limited by dowel pins 132 which are secured in a manner similar to the dowels 118 (Fig. 12). However, the bore 134 in the element 114 has a diameter somewhat greater than that of the dowel 132 so that the element 114 has a limited movement toward and away from the anvil chain 22 and any irregularities in the position, spacing, or shape of the stapes S on the anvils 20 will not cause the machine to jam.

The bonding medium which preferably is a cellulose acetate composition is supplied to the staples from a container 136 which is mounted on the block 104 and has a threaded connection 138 therewith. The bonding medium runs by gravity from the container 136 into a recess 140 in the block 104 which is in communication with valve openings 142 in a valve gate 144. The center opening 142 leads to a vertical duct 146 and the two side openings 142 communicate with diagonal ducts 148 in the block 102. The duct 146 communicates with a shallow rectangular feeder recess 150 in the upper wall of the rectangular opening 110 which is immediately above the center of the continuously-moving staples S. The lower face of the recess 110 is so positioned that the upper surface of the staples S contact it and thus a thin layer 151 of the bonding medium is applied to the top of the staples and into the spaces between adjacent staples as they pass the shallow feeder recess 150.

The two diagonal ducts 148 communicate directly with a pair of L-shaped ducts 152 formed in the wiper and spreader elements 114 which have formed in their faces shallow feeder recesses 154. Each of the blocks 114 is rounded at one end 156 and is beveled at 158 and at 160 so that the high point in the face is at the recess

154, so that regardless of the irregularities in the arrangement of the staples on the anvils 20, the face of the element 114 at recess 154 will always be in contact with the legs of the staples as they move therepast. Each recess 154 is filled with the bonding medium, and a thin layer 155 of this medium will be deposited on the outer faces of the legs and in the recesses therebetween.

In order that the pressure of the springs 126 on the elements 114 be carefully regulated, the screws 128 are accessible through openings 162 in the walls 80 and 82.

The valve gate 144 has a generally rectangular cross-section (Fig. 11) and is slidable in a groove 164 in the lower face of the block 104. At its left hand (Fig. 10) the valve gate is provided with a hollow cylindrical part 166 for the reception of a coil spring 168 which is confined therein by a machine screw 170, the hollow part 166 being slidably arranged in a bore 172 which is formed partly in the block 104 and partly in the block 102. At its right end (Fig. 10) the valve gate 144 has a beveled end 174 which engages in a notch 176 in the wall 82. The blocks 102 and 104 may be lifted from within the walls 80, 82, 84 and 88, by grasping the container 136 and lifting vertically, each face of the block 102 being provided with a plurality of ribs 178 (Fig. 12) which ride on the interior surface of these walls; block 104 is spaced on all four sides from these walls. The spring 168 has sufficient strength to maintain the valve gate 144 biased toward the right, but is sufficiently weak to resist the removal of the blocks 102 and 104, as described.

When the blocks 102 and 104 are lifted from the housing, the spring 168 moves the valve gate 144 to the right to close the ducts 146 and 148, thereby preventing leakage of the bonding medium during such removal. When the blocks 102 and 104 are returned to their position in the housing 76, the valve gate 144 is biased toward the left (Fig. 10) by a beveled slot 180 formed in the upper edge of the wall 82, and its beveled end 174 snaps into the notch 176 accurately to position the blocks in the housing.

The staples S carried by the anvil chain 22 as it emerges from the housing 76 carry a thin layer 151 of the bonding medium on their tops and similar layers 155 on their legs, as shown in Fig. 14. This bonding medium is quite tacky and has little tendency readily to run and consequently remains in place on the staples. The coated staples immediately enter the drier C which is of the infrared type and comprises a housing 182 supporting a plurality of infrared lamps 184. The housing 182 is secured to the track flange 24 of the I-beam 26 by a clamp 186. The infrared lamps 184 are so arranged in the housing 182 that they concentrate and focus the infrared rays directly upon the staples as they are carried through the drier. The drier C is of sufficient length so that the bonding medium is completely dry when the staples emerge from the exit end.

At its outer end of travel the anvil chain 22 passes over an idler sprocket 188 which is rotatably mounted on a shaft 190 journaled in a pair of plates 192 and 194. At their outer ends the plates 192 and 194 are connected by a pair of spacer bolts 196. The plate 192 is provided with a slot 198 which slidably engages the outer edge of the track 24. The plate 194 is welded to a second and substantially thicker plate 200 provided with a slot similar to the slot 198, slidably to receive the opposite edge of the track 24. These slots are of substantial length and engage a substantial length of the edges of the track 24 to prevent tipping of the plates relative to the I-beam 26.

At their opposite or inner ends, the plates 192 and 194 are connected by a spacer bolt 202 which passes through a longitudinal slot 203 in the web of the I-beam 26. A chain tension adjustment screw 204 engages the spacer bolt 202 and is threadably mounted in a bracket 206 welded to the I-beam web adjacent one end of the slot 203 and is provided with a locknut 208. The tension on the anvil chain 22 and the proper positioning of the sprocket 188 relative to the I-beam 26 and the track 24, is obtained by means of the tensioning and positioning bolt 204.

Between the anvil chain 22 and the plates 192 and 200 is positioned a pair of guide rails 210 which are secured to the track 24 by Allen-headed machine screws 212. The guide rails 210 are shaped to receive the flanges 28 of each anvil 20 to position the anvils on the track so that the teeth of the sprocket 188 will engage within the recesses 38 and between adjacent ends of the links 48 (see Figs. 2 and 8). As the anvil chain passes over the sprocket 188, the anvils are moved downwardly and around relative to each other (Fig. 2). The inclined side walls on the anvil present a sharp angle with the top 32, so that the stick of staples is prevented from having an upward movement relative to the anvil and is firmly grasped thereby. Furthermore, the leading edge 44 of each anvil 20 is slightly wider than the trailing edge and the staple stick is wedged thereon. Thus, the anvil chain in separating the upper surfaces of adjacent anvils in passing around the sprocket 188, breaks the bond between the last staple on one anvil and the lead staple on the following anvil. Since each of the anvils is of equal length, this breaks the continuous moving stick into small sticks each of equal length, all of which contain substantially the same number of staples.

A second pair of guide rails 211, similar to the guides 210, are secured to the web of the I-beam and engage the flanges 28 of the anvils to center the anvils properly to engage the staple sticks with the ejector mechanism E.

The small sticks of staples are removed from the anvils by the ejector mechanism E. This mechanism comprises a plunger 214 which is biased outwardly by a spring 216 in a cylinder 218. The cylinder 218 is suspended from the plate 194 by a pair of ears 220 connected thereto by bolts 222 and is held in an angular position relative to the track but parallel to the anvil chain 22. The lower flange and a portion of the web of the I-beam 26 is cut away at 224 to permit travel of the anvil chain 22 in an angular direction beneath the outer end of the track so that the outer end of the ejector mechanism might be elevated.

The sprocket 188 carries on one face thereof four rollers 226 which are rotatably mounted on equidistantly spaced shafts 228 fixed in the body of the sprocket 188. An annular spacer plate 230 is fitted on one face of the sprocket 188 to position the rollers 226 over the cylinder 218 and to receive in a press fit enlarged portions 229 of the shafts 228. The rollers 226 engage and rotate on the face 232 of a cam 234 which is pivotally mounted on the plate 194 at 236. The cam surface 232 has a high point at 238 and falls away very rapidly from that point. The upper and free end of the cam 234 is pivotally connected to a link 240 which has its opposite end connected to the

mid point of a lever 242. The upper end of the lever is pivotally connected at 244 to the plate 200 and is provided with a fork 246 at its lower end. The fork 246 straddles, and its inner sides engage, a rectangular block 248 pivotally mounted within a slot 250 in the plunger 214. The lower portion of the cylinder 218 is cut away at 252 to permit the ends of the fork 246 to project below the plunger, and is slotted at 254 to permit reciprocal movement of the lower end of the lever 242 within the cylinder 218.

The stick of staples is removed from the anvil by a U-shaped ejector 256, the side walls of which are spaced so as to slide along an anvil 20 at the juncture between the inclined walls 34 and the top 32. The bottom wall 258 of the ejector 256 is inclined so as to clear the anvils 20 as they pass over the sprocket 188, thereby preventing breaking the staple sticks or the leading edges of the anvils and jamming of staples between the ejector and an anvil. The ejector 256 is provided with a rearwardly-extending projection 260 secured to the plunger 214 by a pair of bolts 264; the projection extends through a slot 262 in the cylinder 218 to permit reciprocation of the ejector 256 by the plunger 214.

The forward movement of the plunger 214 is limited by a head 266, connected to the main body of the plunger 214 by an extension 268, and a cap 270 threaded onto the end of the cylinder 28; the cap 270 is provided with an adjustment screw 272 which is locked in place by a nut 274.

The ejector mechanism operates as follows: As an anvil 20 is driven over the idler sprocket 188, one of the rollers 226 engages the cam surface 232. As the rotation of the sprocket 188 is counterclockwise (Fig. 2), the roller 226 moves the cam lever 234 in a clockwise direction about its pivot 236. The connecting link 240 moves to the right (Fig. 2) rotating the lever 242 in a counterclockwise direction. Since the lever is pivoted at 244 and is slidably connected to the plunger by the fork 246, the plunger 214 is moved against the spring 216. By the time the anvil approaches the "eject" position, it is in line with the other anvils and between the guide rails 211 and is directly in front of the ejector 256; and the roller 226 has reached the high point 238 on the cam 234. Successive movements of the anvil chain 22 cause the sprocket 188 to carry the roller 226 over the high point 238 and the spring forcibly moves the cylinder 214 and the ejector 256 to the left (Fig. 2), to sweep the stick of staples from the anvil. Previously, it was noted that the anvils taper slightly away from the leading edge 44 at the top. This taper facilitates the removal of the staple stick as the legs of the ejector engage the stick and forcibly throw or "flip" it onto a tray or to a position from which they may be picked up and placed in a carton for shipment.

The position of the ejector 256 relative to the anvil 20 after a stick of staples has been removed is clearly seen in Fig. 8, while the position of the ejector as it encompasses the sides of the anvil 20 is most clearly shown in Fig. 7.

A stick of staples may become so firmly wedged on an anvil that the loaded spring 216 is insufficiently strong to remove it. However, when the apparatus is in the "eject" position the staple stick is in engagement with the ejector 256 and projection 260 is against the rear extremity of the slot 262. A subsequent movement of the anvil chain draws the anvil into the ejector 256 as it can move no farther back and loosens the wedged stick which in turn allows the spring 216 to drive the plunger 214 and the ejector 256 outwardly to remove the staple stick from the anvil and to "flip" it to a packaging station.

Guide and supporting rollers 276 are provided at spaced intervals at the underside of the I-beam 26 to support the anvil chain 22. Fig. 1 shows a roller 276 pivotally mounted on a shaft 278 carried by a strap 280 which is bolted to the web of the I-beam 26 at 282. Fig. 4 shows a second roller 276 positioned beneath the lower flange of the I-beam 26. A T-shaped support 284 carries a shaft 286 in the stem of the T; the support is bolted to the lower flange by bolts 288 passing through the horizontal arms of the T and threaded into the lower flange of the I-beam.

The brake 65 includes a pair of pads 290 and 292 formed of a canvas impregnated with a phenolic resin or a similar suitable brake lining material. The pads 290 and 292 are mounted in a bore 294 of yoke 296 which is slidably secured in a mounting block 298 bolted to the stand 54 adjacent the ratchet drive wheel 60. The block 298 is provided with a slot 300 to receive the yoke 296 which has a keyway 302. A dog pointed set screw 304 engages in the keyway and is secured by a lock nut 306, thereby permitting the yoke a sliding movement toward and away from the stand 54 but preventing its being pulled from the mounting block.

The pads 290 and 292 frictionally engage the opposite faces of the ratchet wheel 60 with sufficient force to prevent reverse movement thereof under normal operation, while permitting slight oscillatory movement thereof by holding a tooth of the ratchet wheel against the pawl 62 if the anvil chain 22 becomes jammed and cannot move. The oscillatory movement prevents damage to the apparatus in such circumstances and allows the operator time to shut off the apparatus or stalls the motor of the apparatus if it be driven by an electric motor as is customary. The pad 290 is immovably secured in the bore 294, while the pad 292 is axially slidable therein. The pad 294 is pressed against the face of the ratchet wheel 60 by a spring 308 retained in the bore 294 by a screw 310, which is adjustable to regulate the braking pressure. The screw 310 is locked against working loose by a set screw 312.

The operation of this apparatus has been described in the preceding paragraphs of the specification, and need not be repeated here. It will be seen from the foregoing description that the apparatus provides a novel method for bonding the staples together with a thin film of the bonding medium, for thoroughly drying the bonding medium on the staples, for breaking the continuous moving strip of bonded staples into short sticks of compact size, each comprising the same number of staples, and for removing the stick of staples from the forming anvil and ejecting them to packaging position from which they may be picked up and placed in cartons or boxes for shipment. Because the staples and the continuous moving staple stick are carried through the apparatus on the anvils, no strain is placed upon the bond between staples, and undesired and unintentional stick breakage is maintained at a minimum.

Certain changes and modifications in the apparatus as described may be made by persons skilled in this art, without departing from the spirit and scope of this invention.

What is desired to be secured and claimed by United States Letters Patent is:

1. The method of joining U-shaped staples

into a stick of staples, comprising arranging the unconnected staples in a moving stream with adjacent staples placed in face to face relation, applying a bonding medium to at least one of the three outer surfaces of the moving staples, passing the staples through a drying zone wherein the bonding medium is dried and the staples are formed into a long continuous moving stick of staples, and bending the long stick of staples to break the bond between certain adjacent staples to form sticks of staples containing a substantially definite and predetermined number of staples.

2. The method of joining U-shaped staples into a stick of staples, comprising arranging the unconnected staples in a moving stream with adjacent staples placed in face to face relation, applying a bonding medium to at least one of the three outer surfaces of the moving staples, passing the staples through a drying zone wherein the bonding medium is dried and the staples are formed into a long continuous moving stick of staples, bending the long stick of staples to break the bond between certain adjacent staples to form sticks of staples containing a substantially definite and predetermined number of staples and delivering the completed staple stick to a packaging station.

3. An apparatus for connecting U-shaped staples into sticks of staples containing a substantially definite and predetermined number of staples, comprising in combination an endless chain, the alternate links of which comprise anvils on which the staples are formed and on which the staples are connected into sticks, track means on which said chain travels, intermittent drive means for said chain, means for applying a bonding medium to at least one outer surface of the staples, a drier through which said anvils carrying the bonded staples pass, means for breaking the bonded staples into sticks, and mechanism associated with said anvil chain and said bond breaking means for removing a completed stick of staples from the anvil and for ejecting it from the apparatus.

4. An apparatus for connecting U-shaped staples into sticks of staples containing a substantially definite and predetermined number of staples, comprising in combination an endless chain, the alternate links of which comprise anvils on which the staples are formed and on which the staples are connected into sticks, track means on which said chain travels, intermittent drive means for said chain, means supported by said track means for applying a bonding medium to at least one outer surface of the staples as the latter are moved therepast, a drier through which said anvils carrying the bonded staples pass, means for breaking the bonded staples into sticks, and mechanism associated with said chain and said bond breaking means for removing a completed stick from the anvil and for ejecting it from the apparatus, said breaking means and said ejecting mechanism being carried by said track means at its outer end.

5. An apparatus for connecting U-shaped staples into sticks of staples containing a substantially definite and predetermined number of staples, comprising in combination an endless chain, the alternate links of which comprise anvils on which the staples are formed and on which the staples are connected into sticks, a structural member having a portion forming a track on which said chain travels, intermittent drive means for said chain, means supported by said structural member and overlying said track for applying a bonding medium to at least one outer surface of the staples as the latter are moved therepast, a drier through which said anvils carrying the bonded staples pass, an idler sprocket over which said anvil chain passes to separate the anvils thereby to break the bond between certain staples and the bonded staples into sticks, said idler sprocket being rotatably carried by said structural member, and mechanism associated with said chain and said bond breaking means for removing a completed stick of staples from the anvil and for ejecting it from the apparatus.

6. An apparatus for connecting U-shaped staples into sticks of staples containing a substantially definite and predetermined number of staples, comprising in combination an endless chain, the alternate links of which comprise anvils on which the staples are formed and on which the staples are connected into sticks, track means on which said chain travels, intermittent drive means for said chain, means for applying a bonding medium to at least one outer surface of the staples, means for breaking the bonded staples into sticks, and mechanism associated with said chain and said bond breaking means for removing a completed stick from the anvil and for ejecting it from the apparatus.

7. An apparatus for connecting U-shaped staples into sticks of staples containing a substantially definite and predetermined number of staples, comprising in combination an endless chain, the alternate links of which comprise anvils on which the staples are formed and on which the staples are connected into sticks, track means on which said chain travels, intermittent drive means for said chain, means for applying a bonding medium to at least one outer surface of the staples, a drier through which said chain and the bonded staples pass, and means for breaking the bonded staples into sticks.

8. An apparatus for connecting U-shaped staples into sticks of staples containing a substantially definite and predetermined number of staples, comprising in combination an endless chain, the alternate links of which comprise anvils on which the staples are formed and on which the staples are connected into sticks, track means on which said chain travels, a stepping drive means for said chain, a brake associated with said drive means for preventing reverse movement of said drive means during normal operation of the apparatus but permitting oscillatory movement thereof should said anvil chain become jammed, means for applying a bonding medium to at least one outer surface of the staples, means for breaking the bonded staples into sticks, and mechanism associated with said chain and said bond breaking means for removing a completed stick from the anvil and for ejecting it from the apparatus.

9. An apparatus for joining U-shaped staples into sticks of staples containing a substantially definite and predetermined number of staples, including in combination an endless chain, the alternate links of which comprise anvils on which the staples are formed and on which the staples are connected into sticks, means for applying a bonding medium to the outer surface of the staples to connect the staples into a continuous moving long stick, means for breaking the bonded staples into sticks, a spring pressed ejector mechanism for removing the completed sticks from said anvils, and means actuated by said anvil chain for loading said ejector mecha-

nism and for releasing said ejector mechanism when a staple stick bearing anvil is in a predetermined position relative to said ejector mechanism.

10. An apparatus for joining U-shaped staples into sticks of staples containing a substantially definite and predetermined number of staples, including in combination an endless chain, the alternate links of which comprise anvils on which the staples are formed and on which the staples are connected into sticks, means for applying a bonding medium to the outer surface of the staples to connect the staples into a continuous moving long stick, means for breaking the bonded staples into sticks, an ejector mechanism for removing the completed sticks from said anvils, said ejector mechanism including a cylinder, a plunger reciprocably contained in said cylinder, and a spring biasing said plunger, and means actuated by said anvil chain for moving said plunger against said spring and subsequently releasing said plunger for movement by said spring when a staple stick bearing anvil is in a predetermined position relative to said ejector mechanism.

11. An apparatus for joining U-shaped staples into sticks of staples containing a substantially definite and predetermined number of staples, including in combination an endless chain, the alternate links of which comprise anvils on which the staples are formed and on which the staples are connected into sticks, means for applying a bonding medium to the outer surface of the staples to connect the staples into a continuous moving long stick, means for breaking the bonded staples into sticks, an ejector mechanism for removing the completed sticks from said anvils, said ejector mechanism including a cylinder, a plunger reciprocably contained in said cylinder, an ejector carried by said plunger and adapted to be slidable past and in close proximity to the side walls of said anvils, and means actuated by said anvil chain for moving said plunger against said spring and for subsequently releasing said plunger for movement by said spring when a staple stick bearing anvil is in a predetermined position relative to said ejector.

12. An apparatus for joining U-shaped staples into sticks of staples containing a substantially definite and predetermined number of staples, including in combination an endless chain, the alternate links of which comprise anvils on which the staples are formed and on which the staples are connected into sticks, means for applying a bonding medium to the outer surface of the staples to connect the staples into a continuous moving long stick, means for breaking the bonded staples into sticks, an ejector mechanism for removing the completed sticks from said anvils, said ejector mechanism including a cylinder, a plunger reciprocably contained in said cylinder, and a spring biasing said plunger, a pivotally mounted reciprocable lever having a slidable connection with said plunger, and a cam operated linkage operatively connecting said lever to said bond breaking means for causing said lever to move said plunger against said spring and for subsequently releasing said lever and said plunger for movement by said spring when a staple stick bearing anvil is in a predetermined position relative to said ejector mechanism.

13. An anvil on which U-shaped staples are formed and subsequently connected into sticks of staples comprising a body portion, a rectangular recess formed in the base of said body portion and extending therethrough, said body portion having a staple-carrying portion formed thereon, the top of said staple-carrying portion being wider at the leading edge of said anvil than at the trailing edge to facilitate the removal of a stick of staples therefrom.

14. An anvil on which U-shaped staples are formed and subsequently connected into sticks of staples comprising a body portion, said body portion having a staple-carrying portion formed thereon, the top of said staple-carrying portion being slightly wider at the leading edge of said anvil than at the trailing edge to facilitate the removal of a stick of staples therefrom.

15. An apparatus for connecting U-shaped staples into sticks of staples, including in combination an endless chain, the alternate links of which comprise anvils on which the staples are formed and on which the staples are connected into sticks of staples, drive means for said anvil chain, a housing through which said anvil chain passes, a bonding medium container mounted on said housing, a duct system formed within said housing and supplied with a fluid bonding medium from said container, and means connected to said duct system and engaging the outer surface of the staples as they pass through the housing for spreading a thin layer of the bonding medium on the surface of the staples.

16. An apparatus for connecting U-shaped staples into sticks of staples, including in combination an endless chain, the alternate links of which comprise anvils on which the staples are formed and on which the staples are connected into sticks of staples, drive means for said anvil chain, a housing through which said anvil chain passes, said housing including a pair of removable superimposed blocks, a bonding medium container mounted on the upper of said blocks, a duct system formed within said blocks and supplied with a fluid bonding medium from said container, a normally open valve in said duct system positioned and arranged so as to close when said blocks are removed from said housing, and means carried by the lower of said blocks and connected to said duct system and engaging the outer surface of the staples as they pass through the housing for spreading a thin layer of the bonding medium on the surface of the staples.

17. An apparatus for connecting U-shaped staples into sticks of staples, including in combination an endless chain, the alternate links of which comprise anvils on which the staples are formed and on which the staples are connected into sticks of staples, drive means for said anvil chain, a track on which said anvil chain travels, a housing through which said anvil chain passes, said housing including a pair of removable superimposed blocks supported within a shell mounted on said track, a bonding medium container mounted on the upper of said blocks, a duct system formed within said blocks and supplied with a fluid bonding medium from said container, a spring-actuated normally open valve in said duct system positioned between said blocks, said valve having a part engaging in a notch in a wall of said shell to support said blocks above said track, and said valve being arranged so as to close when said blocks are removed from the shell, and wiper means carried by the lower of said blocks and connected to said duct system and engaging the outer surface of the staples as they pass through the housing for spreading a thin layer of the bonding medium on the surface of the staples.

18. An apparatus for connecting U-shaped staples into sticks of staples, including in com-

bination an endless chain, the alternate links of which comprise anvils on which the staples are formed and on which the staples are connected into sticks of staples, drive means for said anvil chain, a housing through which said anvil chain passes, a bonding medium container mounted on said housing, a duct system formed within said housing and supplied with a fluid bonding medium from said container, and wiper elements pivotally mounted within said housing and biased toward the center thereof connected to said duct system and engaging the outer surface of the staples as they pass through the housing for spreading a thin layer of the bonding medium on the surface of the staples.

19. Apparatus for connecting U-shaped staples into sticks of staples containing a substantially definite and predetermined number of staples, comprising in combination movable means on which the staples are arranged in a face to face relation and on which the staples are connected into sticks, said means comprising a plurality of interconnected relatively movable elements, track means for guiding said movable means, drive means for said movable means, means for applying a bonding medium to at least one surface of the staples, a drier through which the bonded staples are passed by said movable means, and means for moving said elements relative to one another to break the bonded staples into sticks.

20. Apparatus for connecting U-shaped staples into sticks of staples containing a substantially definite and predetermined number of staples, comprising in combination movable means on which the staples are arranged in a face to face relation and on which the staples are connected into sticks, drive means for said movable means, means for applying a bonding medium to at least one surface of the staples so as to connect the staples into a long moving stick, a drier through which the bonded staples are passed by said movable means, and means including said movable means for bending the long stick of staples so as to break it into shorter sticks each containing a predetermined number of staples.

21. Apparatus for connecting U-shaped staples into sticks of staples containing a substantially definite and predetermined number of staples, comprising in combination a plurality of interconnected relatively movable elements on which the staples are arranged in face to face relation and on which the staples are connected into sticks, track means on which said elements travel, drive means for said elements, means for applying a bonding medium to at least one surface of the staples so as to connect the staples into a long moving stick, and means including said relatively movable elements for bending the long stick of staples so as to break it into shorter sticks each containing a predetermined number of staples.

22. Apparatus for connecting U-shaped staples into sticks of staples, including in combination movable means on which the staples are arranged in face to face relation and on which the staples are connected into sticks of staples, means for driving said movable means, a housing through which said movable means passes, a bonding medium container mounted on said housing, a duct system formed within said housing and connected to said container, said duct system being adapted to be supplied with a fluid bonding medium from said container, and means connected to said duct system and engaging the surface of the staples as they pass through the housing for spreading a thin layer of the bonding medium on the surface of the staples.

23. Apparatus for connecting U-shaped staples into sticks of staples, including in combination movable means on which the staples are arranged in face to face relation and on which the staples are connected into sticks of staples, means for driving said movable means, a housing through which said movable means passes, a bonding medium container mounted on said housing, a duct system formed within said housing and connected to said container, said duct system being adapted to be supplied with a fluid bonding medium from said container, and a wiper element pivotally mounted within said housing and biased toward said movable means, said wiper element being connected to said duct system and engaging the outer surface of the staples as they pass through the housing for spreading a thin layer of the bonding medium on the surface of the staples.

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