

Feb. 8, 1944.

J. A. WEBER ET AL

2,341,347

"C" CLIP FORMING MACHINE

Filed March 7, 1942

8 Sheets-Sheet 1

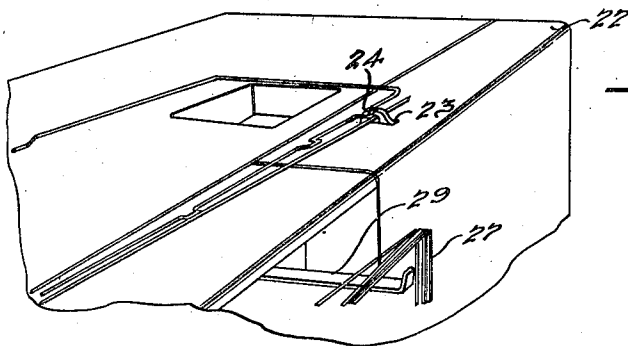


FIG. 1.

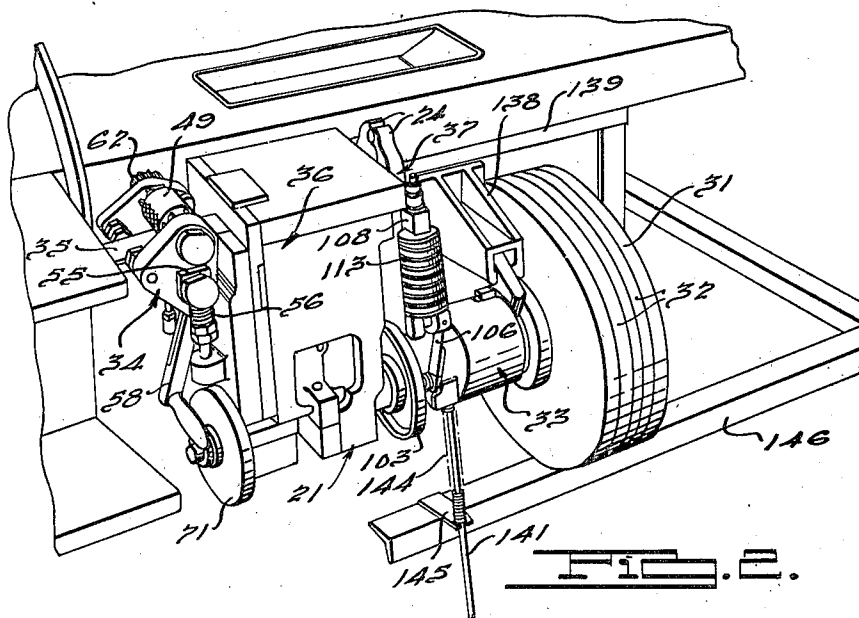


FIG. 2.

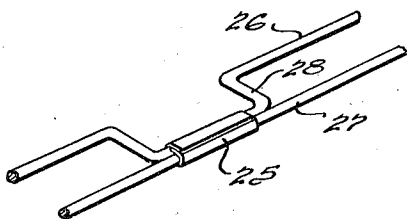
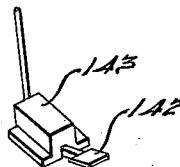


FIG. 3.



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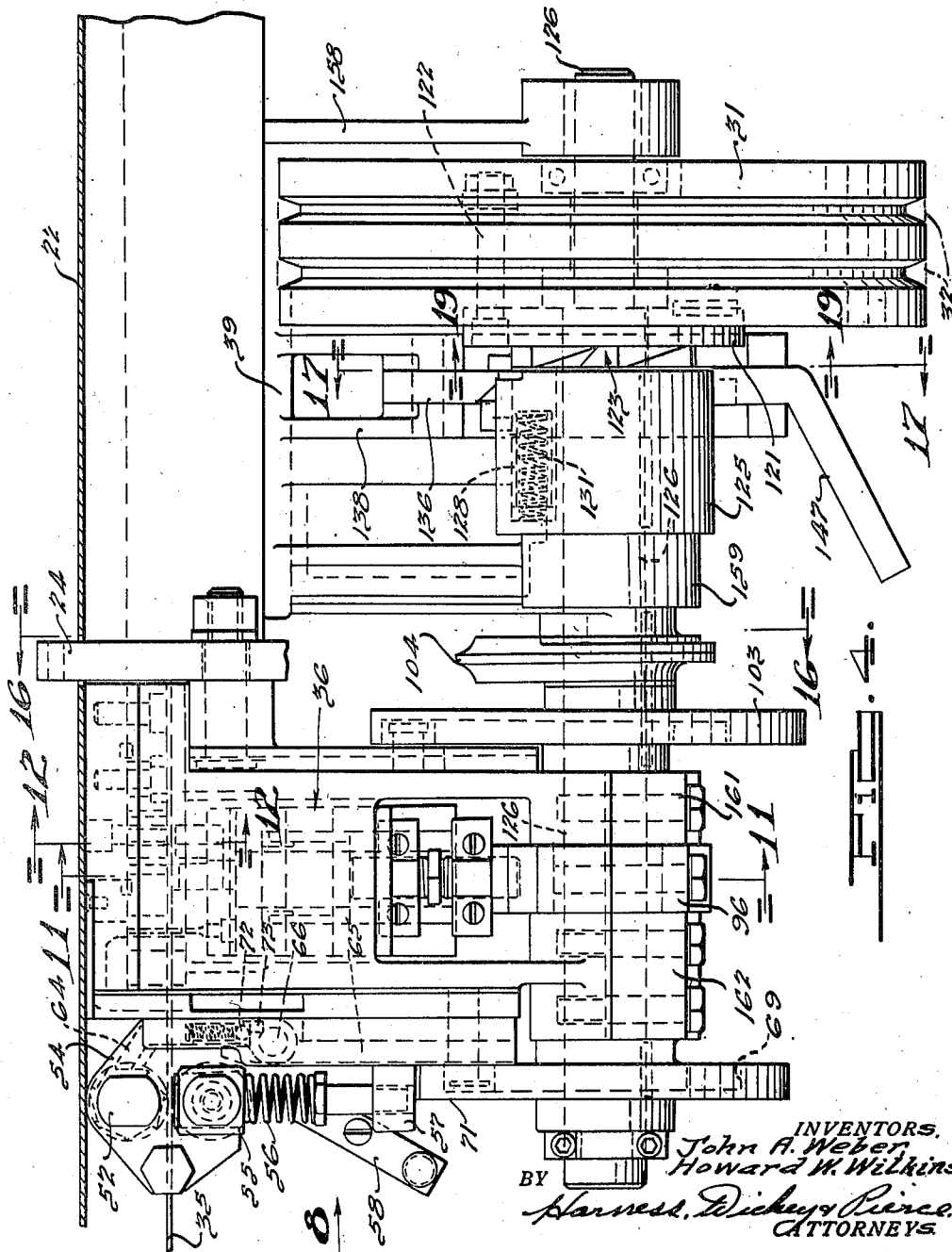
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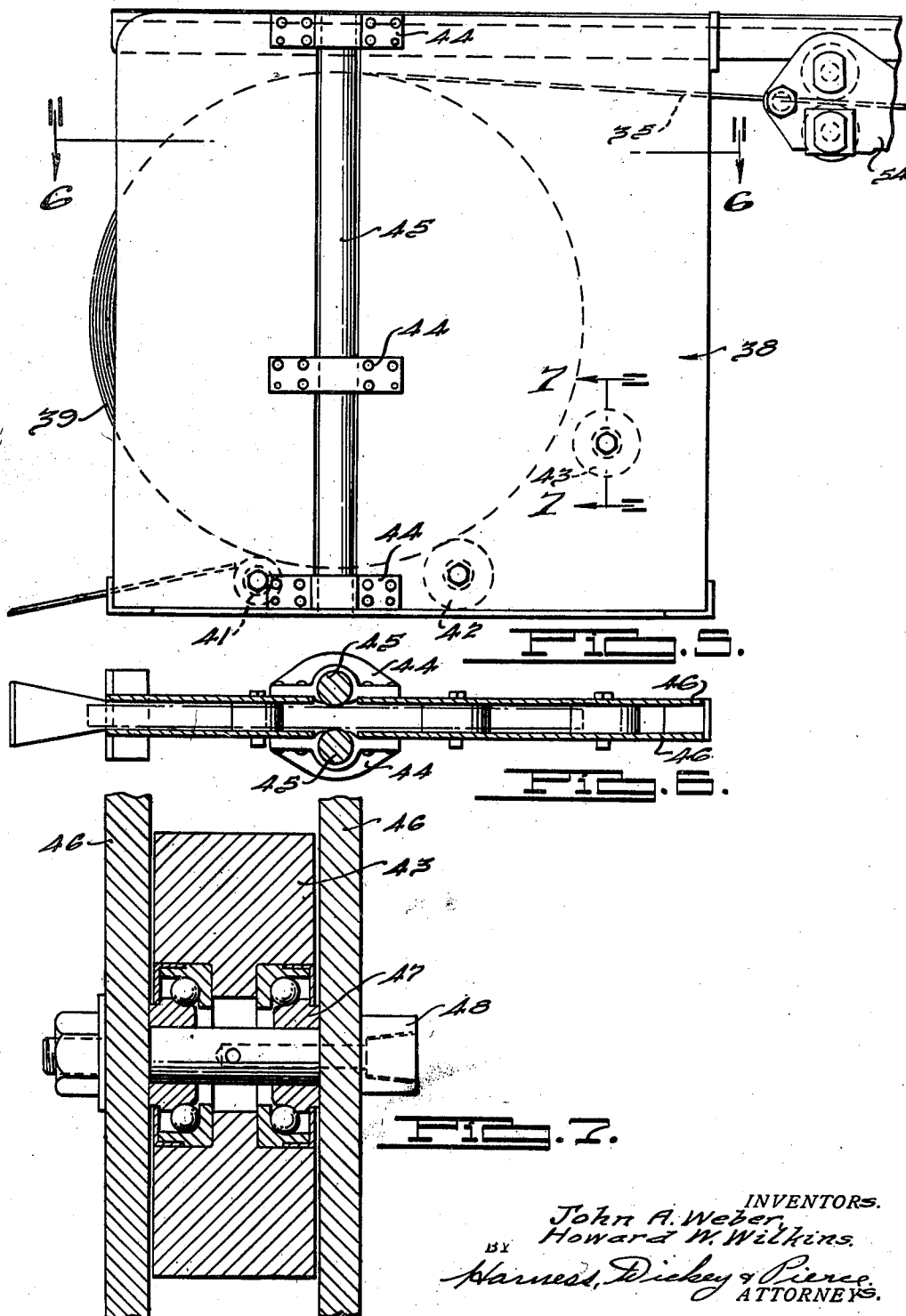
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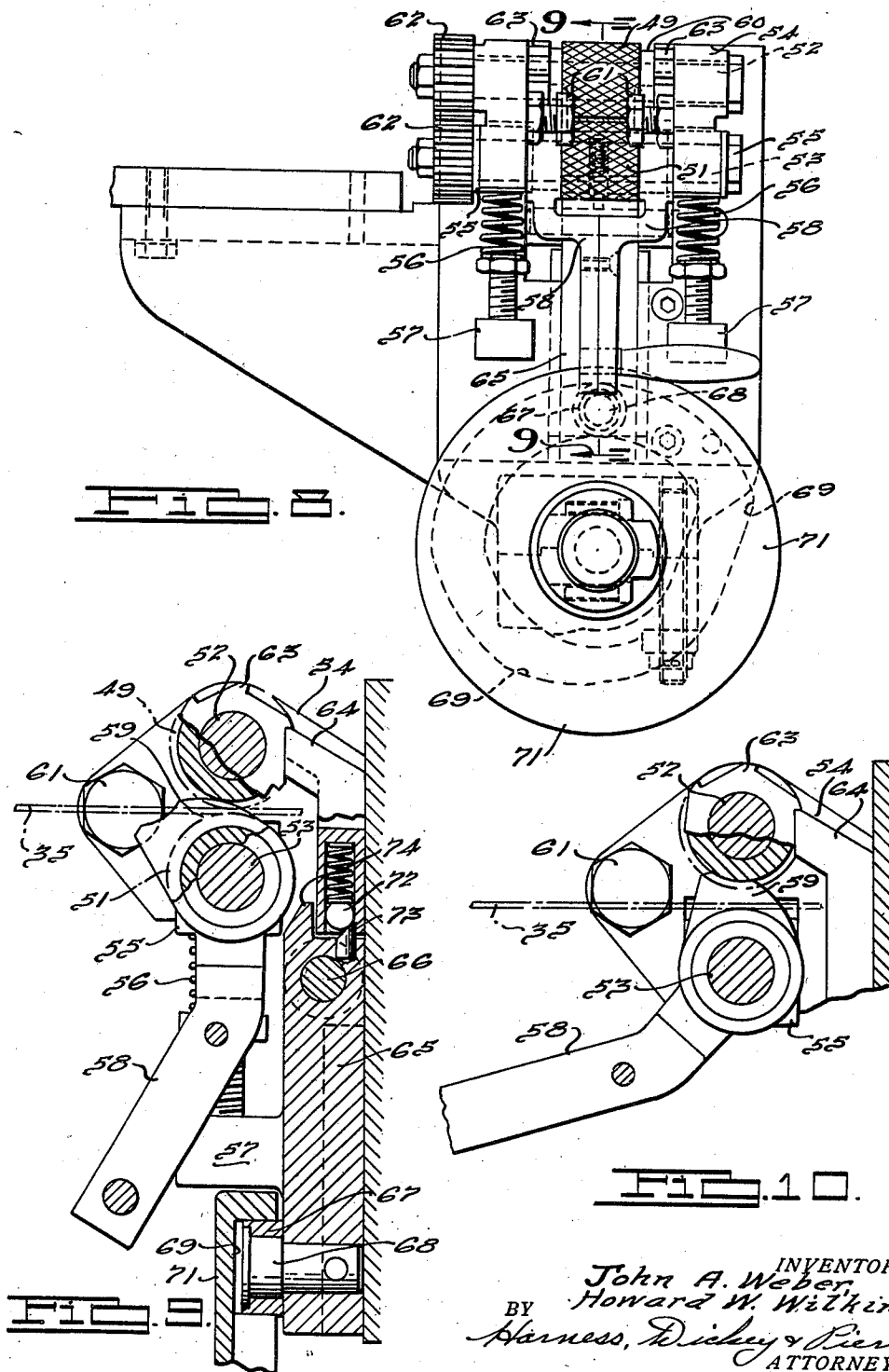
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"C" CLIP FORMING MACHINE

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8 Sheets-Sheet 4



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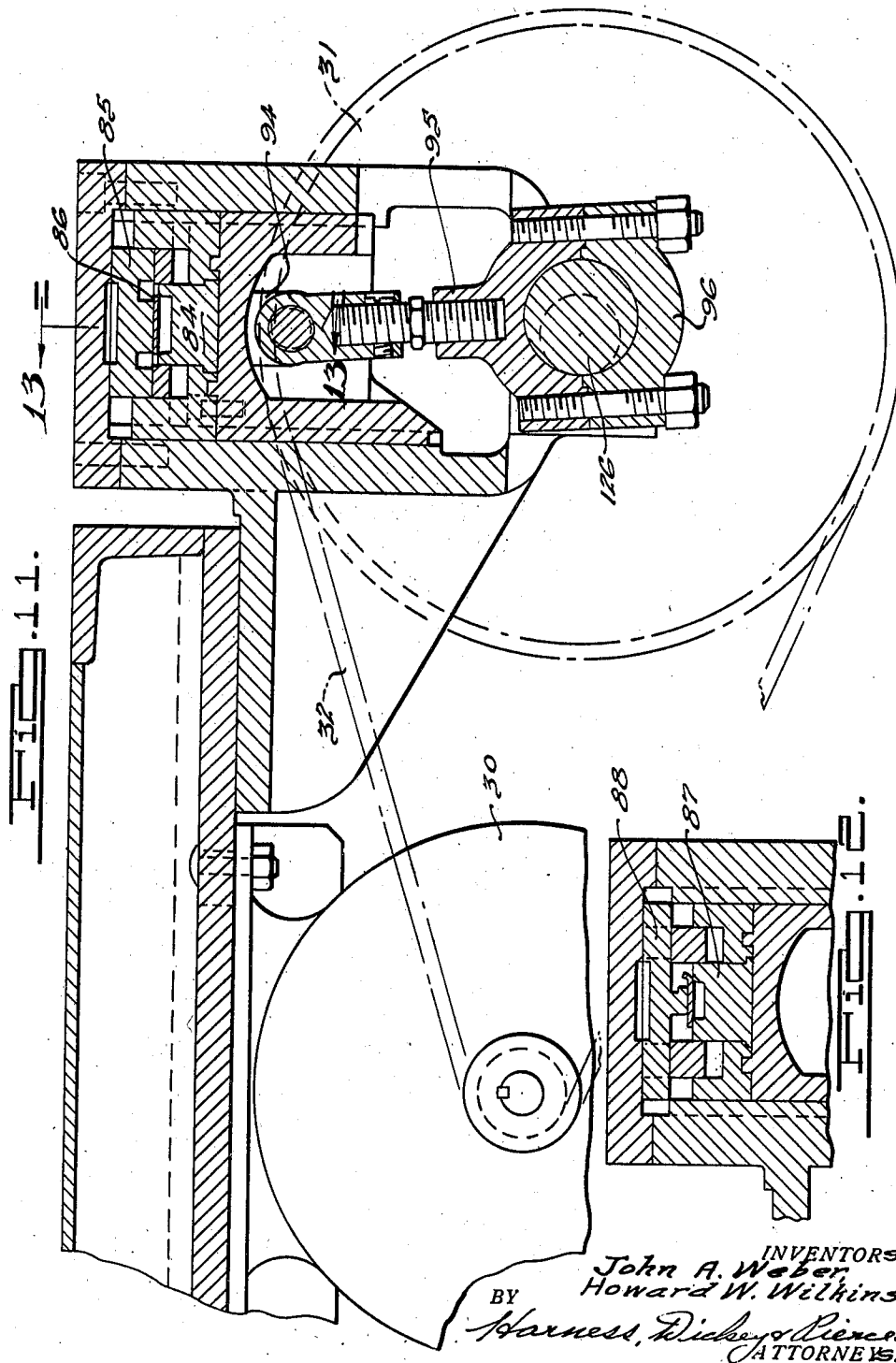
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8 Sheets-Sheet 5



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"C" CLIP FORMING MACHINE

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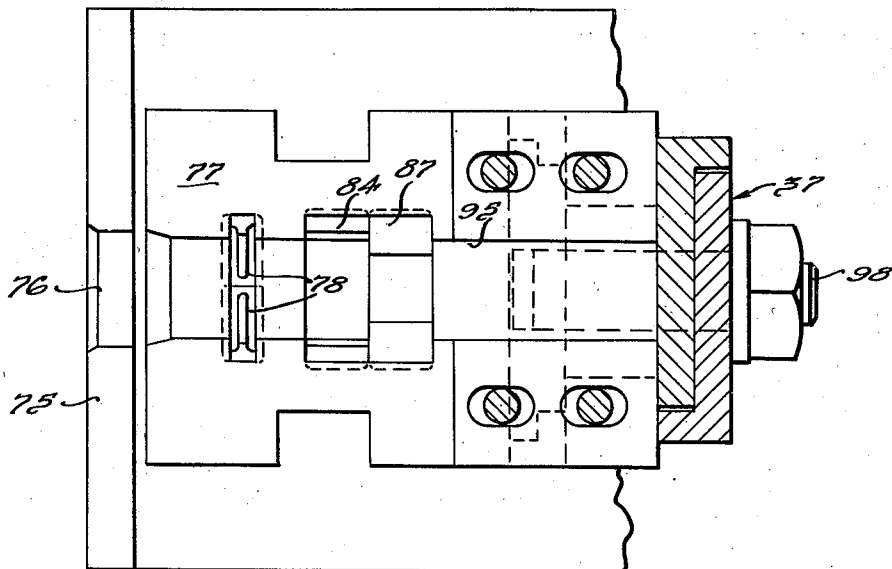
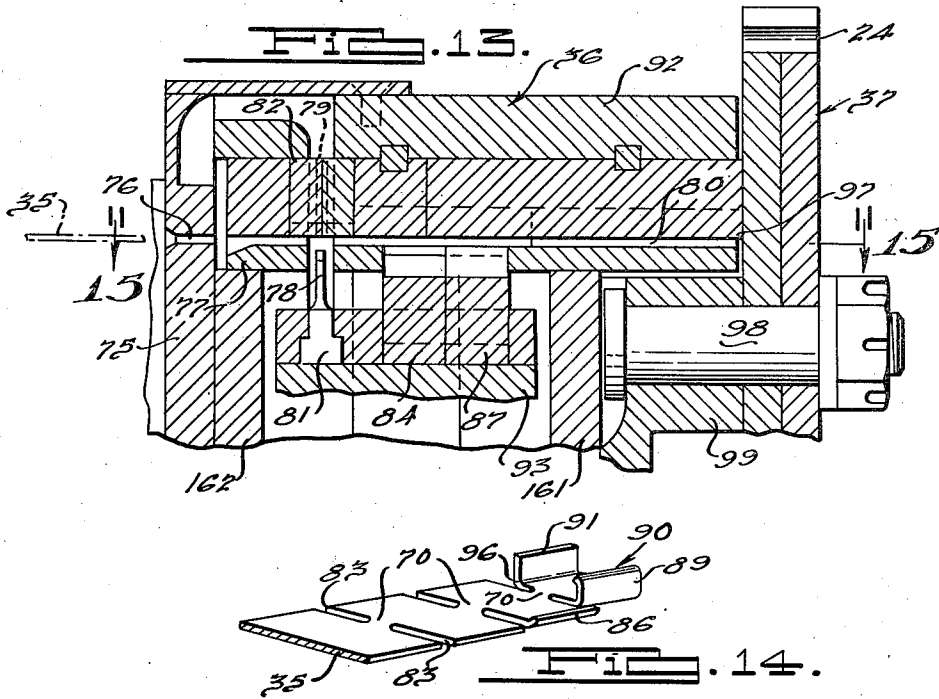


FIG. 15. INVENTORS.
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"C" CLIP FORMING MACHINE

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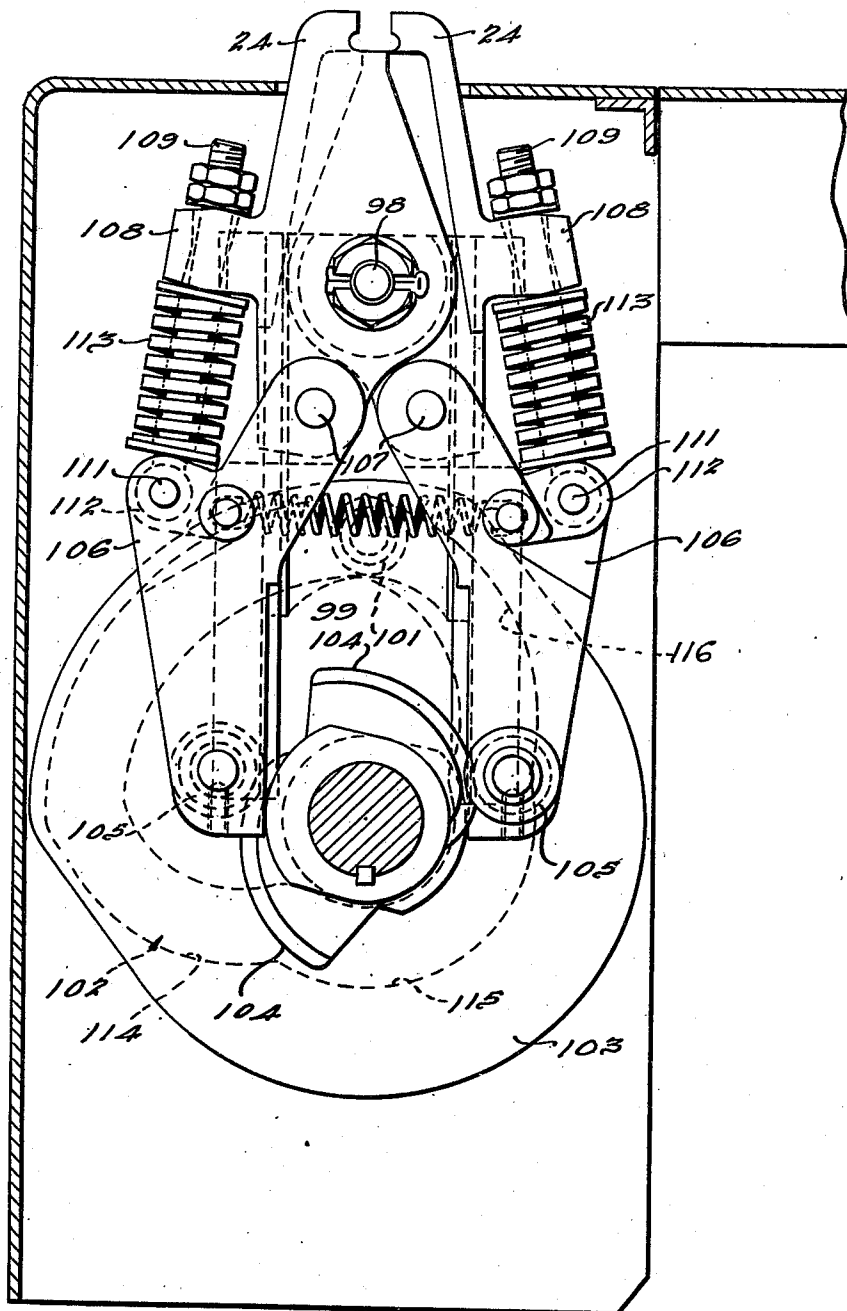


FIG. 16.

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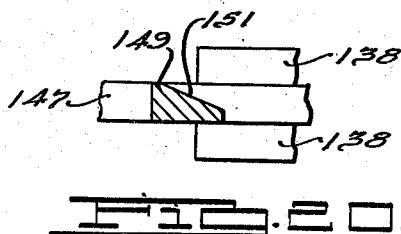
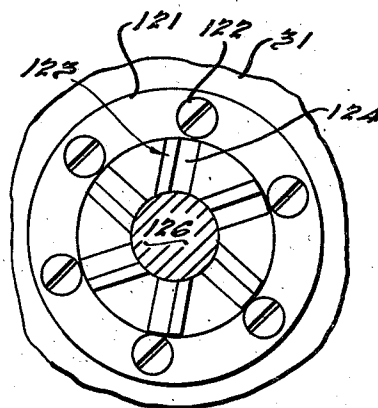
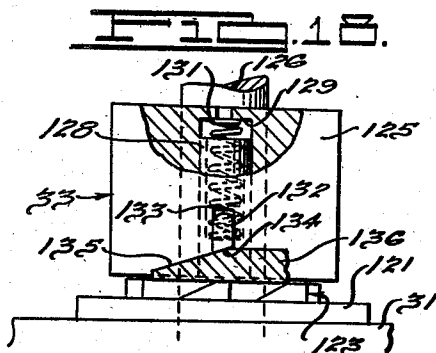
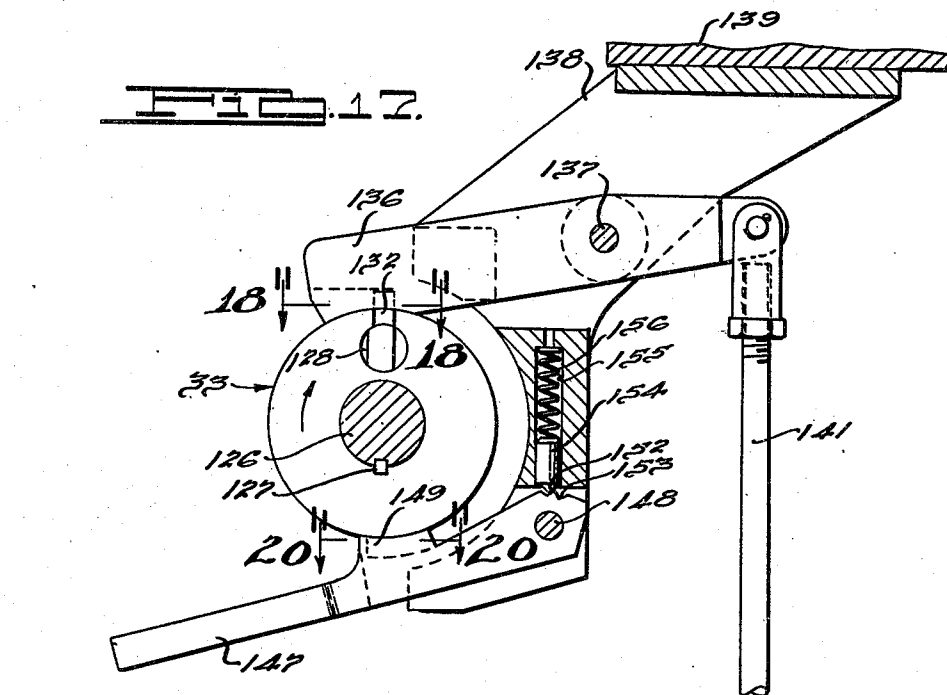
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"C" CLIP FORMING MACHINE

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8 Sheets-Sheet 8



Fin. 19

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UNITED STATES PATENT OFFICE

2,341,347

C CLIP FORMING MACHINE

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Application March 7, 1942, Serial No. 433,726

9 Claims. (Cl. 140—3)

Our invention relates to ring forming and clinching mechanism, and particularly to a device for cutting and forming rings from a strip of flat stock and clinching the formed ring about a pair of members to be secured together.

Seat frames, particularly those for automotive use are usually made of border wires secured to each other, to braces and to the springs, by rings which are clinched thereover. The rings may be made of wire or may be formed from flat sheet stock. The rings were usually formed prior to clinching and hand tools were utilized for holding one of the rings and operated to clinch the ring over a pair of the frame elements.

The present invention pertains to a device for cutting and forming a strip of metal into open rings and advancing the rings serially to a pair of jaws which are operated in synchronism with the cutting and forming mechanism. The formed ring is retained by the jaws and delivered over the pair of elements to be secured together after which the jaws are operated to clamp the rings thereabout. Each time the operator places the elements to be secured together in a position to be engaged by the jaws, a lever is tripped to have the jaws move together to clamp the ring over the elements. During this operation the strip of material is operated upon in the shearing and forming dies and after the jaws are lowered the endmost formed ring is disposed thereinto, severed from the strip and moved upward with the jaws in position to be clinched over the elements to be secured together.

Accordingly, the main objects of my invention are; to provide a device for advancing, shearing, and forming a strip of metal into open rings each time a ring is clinched about a pair of elements; to provide a device for progressively shearing a strip of material and forming open rings from the connected sheared sections which progressively advance to the clinching jaws which sever a ring from the strip as the jaws move into position to engage the elements to be secured together; to provide a device for forming and advancing rings from a strip of material which is driven by a motor and controlled by a clutch which, upon being released, clinches a ring about elements to be secured together and advances the strip to deliver a new ring to the clinching jaws and move the strip into position to be operated on by the next adjacent set of dies; and in general, to provide a device for forming and clinching rings about elements to be secured together, which is simple in construction, positive in operation, and economical of manufacture.

Other objects and features of novelty of my invention will be either specifically pointed out or will become apparent when referring, for a better understanding of my invention, to the following description taken in conjunction with the accompanying drawings, wherein:

Figure 1 is a broken perspective view of a table having a device embodying features of my invention supported thereby;

Figure 2 is an enlarged perspective view of the table and machine illustrated in Fig. 1, with parts broken away;

Figure 3 is a view of a pair of border wires which have been secured together by the device illustrated in Fig. 2;

Fig. 4 is an enlarged view, in elevation, of the device illustrated in Fig. 2;

Fig. 5 is a view in elevation of a holder for the roll of material to be fed into the device;

Fig. 6 is a sectional view of the structure illustrated in Fig. 5, taken on the line 6—6 thereof;

Fig. 7 is an enlarged sectional view of the structure illustrated in Fig. 5, taken on the line 7—7 thereof;

Fig. 8 is an enlarged end view of the structure illustrated in Fig. 4, as viewed from the point 8 thereof;

Fig. 9 is an enlarged sectional view of the structure illustrated in Fig. 8, taken on the line 9—9 thereof, with the strip of material in clamped position;

Fig. 10 is a view of the clamping rolls illustrated in Fig. 9 with the strip of material in released position;

Fig. 11 is an enlarged sectional view of the structure illustrated in Fig. 4, taken on the line 11—11 thereof;

Fig. 12 is an enlarged sectional view of the structure illustrated in Fig. 4, taken on the line 12—12 thereof;

Fig. 13 is an enlarged sectional view of the structure illustrated in Fig. 11, taken on the line 13—13 thereof;

Fig. 14 is an enlarged perspective view of the strip of material showing the operations performed thereon by the shearing and forming dies of the device;

Fig. 15 is a sectional view of the structure illustrated in Fig. 13, taken on the line 15—15 thereof;

Fig. 16 is an enlarged sectional view of the structure illustrated in Fig. 4, taken on the line 16—16 thereof;

Fig. 17 is an enlarged sectional view of the structure illustrated in Fig. 4, taken on the line 17—17 thereof;

Fig. 18 is a sectional view of the structure illustrated in Fig. 17, taken on the line 18—18 thereof;

Fig. 19 is a broken sectional view of the structure illustrated in Fig. 4, taken on the line 19—19 thereof; and

Fig. 20 is a sectional view of the structure illustrated in Fig. 17, taken on the line 20—20 thereof.

The forming and clinching device embodies a mechanism 21 which is supported on a table 22 having an opening 23 therein through which the clinching jaws 24 project when in position to clinch a band 25 about a pair of border wires 26 and 27, as illustrated in Fig. 3. The wires are of the conventional type employed at the edge of a seat cushion, with the wire 26 having an offset portion 28 which engages the wire 27 and which is encompassed by the band 25 when clinched thereabout. Brackets 29 are spaced on the machine for supporting a plurality of the wires 26 and 27.

The device 21 embodies a pulley 31 having a pair of V-grooves for the reception of a pair of driving belts 32. A motor 30 is employed for driving the pulley 31 continuously in rotation. A clutch mechanism 33 is employed for connecting and disconnecting the drive from the pulley 31 to the mechanism of the device 21. A gripping mechanism 34 for the strip of material 35 progressively feeds the strip through the device. The strip is progressively advanced to the shearing and forming dies of the mechanism 36. The endmost formed band on the strip is advanced to the jaws 24 of the clinching mechanism 37 when it is severed from the strip and clinched about the elements 26 and 27 to be secured together.

In Figs. 5, 6, and 7, we have illustrated a supporting device 38 for the roll 39 of the strip material 35. The roll is supported on a pair of rollers 41 and 42 with another roller 43 positioned to prevent the roll of material from moving from the rollers 41 and 42 when the strip 35 is advanced in the device 21. A plurality of pairs of brackets 44 support a pair of vertical rollers 45 for guiding the roll of material 39 between side walls 46. The rollers 41, 42, and 43 are mounted on a pair of bearings 47 which may be lubricated through a supporting shaft 48.

The strip of material 35 is fed into a pair of knurled rollers 49 and 51 of the gripping mechanism 34 mounted on shafts 52 and 53, respectively. The shaft 52 is mounted in a bracket 54 while the shaft 53 is mounted in brackets 55 which are slidably secured within the bracket 54 for vertical movement against the bias of a pair of springs 56. The tension in the spring 56 is adjusted by a pair of studs secured in the bosses 57. A bifurcated bracket 58 is pivotally mounted on the shaft 53, each bifurcated end being provided with a cam 59 by which the shaft 53 is moved from the shaft 52, as illustrated in Fig. 10. This permits the strip of material 35 to be inserted between rollers 49 and 53 where it is guided by the heads of bolts 61 disposed on the inner faces of the bracket 54.

After the strip 35 has been inserted in the rolls as illustrated in Fig. 10 manipulation of the bracket 58 releases the cams 59 from engagement with the faces 60 of the roller 49 which permits the springs 56 to move the brackets 55 upwardly to have the rollers 49 and 51 securely engage the strip. A pair of pinion gears 62 are secured on the ends of the shafts 52 and 53 in mesh with each other to place the shafts 52 and 53 and the rollers 49 and 51 in driving relation with each

other. A plurality of ratchet teeth 63 are provided on each end of the roller 49 in position to be engaged by fingers 64 which are mounted for vertical operation in a slot in the bracket 54. The fingers 64 are secured to a slide 65 by pins 66 on which the fingers 64 are tiltable. The slide 65 has a roller 67 secured on the end by a pin 68 which projects frontwardly thereof. The roller operates in a cam slot 69 in a cam pulley 71.

During rotation of the pulley 71 the slide 65 is moved downwardly and upwardly to move the fingers 64 out of engagement with one of the ratchet teeth 63 and pivoted forwardly about the pivot 66 into a position to engage the next adjacent teeth on the roller 49. A spring-pressed ball 72 in the body of the fingers 64 engages a sloping surface on pins 73 which urge the fingers 64 forwardly in position to engage the ratchet teeth. When the slide 65 is moved upwardly, the fingers 64, being limited in forward movement by the stop 74, engage the next adjacent ratchet tooth of the roller 49 and rotate the roller 49 an amount which advances the strip 35 an amount required to make one of the ring bands. Thus for each revolution of the shaft of the device the strip 35 is advanced an amount equal to that required to make one of the bands, and it is during the time of this operation that the jaws 24 are operated to clinch a band and to move into a position to receive a band which has been completed during the clinching operation.

The shearing and forming mechanism 36 embodies a housing 75 having a slot 76 through which the strip of material 35 is introduced. The strip is first advanced to a set of shearing dies 77 comprising a pair of spaced shearing blades 78 and a pair of spaced slots 79 in the die blocks 81 and 82, respectively. When the device is operated a pair of spaced aligned slots 83 are sheared by the blades 78 in the strip 35 as illustrated in Fig. 14.

A set of die blocks 84 and 85 are mounted adjacent to the die blocks 81 and 82 for the purpose of bending up the corner 86 of the band; as illustrated in Fig. 11. A set of die blocks 87 and 88 are mounted adjacent to the die blocks 84 and 85 for the purpose of rolling up the flanges 89 and 91 on the band which is the shape of the band when delivered to the jaws 24 of the clinching device 37. The die elements 82, 85, and 88 are mounted in the upper portion 92 of the housing while the mating die portions 81, 84, and 87 are mounted in a slide 93 disposed within the housing. The slide 93 is provided with a boss 94, as illustrated in Fig. 11, to which an arm 95 of an eccentric 96 is adjustably connected.

It will be noted from Fig. 14 that a pair of aligned slots 83 are cut in the strip 35 at the same time that one of the band portions has the end 86 bent upwardly thereon. The slotting of one portion and the bending of the end 86 on another portion occur at the same time that an adjacent portion has the flanges 89 and 91 bent upwardly thereon. The strip 35 is continuously advanced to the die sets and progressively operated upon to completely form a band 90 as illustrated in Fig. 14. The strip is continuously advanced until the endmost formed band 90 projects from the slot 80 at the opposite end of the housing from the slot 76 and is disposed within the jaws 24 of the clinching device 37 when the jaws are retracted and aligned with the slot. Upon the upward movement of the clinching device 37, the web 70 between the slots 83 is sheared by the shearing edge 97 so that a severed band 90 is supported within the jaws when the jaws pro-

ject from the top of the table 22, as illustrated in Fig. 1.

The pair of jaws 24 are mounted on a pin 98 which extends from a vertically moving slide 99 mounted on the face of the housing 75. The slide 99 is provided with a cam roller 101 which operates in a cam slot 102 in a cam pulley 103. The cam pulley 103 carries on the front face thereof a pair of oppositely disposed cams 104 which engage rollers 105 on the ends of a pair of arms 106 which are pivoted on the jaws 24 by pins 107. Bosses 108 are provided on each of the jaws through which eye bolts 109 project, the end of the bolt being secured by pins 111 to a projection 112 on the arms 106. Springs 113 are disposed over the eye-bolts between the projections 112 and the bosses 108, to provide resilient pressure for the ends of the jaws during a clinching operation. After the cams 104 have rotated substantially 70 degrees the rollers 105 are disengaged therefrom, thereby permitting the arms 106 to move inwardly and the jaws 24 to remain open for the remainder of the complete revolution of the cam pulley 103. After the jaws 24 have been moved inwardly and outwardly of each other by the cams 104 during the first 70 degree movement of the cam pulley 103, the cam track 102 operates on the roller 101 to move the slide 99 downwardly. This occurs in the arc of the track indicated by 114. Thereafter the roller dwells in the arc portion 115 for substantially 90 degrees and it is during this dwell portion that the jaws 24 are aligned with the slot 80 to receive the formed band 90 on the end of the strip 35. The roller 101 is operated in the track portion 116 to move the slide 99 upwardly back to the initial position as illustrated in Fig. 16. This projects the jaws 24 above the top of the table after shearing the endmost band 94 from the strip on the shearing edge 97.

The clutch mechanism 33 comprises a plate 121 which is secured to the inner face of the pulley 31 by a plurality of screws 122. The plate has a plurality of projecting teeth 123 having sloping faces 124. The teeth of the plate 121 are presented toward a cylindrical clutch block 125 which is secured to the shaft 126 by a key 127. A plunger 128 is disposed parallel to the shaft 126 in an aperture 129 in the block, and is urged outwardly of the aperture by a spring 131. The plunger 128 is provided with a projection 132 which operates in a slot 133 in the block. The projection 132 is provided with a sloping face 134 which is normally engaged by a sloping face 135 on a lever 136. The lever is pivoted at 137 on a bracket 138 which is supported or otherwise attached to a plate 139. The opposite end of the link from that containing the sloping face 135 is pivotally connected to a rod 141, the opposite end of which is pivoted to a foot lever 142 contained within a housing 143 which is secured to the floor.

A spring 144 encompasses the rod at the upper end thereof and provides a bias for tilting the pivoted end of the lever 136 upwardly to urge the opposite end of the lever against the block 125 in a position to engage the projection 132 of the plunger 128. The lower end of the spring is abutted against a bifurcated plate 145 mounted on a cross brace 146 of the device. The lower end of the bracket 138 has a lever 147 secured thereto by a pivot 148 provided with a projecting arm 149 having a sloping face 151. Adjacent to the pivot of the link a pair of notches 152 and 153 are provided in position to be engaged by a

projection on a plunger 154 which is movable in an aperture 155 in the bracket. A spring 156 urges the plunger out of the end of the aperture into a notch 152 or 153 and retains the lever 147 with the arm 149 disposed for engagement with the block 125 or away therefrom at the will of the operator.

When it is desired to clinch a band about the pair of wires the foot lever 142 is moved downwardly tilting the lever 136 in a clockwise direction for releasing the projection 132 and permitting the plunger 128 to be urged outwardly by the spring 131 into engagement with a tooth 123. The block 125 is then free to rotate with the pulley 31 for one complete revolution within which time the link 136 moves back into engagement with the block 125 upon release of the lever 142. The projection 132 contacts the sloping face 135 of link 136 and withdraws the plunger 128 from engagement with the tooth 123 and interrupts the operation of the shaft 126.

The complete revolution of the block occurs when the link 147 is moved downwardly from the block 123 so as to have the arm 149 out of position to engage the projection 132. When a half revolution of the shaft 126 is desired, the movement of the link 147 into the position illustrated in Fig. 17, places the arm in position to engage the projection 132 to move the plunger 128 out of engagement with a tooth 123. The link 147 is only employed when the operator desires to interrupt the complete operating cycle of the device with the jaws 24 in position to receive a band 90.

The shaft 126, upon which the pulley 31 is rotatable, is supported on brackets 158 and 159 which extend from the web 160 from which the brackets 138 project. The web 160 is attached to the supporting plate 139 which is secured to the housing 36 to form a unit construction. Projections from the housing form the pair of brackets 161 and 162 which also support the shaft 26. The pulley 31 rotates independently on the shaft 126 and drives the shaft when the plunger 128 is in engagement with a tooth 123 of the plate 121. The device is illustrated in Fig. 4 with the plunger 128 out of engagement with a tooth 123 and with the pulley 31 operating in rotation. The jaws 24 project above the table 22 in position to receive the elements 26 and 27 to be secured together. The cam plate 71 is in the position illustrated in Figs. 8 and 9 with the roller 67 of the slide 65 in uppermost position. The cam plate 103 along with the cam elements 104 of the jaws 24 are in the position illustrated in Fig. 16. The eccentric element 96 for operating the dies 81, 84 and 87, is in the position illustrated in Fig. 11. When the foot pedal 142 is operated and the plunger 128 moves in engagement with a tooth 123 the shaft 126 is rotated with the pulley 31 to first move the jaws into and out of engagement with each other to clinch the band 90 about the elements 26 and 27. During this operation the eccentric 96 has moved up toward its maximum amount to have dies 81, 84, and 87 perform the shearing and forming operations on the strip 35. The jaws are moved down in the next 45 degrees of shaft rotation and stay in this down position until the shaft has moved through 300 degrees. Between 90 and 240 degrees of movement of the shaft 126 the slide 65 moves down to move the ratchet fingers 64 into engagement with a ratchet tooth 63 of the roller 49 and the next 60 degree movement of the cam plate 71 moves the slide upwardly along with the

ratchet fingers which rotate the roller 49 and therefore the roller 51 an amount to advance the strip 35 the length of the band 90 plus the amount of metal removed by the shearing die 81. This advancement, moves the endmost link 90 as illustrated in Fig. 14 into the jaws 24 and thereafter the cam 71 dwells on the roller 67 and the jaws 24 are moved upwardly by the cam plate 103 to sever the web 70 on the shearing edge 87 to release the band 90 from the strip. The eccentric 96 completes its 360 degree movement back to the position illustrated in Fig. 11. At this time the projection 132 has moved up the sloping face 135 of the link 136 to move the plunger 128 out of engagement with a tooth 123 which thereby interrupts further rotation of the shaft 126 and completes the cycle of operation with a formed band disposed in the jaws 24 which again project through the aperture 23 of the table 22 in position to receive the next pair of border wires 26 and 27.

When the link 147 is moved into the position illustrated in Fig. 17 with the arm 149 in position to have the sloping surface 151 engage the projection 132, the plunger will be in position to interrupt the rotation of the shaft 126 at a half cycle of operation or 180 degree movement in rotation. In this position the advanced strip has been operated on by the die elements 81, 84 and 87 and the jaws have been lowered in position to receive the formed band at the end of the strip when the strip is again advanced. This permits the operator to insert the end of a new strip 25 within the rolls 49 and 51, and removes the end of the prior roll which will then be unsupported within the slot 195 of the housing 35. The end of the new strip progresses through the dies and advances to the jaws 24 in the next succeeding cycles of operation of the device. The loading of the machine has been simplified further by the use of the rollers 41 and 42 on which the roll of material is supported.

What is claimed is:

1. In a device for forming and clinching bands about elements to be secured together, a shaft, cams on said shaft, a pulley rotatable on said shaft, a clutch for engaging said pulley for driving said shaft by said pulley for operating said cams, a clinching jaw, a set of dies for operating on a strip of material, means for advancing the strip of material to said dies and jaw, and means interconnecting said jaws, dies, and strip advancing means to said cams for severing a formed band from the strip operating the jaws to clinch a band and progressively form additional bands.

2. In a device for forming and clinching bands about elements to be secured together, a rotatable shaft, cams on said shaft, a pair of clinching jaws operated by one of said cams, a set of dies operated by another of said cams for forming a strip of material into connected U-shaped clips, means for advancing said strip of connected U-shaped clips to said dies and jaws operated by an additional cam on said shaft, and control means for rotating said shaft through 360 degrees for clinching a band, progressively forming additional bands and delivering a band to the jaws which severs the band as the jaws are moved to clinching position.

3. A device for banding a pair of elements together including, in combination, a supporting table having an aperture therein, a device supported by said table and having a pair of jaws projectable through said aperture, means on said device for progressively forming C-shaped bands

from a strip of material, means for retracting said jaws from said aperture in position to receive one of said bands after it is formed, and means for moving said jaws to sever the band from the strip, to project the jaws from said aperture and for operating said jaws to clinch said formed band.

4. In a device for forming and clinching bands about elements to be secured together, a shaft, a plurality of cams on said shaft, a pair of jaws movable toward and away from each other by one cam and movable in reciprocation as a unit by another cam, a plurality of dies actuated by another of said cams which progressively operate on a strip of material, and strip advancing means actuated by another of said cams, said cams being so disposed as to first clinch a band about elements to be secured together, then advance the dies to shape bands on the strip of material, next retract the jaws to a position of alignment with the formed end of the strip of material, next advance the strip to have the endmost formed band inserted in the jaws, and thereafter move the jaws upwardly to sever the band from the strip.

5. In a device for forming and clinching bands about elements to be secured together, a shaft, a plurality of cams on said shaft, a pair of jaws movable toward and away from each other by one cam and movable in reciprocation as a unit by another cam, a plurality of dies actuated by another of said cams which progressively operate on a strip of material, and strip advancing means actuated by another of said cams, said cams being so disposed as to first clinch a band about elements to be secured together, then advance the dies to shape bands on the strip of material, next retract the jaws to a position of alignment with the formed end of the strip of material, next advance the strip to have the endmost formed band inserted in the jaws, thereafter move the jaws upwardly to sever the band from the strip, driving means for said shaft, clutch means for securing said driving means to said shaft, and means for disengaging said shaft from said driving means after a single revolution of said shaft.

6. In a device for forming and clinching bands about elements to be secured together, a shaft, a plurality of cams on said shaft, a pair of jaws movable toward and away from each other by one cam and movable in reciprocation as a unit by another cam, a plurality of dies actuated by another of said cams which progressively operate on a strip of material, and strip advancing means actuated by another of said cams, said cams being so disposed as to first clinch a band about elements to be secured together, then advance the dies to shape bands on the strip of material, next retract the jaws to a position of alignment with the formed end of the strip of material, next advance the strip to have the endmost formed band inserted in the jaws, thereafter move the jaws upwardly to sever the band from the strip, driving means for said shaft, clutch means for securing said driving means to said shaft, means for disengaging said shaft from said driving means after a single revolution of said shaft, and additional means for interrupting the rotation of said shaft after rotating through substantially 180 degrees.

7. In a device for forming and clinching bands about elements to be secured together, a shaft, means for supporting said shaft for rotation, a plurality of cams on said shaft, a pair of clinch-

ing jaws operable by one of said cams for moving the jaws together and by another of said cams for reciprocating the jaws to and from clinching position, a set of dies for shearing aligned slots in a strip of material, additional dies for forming flanges on the edges of said sheared portions, and means for connecting said die sets to a cam on said shaft, a pair of rollers, means connected to another of said cams for rotating said pair of rollers for advancing said strip through said dies, means for rotating the shaft through 360 degrees to first operate the jaws for clinching a band about the element, for moving the dies for operation on said strip of material, for retracting the jaws into alignment with the strip, advancing the strip to deliver the endmost band to the jaws, and severing the band from the strip as the jaws are moved to their initial position.

8. In a device for forming and clinching bands about elements to be secured together, a shaft, means for supporting said shaft for rotation, a plurality of cams on said shaft, a pair of clinching jaws operable by one of said cams for moving the jaws together and by another of said cams for reciprocating the jaws to and from clinching position, a set of dies for shearing aligned slots in a strip of material, additional dies for forming flanges on the edges of said sheared portions, and means for connecting said die sets to a cam on said shaft, a pair of rollers, means connected to another of said cams for rotating said pair of rollers for advancing said strip through said dies, means for rotating the shaft through 360 degrees to first operate the jaws for clinching a band about the element, for moving the dies for opera-

tion on said strip of material, for retracting the jaws into alignment with the strip, advancing the strip to deliver the endmost band to the jaws, and severing the band from the strip as the jaws are moved to their initial position, and means for separating said feed rolls to permit the insertion of a new strip of material therebetween.

9. In a device for forming and clinching bands about elements to be secured together, a shaft, means for supporting said shaft for rotation, a plurality of cams on said shaft, a pair of clinching jaws operable by one of said cams for moving the jaws together and by another of said cams for reciprocating the jaws to and from clinching position, a set of dies for shearing aligned slots in a strip of material, additional dies for forming flanges on the edges of said sheared portions, and means for connecting said die sets to a cam on said shaft, a pair of rollers, means connected to another of said cams for rotating said pair of rollers for advancing said strip through said dies, means for rotating the shaft through 360 degrees to first operate the jaws for clinching a band about the element, for moving the dies for operation on said strip of material, for retracting the jaws into alignment with the strip, advancing the strip to deliver the endmost band to the jaws, severing the band from the strip as the jaws are moved to their initial position, a pulley freely rotatable on said shaft, clutch means for engaging said pulley with the shaft, and means for releasing said clutch means at the end of a single rotation of the shaft.

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