July 23, 1940. S. G. SMITH 2,208,819

RING CLINCHING DEVICE

Filed Feb. 7, 1938 3 Sheets-Sheet 1

FIG. 1.

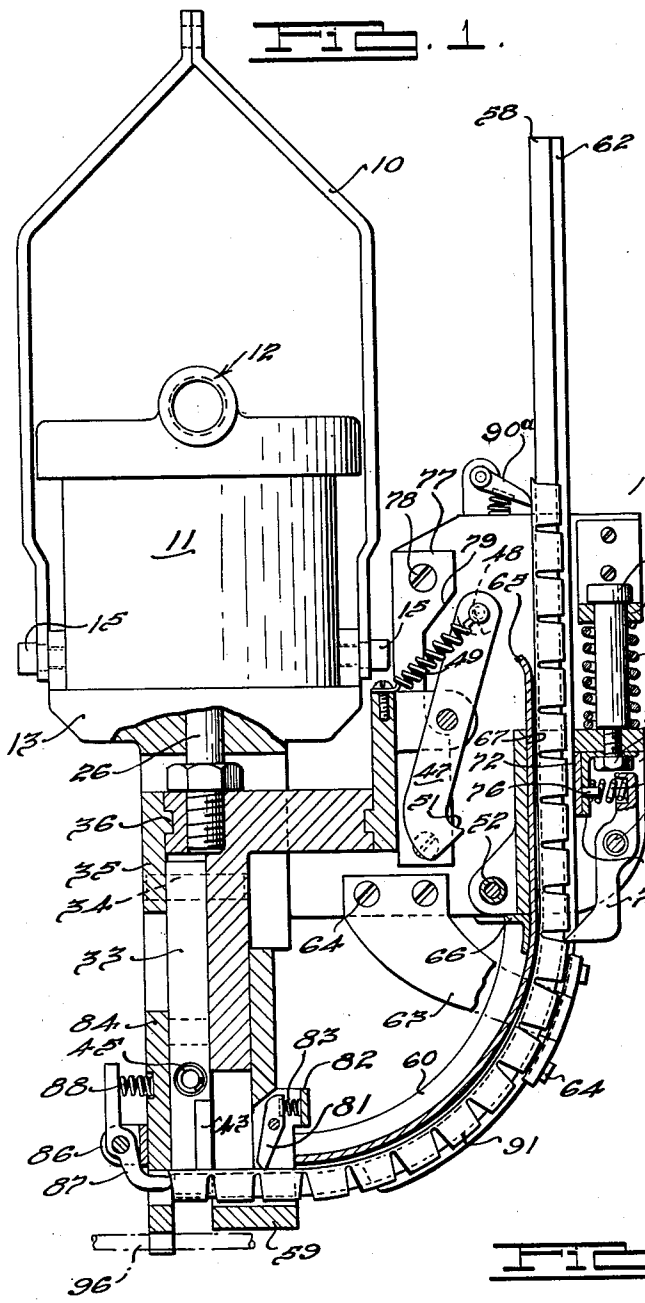
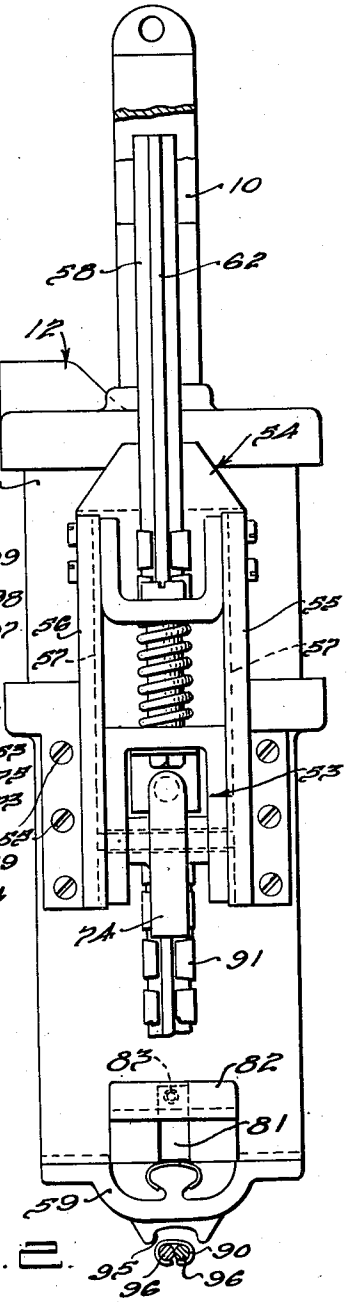


FIG. 2.



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Filed Feb. 7, 1938 3 Sheets-Sheet 2

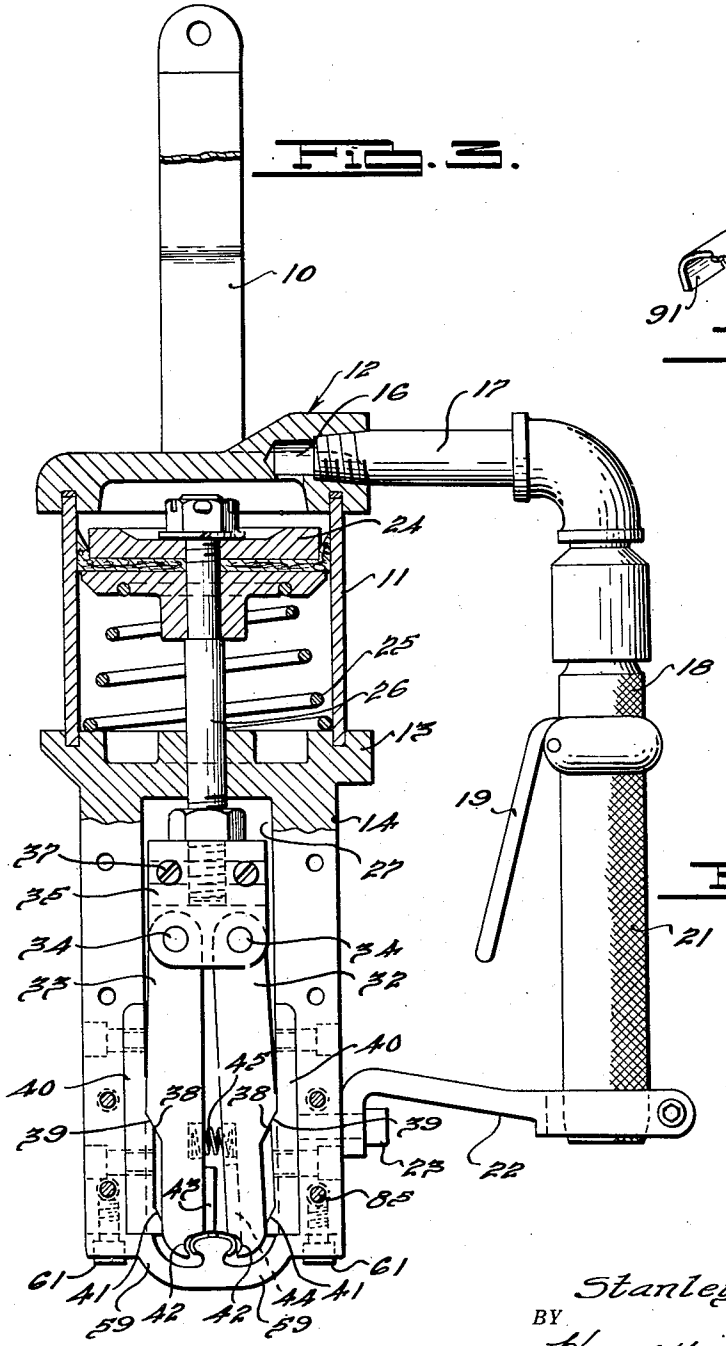


Fig. 3.

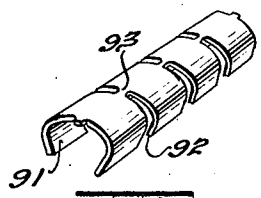


Fig. 4.

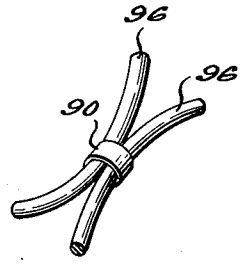


Fig. 5.

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Filed Feb. 7, 1938 3 Sheets-Sheet 3

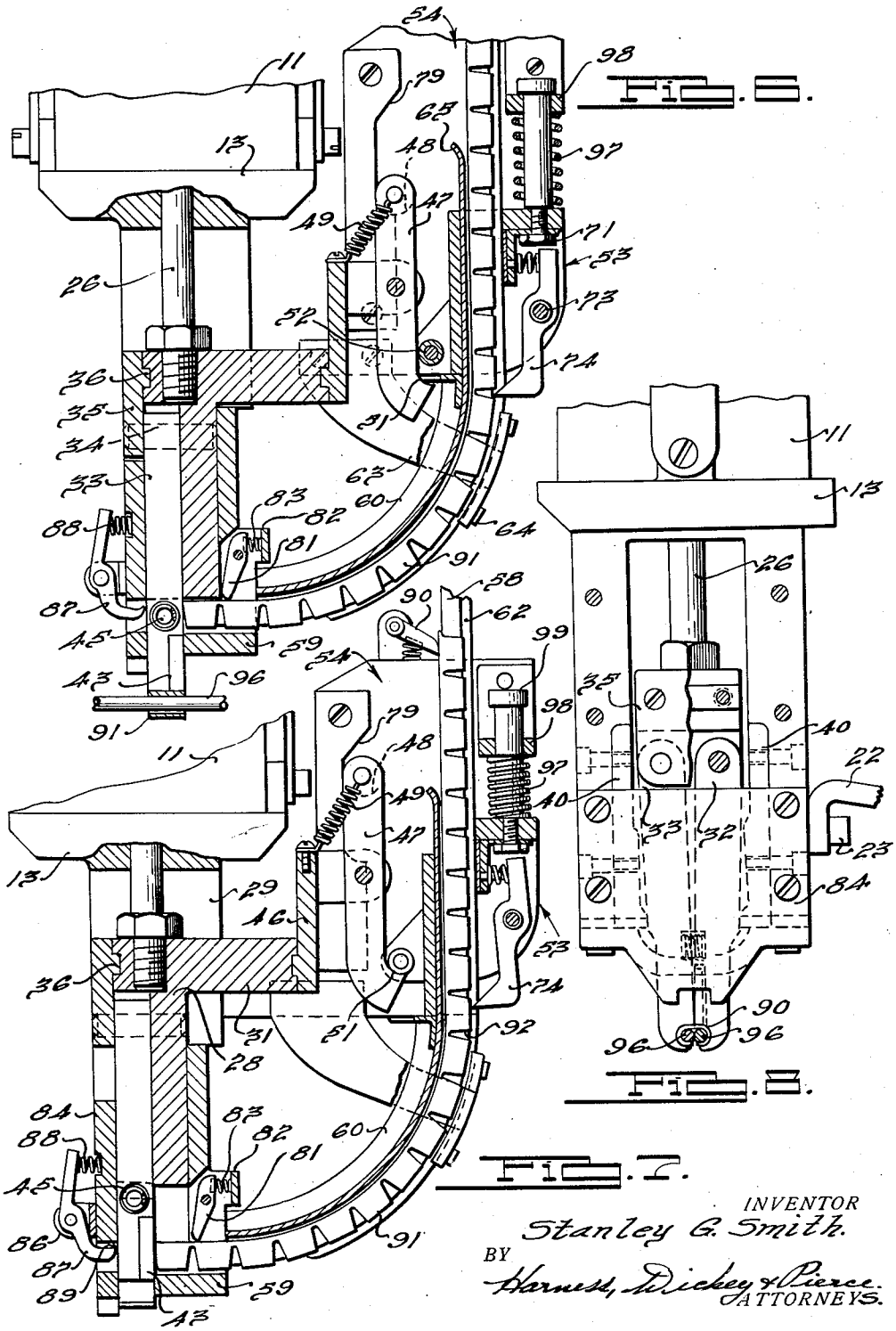


Fig. 5.

Fig. 8.

Fig. 7.

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2,208,819

RING CLINCHING DEVICE

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Application February 7, 1938, Serial No. 189,023

8 Claims. (Cl. 140—55)

My invention relates to portable ring clinching devices, and particularly to a ring clinching device which automatically severs a ring from a strip, advances the ring over the elements to be secured together and clinches the rings thereabout.

In my Patent No. 2,145,461, issued January 31, 1939, and assigned to the assignee of the present invention, I have illustrated, described and claimed a device for severing a piece of wire from a roll, bending the wire in the shape of a ring, advancing the ring over elements to be secured together, and clinching the ring thereabout.

The present invention pertains to a similar device wherein formed strips of material are fed to the clinching jaws which sever a ring therefrom and hold the ring in position. Upon further actuation of the jaws the ring is advanced over elements to be secured together and is clinched thereabout. Means are provided on the device for advancing the formed strip after each clinching operation and means are also provided for retaining the strip in advanced position to have the end element of the strip disposed in the path of movement of the jaws. Fluid means is employed for actuating the jaws, controlled from a trigger mounted adjacent to the operating handle. Means are preferably provided for suspending the device from an overhead support which permits the device to be freely swung and moved about the elements which are to be secured together.

Accordingly, the main objects of my invention are; to provide a ring clinching device which is power operated to sever a ring from a strip and to operate jaws to hold the ring and advance the ring about elements to be secured together; to provide a ring clinching device with jaws which sever a ring from a strip and retain the ring in position as it is advanced to engage elements to be secured together and which clinch the ring thereabout; to provide a ring clinching device with means for retaining a formed strip and for periodically advancing the strip to a shearing element; to provide a ring clinching device with jaws which receive the end element of a strip and with a shearing blade for severing the end element from the strip after the jaws are in position to retain the severed element; and in general, to provide a portable ring clinching device 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 view, partly in section and partly in elevation, of a ring clinching device embodying features of my invention;

Fig. 2 is a broken rear view of the device illustrated in Fig. 1;

Fig. 3 is a front view, with parts in section and parts broken away, of the structure illustrated in Fig. 1, with the operating elements in retrieved position;

Fig. 4 is a view in perspective of a section of the formed strip which is employed in the device illustrated in Fig. 1;

Fig. 5 is a view of two elements which have been secured together by a ring severed from the formed strip illustrated in Fig. 4;

Fig. 6 is a view of structure, similar to that illustrated in Fig. 1, with parts shown in fully extended position;

Fig. 7 is a view of structure, similar to that shown in Fig. 6, with parts in partially retrieved position; and,

Fig. 8 is a broken view of the structure, similar to that illustrated in Fig. 3, with parts in extended position.

Referring particularly to Figs. 1, 2, and 3, I have illustrated the ring clinching device as embodying a cylinder 11, having a head 12 and base 13, the latter of which is provided with a base extension 14 to form a housing for the operating elements of the device. The base of the cylinder 13 is provided with trunnions 15 to which a frame 10 is pivoted for suspension from an overhead support. An aperture 16 in the head 12 communicates with the cylinder 11 and has a conduit 17 attached thereto. The conduit 17 is provided with a valve 18 operated by a trigger 19 adjacent to a conducting element 21 which forms a handle for the device. A brace 22 interconnects the conducting element 21 with the base extension 14 of the device, being secured thereto by a bolt 23.

Within the cylinder 11 a piston 24 is mounted for movement in reciprocation, being actuated downwardly by a fluid under pressure delivered through the conduit 17. A spring 25 is mounted in the cylinder below the piston in engagement with the piston and the base 13 for the purpose of retrieving the piston after the fluid pressure is released. The piston carries a rod 26 which projects through the base 13 to within a rectangular slot 27 in the base extension 14. The rod is connected to a slide 28 which operates within

the slot and within a slot 29 extending transversely through the base extension 14. An arm 31 on the slide 28 projects outwardly from the base extension 14 through the slot 29 thereof.

A pair of jaws 32 and 33 are carried by the slide 28 for pivotal movement on pins 34. The front ends of the pins are journaled in a plate 35 having a tongue and groove connection 36 with the slide to which it is secured. The jaws 32 and 33 have a cam surface 38 thereon which cooperates with the cam surfaces 39 and 41 on the plate 40 provided on the inner wall of the aperture 27 and secured to the base extension 14. Recesses 42 are provided on the lower end of the jaws for engaging a ring and for holding the ring after it is severed and for thereafter clinching the ring about elements to be secured together.

A shearing blade 43 is secured to the clinching jaws 33 as illustrated in Fig. 3. A recess 44 is provided on the jaw 32 for receiving the shearing blade 43 and permitting the jaws to move into complete ring clinching position. A spring 45 has its opposite ends recessed in apertures in the adjacent faces of the jaws 32 and 33 for biasing the jaws away from each other.

The arm 31 of the slide 28 extending through the aperture 29, has a bracket 46 secured thereto upon which a link 47 is pivoted. One end of the link is provided with a roller 48 and a spring 49, the latter being anchored to the bracket 46 to bias the link in a counterclockwise direction. A hook 51 is formed on the opposite end of the link 47 for engaging a roller 52 on a carriage 53. Rearwardly of the base 13 a housing 54 is mounted, secured to the base extension 14 by a plurality of bolts 55. The housing 54 embodies two side plates 55 and 56, having ways 57 provided therein for receiving the carriage 52 and for guiding the carriage during its movement.

A curved mandrel 58, which is elliptical in section, extends through the housing 54 and the carriage 53, and is secured to the base extension 14 through laterally projecting arms 59 which terminate at one side of the slot 27. The arms extend from the lower end of the mandrel 58 and are joined to the bottom of the base extension 14 by bolts 61. The mandrel 58 has an extended ridge 62 on its rear side to which brackets 63 are secured by bolts 64, the brackets being also secured to the sides 55 and 56 of the housing 54 by screws 64.

A shield 65 is secured frontwardly to the mandrel 58 in spaced relation thereto by an angle bracket 66 which is welded or otherwise secured to the sides 55 and 56 of the housing 54, and an arcuate strip 60, which extends from the angle bracket to the base extension 14. The shield assists in positioning the strip on the mandrel 58 and prevents the strips from overlapping when forced downwardly on the mandrel. The carriage 53 is provided with an aperture 67, the walls of which engage the shield 65, and the rear extending ridge 62 of the mandrel 58. An angle element 69 is secured to the carriage by a bolt 71 and is provided with a shoe 72 which has sliding engagement with the extending ridge 62 of the mandrel. The carriage has a laterally extending pivot 73 upon which a finger 74 is pivotally mounted. The opposite end of the finger 74 has a recess for receiving a spring 75 which abuts against the angle member 69 on which it is positioned by a pin 76.

The side 55 of the housing 54 has a cam element 77 secured thereto by a screw 78. The cam surface 79 thereof is disposed in the path of the roller 48 of the link 47 in a position to actuate the link clockwise when the slide 28 is retrieved by the spring 25. A pawl 81 is pivoted on a bracket 82 projecting from the lower side of the base extension 14 being urged in counterclockwise direction by a spring 83 toward the mandrel 58 adjacent to which it is disposed. A plate 84 extends across the lower front face of the base extension 14 to cover the aperture 27 and the jaws 32 and 33, the plate being secured to the extension by screws 85. A similar pawl 90a is mounted on the upper part above the housing 54, functioning in a similar manner to the pawl 81 for preventing the upward movement of a strip on the mandrel 58 which has not been advanced to a position to be engaged by the pawl 81.

The plate 84 has a bracket 86 thereon on which a finger 87 is pivotally mounted. The finger is urged in a counterclockwise direction by a spring 88. The end 89 of the finger 87 normally projects into the aperture 27 in aligned relation with the top of the mandrel 58 for receiving the end of the strip 91 from which the rings 90 are severed.

The strip 91 is illustrated in perspective view in Fig. 4. The strip embodies a metal strap bent in U-shape, aligned notches 92 which form the rings 90 are connected to each other by a web of material 93. The web 93 is severed by the shearing blade 43 when the device is operated. Any length of strip may be employed, the strip being fed upon the oval shaped portion of the mandrel 58, passed downwardly through the carriage 53, beyond the pawl 81 to abut against the inner surface of the plate 84. In this position the outermost end portion of the strip 91 rests upon the end 89 of the finger 87 to retain the end ring 90 against tilting when the shearing blade 43 severs the web 93. The plate 84 has a work receiving lip 95 which projects below the base extension 14 for receiving and positioning elements 96 which are to be secured together by the ring 90. The lip 95 positions the elements so that they will be engaged by the ring as the jaws 32 and 33 are moved downwardly.

After the formed strip 91 is placed on the mandrel 58 it is locked thereon against reverse movement by the pawl 81. Upon the actuation of the trigger 19, the valve 18 is opened to permit fluid to pass through the conduit 17 through the cylinder head 12 to force the piston 24 downwardly. The piston rod 26, moving downwardly with the piston, moves the slide 28 downwardly from the position illustrated in Figs. 1 and 3. The shearing blade 43 severs the web 93 of the strip 91 releasing the endmost ring 90 therefrom which is received by the recesses 42 of the jaws 32 and 33. The jaws are moved toward each other to grasp the ring by the action of the cam surfaces 38 sliding over the cam surfaces 39 an amount sufficient to have the recesses 42 engage the ring with a force sufficient to hold the ring without producing any distortion therein. The further downward movement of the piston 24 and rod 26 moves the jaws 32 and 33 further downwardly to dispose the ring 90 over the elements 96 which are positioned in the work receiving lip 95 at the bottom of the tool. After the ring is disposed over the elements 96 further and final downward movement of the jaws 32 and 33 effects the clinching of the ring 90. The cam surfaces 38 pass over the cam surfaces 41 to produce the final movement of the jaws toward each other to clinch the ring 90 about the work elements.

This clinching position is illustrated clearly in Figs. 6 and 8.

Upon the release of the trigger 19, the valve 18 is operated to interrupt the flow of fluid to the cylinder 11 and to expel the fluid remaining in the cylinder. The spring 25 retrieves the piston, the rod 26, the slide 28, and arm 31 to its initial position. During the downward movement of the slide 28 the lever 47 is moved counterclockwise by the tension of the spring 49 after the roller 48 is released by the cam surface 79. The hook end 51 of the lever 47 moves under the roller 52 of the carriage 53 with which it is engaged during the retrieving movement of the piston and slide. As the arm 31 of the slide 28 moves upwardly the carriage 53 is moved upwardly therewith an amount sufficient to have the finger 74, which is pivoted on the carriage, engage a slot 92 of the strip 91. During the upward movement of the carriage the strip 91 is retained against movement therewith by the pawl 81. The upward movement of the carriage 53 in the slide 57 compresses a spring 97 which is secured between the carriage and an element 98 bridging the sides 55 and 56 of the housing 53. A stud 99 is slidable in the element 98 and projects through the spring 97 to retain the spring in position.

Upon the further upward movement of the slide 28 and arm 31, the roller 48 on the link 47 engages the cam surface 79 of the cam 77 and moves the link 47 clockwise to withdraw the hooked end 51 from engagement with the roller 52 of the carriage. Upon the release of the roller 52 from the hooked end 51 of the link 47, the carriage 53 is moved downwardly under the tension applied to the spring 97, to force the strip 91 downwardly therewith through the engagement of the finger 74 in a slot 92 thereof. In this manner the endmost ring 90 of the strip is fed within the slot 27 to have one end rest on the lower end of the mandrel 58 and the opposite end supported on the end 89 of the supporting finger 87 carried by the plate 84. The elements of the device are now in their initial position as illustrated in Figs. 1 and 3.

When employing the device it is only necessary to dispose the work receiving lip 95 adjacent to the elements to be secured together and to operate the trigger 19. This produces the downward movement of the slide 28 for severing a ring 90 from the strip 91 and for operating the jaws toward each other for holding the ring in the recess 42 provided on the ends thereof. The further downward movement of the slide 28 disposes the ring 90 over the elements and through a final movement of the slide, the jaws 32 and 33 are moved toward each other for effecting the clamping of the ring about the elements. During the downward movement of the slide the link 47 is operated in counterclockwise direction to have the hooked end 51 thereof move into a position to engage the roller 52 of the carriage 53. Upon release of the trigger 19, the slide 28 is retrieved by the spring 25, which upward movement produces the engagement of the hooked end 51 with the roller 52 and the upward movement of the carriage 53 therewith. During the upward movement the finger 74 moved from one slot 92 to an adjacent slot of the strip, the strip being retained in position against movement therewith by the pawl 81 which clamps the strip to the mandrel 58.

During the final retrieving movement of the slide 28 the link 47 is rotated in a clockwise direction by the cam surface 79 engaging the roller 48 on the upper end thereof. This movement releases the hooked end 51 from the roller 52 and permits the carriage 53 to move downwardly under the bias of the spring 97 to advance the strip 91 on the mandrel and move the endmost ring 90 thereof against the inner face of the plate 84 where it is held by the end 89 of the finger 87. By forming a strip of metal and cutting notches 92 therein, rings 90 are provided, joined by a small web 93. In this manner, flexibility is provided to the strip which permits it to follow the curved shape of the mandrel 58 as the strip is advanced thereover.

The small web 93 is further useful in requiring a minimum of force for severing the rings 90 from the strip when the cutting blade 43 is actuated. The device thus constructed is positive in operation, and is readily manipulated to permit rapid application of rings about elements which are to be secured together.

While I have described and illustrated but a single embodiment of my invention, it will be apparent to those skilled in the art that various changes, omissions, additions, and substitutions may be made therein without departing from the spirit and scope of my invention, as set forth in the accompanying claims.

What I claim is:

1. A device for attaching rings about an element, including, in combination, a reciprocable slide, means for moving said slide through a single cycle of reciprocation, a support for a strip of material composed of connected rings from which rings are severed, jaws carried by said slide, a shearing blade carried by said slide effective for severing a ring from said strip of material, and means for advancing said jaws toward each other during the severing operation to have said jaws clamp and retain said severed ring when out of engagement with the elements to be clamped.

2. A device for attaching rings about an element, including, in combination, a reciprocable slide, means for moving said slide through a single cycle of reciprocation, a support for a strip of material composed of connected rings from which rings are severed, jaws carried by said slide, a shearing blade carried by said slide effective for severing a ring from said strip of material, means for advancing said jaws toward each other during the severing operation to have said jaws clamp and retain said severed ring when out of engagement with the elements to be clamped, and means for further moving said jaws toward each other after the ring has been disposed over the element to clamp the ring thereabout.

3. A device for attaching rings about an element including, in combination, a reciprocable slide carrying a strip of material composed of connected rings, means for moving said slide through a single cycle of reciprocation, a shearing blade carried by said slide effective for severing a ring from said strip of material, jaws carried by said slide means for advancing said jaws toward each other during the severing operation for having said jaws clamp and retain said severed ring, means for further moving said jaws for disposing the ring over the element and for clamping the ring thereabout, and means operated during the reverse movement of the slide for advancing the strip of material adjacent to said jaws and shearing blade after the jaws are retrieved.

4. In a device for severing and clinching rings about elements to be secured together including, in combination, a carrier for supporting a formed strip of material having rings partly severed therefrom, means for advancing the strip of material on said carrier, means for completing the severing of the endmost ring from the strip, means for engaging said ring during the severing operation and for holding the ring thereafter, means for advancing the holding means for the ring to have the ring disposed over said elements and for thereafter manipulating the holding means for clinching the ring thereabout, and means for retrieving the holding means and shearing blade.

5. In a device for severing and clinching rings about elements to be secured together, a mandrel on said device over which joined rings are advanced, means for engaging and advancing said joined rings, means for severing the endmost ring, means for holding the ring as it is severed, means for advancing said holding means to dispose said ring over said elements, and means for moving said holding means for clinching said ring about said elements.

6. In a device for severing and clinching rings about elements to be secured together, a mandrel on said device over which joined rings are advanced, means for engaging and advancing said joined rings, a reciprocable slide, jaws carried by said slide, a shearing blade carried by said jaws for severing a web from the endmost ring when the slide is moved downwardly, means for moving said jaws to hold said endmost ring as it is severed, and additional means for moving said jaws upon further movement of said slide for clinching said ring held thereby.

7. In a device for severing and clinching rings about elements to be secured together, a mandrel on said device over which joined rings are advanced, means for engaging and advancing said joined rings, a reciprocable slide, jaws carried by said slide, a shearing blade carried by said jaws for severing a web from the endmost ring when the slide is moved downwardly, means for moving said jaws to hold said endmost ring as it is severed, additional means for moving said jaws upon further movement of said slide for clinching said ring held thereby, and means operable during the reciprocable movement of said slide for actuating said engaging and advancing means of said joined rings.

8. In a device for clinching rings about elements to be secured together, a cylinder, a piston in said cylinder, a slide carried by said piston, jaws on said slide movable toward each other, a carriage on said device, means on said slide for moving said carriage, means on said carriage for advancing a strip comprising a plurality of rings secured together by a web, means for clamping said strip after it is advanced, shearing means carried by said jaws, movable means for supporting the foremost end of the end ring, and means for actuating said piston and slide in reciprocation for moving said jaws to sever the web of the endmost ring, to move the jaws to engage and hold the severed ring, to advance the ring and jaws over the elements, and to move the jaws thereafter to clinch the ring, during one half cycle of reciprocation, and upon the reverse one half cycle to actuate the carriage to produce the advancement of the endmost ring into position to be severed and held by the jaws after the slide and jaws are retrieved.

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