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Boyd et al.

[11] **3,830,089**

[45] **Aug. 20, 1974**

[54] **RING CLINCHING TOOL**

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[73] Assignee: **Cooper Industries, Inc.**, Houston, Tex.

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[21] Appl. No.: **402,586**

[52] **U.S. Cl.** ..... **72/407**, 29/212 D

[51] **Int. Cl.** **B21d 7/06**

[58] **Field of Search** ..... 29/212 R, 212 D; 72/407, 72/410, 424; 81/301, 321

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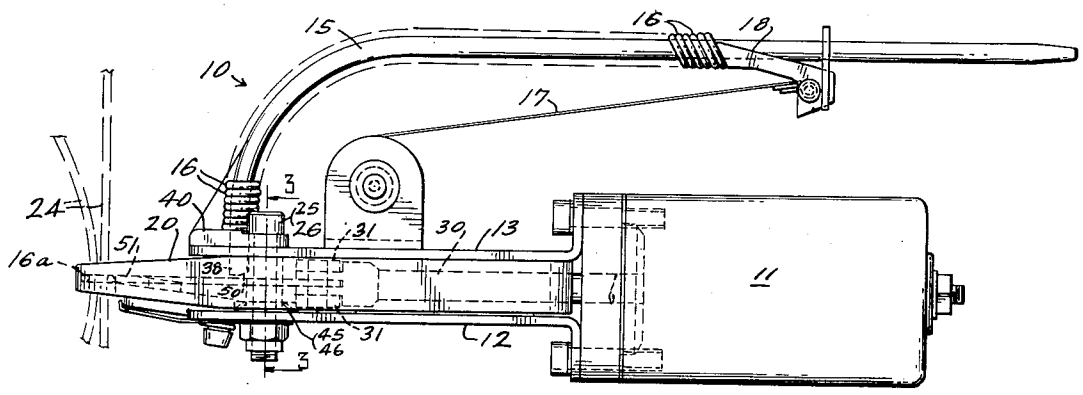
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Assistant Examiner—M. J. Kennan
Attorney, Agent, or Firm—Owen & Owen, Vincent L. Barker, Jr., Thomas M. Freiburger

[57] **ABSTRACT**

The invention is an improved power hog ring or C-ring clinching tool which is capable of maintaining complete control of the individual rings as they are fed from the magazine into the jaws and then into the clinching grooves of the tool. To provide the controlled release of a single ring from the end of the magazine, the tool employs laterally movable, spring biased jaws which yield enough to admit a ring when it is forced by the feeder blade between the magazine tip and the jaws. This allows the magazine to be firmly attached to the body of the tool with no moving parts, and tends to prevent jamming of rings in the jaws or the unintended escape of rings therefrom.

11 Claims, 7 Drawing Figures



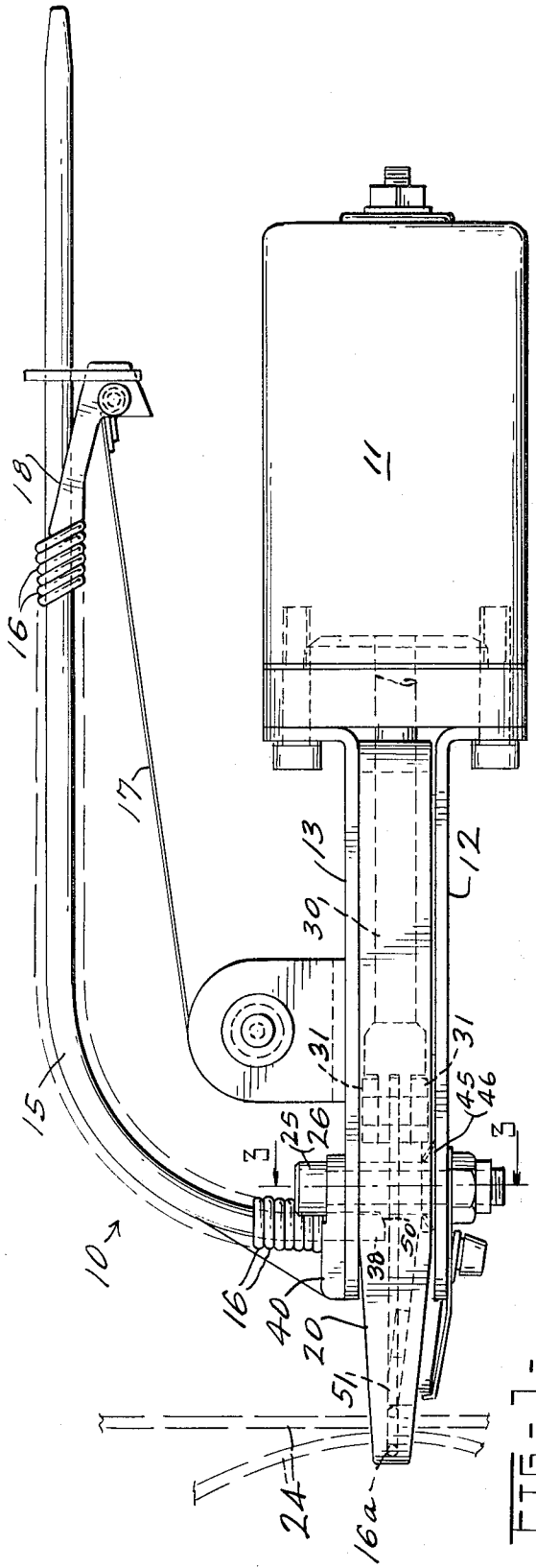

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FIG-1-

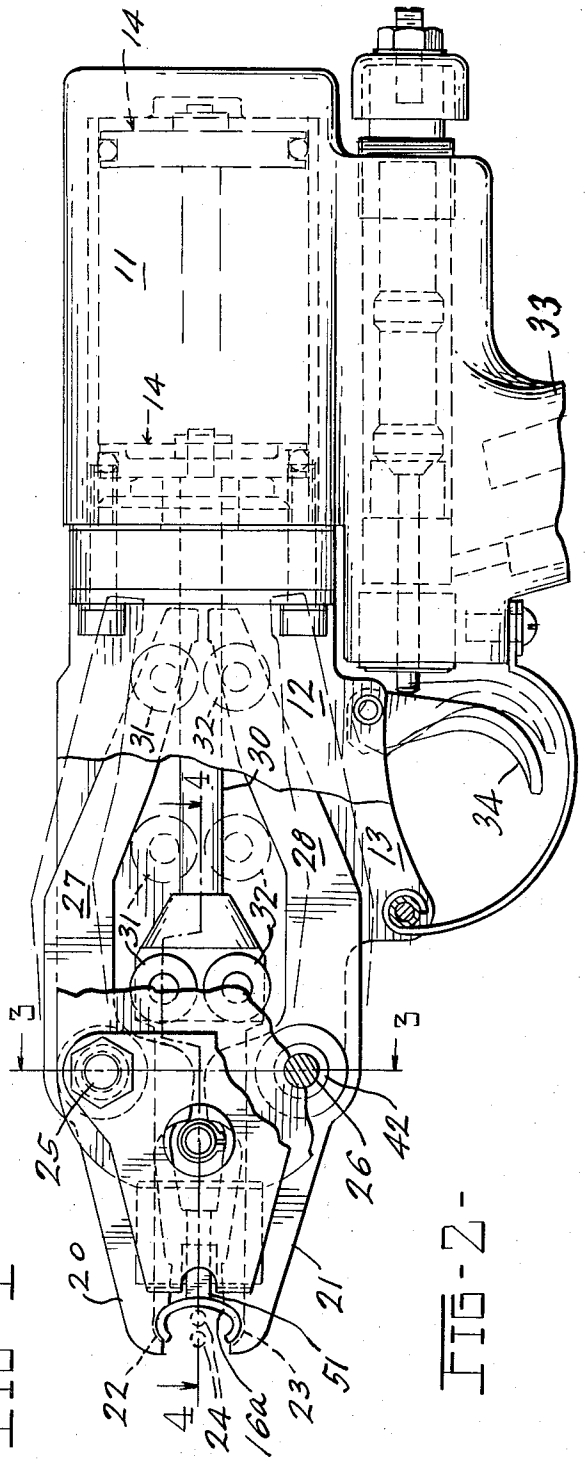

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FIG-2-

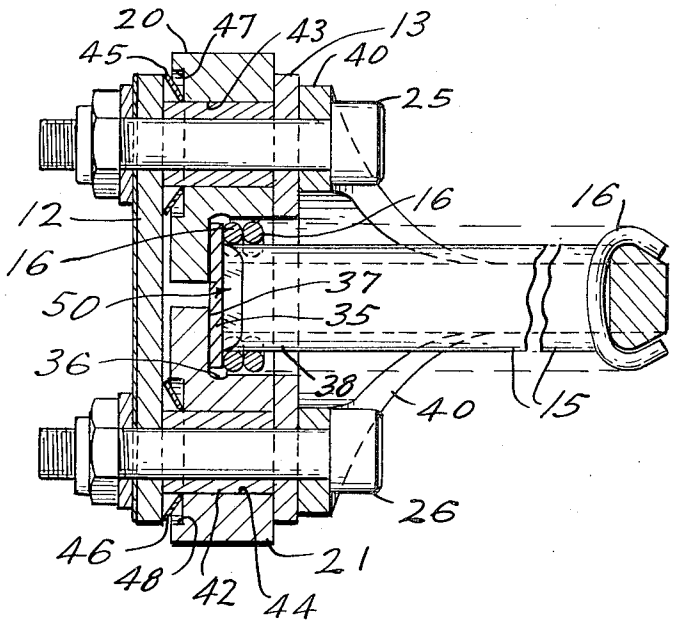


FIG-3-

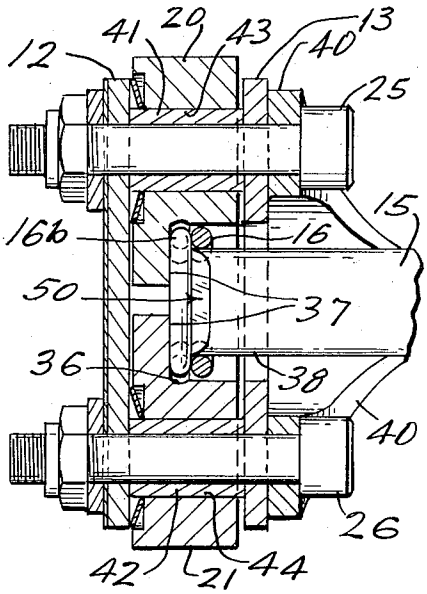


FIG-7-

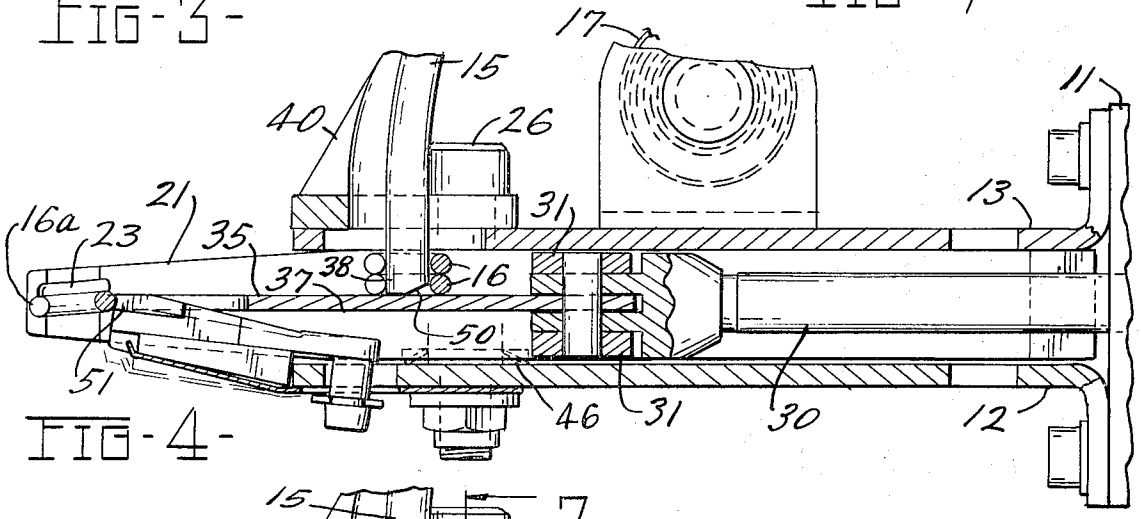


FIG-4-

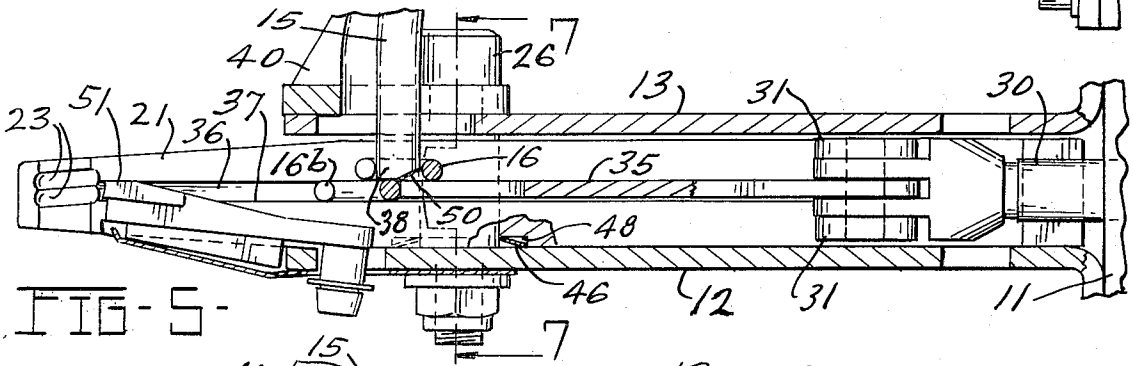


FIG-5-

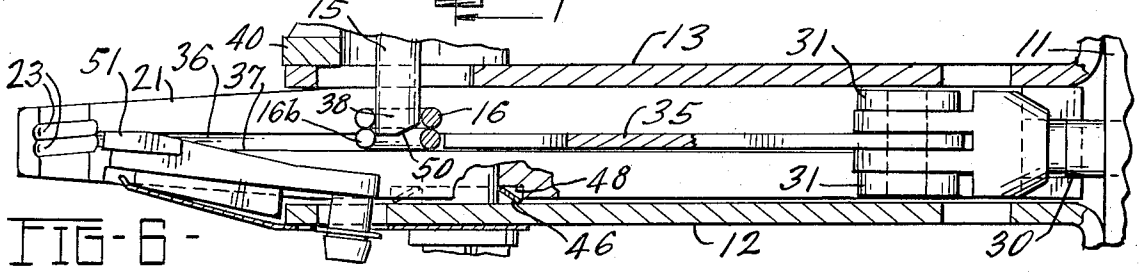


FIG-6-

RING CLINCHING TOOL

BACKGROUND OF THE INVENTION

The invention relates to a power-actuated tool for clinching hog rings and more particularly to a power hog ring tool or gun with an improved feed mechanism.

This invention is an improvement over the type of tool shown in U.S. Pat. No. 2,656,539. Generally, this type of tool comprises a drive motor, a feeder device and clinching mechanism which may both be operated by the drive motor, and a ring feed magazine to feed hog rings to the feeder device. Variations of the hog ring tool of the above mentioned patent are described in U.S. Pat. Nos. 2,867,808 and 3,537,293.

Problems relating to the feed mechanism have been experienced with prior art hog ring guns of the type described above. The rings are fed from a stack in the magazine in side-by-side fashion toward the end of the magazine. The magazine on which the hog rings ride terminates in a feeding end positioned between a pair of clinching jaws having ring guide grooves. This feeding end is spaced a specified distance from a rigid wall at the opposed side of the ring guide grooves so that the first hog ring in the magazine feeding end just fails to pass through. Thus, the position of the magazine must be set with very close tolerances.

A feeder blade then travels along the ring guide grooves to push one (and only one) ring through the space and off the end of the magazine. To accomplish this, the magazine feed end retracts to permit passage of the feeder blade and the ring which it has engaged.

Various arrangements have been provided to allow the magazine end to yield enough for the passage of one hog ring and the feeder blade. In some hog ring guns, the entire magazine pivots from a point rearward on the gun, its feeding end being held in proximity to the feeder blade and ring guide grooves by a spring and adjustable stop. This stop is adjusted to just prevent a ring from passing through the space defined by the magazine end and the rigid wall at the opposite side of the ring guide grooves. When the feeder blade pushes against a hog ring, the ring squeezes against a beveled or cam-shaped surface at the end of the magazine and pivots the magazine away from the jaws and rigid wall just enough to allow the ring to pass through. The ring is then pushed on along the guide grooves by the feeder blade until it reaches a set of clinching grooves at the end of the jaws.

Another arrangement for controlling the space through which a ring must pass has been the provision of a spring mounted shoe on the end of the magazine. Thus, the major portion of the magazine is in fixed position on the gun but a small tip portion may be pushed back against the force of a spring to open a space sufficient for a ring to pass. A camming edge is provided on the shoe similar to that discussed above.

Both these feeding arrangements have in practice encountered problems of ring control. With the pivotal magazine, normal production line usage can quickly knock the non-rigid, exposed magazine out of adjustment. This will cause either jamming of rings in the gun or complete loss of ring control so that rings leave the gun without being clinched. In addition, adjustment of the clearance between the magazine and the ring guide

grooves is normally difficult and a rather high degree of skill is required for building and repairing.

With the movable shoe feed arrangement, shims must be employed where the magazine is mounted on the gun in order to insure that the space at the feeding end of the magazine is neither too great, resulting in loss of ring control, nor too small, resulting in ring jamming. The average repairman and assembler do not know how to determine the correct size of shim required. Accidental damage to the magazine, though not as critical as with the pivotal magazine, can still render the tool inoperative. Furthermore, the small movable shoe, which must translate laterally at the magazine end to release hog rings, also has a tendency to rock longitudinally as the ring and feeder blade travel past it. This causes wear in the shoe mounting which becomes progressively worse with the tool's use until finally the shoe may become wedged in the magazine, thus resulting in loss of all ring control.

Complicating the ring control problem is the fact that commercially produced hog rings normally involve wide manufacturing tolerances so that dimensions are often quite variable from ring to ring and imperfections in shape are common. Also, the rings are not flat, but are somewhat skewed to facilitate overlapping during clinching. These factors make ring control difficult in prior art hog ring guns in that the magazine end clearance must be closely set to release only one ring at a time and must be continuously maintained at that setting.

To further complicate matters, many fastening jobs require hog rings which are plastic coated. The plastic coating can be broken or pinched off in the installation process because of jamming and other improper function. This, of course, makes an unsightly installation and further complicates the job of keeping the tools set at their optimum adjustment.

SUMMARY OF THE INVENTION

The present invention provides an improved hog ring tool with a feed mechanism which greatly improves ring control, simplified building and repairing, and accommodates wider variations in basic ring dimensions. The magazine of the improved gun is firmly attached to the tool with no moving parts such as a pivot, springs or a shoe. To prevent the rings from jamming, ejecting from the tool without being clinched, or being drawn backward by the feeder blade, the clinching jaws themselves are designed to have a slight lateral movement toward and away from the magazine end. This is a somewhat radical change from the prior belief that the clinching jaws must be rigidly set to operate in a fixed plane. It is accomplished through the use of a pair of Belleville springs which bias the jaws toward the magazine so that a flexible spring-loaded restriction is created between the rigid magazine end and the jaw wall adjacent the ring guide grooves in the jaws. Thus a hog ring at the magazine feeding end just fails to pass through until it is pushed by the feeder blade against a fixed camming surface on the magazine end. This urges the jaws away from the magazine, deflecting the Belleville springs to allow the ring to pass through the restriction.

The improved feeding mechanism of the present invention facilitates added flexibility at the magazine feeding end so that wider dimensional variations and production imperfections in hog rings can be accom-

modated. In addition, the mechanism is sturdier and less susceptible to maladjustment and malfunction than most prior art hog ring feeding devices. Since the magazine position is not as critical as in other guns, a rear bracket mounting the magazine to the gun body on most prior guns is eliminated in the gun of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view of a hog ring tool according to the invention;

FIG. 2 is a view in elevation of the tool of FIG. 1, with portions broken away;

FIG. 3 is a cross-sectional view taken along the lines 3—3 of FIGS. 1 and 2, and shown on an enlarged scale;

FIG. 4 is a cross-sectional view taken along the line 4—4 of FIG. 2, showing a feeder blade of the tool in forward position feeding a hog ring into a pair of clinching grooves;

FIG. 5 is a cross-sectional view of the tool similar to that of FIG. 4 but with the feeder blade contacting a hog ring near the magazine end;

FIG. 6 is a sectional view of the tool similar to that of FIG. 4 but with the feeder blade slightly retracted from its position of FIG. 5; and

FIG. 7 is a cross-sectional view taken along the line 7—7 of FIG. 5 but with the feeder blade not shown.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring to the drawings, FIG. 1 indicates a hog ring tool or gun generally indicated by the reference number 10. The gun 10 includes a body or housing 11 and a pair of parallel side plates 12 and 13. Within the housing 11 is a drive motor 14 (schematically seen in FIG. 2) which is pneumatically operated. Mounted on the side plate 13 is a ring feed magazine 15 holding a stack of hog rings 16 which are urged in the direction of the side plate 13 by a clock spring 17 and ring pusher 18.

Between the parallel side plates 12 and 13, as best seen in FIG. 2, are a pair of opposed clinching jaws 20 and 21. The jaws 20 and 21 include sets of clinching grooves 22 and 23 which in FIG. 2 are shown engaging a hog ring 16*a* about to be clinched around a pair of wires, cords, or other structure 24. Each jaw is pivotally attached between the side plates 12 and 13 by pivot bolts 25 and 26.

The rear ends 27 and 28 of the jaws 20 and 21 converge to form part of the clinching driving mechanism. A shaft 30 is operably connected to the drive motor 14 for forward and reverse longitudinal movement. Rollers 31 and 32 connected to the shaft 30 spread the converging rearward jaw ends 27 and 28 apart when the drive motor 14 drives the shaft 30 in a rearward direction. This forces the clinching grooves 22 and 23 toward one another, thus clinching the hog ring 16*a* into an overlapped or closed circle around the items 24 to be fastened together.

The body 11 also includes a handle 33 and a trigger 34, as shown in FIG. 2. When the trigger 34 is depressed, the motor 14 drives the shaft 30 rearwardly to clinch a hog ring 16*a*, as discussed above. Details of the motor 14, trigger 34 and their pneumatic connections are not considered to be part of this invention.

Extending forward from the shaft 30 is a ring feeder blade 35, best seen in FIGS. 3 through 7. Following the clinching operation discussed above, the shaft 30 and feeder blade 35 begin to move forward. The feeder blade 35 engages a ring 16*b* from the end of the magazine 15, as shown in FIGS. 5 and 6.

The clinching jaws 20 and 21 include a pair of opposed ring guide grooves 36, one of which is shown in FIGS. 5 and 6. The guide grooves 36 define a path of travel for the hog rings 16*b* as they move from the magazine 15 toward the ring clinching grooves 22 and 23.

Referring to FIG. 6, a hog ring 16*b* about to be engaged by the feeder blade 35 rests against a wall 37 defined in the jaws adjacent the guide grooves 36 and opposite the magazine 15. A tip portion 38 of the magazine 15 defines a passageway with the jaw wall 37 which is narrower than the width of a hog ring 16, so that a hog ring 16*b* just fails to pass off the magazine end 38. To facilitate the passage of one and only one hog ring 16 at a time off the magazine end 38 and along the guide grooves 36, the jaws 20 and 21 with their jaw wall 37 are allowed to move laterally away from the magazine end 38 when the feeder blade 35 forces a hog ring 16*b* forward. The magazine end 38, however, remains stationary, being rigidly affixed to the side plate 13 by means of a mounting side plate 13 by means of a mounting bracket 40 and bolts 25 and 26. This lateral movement is accomplished as follows.

As shown in FIGS. 3 and 7, the side plates 12 and 13 are spaced apart sufficiently to allow the jaws 20 and 21 an amount of lateral movement. Spacer sleeves 41 and 42 pass through bores 43 and 44 in jaws 20 and 21, respectively, and bolts 25 and 26 passing through the sleeves 41 and 42 maintain the side plates 12 and 13 a fixed distance apart.

Again referring to FIGS. 3 and 7, the jaws 20 and 21, which are thinner than the length of the spacer sleeves 41 and 42, are biased toward the magazine end 38 and the side plate 13 by a pair of compression springs 45 and 46. These are preferably spring washers of the type known as Belleville springs. The springs 45 and 46 reside in counterbores 47 and 48, respectively, in the jaws 20 and 21. Thus the jaws 20 and 21 and jaw wall 37 are continuously urged away from the side plate 12 and toward the magazine end 38 and the side plate 13.

To initiate movement of the jaw wall 37 away from the magazine end 38, a camming surface or bevel 50 is provided on the magazine end 38. When the feeder blade 35 pushes a ring 16*b* forward, that ring 16*b* slides along the camming surface 50, creating a force component against the jaw wall 37 to force jaws 20 and 21 toward the side plate 12, as shown in FIGS. 5 and 7. This allows that ring 16*b* pushed by the feeder blade 35 to pass off the magazine end 38. The feeder blade 35 is narrower than the hog rings 16, so that when a ring 16 has cleared the magazine end 38, the jaws 20 and 21 are biased back to their normal position adjacent the side plate 31. Thus the space between the magazine end 38 and the jaw wall 37 is again narrowed so that a subsequent ring 16 cannot pass until the process is repeated by the next forward stroke of the feeder blade 35. Once the feeder blade 35 has cleared a ring 16*b* from the magazine, its further movement is as follows.

The feeder blade **35** continues to push the hog ring **16b** along guide grooves **36** in the jaws **20** and **21,** which converge slightly to offer resistance and stability to the ring **16b** as it travels to the clinching grooves **22** and **23.** FIGS. **3** and **4** show the position of the feeder blade **35** and jaws **21** and **22** during this part of the feed cycle.

A spring biased back-up anvil **51,** which is disclosed in above-mentioned U.S. Pat. No. 2,867,808, is provided between the jaws **20** and **21** just behind the clinching grooves **22** and **23.** The anvil **51** pivots away from the path of ring travel when a ring **16***b* is pushed to the clinching grooves **22** and **23,** and provides back-up support for the ring **16***a* as it is clinched into an overlapping circular shape. Upon retraction of the feeder blade **35,** the jaws **20** and **21** close and another ring **16** comes to rest against the jaw wall **37** in position to be fed by the next forward movement of the feeder blade, as shown in FIG. **6.**

The above described preferred embodiment provides a hog ring clinching tool which is capable of maintaining a high degree of control over a hog ring as it is fed from the end of the magazine to the clinching grooves. In addition, the components of the present hog ring gun are inexpensive, repair is simplified, and sensitivity of the gun to accidental damage and to ring dimension variations is reduced. Various other embodiments and alterations to the preferred embodiment may be made by those skilled in the art without departing from the spirit and scope of the following claims.

What is claimed is:

1. In a tool for clinching hog rings including a body, first and second side plates, first and second opposed ring clinching jaws pivotally mounted between the side plates for movement between open and closed positions, said clinching jaws having ring guide grooves defining a path of travel for the rings and leading to ring clinching grooves, a ring magazine mounted on one of the side plates for delivering rings into the guide grooves of the clinching jaws, a slidable feeder blade in communication with a feeding end of the magazine for feeding the rings through the path of travel from the magazine along said guide grooves to the clinching grooves, and drive means operatively connected to the clinching jaws and the feeder blade, the improvement comprising

spacer means for maintaining such first and second side plates a predetermined minimum lateral distance apart, said first and second opposed ring clinching jaws being mounted between such side plates and having a width smaller than said predetermined minimum distance whereby said ring clinching jaws are afforded a predetermined amount of lateral movement between such side plates,

bias means for urging said jaws toward such magazine feeding end, and

camming means at such magazine feeding end for causing lateral movement of said jaws against such bias means when a hog ring is forced by such feeder blade off such magazine end and along such path of travel toward said clinching grooves.

2. Apparatus according to claim **1** wherein said spacer means comprises at least one bore through each clinching jaw, a spacing sleeve through each said bore, each spacing sleeve being in contact with both side plates, and means passing through one of said spacing sleeves to secure together such side plates.

3. Apparatus according to claim **2** wherein said bias means comprises a counterbore positioned in such jaw around each said spacing sleeve and adjacent such side plate opposite such magazine feeding end, and a spring within each said counterbore, whereby said springs urge such jaws toward such magazine feeding end.

4. Apparatus according to claim **1** wherein said camming means comprises a bevel on such magazine feeding end and a jaw wall defined by such jaws opposite such magazine feeding end and adjacent such path of travel, such magazine feeding end being spaced from said jaw wall a distance less than the width of a hog ring, whereby a hog ring pushed by such feeder blade along such path of travel squeezes such jaws laterally away from such magazine feeding end until the hog ring has cleared such magazine feeding end.

5. A ring feed apparatus for use in a hog ring clinching tool, comprising

a pair of parallel side plates maintained a fixed distance apart on such tool,

a pair of opposed clinching jaws pivotally mounted between said side plates, said jaws having a width less than said fixed distance, whereby said jaws will translate laterally between said side plates a predetermined distance,

a hog ring guide groove in each opposed clinching jaw, said guide grooves defining a path of ring travel in a plane generally parallel to and intermediate said side plates,

a ring magazine mounted on one of said side plates and having a feed end extending between said clinching jaws adjacent said guide grooves,

bias means for urging said clinching jaws laterally toward said magazine feed end,

a feeder blade mounted between said jaws for movement along said path of travel,

drive means operatively connected to said feeder blade,

wall means mounted on said jaws adjacent said guide grooves and opposite said magazine feed end for defining a passage in said path of travel narrower than a hog ring, and

camming means at said magazine feed end for displacing said jaws, wall means and guide grooves away from said magazine feed end when a ring is pushed by said feeder blade off said magazine feed end, said jaws, wall means and guide grooves being displaced a sufficient distance to allow such ring to pass between said wall means and said magazine free end, said jaws, wall means and guide grooves being biased back toward said magazine feed end when such ring has advanced along said path of travel a sufficient distance to clear said magazine.

6. The feed apparatus of claim **5** wherein said bias means comprises a counterbore positioned in each jaw adjacent said side plate opposite said ring magazine and a spring within each counterbore for urging said jaws toward said magazine feed end.

7. The feed apparatus of claim **5** wherein said camming means comprises a bevel on such magazine feed end.

8. A ring feed apparatus for a ring clinching tool, comprising, in combination,

a pair of spaced apart side plates in fixed relation on said tool,

a pair of opposed clinching jaws pivotally mounted intermediate said side plates, said jaws having a width less than the distance between said side plates,

a ring feed magazine secured to one of said side plates and adapted to feed an open ring against the opposed surface of said clinching jaws,

bias means urging said clinching jaws toward said ring feed magazine, and

means for pushing said clinching jaws away from said magazine against said bias means such that such open ring can pass between said magazine and said opposed clinching jaws when said bias means is overcome.

9. The apparatus of claim **8** wherein said bias means comprises at least one Belleville spring positioned to urge said clinching jaws toward said feed magazine.

10. The apparatus of claim **8** wherein said means for pushing said clinching jaws away from said magazine is a reciprocating feeder blade which pushes said open ring between said magazine and said clinching jaws to move said jaws against said bias means and away from said magazine.

11. The apparatus of claim **8** wherein said ring feed magazine has a feeding end having a beveled surface effective to cause said open ring to laterally push against said clinching jaws to overcome said bias means.

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