

[54] **STAPLING MACHINE**  
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 Brooklyn, N.Y.  
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 [51] Int. Cl. .... **B27f 7/10**  
 [58] Field of Search ..... 227/85, 87, 88, 89,  
 227/90, 91

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[57] **ABSTRACT**

A stapling machine in which a pair of punches cooperates with a die and a retractable anvil to cut off a portion of a wire fed between the die and the punches and bend the wire into a U-shaped staple, and in which a clincher cooperates with a stationary clinching anvil located below the retractable anvil to clinch the U-shaped staple about material placed on the clinching anvil. The clincher is carried by a driver bar reciprocated in longitudinal direction and the punches are carried by a carrier bar coupled by releasable coupling means to the driver bar for movement therewith. After the punches on the carrier bar have cut off a wire portion, formed the same into a U-shaped staple and moved the staple toward the clinching anvil, further movement of the carrier bar is stopped by stop means while the coupling means are moved to an uncoupling position so that the driver bar and the clincher thereon can continue their movement towards the clincher anvil to perform the clinching operation.

**30 Claims, 15 Drawing Figures**

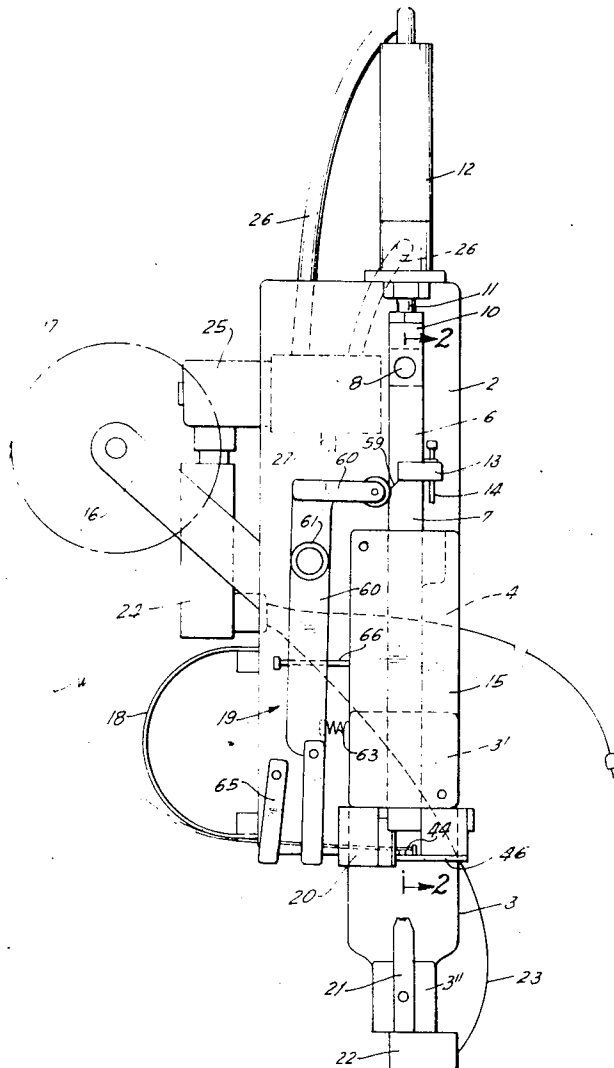


FIG. 1

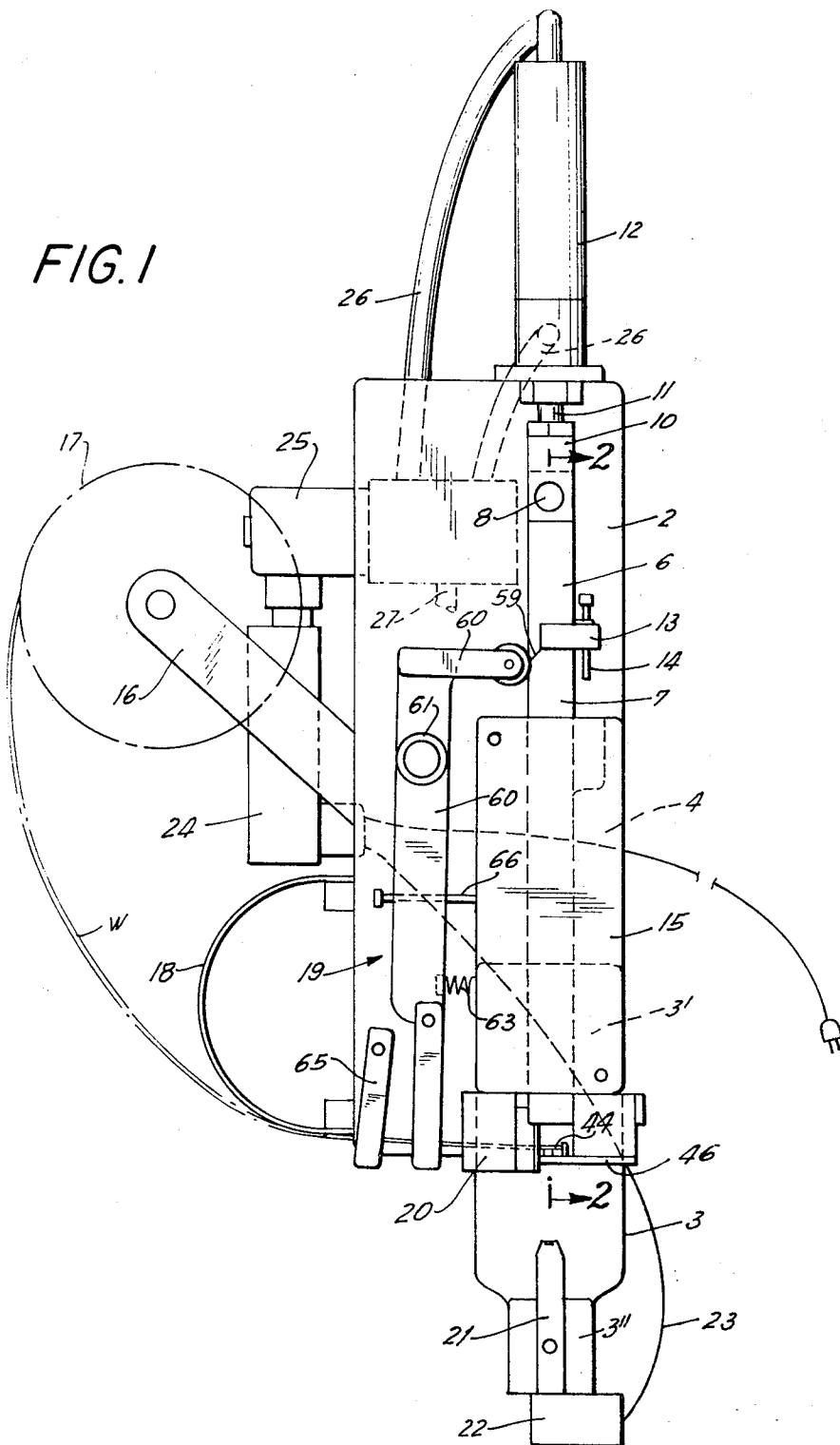


FIG. 2

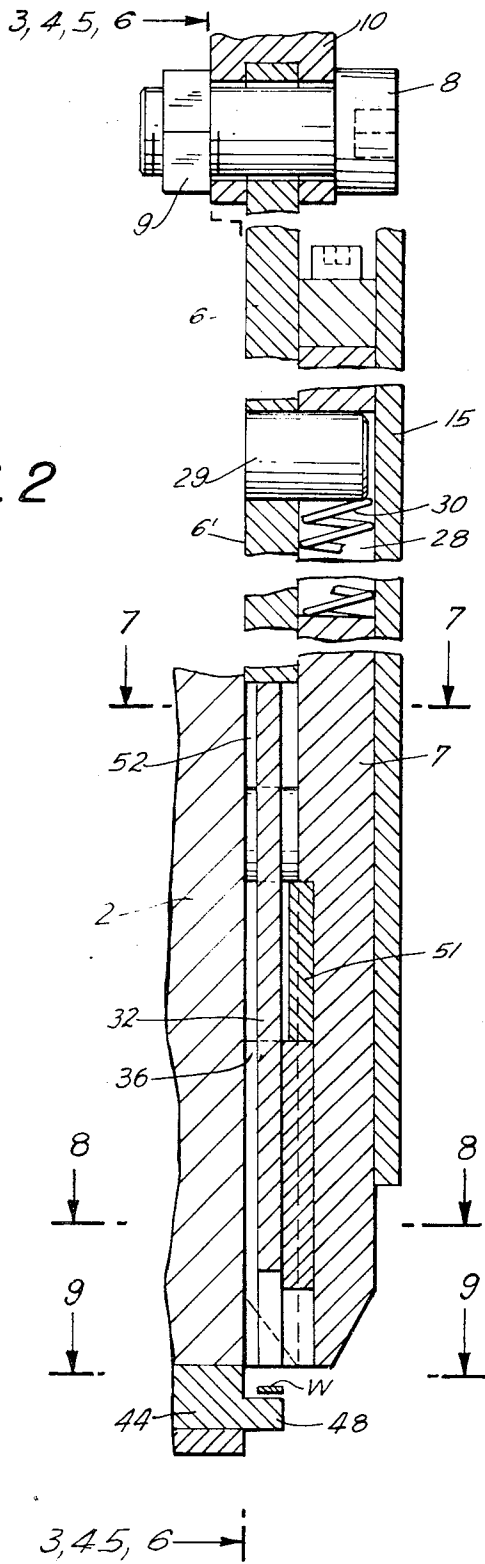


FIG. 7

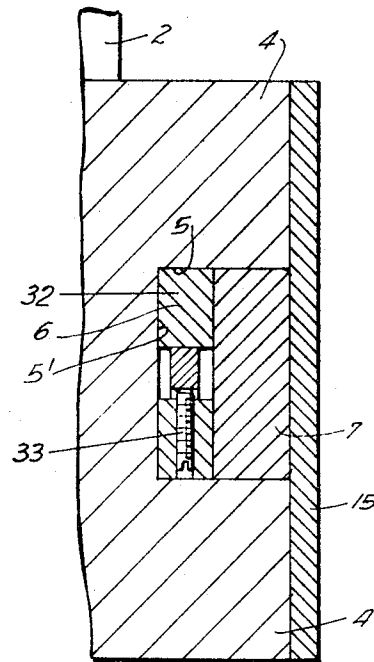
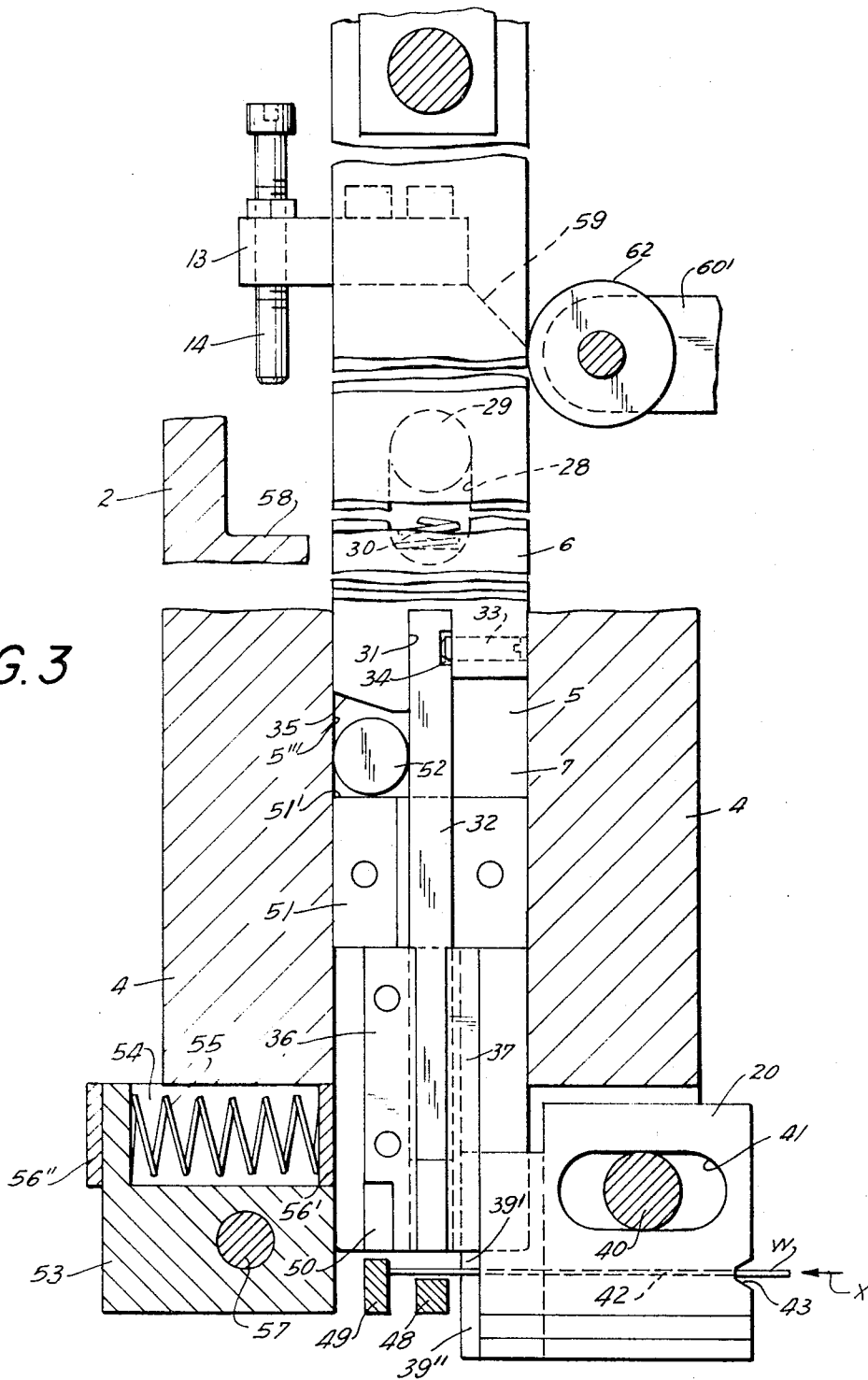


FIG. 3





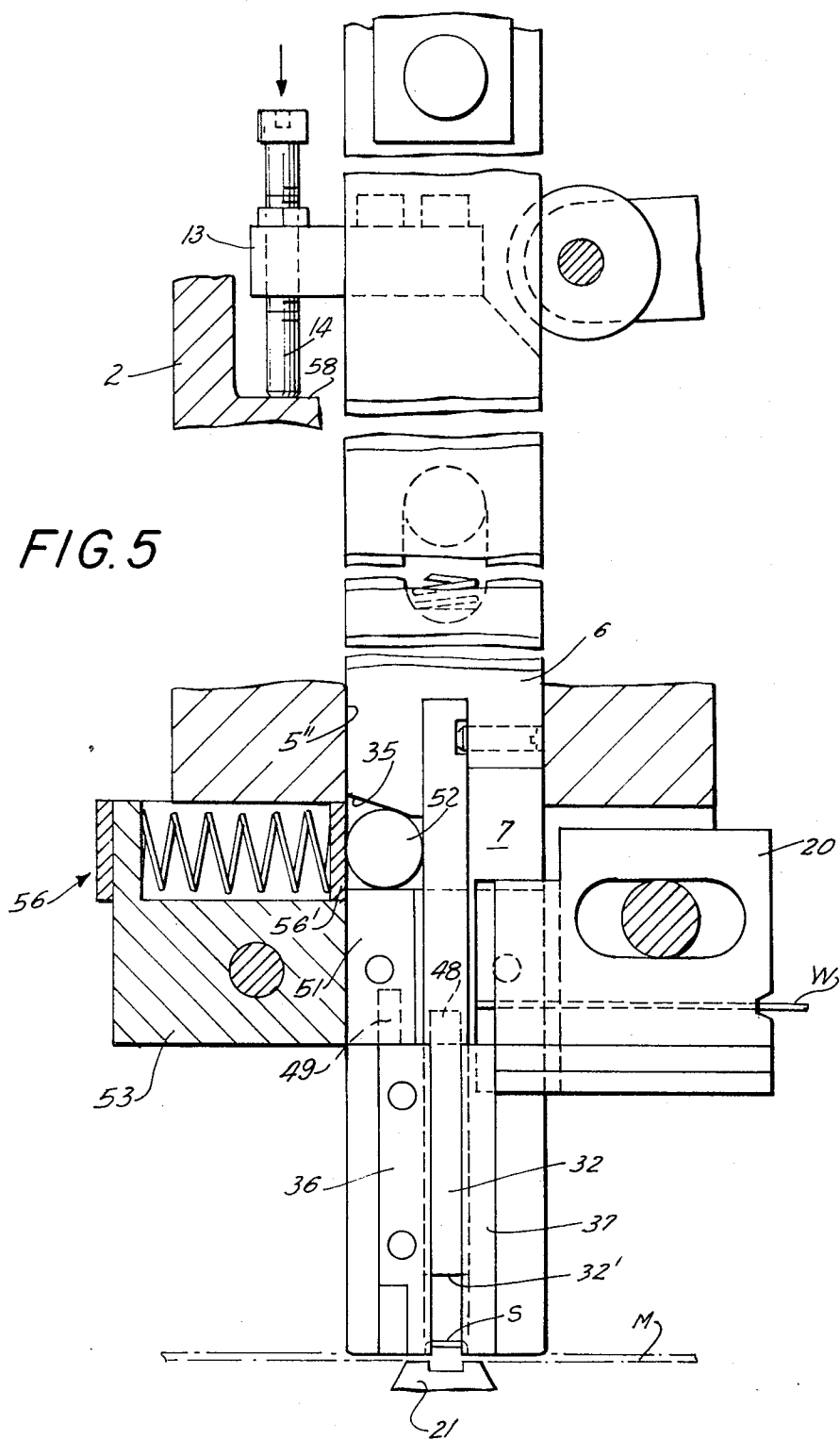
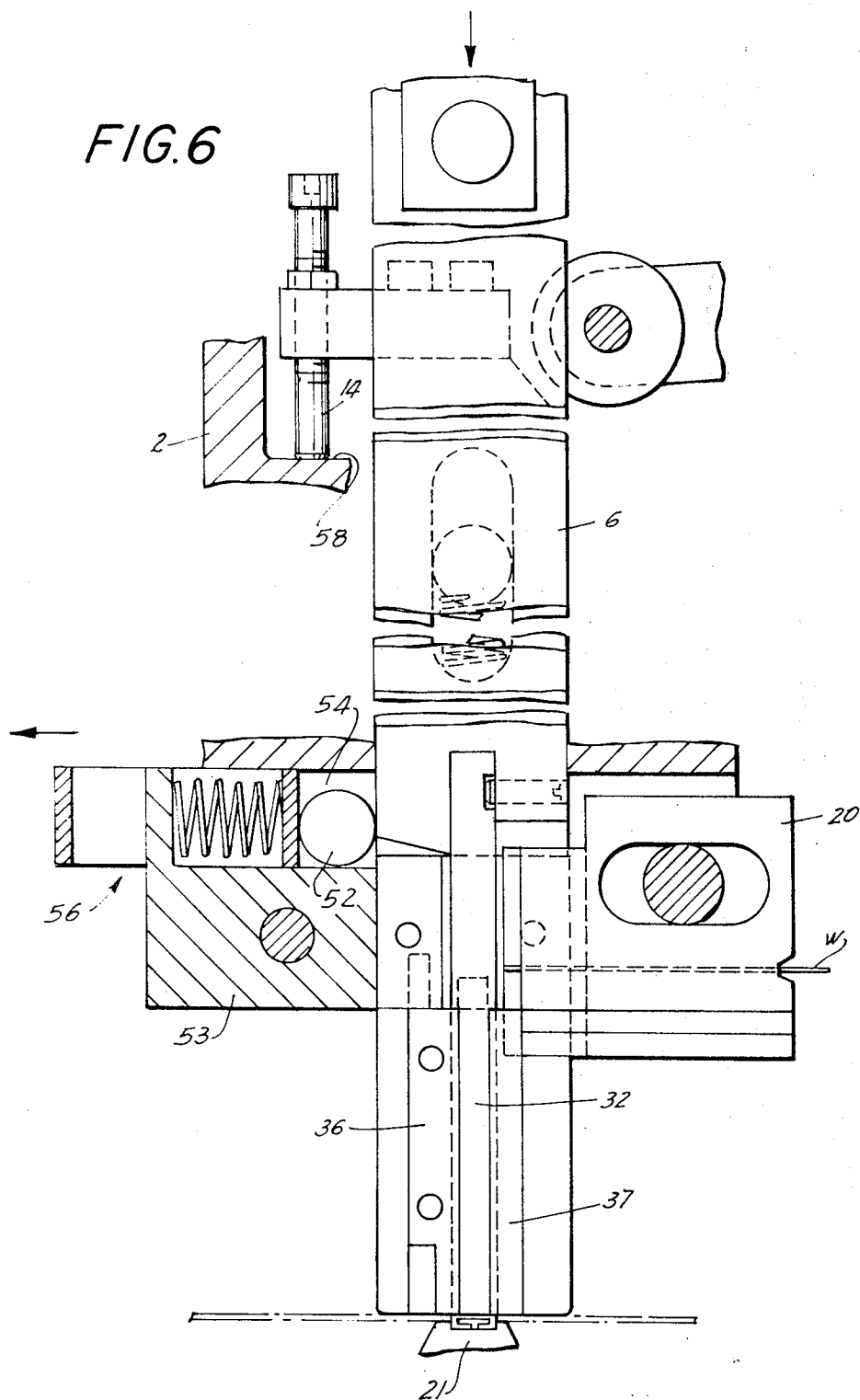
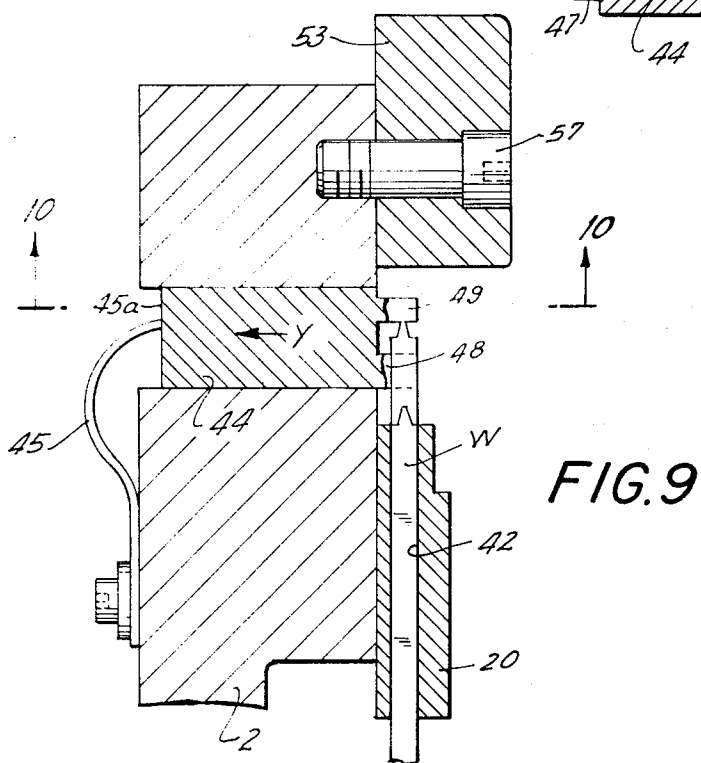
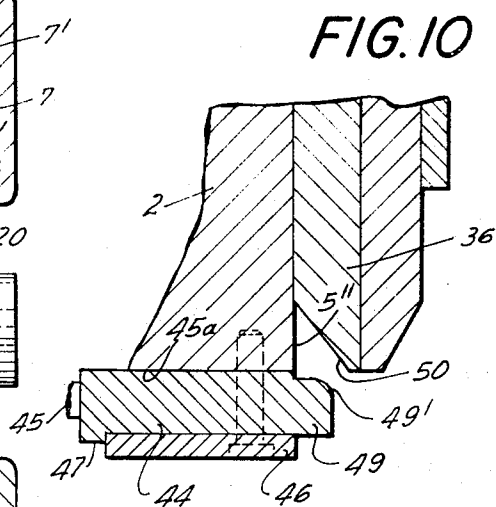
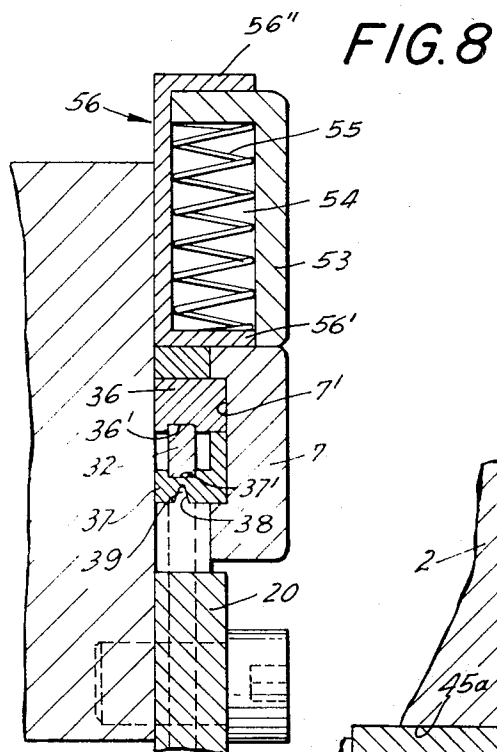


FIG. 6







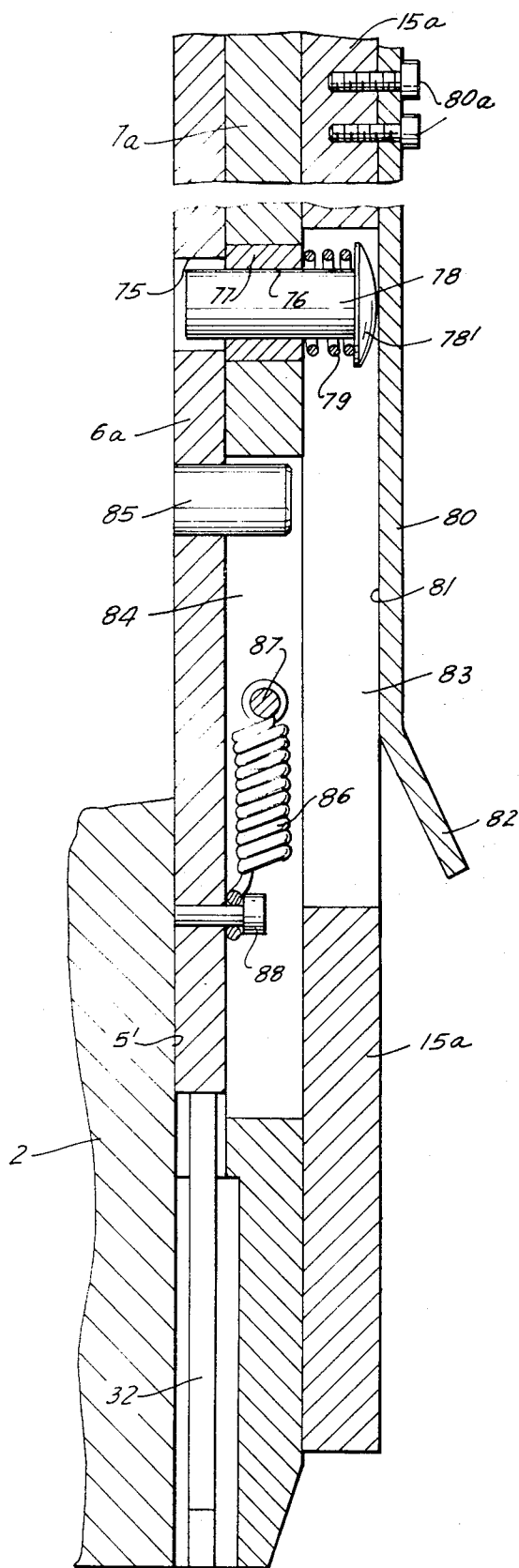
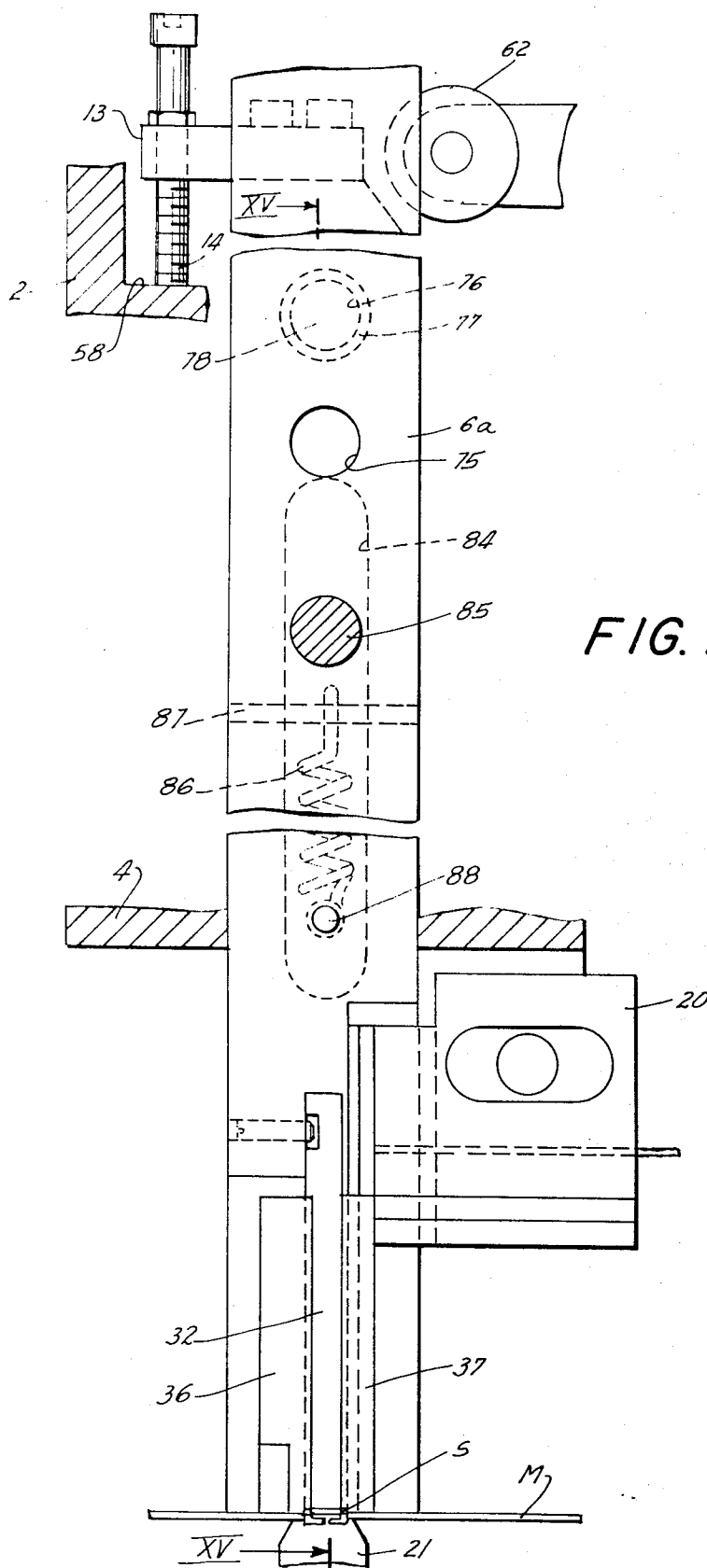


FIG. 13



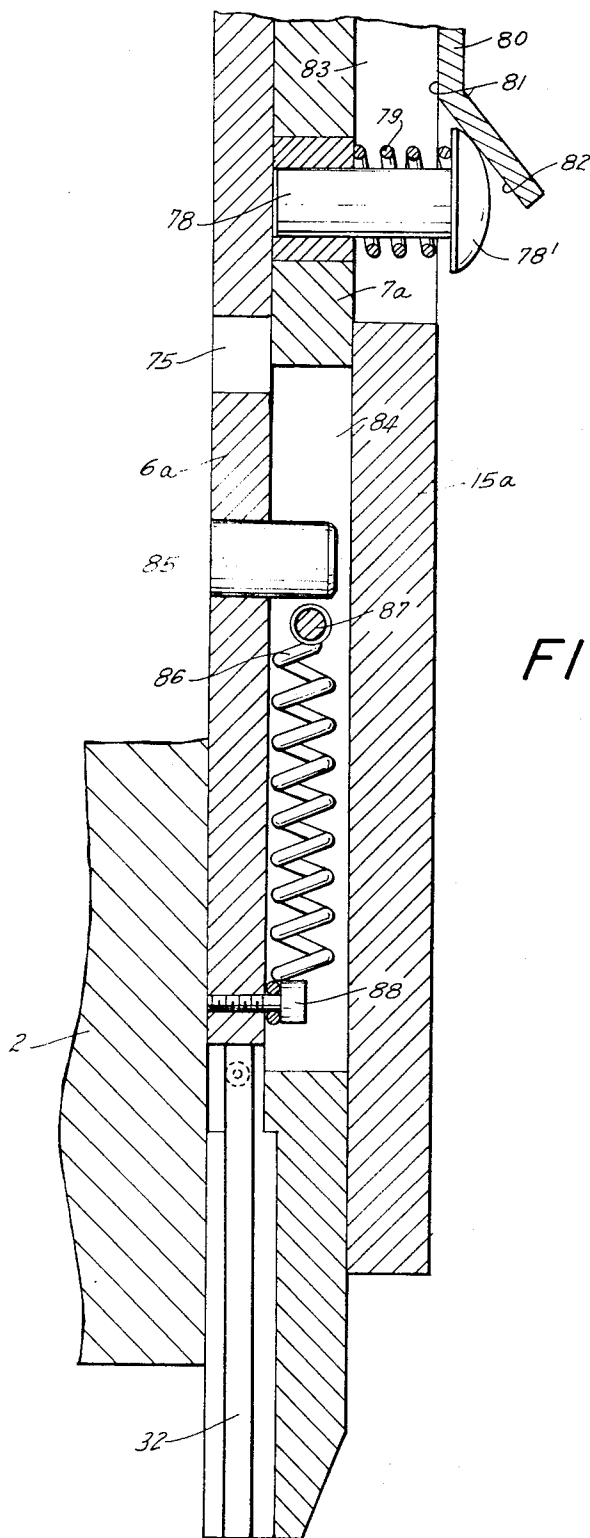


FIG. 15

## STAPLING MACHINE

## BACKGROUND OF THE INVENTION

The present invention relates to a stapling machine, and more specifically to a stapling machine of the type in which the machine need not be loaded with pre-shaped staples which are then subsequently clinched to the material to be stapled, but in which a continuous wire is stepwise fed into the machine, then cut and formed into a U-shaped staple by elements of the machine and subsequently driven through the material to be stapled and clinched about the material. Stapling machines of this type are known in the art, but the mechanisms of such machines for operating the elements to perform the cutting and bending of the wire and to subsequently drive the thus-formed staple through the material to be stapled and to clinch the staple about the material are extremely complicated.

## SUMMARY OF THE INVENTION

It is an object of the present invention to provide a stapling machine of the aforementioned kind, that is a stapling machine in which a continuous wire is stepwise fed into the machine and in which successive portions of the wire are cut and formed into U-shaped staples which are subsequently driven through the material to be stapled and clinched about this material, and in which the drive for the various elements to perform the above mentioned apparatus in proper sequence, is greatly simplified as compared to machines known in the art.

It is a further object of the present invention to provide for a stapling machine of the aforementioned kind which is composed of relatively few and simple parts so that the stapling machine may be manufactured at reasonable cost and will stand up perfectly under extensive use.

With these objects in view, the stapling machine according to the present invention mainly comprises combined bending and cutting means including a stationary die, a retractable anvil, and a pair of punches cooperating with the stationary die for cutting off a portion of an elongated wire fed between the die and the punches and cooperating with the retractable anvil for subsequently bending the cut off wire portion into a U-shaped staple and to drive this staple downwardly toward a stationary clinching anvil located below the retractable anvil. The machine includes further clinching means comprising the aforementioned clinching anvil and a clincher located between the two punches and reciprocable in the same direction as the same and cooperating with the clinching anvil for clinching the U-shaped staple. The two punches are carried spaced from each other by a carrier member, whereas the clincher is carried by a driver member to which moving means are connected for moving the driver member along an active stroke and a return stroke, and coupling means are provided for coupling the carrier member to the driver member so that these two members move together at least during part of the active stroke of the driver member. Since the clincher has to continue its stroke to perform the clinching operation, while movement of the punches has to be stopped after the punches have cut and bent the wire into a U-shaped staple and driven the staple towards the clinching anvil, the aforementioned coupling means is movable between a coupling position and an uncoupling position

and cooperating stop means are provided on the support and on the carrier member for stopping the movement of the latter after the punches mounted thereon have bent the cut wire portion into a U-shaped staple and moved the latter towards the clinching anvil, whereas means cooperating with the coupling means are provided for moving the same to said uncoupling position when movement of the carrier has been stopped so as to permit the clincher carried by the driver to move downwardly relative to the punches to perform the clinching of the staple. Further means are provided to return the coupling means again to the coupling position during movement of the driver member along the return stroke.

The aforementioned coupling means may comprise a rolling element, for instance a roller, a pair of abutment means respectively provided on the driver and on the carrier member, and respectively engaging the roller from above and below, and a guide face on the support means for maintaining the roller between the aforementioned pair of abutment means. The means for moving the coupling means to the uncoupling position may comprise a cam face on one of the aforementioned abutment means inclined to the direction of reciprocating movement of the driver and the carrier member in such a manner so as to push the roller toward the guide face and a pocket is provided in the guide face laterally aligned with the roller in the position the latter reaches when the carrier member is stopped by the stop means so that the roller will move by the action of the cam face into the pocket and out of engagement with the abutment means on the carrier member so as to permit the driver member to continue its movement while the carrier member is stopped.

The means for returning the coupling means to the coupling position may comprise a pusher member having an end face and being reciprocable in the aforementioned pocket in direction transverse to the movement of the driver and carrier members between a first position in which the aforementioned end face is flush with the guide face on the support and a second position withdrawn into said pocket for a distance equal to the diameter of the roller, and biasing means for biasing said pusher member to the first position.

The coupling means according to the present invention may also be constructed in a way different from the manner described above.

Thus, the driver and carrier, which are preferably constituted by a pair of elongated bars reciprocable in a predetermined direction, may each be formed with a bore extending transverse to the predetermined direction therethrough, which bores are aligned with each other at least in the rest position of the driver. In this case the coupling means may comprise a pin extending through the bores in the aligned position of the latter, biasing means cooperating with the pin for biasing the latter in the aforementioned transverse direction for moving the pin out of the bore of one of the bars, and means cooperating with the pin for rendering the biasing means inactive during the active stroke of the driver until the carrier is stopped by the stop means, and for rendering the biasing means active when the carrier is stopped to thus move the pin out of the bore in the one bar, permitting thereby the driver to continue its movement while the carrier is stopped.

The aforementioned biasing means preferably comprise spring means engaging the pin and being biased

for urging the pin out of the bore of said one bar, and the means for rendering the biasing means inactive and active preferably comprise stationary cam means having a cam face engaging one end of the pin. This cam face has an elongated portion extending in the direction of reciprocation of the driver and the carrier and substantially parallel to the bottom face of a groove in which the driver and the carrier are mounted for reciprocation, and a portion inclined to the elongated portion in such a direction so as to permit the pin to move under the influence of the spring out of the bore of the one bar.

This arrangement necessarily comprises also means for returning the coupling means to the coupling position thereof and such means preferably comprise aligning means in the form of an elongated slot extending in the predetermined direction of reciprocation of the driver and the carrier and being formed in one of the bars, a pin member fixed to the other bar and extending into this slot, and additional biasing means cooperating with the bars for yieldably maintaining the pin member in engagement with one end of the slot. This one end of the slot in the one bar and the pin member in the other bar being arranged relative to the aforementioned bores so that the latter are aligned with each other when the pin member engages said one end of the slot.

The moving means, which are connected to the driver member for reciprocating the same along a rectilinear path along the active and the return stroke, may comprise fluid operated cylinder and piston means connected to the driver member, but evidently it is also possible to provide other moving means for moving the driver member along its active and its return stroke, for instance, solenoid means may be used for this purpose, or simply an operator actuated lever pivotally connected at one end to the support means of the machine and linked intermediate its ends to the upper end of the driver member.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings.

#### BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is an overall front view of the stapling machine according to the present invention;

FIG. 2 is a partial cross-section taken along the line 2—2 of FIG. 1;

FIG. 3 is a cross-section taken along the lines 3—3 of FIG. 2 and showing the essential elements of the stapling machine according to the present invention in an upper rest position;

FIGS. 4—6 are similar sectional views as shown in FIG. 3 in which the various elements shown therein are illustrated in position which they subsequently assume during cutting off a wire portion and forming the same into a staple, driving the staple toward the stationary clinching anvil, and finally clinching the staple on the clinching anvil;

FIG. 7 is a transverse cross-section taken along the line 7—7 of FIG. 2;

FIG. 8 is a cross-section taken along the line 8—8 of FIG. 2;

FIG. 9 is a cross-section taken along the line 9—9 of FIG. 2;

FIG. 10 is a vertical cross-section taken along the line 10—10 of FIG. 9;

FIG. 11 is an enlarged partial view of the feeding means for stepwise feeding of the wire;

FIG. 12 is a cross-section similar to FIG. 3 and showing the essential elements of a modification of the stapling machine in an upper rest position;

FIG. 13 is a cross-section taken along the line XIII—XIII of FIG. 12;

FIG. 14 is a cross-section similar to FIG. 12 and showing the elements in the lowermost or clinching position; and

FIG. 15 is a cross-section taken along the line XV—XV of FIG. 14.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawing and more specifically to FIG. 1 of the same, it will be seen that the stapling machine according to the present invention comprises support means in form of a frame including an upright base plate 2, a U-shaped bracket 3 integrally connected at its upper rearwardly extending arm 3' to the base plate 2 and having a lower forwardly extending arm 3''. The base plate 2 is provided at the lower right-hand portion thereof, as viewed in FIG. 1, with a forwardly projecting boss 4, as clearly shown in FIG. 7, which in turn is formed with a longitudinal groove 5 extending in vertical direction. An elongated driver member or driver bar 6 is located in this groove 5 abutting with one face thereof against the bottom face 5' of this groove and an elongated carrier member or carrier bar 7 is likewise located in the groove 5 abutting against the opposite face of the driver member 6 so that the driver and carrier members 6 and 7 may be reciprocated in longitudinal direction of the groove. The upper end of the driver member is connected by means of a screw 8 and nut 9 to a U-shaped connecting link 10, as best shown in FIGS. 1 and 2, and the connecting link 10 is in turn connected to the piston rod 11 of moving means 12 shown as fluid operated cylinder and piston means mounted on the upper end of the base plate 2, as clearly shown in FIG. 1, so that the drive member 6 may be reciprocated in downward direction along an active stroke and in upward direction along a return stroke as will be described later on. The carrier member 7 ends short of the upper end of the driver member 6 and the carrier member 7 carries fixedly connected thereto by screws or the like on its upper end a transversely extending block 13 which is formed in the region of its free end with a vertically extending threaded bore in which a stop screw 14 is adjustably mounted for a purpose as will be described later on. A cover plate 15 is connected by screws or the like to the boss 4 projecting forwardly from the base plate and the cover plate 15 extends over the groove 5 formed in the boss 4 so as to maintain the drive and carrier members 6 and 7 in the groove 5 as clearly shown in FIG. 7.

FIG. 1 shows further a bracket 16 connected to the base plate 2 and projecting laterally therefrom, which carries a wire reel 17 schematically illustrated in FIG. 1 on which a preferably flat wire *w* from which the staples are to be cut and formed is wound. The wire *w* is

guided over a bow shaped wire guide 18 preferably formed from spring stock into feed means 19 schematically illustrated in FIG. 1, so as to be stepwise fed, in a manner as will be described later on in detail, through and beyond a die 20 located in the lower region of the base plate 2.

A clinching anvil 21 is stationarily mounted in a groove formed in the front face of the lower arm 3'' of the U-shaped bracket 3.

Pressure fluid, for instance compressed air, is supplied alternately to the lower and upper end of the cylinder of the moving means 12 through conduits 26 and a conduit 27 connected to a supply of such pressure fluid, not shown in the drawing, and passage of fluid through the conduits 26 is controlled by a solenoid valve 25 of standard construction preferably connected to the rear side of the base plate 2 in any convenient manner. Operation of the solenoid valve 25 is controlled from an operating mechanism 24 of standard construction connected to the solenoid valve and actuated by a switch 22 mounted on the bottom face of the arm 3'' and connected by a wire 23 to the operating mechanism 24. When the pushbutton of the switch 22 is operated, the solenoid valve 25 will be actuated in known manner to supply pressure fluid either to the upper or the lower end of the cylinder of the moving means 12 to thereby reciprocate the driver member 6 connected thereto on its active downstroke or on its upward return stroke.

FIGS. 2 and 3 show the driver member 6 and the carrier member 7 in their upper rest position, and these Figures illustrate also the elements connected to the driver member 6 and the carrier member 7 as well as the elements cooperating therewith.

As clearly shown in FIG. 3, the carrier member 7 is formed in an upper portion thereof with an elongated slot 28 into which a pin 29 fixedly connected to the driver member 6, by being for instance pressed-fitted in a corresponding bore of the driver member, projects. A coiled relatively weak compression spring 30 located in the slot 28 and abutting with opposite ends against the lower end of the slot and a portion of the pin 29 presses the latter against the upper end of the slot to thereby yieldably connect the carrier member 7 to the driver member 6 for reciprocating movement in such a manner that the drive member may continue along its active downward stroke upon arresting of the carrier member 7 by compressing the coil spring 30.

As best shown in FIG. 3, the lower end of the driver member 6 is formed with a short central slot 37 in which the upper end of an elongated bar-shaped clincher 32 is located and held for reciprocation with the driver member 6 by means of a set screw 33 threaded in a transverse bore in the driver member and engaging with its inner end in a notch 34 in the upper end of the clincher 32. The left-hand lower end portion, as viewed in FIG. 3, of the driver member 6 is provided with a cam face 35 on its lower end thereof which extends upwardly and outwardly inclined with regard to the direction of reciprocation of the driver member 6, for a purpose as will be described later on in detail.

The carrier member 7 carries on a lower portion thereof and on a face facing away from the cover plate 15 two punches 36 and 37 transversely spaced from each other and fixed to the carrier member 7 by screws or the like. The left faces of the punches 36 and 37, as viewed in FIG. 2, are located in one plane with the face

6' (FIG. 2) of the driver member 6 which faces away from the carrier member 7. Each of the punches 36 and 37 is provided on a face thereof facing the other punch with an elongated groove 36', 37', respectively, in which opposite marginal portions of the clincher 32 are guided (FIG. 8). The punch 37 is further formed on the face thereof facing away from the face in which the groove 37' is formed with a substantially V-shaped groove 38 extending in longitudinal direction of the punch 37. A projection 39 of corresponding V-shaped cross-section extending in longitudinal direction on the front face of the die 20 which faces the punch 37 projects into the groove 38.

The die 20 is fastened to the base plate 2, as best shown in FIG. 3, by means of a screw 40 which extends through an elongated transverse slot 41 formed in the die so that the latter may be adjusted in transverse direction to provide a minimum clearance between the projections 39 on the die and the V-shaped groove 38 formed in the punch 37 and to permit also proper adjustment of the die after regrinding of the projection if this becomes necessary after extended use of the stapling machine.

The die 20 is formed between the transverse slot 41 and the bottom face thereof with a horizontally extending groove 42 extending through the die and the projection 39 thereon and which divides the projection 39 in an upper portion 39' and a lower portion 39''. The wire *w* from which the staples are to be formed is fed by the feeding means 19 stepwise through the groove 42 in the direction of the arrow X, shown in FIG. 3, over the upper face of the lower portion 39'' of the projection 39 provided on the die 20 and below the bottom face of the punch 37 when the latter is in the rest position as shown in FIG. 3. A notch 43 is provided in the right-hand face of the die 20, as viewed in FIG. 3, to facilitate threading of the wire *w* into the groove 42.

The bottom face of the punch 37 forms along the groove 38 and adjacent portions of the face in which the groove is formed a cutting edge cooperating with the cutting edge provided on the upper face of the projecting portion 39'' and adjacent face portions of the die 20 for cutting off a portion of the wire *w* fed between the bottom face of the punch 37 and the upper face of the portion 39'' of the projection on the die when the punches 36 and 37 are moved in downward direction as will be described later on.

A retractable anvil 44 is provided to cooperate with the punches 36 and 37 to form the cut off portion of the wire *w* into a U-shaped staple, as will be described later on in detail. The retractable anvil 44 is movable in a groove 45a in the bottom face of the base plate 2 in a direction normal to the direction of reciprocation of the driver and carrier members 6 and 7 from an active position as shown in FIGS. 9 and 10 to a withdrawn position in the direction of the arrow *y* shown in FIG. 9 against the action of a leaf spring 45 connected at one end with a screw or the like to the base plate 2 and engaging with its free end the rear end of the retractable anvil 44. A plate 46 connected by screws or the like to the base plate 2 and extending over the open end of the groove 45, as best shown in FIG. 10, maintains the retractable anvil 44 in the groove. A small shoulder 47 provided at the rear end of the retractable anvil 44 engages the rear face of the plate 46 to prevent movement of the anvil in the direction opposite to the direction indicated by the arrow *y* under the action of the spring

45 beyond the position as shown in FIGS. 9 and 10. The retractable anvil 44 has two portions 48 and 49 which project forwardly beyond the face 5'' of the base plate 2, which is flush with the bottom face 5' of the grooves 5 provided in the boss 4 on the base plate, when the anvil 44 is in its active position as shown in FIGS. 9 and 10.

The two portions 48 and 49 are transversely spaced from each other, as best shown in FIGS. 3 and 9, and the portion 48 is located below the clincher 32 and substantially aligned in vertical direction therewith, whereas the portion 49 is located below and substantially vertically aligned with a cam face 50 provided on a lower portion of the punch 36 so that the cam face 50 may cooperate with a curved face 49' on the anvil portion 49 to move the retractable anvil 44 against the pressure of the spring 45 in the direction of the arrow y when the punch 36 moves with the carrier member 7 in downward direction, as will be described later on in detail.

In order to assure a positive drive of the carrier member 7 and the punches 37 and 36 mounted thereon by the driver member 6 during cutting of the wire w by the punches and during bending of the cut wire portion into a U-shaped staple, while permitting the driver member and the clincher 32 mounted thereon to continue its active stroke while the carrier member 7 is stopped, a releasable coupling is provided between the driver member 6 and the carrier member 7. This releasable coupling comprises an abutment member 51 fixed by screws or the like, as shown in FIG. 3 to the carrier member 7 above the punches 36 and 37. The left portion of this abutment member 51, as viewed in FIG. 3, has a thickness substantially equal to that of the driver member 6 and the upper end of this abutment member 51 has an abutment face 51' extending substantially horizontally. A rolling element, preferably in the form of a roller 52 having an axial length substantially equal to the thickness of the driver member 6 is located on this abutment face 51' of the abutment member 51 between the latter and the cam face 35 of the driver member 6. The roller 52 abuts at the right side, as viewed in FIG. 3, on the clincher 32 and on the left side on the left side face 52''' of the groove 5 formed in the boss 4.

A block 53 is mounted by means of a screw 57 on the base plate 2 with the right end face of the block, as viewed in FIG. 3, flush with the left side face 5''' of the groove 5 formed in the boss 4. The block 53 is provided at its upper end abutting against the lower end face of the left portion, as viewed in FIG. 3, of the boss 4 with a cutout 54 which forms a pocket opening into the groove 5. U-shaped pusher member 56 (see also FIG. 8) is slidably arranged in the pocket 54. The front arm 56' of the U-shaped pusher member is pressed by a spring 55 abutting with opposite ends against the front arm 56' and the closed rear portion of the pocket 54 towards the right, as viewed in FIG. 3, whereas the rear arm 56'' of the U-shaped pusher member engages the left face of the block 53, so as to hold the front face of the front arm 56' flush with the side face 5''' of the groove 5 against the pressure of the spring 55.

The above-described stapling machine will operate as follows:

At the start of the operation the driver member 6 and the carrier member 7 connected thereto are in the upper rest position, as shown in FIG. 3, in which the

bottom faces of the punches 36 and 37 are above the upper faces of the retractable anvil 44 and above the upper face of the lower die portion 39''. A wire w is then fed, initially by hand, through the slot 42 of the die until the left end of the wire, as viewed in FIG. 3, abuts against the right face of the projecting portion 49 of the retractable anvil, as shown in FIG. 3. In this position of the driver and carrier members, the lower end of the stop screw 14, connected to the upper end of the carrier member 7 by the block 13, is upwardly spaced from an opposite stop face 58 provided in a cut-out of the base plate 2.

When the operator now presses the pushbutton of the switch 22, the solenoid valve 25 will be operated to feed compressed air into the upper end of the cylinder of the cylinder and piston means 12 to thereby move the piston in the cylinder downwardly and to drive the driver member 6 connected to the piston rod 11 in downward direction along its active stroke. During the first part of this active stroke of the driver member 6 the carrier member is taken along due to the connection between driver and carrier members 6 and 7 by the pin 29 and the light compression spring 30. When the lower end faces of the punches 36 and 37 engage the wire, the spring 30 is slightly compressed so that the cam face 35 on the driver member 6 engages an upper surface portion of the roller 52 and the carrier member 7 is then positively taken along by the engagement of the roller 52 with the cam face 35 and the abutment face 51' of the abutment member 51. During the further downward movement of the driver member 6 and the carrier member 7 connected thereto, the cutting edge on the punch 37 cooperates with the cutting edge provided on the upper face of the lower portion 39'' of the projection 39 on the die 20 to cut the wire and subsequently thereto, during the further downward movement of the carrier and driver members, the cut wire portion will be bent about the projecting portion 48 of the retractable anvil 44 into a U-shaped staple s as shown in FIG. 4. During the first part of the bending of the staple s, the cam face 50 on the punch 36 engages the curved cam face 49' on the projecting portion 49 of the retractable anvil 44 and moves during further downward movement of the punches the anvil 44 in the direction of the arrow y against the pressure of the leaf spring 45 in rearward direction out of the way of the bent staple. When the bending is finished, the retractable anvil 44 is completely withdrawn so that the front face of the projecting portion 48 is flush with the bottom face 5' of the groove 5, and the finished staple may therefore move downwardly simply by friction together with the punches 36 and 37. The downwardly extending legs of the staple s are thereby located in the grooves 36' and 37' of the two punches.

The material M to be stapled is placed on the upper face of the stationary clinching anvil 21 and the stop screw 14 connected by the block 13 to the upper end of the carrier member 7 is adjusted in such a manner that when the bottom faces of the punches 36 and 37 engage the top face of the material M on the top face of the clinching anvil 21, the lower end of the stop screw 14 engages the stop face 58 on the base plate 2, as shown in FIG. 5, so that further downward movement of the carrier member 7 and the punches 36 and 37 connected thereto is stopped. As shown in FIG. 5, at this position of the carrier member 7 and the driver member 6, the roller 52 between the cam face 35 of the

driver member 6 and the abutment face 51' of the abutment member 51 is located opposite the front arm 56' of the pusher member 56.

While further downward movement of the carrier member 7 and the punches 36 and 37 thereon is thus stopped, the driver member 6 continues on its downward active stroke and the cam face 35 of the driver member 6 pushes the roller 52 towards the left, as viewed in FIG. 5, to thereby move the pusher member 56 towards the left against the action of the spring 55 so that the roller 52 will be pushed into the pocket 54 as shown in FIG. 6. During this further movement of the drive member 6, the clincher 32 connected thereto moves downwardly relative to the punches 36 and 37 which are at this time held stationarily and is guided in the grooves 36' and 37' of the punches during the relative movement of the clincher 32 with respect to the punches 36 and 37. The bottom face 32' of the clincher engages now the top face of the U-shaped staple s, drives the legs of the staple through the material M and finally clinches the staple to its bent position as shown in FIG. 6, to thereby connect the two parts of the material M to each other.

After the clinching movement is finished, the operator will push the pushbutton of the switch 22 again to thereby reverse the solenoid valve 25 so that pressure fluid is fed into the lower end of the cylinder of the moving means 12 and the driver is thereby moved upwardly on its return stroke. As the cam face 35 on the driver member 6 passes the open end of the pocket 54, the pusher member 56, under the action of the spring 55, pushes the roller 52 towards the right, as viewed in FIGS. 3-6 and out of the pocket 54 so that the roller 52 is again located between the cam face 35 and the abutment face 51'. During the return stroke of the driver member 6, the spring 30 expands to push the pin 29 against the upper end of the slot 28 in the carrier member so that the carrier member is thereby taken along with the driver member 6. The expansion of the spring separates also the lower end of the cam face 35 from the abutment face 51' for a distance greater than the diameter of the roller 52 so that the roller may freely move into the opened space.

The feeding mechanism 19 for feeding the wire w stepwise through the slot 42 of the die 20 and over the projecting portion 48 of the retractable anvil 44 comprises a feed pawl 64 and a holding pawl 65. The holding pawl 65 is stationarily mounted on the base plate 2, whereas the feed pawl 64 is connected to the lower end of a lever 60 which is pivoted intermediate its end about a pivot pin 61 (FIG. 1). The lever 60 has at its upper end a transversely extending arm 60' which carries at its free end a follower in form of a roller 62. In the upper rest position of the driver member 6 and the carrier member 7 connected thereto, the roller 62 engages the left side face of the carrier member 7, as viewed in FIG. 1. A spring 63 sandwiched between the lever 60 and the boss 4 on the base plate biases the lever 60 for tilting movement about the pivot pin 61 in clockwise direction so as to hold the roller 62 in engagement with the aforementioned side face, respectively to move the roller 62 towards the right, as viewed in FIG. 1, when a cam face 59 on the upper end of the carrier member 7 moves downwardly beyond the roller.

Each of the pawls 64 and 65 are of substantially identical construction and each comprises a pawl member

67 (FIG. 11) pivoted at its upper end on a pivot pin 68 for tilting movement whereas a compression spring 72 cooperates with the pawl member 67 to bias the latter for tilting movement in clockwise direction about its pivot pin 68. Each of the pawl members 67 carries at its lower end a pair of balls 69 between appropriate projections on the pawl member 67 so that the balls 69 will move during tilting movement of the respective pawl member 67 therewith. The balls 69 respectively engage side faces 70 and 71 of a groove formed in the holding and feeding pawls 64 and 65, respectively, and, as shown in FIG. 11, these side faces 70 and 71 are inclined with respect to each other so as to approach each other towards the left side, as viewed in FIG. 11, of this groove. The wire w to be fed is threaded between the two balls on each pawl.

The operation of this feed mechanism 19 will be obvious from the above description of the construction thereof. During the downward movement of the carrier member 7, the cam face 59 on the carrier member 7 moves downwardly beyond the roller 62 so that the lever 60 and the feeding pawl 64 fixed thereto may swing about a pivot pin 61 under the influence of the spring 63 in clockwise direction whereby the rollers 69 on the feed pawl 64 move towards the left, as viewed in FIG. 11, tending thereby to move the wire w toward the left. During any such leftward movement of the wire, the rollers 69 on the holding pawl 65 will, however, also, due to the friction between the wire and these rollers, be moved to the left, as viewed in FIG. 1, so that the rollers through the action of the faces 70 and 71 will move toward each other and positively clamp the wire between them so that any further movement of the wire towards the left is stopped. Tilting of the lever 60 in clockwise direction is limited by set screw 73 adjustably mounted on the stationary holding pawl 65. Therefore, as the carrier member moves further downwardly to the position as shown in FIG. 4, the roller 62 may be held disengaged from the cam face 59. As the carrier member 7 moves back again together with the driver member 6 on the return stroke of the latter, cam face 59 on the carrier member 7 will engage the roller 62 to thereby tilt the lever 60 and the feed pawl 64 connected thereto in counterclockwise direction against the pressure of the spring 63. During such movement of the feed pawl 64 in counterclockwise direction or towards the right, as viewed in FIG. 11, the rollers 69 on the feed pawl will clamp the wire w therebetween and feed the wire towards the right, as viewed in FIGS. 1 and 11, while the rollers 69 on the holding pawl will be taken along by friction and also be moved towards the right, to thereby free the previously clamped portion of the wire for movement towards the right. As evident from FIG. 3, feeding of the wire will occur when the bottom faces of the punches 36 and 37 have moved upwardly beyond the slot 42 in the die 20. The length of the return stroke of the feed pawl 64 and therewith also the length of its active feeding stroke may be adjusted by means of the adjustment screw 73, whereas an additional adjusting screw 66 threaded in a transverse bore of the lever 60 will prevent rebound or vibration of this lever when the cam face 59 engages, during the fast upward stroke of the carrier member 7, the roller 62.

FIGS. 12-15 illustrate a modification of the above-described stapling machine. The modification shown in these Figures differs from the above-described machine

only by a different construction of the coupling means which couple the driver and the carrier for simultaneous reciprocation during the active stroke of the driver until the carrier is stopped by the stop means to permit the driver to continue in its active stroke for moving the clincher connected to the driver to its clinching position, and by the means for returning the coupling means again to an active position during the return stroke of the driver.

FIGS. 12-15 illustrate only such members of the modified construction which are different from the above-described construction illustrated in FIGS. 1-11, and it is to be understood that the stapling machine, only partly illustrated in FIGS. 12-15, otherwise contain all the elements as described above and as shown in FIGS. 1-11. The elements of the modification shown in FIGS. 12-15 which are identical with the elements in the above-described modification are designated with the same reference numerals, whereas elements which are modified, but which perform the same function as the elements described above, are designated with the same reference numeral to which a suffix *a* is added.

In FIGS. 12 and 13 the various elements of the modification are shown in their upper rest position, whereas in FIGS. 14 and 15 the various elements are shown in the final position in which the clincher 32 cooperates with the clinching anvil to clinch the staple to its final shape in which the staple connects two stringers of a slide fastener.

As shown in FIGS. 12 and 13, the elongated driver 6a and carrier 7a are constituted by elongated bars which are superimposed upon each other and arranged for reciprocating movement in longitudinal direction in a groove 5 formed in the base plate 2, respectively in the boss 4 projecting forwardly from the base plate as described above in connection with the embodiment shown in FIGS. 1-11. The driver 6a is formed with a bore 75 therethrough, the axis of which extends normal to the direction of reciprocation of the driver 6a, and the carrier 7a is formed with a corresponding bore 76 which is aligned with the bore 75 in the driver when driver and carrier are in the rest position as shown in FIGS. 12 and 13. The bore 76 is preferably formed in a hardened bushing 77 press-fitted in a larger bore of the carrier 7a. A pin 78, forming the coupling means for coupling the carrier to the driver for simultaneous reciprocation extends, as shown in FIGS. 12 and 13, through the aligned bores 75 and 76, and a portion of this pin extends into an elongated slot 83 formed in the cover 15a which extends over the groove 5 in which the driver and the carrier are reciprocable to hold these two members in the groove. The free end of the pin 78 in the slot 83 of the cover 15a is provided with a head 78' of a larger diameter than the pin and having preferably an end face of spherical configuration. A coil compression spring 79 is wound about the aforementioned pin portion between the left face, as viewed in FIG. 13 of the carrier 7a and the head 78' so as to urge the pin 78 towards the right, as viewed in FIG. 13 and tending thereby to move the left end portion, as viewed in FIG. 13 of the pin 78 out of the bore 75 in the driver 6a. Such movement of the pin under the influence of the spring or biasing means 79 is, however, prevented in the position of the various elements as shown in FIGS. 12 and 13 by a cam plate 80 which extends over the elongated slot 83 and which is fastened to the cover

15a by screws 80a, since, as shown in FIG. 13, the outer face of the head 78' of the pin 78 engages the elongated cam face 81 of the cam plate 80. The elongated cam face 81, which extends parallel to the movement of reciprocation of the driver and carrier is continued at its lower end by an outwardly and downwardly inclined cam face 82 for a purpose which will be described later on.

The modified construction includes also a pin member 85 press-fitted in a corresponding bore of the driver 6a, whereas the carrier 7a is formed with an elongated slot 84 which extends in longitudinal direction thereof and a coil tension spring 86 fixed at opposite ends thereof by a transverse pin 87 extending through a corresponding bore in the carrier 7a and to a screw 88 threaded into a corresponding bore of the driver 6a. As shown in FIGS. 12 and 13, the spring 86 will hold the pin 85 in engagement with the upper end of the slot 84 formed in the carrier 7a when the various elements are in the rest position as illustrated in FIGS. 12 and 13.

The above-described modification will operate in a manner very similar to that described in connection with FIGS. 1-11.

When the moving means 12, shown in FIG. 1, move the driver 6a connected thereto by the pin 8 downwardly along the active stroke of the driver, the carrier coupled to the driver by the pin 78 will move therewith during the first part of the active stroke of the driver 6a and the punches 36 and 37 connected to the carrier member 7a will cooperate first with the stationary die 20 to cut a portion of the wire *W* in the manner as described in connection with the first embodiment and subsequently thereto the cut wire portion is bent about the portion 48 of the retractable anvil to a substantially U-shaped configuration. During the further downward movement of driver and carrier, the cam face 50 on the punch 36 will cooperate with the portion 49 of the retractable anvil to retract the latter so that the U-shaped staple may move past the retracted anvil. During such movement, the spherical face of the head 78' of the coupling pin 78 will engage the elongated portion 81 of the cam face of the cam 80 connected to the cover 15a and extending over the slot 83 in which the head of the coupling pin 78 moves.

Before the stop screw 14 connected by the block 13 to the upper end of the carrier 7a abuts against the stop face 58 on the base plate 2, the spherical head 78' of the coupling pin 78 will reach the region of the outwardly inclined cam face 82 so that the stop pin 78 can move under the influence of the biasing means, that is the coil compression spring 79, outwardly of the bore 75 in the driver 6a and when the bottom faces of the punches 36 and 37 reach the top face of a material *M* to be stapled and resting on the top face of the stationary anvil, as shown in FIG. 14, the coupling pin 78 has reached the position as shown in FIG. 15 and has moved out of the bore 75 in the driver 6a. The further downward movement of the carrier 7a is now stopped by engagement of the lower end of the stop pin 14 with the stop face 58, while the driver carrying the clincher 32 moves further downwardly to the position shown in FIGS. 14 and 15 to thereby clinch the staple *S* to the form as shown in FIG. 14. During such downward movement of the driver 6a relative to the stationarily held carrier 7a, the tension spring 86 will be tensioned and extended to the position as shown in FIGS. 14 and 15.

During the return stroke of the driver 6a, the thus tensioned spring 86 will again contract and thereby move the pin 85 fixed to the driver 6a upwardly in the slot 84 until the pin engages the upper end of this slot. In this position the bore 75 and 76 in the driver 6a and in the bushing 77 in the carrier 7a are aligned with each other.

As the pin 85 engages the upper end of the slot 84 in the carrier 7a, the carrier is moved upwardly together with the driver and the coupling pin 78 will be moved again towards the left, as viewed in FIG. 15, by the action of the cam faces 82 and 81 which engage the spherical head 78' of the pin so that the left end portion of the pin, as viewed in FIGS. 13 and 15, will move again into the bore 75 in the driver 6a, whereby driver and carrier are again positively coupled to each other by the coupling pin 78.

The cam 80 with the cam faces 81 and 82 constitute therefore means cooperating with the pin 78 to render the biasing means, that is the spring 79, inactive during the active stroke of the driver 6a until the carrier 7a is stopped by the stop means 14, 58 and for rendering the biasing means active when the carrier is thus stopped.

During the return stroke of the driver 6a, the feed means comprising the pawls 64 and 65 will feed the wire W in forward direction in the manner as described in connection with embodiment illustrated in FIGS. 1-11.

The stapling machine of the present invention is especially suitable for connecting by the staple formed in the machine two stringers of a slide fastener at the bottom ends thereof so as to provide a bottom stop for the slide fastener, but it is evident that the stapling machine may also be used for stapling other material parts to each other, for instance cardboard parts or the like for forming of boxes.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of stapling machines different from the types described above.

While the invention has been illustrated and described as embodied in a stapling machine, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

For instance, as mentioned above, the moving means for moving the driver member 6 along its active and its return stroke may not only be constituted by fluid operated cylinder and piston means 12, as illustrated in FIG. 1, but instead these fluid-actuated cylinder and piston means also solenoid means may be used or, simply a manually or foot operated lever which is pivotally connected at one end to the base plate 2 and connected intermediate its ends by a link to the upper end of the driver member 6.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention, and therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be protected by Letters Patent is:

1. A stapling machine comprising support means; combined bending and cutting means comprising a stationary die having a cutting edge and being mounted on said support means, a retractable anvil mounted on said support means spaced from said die and being movable between an active and a withdrawn position, a pair of spaced punches reciprocable in a predetermined direction, one of said punches having a cutting edge cooperating with the cutting edge of said die and being located between said die and one side of said anvil, and the other being located on the other side of said anvil, said punches cooperating with said die and said anvil for cutting off a portion of a wire fed between said die and said punches, for then bending the cut-off wire portion into a U-shaped staple and for subsequently moving the U-shaped staple downwardly, means biasing said retractable anvil to said active position, and means for moving said anvil to said retracted position after the wire portion has been bent into a U-shaped staple; clinching means comprising a clinching anvil mounted on said support means downwardly spaced from said retractable anvil and a clincher located between and reciprocable in the same direction as said punches and cooperating with said clinching anvil for clinching the U-shaped staple; a carrier member carrying said two punches spaced from each other; a driver member mounted on said support means reciprocable in said predetermined direction and carrying said clincher for movement therewith; moving means connected to said driver member for moving the same along an active stroke from an upper rest position to a lower end position in which said clincher clinches said U-shaped staple and along a return stroke back to said rest position; coupling means movable between a coupling position and an uncoupling position for connecting, when in said coupling position, said carrier member to said driver member for movement along said active stroke; cooperating stop means on said support means and said carrier member for stopping the movement of the latter after said punches mounted thereon have bent said cut-off wire portion into a U-shaped staple and moved the latter towards said clinching anvil; means cooperating with said coupling means after stopping of said carrier member and further movement of said driver member along its active stroke for moving said coupling means to said uncoupling position so as to permit said clincher carried by said driver member to move downwardly relative to said punches to clinch the staple; means to return said coupling means to said coupling position during movement of said driver member along its return stroke; and additional means between said carrier member and said driver member for moving said carrier member with said driver member during the return stroke of the latter while positioning said carrier member relative to said driver member for permitting movement of said coupling means to said coupling position, said additional means comprising an elongated slot formed in one of said members, a pin fixed to the other of said members and additional biasing means for yieldably maintaining said pin in engagement with one end of said slot.

2. A stapling machine as defined in claim 1, wherein said coupling means comprises a roller, a pair of abutment means respectively provided on said driver member and said carrier member to respectively engage said roller on opposite portions of its peripheral surface, and guide face means on said support means for main-

taining said roller between said pair of abutment means, and wherein said means for moving said coupling means to said uncoupling position comprise a cam face on one of said abutment means inclined to said predetermined direction in such a manner to push said roller toward said guide face means, and a pocket in said guide face means laterally aligned with said roller in the position the latter reaches when said carrier member is stopped by said stop means so that said roller will move by the action of said cam face into said pocket and out of engagement with said abutment means on said carrier member permitting thereby said driver member to continue its movement while said carrier member is stopped.

3. A stapling machine as defined in claim 2, wherein said cam face is provided on said abutment means of said driver member and wherein said abutment means on said carrier member has an upper abutment face extending substantially normal to said predetermined direction and engaging said roller from below.

4. A stapling machine as defined in claim 2, wherein said support means comprises an elongated guide member formed with an elongated groove extending in said predetermined direction and having a bottom face and a pair of side faces, one of which constitutes said guide face means, said driver member and said carrier member being constituted by a pair of elongated bars arranged superimposed upon each other in said groove and being reciprocable therein.

5. A stapling machine as defined in claim 4, wherein said bar constituting said driver has a rear face engaging the bottom face of said groove, and a front face, said bar constituting said carrier having a rear face engaging said front face of the other bar, said punches being carried on said rear face of said carrier bar on a portion thereof downwardly spaced from the bottom end of the driver bar, and including a cover fixed to said guide member extending over the open side of said slot and engaging the front face of said carrier bar.

6. A stapling machine as defined in claim 1, wherein said means for moving said retractable anvil to said retracted position comprises cooperating cam means on said anvil and on one of said punches.

7. A stapling machine as defined in claim 1, wherein said punch located between said die and said one side of said retractable anvil is formed in the face thereof facing said die with an elongated groove of V-shaped cross-section and wherein said die is provided with an elongated projection of corresponding V-shaped cross-section and projecting into said groove.

8. A stapling machine as defined in claim 7, and including mounting means mounting said die on said support means adjustable in a direction normal to said predetermined direction to reduce any clearance between said projection and said groove after grinding of said die projection.

9. A stapling machine as defined in claim 1, wherein each of said punches is provided on the face thereof facing the other punch with an elongated guide groove extending in said predetermined direction for guiding said clincher during its movement relative to said punches.

10. A stapling machine as defined in claim 1, wherein said driver is provided at the lower end thereof with a slot extending in said predetermined direction, said clincher having an upper portion located in said slot,

and means engaging said upper portion of said clincher for releasably connecting said clincher to said driver.

11. A stapling machine as defined in claim 1, and including means for stepwise feeding a wire between said die and said punches during movement of said driver and said carrier therewith along the return stroke.

12. A stapling machine as defined in claim 11, wherein said feeding means comprises feed pawl means movable along a feed stroke for feeding said wire in one direction and a return stroke, a holding pawl means substantially preventing movement of said wire in the opposite direction during the return stroke of said feed pawl means, and cooperating means on said carrier and said feed pawl means for moving the latter along said feed stroke during movement of said carrier together with the driver during the return stroke of the latter.

13. A stapling machine as defined in claim 12, wherein said feed pawl means comprises a lever tiltably mounted between the ends thereof on said support means, and wherein said cooperating means comprise a cam face on said carrier and follower means connected to said lever and adapted to engage said cam face.

14. A stapling machine as defined in claim 13, and including biasing means engaging the lever and urging said follower toward said cam face, and means cooperating with said lever for adjusting the length of the return stroke and therewith also the length of the feeding stroke thereof.

15. A stapling machine as defined in claim 1, wherein said moving means comprise fluid actuated cylinder and piston means.

16. A stapling machine as defined in claim 15, wherein said fluid actuated cylinder and piston means comprise a cylinder mounted on said support means, a piston reciprocable in said cylinder means and having a piston rod connected to said driver, and control means for alternately feeding pressure fluid to opposite ends of said cylinder.

17. A stapling machine as defined in claim 16, wherein said control means comprises a solenoid operated valve and switch means connected to the solenoid of the valve for actuating the solenoid.

18. A stapling machine as defined in claim 1 wherein said additional biasing means comprises a compression spring in said slot between the lower end of the latter and said pin for urging said pin against the upper end of said slot.

19. A stapling machine comprising support means; combined bending and cutting means comprising a stationary die having a cutting edge and being mounted on said support means, a retractable anvil mounted on said support means spaced from said die and being movable between an active and a withdrawn position, a pair of spaced punches reciprocable in a predetermined direction, one of said punches having a cutting edge cooperating with said cutting edge of said die and being located between said die on one side of said anvil and the other of said punches being located on the other side of said anvil, said punches cooperating with said die and said anvil for cutting off a portion of a wire between said die and said punches, for then bending the cut-off wire portion into a U-shaped staple and for subsequently moving the U-shaped staple downwardly, means biasing said retractable anvil to said active position, and means for moving said anvil to said retracted position after the wire portion has been bent into a U-

shaped staple; clinching means comprising a clinching anvil mounted on said support means downwardly spaced from said retractable anvil and a clincher located between and reciprocable in the same direction as said punches and cooperating with said clinching anvil for clinching the U-shaped staple; a carrier carrying said two punches spaced from each other; a driver mounted on said support means reciprocable in said predetermined direction and carrying said clincher for movement therewith; moving means connected to said driver for moving the same along an active stroke from an upper rest position to a lower end position in which said clincher clinches said U-shaped staple and along a return stroke back to said rest position; coupling means movable between a coupling position and an uncoupling position for connecting, when in said coupling position, said carrier to said driver for movement along said active stroke, said coupling means comprising a roller, a pair of abutment means respectively provided in said driver and said carrier to respectively engage said roller on opposite portions of its peripheral surface, and guide face means on said support means for maintaining said roller between said pair of abutment means; cooperating stop means on said support means and said carrier for stopping the movement of the latter after said punches mounted thereon have bent said cut-off wire portion into a U-shaped staple and moved the latter toward said clinching anvil; means cooperating with said coupling means after stopping of said carrier and further movement of said driver along its active stroke for moving said coupling means to said uncoupling position so as to permit said clincher carried by said driver to move downwardly relative to said punches to clinch the staple, said last-mentioned means comprising a cam face on one of said abutment means inclined to said predetermined direction in such a manner to push said roller toward said guide face means, and a pocket in said guide face means laterally aligned with said roller in the position the latter reaches when said carrier is stopped by said stop means so that the roller will move by the action of said cam face into said pocket and out of engagement with said abutment means on said carrier permitting thereby said driver to continue its movement while said carrier is stopped; and means to return said coupling means to said coupling position during movement of said driver along its return stroke, said returning means comprising a pusher member having an end face and being reciprocable in said pocket in a direction transverse to said predetermined direction between a first position in which said end face is flush with said guide face means and a second position withdrawn into said pocket for a distance equal to the diameter of said roller, and further biasing means for biasing said pusher member to said first position.

20. A stapling machine comprising support means; combined bending and coupling means comprising a stationary die having a cutting edge and being mounted on said support means, a retractable anvil mounted on said support means spaced from said die and being movable between an active and a withdrawn position, a pair of spaced punches reciprocable in a predetermined direction, one of said punches having a cutting edge cooperating with the cutting edge of said die and being located between said die and one side of said anvil, and the other being located on the other side of said anvil, said punches cooperating with said die and said anvil for

cutting off a portion of a wire fed between said die and said punches, for then bending the cut-off wire portion into a U-shaped staple and for subsequently moving the U-shaped staple downwardly, means biasing said retractable anvil to said active position, and means for moving said anvil to said retracted position after the wire portion has been bent into a U-shaped staple; clinching means comprising a clinching anvil mounted on said support means downwardly spaced from said retractable anvil and a clincher located between and reciprocable in the same direction as said punches and cooperating with said clinching anvil for clinching the U-shaped staple; a carrier carrying said two punches spaced from each other; a driver mounted on said support means reciprocable in said predetermined direction and carrying said clincher for movement therewith; moving means connected to said driver for moving the same along an active stroke from an upper rest position to a lower end position in which said clincher clinches said U-shaped staple and along a return stroke back to said rest position; coupling means movable between a coupling position and an uncoupling position for connecting, when in said coupling position, said carrier to said driver for movement along said active stroke; cooperating stop means on said support means and said carrier for stopping the movement of the latter after said punches mounted thereon have bent said cut-off wire portion into a U-shaped staple and moved the latter toward said clinching anvil, said stop means comprising a member fixed to the upper end of said carrier projecting laterally therefrom and formed with a threaded bore therethrough, a stop screw adjustably screwed in said bore, and a stop face on said support means to be engaged by the end of said stop screw; means cooperating with said coupling means after stopping of said carrier and further movement of said driver along its active stroke for moving said coupling means to said uncoupling position so as to permit said clincher carried by said driver to move downwardly relative to said punches to clinch the staple; and means to return said coupling means to said coupling position during movement of said driver along its return stroke.

21. A stapling machine comprising support means; combined bending and cutting means comprising a stationary die having a cutting edge and being mounted on said support means, a retractable anvil mounted on said support means spaced from said die and being movable between an active and a withdrawn position, a pair of spaced punches reciprocable in a predetermined direction, one of said punches having a cutting edge cooperating with the cutting edge of said die and being located between said die and one side of said anvil, and the other being located on the other side of said anvil, said punches cooperating with said die and said anvil for cutting off a portion of a wire fed between said die and said punches, for then bending the cut-off wire portion into a U-shaped staple and for subsequently moving the U-shaped staple downwardly, means biasing said retractable anvil to said active position, and means for moving said anvil to said retracted position after the wire portion has been bent into a U-shaped staple; clinching means comprising a clinching anvil mounted on said support means downwardly spaced from said retractable anvil and a clincher located between and reciprocable in the same direction as said punches and cooperating with said clinching anvil for clinching the U-shaped staple; a carrier carrying said two punches

spaced from each other; a driver mounted on said support means reciprocable in said predetermined direction and carrying said clincher for movement therewith; moving means connected to said driver for moving the same along an active stroke from an upper rest position to a lower end position in which said clincher clinches said U-shaped staple and along a return stroke back to said rest position, said driver and said carrier being constituted by a pair of elongated bars reciprocable in said predetermined direction and each being formed with a bore extending transverse to said predetermined direction, the bores being aligned with each other at least in said rest position of said driver; cooperating stop means on said support means and said carrier for stopping said movement of the latter after said punches mounted thereon have bent said cut-off wire into a U-shaped staple and moved the latter towards said clinching anvil; coupling means movable between a coupling position and an uncoupling position for connecting, when in said coupling position, said carrier to said driver for movement along said active stroke, said coupling means comprising a pin extending through said bores in said aligned position of the latter, second biasing means cooperating with said pin for biasing said latter in said transverse direction for moving said pin out of the bore of one of said bars, means cooperating with said pin for rendering said second biasing means inactive during the active stroke of said driver until the carrier is stopped by said stop means and for rendering said second biasing means active when said carrier is stopped to thus move said pin out of the bore in said one bar permitting thereby said driver to continue its movement while said carrier is stopped so as to permit said clincher carried by said driver to move downwardly relative to said punches to clinch the staple; and means to return said coupling means to said coupling position during movement of said driver along its return stroke.

22. A stapling machine as defined in claim 21, wherein said support means comprises an elongated guide member formed with an elongated groove extending in said predetermined direction and having a bottom face and a pair of side faces, said elongated bars being arranged superimposed upon each other in said groove and said bores having axes substantially normal to said bottom face of said groove.

23. A stapling machine as defined in claim 22, wherein said second biasing means comprises spring means engaging said pin and being biased for urging said pin out of the bore of said one bar, and wherein said means for rendering said second biasing means inactive and active comprises stationary cam means having a cam face engaging one end of said pin, said cam face having an elongated portion extending in said predetermined direction substantially parallel to said bottom face of said groove and a portion inclined to said elongated portion in a direction so as to permit said pin to move under the influence of said spring means out of said bore in said one bar.

24. A stapling machine as defined in claim 23, wherein said means for returning said coupling means to said coupling position comprises means to align said bores with each other during the return stroke of said driver so that said cam means may move said pin against the action of said second biasing means back into the bore of said one bar.

25. A stapling machine as defined in claim 24, wherein said aligning means comprises an elongated slot extending on said predetermined direction and being formed in one of said bars, a pin member fixed to the other bar and extending into said slot, and additional biasing means cooperating with said bars for yieldably maintaining said pin member in engagement with one end of said slot, said one end of said slot in said one bar and said pin member in said other bar being arranged relative to said bores so that the latter are aligned with each other when said pin member engages said one end of said slot.

26. A stapling machine as defined in claim 25, wherein said additional biasing means comprises a coil spring located in said slot and connected at opposite ends to said driver and said carrier, respectively.

27. A stapling machine as defined in claim 23, wherein said driver has a rear face engaging said bottom face of said groove and a front face, said carrier being superimposed on said driver and having a rear face engaging said front face of said driver and a front face, said one bar being constituted by said driver.

28. A stapling machine as defined in claim 27, and including a cover fixed to said guide member extending over the open side of said groove and engaging with one face thereof said one face of said carrier, said cover being formed with an elongated slot extending in said predetermined direction, said pin having an end portion projecting into said slot in said cover, said cam being fixed to said cover extending over said slot formed therein.

29. A stapling machine as defined in claim 28, wherein said pin has at the free end of the portion extending into said slot of said cover a head of larger diameter than the remainder of said pin and having a spherical face engaging said cam face, and wherein said spring means comprises a coil compression spring about said portion of said pin between the head and the front face of said carrier.

30. In a stapling machine or the like, a combination comprising guide means formed with an elongated groove; an elongated driver member and an elongated driven member mounted superimposed upon each other in said groove for movement in longitudinal direction along an active stroke and a return stroke; coupling means movable between a coupling position and an uncoupling position for connecting, when in said coupling position, said driver member to said driven member for movement along its strokes; stop means cooperating with said driven member for stopping movement of the latter before said driver member reaches the end of its active stroke; means cooperating with said coupling means for moving the same to said uncoupling position when movement of the driven member has been stopped while said driver member finishes its active stroke; means to return said coupling means to said coupling position during movement of said driver member along its return stroke; and additional means between said driven member and said driver member for moving said driven member with said driver member during said return stroke while positioning said driven member relative to said driver member for permitting movement of said coupling means to said coupling position, said additional means comprising an elongated slot formed in one of said members, a pin fixed to the other of said members and biasing means for yieldably maintaining said pin in engagement with one end of said slot.

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