April 19, 1955 H. O. MOORE 2,706,293

ELECTRICAL ACTUATOR FOR STAPLERS

Filed July 21, 1954 3 Sheets-Sheet 1

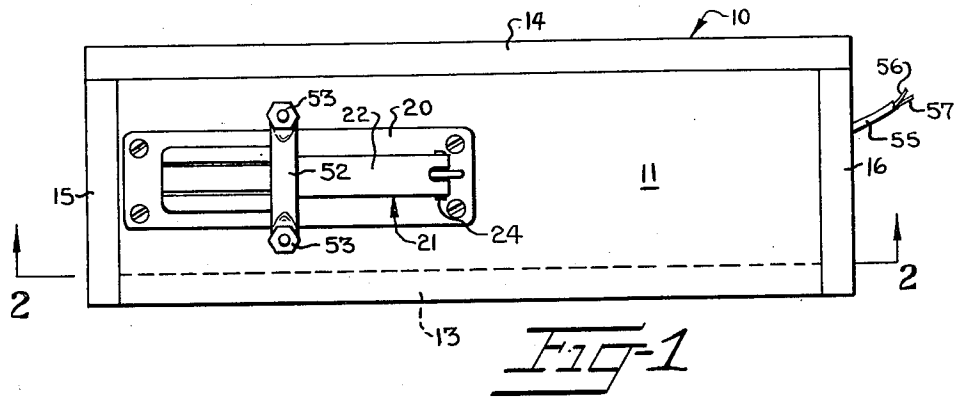


Fig-1

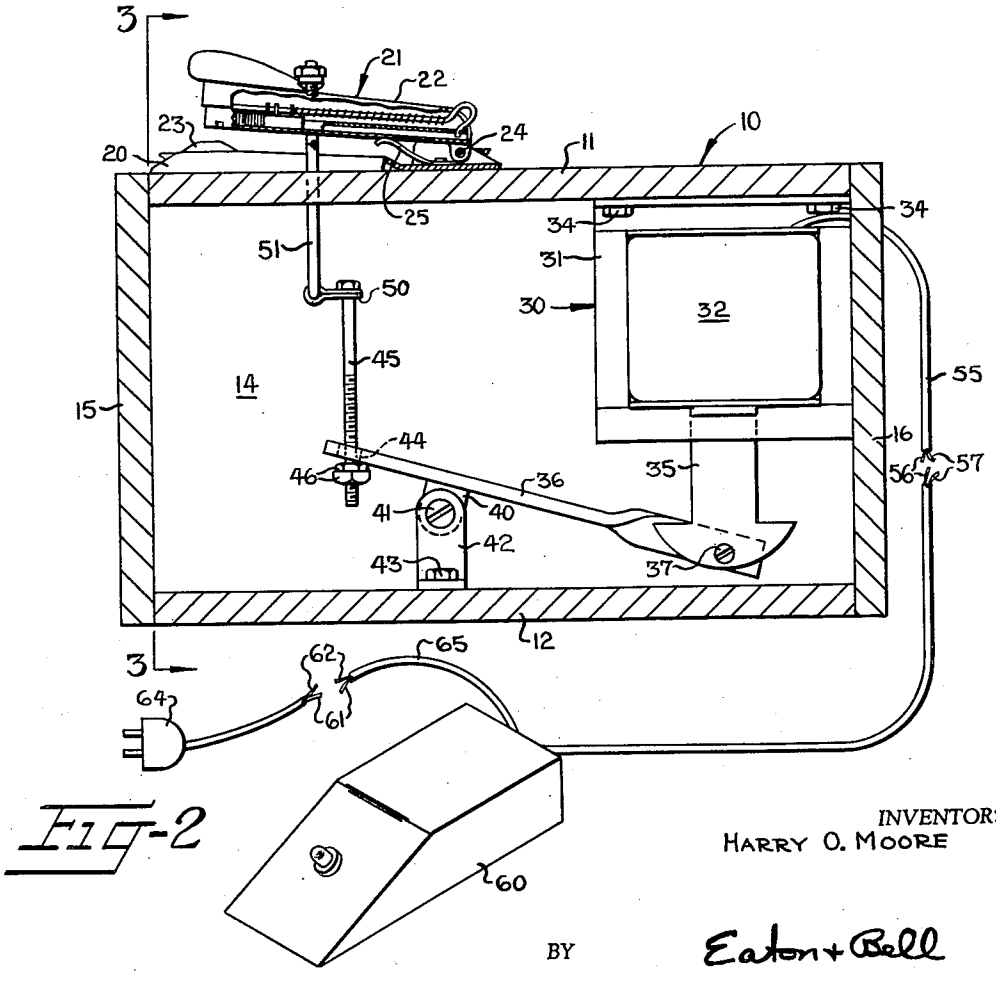


Fig-2

INVENTOR:
HARRY O. MOORE

BY Eaton + Bell

ATTORNEYS

April 19, 1955 H. O. MOORE 2,706,293

ELECTRICAL ACTUATOR FOR STAPLERS

Filed July 21, 1954 3 Sheets-Sheet 2

Fig-3

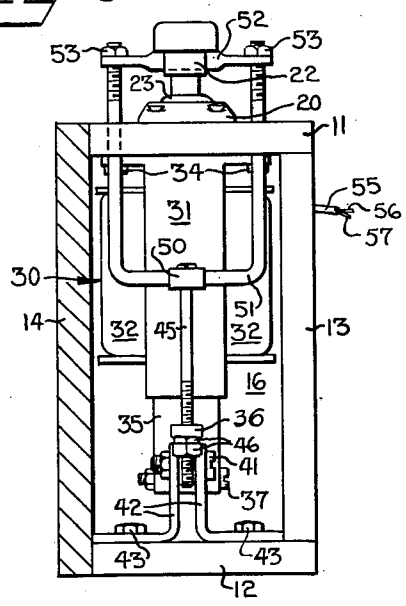
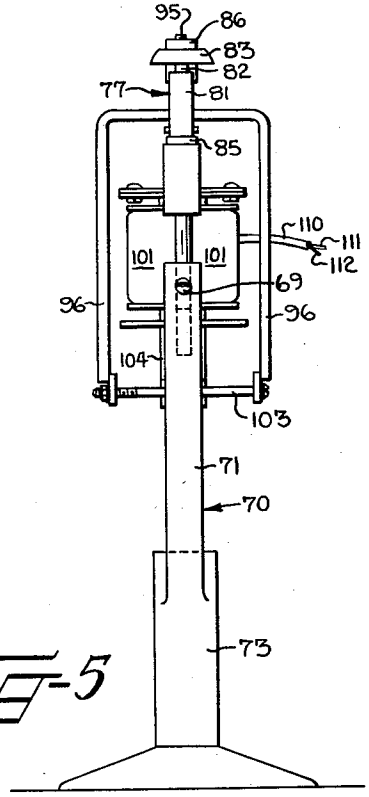


Fig-5



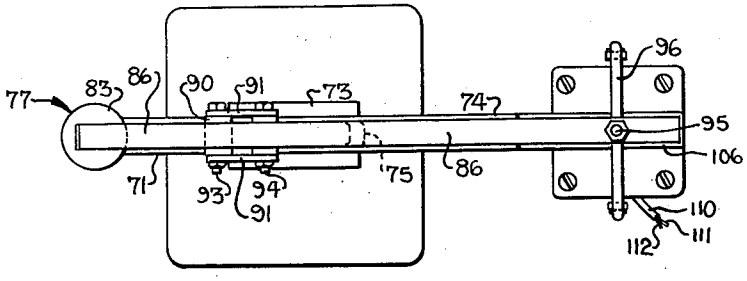


Fig-4

INVENTOR:
HARRY O. MOORE

BY Eaton & Ball

ATTORNEYS

April 19, 1955 H. O. MOORE 2,706,293

ELECTRICAL ACTUATOR FOR STAPLERS

Filed July 21, 1954 3 Sheets-Sheet 3

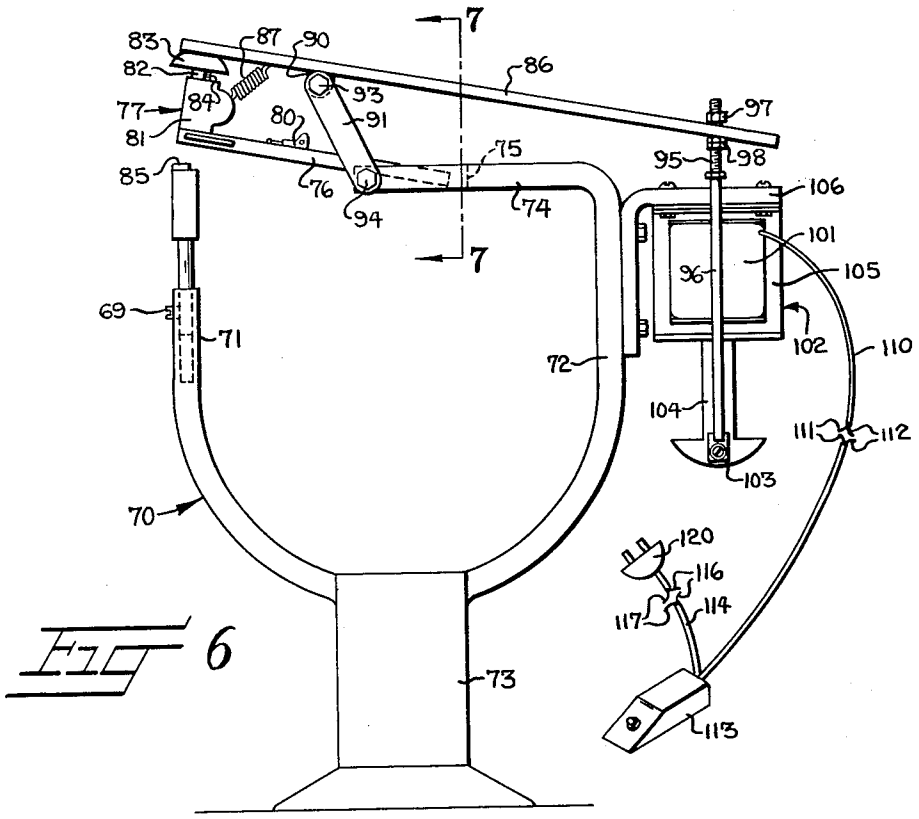


Fig 6

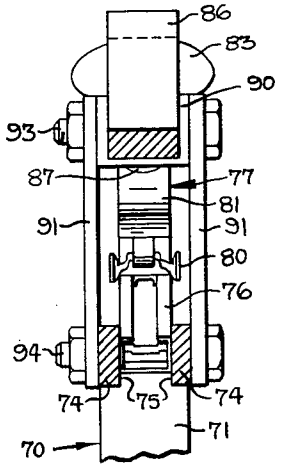


Fig 7

INVENTOR:
HARRY O. MOORE

BY Eaton & Bell

ATTORNEYS

United States Patent Office 2,706,293 Patented Apr. 19, 1955

2,706,293

ELECTRICAL ACTUATOR FOR STAPLERS

Harry O. Moore, Charlotte, N. C., assignor to Silabert Corporation, Charlotte, N. C., a corporation of North Carolina

Application July 21, 1954, Serial No. 444,873

8 Claims. (Cl. 1—3)

This invention relates to fastener-applying implements, such as stapling machines, for attaching papers and other sheets, for securing the walls of paper board cartons together and for use generally in fastening or stapling together various objects and articles.

It is an object of this invention to provide an improved electrically operable stapler actuator which is much more simple to construct, maintain and reload than similar devices currently in use and which, consequently, can be more economically produced than similar devices heretofore employed.

It is another object of this invention to provide an improved mounting for a stapler of the usual hand-operated type with novel electrically controlled means for actuating the stapler. The improved mounting means comprises a frame to which the usual type of hand-operated stapler is secured and the movable element of the fastener-applying implement or stapler is actuated by one end of an arm or lever pivoted intermediate its ends on the frame and extending rearwardly relative to the operating end of the stapler and having its other end connected to the lower end of the plunger of a solenoid, the coil of which is disposed above the free end of the plunger and mounted in a solenoid frame suitably secured to the main frame so that, upon actuation or energization of the coil of the solenoid, the plunger suddenly darts upwardly to impart downward movement to the front end of the arm or lever for actuating the stapler. The weight of the plunger of the solenoid is such that, when the flow of current to the solenoid is interrupted, the solenoid plunger will move downwardly, by gravity, and return the lever to inoperative position.

In the present application, two forms of the invention are shown, the first of which is devised for stapling relatively small particles such as paper bags of merchandise or sheets of paper. The second form is devised for stapling relatively large articles such as cardboard or paperboard boxes and the like. In the first form, the frame is in the form of a housing on the upper wall of which the stationary element of the stapler is secured and the frame of a solenoid is fixed to the lower surface of the top wall of the main frame or housing. The lower wall of the housing has a lever pivotally connected thereto intermediate the ends thereof, one end of which is pivotally connected to the plunger of the solenoid and the other end of which is connected to suitable linkage which serves to connect the said other end of the lever to the movable element of the stapler.

In the second form of the invention, the movable element of the stapler is pivotally connected to a forwardly projecting arm integral with the rear leg of a substantially U-shaped frame whose other leg has a clinching anvil on the upper end thereof forming the stationary part of the stapler. The lever is pivotally connected intermediate its ends on the arm projecting forwardly from the rear leg of the U-shaped frame and one end engages the upper portion of the front end of the movable element of the stapler and the rear end thereof has a suitable linkage connecting the same with the plunger of a solenoid suitably secured to the rear vertical leg of the frame.

Some of the objects of the invention having been stated, other objects will appear as the description proceeds when taken in connection with the accompanying drawings, in which—

Figure 1 is a top plan view of one form of the apparatus;

Figure 2 is a longitudinal vertical section view taken substantially along line 2—2 in Figure 1 and showing the circuit for the solenoid;

Figure 3 is a transverse vertical sectional view, mostly in elevation, taken substantially along line 3—3 in Figure 2;

Figure 4 is a top plan view of another form of the apparatus;

Figure 5 is a front elevation looking at the left-hand side of Figure 4;

Figure 6 is a side elevation looking at the right-hand side of Figure 5 and showing the circuit for the solenoid;

Figure 7 is an enlarged fragmentary vertical sectional view taken along line 7—7 in Figure 6.

Referring more specifically to the drawings, one form of the invention is shown in Figures 1, 2 and 3 and the other form of the invention is shown in Figures 4, 5, 6 and 7. In the first form of the invention, the numeral **10** broadly designates a suitable housing which may be in the form of a box-like structure including top and bottom walls **11**, **12**, side walls **13**, **14** and front and rear end walls **15**, **16**.

Suitably secured to the forward portion of the outer surface of the top wall **11** of the frame or housing **10** is the base or stationary element **20** of a conventional stapler broadly designated at **21** of the usual hand-operated type and this stapler **21** is preferably of the type disclosed in the patent to Morris Abrams et al., Number 2,312,142, dated February 23, 1943, and such as is manufactured by Arrow Fastener Company, Brooklyn 6, New York. The specific stapler noted is illustrative only, and it is to be understood that the present invention may be satisfactorily employed with various other types and sizes of staplers, but staplers of the type noted have been found preferable because the supply of staples therein can be easily replenished without removing the arm or movable element **22** thereof from the stationary element **20**.

The base **20** of the stapler **21** has a clinching anvil **23** fixed thereon and the arm or movable element **22** is pivotally connected to the base or stationary element, as at **24** and forms a magazine for containing a supply of fasteners or staples. The arm **22** is normally resiliently urged upwardly by a leaf-spring member **25**, all of which is clearly shown in said Patent No. 2,312,142.

The improved electrically operated or controlled means for actuating the stapler **21** comprises a solenoid broadly designated at **30** and including a substantially rectangular frame **31** in which a coil **32** is secured. The frame **31** is suitably secured to the inner surface of the top wall **11** of the housing **10** adjacent the rear wall **16** as by screws **34**. Mounted for vertical movement in the lower portion of the frame **31** and within the coil **32** is a solenoid plunger **35**.

The plunger **35** is connected by suitable linkage to the stapler **21**, said linkage comprising a lever **36** pivotally connected as at **37** to the lower end of the plunger **35**. The medial portion of the lever **36** has a downwardly projecting portion **40** thereon which is pivotally mounted as at **41** between a pair of angle clips or brackets **42** serving as mounting means, whose horizontal legs extend laterally relative to the lever **36** and are suitably secured as by screws **43** to the inner surface of the bottom wall **12** of the housing **10**.

The forward portion of the lever **36** has an opening or slot **44** therein which is loosely penetrated by a threaded element or screw **45** preferably having a conventional head formed integral with the upper end thereof and an abutment adjacent the lower end thereof which may be in the form of a pair of lock nuts **46** threadably mounted thereon to facilitate adjustment of the effective stroke of the lever **36**. The abutment **46** is engaged by the lever **36** during actuation or energization of the coil **32** of the solenoid **30**.

The upper end of the link element or screw **45** slidably penetrates an arm **50**, the head of the screw **45** serving as an abutment for engaging the upper surface of arm **50** when the screw **45** is moved downwardly with the corresponding end of the lever **36**. The arm **50** is fixed to the lower horizontal portion of a U-shaped member or yoke **51**, the two vertical legs of which slidably penetrate the top wall **11** of the housing **10** and straddle the base **20** and arm **22** of the stapler **21**. The upper ends

of the legs of the yoke **51** loosely penetrate a cross bar or yoke connecting element **52** which rests against the upper surface of the movable arm **22** of the stapler **21** and is removably connected to the legs of the yoke **51** as by nuts **53** threadably mounted on the upper ends of said legs.

The coil **32** of the solenoid **30** has a cable **55** extending therefrom in which a pair of wires or conductors **56, 57** are disposed, corresponding ends of said wires **56, 57** being connected to opposite ends of the coil **32** and the other ends of the wires **56, 57** being connected to a suitable switch **60** which is shown in the form of a foot-operated switch in Figure 2. The other side of the switch **60** has a pair of wires **61, 62** leading therefrom and being connected to a suitable plug **64** adapted to be connected to a suitable source of electrical energy, not shown. The wires **61, 62** are preferably housed in a flexible cable **65**.

Upon closing the switch **60**, the coil **32** of the solenoid **30** is energized to cause sudden upward movement of the plunger **35** and to thereby impart counter-clockwise movement to the lever **36**. As the front end of lever **36** moves downwardly, it is apparent that corresponding movement is imparted to the linkage comprised of the screw **45**, the arm **50**, the yoke **51** and the cross bar **52** to thereby actuate the movable element **22** of the stapler **21**.

It is apparent that, upon the switch **60** again being opened, the coil **32** of solenoid **30** is de-energized and the weight of the plunger **35** is such that it will move downwardly, by gravity, to impart upward movement to the front end of the lever **26** and whereupon the leaf-spring **25** will raise the movable element **22** of the stapler **21** along with the cross bar **52**, the yoke **51**, the arm **50** and the screw **45**, thus providing a simple and efficient means for operating the stapler **21**, which may be much more economically maintained and constructed than similar devices currently in use.

Second form of the invention

The second form of means for operating the stapler shown in Figures 4, 5, 6 and 7 is quite similar to the form shown in Figures 1, 2 and 3 and is merely shown to illustrate its application to a commercial stapling apparatus of the character frequently used in stapling large articles such as cardboard or paperboard boxes, and the like.

The second form of stapler actuating device comprises a substantially U-shaped frame **70** having spaced front and read legs **71, 72** projecting upwardly in diverging relation from a base or pedestal **73**. Although the legs **71, 72** are illustrated as being of arcuate configuration, it is to be understood that they may extend laterally from the base and thence vertically to form a substantially rectangular frame if desired. Also, stable reinforcing means, not shown, may extend from the base **73** to the outer surface of each leg **71, 72**. The front leg **71** is adjustable vertically relative to the rear leg **72** by any suitable means such as a set screw **69**. This feature facilitates the entry of various sizes of cartons and other articles into the frame preparatory to the stapling operation.

The upper end of the rear leg **72** has a forwardly projecting stapler supporting arm **74** thereon whose front end is bifurcated, as at **75**, for the reception of the rear end portion of the movable element or arm **76** of a conventional stapler or fastener-applying implement broadly designated at **77**.

The arm or movable element **76** of the stapler **77** is of usual hollow construction and serves as a housing for staples, not shown, which staples may be inserted through the rear end of the arm **76** and are normally urged forwardly by a spring-loaded element **80** in a manner well known in the art.

The arm **76** has a conventional stapler head **81** thereon in which a plunger **82** is mounted for vertical movement, said plunger being provided with a cap **83** and normally being urged upwardly by a compression spring **84**. The front leg **71** of the substantially U-shaped frame **70** is provided with a suitable clinching anvil **85** on the upper end thereof. It is apparent that, when the arm **76** of the stapler **77** is moved downwardly against the anvil **85**, the cap **83** is then depressed and whereupon the plunger **82** forces the staples outwardly against the anvil **85** for upsetting the ends of the staples in the usual manner.

The improved means for electrically actuating the stapler **77** is similar to that heretofore described and comprises a lever **86** which is shown in the form of an elongated relatively thin flat bar whose front end bears against the upper surface of the cap **83** on the plunger **82**, said cap being held against the front portion of the lever **86** as by a tension spring **87**, one end of which is connected to the forward portion of the lever **86** and the other end of which is connected to the stapler head **81**.

The forward portion of the lever **86**, rearwardly of the stapler head **81**, has a depending projection **90** thereon which is pivotally connected to the upper ends of a pair of rigid links or arms **91**, as by a bolt **93**. Said links **91** thus serve as mounting means for lever **86**. The rigid links **91** extend downwardly and rearwardly at an angle and are fixed against opposite sides of the forwardly projecting arm **74** on the rear leg **72** as by a bolt **94**. The bolt **94** also serves to pivotally support the stapler arm **76** between the arms defined by the bifurcated end **75** of the arm **74** of the U-shaped frame **70**.

The lever **86** extends rearwardly beyond the vertical plane of the leg **72** of the U-shaped frame **70** and is loosely penetrated by a threaded shaft or screw **95** whose lower end is suitably secured, or integral with, an inverted U-shaped member or yoke member **96**. The threaded shaft **95** has upper and lower spaced lock nuts or abutments **97** and **98** adjustably secured thereon which engage the respective upper and lower surfaces of the rear portion of the lever **86**.

It will be observed in Figures 4 and 5 that the two arms of the inverted U-shaped member **96** extend downwardly past opposite sides of the coil **101** of a solenoid broadly designated at **102**. The lower ends of the arms or legs of the inverted U-shaped member **96** have opposite ends of a transverse bar **103** suitably secured thereto, which bar **103** is shown in the form of a bolt in Figure 5, This transverse bar or bolt **103** slidably penetrates the lower end of a solenoid plunger **104** which is mounted for vertical movement in the coil **101** and which is also mounted for vertical movement in the lower portion of a substantially rectangular frame **105** which supports the coil **101**. The frame **105** is suitably secured to the horizontal leg of an angle bracket **106** whose vertical leg is suitably secured to the rear surface of the rear leg **72** of the U-shaped frame **70**.

The flow of current to the coil **101** of the solenoid **102** may be controlled in any desired manner and, in this instance, there will be observed in Figure 6 a cable **110** having wires **111, 112** therein, corresponding ends of which are connected to opposite ends of the coil **101** and the other ends of which are connected to corresponding sides of a normally open manually operable switch **113** which is shown in the form of a foot-operated switch in Figure 6. The switch **113** also has a cable **114** leading therefrom in which wires **116, 117** are disposed, corresponding ends of the wires **116, 117** being connected to the opposite sides of the switch **113** from that to which the wires **111, 112** are connected and the other ends of the wires **116, 117** being connected to a suitable plug **120** adapted to be connected to a suitable source of electrical energy, not shown.

It is thus seen that, when the switch **113** is open, the weight of the solenoid plunger **104** is sufficient to urge the rear end of the lever **86** downwardly so the parts occupy the position shown in Figure 6. However, upon closing switch **113**, coil **101** of solenoid **102** is energized thereby causing the solenoid plunger **104** to dart upwardly in Figure 6 and to thereby impart downward movement to the forward end of the lever **86**, thus causing corresponding downward movement of the plunger **82** of the stapler **77** relative to the stapler head **81** to complete the stapling operation. Of course, when the switch **113** is again permitted to open, it is apparent that the parts will return to substantially the position shown in Figure 6.

It is thus seen that I have provided improved means for mounting and operating conventional staplers or fastener-applying implements which is extremely simple to manufacture and maintain and can, consequently, be much more economically produced than similar devices currently in use. To this end, a lever is connected at one end to the lower end of a solenoid plunger and the other end of the lever is connected by linkage to the corresponding fastener-applying implement or stapler in both forms of the invention.

In the drawings and specification there has been set

forth a preferred embodiment of the invention and although specific terms are employed, they are used in a generic and descriptive sense only, and not for purposes of limitation, the scope of the invention being defined in the claims.

I claim:

1. In a fastener-applying apparatus having a frame and a stapler fixed on said frame and said stapler having a movable element thereon, the combination of improved means for actuating said movable stapler element comprising a solenoid fixed to said frame rearwardly of the stapler, a solenoid plunger mounted for vertical movement in the solenoid and normally depending therefrom, mounting means on said frame, a lever pivotally mounted on said mounting means, means connecting one end of said lever to the lower end of said plunger, and means operatively connecting the other end of said lever to the movable element of said stapler.

2. An improved electrically operable stapler actuator adapted to receive a stapler having an anvil and a movable element for feeding and pressing staples onto the anvil upon actuation thereof, said improved actuator comprising a frame adapted to support said anvil and said movable stapler element adjacent its forward portion, a solenoid secured to the frame adjacent its rear portion, a plunger mounted for vertical movement in said solenoid and normally depending therefrom, mounting means on said frame, a lever pivotally mounted on said mounting means at a point between the anvil and the plunger of said solenoid, means connecting the rear end of the lever to the plunger of the solenoid and means operatively connecting the front end of the lever to the movable element of the stapler whereby, upon energization of said solenoid, the plunger is caused to dart upwardly therein to cause the rear portion of said pivoted lever to move upwardly and the forward portion thereof to move downwardly to actuate the movable element of the stapler.

3. An improved electrically operable stapler actuator having a frame adapted to receive a stapler adjacent one end thereof said improved actuator comprising a solenoid secured to the frame in spaced relation to said stapler, a solenoid plunger mounted for vertical movement within said solenoid and extending therefrom, mounting means on said frame, a lever pivotally supported intermediate its ends on said mounting means beneath said stapler, one end of said lever being pivotally connected to the free end of said solenoid plunger, an adjustment screw adjustably connected to the end of said lever remote from said solenoid plunger, a substantially U-shaped member connected at its web portion to the end of said screw remote from said lever and having its legs extending past opposite sides of the stapler, a cross bar connected to and spanning the distance between the ends of the legs of said U-shaped member, and said cross bar resting against the upper surface of said stapler, at least during downward movement of the corresponding ends thereof whereby, upon energization of the coil, the plunger will dart upwardly to impart corresponding movement to the lever and to cause the front end of the lever to move downwardly to impart corresponding movement to the threaded shaft or screw, the U-shaped member and the actuating member or movable element of the stapler.

4. An improved electrically operable stapler actuator for accommodating a stapler having an anvil thereon and a normally upwardly biased stapler actuating member; said improved actuator comprising a substantially horizontally disposed frame member, means securing the stapler to the forward portion of said frame member, a U-shaped member having a cross bar connecting the upper ends of the legs thereof and normally resting upon the actuating member of the stapler, the legs of said U-shaped member loosely penetrating the main frame member on opposite sides of the stapler, a threaded member having its upper end fixed to the lower portion of the U-shaped member and extending downwardly therefrom, mounting means on said frame, a lever pivotally supported intermediate its ends on said mounting means and being loosely penetrated at its forward end by the lower portion of said threaded shaft, a threaded abutment adjustably secured on the lower end of said threaded shaft and adapted to be engaged by the forward end of said lever, a solenoid plunger pivotally connected to the rear end of said lever and extending upwardly therefrom, a solenoid coil surrounding the upper portion of said solenoid plunger and adapted to be connected in an electrical circuit, a solenoid coil frame supporting said solenoid coil and being secured to the lower surface of the frame member, and the weight of the solenoid plunger being sufficient to move the rear end of the lever downwardly to thereby normally maintain the U-shaped member in raised position whereby, upon energization of said coil, the plunger will move upwardly to impart corresponding downward movement to the actuating member of the stapler.

5. An improved electrically operable stapler actuator adapted to receive a stapler, said improved actuator comprising a substantially U-shaped frame forming spaced front and rear upright legs thereon, a forwardly projecting arm integral with the rear leg and terminating short of the front leg, an anvil fixed on the upper end of the front leg and adapted to cooperate with said stapler in a stapling operation, a lever, upwardly projecting means on the forward end of the arm integral with said rear leg for pivotally supporting the medial portion of said lever, spring means normally urging the free front end of said lever toward the upper surface of said stapler, means pivotally supporting said stapler on the forward portion of said forwardly extending arm integral with said rear leg of the U-shaped frame, a solenoid carried by the rear leg of the frame, a plunger extending from said solenoid, a U-shaped member having its legs disposed on opposite sides of said solenoid, means pivotally connecting the legs of said inverted U-shaped member to the solenoid plunger, and means connecting the web of said U-shaped member to the rear portion of said lever whereby the weight of the solenoid plunger normally maintains the front end of the lever in elevated position and normally maintains the arm of the stapler in raised inoperative position and whereby, upon energization of said coil, the solenoid plunger will dart upwardly to impart downward movement to the stapler to cause the arm thereof to engage the anvil and to subsequently depress the plunger of the stapler.

6. An electrically operable stapler actuator for a stapler having a magazine and an operating head for dispensing staples, said actuator comprising a frame adapted to receive the stapler, said frame comprising a base and a pair of upwardly diverging arms extending from said base, a substantially horizontally disposed frame member extending from the upper end of a first of said arms toward the upper end of a second of said arms and terminating short thereof, a stapler having an operating head pivotally connected to the free end of said horizontally disposed frame member, means pivotally supporting the end of said operating head remote from said horizontally disposed frame member in spaced relation above the upper end of said second arm, an anvil fixed to the upper end of the second arm, electrically operable means for actuating said stapler comprising a solenoid and a switch disposed in an electrical circuit, means connecting said solenoid to said first arm, a solenoid plunger extending from said solenoid, a lever, means for a maintaining one end of said lever in engagement with the operating head of said stapler, and means connecting the other end of said lever to said solenoid plunger.

7. A structure according to claim 6 wherein the free end of said substantially horizontally disposed frame member is bifurcated for the pivotal reception of the end of said stapler remote from its operating head.

8. A structure according to claim 7 wherein means are provided for pivotally connecting the medial portion of said lever to the free end of said horizontally disposed frame member.

References Cited in the file of this patent

UNITED STATES PATENTS

2,580,135 Soave ---------- Dec. 25, 1951