

Aug. 2, 1960

H. O. MOORE

2,947,002

ELECTRICALLY OPERABLE STAPLER

Filed Feb. 11, 1957

4 Sheets-Sheet 1

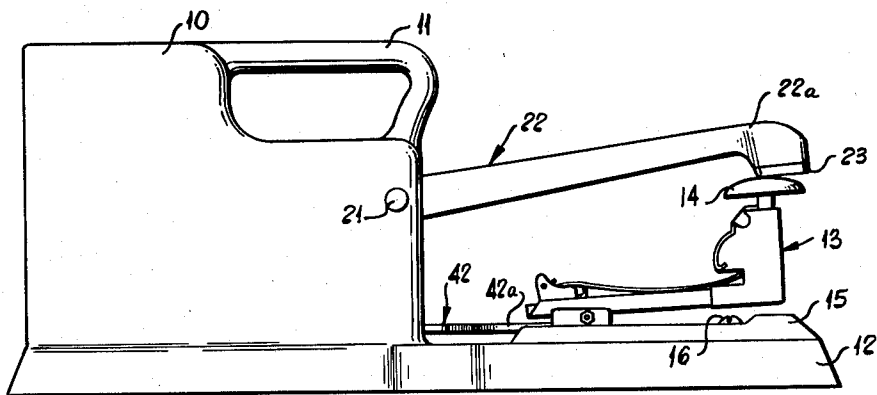


Fig-1

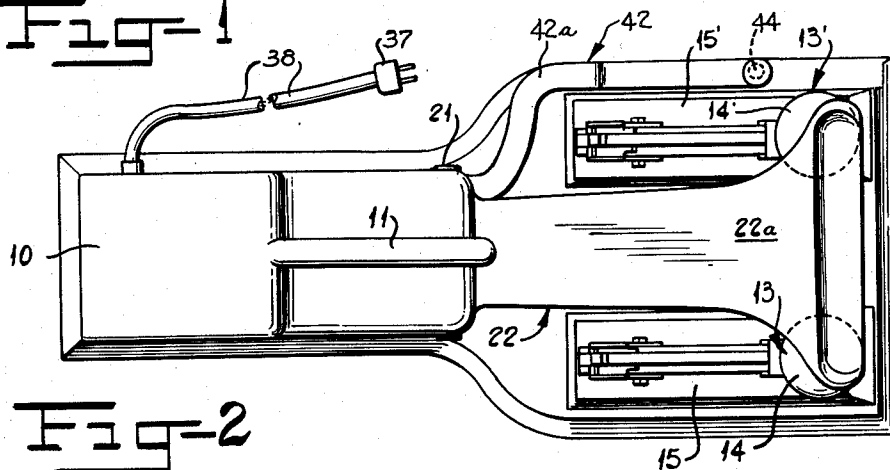


Fig-2

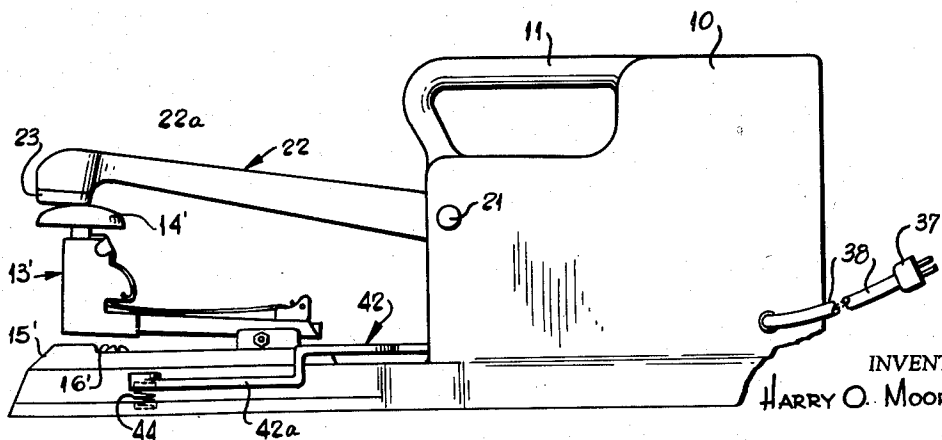


Fig-3

INVENTOR:

HARRY O. MOORE

BY Eaton, Bell, Hunt & Seltzer

ATTORNEYS

Aug. 2, 1960

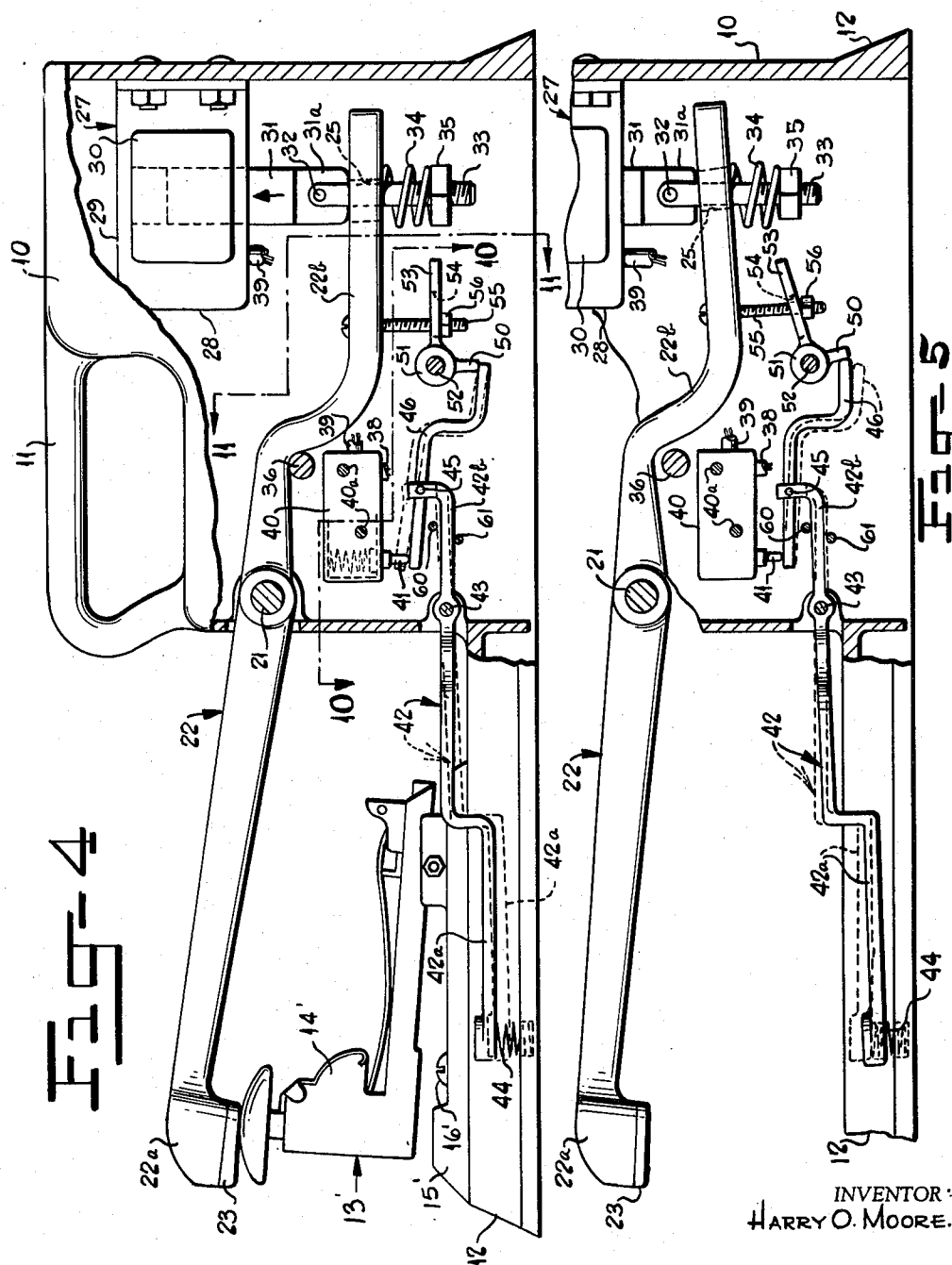
H. O. MOORE

2,947,002

ELECTRICALLY OPERABLE STAPLER

Filed Feb. 11, 1957

4 Sheets-Sheet 2



INVENTOR:
HARRY O. MOORE.

BY Eaton, Bell, Hunt + Seltzer

ATTORNEYS

Aug. 2, 1960

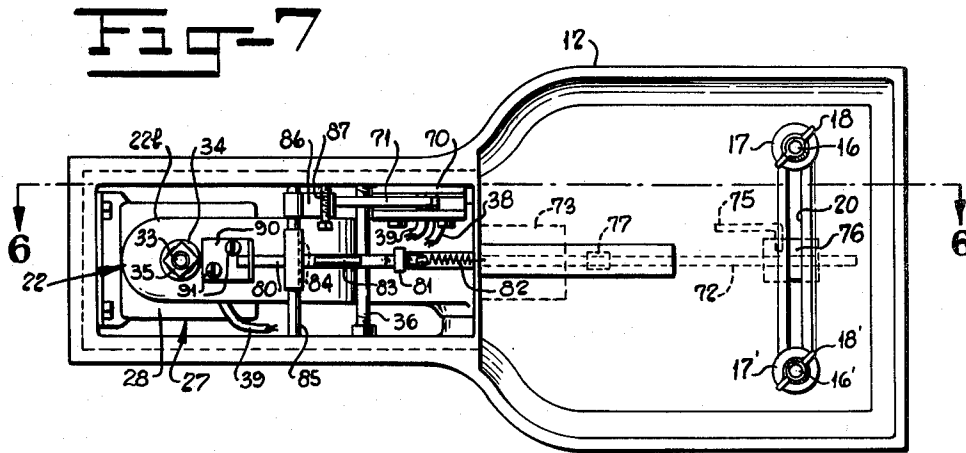
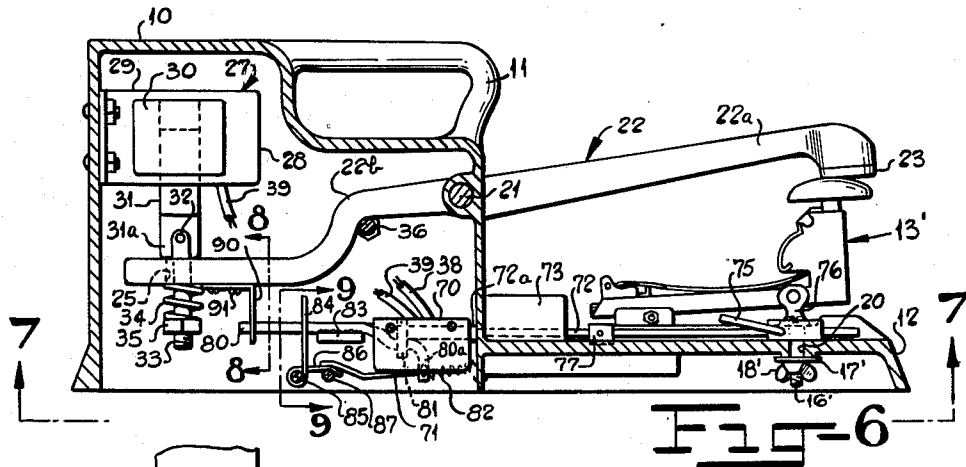
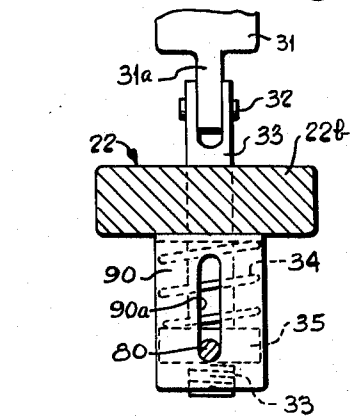
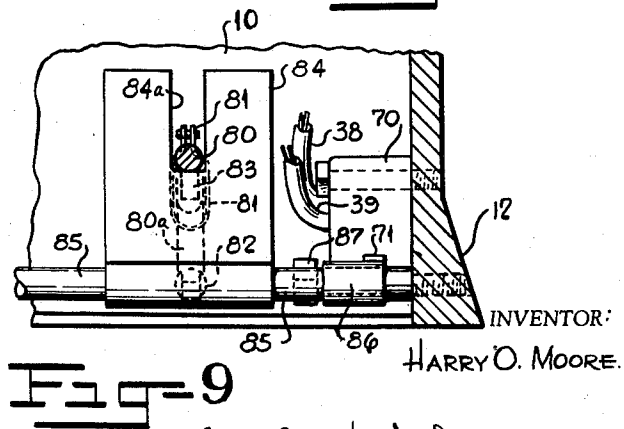
H. O. MOORE

2,947,002

ELECTRICALLY OPERABLE STAPLER

Filed Feb. 11, 1957

4 Sheets-Sheet 3



INVENTOR:
HARRY O. MOORE.

BY Eaton, Bell, Hunt + Deltger

ATTORNEYS

Aug. 2, 1960

H. O. MOORE

2,947,002

ELECTRICALLY OPERABLE STAPLER

Filed Feb. 11, 1957

4 Sheets-Sheet 4

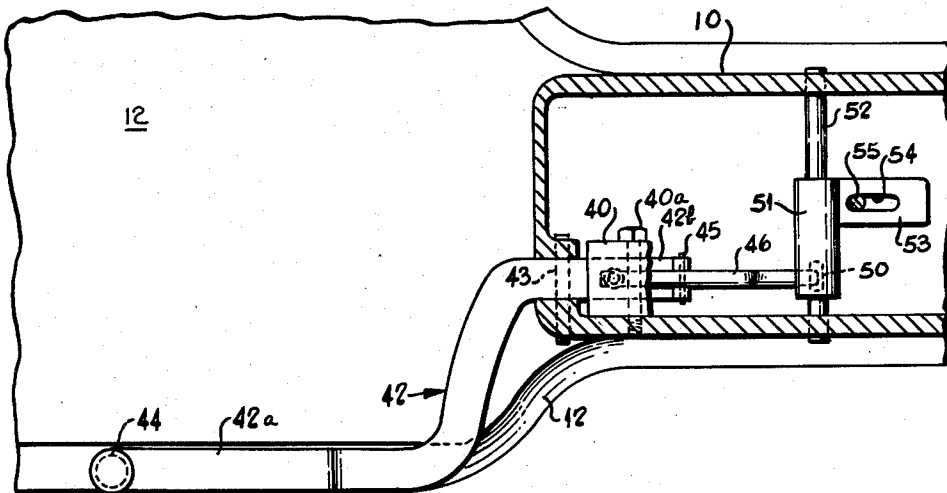


Fig-10

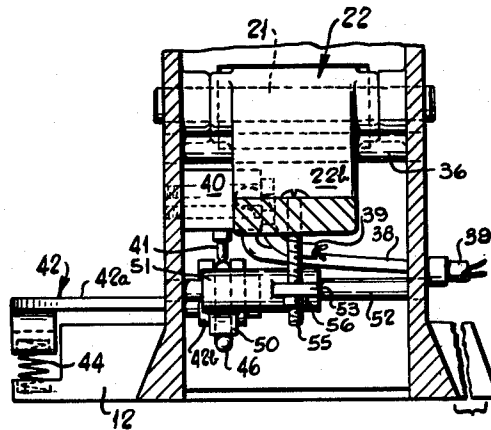


Fig-11

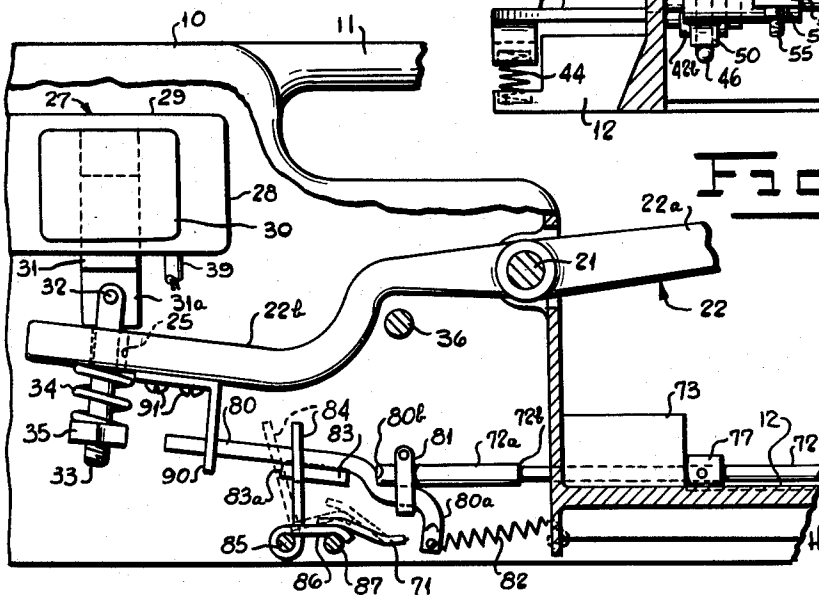


Fig-12

INVENTOR:
HARRY O. MOORE.

BY Eaton, Bell, Hunt & Deltzer

ATTORNEYS

1

2,947,002

ELECTRICALLY OPERABLE STAPLER

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

Filed Feb. 11, 1957, Ser. No. 639,538

2. Claims. (Cl. 1—3)

This invention relates to stapling machines and more particularly to an improved electrically operable stapler adapted to receive conventional hand-operated stapling machines and which is provided with improved electrically operable means for actuating the conventional stapling machines.

It is an object of this invention to provide a stapler which is constructed to actuate two conventional hand-operated stapling machines at one time and wherein means are provided for adjusting the distance between the two stapling machines to permit various widths of packages or boxes to be stapled.

It is another object of this invention to provide an improved and simplified lever means for actuating the conventional stapling machines which is so constructed as to be able to actuate most any type of conventional hand stapling machine.

It is a further object of this invention to provide a solenoid-actuated stapling mechanism which is energized by novel forms of switch actuating means which automatically break the electrical circuit to the solenoid to limit the stroke of the solenoid plunger and prevent it from engaging the closed end of the solenoid. This arrangement prolongs the life of the solenoid and prevents it from being beaten to pieces in a short interval of time as well as reduces the noise of operation. One form of switch actuating means is embodied in an hand-operated type while another form is embodied in a type actuated by the article being stapled.

It is a further object of this invention to provide a stapler machine actuator lever provided with resilient means operatively connecting the same with a solenoid. The resilient means serves to prolong the life of the stapling machine by serving as a shock absorber to absorb a portion of the impact applied to the stapling machines during stapling operations and to assist in limiting the operational stroke of the solenoid plunger.

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 side elevational view of the first form of the electrically operable stapler shown in inactive position;

Figure 2 is a top plan view looking down on Figure 1;

Figure 3 is a side elevational view looking at the opposite side of Figure 1 and showing the arrangement of the switch actuating lever thereon;

Figure 4 is an enlarged side elevational view of Figure 1, partly in section and showing the arrangement of the various elements inside the housing for actuating the stapler;

Figure 5 is a view similar to Figure 4 with the conventional stapler machines removed and the parts arranged in operating or energized position;

Figure 6 is a vertical sectional view of a modified form of the invention showing a modified switch actuating mechanism and taken along line 6—6 of Figure 7;

2

Figure 7 is a bottom plan view taken along line 7—7 of Figure 6;

Figure 8 is an enlarged vertical sectional view taken along line 8—8 of Figure 6 and showing the manner in which the solenoid is connected with the stapler operating lever;

Figure 9 is an enlarged vertical sectional view taken along line 9—9 of Figure 6 and showing the arrangement of some of the parts for actuating the switch;

Figure 10 is an enlarged horizontal sectional view partly in plan taken along line 10—10 of Figure 4 of the first form of the invention and showing the arrangement of the switch actuating lever components;

Figure 11 is an enlarged vertical section taken on line 11—11 of Figure 4 of the first form of the invention and showing the arrangement of the switch actuating components and the manner in which the same are operatively connected to the stapler actuating lever;

Figure 12 is an enlarged fragmentary detail of Figure 2 of the second form of the invention with the parts shown in operating or energized position.

Referring now to the drawings, the same elements of both forms of the invention will be identified by the same reference numeral. Now referring more specifically to Figures 1 to 5, 10 and 11 wherein the first form of the invention is shown, the stapler is provided with an upright housing 10 having an arm 11 suitably secured thereto for facilitating the carrying of the stapler. Extending forwardly from the lower portion of the upright housing 10 is a platform or base 12 upon which are positioned a pair of conventional hand staplers 13 and 13'. The staplers 13, 13' comprise head portions 14, 14' and anvils or base portions 15, 15' which are penetrated by screws 16, 16', respectively, as shown in Figure 7. The screws 16, 16' are provided with washers 17, 17' and wing nuts 18, 18', respectively. The screws 16, 16' as observed in Figure 7 extend through an elongated transverse slot 20 provided in the base 12 to permit the staplers 13, 13' to be adjusted with respect to each other so as to accommodate various sizes of articles or packages to be stapled and to permit the staples to be placed the desired distance apart.

A stapler actuating lever broadly indicated by reference numeral 22 is pivotally mounted at 21 in the upper portion of the housing 10 for actuating the staplers 13, 13'. As will be observed in Figure 2, the outer end portion 22a of the lever 22 extending forwardly from the pivot 21 is substantially T-shaped with the outermost end of the lever being considerably wider than the portion adjacent the pivot 21 to permit the lever to actuate both staplers 13, 13' simultaneously. An elongated resilient cushion or pad 23 is preferably secured to the underside of the outermost end of the lever portion 22a to absorb the initial impact on the stapler heads 14, 14' and to lessen the noise of operation.

The inner extremity 22b of the lever 22 extending inwardly from the pivot 21 is substantially Z-shaped as viewed in Figures 4 and 5 and is provided with a vertical aperture or bore 25 adjacent its inner end. Positioned immediately above the aperture 25 is a vertically disposed solenoid 27 having an inverted generally U-shaped frame 28 enclosing the upper end 29, a coil 30 and a solenoid plunger 31 provided with a lug 31a depending vertically therefrom. The frame 28 is preferably built up in the usual manner from a number of identical U-shaped laminae stacked together to form a bank and secured together by means of rivets. This vertical arrangement of the solenoid plunger 31 permits the same to serve as weight means for resetting the parts after a stapling operation which will be explained in detail later.

The stapler actuating lever 22 is connected to the lug 31a of the solenoid plunger 31 by means of a bolt or

rod 33 penetrating the aperture 25 and being pivotally connected to the plunger by a pin 32. As will be observed in Figure 8, the bolt or rod 33 is provided with a bifurcated upper end portion in which is received the lug 31a of the solenoid plunger 31 through which the pin 32 extends to connect the two together. A compression spring 34 surrounds the lower portion of the bolt 33 with its upper end engaging the underside of the lever portion 22b and the lower end of the spring being retained on the bolt by a nut 35 against which the spring abuts.

As will be apparent upon observing Figures 4 and 5, the spring 34 serves as a loose connection to resiliently carry the inner end 22b of the lever 22 when the solenoid plunger 31 is actuated and moves upwardly during a stapling operation to lower the front end portion 22a of the lever 22 against the stapler heads 14, 14'. The spring 34 thus serves to absorb a portion of the impact on the stapler heads 14, 14' and to prevent too great a thrust being exerted thereon during a stapling operation. This greatly prolongs the life of the stapler machines 13, 13'. Also, the spring 34 serves to limit the operational stroke of the solenoid plunger 31 and prevents it from engaging the closed upper end 29 and the frame 28 which will be explained in greater detail shortly.

For maintaining the inner end 22b of the lever 22 in substantially horizontal position when the solenoid is de-energized, a stop rod 36 suitably secured in the opposite walls of the housing 10 is provided for the lever 22 to rest on. The stop rod 36, also serves to maintain the solenoid plunger 31 partially inside the coil 30 and to prevent the same from dropping therefrom and interrupting the operation of the solenoid.

For actuating the solenoid, a switch 40 (Figures 4 and 5) is provided which is positioned within the housing 10 and suitably secured to one side wall thereof as by screws 40a. Conductors 39 electrically connect one side of the switch 40 to the coil 30 of the solenoid. Conductors 38 extend from another side of the switch 40 to a conventional plug 37 which is adapted to be connected to a suitable source of power.

The switch 40 is a conventional type of switch and is provided with a spring loaded switch button or plunger 41 for normally maintaining the switch in open position. For actuating the switch button 41 to close the switch, a switch actuating lever broadly indicated by reference numeral 42 (Figures 4 and 5) is provided which is pivotally mounted at 43 in the front portion of the housing 10 adjacent one side thereof.

The switch actuating lever is a hand operated type of lever wherein the forward portion 42a of the same extending forwardly from the pivot 43 is substantially Z-shaped as viewed in Figure 4 and is provided with a compression spring 44 to normally maintain the lever in the position shown in full solid lines in Figure 4. The rearward portion 42b of the lever 42 extending inwardly from the pivot 43 is substantially L-shaped as viewed in Figure 4 with its inner end extending upwardly and to which is pivotally connected at 45 a Z-shaped rod 46. It will be observed in Figures 4 and 5 that the rod 46 is so connected at 45 that the greater portion of the rod 46 extends rearwardly from the pivot point 45 in overbalancing relation so as to cause the forward end of the rod to engage the switch button 41.

An arm 50 engages the upper surface of the inner end of the rod 46 to normally maintain the rod 46 in the position shown in full solid lines in Figure 4. The arm 50 is connected to a hub 51 which is pivotally mounted on a pin 52 suitably connected to the opposite side walls of the housing 10 as shown in Figures 10 and 11. The hub 51 as shown in Figure 10 extends inwardly from the arm 50 and has suitably connected adjacent its inner end a second arm 53 which is provided with an elongated slot 54 which is penetrated by a bolt 55 secured to the lever portion 22b. The bolt 55 has a nut 56 threadably secured to its lower end which nut serves as a lower stop for the arm 53

and to carry the arm 53 therewith when the stapler actuating lever 22 is moved from the position shown in Figure 4 to that shown in Figure 5.

It should be noted in Figure 4 that the arm 53 is considerably longer than the arm 50 and normally lies in substantially a horizontal plane whereas the arm 50 lies in a vertical plane when the device is in inoperative position with the arm 53 thus serving as a counterbalance to normally maintain the rod 50 in its vertical plane in engagement with the arm 46.

Stop pins 60, 61 as shown in Figures 4 and 5 are provided to limit the uppermost and lowermost positions of the switch actuating lever portion 42b. The pin 60 positioned to engage the uppermost surface of the switch actuating lever arm portion 42b serves to prevent too much force being exerted on the switch button 41 when the lever arm 42 is depressed to actuate the same. The lowermost pin 61 adapted to engage the lower surface of the lever arm portion 42b serves to maintain the lever arm portion 42b in substantially a horizontal position as shown in solid lines in Figure 4 to thus prevent the compression spring 44 at the front portion of the lever 42 from moving the opposite ends of the Z-shaped rod 46 out of engagement with the switch button 41 and the arm 50, respectively, when the solenoid is de-energized.

Now to explain the actuation of the switch 40, the switch actuating lever 42 and the rod 46 pivotally connected thereto are normally in the position shown in full solid lines in Figure 4 when the solenoid is de-energized or in inactive position. Upon the switch actuating lever 42 being depressed and moved to the position shown in dotted lines in Figure 4, the forward end of the rod 46 which engages the switch button 41 is moved to the position shown in dotted lines to depress the switch button and thus close the switch to energize the solenoid. It should be noted that the rear end of the rod 46 serves as a pivot point since this end is lockingly engaged by the arm 50 and prevented from upward movement. Thus, upon the switch actuating lever 42 being pivoted at 43 to move its inner end 42b upwardly, the forward end of the rod 46 will be carried upwardly therewith to depress the switch button 41 and close the switch.

Now, upon the switch button 41 being depressed to close the switch 40, the solenoid plunger 31 will be retracted or drawn upwardly inside the coil 30 to thus pivot the forward end portion 22a of the stapler actuating lever 22 downwardly into engagement with the heads 14, 14' of the staplers 13, 13'. It should be noted however that upon the solenoid plunger 31 moving upwardly the rear end portion 22b of the stapler actuating lever 22 is resiliently carried by the spring 34 to thus prevent any likelihood of the stapler heads 14, 14' receiving such a force as to damage the same. In this respect, it should be noted that the resilient cushion 23 secured to the under surface of the front end of the stapler actuating lever portion 22a serves to dampen the impact on the heads 14, 14' of the staplers and to insure a quieter operation.

When the solenoid plunger 31 is actuated the parts will be moved to the position shown in solid lines in Figure 5, wherein the normally horizontal arm 53 has been carried or pivoted by the bolt 55 and nut 56 to an uppermost position to thus move the normally vertical arm 50 out of engagement with the rear end portion of the rod 46. In this position, the rod 46 is free to pivot at 45 and permit the spring loaded switch plunger 41 to again open the switch and deenergize the solenoid even though the switch actuating lever 42 is still depressed. The movement of the spring actuated plunger 41 into the open position shown in solid lines in Figure 5 causes the rear end portion of the rod to pivot upwardly into the path of travel of the arm 50. Now, upon the switch actuating lever 42 being released, the compression spring 44 pivots the inner lever portion 42b downwardly into the dotted line position to thus lower the inner end of the rod 46 to the dotted line position shown in Figure 5

5

to permit the arm 50 to again engage the upper surface thereof upon the solenoid dropping down again to the starting position shown in Figure 4. As stated before, the arm 53 serves as a counterbalancing means to insure that the arm 50 will be moved to engage the upper surface of the inner portion of the rod 46 to thus reset the parts for another stapling operation.

It should be particularly noted that the arrangement of the parts for closing and opening the switch 40 permits the switch to be immediately opened subsequent to the solenoid being energized even though the switch actuating lever 42 is still manually depressed and in the solid line position shown in Figure 5. This arrangement limits the operational stroke of the solenoid plunger 31 and prevents the plunger from engaging the closed end 29 of the frame 28. It should also be noted that the spring 34 assists in limiting the operational stroke of the solenoid plunger and brings it to a cushioned stop.

Now, referring to the second form of the invention shown in Figures 6 to 9 and Figure 12, this form of the invention differs over the first form only in the means for closing the circuit to the solenoid. In the first form of the invention, we have seen that the switch actuating lever 42 is manually depressed to close the circuit. In this form of the invention, the article being stapled serves to close the circuit to actuate the stapler.

Referring now to Figures 6 and 7 in particular, a switch 70 is suitably secured to one side wall of the housing 10 and is provided with a spring leaf switch lever 71, as shown best in Figures 6 and 12, which is inherently biased downwardly to normally maintain the switch 70 in open position.

For actuating the switch lever 71, a rod 72 is positioned above the medial portion of the base or platform 12 and is slidably mounted in a boss 73 formed integral with the front wall of the housing 10. The boss 73 is provided with a longitudinal bore therein to permit the rod 72 to extend inside the housing 10. An article-engaging abutment or trip 76 is adjustably secured by an L-shaped locking arm 75 to the forward portion of the rod 72. The position of the abutment 76 on the rod 72 will be determined by the area of the article wherein the staplers are desired to be placed, that is, if the article is to be stapled close to its innermost end which is in engagement with the abutment, the abutment 76 will be positioned closer to the outer end of the rod 72 than if the article is to be stapled a considerable distance inwardly from its innermost end.

A stop 77 is secured to the switch actuating rod 72 adjacent the boss 73 and is adapted to engage the boss 73 and serve as the innermost stop for the rod 72. The switch actuating rod 72 extends inside the housing 10 and is provided with an enlarged inner end portion 72a to define a shoulder 72b adjacent the inner surface of the front wall of the housing 10, which serves as a stop for the rod by engaging the wall of the housing to limit the outermost position of the rod 72.

A substantially L-shaped rod 80 is loosely secured to the inner end portion 72a of the rod 72 by a U-shaped clamp 81. The rod 80 serves as an extension of the rod 72 and is provided with a downwardly depending end portion 80a to the lower end of which is secured one end of a tension spring 82, the other end of the spring being secured to the front wall of the housing 10. The rod 80 is also provided with a shoulder portion 80b which is maintained in engagement with the inner end of the rod portion 72a by the spring 82 to permit the two rods to operate in unison. The spring 82 thus serves to reset the article engaging abutment 76 on the front end of the rod 72 by moving the rod 72 outwardly after each stapling operation to reset the same for a subsequent operation.

The innermost end portion of the rod 80 is slidably positioned in an elongated vertical slot 90a (Figure 8) provided in an L-shaped bracket 90 (Figure 12) which is suitably secured by screws 91 to the lower surface of the inner end portion 22b of the stapler actuating lever

6

22. The medial portion of the rod 80 extends through a slot 84a (Figure 9) provided in the upper end of a plate-like arm 84 which is fixedly secured on a medial portion of a shaft 85. A cam or abutment element 83 is suitably secured to the under surface of the rod 80 at the medial portion thereof and is provided with a flat nose portion 83a which serves to engage the proximal vertical surface of the plate-like arm 84 to pivot the same in a counterclockwise direction, from the solid line position to the dotted line position as viewed in Figure 12, for reasons shortly to be explained.

Also fixedly secured to the shaft 85 and spaced outwardly from the plate-like arm 84 as clearly shown in Figures 7 and 9, is an arm 86 which normally has its free end resting against a stop 87 secured to one side wall of the housing 10 to limit the lowermost position of the arm 86. The spring leaf switch actuating lever 71 is positioned to overlie the arm 86 and to be moved upwardly into the dotted line position of Figure 12 to close the switch 70 upon the arm 86 being pivoted counterclockwise.

With the parts arranged in their inactive position as shown in Figure 6, the stapler is actuated by the material to be stapled engaging the abutment 76 of the rod 72 to slidably move the rod 72 inwardly which in turn carries the rod 80 inwardly therewith to move the cam 83 into engagement with the proximal vertical surface of the plate-like arm 84 to rotate the same in a counterclockwise direction which rotates the shaft 85 therewith to thus also rotate the arm 86 to cause the same to lift the switch actuating lever 71 to close the switch 70.

Upon the switch 70 being closed, the solenoid coil 30 will be energized to lift or retract the solenoid plunger 31 which in turn lifts the inner end portion 22b of the stapler actuating lever 22 which carries the rod 80 therewith to thus move the shoulder 83a of the cam 83 out of engagement with the proximal vertical surface of the plate-like arm 84 to position the cam 83 in the slot 84a as shown in Figure 12. With the shoulder 83a of the cam 83 now out of engagement with the vertical surface of the plate-like arm 84, the leaf spring switch actuating lever 71 will spring downwardly to open the switch 70 and exert a downward pressure on the arm 86 to thus rotate the shaft 85 and the plate-like arm 84 secured thereto clockwise, from the dotted line position to the position shown in solid lines in Figure 12 to thus reset the arms for another stapling operation. The tension spring 82 as shown in Figure 12 will now move the rod 80 to the right as viewed therein to thus reposition the cam 83 in the position shown in Figure 6 and at the same time moving the rod 72 outwardly until the shoulder portion 72b thereof engages the inner surface of the front wall of the housing 10.

It is thus seen that there has been provided a stapler adapted to use one or more conventional hand stapling machines and wherein both forms of the invention are provided with means for automatically opening the switch and resetting the parts after a stapling operation.

In the drawings and specification, there have been set forth several embodiments 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. A stapling device comprising a housing, a base extending forwardly from said housing, at least one stapling machine mounted on said base, a stapling machine actuating lever, means pivotally mounting said stapling machine actuating lever on said housing, said stapling machine actuating lever extending forwardly from said pivot means and overlying said stapling machine to actuate the same, a vertically disposed solenoid positioned in said housing and having a solenoid plunger normally depending downwardly therefrom, said stapling machine actuating lever extending rearwardly from

said pivot means inside the housing and underneath said solenoid, means for connecting the rear end portion of said stapling machine actuating lever to the solenoid plunger, and means for energizing said solenoid to retract the solenoid plunger to pivot the outer end of the actuating lever downwardly against the stapling machine to perform a stapling operation, said means for energizing the solenoid comprising a normally open switch, a switch button for closing the switch, a substantially horizontally disposed and pivotally mounted switch actuating lever positioned alongside said base adjacent said stapling machine and extending inside said housing, resilient means for normally urging the outermost end of said switch actuating lever upwardly, a substantially horizontally disposed rod pivotally secured to the inner end portion of said switch actuating lever, said rod being pivotally mounted at a medial portion thereof in overbalancing relation so that the end portion thereof extending rearwardly from the pivot point overbalances the end portion extending forwardly from the pivot point, the forward end of said rod being in engagement with said switch button to actuate the same and close the switch, a normally substantially vertically disposed and pivotally mounted arm lockingly engaging the rear end portion of said rod to prevent upward movement thereof, a normally horizontally disposed arm connected to said vertically disposed arm, and means for connecting the horizontally disposed arm to the rear end portion of the stapler machine actuating lever whereby upon said switch actuating lever being depressed, the forward end portion of said rod will be pivoted upwardly to close the switch and energize the solenoid to perform a stapling operation.

2. A stapling device comprising a housing, a base extending forwardly from said housing, at least one stapling machine mounted on said base, a stapling machine actuating lever, means pivotally mounting said stapling machine actuating lever on said housing, said stapling machine actuating lever extending forwardly from said pivot means and overlying said stapling machine to actuate the same, a vertically disposed solenoid positioned in said housing and having a solenoid plunger normally depending downwardly therefrom, said stapling machine

actuating lever extending rearwardly from said pivot means inside the housing and underneath said solenoid, means for connecting the rear end portion of said stapling machine actuating lever to the solenoid plunger, and means for energizing said solenoid to retract the solenoid plunger to pivot the outer end of the actuating lever downwardly against the stapling machine to perform a stapling operation, said means for energizing the solenoid comprising a switch positioned inside the housing and having a spring leaf switch lever normally maintaining the switch in open position, a relatively long horizontally disposed and slidably mounted switch actuating rod overlying said base adjacent said stapling machine and extending rearwardly inside said housing, means secured adjacent the forward end portion of said rod for being engaged by the article being stapled to move the rod rearwardly, a relatively short rod connected to the rear end portion of said switch actuating rod and having its rearmost end portion slidably carried by said stapling machine actuating lever, a cam secured to said short rod, a rotatable shaft positioned below said short rod, a vertically extending arm secured to said shaft and extending in the path of travel of said cam, and a second arm secured to said shaft and having its free end engaging the spring leaf switch lever to close the switch upon said switch actuating rod being moved rearwardly.

References Cited in the file of this patent

UNITED STATES PATENTS

1,383,977	Bowman	July 5, 1921
1,564,831	Crane	Dec. 8, 1925
2,088,350	Shanks	July 27, 1937
2,252,886	Fusco	Aug. 19, 1941
2,381,075	Nelsen	Aug. 7, 1945
2,399,575	Schleicher	Apr. 30, 1946
2,403,947	Oussani	July 16, 1946
2,635,235	Greene	Apr. 21, 1953
2,643,307	Geel	June 23, 1953
2,656,537	Geel	Oct. 27, 1953
2,698,159	Crum	Dec. 28, 1954
2,783,470	Valdez	Mar. 5, 1957
2,866,973	Ruskin	Jan. 6, 1959