

March 10, 1942.

O. E. OLSEN

2,275,548

STAPLING MACHINE

Filed Aug. 16, 1940

2 Sheets-Sheet 1

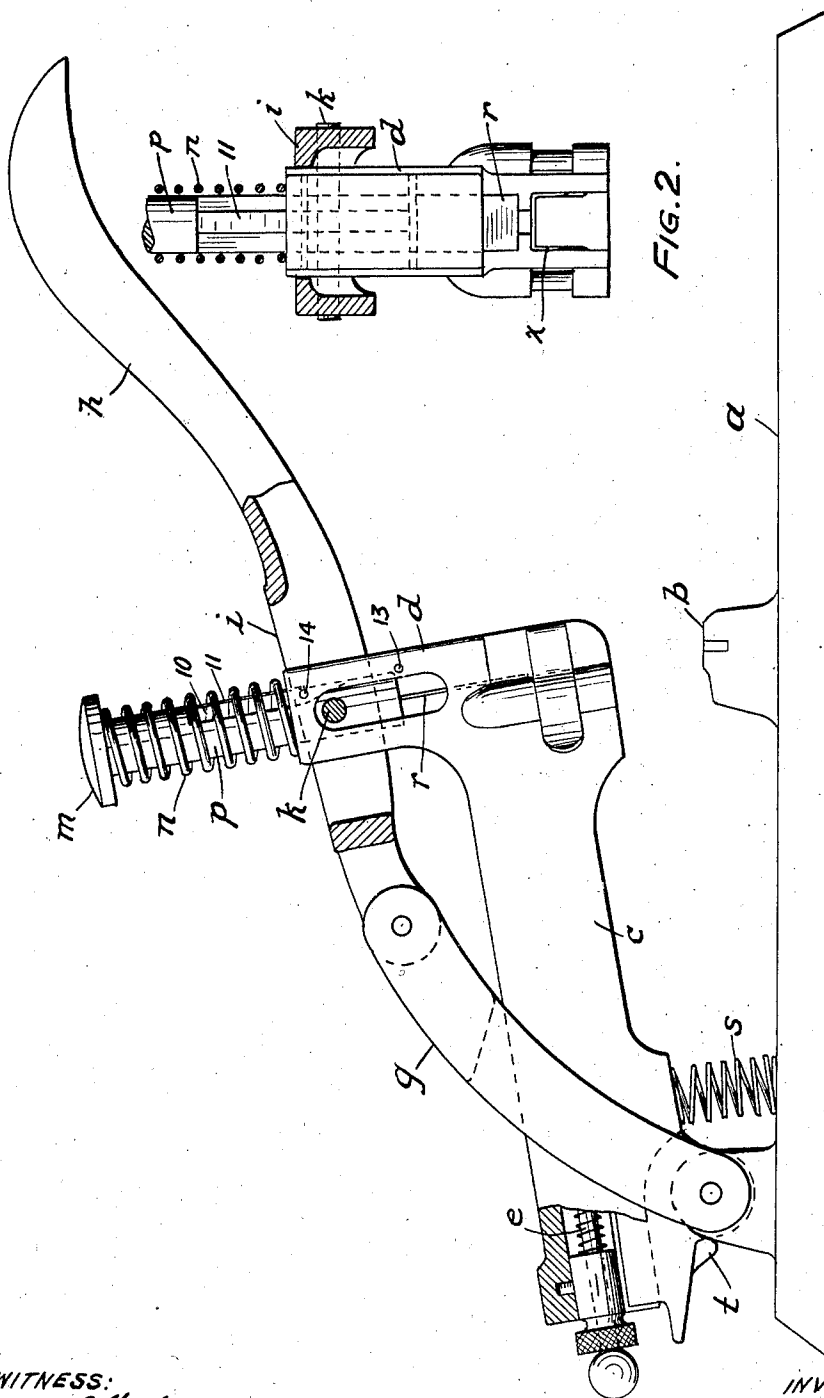


FIG. 2.

FIG. 1.

WITNESS:  
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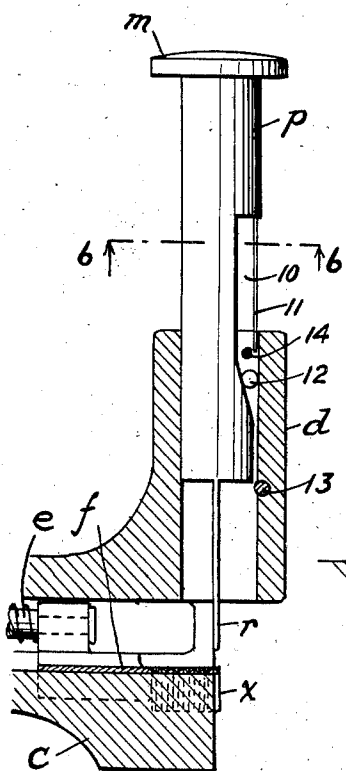


FIG. 3.

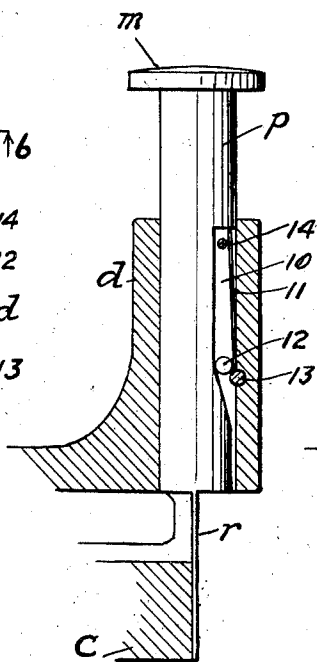


FIG. 4.

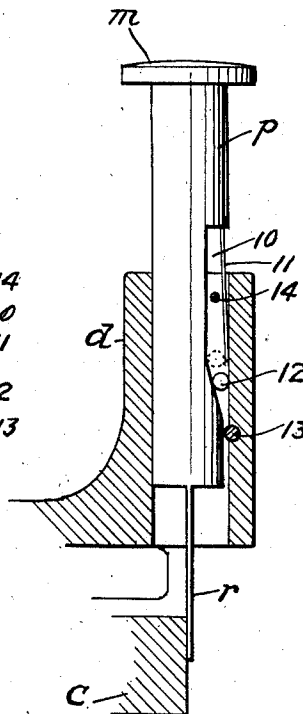


FIG. 5.

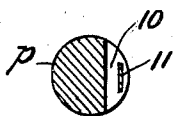


FIG. 6.

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## UNITED STATES PATENT OFFICE

2,275,548

## STAPLING MACHINE

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Acme Staple Company, Camden, N. J., a corporation of New Jersey

Application August 16, 1940, Serial No. 352,863

7 Claims. (Cl. 1—3)

My invention relates to machines for driving staples and is particularly applicable to those machines which contain means for automatically feeding staples, singly and successively, into position to be driven by successive operations of the staple driving mechanism. Such machines are well known in the art. Their successful operation, however, requires the operation of the feeding mechanism only if, in the immediately preceding staple driving operation, such mechanism has so fully completed its movement as to effect the driving and discharge of the previously positioned staple. Otherwise the staple is not discharged, and if, on the following up-stroke of the staple driving device, the feeding mechanism is allowed to deliver another staple, the machine becomes clogged and its further successful operation is prevented. Means to prevent, in such case, the operation of the staple feed mechanism are known in the art. My invention comprises a new and improved means for accomplishing the same object, said means being very simple in construction and certain in operation.

A preferred embodiment of the invention is shown in the accompanying drawings, in which—

Fig. 1 is a side view of the stapling machine.

Fig. 2 is an end view of the machine, with the hand operated lever and the spring for raising the staple driver shown in section.

Figs. 3 and 4 are sectional views of part of the machine; Fig. 3 showing the staple driver in its uppermost position relative to the frame carrying the staples and the staple feeding mechanism, and Fig. 4 showing the staple driver in the position it occupies when it has completed the driving and delivery of a staple.

Fig. 5 is a view, similar to Figs. 3 and 4, with the staple driving device in the position it occupies when it has not fully completed its down stroke and with the elements embodying my invention in the position they then occupy to prevent the feeding of another staple into position to be driven.

Fig. 6 is a section on the line 6—6 of Fig. 3.

Secured to the base *a* is the usual anvil *b*. On the base is pivotally mounted a frame *c* having at its free end a head *d* acting as carrier or holder for the staple driving device hereinafter described. A spring *s* normally lifts the frame to the position shown in Fig. 1. A lug *t* on the frame limits its upward movement. Slidable longitudinally in the frame *c* is a spring-actuated push bar *e* carrying on its end an inverted U-shaped staple-feeding device *f* adapted to feed staples *x*

one by one into alignment with the staple driving device.

Pivoted to the base *a* on the same axis as frame *c* is a link *g*, to which is pivoted a hand actuated lever *h*, which between its ends is split to form a yoke *i* embracing the carrier *d*. A cross pin *k* connecting the arms of the yoke extends through a slot in member *d* and carries the plunger *p* of the staple driving device.

A spring *n*, confined between the upper end of carrier *d* and a head *m* on the upper end of plunger *p*, normally holds the plunger *p*, and also levers *h* and *g*, in the position (relative to frame *c*) shown in Fig. 1.

Depending from the plunger *p* is a staple driver blade *r* in line with a staple which has been moved by the staple feeding device into operative relation with the anvil *b*.

In operation the lever *h* is moved down by hand, carrying with it as a unit the frame *c*, the link *g* and the staple driver without changing their relative positions, until after the free end of frame *c* contacts with anvil *b*. Thereafter pressure upon the lever *h* forces plunger *p* and driver blade *r* down (against the resistance of spring *n*) far enough to drive the staple through the article, to be stapled, resting on the anvil *b*. Fig. 3 illustrates the position of the stapling device relative to the frame *c* when the plunger is fully retracted. Fig. 4 illustrates the position of the stapling device relative to the frame *c* when it has fully completed its down stroke.

When the hand lever *h* is released the parts return to the normal position shown in Figs. 1 and 3. In such return movement of the stapling device the driver blade *r* is retracted sufficiently to allow the feeding device to feed another staple into position to be engaged by the driver blade on the next down movement of the hand lever *h*.

The above operation is that which takes place in the normal operation of the machine. Without other mechanism, the machine, when operated as described, operates successfully. It often happens, however, that the operator does not so fully complete the stroke as to effect the driving of the staple, with the result that the staple is not discharged and on the up-stroke of the staple driving device another staple is delivered. This clogs the machine and prevents its further successful operation. The object of the present invention is to prevent a full upward or return stroke of the staple driver unless, in its preceding down stroke, it has fully completed its movement. By preventing the staple driver from completing its full upward or return stroke, the driver

blade *r* remains in position to block the feed device from feeding another staple into operative position.

The mechanism for accomplishing this object will now be described. The plunger is cut away to form, with the wall of its carrier or holder *d* (which wall may be cylindrical, as shown, or may have any other contour), a longitudinally extending channel 10, segmental shaped in cross-section. The chord wall of the segmental channel at its lower end tapers outward so that the lower end of the channel is wedge-shaped. Secured to the upper part of the plunger is a leaf spring 11, which, in the down stroke of the plunger, slides down through the channel 10 along the concave wall of the holder *d* opposite the flat (chord) wall of the segmental channel. Loose within the channel 10 is a ball 12, which, before the down stroke of the plunger *p* relative to the frame *c*, occupies the position shown in Fig. 3; that is, it has fallen by gravity into the wedge end of the channel 10. As the plunger *p* moves downward the ball 12 maintains this position until, at the completion of the down stroke of the plunger, it contacts with a pin 13 on the member *d* and is thereby displaced upward and inward and wedged between the flat wall of the channel 10 and the lower free end of the spring 11, as shown in Fig. 4. By reference to Fig. 6 it will be observed that the longitudinal central part of the spring does not contact with the inner wall of the holder *d* owing to the concavity of the wall. The ball, therefore, when pushed, by the pin 13, between the spring and the flat wall of the channel 10, compresses the longitudinal central part of the spring and the tension of the spring holds the ball in the position shown in Fig. 4 so as to insure its moving up with the plunger *p* and spring 11 until it engages a pin 14 on the member *d*. Pin 14 prevents further upward movement of the ball and it again drops into the wedge end of the channel 10, as shown in Fig. 3. For the ball may be substituted a roller and in claiming a ball it is intended to include a roller as an equivalent.

In the normal operation of the device the described ball, spring and groove might be said to perform no useful function. If, however, the downward movement of the staple driving device is not completed, it will not move down far enough to allow the ball 12 to contact with pin 13 and the ball will continue to remain in the wedge end of the channel 10 as shown in Fig. 5. By virtue of the wedging action formed between the plunger and the holder *d*, with the ball in this position there can be no upward movement of the staple driving device *p*, *r*, relative to the frame *c*, and hence, when pressure on the hand lever is removed and after the frame *c* is returned to the position shown in Fig. 1, the spring *o* is powerless to raise the plunger *p* relative to frame *c* and hence the driver blade *r* is not retracted sufficiently to allow another staple to be fed by the staple feeding device. In order to restore the parts to the position shown in Fig. 1, it is necessary to again so operate the hand lever as to insure the completion of the downward movement of the staple driving device. Not until then is it possible to knock the ball or roller 12 out of the wedge-shaped end of the channel 10 so as to lock it between the flat wall of the channel 10 and the spring 11, and thereby permit the spring *o* to raise the staple driving device to its uppermost position relative to frame *c* and thereby fully retract the driving blade *r*

and allow another staple to be fed into position to be driven on the next stroke of the staple driving device.

While that part of the stapling machine which is novel (namely, the means to lock the staple driver from moving upward in the holder if the staple driver does not complete its down stroke and to unlock the staple driver to allow it to move upward if its full down stroke is completed) has a special utility as applied to or combined with a stapling machine, such novel part of the machine is adaptable to other uses and, except in those claims which specify stapling machine elements, I do not wish to be confined to such application or combination. Said novel part of the machine is adapted for use in any machine which comprises a reciprocable (including oscillatable) element which is intended to have a forward movement of definite distance or scope and whose return movement it is desired to limit or prevent in the event that its intended forward movement shall not have been completed.

What I claim and desire to protect by Letters Patent is:

1. In a stapling machine including a staple driver and its holder; means allowing retraction of the staple driver when its down stroke is completed while preventing its retraction unless its downstroke is completed, said means comprising a wedge-shaped channel between the driver and its holder; a ball which, when free to move, enters said channel and by its wedging action prevents upward movement of the driver while allowing downward movement thereof; means operable only in the completion of the downward staple-driving movement of the driver to dislodge the ball from said wedge-shaped channel and lock it from returning thereto; and means operable in the upward movement of the channel to unlock said ball.

2. In a stapling machine including a staple driver and its holder; means to prevent retraction of the staple driver when its down stroke is not completed, said means comprising a channel between the staple driver and the inner wall of its holder having a wedge-shaped lower end; a leaf spring secured to the staple driver and adapted, in the downstroke of the staple driver, to slide in said channel; a ball loose in said channel adapted to fall into its wedge-shaped end and thereby lock the staple driver from moving upward relative to said frame; and a stop adapted, in the end portion of the downstroke of the staple driver, to engage said ball and arrest its further downward movement and hold it in position to be held by said leaf spring from dropping back into the wedge shaped end of the channel in the upstroke of the staple driver; whereby if the downstroke of the staple driver is not completed said stop will be inoperative and the ball will remain in the wedge shaped end of the channel and prevent such retraction of the staple driver as will allow the feed of another staple.

3. The device defined in claim 2 comprising also a stop adapted, upon completion of the upstroke of the staple driver, to arrest the upward movement of the ball and allow it to again drop into the wedge shaped portion of the channel.

4. In a stapling machine including a plunger and a carrier in which said plunger is slidable; means to prevent retraction of the plunger when its downstroke is not completed, said means comprising a channel, extending longitudinally of the plunger, the lower inner wall of which is inclined toward the inner wall of the carrier, thereby forming a channel having an upper end of uni-

form cross-section and a lower wedge-shaped end; a leaf spring secured at its upper end to the plunger and adapted, in the down stroke of the plunger, to slide in said channel along the wall of the carrier; a ball loose in said channel adapted to fall by gravity into its wedge-shaped end and thereby lock the plunger from moving upward relative to its holder; a stop on the carrier adapted, in the end portion of the down stroke of the plunger, to engage said ball and arrest its downward movement and force it between the inner wall of the channel and the lower free end of the leaf spring to thereby lock it from falling back into the wedge-shaped lower end of said channel in the up stroke of the plunger; and another stop on the carrier adapted, upon the completion of the up stroke of the plunger, to move said ball out of its locked position and allow it to again drop into the wedge-shaped end of the channel; whereby if the down stroke of the plunger is not completed, said stops will be inoperative and the ball, remaining in the wedge-shaped lower end of the channel, will prevent retraction of the plunger.

5. In a stapling machine including a plunger and a carrier in which said plunger is slidable, means to prevent full retraction of the plunger when its downstroke is not completed, said means comprising a channel between the plunger and the inner wall of the carrier having a wedge shaped lower end; a leaf spring secured to the plunger and adapted, in the down stroke of the plunger, to slide in said channel; a ball loose in said channel adapted to fall into the wedge-shaped lower end of the groove and thereby lock the plunger from being retracted; a stop adapted, in the end portion of the down stroke of the plunger, to engage said ball and hold it in position to be engaged by said leaf spring and to be

thereby held from returning to the wedge shaped part of said channel, thereby allowing the plunger to be retracted; and another stop adapted, upon completion of the upstroke of the plunger, to arrest the upward movement of the ball and allow it to again enter the wedge-shaped portion of the channel; whereby the means to prevent full retraction of the plunger is operative only when the plunger has not completed its down stroke and whereby upon any subsequent operation of the hand lever to effect a full down stroke of the plunger said means is rendered inoperative.

6. A device adapted to prevent retraction of a reciprocable element unless its intended forward stroke is completed comprising means providing a passage through which said element is reciprocable; means providing a channel, between said element and the inner wall of said passage, having a wedge-shaped portion; a leaf spring secured to said element adapted in the latter's forward stroke to slide in said channel; a ball loose in said channel adapted to enter said wedge-shaped portion and, while remaining therein, lock said element from retraction in the passage; and a stop adapted, in the end movement of the forward stroke of the reciprocable element, to engage said ball and move it relatively to the reciprocable element out of said locking position and into position to be held by said spring from returning to said locking position, thereby unlocking said element and permitting it to make a return stroke.

7. A device in accordance with claim 6 comprising also a stop adapted, in the end movement of the return stroke of said reciprocable element, to arrest the return movement of the ball and allow it to return to said locking position.

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