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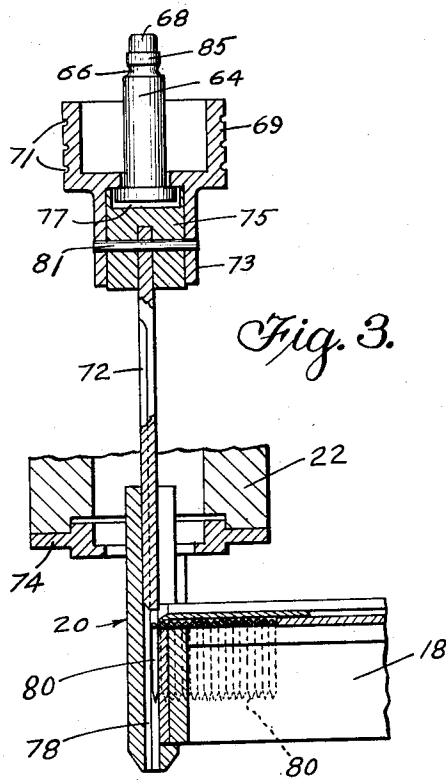
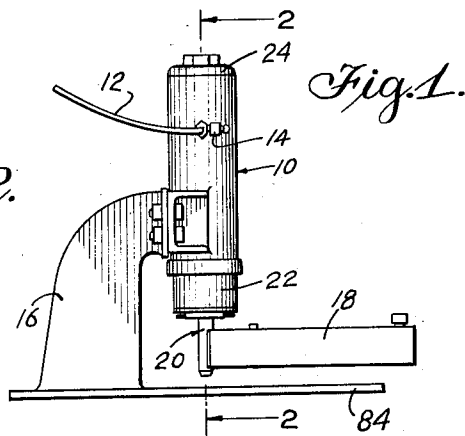
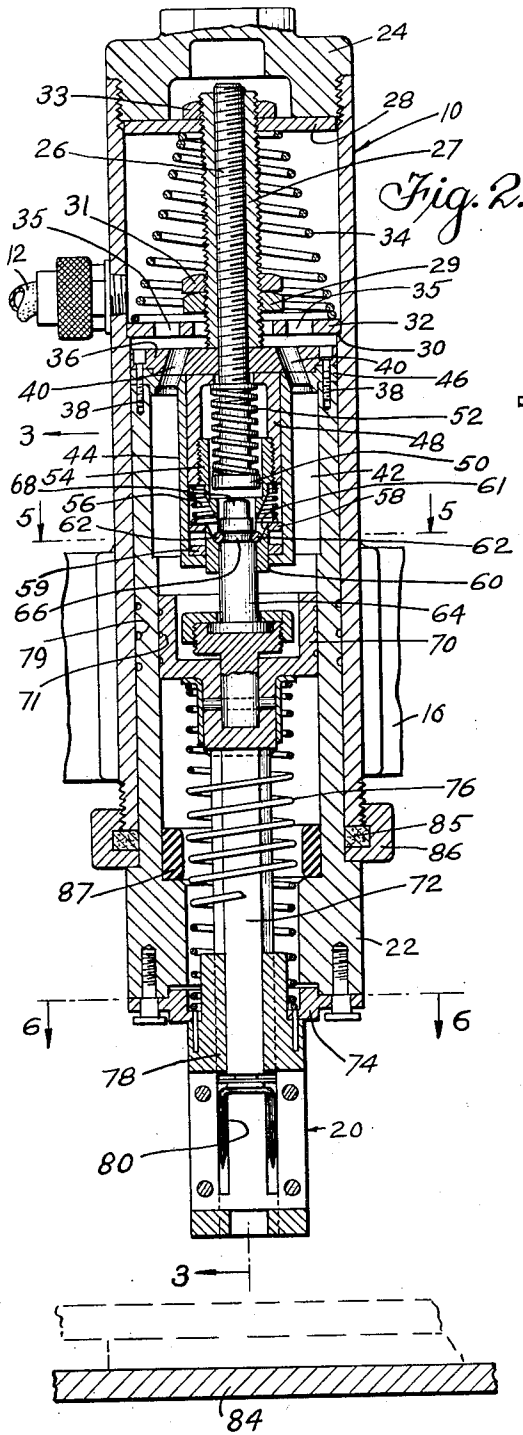
L. M. OSBORNE ET AL

2,774,968

STAPLING MACHINE

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2 Sheets-Sheet 1



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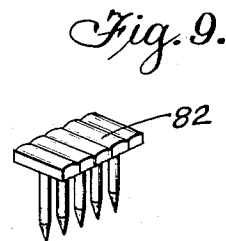
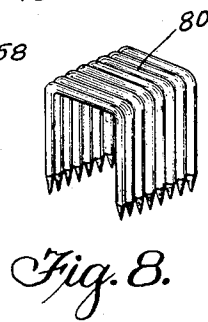
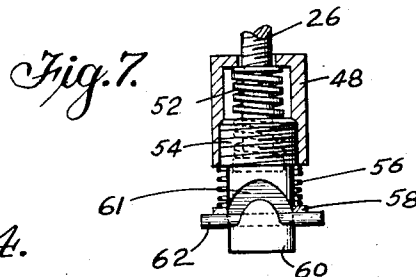
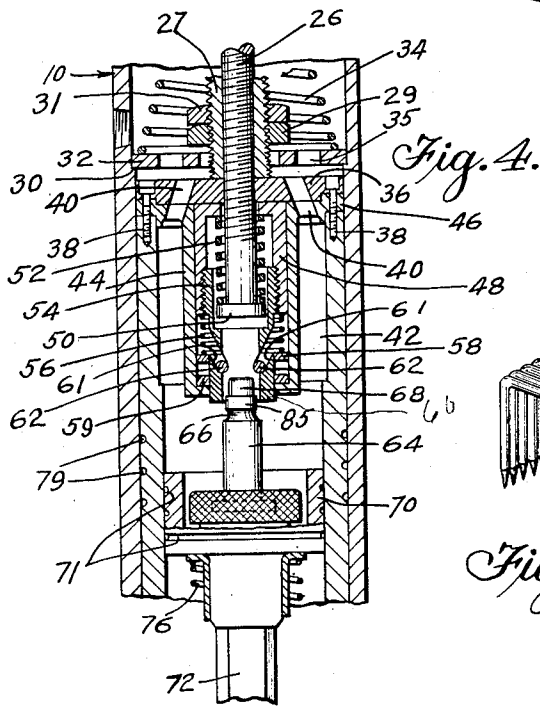
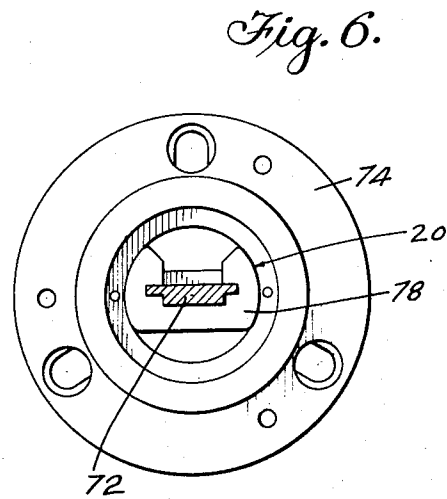
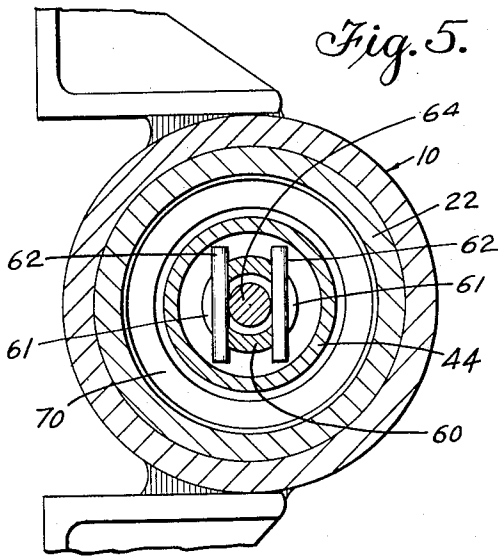
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STAPLING MACHINE

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Application October 4, 1954, Serial No. 460,061

10 Claims. (Cl. 1—44.4)

This invention relates to an improved stapling machine, and has for one of its principal objects the provision of a device of the class described which is preferably operated by compressed air and which will automatically act to securely hold the work to be stapled in position for the stapling operation.

One of the important objects of this invention is the provision in a stapling machine of a device which is capable of being operated in groups of two, three, four or even more units and all of which are so constructed that any work operated upon by the group will be securely primarily held in position and practically instantaneously later have the staple or other fastening means driven thereinto, and this regardless of slight irregularities or non-uniformity of the pieces of work. It may also be portable.

Another and still further object of the invention is to provide a stapling machine which for its size, will have a great deal more power and capacity than previously constructed units, and which will at the same time be relatively simple but highly efficient.

Other and further important objects of the invention will be apparent from the disclosures in the accompanying drawing and following specification.

The invention, in a preferred form, is illustrated in the drawings and hereinafter more fully described.

In the drawings:

Figure 1 is a side elevation of the improved stapling machine of this invention, illustrating one unit on a support or rack.

Figure 2 is an enlarged vertical section of the stapling unit illustrating interior construction.

Figure 3 is a detail vertical section taken on the line 3—3 of Figure 2 and at right angles to the showing of that figure.

Figure 4 is a view embodying certain selected portions of Figures 2 and 3 and illustrating the parts in a different operating relationship.

Figure 5 is an enlarged horizontal section taken on the line 5—5 of Figure 2, looking in the direction indicated by the arrows.

Figure 6 is an enlarged section on the line 6—6 of Figure 2, looking downwardly.

Figure 7 is an enlarged detail view of the automatic quick-release mechanism for the stapler or nail driving means.

Figure 8 illustrates a group of joined staples such as are used in the operation of the device.

Figure 9 is a perspective view of a novel type of nail which can also be used in the stapler of this invention.

As shown in the drawings:

The reference numeral 10 indicates generally a cylinder which comprises the casing or housing of the improved stapler of this invention. The device is preferably operated by means of compressed air entering through a line 12 and controlled by a manually operated valve 14 of any suitable construction.

The cylinder 10 or a group of same is supported upon

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a bracket or stand 16 and a reservoir or chute for staples or nails to be used in the device is provided at 18. One end of the hopper or reservoir 18 is fastened to a projection 20 which forms part of a cylinder 22 mounted for free rotation and slidable movement in the casing 10 and the other end of the hopper is free so that it can be rotated into almost any desired operating position.

A closure or cap 24 is screw-threaded into the top of the case 10 and the removal of this cap provides access to a pressure adjusting means. This comprises a screw-threaded shaft 26 which is fitted into a holder or plate 28, by means of an intermediate sleeve 27, as best shown in Figure 2. The holder or plate slides in the casing.

An annular shoulder 30 is formed interiorly of the casing 10 and a plate 32 having a central opening is seated upon this shoulder. A conical spring 34 is positioned on the plate 32 and bears against the under-face of the retainer 28 for the shaft 26.

The shaft 26 is itself screw-threaded into a sleeve 27 and this sleeve is exteriorly screw-threaded throughout its length to accommodate the plate or holder 28 at its top end and to accommodate a stop nut 29 and a lock nut 31 which are mounted upon it, and which limit the downward movement of the shaft 26 and the sleeve 27 through the central opening in the plate 32. A lock nut 33 positions the upper end of the shaft 26 with respect to its sleeve 27 and this abuts against the upper face of the plate 28. Extra openings for air are provided in the plate 32, as illustrated at 35.

Mounted upon the upper end of the cylinder 22 is a disc 36, this being held in position by means of bolts or the like 38 and this disc has openings 40 therein communicating with a space 42 inside the upper end of the cylinder 22.

The adjustable shaft 26 passes through a central opening in the disc 36 and is screw-threadedly fitted therein for adjusting purposes.

Likewise fastened to the top of the cylinder 22 by the bolts 38 is an intermediate element comprising a cylindrical structure 44 having an annular upper flange 46 through which the bolts 38 pass, and mounted inside the upper end of this cylinder 44 is an additional cylindrical element 48. This also has an aperture in its upper face for passage of the adjusting screw 26 therethrough (Figure 4).

The lower end of the adjusting screw 26 is radially extended as shown at 50 and this forms a shoulder or stop for supporting a relatively strong helical spring 52 which surrounds the lower end of the adjusting screw 26 and the upper end of which bears against the intumed upper integral flange of the cylinder 48.

The lower end of the cylinder 48 is interiorly screw-threaded to receive a correspondingly screw-threaded insert 54 shaped as best shown in Figures 2 and 4, and has an upper sleeve portion which surrounds the lower end and shoulder 50 of the adjusting screw 26.

A helical spring 56 surrounds the lower end of this element 54 and abuts the lower end of the cylinder 48, and this is seated upon the upper of two washers 58 and 59 which are positioned in the lower end of the case or cylinder 44 and which surround the part 60 which is likewise fixed in the lower end of the case 44.

This sleeve portion 60 of element 54 has two outwardly tapered inner upper faces against which a pair of pins 62 is adapted to ride. These pins are shown in more detail in Figure 5 and are prevented from getting out of their respective retaining slots by the washer 58. The spring 56 holds the washer 58 against the pins 62.

The outside diameter of the annulus 66 formed in the top end of a male element 64 controls the extent of move-

ment of the pins 62 in the tapered slots 61 in the sleeve portion 60.

The male element 64 has an annular slot 66 in its head for the reception of the pins 62 is slidable and rotatable in the pin retaining cylinder 60, and is provided with an integral upper extension 68 which is normally just below the lower face of the shoulder or stop 50 on the end of the adjusting screw 26.

This male element 64 is fitted into a cup or piston 70 slidable in the cylinder 22 and a hammer or driving element 72 for the staples or nails is fastened to the lower end of the cup-like piston 70, as best shown in Figure 2.

A slightly modified form of construction for the assembly of the piston and staple driver is illustrated in Figure 3, wherein a piston 69, somewhat similar in shape to the piston 70, is employed, this having a central opening for the reception of the lower end of the male element 64 and which freely rotates therein.

Fastened into the lower extension 73 of the piston 69 is a cylinder block or stud 75 having a recess 77 in its top for the reception of the shouldered end of the male element 64. This block 75 has a slot in its lower end for the reception of the staple driver 72 and a pin 81 connects the driver 72 and the stud 75 with the downwardly extending skirt 73 of the piston 69.

Annular grooves 71 are formed in the exterior face of the piston 69 and similarly in the exterior face of the piston 70. These allow of a relatively loose sliding fit between the parts, while at the same time retaining sufficient oil or lubricant to prevent undue escape of air. Similar grooves 79 are formed in the outer face of the cylindrical piston 22 to take care of a corresponding action of this cylindrical piston in the case 10.

A closure plate 74 is fastened on to the lower end of the cylinder 22 by bolts and this retains a fourth helical spring 76 in position in the cylinder 22 and surrounding the staple driver 72. The end of the driver operates in slides or tracks 78 fastened in the closure plate 74.

A group of staples, connected by an adhesive plastic or the like, is used with the device, as shown at 80 in Figure 8, and T-headed nails likewise grouped can be used as shown at 82 in Figure 9.

In operation, air under pressure is admitted to the interior of the case or housing 10 by way of the valve 14.

This enters the space in the upper end of the case in which the spring 34 is located and passes through the opening in the plate 32 acting to depress the upper face plate 36 of the cylinder-like piston 22. This forces the cylinder with all its contained appurtenances downwardly, and the guides 78 for the driver blade 72 likewise move downwardly, carrying the hopper 18 with them and against the work which has previously been placed on a base plate or support 84 beneath the stapler 10. This securely holds the work in position.

Additional air passes through the openings 40 in the plate 36 and operates against the upper face of the cup-like piston 69 (Figure 3) or 70 (Figure 2), and as the outer piston or cylinder 22 cannot move further downwardly owing to its contact with the work, the cup-like piston 69 or 70 with its male extension element 64 is automatically released from its connection with the interior portions 44, 54 and 60 of the upper end of the piston 22, whereby the driving blade 72 operates to force a staple 80 or nail 82 into the work.

This automatic release is effected by the shifting of the pins 62 upwardly in their tapered slots 61 owing to the separate action of the two pistons 22—36 and 70.

Pulling down of the parts 48 and 60 until the pins 62 ride against the lower washer 59 forces the pins out of their slots 61.

However, as soon as the air valve is closed, the spring 76 will automatically return the piston 70 to upper position and a connection of the male element 64 with the extension 60 through the pins 62, will be immediately

effected with the unit 44 forming part of the cylindrical piston 22.

A shifting of the adjustment screw 26 regulates the pressure against the piston before its automatic release. This adjustment enables the driving of heavy staples or nails as well as a change to lighter operations, and this can be accomplished very readily. Also the hold-down pressure of the element 73 against the work can be likewise accordingly adjusted. The fact that the male element 64 is freely rotatable in its support, whether it be the piston 69 or 70 and with regard to the locking pins 62, eliminates the chances of undue wear on any particular part thereof, and provides a longer lasting operation.

A packing gland 85 is held in position on the lower end of the case 10 by means of a securing ring 86, this being so designed that a fairly free slidable movement of the cylindrical piston 22 with respect to the case 10 will always result. A rubber bumper 87 is fitted on to a shoulder adjacent the lower end of the cylinder 22 so as to absorb any undue shock owing to extreme movement of either of the pistons 69 or 70 downwardly in the cylinder 22.

It will be obvious that herein is provided a very effective stapling apparatus which is more compact, less complicated and at the same time possesses greater efficiency than earlier devices. Additionally, the units can be employed in groups for multiple nailing, stapling or tacking, wherein a great deal of time can be saved in manufacturing boxes, crates or the like.

The work holding means is adjustable and variable so that irregularities in the portions of boxes or crates to be assembled will automatically be compensated for. The variable preload on the staple driver and work holder is readily adjustable by way of a simple operation. The rotatable chute, reservoir or hopper forming a magazine for the staples or nails, assures of a great flexibility in handling difficult jobs and also enables a relatively simple group operation.

The device can be made of any desired size, can be fixed or portable, and can be employed as an engraving tool or for the manufacture of hammered metal objects. It may also serve as a punch press for light work and actually comprises a pneumatic hammer.

By including a longer extension which can be used as a handle instead of the stand 16, the apparatus can be readily employed for nailing floor boards into place as the operator can simply walk along the floor, spot the device in positions where nails are to be inserted, and trigger the valve.

We are aware that many changes may be made and numerous details of construction varied throughout a wide range without departing from the principles of this invention, and we therefore do not propose limiting the patent granted hereon otherwise than as necessitated by the prior art.

We claim as our invention:

1. A stapling machine comprising an outer casing, a combination cylinder and piston slidable in the outer casing, another piston slidable in the cylindrical piston and a staple driver operated by the second piston, both pistons being pneumatically operated, the second piston being connected to the first piston for automatic disengagement therefrom, said automatic disengaging means including a pair of pins movable in tapered slots in the first piston and an upper extension of the second piston having an annular slot therein to selectively receive the pins.

2. A device as described in claim 1, wherein the pistons are preloaded for variable operation, the preload means comprising springs, adjusting means for the springs, said adjusting means including plates for holding the springs, certain of said plates being movable in the casing and screw-threaded shafts and sleeves in the plates.

3. A device as described in claim 2, wherein each piston includes a combined oil retaining and air baffle means,

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said means comprising annular grooves in the outer face of said pistons.

4. A device as described in claim 3, wherein a trigger valve is provided for the pneumatic operating means.

5. A device as described in claim 3, wherein lock nuts and stop means are provided on the screw-threaded shafts and sleeves.

6. A device as described in claim 3, wherein certain of the plates are fixed in the casing and others are movable therein, said motion being controlled by the springs.

7. A device as described in claim 3, wherein the upper extension of the second piston is mounted therein for free rotation with respect thereto.

8. A device as described in claim 7, wherein an auxiliary spring controls the release movement of the pair of pins.

9. A device as described in claim 1, wherein a maga-

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zine for the staples is rotatably mounted on the casing and adjacent the staple driver.

10. A device as described in claim 1, wherein the first piston comprises a work holding means and the second piston operates the staple driving means.

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