

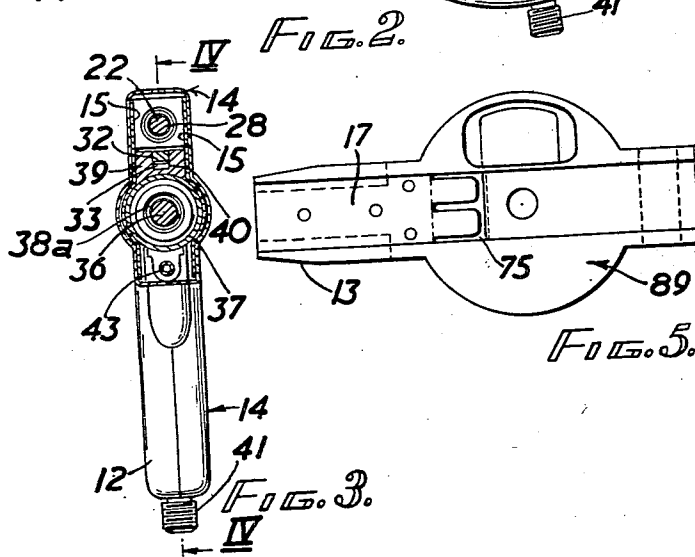
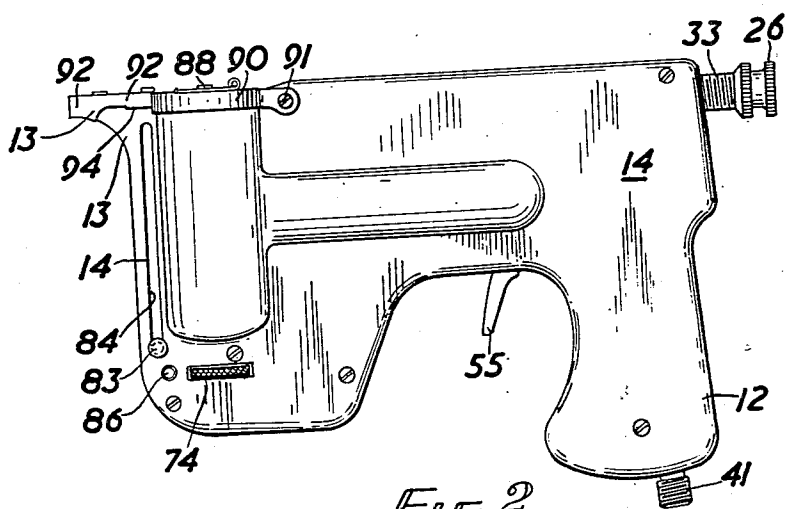
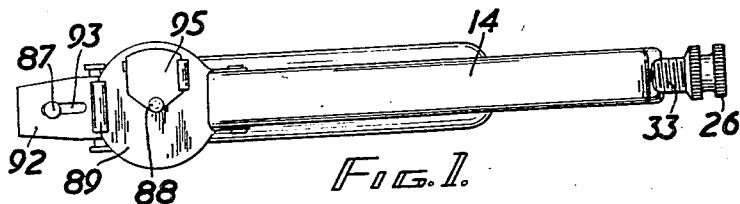
May 21, 1957

H. KLOPSTOCK
STAPLING APPLIANCES

2,792,571

Filed Nov. 9, 1954

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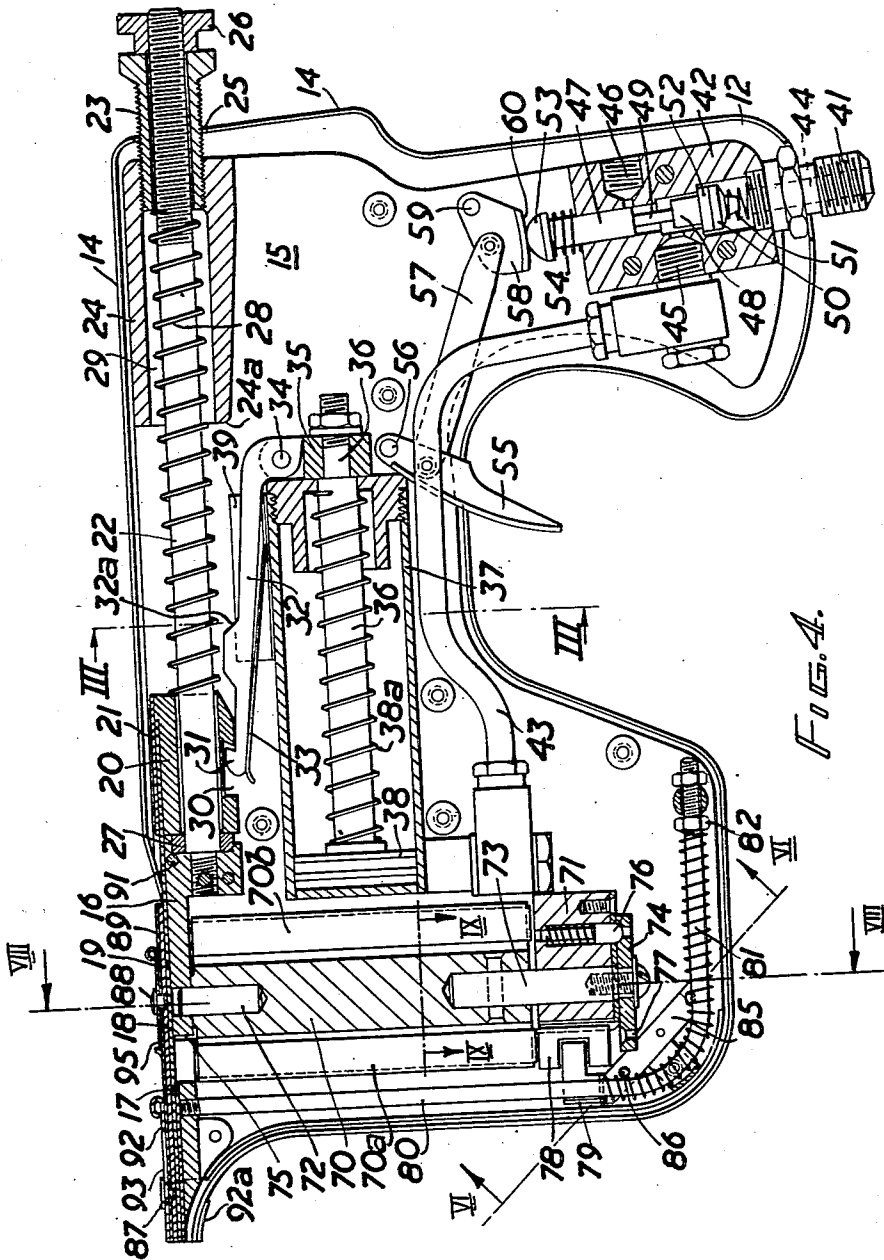


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3 Sheets-Sheet 2



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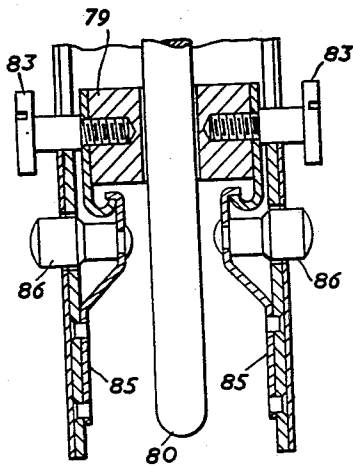
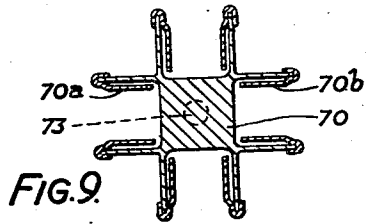


FIG. 6.

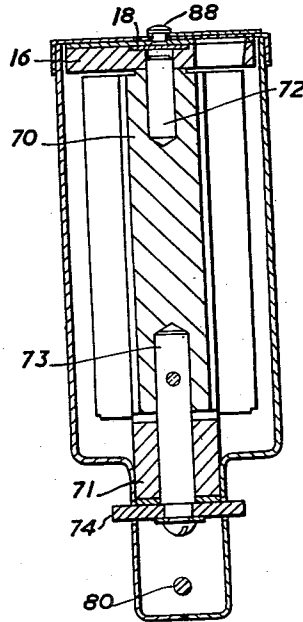


FIG. 8.

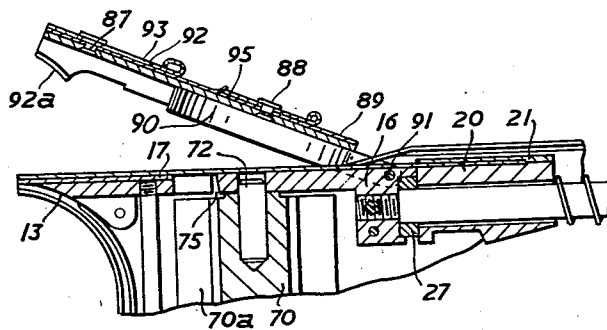


FIG. 7.

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STAPLING APPLIANCES

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Application November 9, 1954, Serial No. 467,858

Claims priority, application Great Britain November 10, 1953

6 Claims. (Cl. 1—44.4)

This invention relates to stapling appliances and, in particular, to such appliances operated by fluid pressure, such as the pressure of compressed air.

An object of the invention is to provide a stapling appliance, operated by a fluid under pressure, which is dependable and will eject staples with a force independent of the pressure of the fluid. Another object of the invention is to provide a construction which employs many parts that can be used for a manually operated appliance, such as that described in my copending application of even date.

In accordance with the present invention, the actual ejection of the staples from the appliance is effected by a release of stressed spring means, the original stressing of the spring means being brought about by the pressure fluid. Thus, when a compression spring is employed, this spring is compressed by the fluid under pressure and the ejection of the staples is effected by the release of the compressed spring.

Preferably, the release of the spring means is effected independently of the fluid under pressure; thus means may be provided for releasing the spring and effecting the ejection when the spring has been compressed to a prescribed extent. In this way, the force behind the ejection stroke is dependent only on the characteristics of the spring and are not effected by the fluid pressure.

Advantageously, the stapling appliance is in the form of a gun having a pointed nose through which the staples are ejected. This construction enables staples to be placed at otherwise inaccessible points.

The invention will be more readily understood by way of example for the following description of a pneumatically operated stapling appliance, reference being made to the accompanying drawings, in which:

Figures 1 and 2 are a plan view and a side view respectively of the stapling appliance;

Figure 3 is a section on the line III—III of Figure 4;

Figure 4 is a section on the line IV—IV of Figure 3 on an enlarged scale;

Figure 5 is a plan view of a part of the stapling appliance.

Figure 6 is a section taken on line VI—VI of Figure 4;

Figure 7 is a sectional view similar to part of Figure 4 showing the magazine cover raised;

Figure 8 is a section taken on line VIII—VIII of Figure 4; and

Figure 9 is a section taken on line IX—IX of Figure 4.

As illustrated in the accompanying drawings, and especially Figures 2 and 4, the appliance has the general exterior form of a gun with a pistol grip 12 and a nose 13. The appliance has an outer casing 14 in which are mounted two sub assembly plates 15 which are spaced accurately apart by spacing members.

At the forward end of the appliance, there is a support bracket 16 (Fig. 4) secured by screws between the plates 15 (Fig. 3) and having a smooth upper surface which with a wearing plate 17 to be described hereinafter forms a staple drive-way 18 (Fig. 4). This drive-way 18 extends

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to the nose 13 of the appliance and within it is slidably located the staple drive blade 19 which extends rearwardly of the bracket 16 and is clamped in a suitable recess in a hammer block 20 by a plate 21 which is secured to the block 20. The hammer block 20 is slidably mounted on a guide rod 22 which at the forward end is firmly fixed in the support bracket 16 and at the rearward end is supported freely in an adjustable sleeve 23 which is threaded in a support block 24 secured between the sub assembly plates 15 by screws. The guide rod 22 and the sleeve 23 projects through an opening 25 in the casing 14. A lock nut 26 is threaded on to the end of the guide rod 22 and locks the parts together.

A leather pad 27 is carried on the forward end of rod 22 against the support bracket 16 and a strong helical compression spring 28 is located on the guide rod between the hammer block 20 and the forward end of the sleeve 23, a part of the spring 22 being located within the bore 29 of the support block 24. The compression of spring 28 can be adjusted by adjusting sleeve 23 in block 24.

The lower part of the hammer block 20 has a recess 30 into which the hooked end 31 of a catch 32 is biased by a leaf spring 33. The catch 32 is pivoted by the pivot pin 34 to a pivot block 35 secured to the end of a piston rod 36. The piston rod 36 passes through the end of a cylinder 37 and is attached, within the cylinder 37, to a piston 38. The cylinder 37 is clamped between the plates 15, and a guide block 39 located immediately above the cylinder is secured by screws between the plates 15. This guide block has a lengthwise groove 40 which guides the catch 32 during its movement as described hereinafter. The leaf spring 33 enters the groove 40 and is riveted to the floor of the groove at its rearward end.

Compressed air for the operation of the appliance is supplied to the forward end of the cylinder 37, in front of the piston 38 through a connector 41 which is connected to a supply of compressed air, a valve shown generally at 42 and air pipe 43. The valve 42 has an inlet port 44 connected to the connector 41, an outlet port 45 connected to the air pipe 43, and an exhaust port 46. There are two valve members 47 and 48; valve member 48 has a stem 49 which engages against valve member 47. In the normal inoperative position, the cylinder valve member 47 does not cover completely the exhaust port 46 so that the outlet port 45 and the exhaust port 46 are in communication round the stem 49. The lower valve member 48 has a shoulder 50 which is normally biased by the spring 51 against the valve seating 52. This valve member therefore prevents compressed air entering the valve. However, when the valve members 47, 48 are forced downwardly, against the bias of spring 51, valve member 47 closes the exhaust port 46 and valve member 48 leaves the seating 52 and puts into communication the inlet port 44 and the outlet port 45. In this position, compressed air is supplied to the air pipe 43 and the cylinder 37. The valve member 47 has an operating head 53 which is biased upwardly by a return spring 54. Operation of the valve is effected by an operating lever 55 which is pivoted by the pin 56 between the sub assembly plates 15. A link 57 is pivoted at its ends to lever 55 and to an operating plate 58 which is pivoted to the plates 15 by the pin 59 and which has a bearing surface 60 engaging the head 53.

At the forward end of the appliance there is provided a magazine 70 which is generally of the type described in pending United States patent application Ser. No. 238,688, filed July 25, 1951, and issued as U. S. Letters Patent No. 2,771,609, on November 27, 1956. Magazine 70 has four vertical compartments of which two are shown at 70a, 70b and is rotatably mounted, at the top in the support bracket 16 by a pin 72 and at the bottom in the detent block 71 by a pin 73. Each com-

partment is adapted to receive a bank of staples. Pin 73 passes right through the detent block 71 and carries at its lower end an operating wheel 74 (Fig. 2) which projects through the casing 14 to enable the magazine 70 to be rotated and to bring in turn the compartments of the magazine into alignment with a slot 75 in the support bracket 16 leading to the drive-way 18. This slot 75 is shaped to receive three-legged staples as described in copending application No. 252,641, filed October 23, 1951, now abandoned, and is shown in Figure 5 which is a plan view of part of the support bracket 16 with the parts thereabove removed. The detent block 71 has a spring biased plunger 76 which is receivable in any of four equally spaced recesses 77 in the wheel 74. The plunger 76 and the recesses 77 ensure that the compartments of the magazine are properly aligned with the slot 75. The staples located in the operative compartment of the magazine 70 are urged upwardly through the aperture 75 by a staple pusher 78 which is attached to a pusher slide 79 mounted on a rod 80 and which is T-shaped in section to bear against the crown and central leg of the lowermost three-legged staple in the magazine. The compartments 70a, 70b are closed at the bottom except for a T-shaped slot for pusher 78 so that the staples are retained in the magazine. The rod 80 is bent so as to extend rearwardly and carries a long helical spring 81 located between the pusher slide 79 and an abutment 82 to supply the necessary upward bias for the slide 79 and pusher 78. Pusher slide 79 carries two screws 83 which project in opposite directions through slots 84 in the casing 14. By grasping these screws 83 with the fingers, the pusher 78 can be withdrawn downwardly to clear the compartment 70a to allow the magazine 70 to be turned 90° to bring the next compartment into operative position. The pusher 78 can be held in its lowest position by two springs 85 (see Fig. 6) which clip on to hooks on the pusher slide 79; the pusher slide can be released by applying pressure to two pins 86, secured to the springs 85 and projecting through openings in the casing 14, to free the springs from the hooks of the slide 79. The wearing plate 17 forming the top of the drive-way 18 is secured by rivets to a nose cover 89 which covers the magazine 70 and which is independent of the casing 14 which does not extend over the magazine. Nose cover 89 has downwardly projecting parts 90 which are hinged to the support bracket 16 by pins 91 and is prevented from lifting by the yoke 92. Yoke 92 is attached to cover 89 by a rivet 87, which passes through a slot 93 in the yoke, and a forward part 92a embracing the forward end of the nose 13 although not blocking the drive-way 18. At the rearward end, yoke 92 has lips 94 engaging outwardly projecting lips on the plates 15. By moving the yoke forward relative to cover 89 so that lips 94 are freed from the cooperating lips on plates 15 and so that the forward part 92a clears the nose 13, the assembly consisting of the cover 89, wearing plate 17 and yoke 92 can be swung backwards to expose the drive-way 18 and to allow any stoppage to be cleared.

The nose cover 89 has an opening enabling staples to be fed into the magazine compartment when these need refilling. The opening is normally covered by the cover plate 95 which is pivoted about a rivet 88. To reload the magazine compartments, the plate 95 is turned away from the opening and staple strips fed into each compartment in turn.

The operation of the device is as follows: Normally, the parts are in the various positions shown in Figure 4 of the drawings, and, in particular, the inlet port 44 is cut off from the cylinder 37 by the valve member 50. When the operating lever 55 is actuated, the operating plate 58 is forced downwardly, causing the shoulder part 50 to leave its seating 52 and to allow compressed air to pass to the outlet port 45 and thence to the air pipe 43. At the same time, the valve member 47 closes the exhaust port 46. Compressed air then enters the cylinder

37 and forces the piston 38 and piston rod 36 to the right, as seen in Figure 4. This movement, through the medium of the catch 32, draws the hammer block 20 to the right and with it the ejector blade 19. The staple pusher 78 normally forces the bank of staples in the magazine against the lower surface of blade 19, but when blade 19 clears slot 75, the foremost staple enters the drive-way 18 in front of the blade. The rearward movement of hammer block 20 compresses spring 28 and when the spring 28 has been compressed to a prescribed extent the spring is released by the engagement of a cam surface 32a of catch 32 with the rounded, forwardly projecting corner 24a of the support block 24 to trip the catch 32. This engagement forces catch 32 downwards out of recess 30 and the blade 19 is caused to forcibly and rapidly move forward to eject the staple in the drive-way 18.

It will be seen, therefore, that the ejection of the staple, by the release of the spring 28, is effected independently of the operation of the piston 38 which merely provides the energy for initially compressing the spring 28. When lever 55 is released, the spring 54 will cause the valve members 47, 48 to rise and to close the inlet port 44 and to put into communication the outlet and exhaust port 45, 46. The compressed air in the cylinder 37 will then exhaust to atmosphere and the piston will be returned to the position shown in Figure 4 by the return spring 38a. On return of the piston 38, the hooked end of the catch 32 will ride over the end of the hammer block 22 and engage in the recess 30 so as to be ready for the next staple operation. The function and operation of the magazine 70 will be readily understood from the description contained in pending United States patent application Ser. No. 238,688.

In my copending application Serial No. 467,857 of even date, I have described a hand operated stapling appliance using the magazine, drive blade and compression spring mechanisms described in this specification. The construction of the appliance of the present application by using parts common to that of my copending application reduces production costs and eases manufacture.

I claim:

1. In a stapling appliance having a casing, a staple drive blade slidably mounted within the casing and means mounted in the casing for feeding staples in front of said blade for forcible ejection from the appliance, the combination of spring means in the casing coacting with the blade for driving the same, pressure fluid operated means mounted in the casing and disposed alongside said spring means parallel thereto for stressing said spring means by pulling action, and release means for releasing the stored energy of said spring means for driving said blade and ejecting said staples.

2. In a stapling appliance having a casing, a staple drive blade slidably mounted within the casing and means mounted in the casing for feeding staples in front of said blade for forcible ejection by said blade from the appliance, the combination of a strong compression spring in the casing coacting with the blade for driving the same, pressure fluid operated means mounted in the casing and disposed alongside said spring parallel thereto for compressing said spring means by pulling action, a releasable coupling between said fluid operated means and said spring, release means in the casing disposed in the path of said coupling for releasing said coupling on compression of said spring and for permitting expansion of said spring to drive said blade, and control means for controlling the supply of pressure fluid to said fluid operated means.

3. A stapling appliance comprising a casing, a staple drive blade slidably arranged in a drive-way mounted in the casing, means for feeding staples to said drive-way in front of said blade, a hammer block secured to said blade, a compression spring operatively connected to said blade, pressure fluid operated means mounted in the casing and disposed alongside said spring parallel

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thereto for compressing said spring, a releasible coupling between said pressure fluid operated means and said hammer block for pulling the latter, release means in the casing for releasing said coupling on a prescribed compression of said spring for causing the forcible driving of said blade, and manually operable means for controlling the supply of pressure fluid to said fluid operated means.

4. A stapling appliance comprising a casing, a staple drive blade slidably arranged in a drive-way mounted in the casing, means in the casing for feeding staples to said drive-way for forcible ejection by said blade, a hammer block secured to said blade, a guide rod on which said hammer block is slidably mounted, a strong compression spring arranged round said guide rod, a cylinder mounted in the casing and disposed parallel of said spring, a piston within said cylinder, a coupling operatively connecting said piston and said hammer block for pulling the latter upon displacement of the piston, and means for supplying pressure fluid to said cylinder to cause movement of said piston to compress said spring, said supply means including a manually operable valve for controlling the supply of pressure fluid.

5. A stapling appliance comprising a casing, a staple drive blade slidably arranged in a drive-way mounted in the casing, means in the casing for feeding staples to said drive-way for forcible ejection by said blade, a hammer block secured to said blade, guide means for said hammer block, a strong compression spring acting on said hammer block and biasing said block and blade towards ejection position, a cylinder mounted in the casing and disposed parallel of said spring, a piston and a piston rod arranged within said cylinder, said piston rod extending outside said cylinder, a releasible connection between piston rod and said hammer block for pulling the latter upon displacement of the piston, release means in the casing for releasing said connection when said hammer block is moved through a prescribed distance causing

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compression of said spring and thereby allowing driving of said blade by said spring, and means in the casing for supplying pressure fluid to said cylinder to cause movement of said piston to compress said spring, said supply means including a manually operable valve for controlling the supply of pressure fluid.

6. A stapling appliance comprising a casing, a drive-way block having a drive-way therein mounted in the casing, a staple drive blade slidably arranged in said drive-way, means in the casing for feeding staples to said drive-way for forcible ejection by said blade, a hammer block secured to said blade, a guide rod on which said hammer block is slidably mounted, a strong compression spring on said guide rod acting on said hammer block, a pressure cylinder mounted in the casing and disposed parallel of the spring, a piston and piston rod in said cylinder, the piston rod extending outside said cylinder, a catch pivoted to said piston rod, and releasibly engaging said hammer block for pulling the latter upon displacement of the piston, means in the casing for supplying pressure fluid to said cylinder to cause movement of said piston and said hammer block to withdraw said blade and compress said spring, said supply means including a manually operable valve for controlling the supply of fluid to and from said cylinder, and a projection located in the path of said catch for releasing said catch from said hammer block when the compressing movement of said hammer block exceeds a given distance.

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