June 29, 1954 A. G. JUILFS 2,682,052

PLUNGER AND STAPLE DRIVING STRUCTURE FOR PNEUMATIC STAPLING MACHINES

Filed April 3, 1953

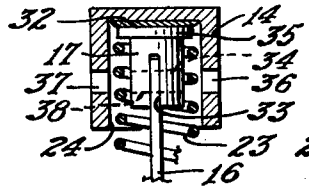


FIG. 2.

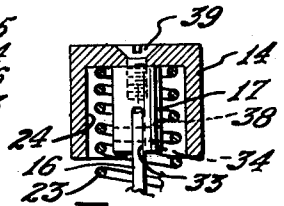


FIG. 3.

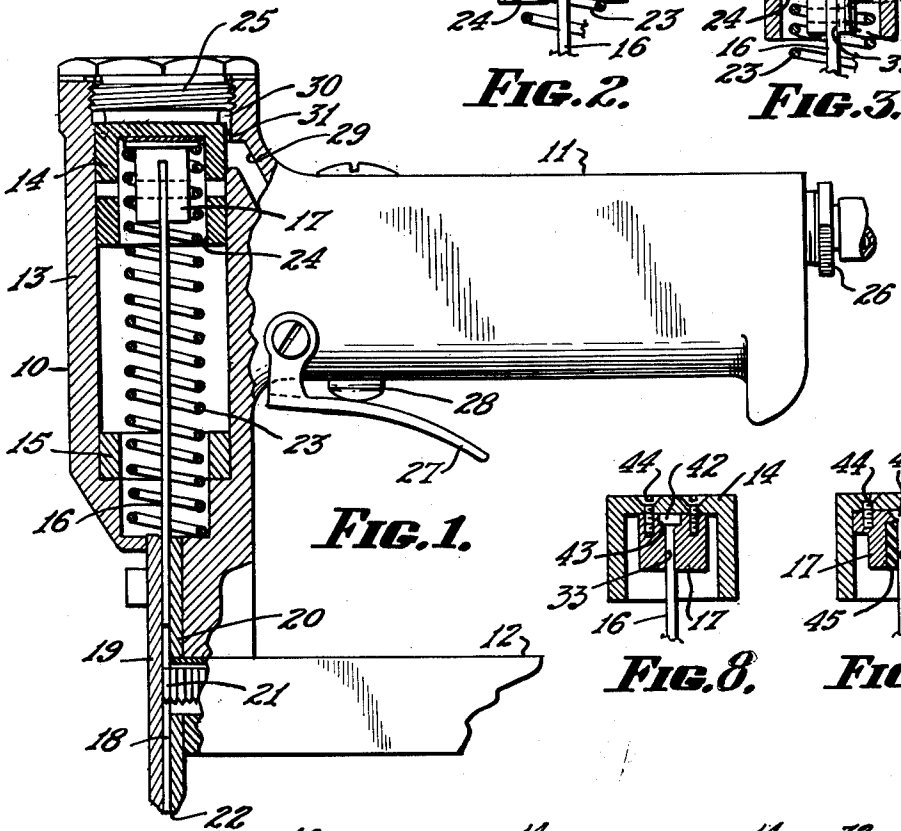


FIG. 1.

FIG. 8.

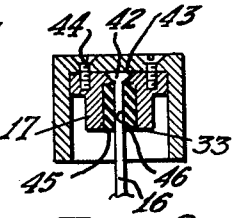


FIG. 9.

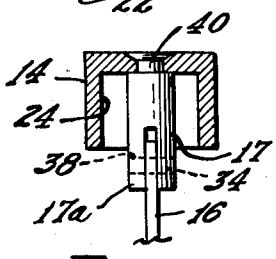


FIG. 4.

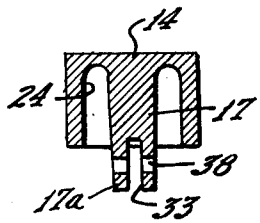


FIG. 5.

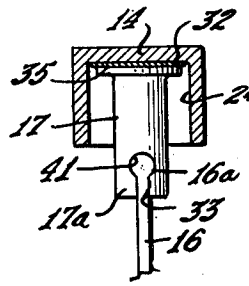


FIG. 6.

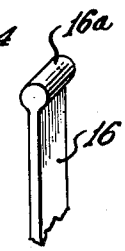


FIG. 7.

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Patented June 29, 1954 2,682,052

UNITED STATES PATENT OFFICE

2,682,052

PLUNGER AND STAPLE DRIVING STRUCTURE FOR PNEUMATIC STAPLING MACHINES

Albert G. Juilfs, Newtown, Ohio

Application April 3, 1953, Serial No. 346,595

10 Claims. (Cl. 1—44.4)

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My invention relates to pneumatic stapling machines and is specifically directed to means for fixing the staple driver to the piston which actuates it.

It is an object of my invention to provide a staple drive mechanism wherein the staple driver may be secured to the piston which actuates it and wherein the height and weight of the stapling machine may be maintained at a minimum.

Other objects and advantages of my invention will become apparent to one skilled in the art from the following description and with reference to the accompanying sheet of drawings wherein like numerals are employed to designate like parts throughout the same and wherein:

Figure 1 is a view partly in section and partly in side elevation showing a pneumatic stapling machine of the type to which the instant invention is applicable and also showing one modification of the instant invention,

Figure 2 is a fragmentary sectional view of the novel staple driver and piston connection generally illustrated in Figure 1,

Figure 3 is a view similar to Figure 2 but showing a modification thereof,

Figure 4 is a view similar to Figures 2 and 3 but showing yet another modification of my invention,

Figure 5 is a sectional view of one of the members employed in still another modification of my invention,

Figure 6 is a view generally similar to Figures 2, 3 and 4 but showing yet another modification of this invention,

Figure 7 is a fragmentary perspective of the staple driver employed with the modification of Figure 6,

Figure 8 is a fragmentary sectional view of another modification of this invention, and

Figure 9 is also a fragmentary sectional view of yet another modification of this invention.

In my copending application Serial No. 181,023, now Patent Number 2,671,214, and in my Patent No. 2,585,941 I have shown stapling machines in which I have emphasized the advantages of so arranging the staple drive mechanism that the staple driver is free of the piston which actuates it. In the arrangement of the patent and the copending application referred to, stress is laid upon the desirability of providing means to stop the piston while permitting the driver to advance by inertia, separate means being provided to stop the driver.

In my Patents Nos. 2,585,939, 2,585,940 and

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2,585,942 I have shown, however, other arrangements wherein the staple driver is pinned to the piston which actuates it. Certain advantages are obtained by arranging the piston and driver in the manner taught in these patents just referred to.

In still another copending application, Serial No. 345,489, I have disclosed a novel stapling machine incorporating an anvil which may be moved toward and away from the nose or nozzle of the machine. Although it is possible to arrange this stapling machine so that the staple driver is either free of its actuating piston or fixed thereto as may be desired, I have found that it is often preferable to secure the driver to the piston. The instant invention, and its various modifications, are especially applicable in a stapling machine of the type described in the copending application last mentioned.

In the instant invention I provide a novel manner of securing the staple driver to its actuating piston. In doing this I lose the free running advantage which is inherent in the arrangements set forth in my copending application Serial No. 181,023, now Patent Number 2,671,214, and in my Patent 2,585,941. Nevertheless I have found that in some instances it is desirable to secure the driver to the piston and in particular I have found that the means of the instant invention constitute an excellent construction for accomplishing this. The means of the instant invention also constitute an improvement over the various methods of pinning a driver to a piston as set forth in my Patents 2,585,939, 2,585,940 and 2,585,942.

Referring first to Figure 1 I have there illustrated a stapling machine of the type to which this invention is particularly well suited. The stapling machine of Figure 1 comprises a body portion 10, a handle 11 and a staple feed magazine 12. The body 10 may comprise a cylinder 13 in which there is a piston 14. In the bottom of the cylinder 13 I provide a rather large bumper 15 against which the piston 14 will seat upon completing its stroke.

A staple driver 16 is fixed within a member 17 which is secured within the piston 14. The driver 16 is adapted to reciprocate within a drive track 18 which is defined by a pair of plates 19 and 20 which are preferably removably secured to the body of the stapling machine 10.

The feed magazine 12 is adapted to force a series of staples 21 into position within the drive track 18 so that upon reciprocation of the driver 16 a staple will be discharged through the end

of the nose or nozzle 22 defined by the plates 19 and 20. There are several satisfactory feed mechanisms which will accomplish this and it is to be understood that the particular feed mechanism employed does not constitute a limitation of the present invention.

A spring 23 is seated within the cylinder 13 and also within a recess 24 provided around the member 17 within the piston 14. This spring urges the piston 14 against the cylinder head 25.

Air is admitted to the stapling machine through the coupling generally indicated at 26. The trigger 27 and valve mechanism generally indicated at 28 control the admission of air to the cylinder behind the piston. It will be understood that upon actuation of the trigger 27 air will flow through the channel 29 into a recess 30 located behind the piston 14. This air will force the piston 14 against the bumper 15 whereby the driver 16 will be forced through the slot 18 so that it will drive a staple 21 out of the nozzle 22 and into the work being stapled. A small groove in the cylinder wall is shown at 31 and this connects the passage 29 with the recess 30.

It is believed that the above description fully defines an operative pneumatic stapling machine.

The instant invention resides in the manner of securing the staple driver 16 within the piston 14 in such a way that the spring 23 may seat within this piston. It is very important that the spring be able to seat within the piston for this enables the height, and therefore the weight, of the stapling machine to be maintained at a minimum.

Referring now to Figure 2 I shall describe one of the basic modification of my invention. In this figure, as will be true throughout the specification, like numerals are employed to designate those parts which are generally shown in Figure 1 and just described. Figure 2, therefore, discloses a piston 14 having a recess 24 in which there is secured a member 17. In the particular modification here shown I have indicated that the member 17 is brazed within the piston 14 as indicated at 32.

The member 17 is provided with a slot 33 adapted to receive the staple driver 16. A pin 34 passes through the member 17 and driver 16 and securely holds the two together.

It is preferred that the embodiment of my invention shown in Figure 2 be made and assembled as follows. First I form a piston 14 having the recess 24. The center piece 17 is then separately formed and I prefer to provide it with a flange 35 as indicated. The slot 33 is then milled within the member 17 after which the member 17 is brazed within the recess 24 of the piston 14 as indicated at 32.

The next step in constructing the modification of Figure 2 is to drill through the assembled members 14 and 17 so as to form the holes 36 and 37 in the wall of the piston 14 and the hole 38 within the member 17. The driver 16 is formed with a hole which will register with the hole 38 just formed in the member 17.

The driver 16 is then inserted within the slot 33 formed in the member 17 and the pin 34 is placed within the hole 38. This pin may be inserted through either of the holes 36 or 37. When the driver and piston are placed within the cylinder 13 it is contemplated that the loops of the spring 23 will serve to maintain the pin 34 in position.

The arrangement just described insures a solid connection between the member 17 and the piston 14 and also between the driver 16 and this member 17. At the same time the construction provides a recess within which the spring 23 may seat. This spring not only serves to return the piston 14 to its starting position after it is fired but it also serves to maintain the pin 34 within the hole 38. This mode of securing the driver 16 to the piston 14 has proved very satisfactory and is believed novel with me.

In Figure 3 I have shown an arrangement which is generally similar to that shown in Figure 2 and, therefore, corresponding parts have been designated by like reference numerals. In the arrangement of Figure 3, however, I attach the member 17 to the piston 14 by means of a screw or the like 39. This construction enables me to eliminate the holes 36 and 37 in the wall of the piston 14 because it will be apparent that I can form the slot 33 and hole 38 within the member 17 prior to the time that it is screwed within the piston 14. It is again contemplated that the loops of the spring 23 will serve to maintain the pin 34 within the hole 38 provided in the member 17. Since, however, the driver will be pinned to the member 17 prior to the time that the member 17 is screwed within the piston 14, it will be possible to rivet or otherwise secure the pin 34 within its hole if this is desired.

In the modification of Figure 4 I have disclosed an arrangement wherein the centrally located member 17 is riveted to the piston 14 within the recess 24 thereof and wherein the member 17 is so formed that the lower portion thereof will extend clear of the piston. This construction enables me to locate the pin 34 outside of the piston 14. In some cases this makes it easier to replace the staple driver should this prove desirable. The riveted connection between the member 17 and the piston 14 is indicated at 40. As mentioned, the hole 38 and its pin 34 are located in an extension 17*a* of the member 17, such extension depending from the piston. Again it will be observed that the spring 23 may surround the member 17 and be received within the recess 24 of the piston 14.

Figure 5 illustrates a modification of my invention wherein the piston 14 and central fixture 17 are formed as a one piece casting. This casting might perhaps be made of powdered metal properly fused together as is known in the metallurgical art. This embodiment also makes use of the extension 17*a* described in connection with the showing of Figure 4.

In Figures 6 and 7 I have illustrated yet another embodiment of this invention. In these figures I provide the member 17 with the extension 17*a* and I also contemplate brazing this member within the piston 14 as indicated at 32 and as discussed in connection with the showing of Figure 2. The piston 14 is again provided with a recess 24 adapted to receive the member 17 and also the spring 23 above referred to. In the modification of Figure 6 the extension 17*a* is again provided with a slot 33 designed to receive the staple driver 16. In this modification, however, the slot 33 has its upper limit defined by a hole 41 which is drilled in the extension 17*a*. The driver 16 is provided with a bead 16*a* which fits within this hole 41.

When the driver 16 and bead 16*a* are slipped laterally to position within the slot 33 and hole 41, and the assembled driver 16, member 17 and piston 14 placed within the cylinder 13 so that the spring 23 is received in the recess 24, the

spring 23 will prevent the driver 16 from being displaced with respect to the member 17. At the same time, however, the bead 16a will hold the driver against longitudinal displacement with respect to the member 17 and piston 14.

Referring now to Figures 8 and 9 I have there illustrated other means by which the driver 16 may be secured to the piston 14. In each of these modifications the driver 16 is formed with a head 42 and the member 17 is formed with a recess 43 adapted to receive this head. The slot 33 extends through the member 17 to the recess 43. In this way the driver may be slipped into position within the member 17 by inserting it from the top. The members 16 and 17 may then be secured to the piston 14 as indicated by the screws 44. It will be apparent that when the member 17 is screwed into the position in the manner just described the driver 16 will be firmly fixed and clamped between the member 17 and the top of the piston 14.

The embodiment of Figure 9 is very much like that of Figure 8 except that in this figure I have shown the member 17 as having a bore 45 into which there is placed resilient material 46. This construction will permit some wobbling of the driver 16 as might be necessary in order to insure proper alignment with the staple drive track 18. It will be obvious that in each of the embodiments of Figures 8 and 9 the screws 44 could be eliminated and the member 17, with the driver 16 and its head 42 seated therein, could be brazed or soldered within the piston 14 as generally indicated in Figure 2. In each of the embodiments of Figures 8 and 9 the spring 23 may seat within the piston 14.

It will be apparent from the above description and from the drawings that the basic structure of my invention incorporates the use of a central member to which the driver may be fastened, the central member being in turn secured to the piston proper. I have found that by providing the piston 14 with the member 17 to which the driver is connected I am able to obtain a much more rigid connection of the driver 16 with the piston 14. This, for example, has resulted in a better construction than that shown in my Patents Nos. 2,585,939, 2,585,940 and 2,585,942.

It is important that the connection between the driver 16 and piston 14 be a good one. When a staple gun, for example, is fired empty so that the work being stapled offers no resistance to the driver and piston, there is a severe strain placed upon the gun, particularly the connection between the driver and piston. In those guns wherein the driver is free of the piston this does not present so great a problem because separate means may be employed to stop the piston and the driver, the driver being free to advance after the piston has been stopped. A single means does not have to stop the combined weight of the piston and its driver.

Where the free running driver feature is eliminated, however, it is obvious that a good connection must be effected between the driver 16 and the piston 14 in order to prevent the driver 16 breaking from the piston. I have found that the embodiments of the instant invention as above set forth produce very rigid connections between the driver and piston which are not easily broken. It is believed that the use of the intermediate member 17 has made these rigid connections possible and it will be apparent that at the same time I have made it possible to seat the needed spring 23 within the piston so as to keep down the height and weight of the gun as is obviously desirable.

It will be obvious to those skilled in the art that modifications may be made in my invention without departing from the scope and spirit thereof, and while I have shown my invention as embodying certain specific structures and arrangements I do not intend to be limited to such exemplary structures and arrangements except insofar as they are specifically set forth in the sub-joined claims.

Having thus described my invention what I claim as new and what I desire to protect by United States Letters Patent is:

1. In a pneumatic stapling machine having a staple driver actuated by a piston driven by air and returned by a spring, the improvement which comprises a connection between said driver and said piston, said piston having a recess defining a piston head and side wall, said connection comprising a member intermediate said piston head and said driver, said driver seating within said intermediate member and said intermediate member being fixed to said piston head within said recess, and said spring surrounding said intermediate member and also seating within said recess.

2. The improvement of claim 1 in which the end of said intermediate member opposite said piston head is provided with a bore, said driver extending within said bore, and resilient material packed in said bore about said driver.

3. The improvement of claim 1 in which said intermediate member is slotted to receive said driver, and a pin passing through said intermediate member, said slot and said driver.

4. The improvement of claim 3 in which said pin is located within said recess.

5. The improvement of claim 4 in which said piston side wall has holes registering with said pin, convolutions of said spring lying between said holes and said pin, whereby said spring maintains said pin within said intermediate member and said driver.

6. In a pneumatic stapling machine having a staple driver actuated by a piston driven by air and returned by a spring, the improvement which comprises a connection between said driver and said piston, said connection being made through a member intermediate said driver and said piston, said intermediate member being fixed to said piston, said piston having a recess to receive said intermediate member, said spring surrounding said intermediate member and also seating within said recess, said intermediate member being slotted to receive said driver, and a pin passing through said intermediate member, said slot and said driver, said intermediate member extending out of said recess, and said pin being located in the extended portion of said intermediate member lying outside of said recess.

7. In a pneumatic stapling machine having a staple driver actuated by a piston driven by air and returned by a spring, the improvement which comprises a connection between said driver and said piston, said connection being made through a member intermediate said driver and said piston, said intermediate member being fixed to said piston, said piston having a recess to receive said intermediate member, said spring surrounding said intermediate member and also seating within said recess, said intermediate member having a slot to receive said driver, said slot terminating in an enlarged opening, and said driver

having an enlarged portion received in said enlarged opening.

8. The improvement of claim 7 in which said enlarged opening comprises a bore extending through said intermediate member, whereby said driver and enlarged portion are placed within said intermediate member from the side thereof.

9. The improvement of claim 8 in which said intermediate member has an extended portion lying outside of said recess, said slot and bore being in said extended portion.

10. The improvement of claim 7 in which said enlarged opening is a recessed area in that end of said intermediate member immediately adjacent said piston, the enlarged portion of said driver seating within said recessed area and abutting said piston, whereby said driver and enlarged portion are placed within said intermediate member from the said end having the said recessed area.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
2,219,739	Duncan	Oct. 29, 1940
2,445,674	Kendall	July 20, 1948
2,585,941	Juilfs	Feb. 19, 1952