United States Patent [19]

Lange

[11] **3,795,357**

[45] **Mar. 5, 1974**

[54] **STAPLING OR NAILING DEVICE OPERATED BY PRESSURE MEDIUM**

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[22] Filed: **Mar. 9, 1972**

[21] Appl. No.: **233,169**

[30] **Foreign Application Priority Data**

Mar. 9, 1971 Germany 2111252

[52] **U.S. Cl.** **227/130**

[51] **Int. Cl.** **B25c 1/04**

[58] **Field of Search** 227/130

[56] **References Cited**

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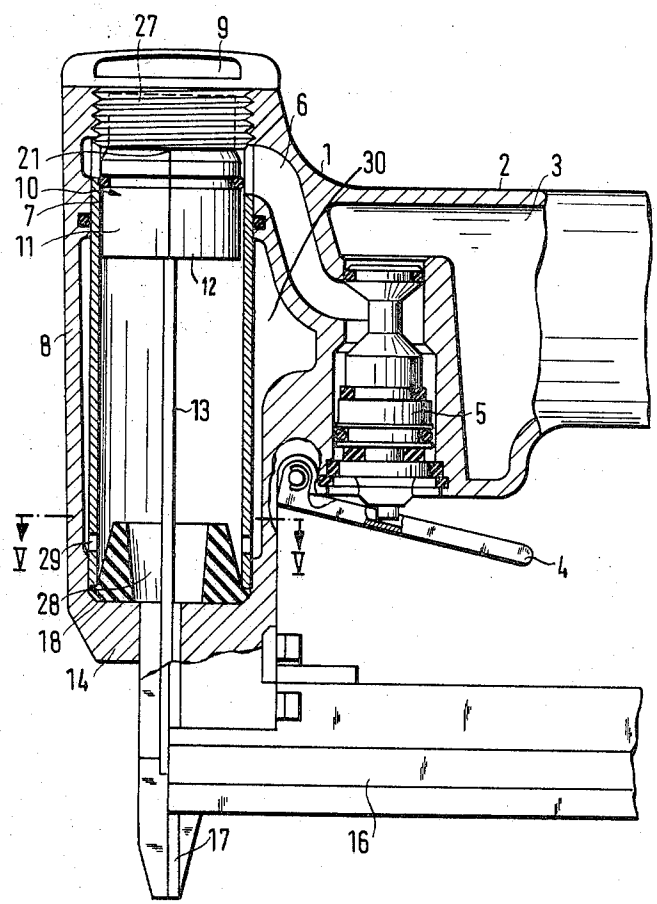
[57] **ABSTRACT**

In a fluid operated fastener device a piston is reciprocable in a working cylinder and actuates a driver means which during the working stroke of the piston drives staples into a work piece. The piston is composed of two semicylindrical parts with a separating line which receives said driver means.

2 Claims, 5 Drawing Figures



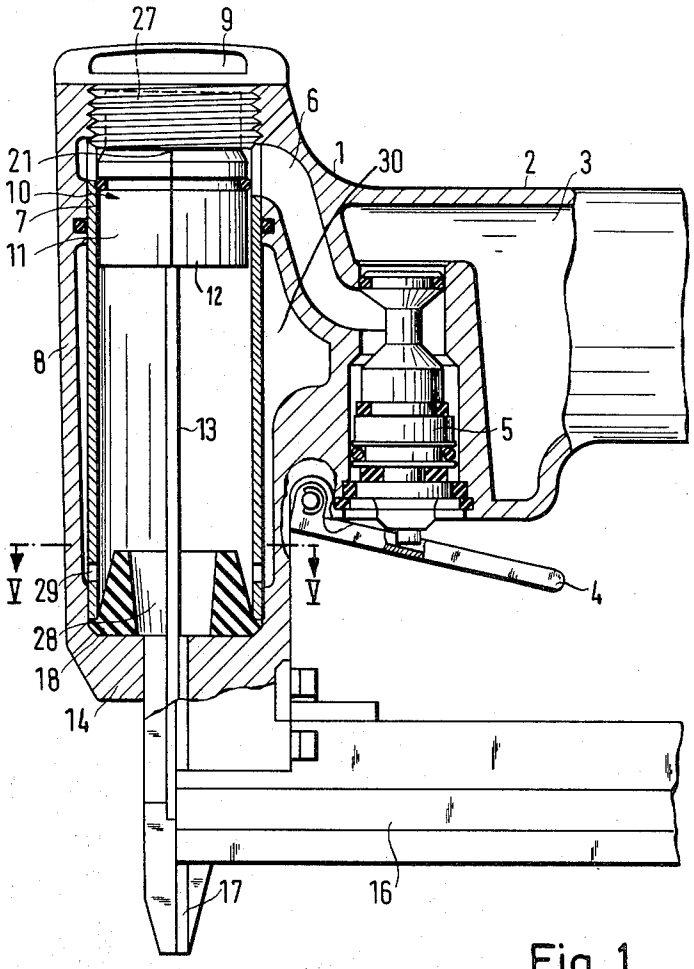


Fig. 1

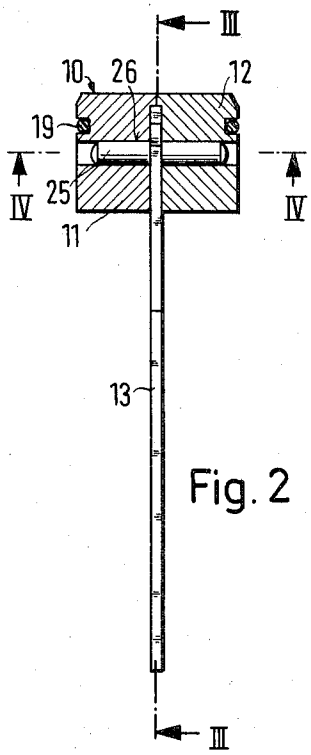


Fig. 2

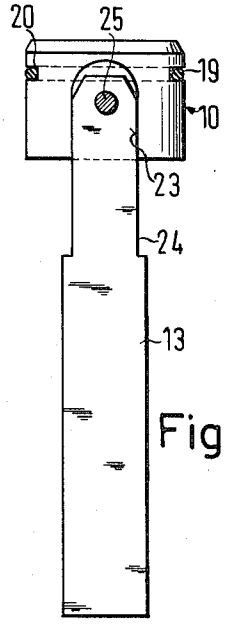


Fig. 3

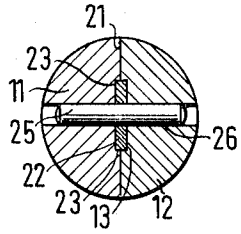


Fig. 4

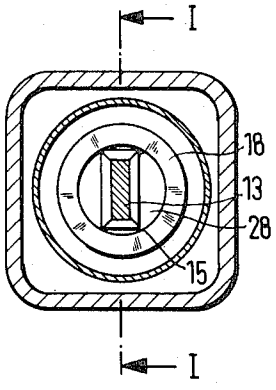


Fig. 5

STAPLING OR NAILING DEVICE OPERATED BY PRESSURE MEDIUM

The present invention relates to a fluid operated fastener device for driving fastening means such as staples, nails and the like into a work piece by means of a driver which is secured to a piston. The piston is actuated by the fluid especially compressed air and is reciprocable in a working cylinder.

Usually the driver comprises generally a driver blade which is inserted into an axial slot formed in the piston. This slot must be produced by a special working step, leading to added costs of production. Further, the driver blade inserted into such a slot of the piston can only be exchanged with difficulty since the pins securing the driver blade must be forced out from the piston by means of a special tool. The driver blade is subject to great stress and must be replaced often such that easy and rapid exchangeability is of great significance. The slot in the piston receiving the driver blade is usually produced by means of a milling cutter and is, therefore, provided with a semicircular bottom permitting a certain amount of swivel between piston and driver blade; this construction leads during operation to tilting, tipping and hence jamming of the piston within the cylinder.

It is an object of the invention to reduce the expenditure of work needed to install the driver blade and to enable an easily disengageable mounting of the driver blade on the piston.

Another object of the invention is to provide efficient guiding of the piston within the working cylinder. A further object is the provision of means which prevent any kind of tipping or tilting of the piston with respect to the driver blade.

According to the invention the piston, movably guided within the working cylinder of the stapling or nailing device, comprises two semicylindrical parts, the separating line of which receives the driver blade. These two parts are held together, without any fastening means, by the surrounding working cylinder and enable effective power transmission onto the driver blade inserted into the separating line of said piston. Also, the driver blade can easily be replaced after the piston has been removed because both piston halves can be separated without taking recourse to special tools. After inserting a new driver blade, both piston halves are rejoined and inserted into the working cylinder. Replacing the driver blade can, thus, be effected in a rapid and simple manner without the use of a special tool.

The driver blade is preferably inserted into a recess arranged on the separating line between both piston halves. The recesses for receiving the driver blade can be provided without any special expenditure of work when manufacturing the piston parts. The work necessary, heretofore, to form the recess for receiving the driver blade is dispensed with.

According to another feature of the invention the recess in the separating line of both piston halves may be provided with paraxial flanges. Since the driver blade is essentially rectangular and, likewise, is provided with parallel longitudinal edges, the parallel flanges prevent the piston from deviating or tilting with regard to the driver blade; thus the piston will not jam in the working cylinder and, hence, assures additional safety in the operation of the device.

Both piston parts are suitably provided with a hole passing therethrough to receive a pin securing the driver blade, which pin transmits the motive force from the piston to the driver blade. It is not necessary to fix the pin in the hole of the piston in any particular way, thus, allowing it to be withdrawn easily after removal of the piston from the drive cylinder in order to enable replacement of the driver blade.

Pneumatically operated stapling or nailing devices frequently have their pistons return to their initial positions by means of compressed air after the working stroke has been terminated. This is done by using part of the driving compressed air applied to said piston such that said compressed air passes during the working stroke via a special channel penetrating the piston to the underside of the piston in order to supply the energy necessary for returning same. Such special channel penetrating the piston can be dispensed with if the separating line of both piston parts has some clearance permitting the driving compressed air to pass through the piston.

Since the driver blade is securely held in the suitably adapted recesses on the separating line of both piston parts, it is possible to design the piston shorter than customary and to provide it with a smooth lower face devoid of projections. This permits enlarging the bumper located at the bottom of the working cylinder to limit the working stroke of the piston such that the thrust of the impacting piston onto the bottom of the cylinder is extensively absorbed and damped. Due to the reduced length of the piston both parts thereof may be made of synthetic material or plastic, e.g., of a die pressing or die casting needing no finishing treatment.

An embodiment of the invention is shown in the drawings by way of example. In the drawings

FIG. 1 is a partial longitudinal section along the line I—I of FIG. 5, representing a stapler operated by means of compressed air;

FIG. 2 is a longitudinal section of the piston with the driver blade of FIG. 1;

FIG. 3 is a side view of FIG. 2;

FIG. 4 is a section along line IV—IV of FIG. 2; and

FIG. 5 is a sectional view along line V—V of FIG. 1.

The stapler illustrated in FIG. 1 comprises a housing body 1 the rear part 2 of which is shaped as a handle and encloses a compressed air reservoir 3 connected to a compressed air conduit (not shown). The reservoir 3 via a common valve assembly 5 actuated by means of a trigger lever 4 and an air channel 6 communicates with the upper end of a working cylinder 7 mounted in the front part 8 of the body 1 and closed by means of a casing cap 9.

Within the working cylinder 7 a piston 10 is reciprocatingly guided which; the piston comprises two symmetrical equal halves 11 and 12 and drives a driver blade 13. This driver blade is guided in a base part 15 mounted in the bottom 14 of the working cylinder 7. During the working stroke of the piston 10, the blade 13 separates a staple from the magazine 16 and drives said staple through an ejection channel 17 into a workpiece or article. On the cylinder bottom 14 an elastic, annular bumper 18 is mounted for limiting the working stroke of piston 10.

The piston 10 is sealed at the inside wall of working cylinder 7 by means of an elastic O-ring 19 inserted in

a corresponding annular slot **20** of piston **10.** This O-ring has essentially a sealing function and does not contribute, however, to holding the piston parts together.

The two piston parts **11** and **12** are provided at their separating line **21** with one rectangular recess **22** each. Each recess is defined by paraxial flanges **23.** The longitudinal edges **24** of the driver blade **13** abut both flanges **23,** thereby holding the driver blade in its position and preventing tilting or tipping of piston **10** within the working cylinder **7.** A cylindrical pin or bolt **25** mounted in a hole **26** passing through both piston parts **11** and **12** serves to transmit the motive force from piston **10** - actuated by the compressed air - to the driver blade **13.**

The piston **10** may be held in the upper initial position shown in FIG. **1** in a known manner by means of a magnet **27** which is mounted in the housing cover **9** closing off the cylinder **7.**

The piston **10** has a smooth lower face, permitting the use of a relatively large size elastic bumper **18** at the cylinder bottom **14,** a recess **28** being formed in the bumper **18** according to FIG. **5.** On account of its large size the bumper **18** offers a particularly good damping effect when the piston **10** is thrust down at the end of its working stroke.

The driver blade **13** is retained loosely in the recesses **22** in the separating line **21** of both piston parts **11** and **12** and can be easily replaced without the need of special tools by drawing apart both piston parts **11** and **12** after the piston **10** has been removed from the cylinder **7.** In this way a worn driver blade can be substituted in a surprisingly brief period of time without rendering the device inoperative for a long time.

Since the recesses **22** in the separating line **21** of both piston parts **11** and **12** can be incorporated in the manufacturing process without finishing treatment, the expenditure of work during the manufacture of said piston is essentially reduced.

During operation the piston **10** is actuated by compressed air passing from the reservoir **3** via channel **6** into the upper end of the working cylinder **7** when the valve assembly **5** has been rendered operable by way of trigger lever **4,** thus moving the driver blade **13** through the ejection channel **17.** The air under the piston inside the working cylinder **7** is displaced by the piston and passes in a manner well known via passages **29** arranged at the lower end of the cylinder **7** into a secondary chamber **30** located between said cylinder **7** and housing body **1.** This air acts on the lower face of piston **10** after the piston has impacted bumper **18** at the end of its working stroke, whereby said piston is returned to its initial position. This quantity of air is supplemented by the compressed air passing through the separating line **21** of piston **10** to arrive via passages **29,** in the secondary chamber **30** in order to increase the pressure of the air already stored there such that the piston **10** safely returns after every working stroke to its upper initial position.

I claim:

1. In a fluid operated fastener device including a working cylinder, a piston reciprocable in said cylinder by means of fluid, driver means for driving fasteners into a work piece, and securing means for securing said driver means to said piston, the improvement comprising two semicylindrical parts forming said piston, said parts cooperating to form a recess at their separating line for receiving said driver means, said driver means extending into said recess, said semicylindrical parts being held together by contact with the interior of said working cylinder, said securing means holding said driver means in said recess of said parts, said parts having a clearance along their separating line permitting fluid to pass therethrough during a working stroke of said piston, whereby the fluid passing through said clearance is utilized for a return stroke.

2. In a fluid operated fastener device including a working cylinder, a piston reciprocable in said cylinder by means of fluid, a driver blade for driving fasteners into a work piece, and securing means for securing said driver blade to said piston, the improvement comprising:

a pair of semicylindrical parts forming said piston and having adjacent walls, said parts having openings therethrough transverse to the axis of said cylinder, said parts being held in contact at their adjacent walls by contact of the parts on their outer circumference with the interior circumference of said working cylinder,

a recess formed in said semicylindrical parts at said walls and extending upwardly from the bottom of said parts beyond said openings in said parts, said recess having parallel flanges,

a driver blade having parallel edges engaging said flanges and an opening therethrough, said driver blade extending into said recess, said opening in said blade aligning with said openings in said parts,

a pin extending through said openings in said parts and said driver blade, said pin aligning said parts and securing said driver blade to said parts of said piston, and

said semicylindrical parts having a clearance between their walls to permit fluid to pass between said parts of said piston during a working stroke for use in a return stroke of said piston.

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