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A request for correction of the originally filed description has been filed pursuant to Rule 88 EPC. A decision on the request will be taken during the proceedings before the Examining Division (Guidelines for Examination in the EPO, A-V, 2.2).

(54) Arrangement in a tool for driving a fastener, e.g. a staple, into an object.

(57) In an arrangement in a tool (1) for driving a fastener (2), such as a staple, into an object (3) by means of a driver actuating the fastener, said driver being connected to a bar-shaped spring (10) and being reciprocable for bending and thus tensioning the spring about a support in a tensioning stroke and for driving the fastener (2) into the object (3) in a striking stroke generated by the tensional force of the spring (10), the support comprises a substantially continuous elongate surface extending in the longitudinal direction of the spring (10). This surface is designed and positioned such that, when the spring is being bent about the support, the abutment surface of the spring (10) against the support successively increases during the tensioning stroke of the driver (6).

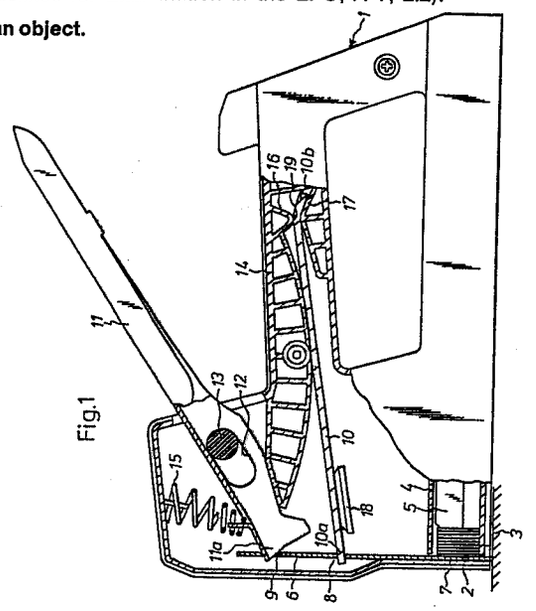


Fig.1

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Description

ARRANGEMENT IN A TOOL FOR DRIVING A FASTENER, SUCH AS A STAPLE, INTO AN OBJECT

The present invention relates to an arrangement in a tool for driving a fastener, such as a staple, into an object by means of a driver actuating the fastener and connected to a bar-shaped spring, said driver being reciprocable for bending and thus tensioning the spring about a support in a tensioning stroke and for driving the fastener into the object in a striking stroke generated by the tensional force of the spring.

A tool of the type stated above is shown and described in, for example, SE-7605579-7.

One disadvantage of this tool is that the bar-shaped spring consists of a laminated leaf spring comprising no less than three leaf springs, which makes the manufacture of the laminated leaf spring, and thus also of the tool, expensive.

Since the laminated leaf spring comprises so many leaf springs, the total amount of energy and thus the tensional force which have been stored in the laminated leaf spring at the end of the tensioning stroke of the driver will be less than if the laminated leaf spring instead is a single leaf spring which supplies the same amount of energy as the above-mentioned laminated leaf spring. This is due to the fact that, during the tensioning stroke of the driver, the leaf springs of the above-mentioned laminated leaf spring will slide against each other, whereby frictional forces and thus losses of energy will occur inside the laminated leaf spring.

A further drawback of the tool according to the above-mentioned patent specification is that its support comprises the lower circumference of a cylinder-shaped support having a small diameter and, consequently, a small circumference. This means that, when the spring has been bent about the support, the abutment surface of the spring against the support is small and, what is more, does not increase during the tensioning stroke of the driver.

A still further drawback of this tool is that the load on the body of the tool about the support during the tensioning stroke of the driver is considerable, which means that the material of the body must be fairly thick.

The object of the present invention therefore is to provide a tool for driving a fastener, such as a staple, into an object with a simple and inexpensive arrangement, whereby the number of leaf springs can be reduced, preferably to a single spring, without decreasing the energy stored in the spring at the end of the tensioning stroke of the driver, and whereby a more favourable distribution of the force acting on the body of the tool during the tensioning stroke of the driver is achieved. The latter implies that the body thickness can be reduced without risk of breakage.

According to the invention, this object is achieved by means of an arrangement of the type mentioned by way of introduction, said arrangement being characterised in that the support comprises a substantially continuous elongate surface extending in the longitudinal direction of the spring, said surface being designed and positioned such that, when the spring is being bent about the support, the abutment surface of the spring against the support successively increases during the tensioning stroke of the driver.

In a preferred embodiment, the bar-shaped spring is a leaf spring.

The elongate support surface can be formed either on a support member fixedly connected with the tool, or on a support member which is displaceable in the vertical and/or horizontal direction of the spring for regulating the tensional force.

The invention will be described in greater detail hereinbelow with reference to the accompanying drawings in which

Fig. 1 is a side view, partly in section, of a tool provided with an arrangement according to the present invention in a resting position, and

Fig. 2 shows the tool in Fig. 1 with the arrangement in a firing position.

Figs 1 and 2 illustrate a tool 1 for driving staples 2 into an object 3. The staples are located in a prior art magazine 4 and are supplied towards the front end of the tool by means of a spring-loaded feed device 5.

The tool further comprises a driver 6 for successively driving the staples 2, said driver being positioned at the front portion of the tool 1 and abutting against the inside of the tool at least in the portion which is to cooperate with a staple 2.

In the resting position of the tool 1 (Fig. 1), the staples 2 are urged against the inside of the driver 6 by means of the feed device 5, the lower end of the driver protruding in this position through an outlet 7 arranged at the front end of the tool 1.

The driver 6 is further provided with two recesses 8, 9 for the front end 10a of a bar-shaped spring 10 and, respectively, the front end 11a of a handle 11. The bar-shaped spring comprises, in the embodiment shown, a single leaf spring 10 whose front end 10a extends through the recess 8 and engages with the driver 6. As is further shown in the Figures, the front end 11a of the handle comprises an upper and a lower shoulder. The front end 11a of the handle 11 extends by its upper shoulder into the recess 9 but is not engaged with the driver 6 in the resting position shown in Fig. 1.

The handle 11 is substantially U-shaped in cross-section, each leg having an elongate hole 12. The handle is pivoted to the body of the tool 1 by means of a pin 13 extending through the holes 12. Since the holes 12 are elongate, the handle 11 can also be displaced in the longitudinal direction of the tool relative to the pin 13. Between its front end 11a and its point of pivotment on the pin 13, the handle 11 is attached to the body of the tool 1 by means of a pressure spring 15.

A support member 14 arranged in the body of the tool 1 is, in the embodiment shown, fixedly connected along its upper side with the tool 1 and

extends in the longitudinal direction of the tool from the front end 11a of the handle 11 to two shoulders 16, 17 extending towards each other in vertical direction and being fixedly connected with the body of the tool 1. As shown in Fig. 1, the spring 10 extends along the support member 14 which is designed such that its lower surface comprises a continuous elongate surface extending in the longitudinal direction of the spring, said surface hereinbelow being called the support surface.

In the resting position shown in Fig. 1, the spring 10 abuts, at its front end 10a, against a damper 18 fixedly connected with the body of the tool 1 and, at its rear end 10b, against the shoulders 16, 17, i. e. the spring 10 extends through an opening 19 formed between the shoulders 16, 17. The vertical position of the damper 18 and the opening 19 is chosen such that the spring 10 touches the support surface in the resting position, i. e. the spring is not biassed in this position. This means, in turn, that there are no loads on the body of the tool in the above-mentioned position.

The function of the tool 1 will now be described in detail. When a staple 2 is to be driven into the object 3, the user presses the handle 11 downwards such that it is turned clockwise about the pin 13, whereby its front end 11a is moved towards the upper boundary surface of the recess 9. When the upper shoulder of this end has been brought into engagement with this boundary surface, a further turning of the handle about the pin 13 will cause the driver 6 and thus the front end 10a of the spring 10 to be raised.

When the driver 6 is raised, the spring 10 will therefore be bent and tensioned about the support member 14, the support surface of said support member being designed and positioned such that, when the spring is being bent about the support member, the abutment surface of the spring 10 against the support member successively increases and the length of the "free" end of the spring 10 successively decreases as the driver is being raised. The stroke raising the driver is called hereinafter and in the claims the tensioning stroke of the driver, while the stroke lowering the driver is called the striking stroke of the driver.

The user presses the handle 11 downwards until the upper shoulder of the front end 11a has swung to such an extent that it leaves the recess 9. The lower end of the driver 6 has now been raised to a level above the staples 2, and the feed device 5 can advance the staple 2 to the outlet 7. In this so-called firing position, in which the driver 6 is released from the handle 11 in that the upper shoulder of the front end 11a leaves the recess 9, the driver is fired downwardly towards the object 3 by the tensional force stored in the spring 10, and the staple 2 positioned in the outlet 7 is driven into the object 3. When the spring 10 reaches the damper 18, it is braked and stops. Since the driver is connected with the spring, it will be arrested as well.

When the handle 11 is released, it is returned to the position shown in Fig. 1 by the pressure spring 15 which moves the handle also in the longitudinal direction such that the upper shoulder of the handle front end 11a enters the recess 9.

Since the abutment surface of the bar-shaped spring 10 against the support member successively increases, while the length of the "free" end of the spring 10 successively decreases when the spring is being bent about the support member during the tensioning stroke of the driver 6, the arrangement according to the present invention utilises a larger part of the spring length that the arrangement of the above-mentioned patent specification SE--7605579-7, with the same deflection of the "free" end of the spring 10. This means, inter alia, that the amount of energy stored in the leaf spring 10 at the end of the tensioning stroke of the driver is much greater than in each leaf spring in the arrangement of the above-mentioned patent specification, which in turn causes the leaf spring 10 to generate a tensional force which also exceeds the tensional force generated by each leaf spring in the above-mentioned arrangement.

It will be appreciated that the invention is not limited to the embodiment illustrated and described, but may be modified in various ways within the scope of the appended claims. For example, the bar-shaped spring may comprise two or more leaf springs instead of one, and the elongate support surface may be formed on a support member which is displaceable in the vertical or horizontal direction of the spring for regulating the tensional force, instead of on a support member fixedly connected with the tool. Moreover, the support surface need not be continuous. A substantially continuous support surface which, for example, is composed of a plurality of rollers arranged adjacent each other and perpendicular to the longitudinal direction of the spring, may also be used.

Claims

1. An arrangement in a tool (1) for driving a fastener (2), such as a staple, into an object (3) by means of a driver (6) actuating said fastener, said driver being connected to a bar-shaped spring (10) and reciprocable for bending and thus tensioning said spring about a support in a tensioning stroke and for driving said fastener (2) into said object in a striking stroke generated by the tensional force of said spring (10), **characterised** in that said support comprises a substantially continuous elongate surface extending in the longitudinal direction of said spring (10), said surface being designed and positioned such that, when said spring is being bent about said support, the abutment surface of said spring against said support successively increases during the tensioning stroke of said driver (6).

2. An arrangement as claimed in claim 1, **characterised** in that said bar-shaped spring is a leaf-spring (10).

3. An arrangemnet as claimed in claim 1 or 2, **characterised** in that said elongate support surface is formed on a support member (14)

fixedly connected with said tool (1).

4. An arrangement as claimed in claim 1 or 2, **characterised** in that said elongate support surface is formed on a support member which is displaceable in the vertical and/or horizontal direction of said spring (10) for regulating the tensional force.

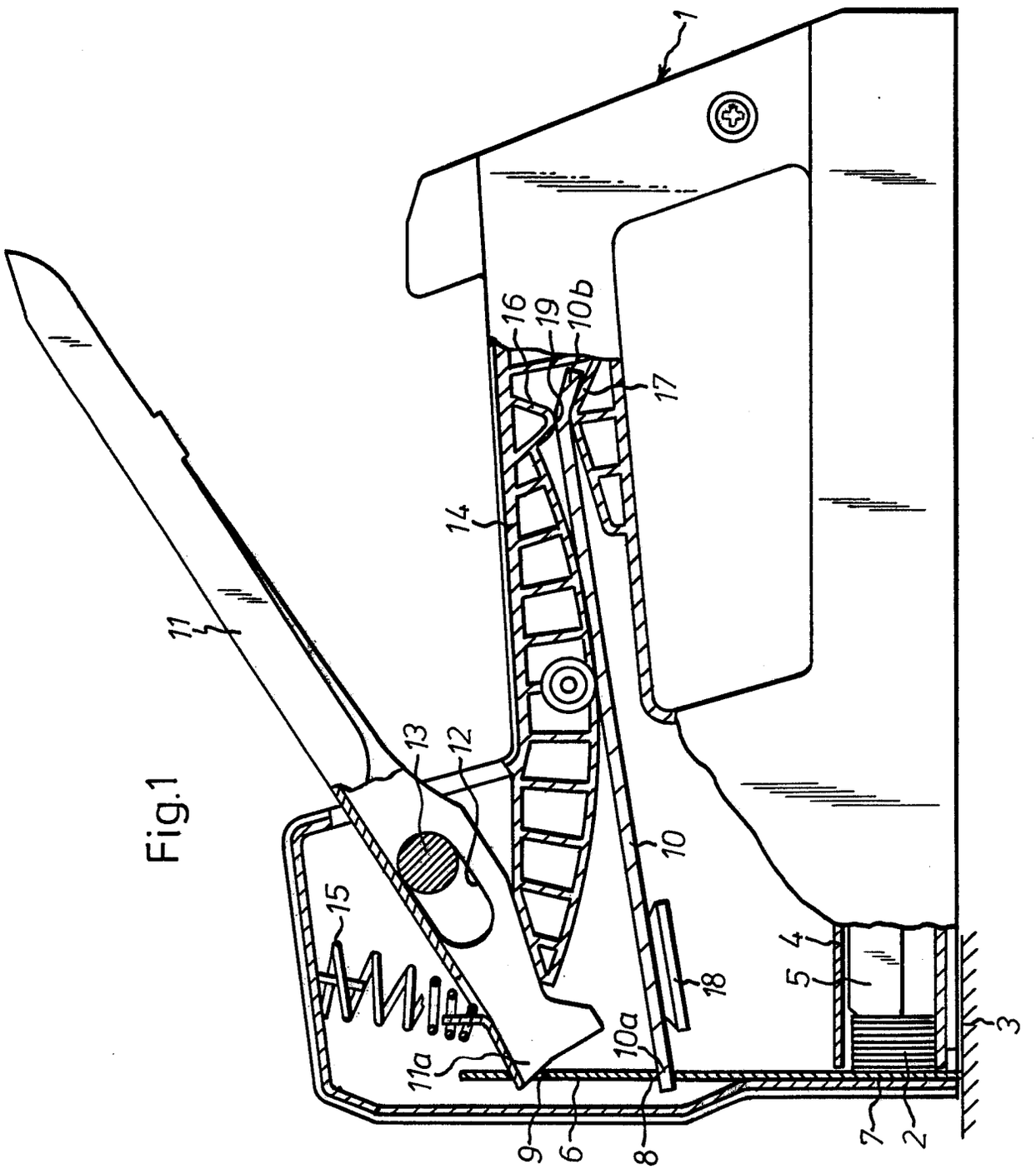
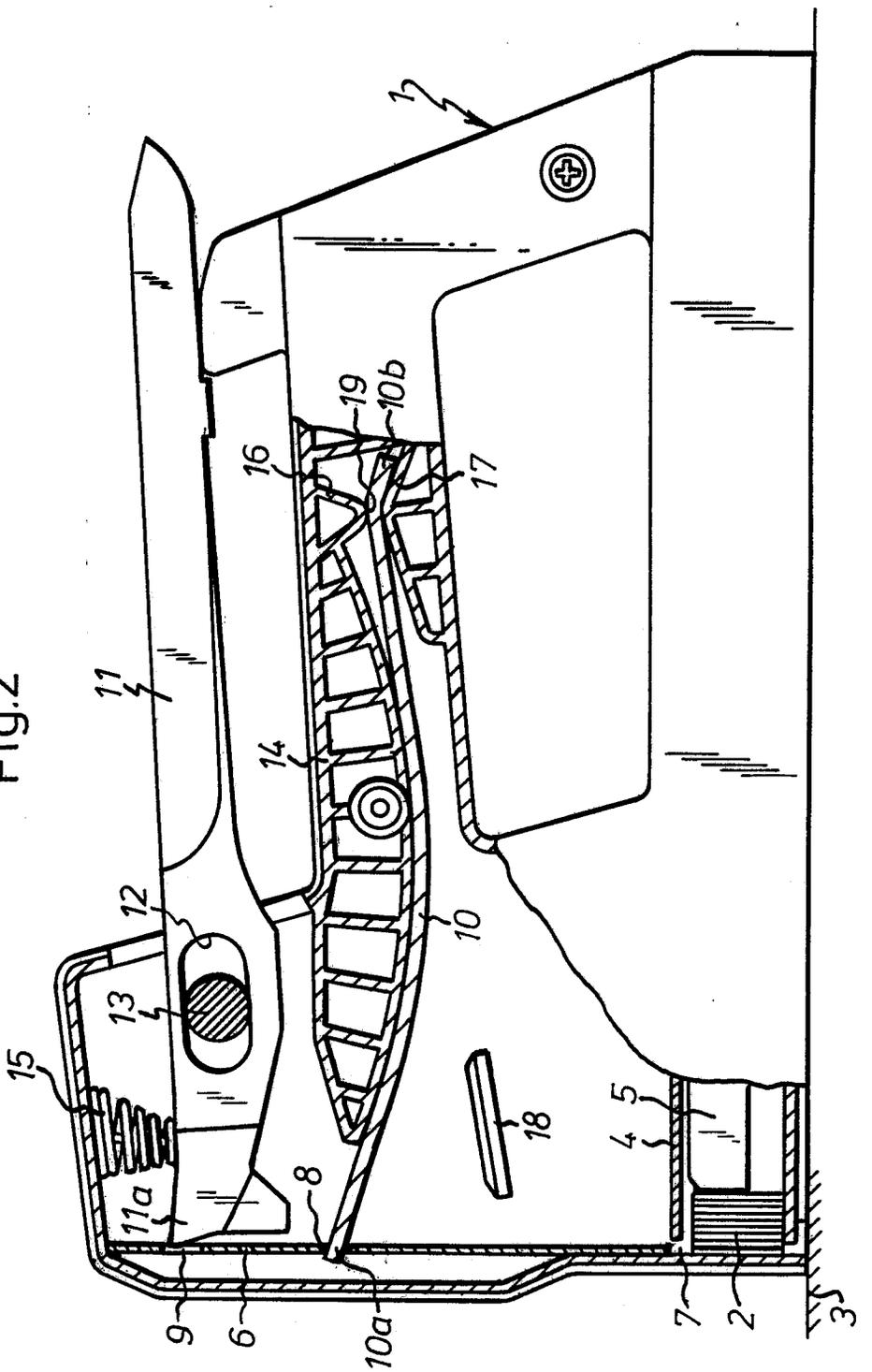


Fig.1

Fig.2



European Patent Office

EUROPEAN SEARCH REPORT

Application number
EP 88850074.1

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	SE-B- 406 287 (ISABERGS VERKSTADS AB)	1-4	B 25 C 5/10

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

B 25 C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
STOCKHOLM	16-05-1988	STOLTZ H.

CATEGORY OF CITED DOCUMENTS

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