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Publication number: **0 543 617 B1**

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EUROPEAN PATENT SPECIFICATION

49 Date of publication of patent specification: **20.09.95** 51 Int. Cl.⁶: **B25C 5/16**, B25C 5/02

21 Application number: **92310478.0**

22 Date of filing: **17.11.92**

54 **A stapling machine.**

30 Priority: **19.11.91 GB 9124498**
19.11.91 GB 9124499
02.12.91 GB 9125596

43 Date of publication of application:
26.05.93 Bulletin 93/21

45 Publication of the grant of the patent:
20.09.95 Bulletin 95/38

84 Designated Contracting States:
BE CH DE DK FR GB IT LI LU NL SE

56 References cited:
WO-A-92/08579
DE-C- 811 464
DE-U- 9 106 427
US-A- 1 970 101
US-A- 2 501 564

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Description

THE PRESENT INVENTION relates to a stapling machine and more particularly to a stapling machine adapted to staple together a plurality of sheets of paper.

A conventional stapling machine incorporates a magazine which holds a "strip" of staples. The staples are biased, by a staple pusher, towards an ejection slot provided at one end of the magazine. An ejection blade is adapted to move through the ejection slot to dispense staples from the magazine. The two legs of the staple then pass, in use of the device, through a plurality of sheets of paper and are then clinched together by means of an anvil.

The strip of staples provided for a stapling machine of this type comprises a plurality of wire staples which are secured together by means of an adhesive. The staples are mounted within the staple magazine and are guided smoothly towards the ejection slot. Difficulties can, however, arise when only a few staples of the strip of staples remain. There is a tendency for the staples to then tilt as the end staple is ejected from the magazine. To overcome this problem it is often necessary to provide a "staple steady" which lies over the strip of staples.

This problem is actually increased in most stapling machines due to the fact that the element which pushes the staples along the staple magazine towards the ejection slot is spring biased and, when the supply of staples is nearly exhausted, the staple pusher has almost reached its terminal position. Using a conventional spring, if the strength of the spring is selected so that the spring is exerting a significant force when the staple pusher has almost reached its terminal position (which force is sufficient to hold the staples as the last few staples are ejected from the magazine) when the pusher has been pulled back to allow a fresh strip of staples to be inserted into the magazine, the force exerted by the pusher may be far too large.

DE-A-811464 discloses a stapling machine incorporating a magazine for a strip of staples, means adjacent one end of the magazine defining a staple ejection slot, an ejection blade adapted to eject a staple through the ejection slot, means to actuate the ejection blade, and a staple pusher adapted to push staples along the magazine towards the ejection slot. The stapling machine incorporates a constant tension spring engaging the staple pusher to apply a force to the staple pusher. The constant tension spring is in the form of a spring strip having a coiled end retained at a substantially predetermined position, a portion of spring strip extending from the coiled end to the

staple pusher. The coiled end is located adjacent the ejection slot underneath the staples within the staple magazine.

WO92/08579 (which document forms part of the state of the art according to Article 54(3) EPC) discloses a stapling machine in which a constant tension spring having two coiled portions is utilised. The coiled portions are received in recesses defined in the under-surface of a staple steady.

The present invention seeks to provide an improved stapling machine.

According to this invention there is provided a stapling machine incorporating a magazine for a strip of staples, means adjacent one end of the magazine defining a staple ejection slot, an ejection blade adapted to eject a staple through the ejection slot, means to actuate the ejection blade, a staple pusher adapted to push staples along the magazine towards the ejection slot and constant tension spring means engaging the staple pusher to apply a force to the staple pusher, wherein the spring means comprise two spiral coils of spring strip, a respective portion of spring strip extending symmetrically with regard to the plane of symmetry of the staple pusher from each coil to the staple pusher, the said coils being retained in cavities defined in a guide, the guide being located in a chamber provided in a staple steady adapted to lie over the magazine to steady the staples within the magazine.

Advantageously a magazine carrier is provided and the staple magazine is slidably mounted on the said magazine carrier so that the staple magazine may move from an operative position to a protracted position.

Preferably a catch is provided to retain the magazine in the operative position, the arrangement being such that if the catch is released the spring means will cause the staple magazine to move to the protracted position.

The stapling machine of the invention may be in the form of a pliers-type stapling machine.

Preferably means are provided to indicate when the supply of staples within the magazine is about to be exhausted.

Conveniently said means comprise one or more indicia present on the spring strip and a window to permit the spring strip to be viewed, the said one or more indicia being so located that they become visible when the supply of staples is about to be exhausted.

Preferably the spring means comprise a single spring strip which defines the two coils and the two said portions, part of the spring strip which interconnects said portions engaging the staple pusher.

In order that the invention may be more readily understood, and so that further features thereof may be appreciated, the invention will now be

described, by way of example, with reference to the accompanying drawings in which

FIGURE 1 is an exploded view of a modified embodiment of the invention, and

FIGURE 2 is an exploded view, corresponding to Figure 5 of another modified embodiment of the invention.

Figure 1 is an exploded view of one embodiment of stapling machine in accordance with the invention. This stapling machine is of the "pliers" type. The stapling machine includes an upper cover 30 containing an assembly to which is pivotally connected an anvil carrier 31, by means of trunnions 32 provided at the end of the anvil carrier. The anvil carrier carries, at its forward end, an anvil 33 which is retained in position by means of an anvil retaining spring 34 which defines an aperture 35 which engages a spigot 36 provided on the anvil carrier 31. The anvil retaining spring 34 also includes an upwardly arched portion 37 which engages the under-surface of a staple magazine carrier 38 which is of channel-form, and which has side walls carrying depending lugs 39 defining arcuate recesses 40 adapted to engage the trunnions 32. The side walls of the channel of the magazine carrier 38 end with inwardly turned flanges 41 and also each side wall has an arcuate slot 42 formed therein. Also, one side wall, as is visible in Figure 5, has an aperture 43 formed therein which constitutes a "window". Mounted within the magazine carrier 38 is a staple magazine 44 in the form of an elongate channel, the side walls of the channel being in-turned to form flanges 45 at the forward end, thus defining a staple ejection slot 46.

A staple ejector or pusher 47 is provided adapted to slide along the magazine 44 to bias staples towards the ejection slot.

A staple steady 48, which may be formed of an integrally moulded plastics body, is provided adapted to lie over the magazine 44 and to steady the staples within the magazine as they move forwardly. A recess is formed in the under-surface of the staple steady 48 to receive the staple pusher 47. The recess is in the form of a channel which defines a path of movement for the staple pusher 47.

A constant tension spring 49 is provided which has two ends, each having a spiral portion 50 and a portion 51 inter-connecting the two ends with the spiral portions. The portion 51 is adapted to engage an abutment 47', provided for that purpose on the staple pusher.

A guide 52 is provided which defines two circular-sectioned cavities dimensioned to accommodate the spiral portions 50 of the spring 49. The guide 52 is adapted to be received in a chamber provided for that purpose, within the staple steady

48. The chamber to receive the guide 52 is associated with the recess for the staple pusher. The guide 52 defines a slot 52'. An aperture 53 is formed in the side of the staple steady 48, also to form a window, the apertures 43 and 53 and the slot 52' being adapted to be co-aligned.

In assembling the stapling machine the spiral portions 50 of the spring 49 are inserted in the cavities in the guide 52, and the guide 52 is then mounted in the appropriate chamber in the staple steady 48. The end 51 of the spring 49 extends across the recess which receives the staple pusher.

The upper part of the staple steady 48 is formed to accommodate snugly a spring 54. The spring 54 has a portion 55 at the forward end thereof which engages an aperture 56 provided in a staple ejector blade 57. The spring 54 comprises a linear part extending from the portion 55. The linear part terminates with an upwardly and forwardly curled region, so that the spring 54 has two substantially parallel portions joined by a "U" bend. The "U" bend abuts a curved recess provided for that purpose on the top of the staple steady 48.

An actuating lever 58 is provided having a bearing 59 defined at substantially its mid-point, the bearing engaging a recess 60 provided for that purpose substantially at the mid-point of the anvil carrier 31. The forward end of the actuating lever 58 carries a roller 60 which passes through the arcuate slots 42 provided in the magazine carrier and which also engages the top surface of the forwardly extending lower portion of the spring 54.

A front plate 61 is provided for the magazine 44 in the form of a plastic moulding that is snap-fitted to the front of the magazine 44, covering the flanges 45. A release catch 62 is provided which is mounted on the front of the housing 30 with the aid of a release catch clip 63. An aperture or window 64 is defined in the side of the main housing 30 adapted to be aligned with the apertures 43 and 53.

It is to be appreciated that by releasing the catch 62 the magazine may slide, under a bias provided by the spring 49, to a position in which the magazine 44 protrudes from the housing 30. The magazine 44 may be grasped so that the magazine may be drawn forwardly out of the housing to replenish the supply of staples. When the magazine is pushed back into the housing, the staple pusher 47 is engaged by the staples within the magazine, and the staple pusher 47 is thus moved towards the right against the bias from the constant tension spring 49. The portion 51 of the constant tension spring inter-connecting the two ends which each terminate in the spiral portions 50 engages the abutment 47' on the staple pusher 47. The spiral portions thus effectively unwind, and the

constant tension spring applies a substantially constant tension to the staple pusher 47. The two spiral portions 51 of the spring 49 apply equal forces, and thus the total force applied to the staple pusher 47 is aligned with its axis of movement. There is thus no tendency for the staple pusher 47 to twist and jam.

When the stapling machine has been supplied with staples and the actuating lever 58 is grasped, simultaneously with the housing 30, the actuating lever will move pivotally about the axis defined by the bearing 59 and the recess 60. This will also tend to move the anvil carrier about the axis defined by the trunnions 32 and the recesses 40. The arched portion 37 of the anvil retaining spring 34 would initially be flattened and any paper located between the anvil and the base of the magazine carrier 38 will be effectively gripped by the "pliers" action. Subsequent movement of the actuating anvil 58 will cause the roller 60 to move the lower part of the spring 54 downwardly, thus driving the staple ejector blade 57 downwardly through the staple ejection slot 46, driving a staple from the staple magazine 44 so that the ends of the arms of the staple penetrate the paper and are then clinched by a recess provided on the anvil.

It is to be appreciated that part of the exterior of one of the spiral portions 50 of the constant tension spring 49 can be viewed through the aligned slot 52' and the apertures and windows 64, 43 and 53. This part of the constant tension spring may provide some marking which, when it becomes visible through the aligned windows and apertures, provides an indication that the supply of staples within the stapling machine is about to be exhausted.

Figure 2 illustrates another embodiment of the invention very similar to that illustrated in Figure 1. Like references are used for like parts in Figure 1 and Figure 2 to obviate unnecessary re-description.

The staple ejector blade 57 in the embodiment of Figure 6 has a rearwardly directed spring portion 70, which co-operates with a rigid beam 71 of channel form that is mounted within the main housing 30. Part of the beam is received in a slot formed on the projection on the upper part of the staple steady. The projection defines a recess that accommodates a curved end part of the spring portion 70. The combination of the channel 71 and the spring 70 performs the function of the spring 54 as described with reference to the Figure 1 embodiment.

In the described embodiments of the invention a window to show the number of staples remaining has been described as being provided on one side of the stapling machine. Of course, in alternative embodiments of the invention windows may be provided on both sides of the stapling machine to

enable the status of the supply of staples to be observed regardless of from which side the stapling machine is being viewed.

Whilst the invention has been described with reference to a "pliers" type machine it is to be appreciated that features of the invention may be incorporated into a conventional or "desk-top" machine.

Claims

1. A stapling machine incorporating a magazine(44) for a strip of staples, means(45) adjacent one end of the magazine defining a staple ejection slot(46), an ejection blade(57) adapted to eject a staple through the ejection slot, means(58) to actuate the ejection blade, a staple pusher(47) adapted to push staples along the magazine towards the ejection slot and constant tension spring means(49) engaging the staple pusher to apply a force to the staple pusher, characterised in that the spring means comprise two spiral coils(50) of spring strip, a respective portion(51) of spring strip extending symmetrically with regard to the plane of symmetry of the staple pusher from each coil to the staple pusher, the said coils(50) being retained in cavities defined in a guide(52), the guide being located in a chamber provided in a staple steady(48) adapted to lie over the magazine to steady the staples within the magazine.
2. A stapling machine according to Claim 1 wherein a magazine carrier(38) is provided and the staple magazine is slidably mounted on the said magazine carrier so that the staple magazine may move from an operative position to a protracted position.
3. A stapling machine according to Claim 2 wherein a catch(62) is provided to retain the magazine(44) in the operative position, the arrangement being such that if the catch is released the spring means will cause the staple magazine to move to the protracted position.
4. A stapling machine according to any one of the preceding Claims in the form of a pliers-type stapling machine.
5. A stapling machine according to any one of the preceding Claims wherein means are provided to indicate when the supply of staples within the magazine is about to be exhausted.
6. A stapling machine according to Claim 5 wherein said means comprise one or more

indicia present on the spring strip and a window to permit the spring strip to be viewed, the said one or more indicia being so located that they become visible when the supply of staples is about to be exhausted.

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7. A stapling machine according to any one of the preceding Claims wherein the spring means comprise a single spring strip which defines the two coils(50) and the two said portions(51), part of the spring strip which interconnects said portions(51) engaging the staple pusher(47).

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Patentansprüche

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1. Heftmaschine mit einem Magazin (44) für einen Heftklammerstreifen, einem Mittel (45), das benachbart zu einem Ende des Magazins angeordnet ist und einen Heftklammerausdruckschlitz (46) bildet, einer Ausdrückklinge (57), die zum Ausdrücken einer Heftklammer durch den Ausdruckschlitz vorgesehen ist, einem Mittel (58) zum Betätigen der Ausdrückklinge, einem Heftklammerschieber (47), der die Heftklammern entlang des Magazins gegen den Ausdruckschlitz drückt, und einem Federmittel (49) mit konstanter Kraft, das den Heftklammerschieber in Eingriff nimmt, dadurch gekennzeichnet, daß das Federmittel zwei (spiralförmige) Wicklungen (50) eines Federstreifens umfaßt, wobei sich jeweils ein Abschnitt (51) des Federstreifens symmetrisch zur Symmetrieebene des Heftklammerschiebers von jeder Wicklung zum Heftklammerschieber erstreckt, und die Wicklungen (50) in Hohlräumen gehalten werden, die in einer Führung (52) gebildet sind, wobei die Führung in einem Raum angeordnet ist, der in einer Heftklammerführungsschiene (48) vorgesehen ist, die so beschaffen ist, daß sie über dem Magazin liegt, und daß sie die Heftklammern im Magazin führt.

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2. Heftklammermaschine nach Anspruch 1, dadurch gekennzeichnet, daß ein Magazinträger (38) vorgesehen ist, auf welchem das Heftklammermagazin verschiebbar befestigt ist, so daß das Heftklammermagazin von einer Arbeitsstellung in eine herausgezogene Stellung bewegt werden kann.

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3. Heftmaschine nach Anspruch 2, dadurch gekennzeichnet, daß eine Verriegelung (62) vorgesehen ist, die das Magazin (44) in der Arbeitsstellung hält, wobei die Anordnung derart ausgebildet ist, daß das Federmittel das Heftklammermagazin in die herausgezogene Stellung

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lung bewegt, wenn die Verriegelung gelöst ist.

4. Heftmaschine nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß die Heftmaschine in Form eines Zangentyps vorliegt.

5. Heftmaschine nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß Mittel vorgesehen sind, die anzeigen, wenn der Heftklammervorrat im Magazin fast verbraucht ist.

6. Heftmaschine nach Anspruch 5, dadurch gekennzeichnet, daß die Mittel eine oder mehrere Indexziffer(n) auf dem Federstreifen und ein Fenster umfassen, das das Betrachten des Federstreifens möglich macht, wobei die Indexziffer bzw. Indexziffern so angeordnet sind, daß sie sichtbar werden, wenn der Heftklammervorrat fast verbraucht ist.

7. Heftklammermaschine nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß das Federmittel einen einzelnen Federstreifen umfaßt, der die zwei Wicklungen (50) und die zwei Abschnitte (51) bildet, wobei der die Abschnitte (51) miteinander verbindende Teil des Federstreifens den Heftklammerschieber (47) in Eingriff nimmt.

Revendications

1. Machine d'agrafage comportant un magasin (44) pour une bande d'agrafes, des moyens (45) voisins d'une extrémité du magasin, définissant une fente d'éjection d'agrafes (46), une lame d'éjection (57) adaptée à éjecter une agrafe à travers la fente d'éjection, des moyens (58) pour actionner la lame d'éjection, un poussoir d'agrafes (47) adapté à pousser des agrafes le long du magasin en direction de la fente d'éjection, et des moyens formant ressort à tension constante (49) s'engrenant avec le poussoir d'agrafes de façon à appliquer une force au poussoir d'agrafes, caractérisée en ce que les moyens formant ressort comportent deux enroulements en spirale (50) d'une bande de ressort, une partie respective (51) de la bande de ressort s'étendant symétriquement par rapport au plan de symétrie du poussoir d'agrafes de chaque enroulement au poussoir d'agrafes, lesdits enroulements (50) étant maintenus dans des cavités définies dans un guide (52), le guide étant disposé dans une chambre présente dans une cale à agrafes (48) adaptée à reposer au-dessus du magasin afin de caler les agrafes à l'intérieur du maga-

sin.

2. Machine d'agrafage selon la Revendication 1, dans laquelle un support de magasin (38) est présent, et le magasin à agrafes est monté de façon à pouvoir glisser sur ledit support de magasin de sorte à pouvoir se déplacer d'une position opérationnelle à une position allongée. 5

3. Machine d'agrafage selon la Revendication 2, dans laquelle un dispositif de blocage (62) est présent pour maintenir le magasin (44) dans la position opérationnelle, la configuration étant telle que, si le dispositif de blocage est relâché, les moyens formant ressort provoqueront le déplacement du magasin à agrafes vers la position allongée. 10
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4. Machine d'agrafage selon l'une quelconque des revendications précédentes, sous la forme d'une machine d'agrafage du type en pince. 20

5. Machine d'agrafage selon l'une quelconque des revendications précédentes, dans laquelle des moyens sont présents pour indiquer le moment où la quantité d'agrafes à l'intérieur du magasin est sur le point d'être épuisée. 25

6. Machine d'agrafage selon la Revendication 5, dans laquelle lesdits moyens comportent un ou plusieurs index présents sur la bande de ressort, et une fenêtre destinée à permettre à la bande de ressort d'être visualisée, ledit ou lesdits index étant disposés de telle sorte qu'ils deviennent visibles lorsque la quantité d'agrafes est sur le point d'être épuisée. 30
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7. Machine d'agrafage selon l'une quelconque des revendications précédentes, dans laquelle les moyens formant ressort comportent une bande de ressort unique qui définit les deux enroulements (50) et lesdites deux parties (51), une partie de la bande de ressort qui interconnecte lesdites parties (51) s'engrenant avec le poussoir d'agrafes (47). 40
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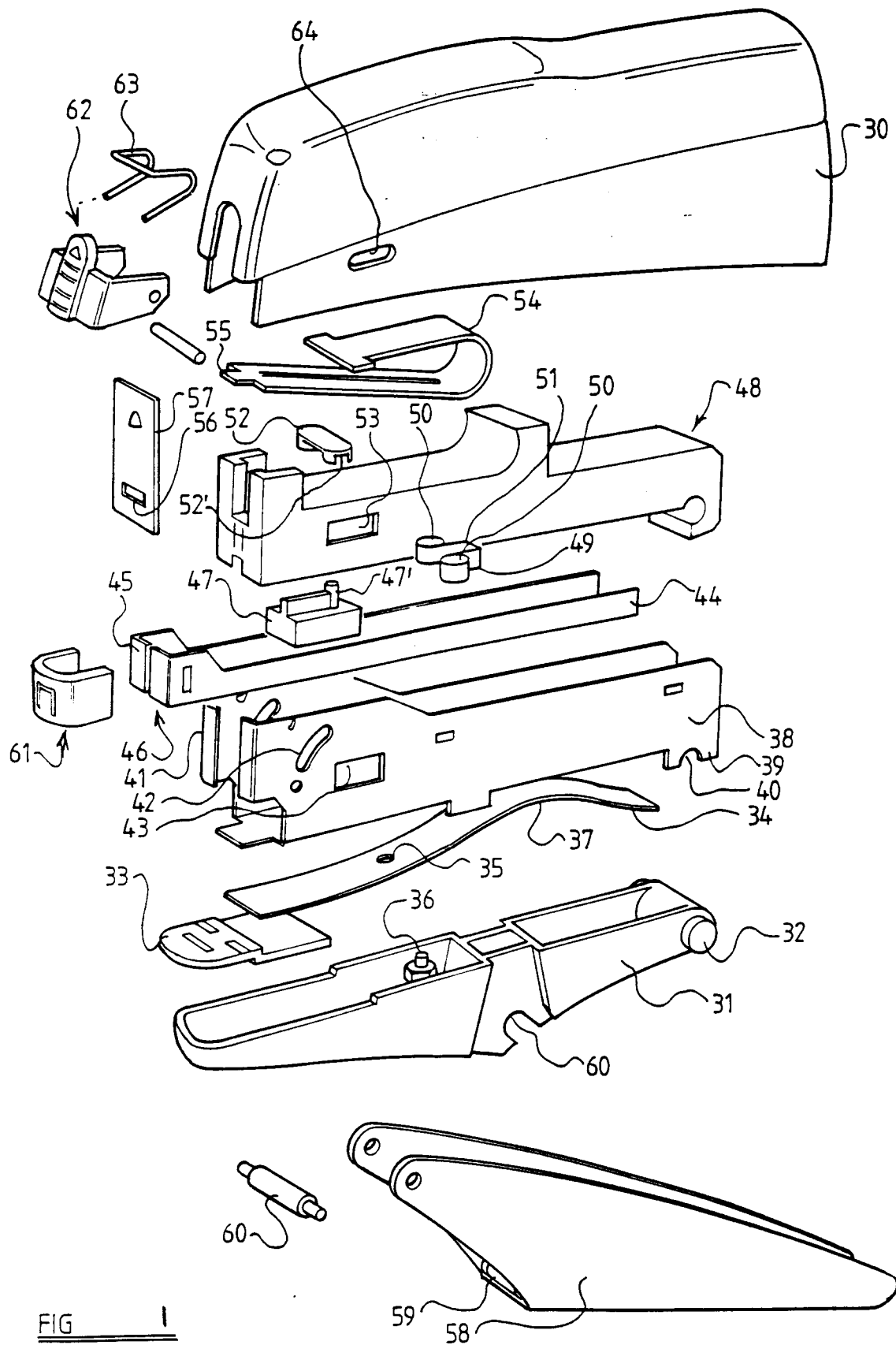


FIG 1

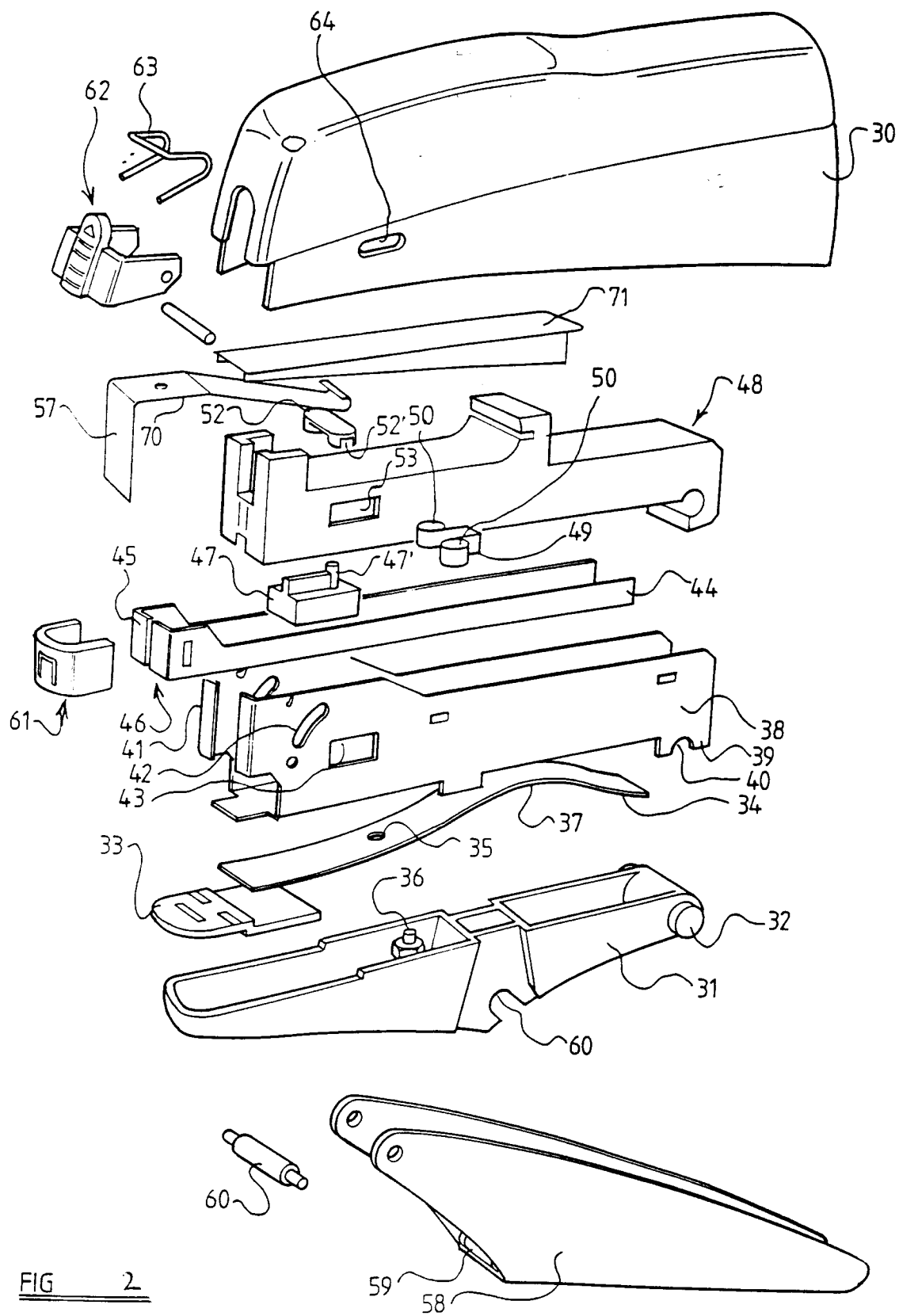


FIG 2