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(54) **MALE ELEMENT FOR BOX-MAKING MACHINE**

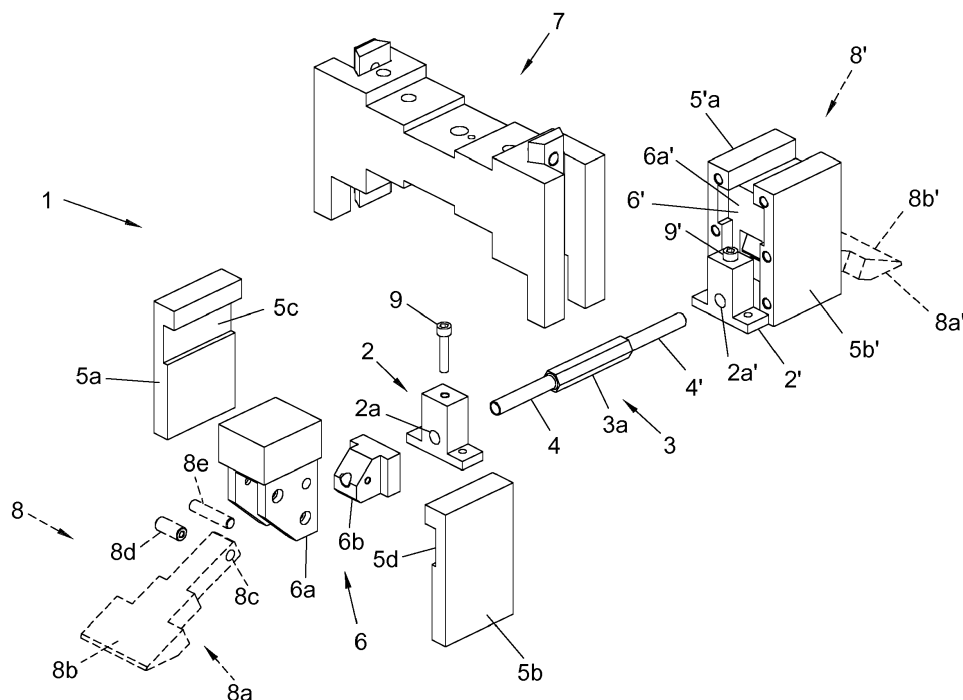
(57) The invention relates to a male element for a box-making machine comprising a central core that comprises in turn:

- two back plates having through holes and arranged on two opposite sides of the central core;
- a rotating shaft for adjusting the position of two pressure means, wherein the through holes of the back plates penetrate said shaft, and wherein said rotating shaft also has

two ends threaded in opposite directions;

- two sliding parts, each of said sliding parts being joined to one of the threaded ends of the shaft; and
- two pressure means, wherein each of these pressure means is solidly connected to one of the sliding parts.

The invention also relates to the box-making machine containing the described male element, in any of its variants.



**FIG. 1**

## Description

### Object of the invention

[0001] The present invention belongs to the technical field of box-making, for example, but not limited to, cardboard boxes.

[0002] More particularly, the present invention relates to a male element intended to be used in a box-making machine which makes it possible to simultaneously and synchronously adjust -by means of a single control element- the position of two different pressure means, arranged on opposite sides of the box-making machine.

### Technical problem to be resolved and background of the invention

[0003] Different box-making machines are currently known that are capable of repeatedly folding a die-cut plate or sheet made of -for example but not limited to- cardboard, to make a box with predefined dimensions and volume.

[0004] Box-making machines commonly comprise two different main elements:

- i) a female element or matrix, that receives the die-cut sheet or plate; and
- ii) a male element, having one or more pressure means intended to exert pressure on the die-cut sheet or plate to fold it, thereby creating an edge or vertex of the box. In order to aid this folding operation, the male element may have one or more stop elements.

[0005] One of these box-making machines is disclosed in Spanish patent number 2,285,884. Said document describes a cardboard box-making machine whose male element comprises four different pressure means, each of which is formed by a swing arm also having individual adjustment means that make it possible to adjust the position of said swing arm in the longitudinal direction.

[0006] The male element disclosed in Spanish patent number 2,285,884 also comprises four stop elements in the manner of a bracket (i.e. each of said stop elements has two arms forming a straight angle therebetween).

[0007] The position of each of the L-shaped stop elements in the longitudinal direction can also be individually adjusted. This, added to the presence of individual adjustment means associated with each of the pressure means, makes it possible for the box-making machines according to Spanish patent number 2,285,884 to create boxes of different dimensions and volumes.

[0008] In the state of the art it is common to use adjustment means comprising screws to adjust the position of the pressure means in a predefined direction (which, for the sake of simplicity, we will call "longitudinal direction"). Said screws can move along a through groove and be fixed at will at different points of interest along the

length thereof, being threaded onto a lower part disposed underneath the groove. Indeed, Spanish patent number 2,285,884 discloses adjustment means of this type (although, in this case, they are intended to adjust to the longitudinal distance at which each of the stop elements is arranged).

[0009] One advantage of this type of adjustment means is that it is necessary to individually regulate the position of each of the different pressure means envisaged in the male element, which increases the time required to correctly configure the box-making machine, reduces its efficiency and increases the likelihood of errors (since the operator must separately adjust the position of each of the pressure means wherein said separation is adequate on each of the sides of the machine).

[0010] Different automated adjustment means are also known, which are capable of simultaneously adjusting the longitudinal position of all the pressure means envisaged in the male element. These automated means require complex mechanisms comprising several components. This makes their widespread use in different box-making machines difficult, since incorporating them considerably increases manufacturing costs.

[0011] Therefore, there is a need in the industry to provide a male element for a box-making machine having means for adjusting the pressure means, but lacking complex and costly automatic adjustment mechanisms and that, simultaneously, makes it possible to symmetrically and synchronously adjust at least two different pressure means on manually actuating a single control element. It is also desirable for said manual adjustment means to have a precision and reliability comparable to those of automated means.

### Description of the invention

[0012] In order to achieve the objectives and avoid the inconveniences mentioned in the previous sections, the object of the present invention is a male element for a box-making machine comprising a central core, characterized in that it also comprises:

- two back plates having through holes and arranged on two opposite sides of the central core;
- a rotating shaft for regulating the position of two pressure means, said shaft passing through the through holes of the back plates, and said rotating shaft also having two ends threaded in opposite directions;
- two sliding parts, each of said sliding parts being joined to one of the threaded ends of the shaft; and
- two pressure means, each of these pressure means being solidly connected to one of the sliding parts.

[0013] In the present invention, the control element in charge of adjusting the position of the pressure means is the threaded shaft.

[0014] Indeed, upon manually rotating this shaft, the two sliding parts move in the direction of travel of said

shaft simultaneously and synchronously (since each of these sliding parts is joined to one of the threaded ends of the shaft). This, in turn, also causes the pressure means to move, extending or contracting in the direction of the shaft (since each of the pressure means is solidly connected to one of the sliding parts).

**[0015]** Therefore, the present invention makes it possible to adjust the position of the two pressure means in a completely identical manner therebetween, despite the fact that said pressure means are arranged on opposite sides of the shaft. Furthermore, rotating the shaft once enables the simultaneous adjustment of the two pressure means, reducing the stop time of the box-making machine with respect to the machines of the prior art, in which the position of each of the pressure means must be individually adjusted.

**[0016]** In a preferred embodiment of the invention, the shaft has a central portion with a geometry adaptable to a key or actuation element. For example and not as limitation, said shaft may have a central portion with a hexagonal geometry. This hexagonal configuration is advantageous because the sides that define said hexagon facilitate the fit of the shaft with the head of a torque wrench.

**[0017]** In another preferred embodiment of the invention, the male element also has runners arranged on both sides of each of the sliding parts.

**[0018]** Each of the sliding parts may optionally have a threaded bushing, intended to join each of said sliding parts with one of the threaded ends of the shaft.

**[0019]** Furthermore, the male element according to the present invention may optionally have grip screws.

**[0020]** In an additional preferred embodiment of the invention, each of the pressure means comprise a flap having a first swiveling beveled end and a second fixed end, joined to a pivot.

**[0021]** In an additional alternative embodiment of the invention, each of the pressure means has a straight central plate, wherein said central plate is arranged perpendicularly to the rotating shaft and joined to the angular plates.

**[0022]** In another embodiment of the present invention, the male part has at least one ancillary portion comprising at least one stop element. Said stop element facilitates the folding operations of the die-cut sheet or plate, required to make the box.

**[0023]** Another object of the invention is a box-making machine comprising a male element in accordance with any of the previously described embodiments.

**[0024]** Throughout the present description, reference will only be made, for the sake of simplicity, to the fact that the male element according to the invention has a single rotating shaft in charge of adjusting the position of two pressure means arranged on opposite sides of the central core. However, it should be noted that the present invention also expressly envisages the possibility that the male element has two or more different rotating shafts, such that each of said rotating shafts adjusts the position of two different pressure means, arranged on

opposite sides.

**[0025]** Next, to help better understand this specification and as an integral part thereof, it is accompanied by a series of figures wherein the object of the invention is depicted in an illustrative and non-limiting manner.

### Brief description of the figures

**[0026]**

**Figure 1.-** This figure shows a partially ordered exploded perspective view of a first embodiment, according to the present invention, of a male element for a box-making machine;

**Figure 2A.-** This figure shows a partially ordered exploded perspective view of a second embodiment of a male element according to the invention, similar to that of Figure 1, but that also comprises stop elements;

**Figure 2B.-** This figure shows a perspective view of the male element illustrated in Figure 1;

**Figure 2C.-** This figure shows a side elevational view of the male element illustrated in Figure 1;

**Figure 2D.-** This figure shows a longitudinal sectional view along line A-B of the male element illustrated in Figure 2C;

**Figure 2E.-** This figure shows, through an isometric view, the manner in which the male element (illustrated in Figures 2A to 2D) is arranged on a box in order to fold it; and

**Figure 3.-** This figure shows an ordered exploded view of a third embodiment, according to the present invention, of a male element for a box-making machine.

### Description of an embodiment of the invention

**[0027]** Throughout the present invention and in the figures, elements with equal or similar functions will be assigned the same numerical references.

**[0028]** Figure 1 shows a first embodiment of a male element 1, according to the present invention, comprising a central core 7 intended to hold different components of the male element, such as the box-making machine movement mechanism (not visible in the figures).

**[0029]** The male element 1 also comprises two back plates 2, 2' joined to the central core 7 and arranged on opposite sides thereof. The back plates 2, 2' also have respective through holes 2a, 2a' and grip screws 9, 9'.

**[0030]** The rotating shaft 3 has two ends 4, 4', threaded in opposite directions, that penetrate the through holes 2a, 2a' and are joined by threading, respectively, to the lower elements of the sliding parts 6, 6'.

**[0031]** In this particular embodiment of the invention, the sliding part 6 comprises two different elements: an upper element 6a and a lower element 6b.

**[0032]** The upper element 6a of the sliding part 6 can move slidably along longitudinal grooves 5c and 5d, pro-

vided in runners 5a and 5b. The lower element 6b of the sliding part 6 is in contact with the upper element 6a.

**[0033]** Sliding part 6' is identical to sliding part 6, although some details of said sliding part 6' and of runners 5a' and 5b' are not visible in the figures.

**[0034]** However, figure 1 shows the upper element 6a' of sliding part 6', which can move slidably along longitudinal grooves in runners 5a and 5b. Sliding part 6' also has a lower element 6b' (visible in figure 2d) which is joined by threading to the end 4' of the rotating shaft 3 and which is also in contact with the upper element 6a'.

**[0035]** Although in this specific embodiment each of the sliding parts 6 and 6' comprise two different elements: an upper element 6a, 6a' and a lower element 6b, 6b', respectively. The present invention also expressly envisages the possibility that sliding parts 6 and 6' are made from a single part.

**[0036]** The central portion 3a of the rotating shaft 3 has, in this particular embodiment of the invention, hexagonal geometry.

**[0037]** The pressure means 8 comprise, in this particular embodiment of the invention, a flap 8a having a first swiveling beveled end 8b and a second end 8c that is fixed to the upper element 6a of the sliding part 6 by means of a pivot 8e. The pressure means 8 also have a stop 8d that limits the travel of the swiveling beveled end 8b.

**[0038]** The pressure means 8' are essentially identical to the pressure means 8, although some of the elements of said means 8' are not visible in the figures. In figure 1, however, it can be observed that the flap 8a' that forms part of said means 8' which, as in the case of the flap 8a, has a first swiveling beveled end 8b' and a second end (not visible in the figures) that is fixed to the lower element of the sliding part 6' by means of a pivot (not visible in the figures).

**[0039]** However, the present invention also expressly envisages the possibility of equipping the pressure means with different elements, as explained below, in relation to figure 3.

**[0040]** Figures 2A, 2B, 2C and 2D show different views of a second embodiment of a male element 1, in accordance with the present invention, for a box-making machine.

**[0041]** The male element 1 shown in said figures 2A-2D comprise all the constituent components of the male element shown in figure 1. Therefore, said common components will be assigned the same numerical references and will not be described again herein.

**[0042]** The male element 1 shown in said figures 2A-2D also has two different ancillary portions, designated by numerical references 100 and 100'.

**[0043]** Each of said ancillary portions 100 and 100' has, in turn, two L-shaped stop elements 150a, 150b and 150a', 150b', respectively, whose position can be adjusted by means known in the art, due to which they will not be described in detail herein.

**[0044]** The ancillary portions 100 and 100' also have

a respective base 120, 120', wherethrough they are fixed to the central core 7 of the male part 1.

**[0045]** Figure 2E shows the manner in which a male part 1 must be arranged, according to figures 2A to 2D, on a box 200, in order to fold it using a box-making machine.

**[0046]** Figure 3 shows a third embodiment of the male part 1 according to the present invention wherein each of the pressure means 18, 18' comprise a central straight plate 18a and 18a', said central plates 18a and 18a' arranged perpendicularly to the rotating shaft 3. Furthermore, each of the central plates 18a and 18a' is joined to two angular plates: to angular plates 18b, 18c (in the case of central plate 18a) and to angular plates 18b', 18c' (in the case of central plate 18a').

**[0047]** In this specific embodiment of the invention, the sliding parts 6 and 6' are made from a single piece.

**[0048]** The other elements of this second embodiment of the male part 1 is identical to that of the first embodiment shown in Figure 1, due to which they will not be described herein.

#### Numerical references of the figures

**[0049]**

- (1) Male element;
- (2, 2') Back plates;
- (2a, 2a') Through holes of the back plates 2 and 2', respectively
- (3) Rotating shaft;
- (3a) Central portion of the rotating shaft;
- (4, 4') Threaded ends of the rotating shaft;
- (5a, 5b; 5a', 5b') Runners;
- (5c, 5d) Longitudinal grooves of runners 5a and 5b', respectively;
- (6, 6') Sliding parts;
- (6a, 6a') Upper elements of sliding parts 6 and 6', respectively;
- (6b, 6b') Lower elements of sliding parts 6 and 6', respectively;
- (7) Central core of the male part;
- (8, 8') First embodiment of the pressure means;
- (8a, 8a') Flaps;
- (8b, 8b') First element of flaps 8a and 8b, respectively;
- (8c) Second end of flap 8a;
- (8d) Stop;
- (8e) Pivot;
- (9, 9') Grip screws;
- (18, 18') Second embodiment of the pressure means;
- (18a, 18a') Straight plates of the pressure means 18 and 18', respectively;
- (18b, 18c; 18b', 18c') Angular plates of pressure means 18 and 18', respectively;
- (100) First ancillary portion;
- (100') Second ancillary portion;

(120) Base of the first ancillary portion;  
 (120') Base of the second ancillary portion;  
 (150a, 150b) Stop elements of the first ancillary portion;  
 (150a', 150b') Stop elements of the second ancillary portion;  
 (200) Box.

## Claims

1. **A male element (1) for a box-making machine**, comprising a central core (7), **characterized in that** it also comprises:

- two back plates (2, 2') having through holes (2a, 2a') and arranged on two opposite sides of the central core (7);
- a rotating shaft (3) for adjusting the position of two pressure means (8, 8'; 18, 18') wherein said shaft (3) passes through the through holes of the back plates (2, 2'), said rotating shaft (3) also having two ends (4, 4') threaded in opposite directions;
- two sliding parts (6, 6'), each of said sliding parts (6, 6') being joined to one of the threaded ends (4, 4') of the shaft (3); and
- two pressure means (8, 8'); (18, 18'), each of said pressure means (8, 8'; 18, 18') being solidly connected to one of the sliding parts (6, 6').

2. **The male element (1) for a box-making machine**, according to claim 1, **characterized in that** the rotating shaft (3) has a central portion (3a) with a geometry adaptable to a key or actuation element.

3. **The male element (1) for a box-making machine**, according to claim 2, **characterized in that** the rotating shaft (3) has a central portion (3a) with hexagonal geometry.

4. **The male element (1) for a box-making machine**, according to any of the preceding claims, **characterized in that** it also has runners (5a, 5b; 5a', 5b') arranged on both sides of each of the sliding parts (6, 6').

5. **The male element (1) for a box-making machine**, according to any of the preceding claims, **characterized in that** each of the sliding parts (6, 6') has a threaded bushing.

6. **The male element (1) for a box-making machine**, according to any of the preceding claims, **characterized in that** it has grip screws (9).

7. **The male element (1) for a box-making machine**, according to any of the preceding claims, **characterized in that**

**in that** each of the sliding parts (6, 6') comprises an upper element (6a; 6a') and a lower element (6b, 6b').

8. **The male element (1) for a box-making machine**, according to any of the preceding claims, **characterized in that** each of the pressure means (8, 8') comprises a flap (8a, 8a') having a first swiveling beveled end (8b, 8b') and a second fixed end (8c), joined to a pivot (8e).

9. **The male element (1) for a box-making machine**, according to any of claims 1 to 7, **characterized in that** each of the pressure means (18, 18') has a straight central plate (18a, 18a'), wherein said central plate (18a, 18a') is arranged perpendicularly to the rotating shaft (3) and joined to angular plates (18b, 18c; 18b', 18c').

10. **The male element (1) for a box-making machine**, according to any of the preceding claims, **characterized in that** it also comprises at least one ancillary portion (100 and 100') having at least one stop element (150a, 150b and 150a', 150b').

11. **A box-making machine, characterized in that** it comprises a male element (1), according to any of the preceding claims.

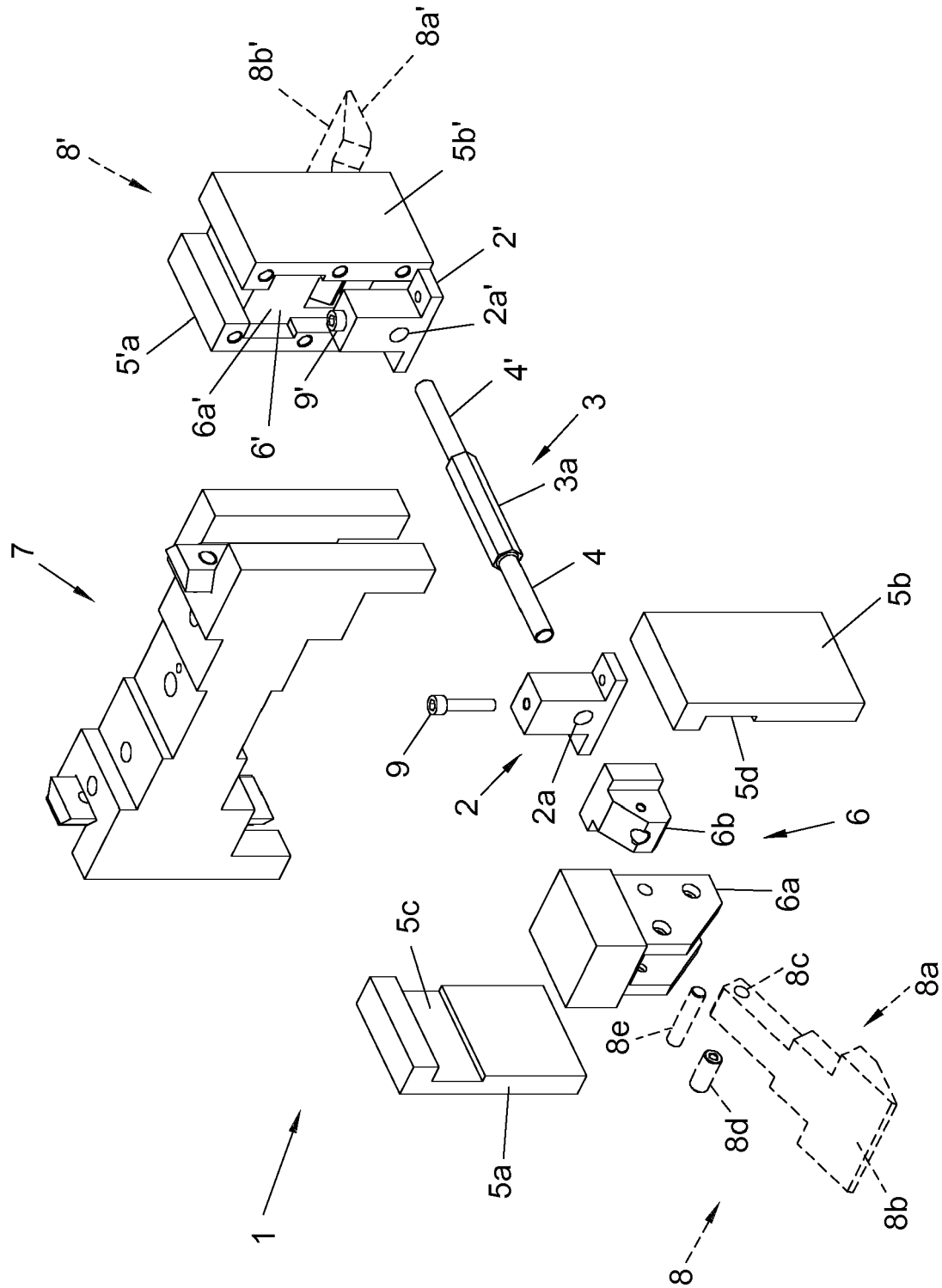


FIG. 1

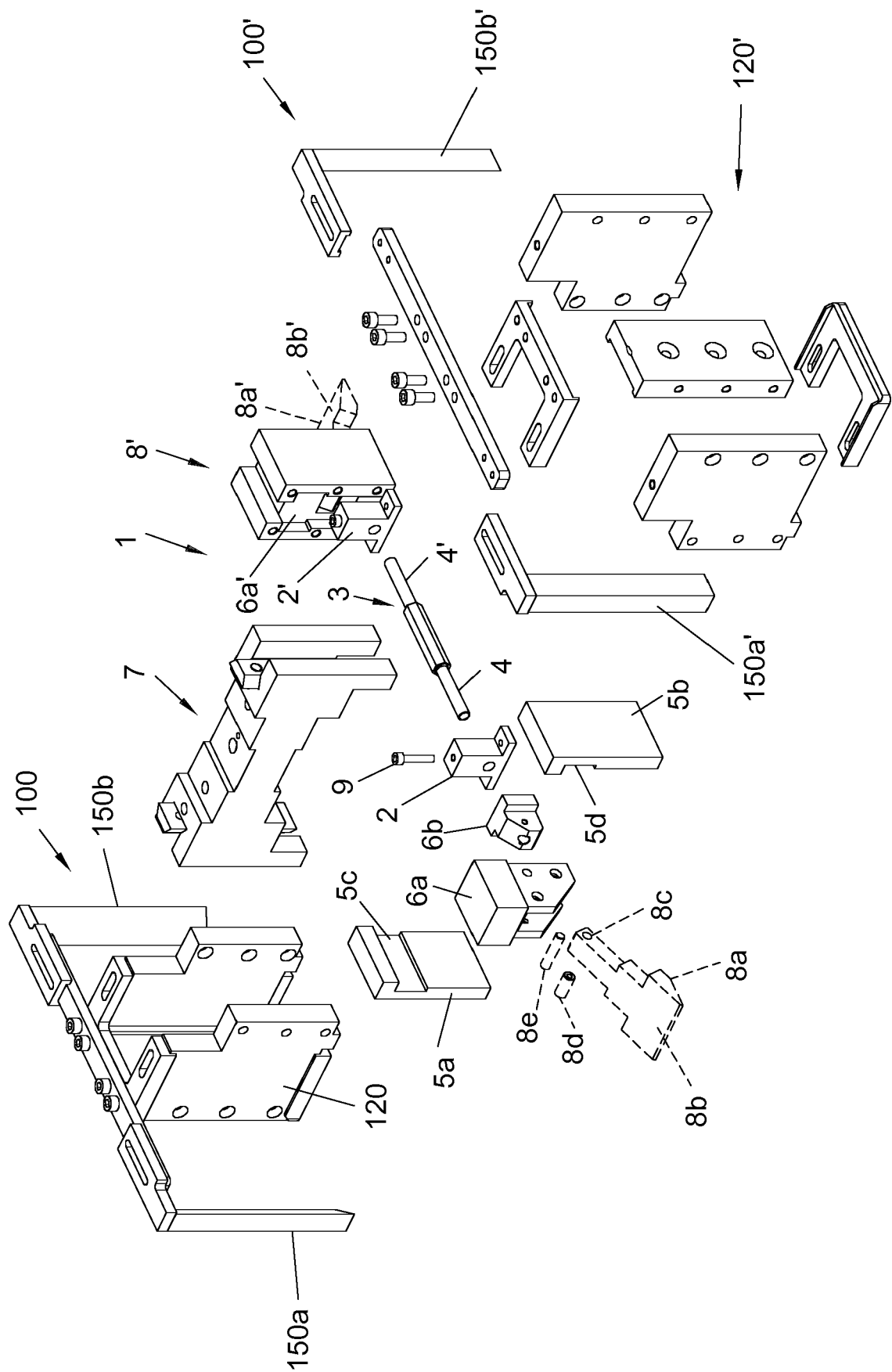


FIG. 2A

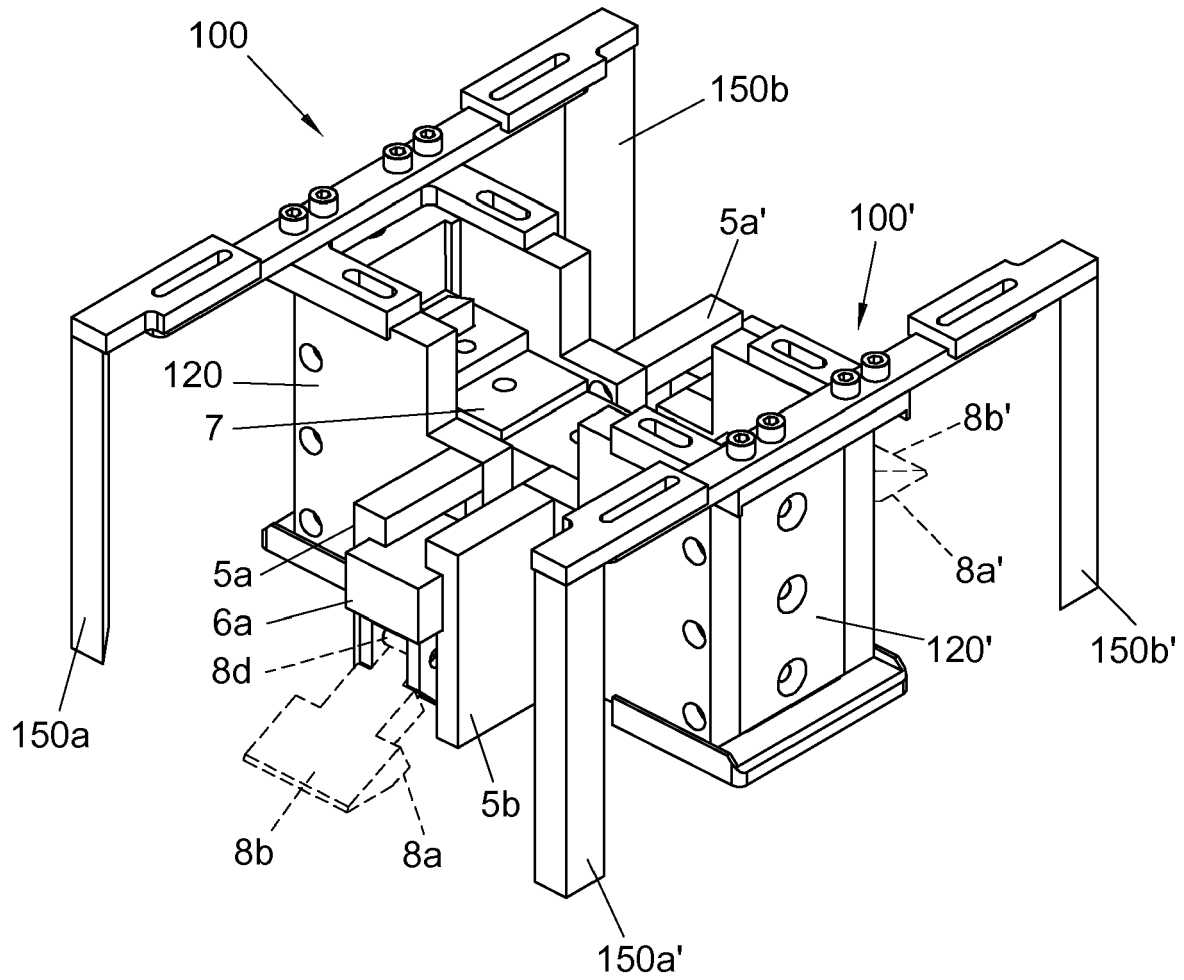


FIG. 2B

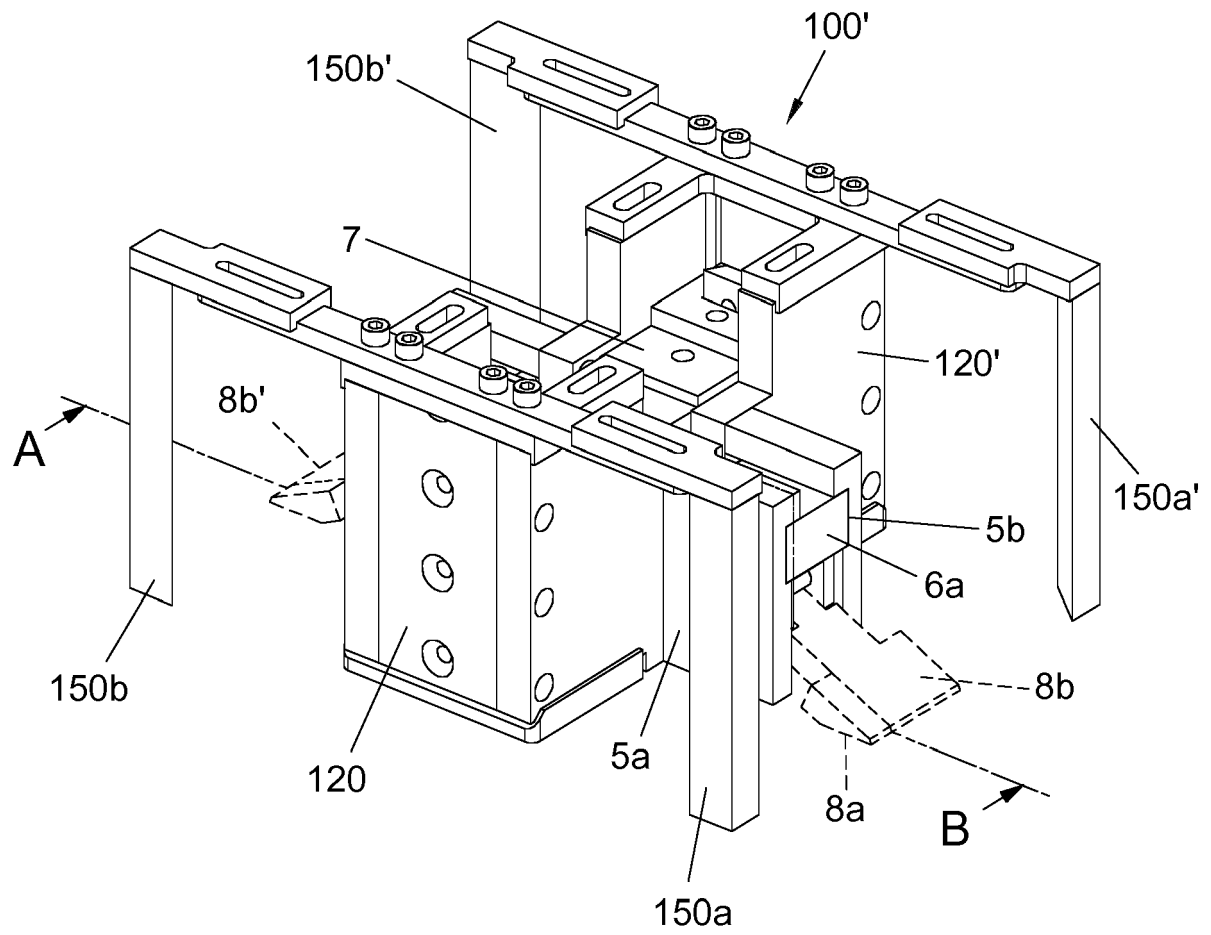


FIG. 2C

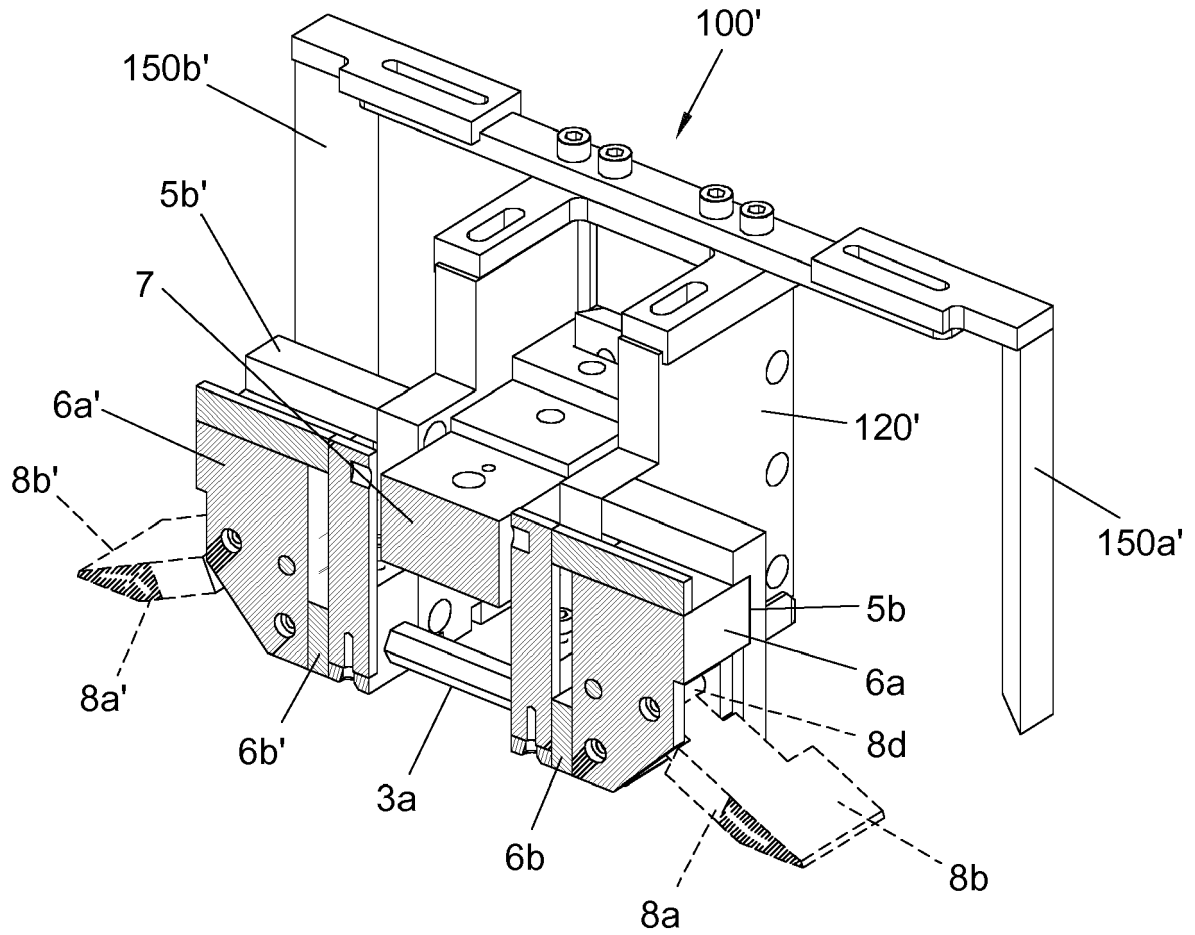


FIG. 2D  
CORTE A - B

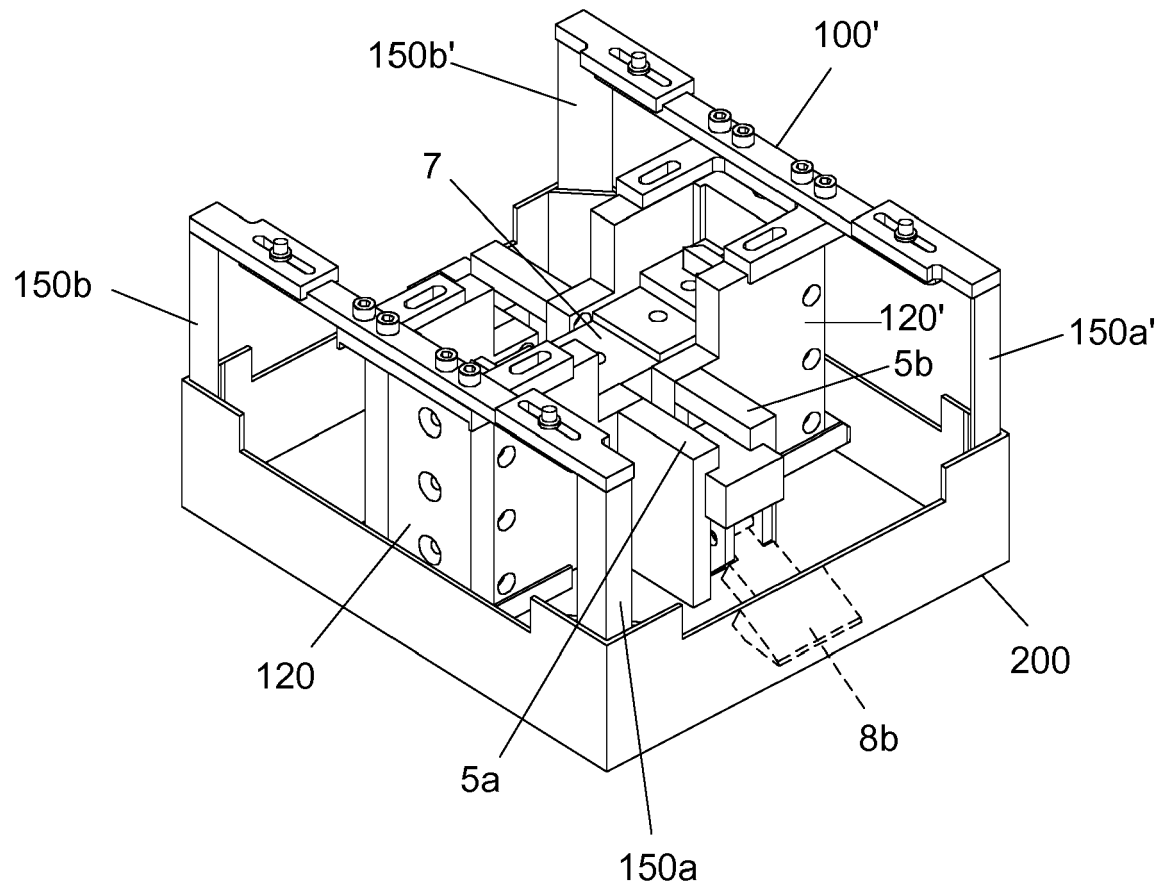


FIG. 2E

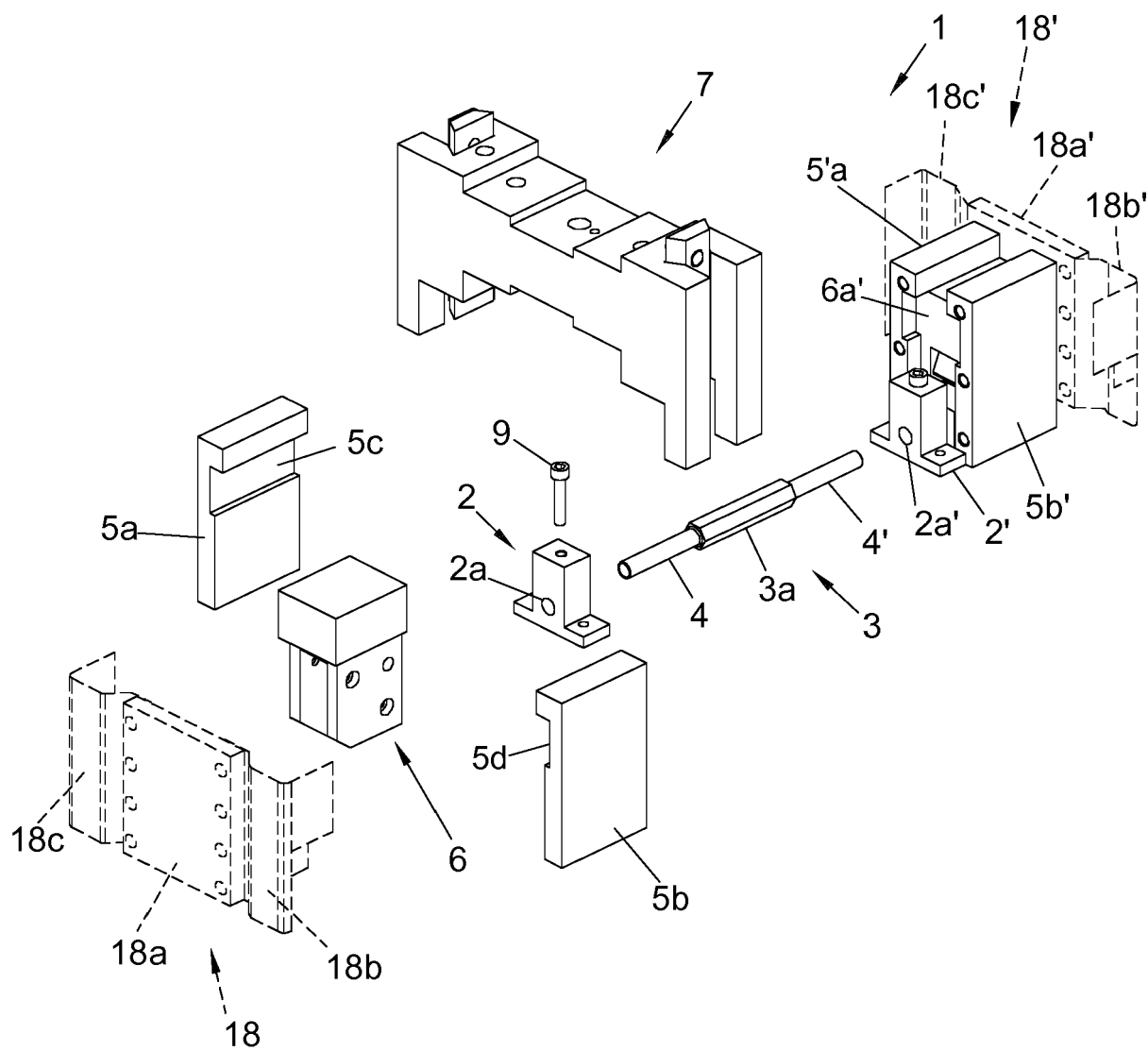


FIG. 3

**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

- ES 2285884 [0005] [0006] [0007] [0008]