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(54) **SLIDING DOOR ARRANGEMENT**

(57) A sliding door arrangement, comprising a belt return bracket (4) a frame (5), a pulley (6) which is arranged to engage with a belt (2), and rotatably attached to the frame (5) for rotation around a rotation axis (16). In addition the sliding door mechanism comprises a belt tensioning mechanism for moving the position of the pulley (4) in relation to the frame (5).

The belt tensioning mechanism further comprises a spring element (9) arranged to move the position of the pulley (4) by a spring force and maintaining a predetermined belt tension. This is advantageous as the predetermined spring force ensures that a correct tension is applied to the belt at all times during operation.

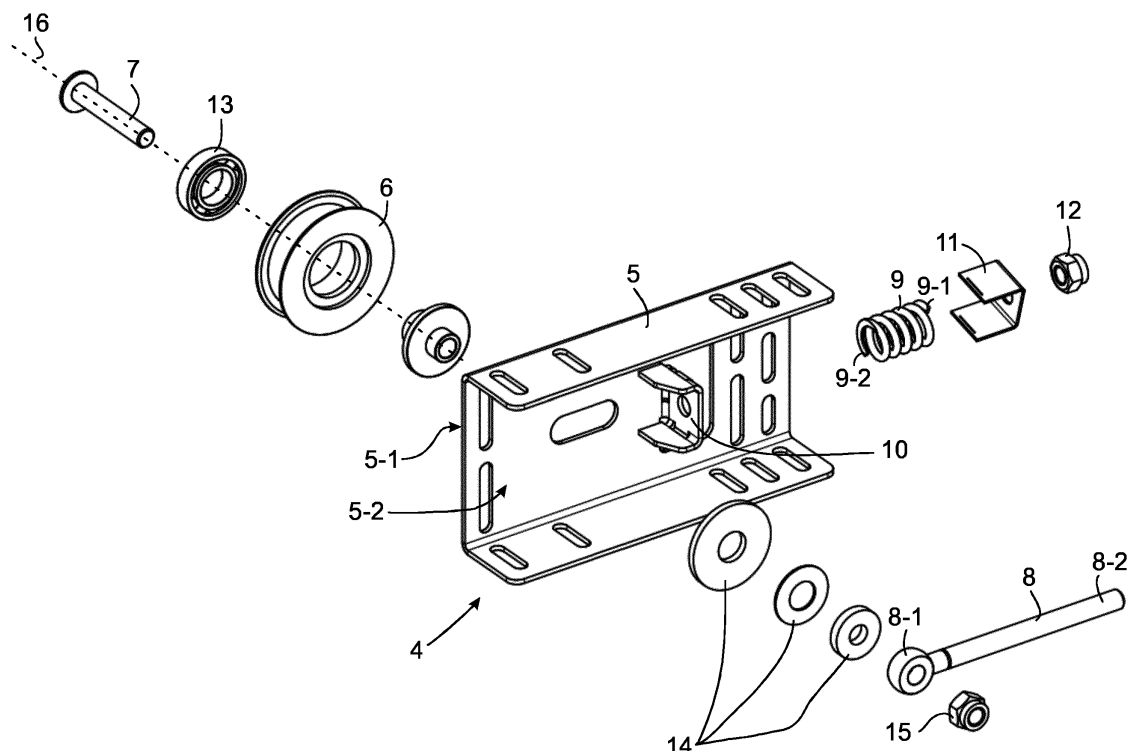


FIG. 2

Description

FIELD OF THE INVENTION

[0001] This invention relates to a sliding door arrangement.

BACKGROUND OF THE INVENTION

[0002] Automated, sliding doors are used in a wide variety of applications, such as building doorways. A sliding door arrangement frequently comprises a motor, a door, a belt, a pulley and a belt return bracket. A correct belt tension is crucial for a smooth operation of sliding doors. Over tightening of the belt increases wear and under tightening causes operational errors and increases callouts. Furthermore, commonly used belts are known to stretch over time, and therefore, tightening of the belt is required periodically.

[0003] A common way of setting the correct belt tension is to use a belt return bracket or a belt return pulley. The belt is tightened by tightening screws in the bracket with a separate tool and the correct tension is confirmed with a suitable tool or by visual inspection. Therefore, the tensioning of the belt greatly relies on a serviceman's experience and skill level.

[0004] Due to the above-mentioned drawbacks, prior art sliding door arrangements are prone to callouts and a separate tool or special skills are required to perform belt tightening.

SUMMARY OF THE INVENTION

[0005] An object of the present invention is to overcome the above-mentioned drawbacks and to provide a sliding door arrangement with a belt return bracket having a belt tensioning mechanism. This object is achieved with a sliding door arrangement according to independent claim 1.

[0006] A belt tensioning mechanism comprising a spring element with a predetermined force ensures that a correct, predetermined tension is applied during the operation despite stretching of the belt. Preferred embodiments of the invention are disclosed in the dependent claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] In the following, the present invention will be described in closer detail by way of example and with reference to attached drawings, in which

Figure 1 illustrates the overall operation of a sliding door arrangement.

Figure 2 illustrates parts of a belt return bracket, and Figure 3a and 3b illustrate the first and second surface in the belt return bracket assembly, respectively.

DETAILED DESCRIPTION OF THE INVENTION

[0008] Figure 1 illustrates the overall operation of a sliding door arrangement. As illustrated in Figure 1, a common way of applying a sliding door system is to have a door 1 attached to a toothed belt 2, which is driven by a motor 3 via a belt pulley 17 for moving the door 1 between a closed position 1-1 and an open position 1-2. In one embodiment of the present invention, the motor is an electric motor. The arrangement also comprises a belt return bracket 4 to ensure a correct tension in the belt 2. Setting a correct belt tension is crucial in order to avoid excessive callouts due to wear or malfunction caused by a stretched belt.

[0009] Figure 2 is an exploded view of the belt return bracket illustrated in Figure 1. The belt return bracket comprises a frame 5, a pulley 6, a pin 7, a rod 8, a spring element 9, a first fixed shoulder 10, a second free-moving shoulder 11, a first fastening element 12, a second fastening element 15, a bearing 13 and flanges 14. In a preferred embodiment of the invention, the pulley 6 is arranged against a first surface of the frame 5-1 with the pin 7 projecting through an elongated hole in the frame 5. The pulley 6 is further arranged to revolve around a rotation axis 16 and to engage with the belt 2. The belt is frequently made of rubber but can also be made out of, for example, an elastomer or a composite material.

[0010] In order to set and maintain a correct operating belt tension, a belt tensioning mechanism is arranged against a second surface of the frame 5-2 for moving the position of the pulley 6 with relation to the frame 5. The belt tensioning mechanism comprises the rod 8 connected to the pin 7 from its first end 8-1 and a fastener attaching a first end of the spring element 9-1 to a second end of the rod 8-2 and a second end of the spring element 9-2 to the frame 5.

[0011] The fastener further comprises the first shoulder 10 fixedly attached to the frame 5 and the second shoulder 11 attached to the rod 8 so that the spring element 9 is arranged between the first shoulder 10 and the second shoulder 11. In such an arrangement, the spring force from the spring element 9 is acting in a direction opposite to the tension force from the belt 2. This is advantageous as the predetermined spring force ensures that a correct tension is applied to the belt at all times during operation and the need for periodical belt tightening is removed. In other words, the spring element is utilized not only once during installation of the sliding door arrangement but continuously over the lifetime of the arrangement.

[0012] In a preferred embodiment of the invention, the second end of the rod 8-2 is threaded and further comprises a first fastening element 12 rotatably attached on the threads of the rod 8. The first fastening element 12 is arranged to enable the adjustment of the distance between the first shoulder 10 and the second shoulder 11, and therefore, the tension of the spring element 9 and the belt 2. This is advantageous, as the belt can be tight-

ened using a simple tool, e.g. a wrench.

[0013] The assembled belt return bracket of Figures 1 and 2 is illustrated in Figures 3a and 3b. Figure 3a illustrates the first surface of the frame 5-1 and Figure 3b illustrates the second surface of the frame 5-2. The directions of spring tension 18 and belt tension 19 are also illustrated. In one embodiment of the invention, the second shoulder 11 includes a projection parallel to the first shoulder and at least one projection protruding towards the first shoulder 10. The purpose of the at least one protruding projection of the second shoulder 11 is to, upon tightening of the belt, make contact with the first shoulder 10 if excessive tightening is applied and thus act as a stopper to prevent over tensioning. In a preferred embodiment of the invention, the second shoulder 11 is suitably designed to include two protruding projections resulting in a u-shaped profile. Other profiles, such as a c-shape profile, are possible as well. A spring element for maintaining a correct tension at all times during operation in combination with a stopper to prevent over tensioning eliminates the need for having a separate tool for belt tightening or relying on serviceman's expertise to set the correct tension.

[0014] The spring element 9 is preferably arranged to surround the rod 8 in the second end of the rod 8-2, as illustrated in Figure 3. The spring element 9 is preferably a metal spring but it may also be, for example, a block of elastomer or a hydraulic spring. In another embodiment of the invention the spring element 9 could be positioned beside the rod 8 surrounding a second rod fixedly attached to the first shoulder 10 and movably attached to the second shoulder 11.

[0015] It is to be understood that the above description and the accompanying figures are only intended to illustrate the present invention. It will be obvious to a person skilled in the art that the invention can be varied and modified without departing from the scope of the invention.

Claims

1. A sliding door arrangement, comprising:

a belt return bracket (4) with:

a frame (5),
a pulley (6), arranged to engage with a belt (2), and rotatably attached to the frame (5) for rotation around a rotation axis (16), and
a belt tensioning mechanism for moving the position of the pulley (4) in relation to the frame (5), **characterized in that** the belt tensioning mechanism comprises:

a spring element (9) arranged to move the position of the pulley (4) by a spring force and maintaining a predetermined

belt tension during operation.

2. A sliding door arrangement of claim 1, wherein the frame (5) comprises a first (5-1) and a second surface (5-2),
the pulley (6) is arranged against the first surface (5-1) of the frame with a pin (7) extending through the frame (5) and around which the pulley (6) is arranged to rotate, and
the belt tensioning mechanism with the spring element (9) is arranged against the second surface of the frame (5-2).

3. A sliding door arrangement of claim 2, wherein the belt tensioning mechanism comprises:

a rod (8) with a first end (8-1) connected to the pin (7), and
a fastener attaching a first end of the spring element (9-1) to a second end of the rod (8-2) and a second end of the spring element (9-2) to the frame (5).

4. A sliding door arrangement of claim 3, wherein the fastener comprises:

a first shoulder (10) fixedly attached to the frame (5), and
a second shoulder (11) attached to the rod (8), and wherein
the spring element (9) is arranged between the first (10) and the second shoulder (11).

5. A sliding door arrangement of claim 4, wherein the second end of the rod (8-2) is provided with a thread via which the second shoulder (11) is attached to the rod (8) and which facilitates adjustment of the mutual distance between the first (10) and the second shoulder (11) and a pre-tension of the spring element (9).

6. A sliding door arrangement of claim 5, wherein a fastening element (12) is rotatably attached on the threads of the rod (8) for the adjustment of the mutual distance between the first (10) and the second shoulder (11) and pre-tension of the spring element (9).

7. A sliding door arrangement of any of claims 4-6, wherein the second shoulder (11) is a stopper which prevents over tensioning of the belt (2) by making contact with the first shoulder (10) if excess tensioning is applied.

8. A sliding door arrangement of claim 7, wherein the second shoulder (11) is u-shaped.

9. A sliding door arrangement of any of claims 3-8, wherein

the spring element (9) is arranged to surround the rod (8).

10. A sliding door arrangement of any of claims 1-9 comprising:

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a door element (1) attached to the belt.

11. A sliding door arrangement of claim 9 comprising:

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a belt pulley (17) arranged to engage with the belt (2), and
a motor (3) for moving the belt (2) and the door element (1) via the belt pulley (17).

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12. A sliding door arrangement of any of claims 1-11 wherein
the belt (2) is a toothed belt.

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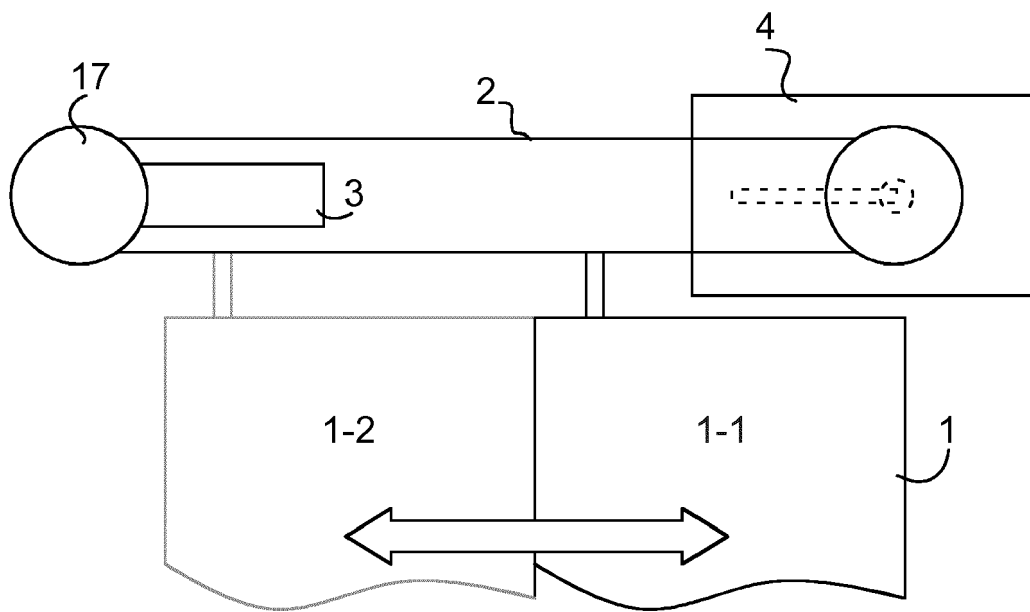


FIG. 1

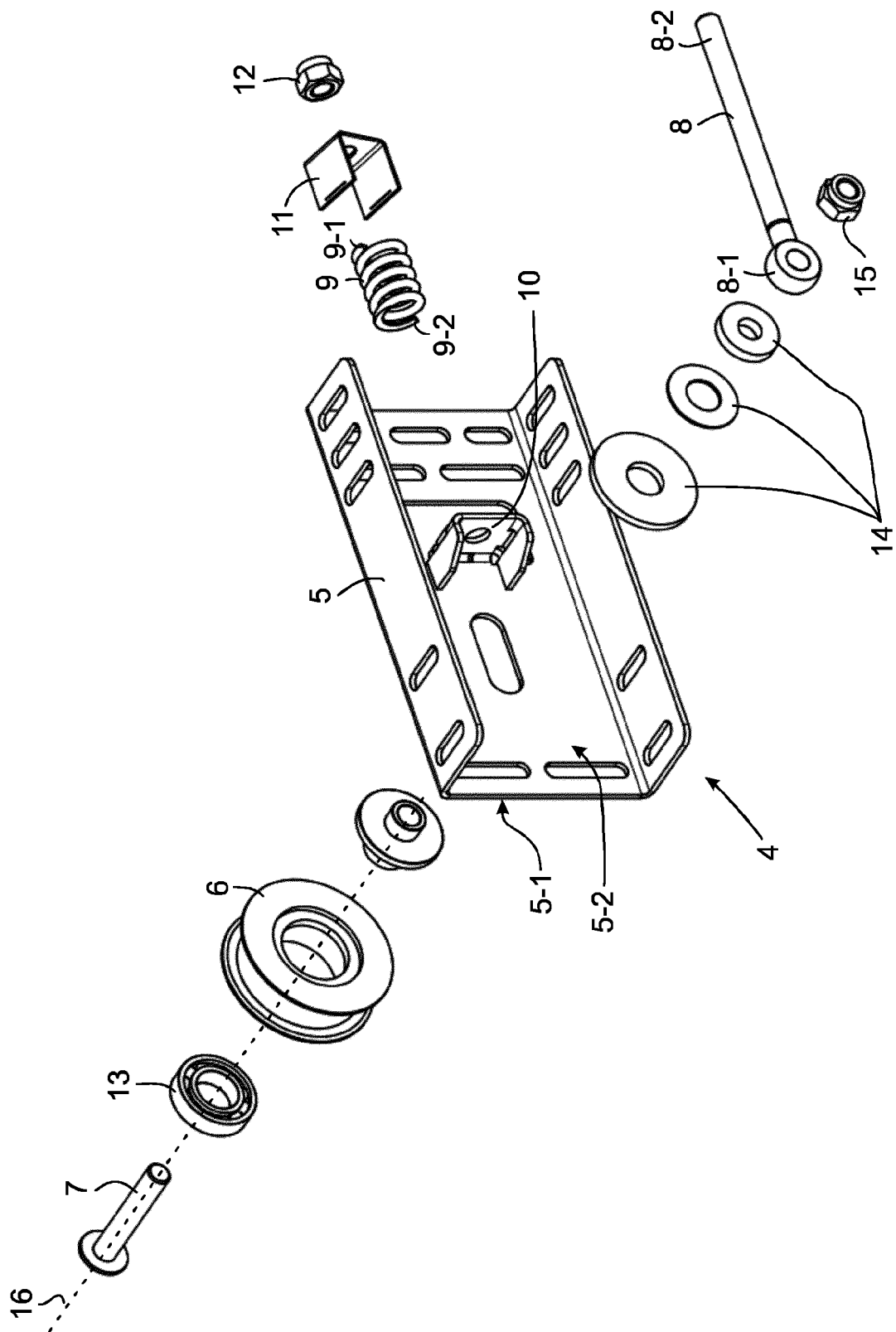
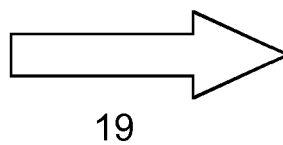
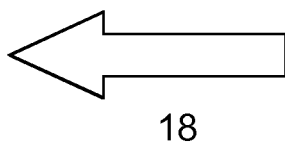
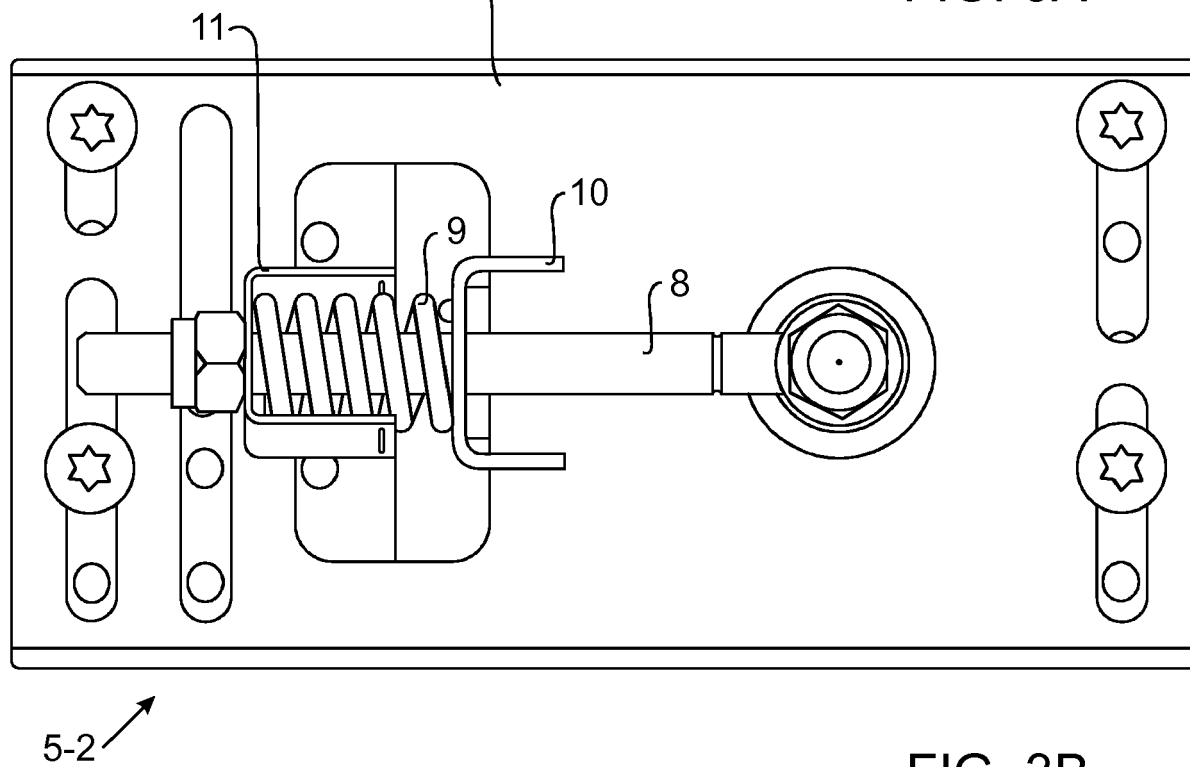
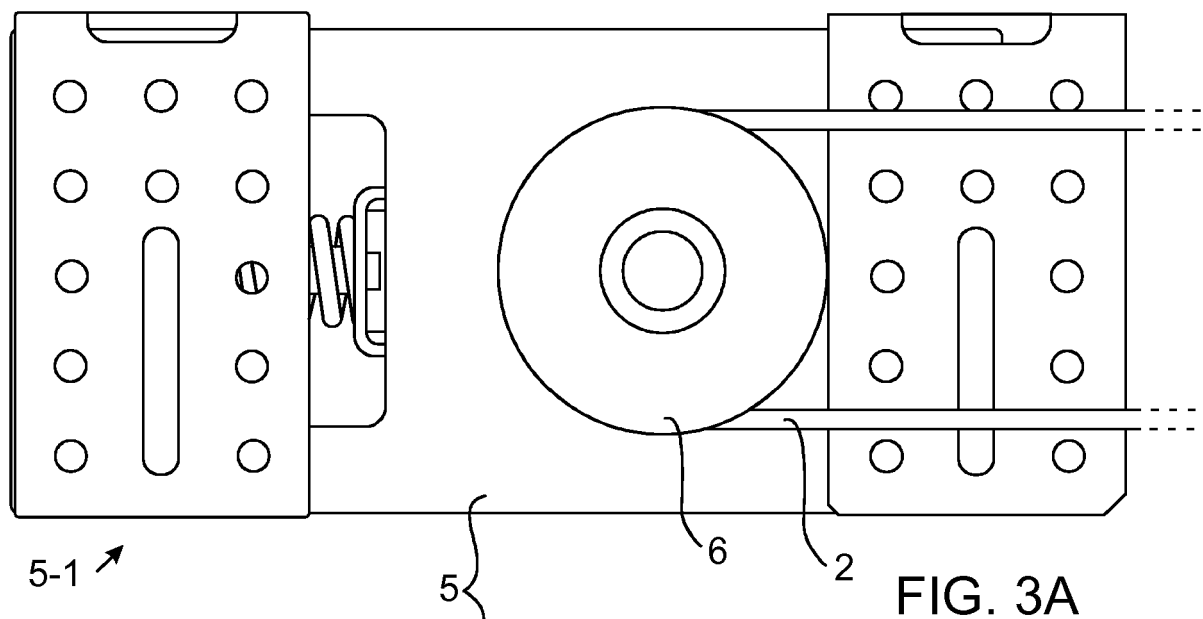


FIG. 2





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Application Number
EP 17 19 1761

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X	US 3 834 081 A (CATLETT J C [US]) 10 September 1974 (1974-09-10) * figures 5,-7, 20 * * column 3, line 63 - column 4, line 23 * * column 6, lines 15-55 *	1-12	INV. E05F15/643
X	EP 0 732 476 A1 (HOERMANN KG [DE]) 18 September 1996 (1996-09-18) * abstract * * column 3, lines 1-21 * * figures 1, 2 *	1-12	
X	EP 2 927 410 A1 (GEZE GMBH [DE]) 7 October 2015 (2015-10-07) * paragraphs [0019] - [0021] * * paragraphs [0024] - [0026] * * figures 1, 5 *	1-12	
			TECHNICAL FIELDS SEARCHED (IPC)
			E05F
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 15 February 2018	Examiner Mund, André
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 17 19 1761

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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