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(54) **DOOR CLOSER ARRANGEMENT**

(57) The invention relates to a door closer arrangement. The installation position of the pulling arm (3) of the door closer arrangement in relation to the door closer (1) can be selected easily and reliably, wherein also the

torque class of the door closer arrangement is selected. The door closer (1) can always be installed at the same site in relation to the hinge line. This considerably simplifies and expedites installation.

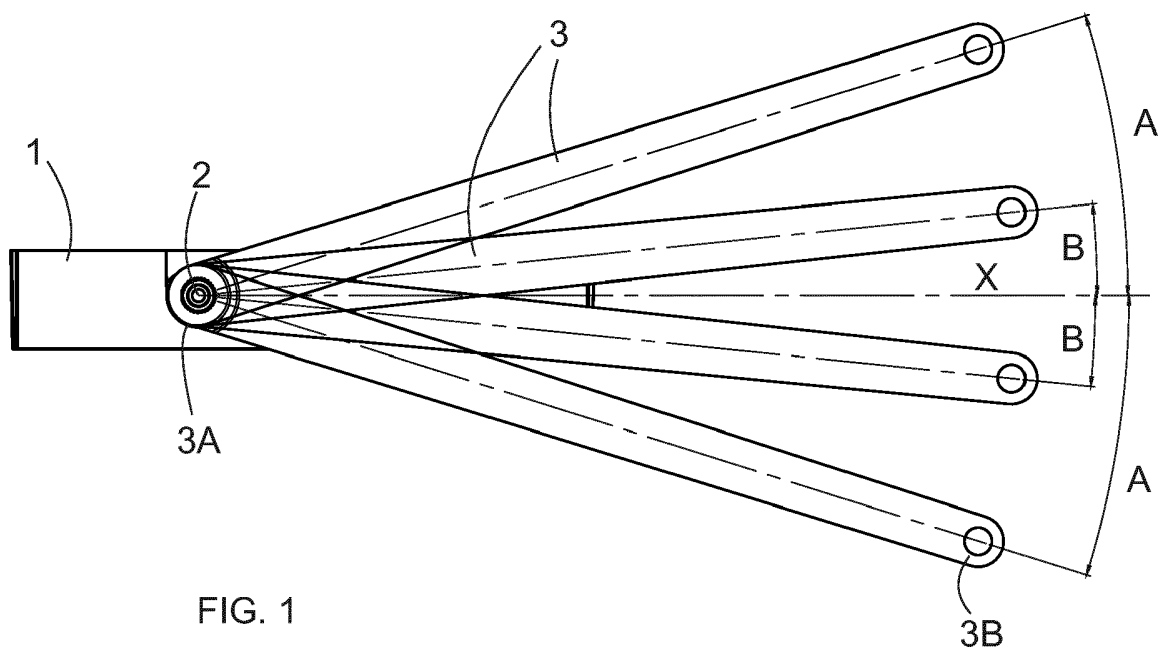


FIG. 1

Description

Technical field

[0001] The invention relates to a door closer arrangement. Specifically, the invention relates to a door closer arrangement, in which the door closer is a so-called cam door closer.

Prior art

[0002] Door closers having a cam are called cam door closers. In these door closers, the rotational axis is provided with a cam. The cam influences how the torque directed onto the door brings about loading of the spring in the door closer as the door is opened and how the force of the loaded spring is guided back onto the door when it closes.

[0003] Door closers are manufactured to different closing moments for different kinds of doors. A larger and heavier door requires more torque to close the door than a lighter and smaller door. In order that the production costs should remain reasonable, it is also common to use the same door closer in two different torque classes. For example, in class EN4 (closing torque of over 26 Nm) and in class EN3 (closing torque of under 26 Nm) are often used the same door closer, because otherwise production costs would rise. It depends on the installation, to which class the door closer is seen as belonging. The installation site of the closer in relation to the hinge line of the door affects to which class the installed door closer belongs. For example, a door closer that is relatively close to the hinge line of the door is included in class EN3 and a door closer that is further away from the hinge line of the door is included in class EN4. However, installation of a door closer requires care and takes a relatively long time.

Brief description of the invention

[0004] The object of the invention is to decrease the disadvantages of known art. The invention is based on the idea that the installation position of the pulling arm of the door closer arrangement in relation to the door closer can be selected easily and reliably, wherein also the torque class of the door closer arrangement is selected. The door closer can always be installed at the same site in relation to the hinge line regardless of which torque class was selected. This considerably simplifies and expedites installation.

[0005] In the invention, the pulling arm connectable to the rotational axis of the door closer comprises a hole, the surface/edge of which comprises the sector area of the pulling arm, and the outer surface/edge of the rotational axis of the door closer comprises the sector area of the rotational axis. The pulling arm is installed to the rotational axis such that the rotational axis, specifically its other end, is inside the hole, and, additionally, the

sector area of the pulling arm is against the sector area of the rotational axis.

[0006] A door closer arrangement according to the invention comprises a door closer 1 having a rotational axis 2 and a cam 4 in connection with the rotational axis. The door closer arrangement also comprises a pulling arm 3, the first end 3A of which is connectable to the rotational axis 2. The first end 3A of the pulling arm 3 has a hole 3C, the edge 3D of which comprises toothing composed of teeth 8 pointing towards the centre point of the hole 3C. The edge 2A of the rotational axis 2 comprises counter-toothings comprising teeth 5 pointing away from the centre point of the rotational axis 2.

[0007] The sector area of the pulling arm is to be placed against the sector area of the rotational axis, for example, in the following manner. The edge 3D of the hole also comprises a sector 9 without toothing, and the counter-toothings also comprises one tooth 7, which is wider than the other teeth 5 of the edge 2A of the rotational axis. The pulling arm 3 is arranged to be connected to the rotational axis 2 such that the tooth 7, which is wider than the other teeth 5 of the edge 3D of the hole of the counter-toothings of the rotational axis 2, is in the area of said sector 9 of the edge 3D of the hole of the pulling arm 3.

[0008] The sector area of the pulling arm is to be placed against the sector area of the rotational axis also in the following manner. The edge 3D of the hole also comprises one tooth 70, which is wider than the other teeth 8 of the edge 3D of the hole, and the counter-toothings also comprises a sector 90 without toothing. The pulling arm 3 is arranged to be connected to the rotational axis 2 such that the tooth 70, which is wider than the other teeth 8 of the edge 3D of the hole of the pulling arm, is in the area of said sector 90 of the counter-toothings of the rotational axis 2.

List of figures

[0009] In the following, the invention is described in more detail by means of the accompanying figures, in which

- Fig. 1 shows an example of a door closer arrangement according to the invention,
- Fig. 2 shows an example of an embodiment according to the invention,
- Fig. 3 shows an example of a pulling arm according to the implementation of Fig. 2,
- Fig. 4 shows another example of an embodiment according to the invention, and
- Fig. 5 shows an installation example of a door closer arrangement according to the invention.

Description of the invention

[0010] Fig. 1 shows an example of a door closer arrangement according to the invention comprising a door closer 1 having a rotational axis 2. The rotational axis

also has a cam 4 inside the door closer, which is by way of example shown in Figs. 2 and 4. The door closer arrangement also comprises a pulling arm 3, the first end 3A of which is to be connected to the rotational axis 2. The first end 3A of the pulling arm 3 has a hole 3C, which is more clearly seen in Fig. 3. The edge 3D of the hole comprises tothing composed of teeth 8 pointing towards the centre point of hole 3C. The edge 2A of the rotational axis 2 comprises counter-tothing comprising teeth 5 pointing away from the centre point of the rotational axis 2.

[0011] The edge 3D of the hole 3C of the pulling arm also comprises a sector area 9 (70 in Fig. 4) of the pulling arm, and the edge 2A of the rotational axis of the door closer comprises a sector area 7 (90 in Fig. 4) of the rotational axis. The pulling arm is installed to the rotational axis such that the rotational axis 2, specifically its other end, is inside the hole 3C, and, additionally, the sector area of the pulling arm is against the sector area of the rotational axis. The surfaces of the sector areas can be against each other in only four different positions, i.e. the pulling arm 3 is to be installed to the rotational axis in four different positions. In this case, the pulling arm is therefore in one possible (of four possibilities) position in relation to the door closer 1. Fig. 1 illustrates the possible positions.

[0012] As can be observed, the positions are symmetrical in relation to the longitudinal axis X of the door closer, wherein the pulling arm 3 can be in two different positions on each side of the door. At the smaller angle B in relation to the longitudinal axis X of the door closer, a larger torque is achieved for closing the door, and, at a larger angle A in relation to the longitudinal axis X of the door closer, a smaller torque is achieved for closing the door. From Figs. 2 and 4 can also be seen, how the cam in connection with the rotational axis 2 is in its basic position (door closer not loaded) in the same line with the longitudinal axis X of the door closer.

[0013] Using a smaller angle B, a larger torque class (for example, EN4) and, using a larger angle, a smaller torque class (for example, EN3) is achieved. This is feasible when tothing and counter-tothing are carried out such that the angle difference between two side-by-side positions of the pulling arm 3 is approximately 8 - 12 degrees.

[0014] In some exemplary implementations, the angle difference is approximately 11 - 12 degrees. The sector of the tooth 8 of the tothing of the pulling arm is therefore approximately 11 - 12 degrees as viewed from the centre point of the hole 3C, and the sector of the tooth 5 of the counter-tothing of the edge 2A of the rotational axis 2 is approximately 11-12 degrees as viewed from the centre point of the rotational axis.

[0015] The tooth 7, which is wider than the other teeth 5 of the counter-tothing of the embodiment of Fig. 2, is in the 22 - 24 degrees sector as viewed from the centre point of the rotational axis. The area of the sector 9 of the edge 3D of the hole of the pulling arm 3 is 55 - 60

degrees. Correspondingly, in the second embodiment of Fig. 4, the tooth 70, which is wider than the other teeth 8 of the edge 3D of the hole of the pulling arm, is in the 22 - 24 degrees sector as viewed from the centre point of the rotational axis, and the area of the sector 90 of the edge 2A of the rotational axis is 55 - 60 degrees.

[0016] The way of placing the sector area of the pulling arm 3 against the sector area of the rotational axis 2 is feasible, for example, in the manner shown in Fig. 2. In the example of Fig. 2, the edge 3D of the hole of the pulling arm comprises a sector 9 without tothing, and the counter-tothing of the rotational axis 2 comprises one tooth 7, which is wider than the other teeth 5 of the edge 2A of the rotational axis. The tooth, which is wider than the other teeth of the rotational axis, therefore forms the sector area of the rotational axis.

[0017] The pulling arm 3 is arranged to be connected to the rotational axis 2 such that the tooth 7, which is wider than the other teeth 5 of the edge 3D of the hole of the counter-tothing of the rotational axis 2, is in the area of said sector 9 of the edge 3D of the hole of the pulling arm 3, wherein above said four different positions of the pulling arm are therefore made possible. The tooth 7, which is wider than the other teeth 5 of the counter-tothing, is therefore arranged to be placed at four different sites in the area of the sector 9 of the edge 3D of the hole of the pulling arm. Fig. 3 illustrates the hole 3C of the pulling arm 3, its teeth 8 and sector 9.

[0018] Fig. 4 shows another example of a second possible embodiment, of how the sector area of the pulling arm is to be placed against the sector area of the rotational axis. In this embodiment, the edge 3D of the hole of the pulling arm also comprises one tooth 70, which is wider than the other teeth 8 of the edge 3D of the hole, and the counter-tothing of the rotational axis 2 also comprises a sector 90 without tothing. The pulling arm 3 is arranged to be connected to the rotational axis 2 such that the tooth 70, which is wider than the other teeth 8 of the edge 3D of the hole of the pulling arm, is in the area of said sector 90 of the counter-tothing of the rotational axis 2. As can be observed, the tooth 70, which is wider than the other teeth 8 of the edge 3D of the hole, is arranged to be placed at four different sites in the area of the sector 90 of the counter-tothing of the rotational axis 2.

[0019] In the embodiments according to the invention, the teeth 8 of the tothing of the pulling arm and the teeth 5 of the counter-tothing of the edge 2A of the rotational axis 2 are arranged to settle interlaced against each other. In the embodiment of Fig. 2 is seen, how the sector 9 of the edge 3D of the hole of the pulling arm has free space 6 between the teeth 5 of the rotational axis 2. This enables that the pulling arm has above said four installation positions. Correspondingly, from the embodiment of Fig. 4 is seen that there is free space 61 between the teeth 8 of the hole 3C of the pulling arm to be placed to the area of the toothless sector 90 of the rotational axis 2, which also enables said four installation positions.

[0020] Fig. 5 shows an installation example, in which the door closer arrangement also comprises a slide rail 10, which is to be connected to the pulling arm from its other end 3B. In this example, the door closer 1 is installed to the door 11 and the slide rail 10 to the frame 12 of the door. It is also possible that the door closer 1 is installed to the frame of the door and the slide rail to the door. The pulling arm 3 slides from its other end in the direction X1 of the slide rail 10 as the door is opened and as the door is closed.

[0021] The installation position of the pulling arm 3 in relation to the door closer 1 can be selected easily and reliably, wherein the torque class of the door closer arrangement is also selected. The door closer 1 can always be installed at the same site in relation to the hinge line regardless of which torque class was selected. The hinge line is a vertical line formed by the hinges 13 of the door, in relation to which the door is to be rotated. The invention considerably simplifies and expedites installation. The installer does not need to estimate, remember and decide, to which site (to the door or to the frame) the door closer is installed.

[0022] In the invention, the sector area of the pulling arm and the sector area of the rotational axis are therefore to be installed against each other such that the installation options of the pulling arm are limited. The features of these sector areas deviate therefore from the toothing of the edge of the pulling arm and the counter-toothing of the edge of the rotational axis. Installation of the pulling arm to the rotational axis is not possible if these sector areas are not against each other.

[0023] In the invention, the pulling arm is therefore arranged to be installed to the rotational axis of the cam door closer such that the pulling arm is either at a smaller angle or at a larger angle in relation to the longitudinal axis of the door closer and on either side of the door closer as viewed from its longitudinal axis. In this case, using the same door closer arrangement, it is possible to provide two different torque classes. The invention also takes into consideration the other requirements of the torque classes (for example, EN3 and EN4) in order that these too are met, such as the functional areas of the adjustment valves of the door closer, angle of opening, etc.

[0024] In light of the examples presented above, it is obvious that an embodiment according to the invention can be provided by various solutions within the scope of the independent claim.

Claims

1. A door closer arrangement comprising a door closer (1) having a rotational axis (2) and a cam (4) in connection with the rotational axis, and which door closer arrangement also comprises a pulling arm (3), the first end (3A) of which is connectable to the rotational axis (2), **characterized in that** the first end

(3A) of the pulling arm (3) has a hole (3C), the edge (3D) of which comprises toothing, which toothing comprises teeth (8) pointing towards the centre point of the hole (3C), and which edge (2A) of the rotational axis (2) comprises counter-toothing, which counter-toothing comprises teeth (5) pointing away from the centre point of the rotational axis (2), the edge (3D) of which hole also comprises a sector (9) without toothing, and which counter-toothing also comprises one tooth (7), which is wider than the other teeth (5) of the edge (2A) of the rotational axis, which pulling arm (3) is arranged to be connected to the rotational axis (2) such that the tooth (7), which is wider than the other teeth (5) of the counter-toothing of the rotational axis (2), is in the area of said sector (9) of the edge (3D) of the hole of the pulling arm (3), or the edge (3D) of which hole also comprises one tooth (70), which is wider than the other teeth (8) of the edge (3D) of the hole, and which counter-toothing also comprises a sector (90) without toothing, which pulling arm (3) is arranged to be connected to the rotational axis (2) such that the tooth (70), which is wider than the other teeth (8) of the edge (3D) of the hole of the pulling arm (3), is in the area of said sector (90) of the counter-toothing of the rotational axis (2).

2. A door closer arrangement according to claim 1, **characterized in that** the teeth (8) of the pulling arm toothing and the teeth (5) of the counter-toothing of the edge (2A) of the rotational axis (2) are arranged to settle interlaced against each other.

3. A door closer arrangement according to claim 2, **characterized in that** the tooth (7), which is wider than the other teeth (5) of the counter-toothing, is arranged to be placed at four different sites in the area of the sector (9) of the edge (3D) of the hole of the pulling arm (3) or the tooth (70), which is wider than the other teeth (8) of the edge (3D) of the hole, is arranged to be placed at four different sites in the area of the sector (90) of the counter-toothing of the rotational axis (2).

4. A door closer arrangement according to claim 3, **characterized in that** the pulling arm (3) is arranged to be placed in the rotational axis (2) of the door closer such that the pulling arm is at either a smaller angle or a larger angle in relation to the longitudinal axis of the door closer and on either side of the door closer as viewed from its longitudinal axis.

5. A door closer arrangement according to any one of claims 2 - 4, **characterized in that** the sector of the tooth (8) of the toothing of the pulling arm (3) is 11 - 12 degrees as viewed from the centre point of the hole (3C), and the sector of the tooth (5) of the counter-toothing of the edge (2A) of the rotational axis (2) is 11 - 12 degrees as viewed from the centre point

of the rotational axis.

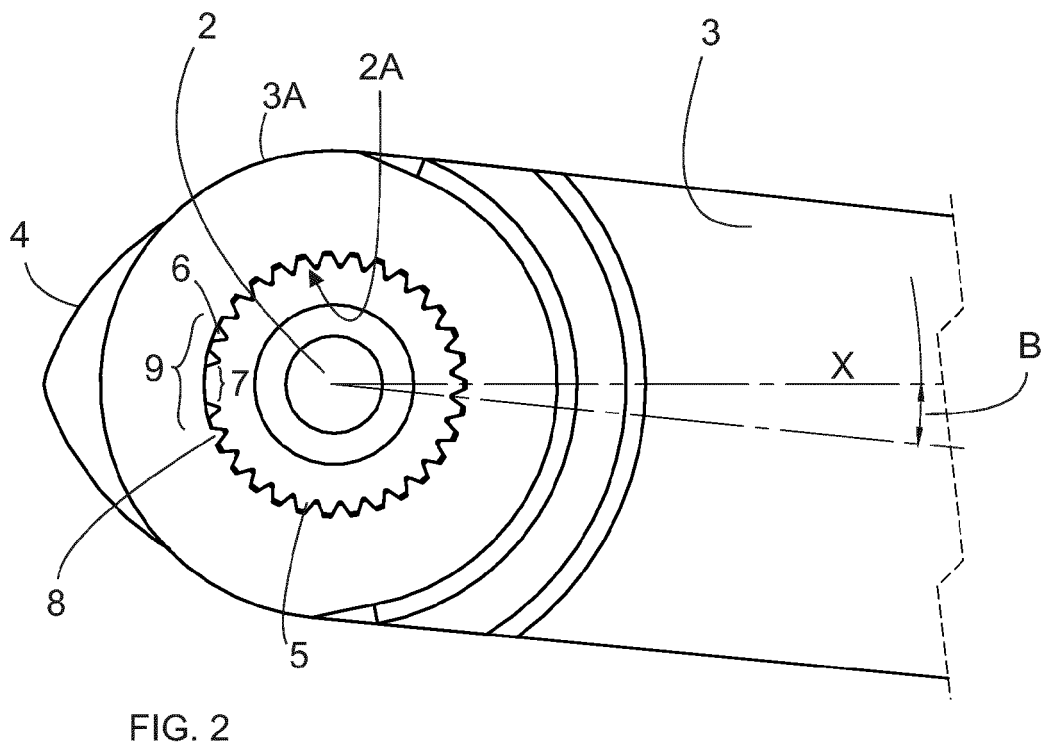
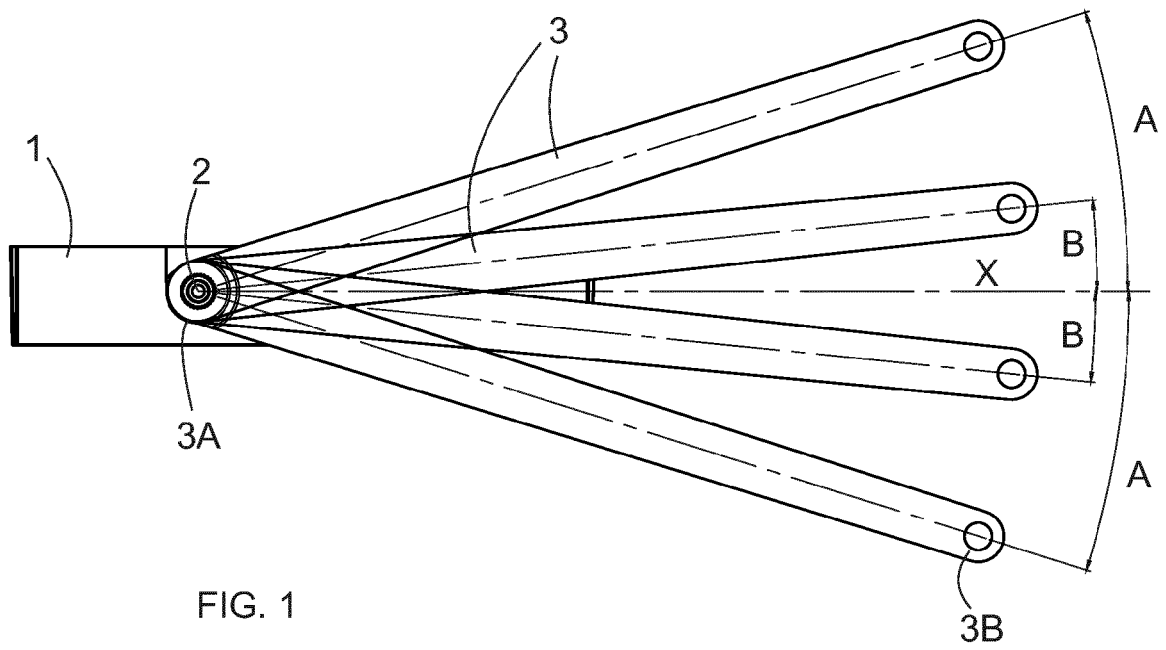
6. A door closer arrangement according to claim 5, **characterized in that** the tooth (7), which is wider than the other teeth (5) of the counter-tooth, is in the 22 - 24 degrees sector as viewed from the centre point of the rotational axis. 5
7. A door closer arrangement according to any one of claims 5 - 6, **characterized in that** the area of the sector (9) of the edge (3D) of the hole of the pulling arm (3) is 55 - 60 degrees. 10
8. A door closer arrangement according to claim 5, **characterized in that** the tooth (70), which is wider than the other teeth (8) of the edge (3D) of the hole of the pulling arm, is in the 22 - 24 degrees sector as viewed from the centre point of the rotational axis. 15
9. A door closer arrangement according to claim 8, **characterized in that** the area of the sector (90) of the edge (2A) of the rotational axis is 55 - 60 degrees. 20
10. A door closer arrangement according to any one of claims 1 - 9, **characterized in that** it comprises a slide rail (10), which is connectable to the pulling arm from its other end (3B). 25
11. A door closer arrangement according to claim 10, **characterized in that** the door closer (1) is installed to the door and the slide rail (10) to the frame of the door. 30
12. A door closer arrangement according to claim 10, **characterized in that** door closer (1) is installed to the frame of the door and the slide rail (10) to the door. 35

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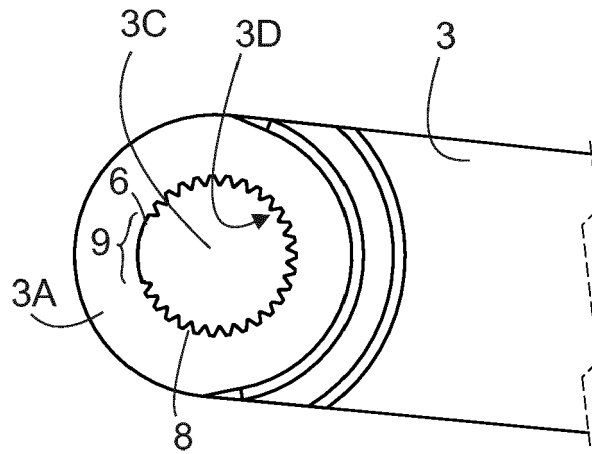


FIG. 3

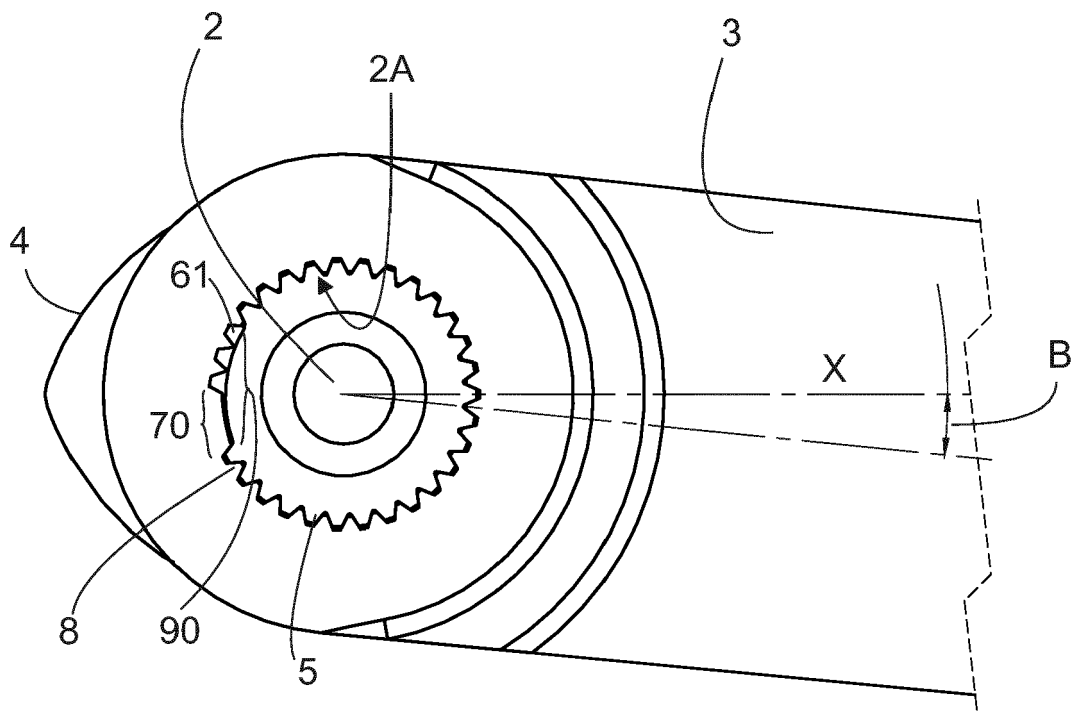
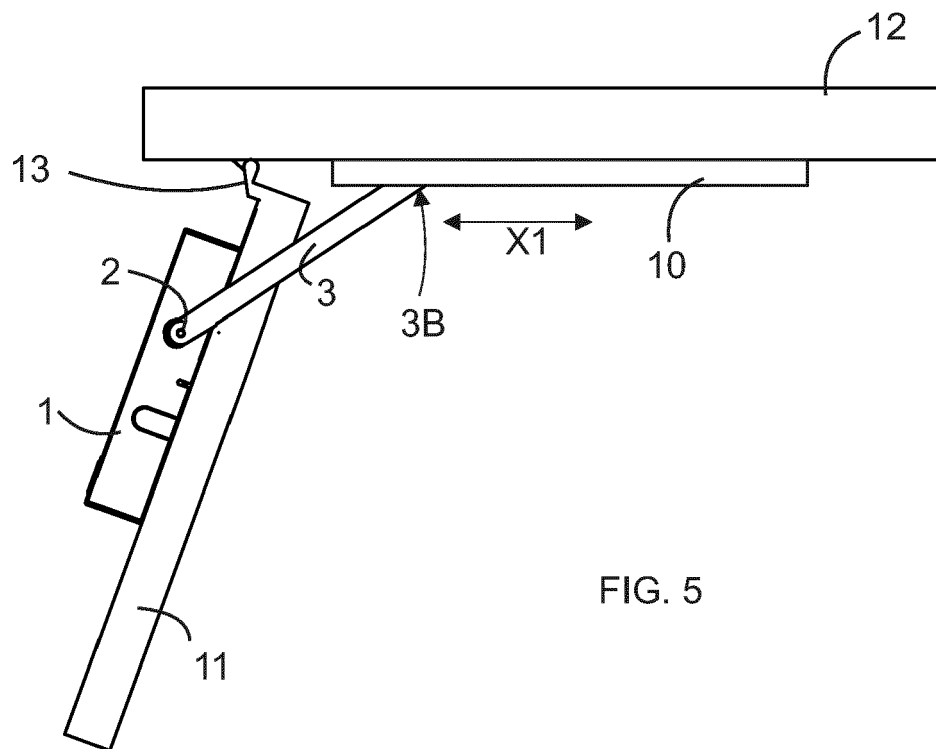


FIG. 4





EUROPEAN SEARCH REPORT

Application Number
EP 15 19 0191

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 580 707 C (GROSSMANN EISEN U STAHLWERK AK) 14 July 1933 (1933-07-14)	1,2, 10-12	INV.
A	* page 1, lines 1-6,26-47,65-73 * * figures 3,4 *	3-9	E05F3/10 E05F3/22
A	DE 40 38 720 A1 (DORMA GMBH & CO KG [DE]) 11 June 1992 (1992-06-11) * column 3, lines 1-3,19-25 * * column 3, line 61 - column 4, line 16 * * figures 1,2,5 *	1,2, 10-12	
A	US 2015/211278 A1 (MOYER DAVID D [US] ET AL) 30 July 2015 (2015-07-30) * paragraphs [0007], [0009], [0054] - [0059] * * figures 1-5 *	1-12	
			TECHNICAL FIELDS SEARCHED (IPC)
			E05F
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		12 April 2016	Wagner, Andrea
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
ON EUROPEAN PATENT APPLICATION NO.**

EP 15 19 0191

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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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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82