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(72) Inventor: **Kärkkäinen, Vesa**  
**80170 Joensuu (FI)**

(74) Representative: **Berggren Oy Ab**  
**P.O. Box 16**  
**Antinkatu 3 C**  
**00101 Helsinki (FI)**

(71) Applicant: **Abloy Oy**  
**80100 Joensuu (FI)**

(54) **Door closer arrangement**

(57) The invention relates to a door closer arrangement. In an arrangement according to the invention, a camshaft door closer (1) is provided with a folding arm

(4). The opening and closing characteristics of the arrangement are good, and it is suitable for installation in a variety of usage sites.

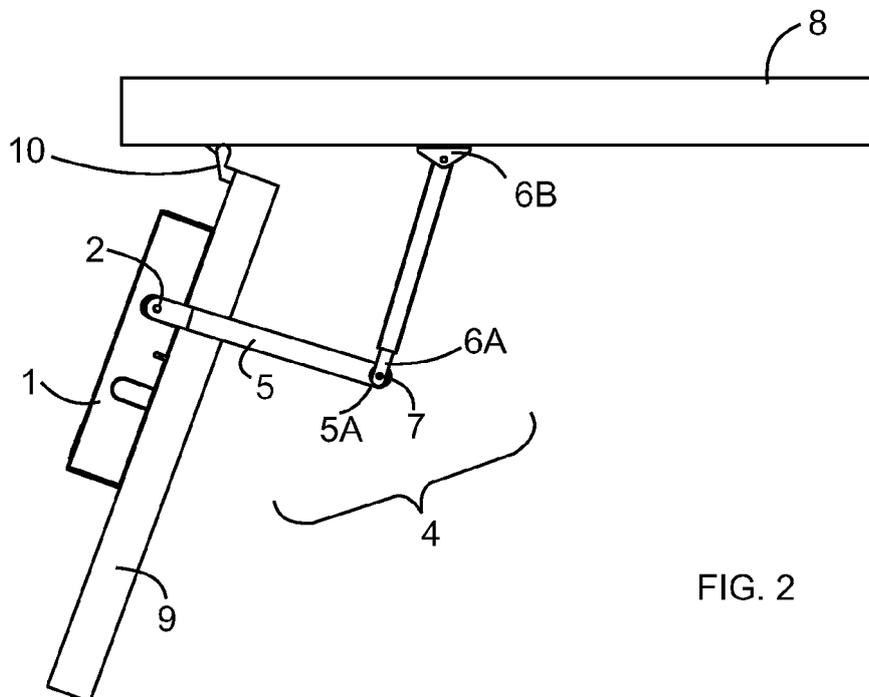


FIG. 2

**Description****Technical field**

[0001] The invention relates to a door closer arrangement comprising a door closer, which has a camshaft as a functional axis.

**Prior art**

[0002] At the present, door closers are generally of two different types: rack and pinion door closers and camshaft door closers. In rack and pinion door closers, the functional axis is provided with a pinion, which lies against a rack. The functional axis is connected to an arm arrangement. The arm arrangement is, depending on the manner of installation, attached also to the door or the door frame. When the door is turned, the arm arrangement transmits the movement of the door to the functional axis, which also turns. The turning functional axis further moves the rack, which is in connection with the spring of the door closer. As the door is opened, the spring stores energy as spring force. The stored spring force is released, when the door closes. Camshaft door closers function in a corresponding manner, but they have no rack, but instead a functional axis provided with a camshaft. The camshaft is opposite a counterface (typically cylindrical in shape), which is in a functional connection with the spring of the door closer.

[0003] There are also found two general types of arm arrangements: the folding arm and the sliding arm. The folding arm is an older arm arrangement type, which is also often called a scissors arm. It comprises two arms, one of which as installed is connected to the door closer. The other ends of both arms are connected to each other forming a joint. The free end of the arm that is not connected to the door closer is to be connected to either the door or the door frame, depending on the manner of installation.

[0004] A sliding arm comprises an arm, which is connected to the functional axis of the door closer from its one end. The other end of the arm is connected to a slide rail such that the head of the arm is free to move on the rail. As installed, the slide rail is connected to either the door or the door frame. A sliding arm is neater in appearance than a folding arm, and it further blends well with the installation environment formed by the door and the frame.

[0005] Both the folding arm and the sliding arm are used with rack and pinion door closers. The opening and closing characteristics of the door closer are, however, not very good, when a rack and pinion door closer is combined with a sliding arm. Nonetheless, users often require the use of a sliding arm for reasons of appearance. Good opening and closing characteristics in a door closer provided with a sliding arm can be obtained, when the door closer is a camshaft door closer. On the market are indeed used the rack and pinion door closer and fold-

ing arm combination or the camshaft door closer and sliding arm combination, with which are achieved good usage characteristics.

**Brief description of the invention**

[0006] The object of the invention is to provide an alternative to current door closer arrangements. The object is achieved in the manner presented in the independent claim. The idea of the invention is to combine a camshaft door closer and a folding arm, wherein the opening and closing characteristics are at least as good as with known door closer arrangements. A camshaft door closer provided with a folding arm is not currently found on the market, as the appearance of a folding arm is not advantageous and current door closer systems already provide as such good usage characteristics.

**List of figures**

[0007] In the following, the invention is described in more detail by means of the accompanying figures, in which

- 25 Fig. 1 shows an example of a door closer arrangement according to the invention, in which the door closer is attached to the door from the hinges side,
- Fig. 2 shows the example of Fig. 1 from another direction,
- 30 Fig. 3 shows an example of a door closer arrangement according to the invention, in which the door closer is attached to the door frame on the opposite side in relation to the hinges,
- 35 Fig. 4 shows the example of Fig. 3 from another direction,
- Fig. 5 shows the possibility of turning the door 180 degrees from the position shown in Fig. 4,
- Fig. 6 shows an example of a door closer arrangement according to the invention, in which the door closer is attached to the door on the opposite side in relation to the hinges,
- 40 Fig. 7 shows an example of a cam connected to the functional axis of a door closer, and
- 45 Fig. 8 shows the efficiency and the opening and closing curves of the inventive door closer arrangement.

**Description of the invention**

[0008] Figs. 1 and 2 show an example of a door closer arrangement according to the invention, in which the functional axis 2 of the door closer 1 is a camshaft, i.e. the functional axis has a cam 3 (Fig. 7). At the end of the camshaft, which extends out from the body of the door closer and is visible, is attached an arm arrangement 4. The arm arrangement comprises two arms 5, 6, of which one 5 is connected to the door closer 1, i.e. thus to the

camshaft 2 of the closer. The other ends 5A, 6A of both arms are connected to each other forming a joint 7. To the camshaft door closer is thus connected a folding arm.

**[0009]** In the example of Figs. 1 and 2, the door closer 1 and the thereto connected arm arrangement 4 are installed to the frame 8 and to the door 9. The door is connected by hinges 10 to the frame. The head 6B of the other arm 6 of the arm arrangement is attached to the frame 8 and the door closer 1 is attached to the door 9 such that the hinges 10 are on the same side as the door closer. As can be observed from the figures, the head 6B of the arm 6 attached to the frame 8 comprises also a joint, thus the arm 6 that is attached thereto is free to turn in relation to the frame 8 of the door.

**[0010]** Figs. 3 and 4 show another manner, in which the inventive door closer arrangement can be installed. Also, in this manner, the door closer 1 and the thereto connected arm arrangement 4 are installed to the frame 8 and to the door 9. The head 6B of the other arm 6 of the arm arrangement is attached in the door 9 and the door closer 1 is attached in the frame 8 such that the hinges 10 are on the other side of the door and the frame. In other words, the hinges are on the opposite side as the door closer in relation to the frame.

**[0011]** The camshaft has one feature that is often a disadvantage. A camshaft is namely free to rotate around. Fig. 7 shows a typical camshaft, in which the cam 3 is attached in the functional axis 2. The functional area of a camshaft according to Fig. 7 is, in an installation according to Figs. 1 and 2, approximately 110 - 120 degrees. Thus, if the door is turned, for example, more than 120 degrees, the cam 3 rotates "over", wherein the door closer 1 functions in the opposite direction. This means that the door closer then no longer attempts to close the door, but instead to open it. The door thus attempts to open, wherein it finally stops, for example, at the wall. In the event that the door closer is installed on the hinges side of the door, then there may be a danger that the door closer will strike against the wall as it is turned too much, for example, 110 degrees, wherein the door closer begins thus to open the door. There is indeed reason to consider the manner of installation and the designed opening angle of the door in order to avoid unpleasant surprises, when the door is used. The installation can also be used to affect the border values of the functioning area of the door closer.

**[0012]** This feature can, however, also be used to advantage, as the adjustments of the door closer also function, when the door closer functions in the wrong direction, i.e. attempts to open the door. Fig. 5 shows this type of manner. When the door 9 is turned, for example, 120 degrees, the door closer 1 begins to work as a door opener. In that case, the door 9 attempts to turn open as a result of the action of the door closer. This does not mean that the door would attempt to open uncontrollably; instead the door closer 1 opens the door in a controlled manner on the basis of the adjustments of the closer. In that case, the door 9 or door handle eventually strikes

against the door frame 8, wall or some other barrier. In these kinds of installation sites it is thus good to use a counter piece 11, which is at least partially of a flexible material. The flexible material can be, for example, rubber or some suitable mixture containing rubber. The counter piece is installed to the door, handle, floor, wall or ceiling.

**[0013]** In the example of Fig. 5, the counter piece is attached to the door 11, wherein it strikes, in the extreme case shown in the figure, at 180 degrees, for example, against the wall (not shown in the figures). The counter piece 11 prevents the door, wall, frame or other part from getting broken or damaged, when the door closer attempts to open the door. The counter piece can be installed, for example, to the floor between 120-180 degrees, wherein its position of installation defines the maximum opening angle of the door. A door closer arrangement according to the invention can, thus, also be used as a device to keep a door open in some installation sites. Using a manner of installation according to Fig. 5 to open a door 180 degrees is not possible if the arm arrangement is indeed a sliding arm. In that case, the arm strikes against the door as it is opened. The installation manner of Fig. 5 is a recommended manner in such cases, in which it is desired that the door is in the opened position 180 degrees, for example, in the direction of a wall, and it is desired that the door closer be on the opposite side of the frame in relation to the hinges, such as, for example, in many exterior doors.

**[0014]** Fig. 6 also shows a manner of installation, in which the combination of a camshaft door closer and a folding arm can function such that the door is to be opened 180 degrees such that the door closer functions as a closer, when the door is open 180 degrees. In this manner of installation, the end of the other arm 6 of the arm arrangement 4 is attached through the installation part 12 to the frame 8 and the door closer 1 is attached to the door such that the hinges 10 are on the opposite side of the door and the frame. The installation part 12 is, for example, an angle iron. This has not previously been possible, so the invention provides new possibilities for use of the door closer arrangement.

**[0015]** Also achieved using a door closer arrangement according to the invention are exceptionally good opening and closing characteristics. In door closers, it is recommended that, with small opening angles of the door, the opening and closing moments are greater than with larger opening angles. Thus, opening and closing the door is pleasant for the user. Using a solution according to the invention, the opening moment decreases rapidly, when the opening angle of the door increases. Correspondingly, the closing moment increases rapidly, when the opening angle of the door (the angle, at which the door is open) decreases as the door closes. The decreasing of the opening moment and increasing of the closing moment are faster (moment curves steeper) than, for example, the opening and closing moments of a rack and pinion door closer provided with a folding arm with the

small opening angles of the door. Also, with larger closing angles of the door, exceptionally good values are achieved, which please the users and are recommended. The efficiency of a door closer arrangement according to the invention is also good, i.e. approximately 80%, when it is, correspondingly, approximately 60% using a rack and pinion door closer provided with a folding arm. Fig. 8 shows an example of the opening curve 81, closing curve 82 and efficiency 83 of a door closer arrangement according to the invention with opening angles of the door of 0 - 120 degrees (the most common opening angles). As can be observed from the figures, the closing and opening curves are more steep with small opening angles of the door (approximately 0-20 degrees) than those of known door closer arrangements. Additionally, the curves are relatively close to each other and, with large opening angles, the curves are also relatively even.

**[0016]** Additionally, the inventive door closer arrangement enables that smaller door closers can be used in installation sites, in which would otherwise be used larger door closers. The inventive door closer arrangement is also suitable for use in fire doors. The invention thus enables a wide area of application to the door closer arrangement.

#### Claims

1. A door closer arrangement comprising a door closer (1), which has a camshaft as a functional axis, **characterized in that** it comprises an arm arrangement (4), which has two arms (5, 6), of which one (5) is connected to the door closer (1), the other ends (5A, 6A) of both of which arms are connected to each other forming a joint (7).
2. A door closer arrangement according to claim 1, **characterized in that** it comprises a counter piece (11) to be installed to a door, handle, floor, wall or ceiling, which counter piece is at least partially of a flexible material.
3. A door closer arrangement according to claim 1 or 2, **characterized in that** the door closer (1) and the thereto connected arm arrangement (4) are installed to a frame (8) and to a door (9), which door is connected by hinges (10) to the frame, a head (6B) of the other arm (6) of the arm arrangement (4) being attached to the frame (8) and the door closer (1) being attached to the door (9) such that the hinges are on an other side of the door and the frame.
4. A door closer arrangement according to claim 1 or 2, **characterized in that** the door closer (1) and the thereto connected arm arrangement (4) are installed to a frame (8) and to a door (9), which door is connected by hinges (10) to the frame, a head (6B) of the other arm (6) of the arm arrangement (4) being

attached to the door (9) and the door closer (1) being attached to the frame (8) such that the hinges are on an other side of the door and the frame.

5. A door closer arrangement according to claim 1 or 2, **characterized in that** the door closer (1) and the thereto connected arm arrangement (4) are installed to a frame (8) and to a door (9), which door is connected by hinges (10) to the frame, the head (6B) of the other arm (6) of the arm arrangement (4) being attached to the frame (8) and the door closer (1) being attached to the door (9) such that the hinges are on the same side as the door closer.

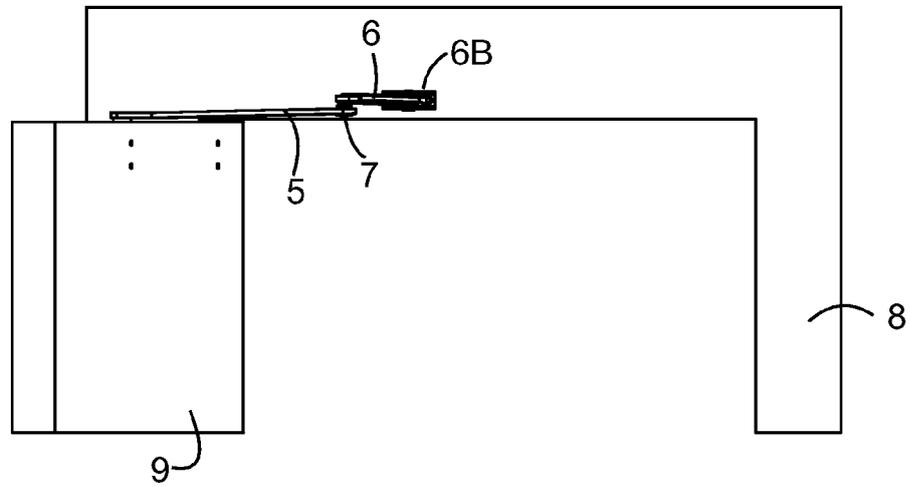


FIG. 1

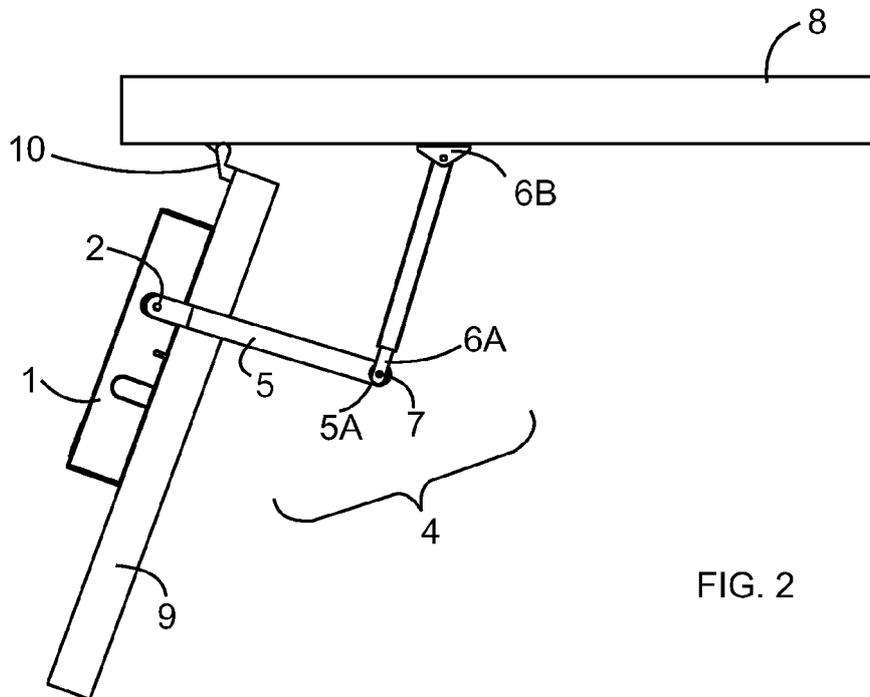


FIG. 2

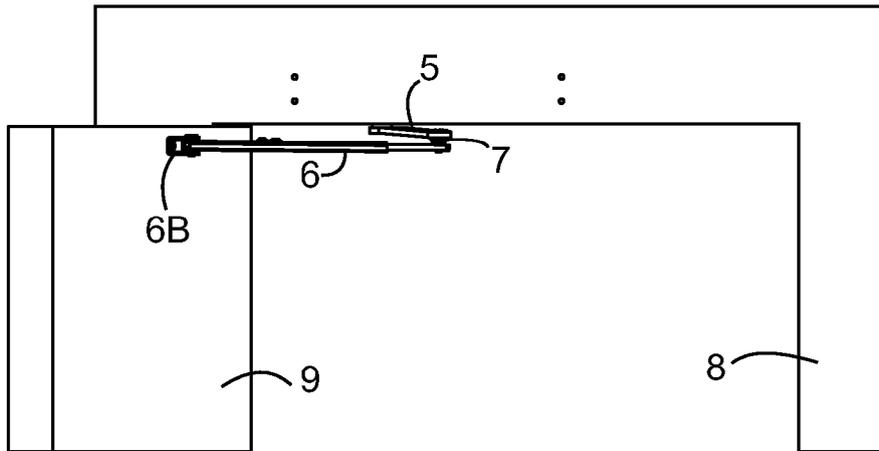


FIG. 3

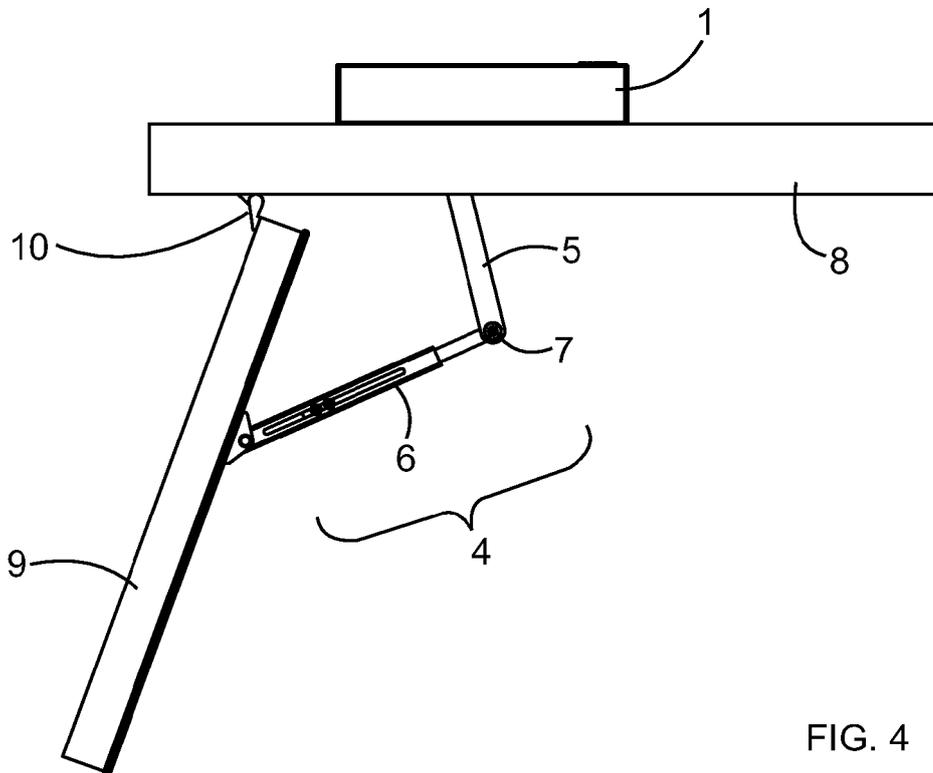
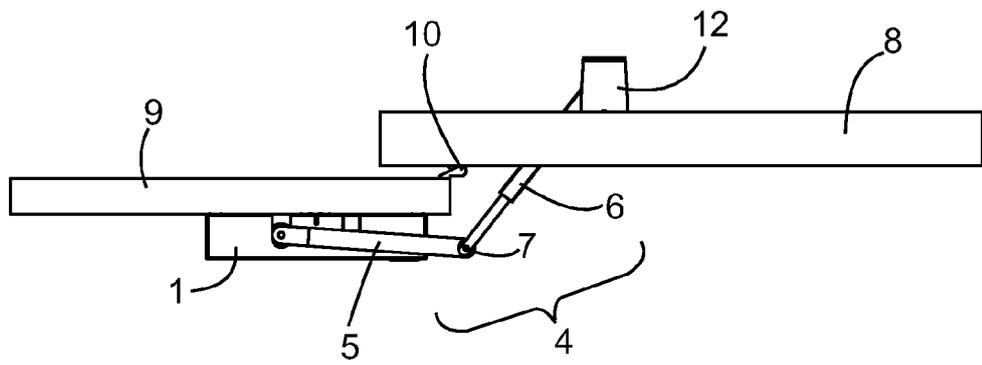
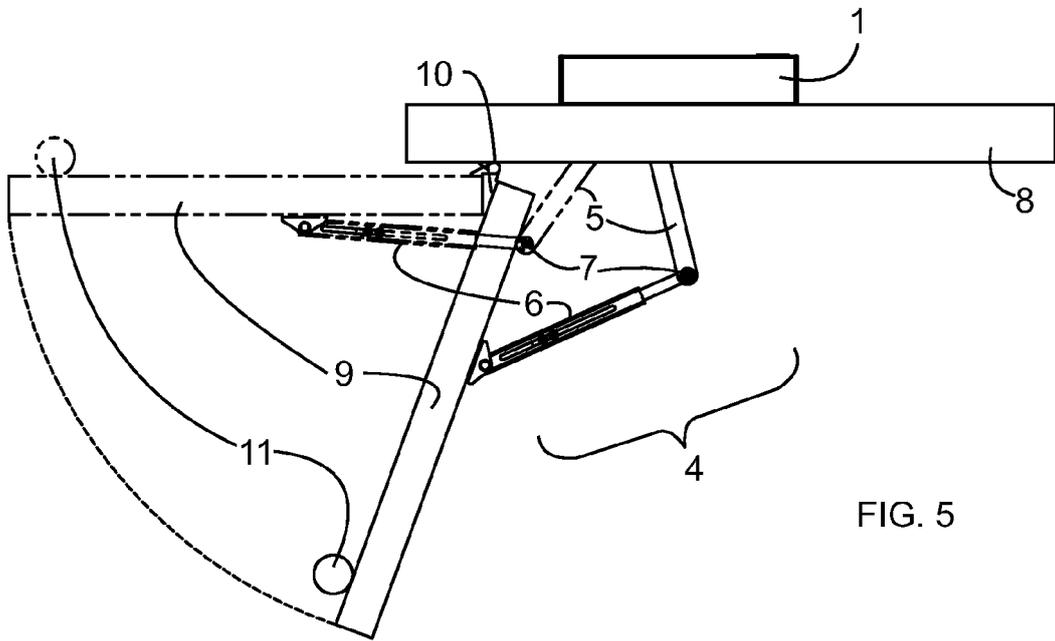


FIG. 4



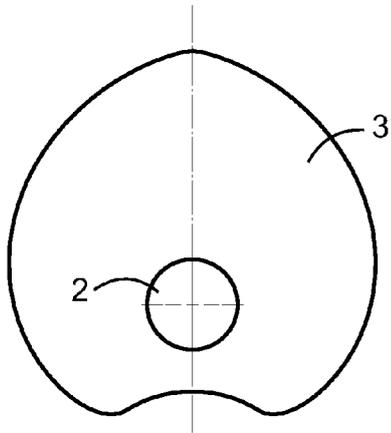


FIG. 7

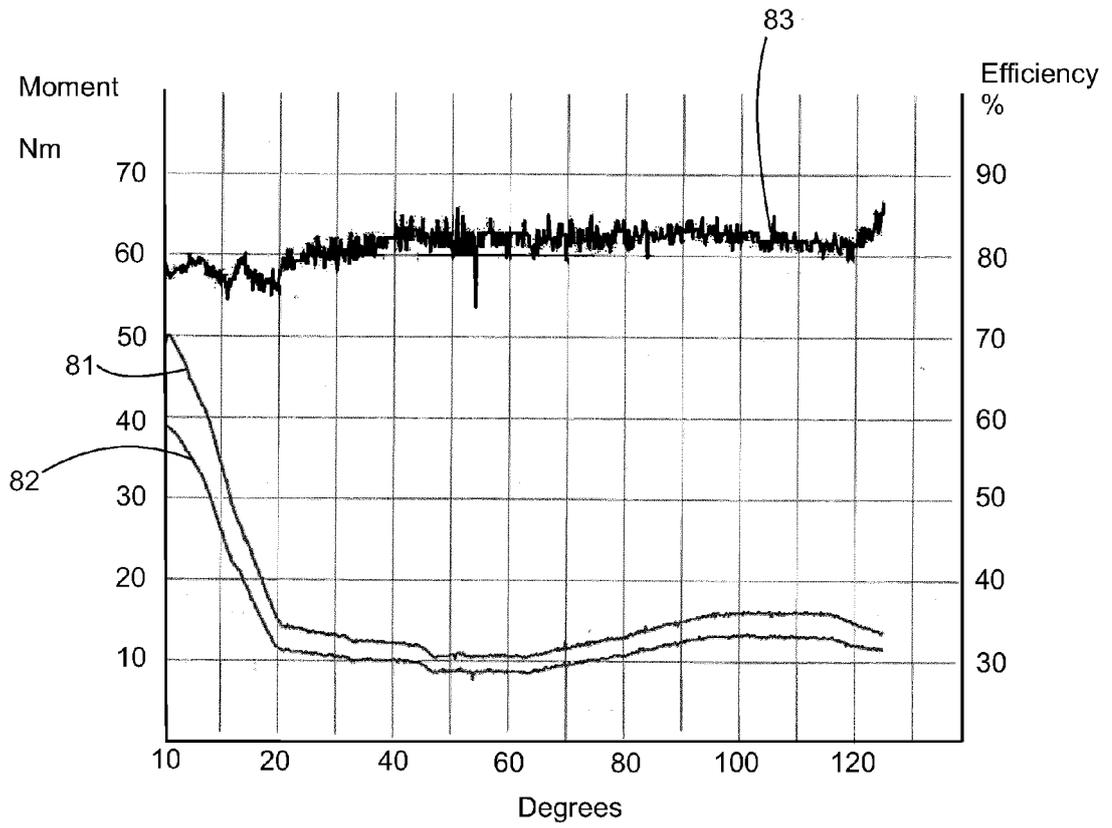


FIG. 8



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Application Number  
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 29 July 2013	Examiner Berote, Marc
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