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(54) Device for rotating a damper blade of a fire damper

(57) The present invention relates to a device (3) for rotating a damper blade (2) of a fire damper (1) about a damper blade axle (A), in which the damper blade (2), within a specific angle range, cannot be rotated with respect to its open and its closed position as a result of a force acting on the damper blade (2), comprising a first transmission arm of the damper blade (4) on the damper blade axle (A) and a second, drivable transmission arm (5) on a drivable axle (B), which are hingedly connected by a coupling element which is arranged on the first transmission arm of the damper blade (4) such that it can be displaced, and is arranged on the second, drivable transmission arm (5) such that it can be displaced and which is guided according to a flowing curve in such a manner that, in the open and in the closed position, the first transmission arm of the damper blade (4) is positioned according to the tangent line of this curve.

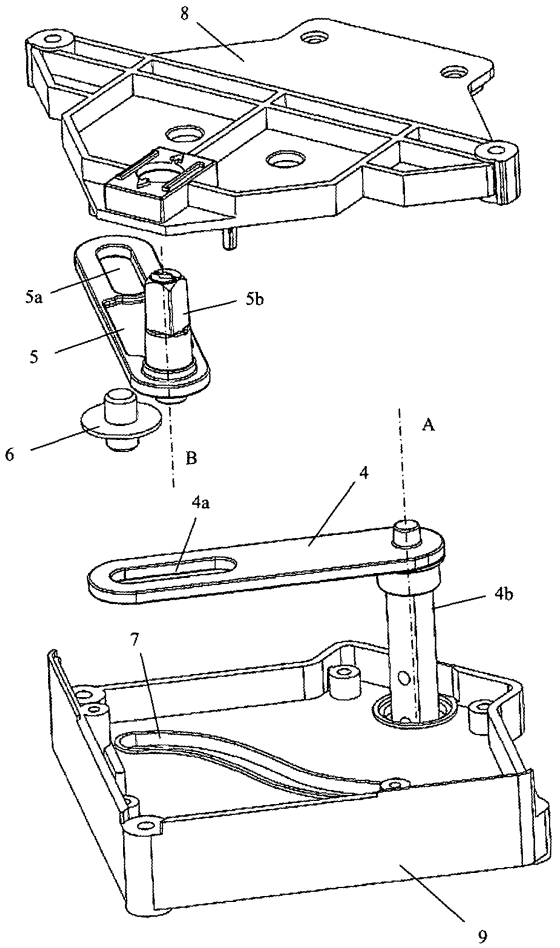

FIG. 2

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Description

[0001] The present invention relates to a device for rotating a damper blade of a fire damper about a damper blade axle from an open position to a closed position and vice versa, comprising a first transmission arm of the damper blade which is connected to the damper blade axle and a second, drivable transmission arm which is connected to a drivable axle, in which the free ends of both transmission arms are hingedly connected to one another by means of a coupling element and in which this coupling element is arranged such that it can be displaced in the length direction of the first transmission arm of the damper blade with respect to this first transmission arm of the damper blade.

[0002] Such fire dampers are used in the case of wall passages in air ducts in order to prevent the propagation of a fire. In this case, a damper blade is fitted in an air flow duct of these fire dampers so as to be rotatable from an open position to a closed position and vice versa. During normal operation of the ventilation device of which such a fire damper forms part, the damper blade has to be in its open position and preferably does not flap or turn with respect to this open position as a result of forces which act on this damper blade, in order to ensure a good circulation. In the case of fire, the damper blade has to be moved to the closed position, in which case it should again not turn with respect to this closed position as a result of forces which act on this damper blade, in order to close off the air flow duct sufficiently to prevent a fire from propagating.

[0003] A large number of devices have already been produced for rotating a damper blade of a fire damper about a damper blade axle from an open position to a closed position and vice versa, in which the damper blade is locked in the open position and in the closed position. These devices are usually of a complicated design.

[0004] DE 31 43 105 A1 describes a simple device, in which rotation of the damper blade from the open position or from the closed position is only prevented if this movement is initiated by forces which act on the damper blade. If this movement from the open position or from the closed position is initiated by the drive by means of the device, this movement can be performed freely. The lock does thus not have to be released in order to be able to rotate the damper blade again thereafter.

[0005] This simple device comprises a first transmission arm of the damper blade which is placed radially with respect to the damper blade axle, and a second, drivable transmission arm which is placed radially with respect to a drivable axle, which is parallel to the damper blade axle, in which the free ends of both transmission arms are hingedly connected to one another by means of a coupling element, this coupling element being fixedly connected to the second, drivable transmission arm and being arranged on the first transmission arm of the damper blade such that it can be displaced in the length direction of this first transmission arm of the damper blade, so that both transmission arms are at right angles to one another in the open and the closed position of the damper blade.

[0006] It is an object of the present invention to provide an alternative and equally simple device for rotating a damper blade of a fire damper about a damper blade axle from an open position to a closed position and vice versa, in which the movement of the flap from the open position or from the closed position by forces which act on the damper blade is prevented over a certain angle range with respect to the open position and the closed position, respectively, but in which the movement can be performed freely by driving the fire damper.

[0007] This object of the invention is achieved by providing a device for rotating a damper blade of a fire damper about a damper blade axle from an open position to a closed position and vice versa, comprising a first transmission arm of the damper blade which is connected to the damper blade axle and a second, drivable transmission arm which is connected to a drivable axle, in which the free ends of both transmission arms are hingedly connected to one another by means of a coupling element, in which this coupling element is arranged such that it can be displaced with respect to this first transmission arm of the damper blade, in which the coupling element is also arranged such that it can be displaced with respect to this second, drivable transmission arm and in which, when the damper blade is rotated from the open position to the closed position and vice versa, the movement of this coupling element is guided by means of guide means in accordance with a flowing curve in such a manner that, in the open position and in the closed position, the first transmission arm of the damper blade, in its length direction, is positioned according to the tangent line of this curve.

[0008] By arranging the coupling element so as to be freely movable with respect to both the first and the second, drivable transmission arm, but guiding it in accordance with a flowing curve in such a manner that the first transmission arm of the damper blade, in the open and in the closed position, is positioned according to the tangent line of this flowing curve, it is ensured that the movement of both transmission arms cannot be initiated, either from the open position or from the closed position, by means of the first transmission arm of the damper blade and thus by forces which act on the damper blade. As a flowing curve has a virtually linear profile across small areas, it is also ensured that upon small displacements of the transmission arms with respect to the closed position or with respect to the open position, this movement can still not be initiated by means of the first transmission arm of the damper blade. The movement over a certain angle range with respect to the open position and with respect to the closed position can therefore only be initiated by means of the second, drivable transmission arm, and thus by a drive connected to the drivable axle.

[0009] In a first specific embodiment of a device according to the present invention, the guide means com-

prise at least one groove which has a shape corresponding to the flowing curve and said coupling element is arranged in the groove, so that the movement of this coupling element is guided according to the curve. Preferably, this device then comprises a top wall and a bottom wall, between which the first transmission arm of the damper blade, the second, drivable transmission arm and the coupling element are arranged, the guide means comprise two grooves which have a shape corresponding to the flowing curve and which are provided in the top wall and the bottom wall, and the coupling element is arranged in both grooves, so that the movement of this coupling element is guided according to the curve.

[0010] In the embodiment in which the guide means comprise one groove, the coupling element is preferably arranged such that it can be displaced in a slot which extends in the length direction and is provided in the first transmission arm of the damper blade or in the second, drivable transmission arm and is arranged in a guiding manner in a groove extending in the length direction in the second, drivable transmission arm or the first transmission arm of the damper blade, respectively.

[0011] In those cases where the guide means comprise two grooves, the coupling element is preferably arranged such that it can be displaced in a slot which extends in the length direction and is provided in the first transmission arm of the damper blade and in a slot which extends in the length direction which is provided in the second, drivable transmission arm. The coupling element is then arranged in both slots and in said grooves in the top wall and the bottom wall.

[0012] In a further specific embodiment of a device according to the present invention, the guide means comprise at least one linear groove, said coupling element being arranged in this groove such that it can be displaced and this coupling element being arranged in a slot which is provided in the first transmission arm of the damper blade or in the second, drivable transmission arm such that it can be displaced, and is arranged in a guiding manner in a groove in the second, drivable transmission arm or in the first transmission arm of the damper blade, respectively, this slot and/or this groove having a shape corresponding to the flowing curve, so that the movement of this coupling element is guided according to the curve.

[0013] In yet another specific embodiment of a device according to the present invention, this device comprises a top wall and a bottom wall, between which the first transmission arm of the damper blade, the second, drivable transmission arm and the coupling element are arranged, the guide means comprising two linear grooves which are provided in the top wall and the bottom wall, said coupling element being arranged in both grooves, being arranged so as to be displaceable in a slot which is provided in the first transmission arm of the damper blade and being arranged so as to be displaceable in a slot which is provided in the second, drivable transmission arm, one of the two or both slots having a shape which corresponds to the flowing curve, so that the movement of this coupling element is guided according to the curve.

[0014] In a preferred device according to the present invention, the first transmission arm of the damper blade is furthermore arranged radially on the damper blade axle, the second, drivable transmission arm is arranged radially on the drivable axle and this drivable axle is arranged parallel to the damper blade axle.

[0015] The flowing curve preferably has a shape which is such that the transmission ratio 1:1 is as close as possible to across as large a range as possible. Preferably, this ratio is substantially 1:1 across virtually the entire range.

[0016] If the damper blade is closed using spring force, a much smaller spring force is required than in the prior art to open or close the damper blade due to the fact that the transmission ratio is as close as possible to 1:1.

[0017] In a further specific embodiment of a device according to the present invention, the angle between the first transmission axle and the axis through the connection points of the damper blade axle with the first transmission arm of the damper blade and of the drivable axle with the second, drivable transmission arm varies between -45° and +45° during the movement of the coupling element according to the flowing curve.

[0018] Preferably, this flowing curve then has a virtually linear shape, in the region of the flowing curve in which, when the coupling element moves according to this curve, the angle between the first transmission axle and the axis through the connection points of the damper blade axle with the first transmission arm of the damper blade and of the drivable axle with the second, drivable transmission arm varies between -45° and -30°, and in the region of the flowing curve in which, when the coupling element moves according to the curve, said angle varies between 30° and 45°.

[0019] Furthermore, the flowing curve is preferably of a completely symmetrical design with respect to the axis through the connection points of the damper blade axle with the first transmission arm of the damper blade and of the drivable axle with the second, drivable transmission arm.

[0020] The present invention will now be explained in more detail with reference to the following detailed description of a preferred embodiment of a device according to the present invention. The description is solely intended to give illustrative examples and to indicate further advantages and particulars of this device, and can therefore not be interpreted in any way as limiting the area of application of the invention or the patent rights sought in the claims.

[0021] In this detailed description, reference numerals are used to refer to the attached drawings, in which:

- ***Figure 1*** shows a fire damper, provided with a preferred embodiment of a device according to the invention, in perspective;
- ***Figure 2*** shows the preferred embodiment of a de-

vice from the fire damper from Figure 1 in an cut-away perspective;

- ***Figure 3*** shows an upper part comprising the top wall, the transmission arms and the coupling element of the preferred embodiment from the fire damper from Figure 1 in perspective;
- ***Figure 4*** shows a bottom part comprising the bottom wall, the transmission arms and the coupling element of the preferred embodiment from the fire damper from Figure 1 in perspective.

[0022] The device (3) for rotating a damper blade of a fire damper (1), as represented in Figure 1, comprises, as represented in Figures 2 to 4, a first transmission arm of the damper blade (4) and a second, drivable transmission arm (5).

[0023] The first transmission arm of the damper blade (4) is provided with a radial axle part (4b) which runs through a bottom wall (9) of the device (3) and through the wall of the fire damper (1) and which is connected to the damper blade axle (A) about which the damper blade (2) of the fire damper (1) is rotatably fitted. This damper blade (2) can in this case rotate from an open position to a closed position and vice versa.

[0024] The second, drivable transmission arm (5) is provided with a radial axle part (5b) which runs through a top wall (8) of the device (3) and which is connected to a drivable axle (B) which can be rotated by means of drive means. All possible known means may be used as drive means, for example a manual drive or a drive which uses a motor or which uses a spring element, etc. The drivable axle (B) is arranged parallel to the damper blade axle (A).

[0025] The free ends of the transmission arms (4, 5) are hingedly connected to one another by means of a coupling element (6). This coupling element (6) is designed as a coupling pivot which is displaceably arranged in a slot (4a) which extends in the length direction and which is provided in the first transmission arm of the damper blade (4) and in a slot (5a) which extends in the length direction and which is provided in the second, drivable transmission arm (5).

[0026] The device (3) furthermore comprises an upper part and a bottom part which are made from plastic. However, these could equally well be made from any other suitable material. The upper part comprises a top wall (8) and the bottom part comprises a bottom wall (9), between which the first transmission arm of the damper blade (4), the second, drivable transmission arm (5) and the coupling element (6) are arranged. The combination, together with the bottom wall (9), is fitted against the wall of the fire damper (1), as can be seen in Figure 1. In the top wall (8), as can clearly be seen in Figure 3, a groove (7) is provided which has a shape corresponding to a flowing curve. In the bottom wall (9), as can clearly be seen in Figure 4, a corresponding groove (7) is provided having the same shape. The ends of the coupling pivot (6) are inserted in these grooves (7) in a guiding manner, so that the movement of this coupling pivot is guided according to said flowing curve. As can be seen in Figure 4, this flowing curve is symmetrical with respect to the axis (C) through the connection points of the damper blade axle (A) with the first transmission arm of the damper blade (4) and of the drivable axle (B) with the second, drivable transmission arm (5). This curve furthermore has a shape which is such that when the coupling element (6) moves, the transmission ratio is as close as possible to 1:1 over as large a range as possible.

[0027] During the movement of the coupling element (6) according to the flowing curve, the angle (a) between the first transmission arm of the damper blade (4) and the axis (C) through the connection points of the damper blade axle (A) with the first transmission arm of the damper blade (4), and the drivable axle (B) with the second, drivable transmission arm (5) may vary between -45° and +45°. The angles of -45° and +45° correspond to the closed position and the open position of the damper blade which is connected to the first transmission arm of the damper blade (4). All intermediate angles correspond to positions of the damper blade situated between the open and the closed position. As can be seen in Figure 4, when the first transmission arm of the damper blade (4) is moved from the illustrated position to the axis (C) through said connection points, this movement is blocked as a result of the coupling pivot (6) abutting the edge of the groove (7) during this movement. Also in a region of the curve where said angle (a) varies between -45° and virtually -30° and between virtually 30° and 45°, the movement of the first transmission arm of the damper blade (4) towards said axis (C) is blocked as a result of the coupling pivot (6) abutting the edge of the groove (7) during this movement. However, if the second, drivable transmission arm (5) is moved towards said axis (C) in a region of the curve where said angle (a) varies between -45° and virtually -30° and between virtually 30° and 45°, then the coupling pivot (6) moves according to the curve and is displaced in the slot (4a) in the first transmission arm of the damper blade (4), so that the movement takes place entirely according to the groove (7) without it being obstructed.

Claims

1. Device (3) for rotating a damper blade (2) of a fire damper (1) about a damper blade axle (A) from an open position to a closed position and vice versa, comprising a first transmission arm of the damper blade (4) which is connected to the damper blade axle and a second, drivable transmission arm (5) which is connected to a drivable axle (B), in which the free ends of both transmission arms (4, 5) are hingedly connected to one another by means of a coupling element (6), in which this coupling element (6) is arranged such that it can be displaced with respect to this first transmission arm of the damper

blade (4), **characterized in that** the coupling element (6) is also arranged such that it can be displaced with respect to this second, drivable transmission arm (5) and **in that**, when the damper blade (2) is rotated from the open position to the closed position and vice versa, the movement of this coupling element (6) is guided by means of guide means (7) in accordance with a flowing curve in such a manner that, in the open position and in the closed position, the first transmission arm of the damper blade (4), in its length direction, is positioned according to the tangent line of this curve.

2. Device (3) according to Claim 1, **characterized in that** the guide means comprise at least one groove (7) which has a shape corresponding to the flowing curve and **in that** said coupling element (6) is arranged in the groove (7), so that the movement of this coupling element (6) is guided according to the curve.

3. Device (3) according to one of the preceding claims, **characterized in that** the device comprises a top wall (8) and a bottom wall (9), between which the first transmission arm of the damper blade (4), the second, drivable transmission arm (5) and the coupling element (6) are arranged, and **in that** the guide means comprise two grooves (7) which have a shape corresponding to the flowing curve and which are provided in the top wall (8) and the bottom wall (9), and **in that** the coupling element (6) is arranged in both grooves (7), so that the movement of this coupling element (6) is guided according to the curve.

4. Device (3) according to Claim 2, **characterized in that** the coupling element (6) is arranged such that it can be displaced in a slot (4a, 5a) which extends in the length direction and is provided in the first transmission arm of the damper blade (4) or in the second, drivable transmission arm (5) and is arranged in a guiding manner in a groove extending in the length direction in the second, drivable transmission arm (5) or the first transmission arm of the damper blade (4), respectively.

5. Device (3) according to Claim 2 or 3, **characterized in that** the coupling element (6) is arranged such that it can be displaced in a slot (4a) which extends in the length direction and is provided in the first transmission arm of the damper blade (4) and in a slot (5a) which extends in the length direction which is provided in the second, drivable transmission arm (5).

6. Device (3) according to Claim 1, **characterized in that** the guide means comprise at least one linear groove (7), **in that** said coupling element (6) is arranged in this groove (7) such that it can be displaced, **in that** this coupling element (6) is arranged in a slot (4a, 5a) which is provided in the first transmission arm of the damper blade (4) or in the second, drivable transmission arm (5) such that it can be displaced, and is arranged in a guiding manner in a groove in the second, drivable transmission arm (5) or in the first transmission arm of the damper blade (4), respectively, this slot (4a, 5a) and/or this groove having a shape corresponding to the flowing curve, so that the movement of this coupling element (6) is guided according to the curve.

7. Device (3) according to Claim 1, **characterized in that** the device comprises a top wall (8) and a bottom wall (9), between which the first transmission arm of the damper blade (4), the second, drivable transmission arm (5) and the coupling element (6) are arranged, **in that** the guide means comprise two linear grooves (7) which are provided in the top wall (8) and the bottom wall (9), **in that** said coupling element (6) is arranged in both grooves, **in that** this coupling element (6) is arranged so as to be displaceable in a slot (4a) which is provided in the first transmission arm of the damper blade (4), and is arranged so as to be displaceable in a slot (5a) which is provided in the second, drivable transmission arm (5a), one of the two or both slots (4a, 5a) having a shape which corresponds to the flowing curve, so that the movement of this coupling element (6) is guided according to the curve.

8. Device (3) according to one of the preceding claims, **characterized in that** the first transmission arm of the damper blade (4) is arranged radially on the damper blade axle (A), **in that** the second, drivable transmission arm (5) is arranged radially on the drivable axle (B), and **in that** this drivable axle (B) is arranged parallel to the damper blade axle (A).

9. Device (3) according to one of the preceding claims, **characterized in that** the flowing curve has a shape which is such that the transmission ratio is substantially 1:1.

10. Device (3) according to one of the preceding claims, **characterized in that** the angle (a) between the first transmission arm of the damper blade (4) and the axis (C) through the connection points of the damper blade axle (A) with the first transmission arm of the damper blade (4) and of the drivable axle (B) with the second, drivable transmission arm (5) varies between -45° and +45° during the movement of the coupling element (6) according to the flowing curve.

11. Device (3) according to Claim 10, **characterized in that** in the region of the flowing curve in which, when the coupling element (6) moves according to this curve, the angle (a) between the first transmission

arm of the damper blade (4) and the axis (C) through the connection points of the damper blade axle (A) with the first transmission arm of the damper blade (4) and of the drivable axle (B) with the second, drivable transmission arm (5) varies between -45° and -30°, and in the region of the flowing curve in which, when the coupling element (6) moves according to the curve, said angle (a) varies between 30° and 45°, this curve has a virtually linear shape.

12. Device (3) according to one of the preceding claims, **characterized in that** the flowing curve is of a symmetrical design with respect to the axis (C) through the connection points of the damper blade axle (A) with the first transmission arm of the damper blade (4) and of the drivable axle (B) with the second, drivable transmission arm (5).

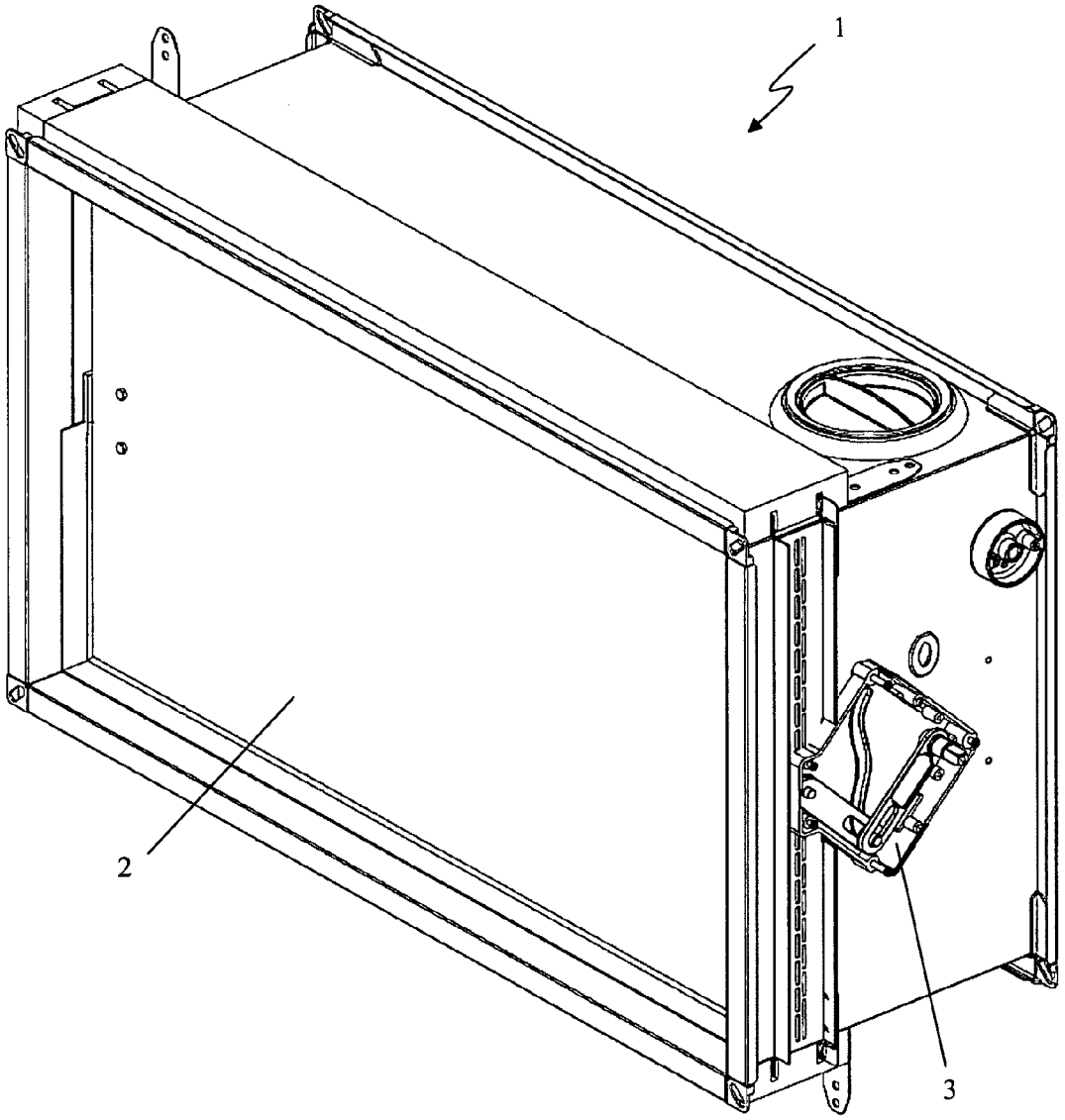

FIG. 1

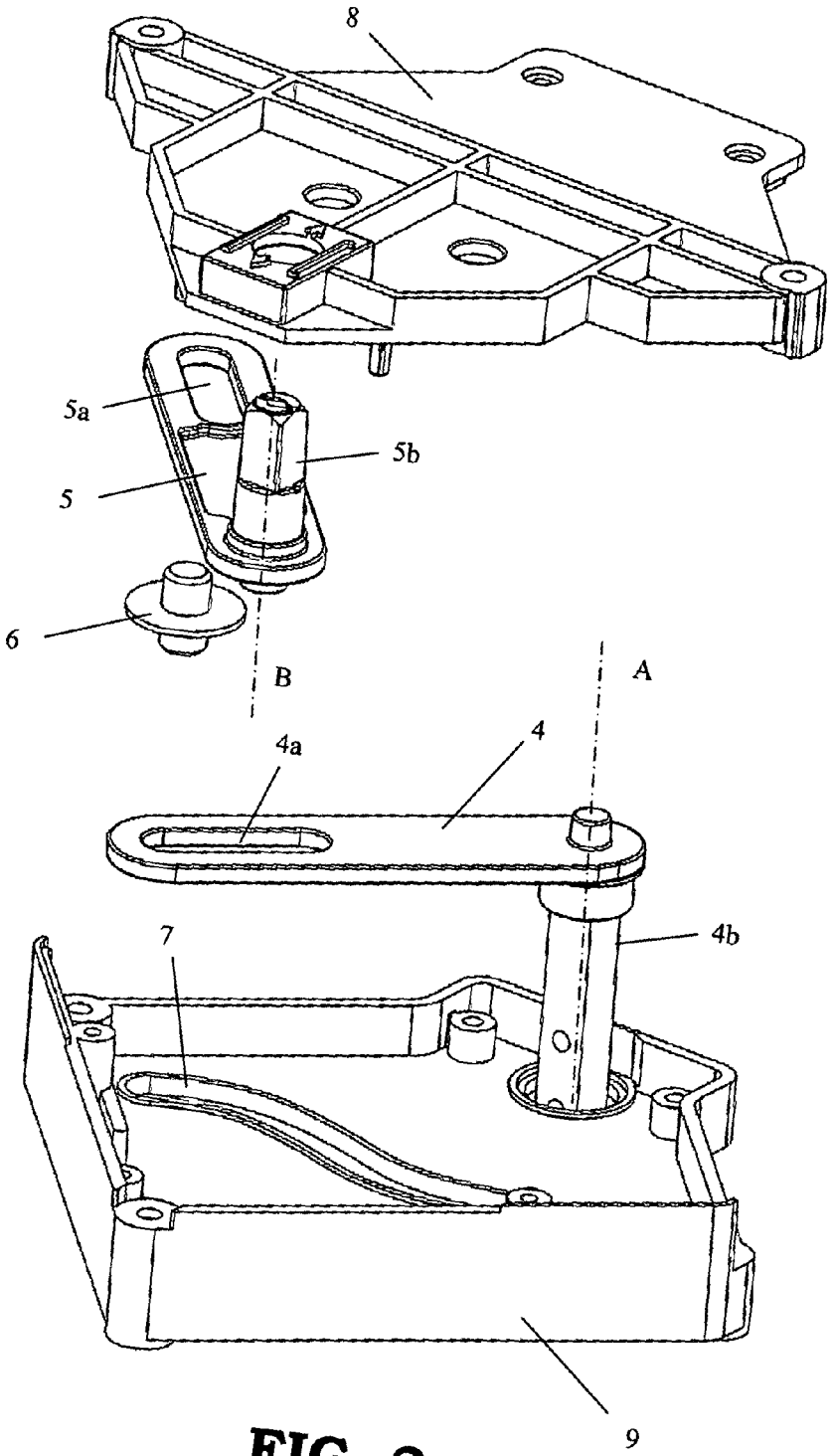

FIG. 2

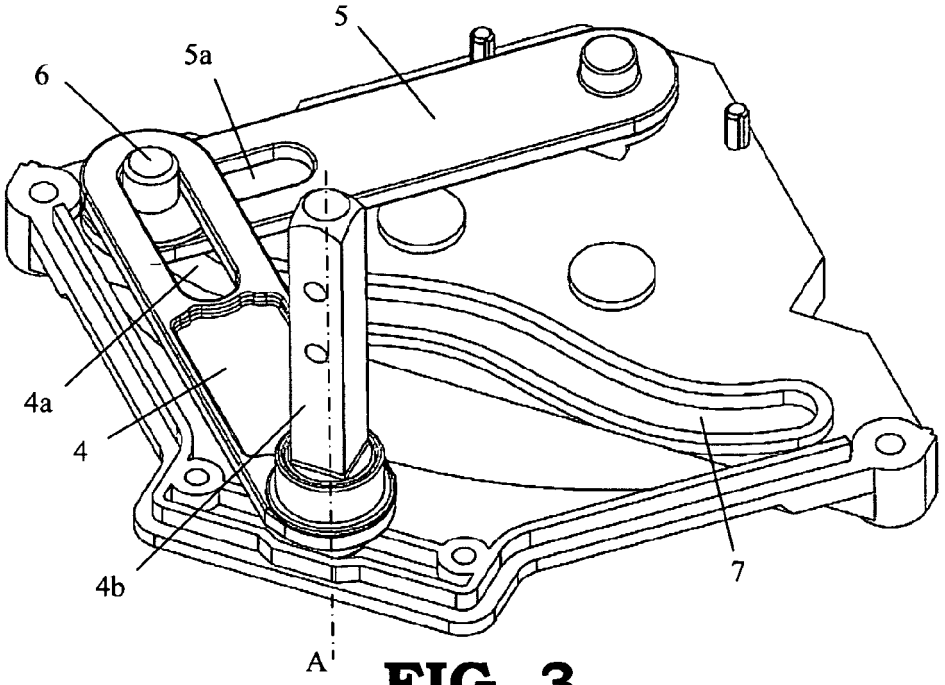

FIG. 3

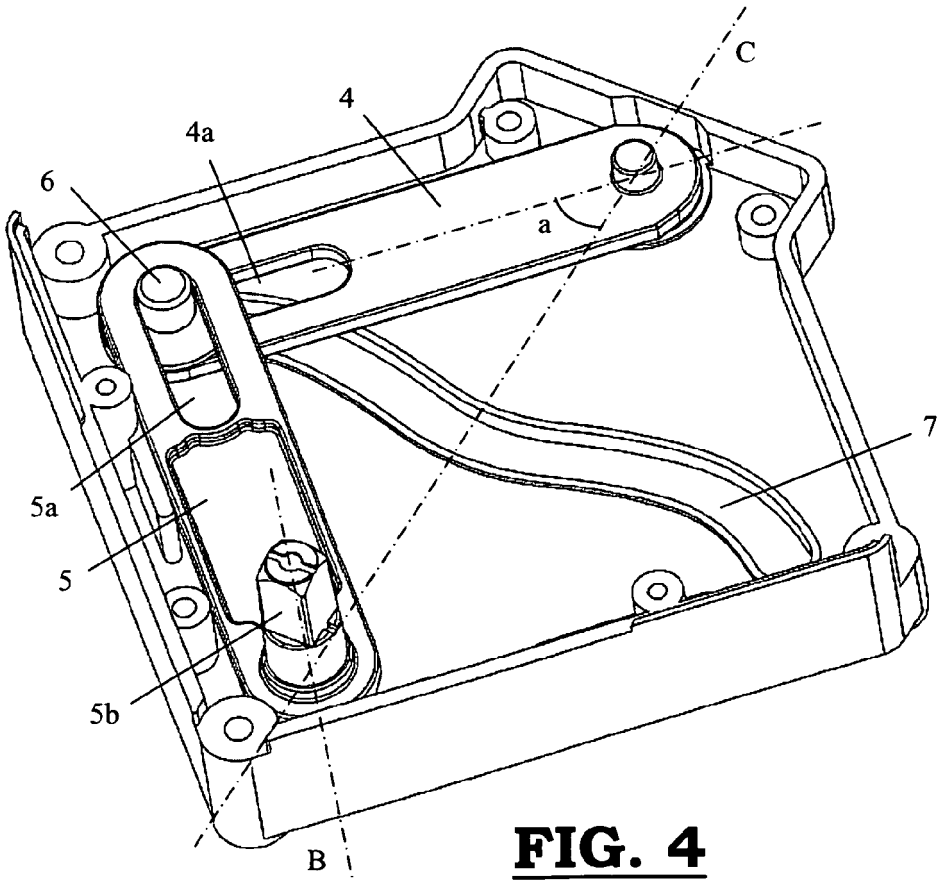

FIG. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 10 00 3349

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A,D	DE 31 43 105 A1 (WILDEBOER) 11 May 1983 (1983-05-11) * the whole document *	1-12	INV. A62C2/24
A	DE 103 40 719 A1 (WILDEBOER) 14 April 2005 (2005-04-14) * the whole document *	1-12	
A	EP 1 348 468 A (WILDEBOER) 1 October 2003 (2003-10-01) * the whole document *	1-12	

TECHNICAL FIELDS SEARCHED (IPC)

A62C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	3 June 2010	Vervenne, Koen

CATEGORY OF CITED DOCUMENTS

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03-06-2010

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 3143105 A1	11-05-1983	CH 657435 A5	29-08-1986
DE 10340719 A1	14-04-2005	NONE	
EP 1348468 A	01-10-2003	AT 337830 T	15-09-2006
		DE 10214243 C1	27-11-2003
		DK 1348468 T3	18-12-2006

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Patent documents cited in the description

- DE 3143105 A1 **[0004]**