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(54) **Control mechanism for an electrical switch**

(57) The invention relates to an electrical switch control mechanism (1), comprising a rocker arm (2) and a control element (3), which is movable between two transition positions, a first (A) and a second (B) transition position, by means of the rocker arm, the electric current being adaptable to pass through the control element from one contact terminal (5; 51, 52, 53) to the other at least in one of the transition positions. The rocker arm (2) and the control element (3) have in association therewith a spring (7), specifically a coil spring, which is set between the rocker arm and the control element, such that the control element is pressed by the spring either to the first (A) or the second transition position as the rocker arm is pivoted with respect to a mid-position and a pivot axis (D-D) over to the first or second side, respectively. According to the invention, the control element (3) comprises

a shaft (31) with its first end (311) set pivotably in connection with the first contact terminal (5) and with its second end (312) unattached and pointed towards the rocker arm (2) and provided with at least one contact pin (32, 33), and that between the control element's ends (311; 312), around the shaft (31), is provided a coil spring (8) and in association with the shaft and the coil spring is further arranged a connecting piece (9) provided with holders (91, 92) in a way to enable its movement along the shaft and, at the same time, the coil spring is allowed to compress at least partially and respectively to expand along the shaft, and that the rocker arm (2) comprises two parallel bosses (21, 22), the ends of which are fitted in the holders (91, 92) of the connecting piece (9), the control element having its shaft (31) adapted to travel in a gap between the parallel bosses.

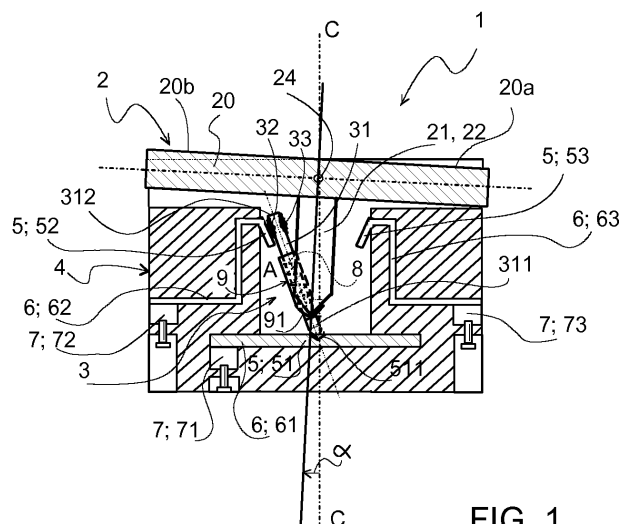


FIG. 1

Description

[0001] The invention relates to an electrical switch control mechanism as set forth in the preamble of claim 1.

[0002] Previously known are various electrical switch control mechanisms, including a rocker arm and a control element operated thereby. The control element is actuated by means of the rocker arm between two opposite transition positions, i.e. first and second transition positions, at least one of said positions being adapted to enable a passage of electric current through the control element. The control element is biased by a spring, such that the control element is pressed by the spring to the first or second transition position as the rocker arm is pivoted over to the first or second side of a mid-position, respectively. Such control mechanisms have been disclosed e.g. in International patent application publication WO 2008/155499 and in Canadian patent publication CA 976589.

[0003] In the cited International patent application publication WO 2008/155499, the control mechanism has its spring disposed for contact with a boss of the rocker arm. A drawback in this configuration is the fact that the spring must be relatively stiff and must be propped from outside in a suitable cylindrical recess of the boss in order to avoid buckling incidents, yet the propping must be implemented in such a way that one end of the spring, which is intended for attachment to the control element, shall be clear of the boss by an appropriate distance and unattached for a partial contraction as the control element is switched to another position. Another drawback is that such a structure is relatively complicated to manufacture, and assembling the control mechanism with an electrical switch is a laborious undertaking. A still further drawback is the fact that the control mechanism develops quite a considerable height as the spring needs to be relatively long. In addition, the spring must be laterally rigid and, hence, made from a heavy-duty material.

[0004] In the cited Canadian patent publication CA 976589, the control element of a control mechanism is a flat component featuring two parallel straight lateral segments and having a tapering tip portion pointing in a direction opposite to that of the lateral segments. By means of pivot brackets, pivotably disposed on the opposite outer edges of the lateral segments, the control element is bearing-mounted on two parallel spaced-apart segments of a first guide plate of the housing. The control element is biased by a coil spring, which is disposed between the rocker arm's boss and a trunnion present between the control element's lateral segments. A drawback in this assembly is that the control element's tip portion, which is provided with contact pins, is disposed on that side of the control element's bearing axle which is opposite with respect to the rocker arm, whereby the control mechanism becomes a relatively tall structure. As a result, the control mechanism cannot be accommodated in a shallow housing, nor in an outlet box. Another drawback is that the coil spring is not supported on anything in a lateral

direction, but is only connected by its ends between the rocker arm and the control element. This hampers the process of assembling a control mechanism and an electrical switch. In addition, the assembly has a poor reliability as the coil spring may slip off of its position between the rocker arm and the control element, whereby the control mechanism develops a fault and no longer functions as intended.

[0005] It is an object of the invention to eliminate the drawbacks associated with prior known switch mechanisms. Another object of the invention is to provide a new switch mechanism, which is simple in design, easy to assemble, and reliable.

[0006] A switch mechanism according to the invention is characterized by what is presented in claim 1. Preferred embodiments of the invention are presented in the dependent claims.

[0007] The electrical switch control mechanism according to the invention comprises a rocker arm and a control element, which is movable between two transition positions, first and second transition positions, by means of the rocker arm, the electric current being adaptable to pass through the control element from one contact terminal to the other at least in one of the transition positions, said rocker arm and control element having in association therewith a spring, specifically a coil spring, which is set between the rocker arm and the control element, such that the control element is pressed by the spring either to the first or the second transition position as the rocker arm is pivoted with respect to a mid-position and a pivot axis over to the first or second side, respectively. According to the invention, the control element comprises a shaft with its first end set pivotably in connection with the first contact terminal and with its second end unattached and pointed towards the rocker arm and provided with at least one contact pin, and that between the control element's ends, around the shaft, is provided a coil spring and in association with the shaft and the coil spring is further arranged a connecting piece provided with holders in a way to enable its movement along the shaft and, at the same time, the coil spring is allowed to compress at least partially and respectively to expand along the shaft, and that the rocker arm comprises two parallel bosses, the ends of which are fitted in the holders of the connecting piece, the control element having its shaft adapted to travel in a gap between the parallel bosses.

[0008] The invention provides a benefit of simple design and convenient manufacturing. The switch mechanism's control element only comprises three parts, which in a manufacturing process are assembled in a straightforward manner with each other and additionally in connection with a rocker arm.

[0009] Another benefit of the invention is the possibility of providing a control mechanism and an electrical switch applying the same in the form of a low profile component and further in such a way that the rocker arm's pivot angle is relatively small. The control mechanism's low profile and the rocker arm's small pivot angle can be used for a

beneficial effect on the appearance of an electrical switch. In addition, a flat electrical switch is preferred from the standpoint of electrical installations for not requiring e.g. a major installation depth.

[0010] The invention will now be described in more detail with reference to the accompanying drawing, in which

fig. 1 shows a control mechanism of the invention in detail from the front in a first transition position;

fig. 2 shows a control mechanism in detail from the front in a second transition position;

fig. 3 shows a control mechanism from the side in a condition dismantled for assemblable parts; and

fig. 4 shows a similar control mechanism from the side in an assembled condition.

[0011] Like reference numerals in the figures are used for like parts.

[0012] One preferred electrical switch control mechanism, intended for attachment in an appropriate outlet box, is detailed in the drawings.

[0013] An electrical switch control mechanism 1 comprises a rocker arm 2 and a control element 3 operated thereby. The rocker arm 2 and the control element 3 are set in a suitable electrical switch housing 4. The control element 3 is accommodated in a housing cavity 41, with contact terminals 5; 51, 52, 53 also conveniently provided therein. The control element 3 is actuated by means of the rocker arm 2 between two transition positions, i.e. between a first A and a second B transition position, which are detailed in figs. 1 and 2. The control element 3 is adapted to electrically couple the first and second contact terminals 5; 51, 52 of an electrical switch with each other in the first transition position A and, respectively, the first and third contact terminals 5; 51, 53 of an electrical switch with each other in the second transition position B. Thereby, the electric current is adaptable to travel through the control element 3 either in the first A or second B transition position.

[0014] It should be noted that, in the simplest embodiment of a control mechanism according to the invention, the control element 3 is adapted to couple electrically the first and second contact terminals 5; 51, 52 of an electrical switch with each other in the first transition position A, while no coupling occurs in the second transition position B. The third contact terminal 5; 53 is not absolutely necessary in this case. Thus, in the first A transition position, the electric current is adaptable to travel through the control element 3, and in the second transition position B the electric current is disconnectable.

[0015] In association with the rocker arm 2 and the control element 3 is a spring 7, particularly a coil spring. The spring 7 is disposed between the rocker arm 2 and the control element 3, such that the control element 3 is pressed by the spring 7 either to the first A or second B

transition position in response to pivoting the rocker arm 2 relative to a mid-position or a plane C-C, which in this example coincides with the vertical plane, and, respectively, over to a first or second side with respect to a pivot axis D-D extending thereby.

[0016] One or more control mechanisms 1 is accommodated in the housing 4 and constructed for an electrical switch provided with one or more rockers. Each control mechanism 1 includes conductors 6; 61, 62, 63 set in connection with the housing 4 and used for connecting the contact terminals 5; 51, 52, 53 to matching terminals 7; 71, 72, 73, by which the control mechanisms are connected to external electrical wiring. The housing 4 is constructed from a highly dielectric material, such as an appropriate type of plastic. The conductors 6 and the terminals 5, 7 are made of an electrically highly conductive material such as copper.

[0017] In the process of electrical installation, the electrical switch is fitted e.g. in an outlet box and connected as part of the electricity network within a building or the like. The electrical switch is connected between the electricity network and a current-using appliance, such as a lighting fixture, in such a way that the electrical switch enables connecting the current-using appliance to the electricity network for commencing the power supply to the current-using appliance and, respectively, switching off the connection with the electricity network and terminating the power supply to the current-using appliance.

[0018] The control element 3 of the electrical switch control mechanism 1 comprises a shaft 31 and a coil spring 8. The shaft 31 is constructed in an electrically highly conductive material, such as copper. A first end 311 of the shaft 31 is set pivotably in connection with the first contact terminal 51. Most preferably, this is implemented in such a way that the first contact terminal 51 is provided with a slot 511, the shaft 31 having its first end 311 fitted therein. Being pressed by the spring 8, the shaft's first end 311 holds its position well in the slot 511 and is not able to move linearly in a shaft pivoting plane in the contact terminal 51 as the control element has its transition position changed from the first A to the second B or vice versa.

[0019] A second end 312 of the shaft 31 is unattached and pointed towards the rocker arm 2. In addition, the shaft 31 has its second end 312 provided with at least one contact pin, in this embodiment with two, a first and a second contact pin 32, 33, present on various sides of the shaft. In a preferred embodiment of the invention, the shaft 31 is an elongated, preferably flat, straight bar.

[0020] Between the ends 311, 312 of the control element 3, around the shaft 31, is disposed a coil spring 8. In connection with the shaft 31, and thus in connection with the spring 8, is further disposed a connecting piece 9 provided with holders 91, 92. This connecting piece 9 is most preferably provided with a hole, the shaft 31 being adapted to extend therethrough. The connecting piece 9 is able to move along the shaft 31 and, at the same time, the coil spring 8 is able to compress at least partially and,

respectively, to expand along the shaft. In a preferred embodiment of the invention, the shaft 31, preferably its first end 311, is provided with an abutment 34, in this case an expansion 34a, against which a second end 82 of the coil spring 8 is adapted to rest, while the connecting piece 9 is adapted to act on a first end 81 of the coil spring 8.

[0021] The rocker arm 2 comprises a flat lever member 20 and two parallel brackets 21, 22, which are set at an angle against the lever member and on the side opposite to its external surface. The ends of the brackets 21, 22 are fitted in the holders 91, 92 of the connecting piece 9. Thus, the shaft 31 of the control element 3, especially the shaft's second end 312, is located in and able to move in a gap 23 between the parallel brackets 21, 22. The rocker arm 2 is constructed from a highly dielectric material, such as a suitable type of plastic.

[0022] In a preferred embodiment of the invention, the connecting piece 9 present on the shaft 31 is a substantially U-shaped component. The connecting piece 9 is disposed on the shaft 31 in such a way that the U-shaped component opens up towards the first end 311 of the shaft 31, the spring 8 being fitted inside this component. The connecting piece 9 has its ends, and at the same time, the U-shape has its tips provided with holders 91, 92 for the rocker arm's 2 brackets 21, 22. In a preferred embodiment of the invention, the holders 91, 92 are channel-shaped members or troughs. The troughs open up towards the rocker arm 2. In the process of assembling the control mechanism, the unattached ends of the rocker arm's 2 brackets 21, 22 are fitted in the holders 91, 92, and in this case in the troughs of the connecting piece 9. The tips of the rocker arm's 2 brackets 21, 22 are preferably wedge-shaped, thus fitting well in the trough-shaped holders.

[0023] The connecting piece is most preferably a U-shaped strip of metal, having its unattached ends, and consequently the tips of the U-shape's arms, provided with holders 91, 92, i.e. designed as troughs.

[0024] The control mechanism 1 according to the invention is most preferably assembled, such that the control element 3 first has its shaft 31 fitted with the coil spring 8 in a way of having its first end 81 resting against the abutment 34, i.e. in this case against the expansion 34a of the shaft. This is followed by threading the connecting piece 9 by way of the hole onto the shaft 31 against the second end 82 of the coil spring 8. The shaft 31, including the coil spring 8 and the connecting piece 9, is fitted in the cavity 41 of the housing 4, reserved for the control mechanism 1, such that the shaft 31 has its second end 312 resting in the slot 511 of an electrical switch's first contact terminal 51. The shaft 31 has its second end 312, which is unattached, fitted between the rocker arm's 2 parallel brackets 21, 22, preferably within a gap 24, such that the brackets' tips 21 a, 22a find the holders 91, 92, such as troughs, of the connecting piece 9. The rocker arm 2, along with its brackets 21, 22, is pressed towards the bottom of the cavity 41 and the first contact terminal

51, the coil spring 8 being compressed to some extent by the action of the connecting piece 9 and, at the same time, the shaft 31 pivots either to the first or second transition position A, B. Now, the rocker arm 2 is locked to the housing by means of a suitable trunnion 24, said trunnion being adapted to extend along the pivoting axis D-D of the rocker arm 2. The control mechanism is basically ready for operation.

[0025] Presuming that the control mechanism has its control element 3 and, respectively, its rocker arm 2 in the transition position A (see fig. 1). Thus, in this position, by applying a pressure on the first half 20a, the rocker arm 2 has been pivoted over a small angle α with respect to the vertical plane C-C extending by way of the trunnion 24 and the pivoting axis D-D, the consequence of this having been that the second or unattached end 312 of the shaft 31 and a first contact pin 32 are resting against the second contact terminal 52. When it is desirable to shift the control element 3, and respectively the rocker arm 2, to the transition position B, a pressure is applied to a second half 20b of the rocker arm 2 across a labile mid-position, whereby it pivots, together with the control element 3, in the opposite direction over a small angle α relative to the vertical plane C-C, and at the same time, by means of the connecting piece 9 and the spring 8, the shaft 31 of the control element 3 and a second contact pin 33 present at its second end 312 pivot, in the vertical plane and in a plane orthogonal to the pivoting axis, over to the other side or to the second transition position B, wherein the second or unattached end 312 of the shaft 31 and the second contact pin 33 are resting against the third contact terminal (see fig. 2). Respectively, by pressing the first half 20a of the rocker arm 2 across the labile mid-position, the control element 3 is enabled to pivot back to the first transition position A.

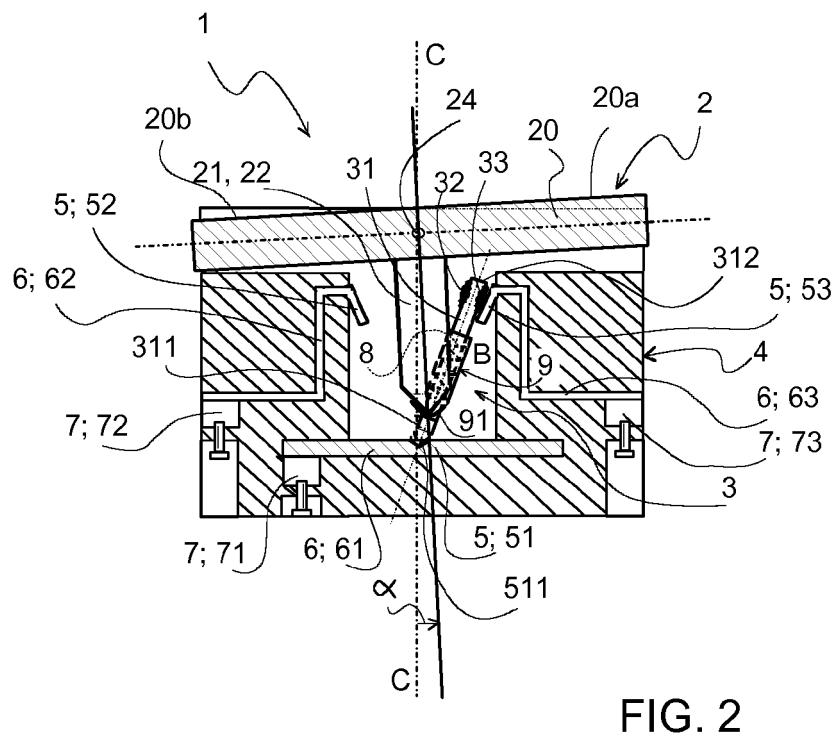
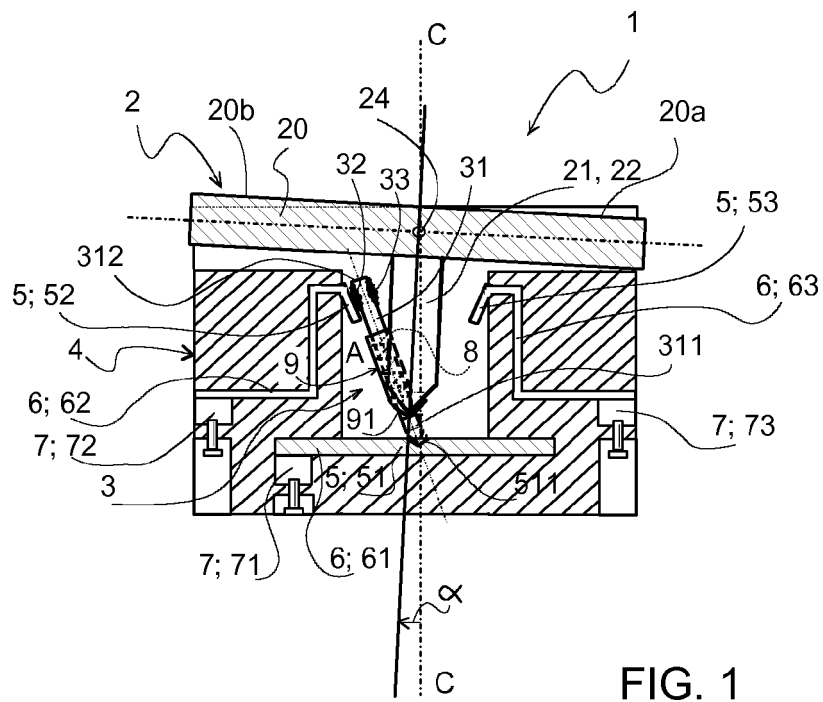
[0026] The invention is not limited to only cover the foregoing exemplary embodiment, but a multitude of modifications are plausible as long as keeping within an inventive concept as defined in the claims.

Claims

1. An electrical switch control mechanism (1), comprising a rocker arm (2) and a control element (3), which is movable between two transition positions, a first (A) and a second (B) transition position, by means of the rocker arm, the electric current being adaptable to pass through the control element from one contact terminal (5; 51, 52, 53) to the other at least in one of the transition positions, said rocker arm (2) and control element (3) having in association therewith a spring (7), specifically a coil spring, which is set between the rocker arm and the control element, such that the control element is pressed by the spring either to the first (A) or the second (B) transition position as the rocker arm is pivoted with respect to a mid-position and a pivot axis (D-D) over to the first

or second side, respectively, **characterized in that** the control element (3) comprises a shaft (31) with its first end (311) set pivotably in connection with the first contact terminal (5) and with its second end (312) unattached and pointed towards the rocker arm (2) 5 and provided with at least one contact pin (32, 33), and that between the control element's ends (311; 312), around the shaft (31), is provided a coil spring (8) and in association with the shaft and the coil spring is further arranged a connecting piece (9) provided with holders (91, 92) in a way to enable its movement along the shaft and, at the same time, the coil spring is allowed to compress at least partially and respectively to expand along the shaft, and that 10 the rocker arm (2) comprises two parallel bosses (21, 22), the ends of which are fitted in the holders (91, 92) of the connecting piece (9), the control element having its shaft (31) adapted to travel in a gap between the parallel bosses. 15

- 20
2. An electrical switch control mechanism according to claim 1, **characterized in that** in association with the first contact terminal (51) is a slot (511), the shaft having its first end (311) fitted therein. 25
3. An electrical switch control mechanism according to claim 1 or 2, **characterized in that** the shaft (31) is an elongated, straight bar, which is also most preferably flat. 30
4. An electrical switch control mechanism according to claim 1, 2 or 3, **characterized in that** the shaft (31), preferably its first end (311), is provided with an abutment (34), such as an expansion of the shaft, against which the coil spring (8) has its second end adapted to rest, while the connecting piece (9) is present at a first end of the coil spring. 35
5. An electrical switch control mechanism according to any of the preceding claims, **characterized in that** the connecting piece (9) is a substantially U-shaped component, having its unattached ends, and at the same time the tips of a U-shape, provided with holders (91, 92) for the bosses (21, 22) of the rocker arm (2). 40 45
6. An electrical switch control mechanism according to claim 5, **characterized in that** the holders (91, 92) are troughs. 50
7. An electrical switch control mechanism according to claim 5 or 6, **characterized in that** the connecting piece (9) is constructed from a strip of metal. 55



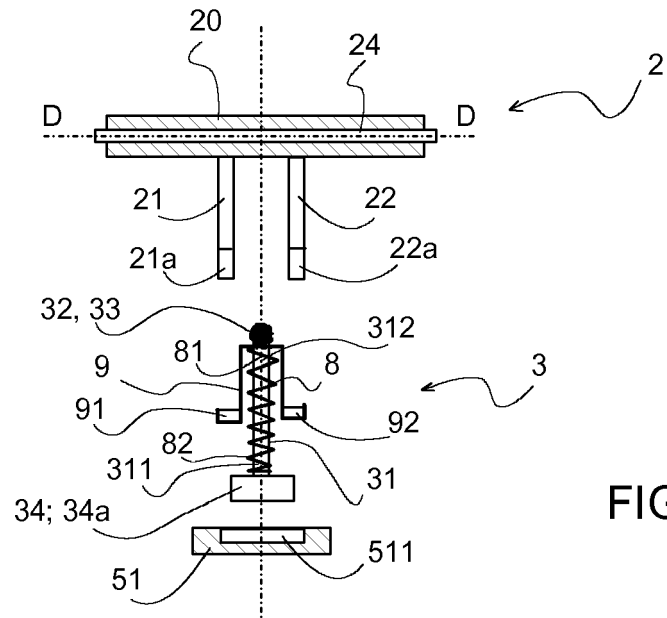


FIG. 3

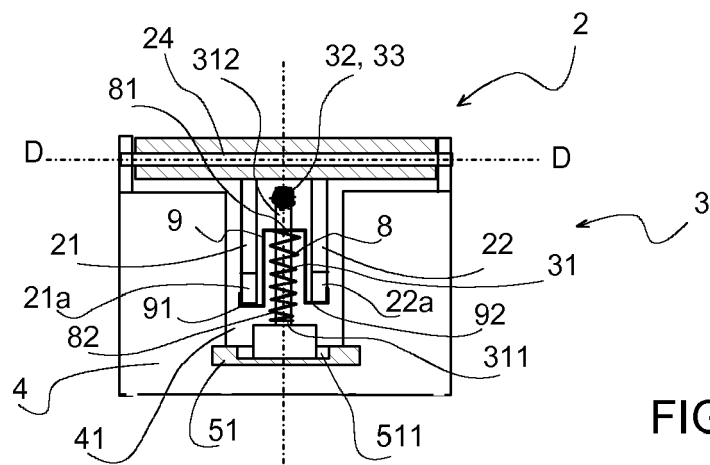


FIG. 4

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 2008155499 A [0002] [0003]
- CA 976589 [0002] [0004]