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(54) **ROTARY SWITCH WITH A GRIP MOUNTED TO THE SPINDLE TOP**

- (57) Rotary switch comprising:

 - a housing;
 - a spindle rotatably accommodated in the housing with a
- spindle top end projection from a surface of the housing;

 - a grip mounted to the spindle top end by means of a snap-fit connection.

Description

[0001] The present invention relates to a rotary switch comprising:

- a housing;
- a spindle rotatably accommodated in the housing with a spindle top end projection from a surface of the housing;
- a grip mounted to the spindle top end.

[0002] The spindle typically carries at least one electroconductive rotary contact bridge and is rotatable within the housing between a plurality of positions, to selectively connect or disconnect pairs of stationary contacts accommodated in the housing. The stationary contacts can be connected to further circuitry. To operate the spindle, a grip can be mounted to a top end of the spindle. An example of such a switch is disclosed in EP 2 256 768 A1. DE 42 06 378 A1 discloses a rotating grip for a rotary switch, which is mounted to a spindle by interlocking geometries.

[0003] It is an object of the present invention to provide a rotary switch which is easy to assemble and resistant to mechanical loads, also after aging of plastic parts.

[0004] The object of the invention is achieved with a rotary switch a grip mounted to a top end of the spindle by means of a snap-fit connection. Such a snap-fit connection allows a fast and cost efficient assembling of the rotary switch.

[0005] In a specific embodiment, the spindle top end can comprise a projection, such as a cross-pin or traverse pin. Furthermore, the grip can comprise a recess for receiving the spindle top end. The recess for receiving the spindle top end can comprise a constriction engaging the projection of the spindle top end to form the snap fit connection upon insertion of the spindle top end into the recess. This provides a robust snap-fit connection. In this respect, the spindle top end is the part of the spindle received within the recess in the grip. When the grip is rotated, the projection, particularly if it is a cross-pin, contributes to improved transfer of the rotating torque from the grip to the spindle.

[0006] The cross-pin can for example be made of a metal, so the mechanical properties of the projection for the snap-fit connection remain stable over time and unaffected by aging. The constriction in the recess can be a gradually narrowing space between two opposite inner walls or linings of the recess receiving the spindle top end, in particular two elastically compressible opposite inner walls of the recess receiving the spindle top end. The inner walls can for example be made of a plastic, e.g., a fiber reinforced plastic, e.g., a glass fiber reinforced polyamide.

[0007] Optionally, the grip may further comprise an access port allowing access to the spindle top end for a tool to release the snap-fit connection. Such a tool can for example be a regular screw driver and can for ex-

ample engage the top surface of the spindle top end, the cross-pin, a recess in the spindle top end or any other part of the spindle top end that allows the tool to exert an upward force on the grip.

[0008] For safety reasons, e.g., in order to prevent that the switch could be turned on during repair or maintenance, the rotary switch may further comprise a safety lock blocking rotation of the switch. Such a lock can for example comprise an insert, received in an insert receiving recess in the grip, the insert engaging a stop on the switch housing. The stop may for example be a ridge, e.g., an annular ridge around the spindle top end, with one or more interruptions for passage of the insert when the insert is inserted into the receiving recess of the grip. Such an annular ridge prevents the spindle top end from being rotated to another position when the rotary switch is blocked.

[0009] In a specific embodiment, the insert can be configured to block release of the snap-fit connection. To this end, the insert can be provided with a projection, e.g., a pin shaped projection, received in an opening or bore in the spindle top end upon insertion of the insert into the insert receiving recess.

[0010] Optionally, the insert of the safety lock and the grip comprise openings which are aligned when the insert is received in the insert receiving recess of the grip. This allows the use of a pad lock or similar lock to prevent unauthorized removal of the insert and to make unauthorized rotation of the spindle impossible.

[0011] The housing can for example comprise a rectangular shape, at least when viewed in the direction of the longitudinal axis, e.g., in top view. The stationary contacts can be accessible from two opposite sides, e.g., substantially parallel sides. This makes it possible to use a plurality of such switches arranged side by side, e.g., on a rail, a panel or similar support. The switch can for example be a multi-deck switch. The switch is particularly suitable as a rotary switch for switching high power DC or AC currents, e.g., for use in the field of solar energy.

[0012] The invention is further explained by the accompanying drawings showing exemplary embodiments.

Figure 1: shows a rotary switch in exploded view;
 Figure 2: shows the switch of Figure 1 in side view;
 Figure 3: shows a cross section along line C-C in Figure 2;
 Figure 4: shows the switch of Figure 1 in cross section;
 Figure 5: shows the switch of Figure 1 with the snap-fit connection being disconnected;
 Figure 6: shows a second embodiment of a rotary switch;
 Figure 7: shows the switch of Figure 6 in cross section.

[0013] Figure 1 shows a rotary switch 1 with a rotary knob or grip 2 of an electrically insulative material, such

as a plastic, to be mounted to a top end 3 of a spindle 4 of the switch 1. The switch 1 comprises a rectangular housing 5, also of an electrically insulative material.

[0014] The spindle 4 extends along a central longitudinal axis R of the switch 1, carrying one or more contact bridges (not shown). The spindle 4 is rotatable within the housing 5 between a plurality of positions, to selectively connect the one or more contact bridges to a selected pair of stationary contacts (not shown) accommodated in the housing 5. The grip 2 is mounted to the spindle top end 3 by means of a snap-fit connection. The snap-fit connection is formed by a cross-pin 6 extending transversely from the spindle top end 3.

[0015] The grip 2 is shown in cross section in Figure 4 mounted on the spindle top end 3. The grip 2 comprises a central recess 7 for receiving the spindle top end 3.

[0016] At the side of the cross-pin 6 of the spindle top end 3, the central recess 7 for receiving the spindle top end 3 is provided with two oppositely arranged linings 8 of a flexibly compressible material, defining a constriction 9 at a level just below the level of the cross-pin 6 after mounting the grip 2. When the spindle top end 3 is slid into the central recess 7 of the grip 2, the cross-pin 6 travels along the two linings 8 and finally snaps behind the constriction 9.

[0017] The elastic properties or compression stiffness of the two linings 8 and the constriction 9 are such that the grip 2 cannot simply be lifted and removed from the spindle top end 3. The linings 8 can be an integral part of the inner walls of the central recess 7.

[0018] The grip 2 comprises an access port 10 allowing direct access to the spindle top end 3 by a screw driver or similar tool (see Figure 5) to push the cross-pin 6 or the top end of the spindle so as to lift the grip 2 from the spindle top end 3 and to release the snap-fit connection against the action of the constriction 9 between the two linings 8.

[0019] Figures 6 and 7 show a second embodiment of a rotary switch 20. The rotary switch 20 is similar to the rotary switch 1 of Figures 1 - 5, except in that the grip 21 comprises a safety lock 22 for locking rotation of the switch and for blocking unintentional release of the snap fit connection. In the shown exemplary embodiment, the safety lock 22 comprises an insert 23 fitting into an insert receiving recess 24 of the grip. Just below the cross-pin 25, a bore 26 crosses the spindle top end 27. The insert 23 has an edge 27 profiled to interlock with a profiled inner wall 28 of the receiving recess 24. This profiled edge 27 of the insert comprises a pin or projection 29 fitting within the bore 26 in the spindle top end 27. When the insert 23 is inserted into the receiving recess 24 of the grip, the pin 29 slides into the bore 26 and blocks movement of the grip 21 relative to the spindle top end 27.

[0020] At the top surface 30 of the rotary switch 20 just below grip 21 is an annular ridge or ring 31 around the spindle top end 27 with a number of interruptions 32. The insert 23 has a lower end 33 extending into such an interruption 32 of the ring 31 when the insert 23 is posi-

tioned in the receiving recess 24 of the grip 21. The annular ridge 31 serves as a stop, while the lower end 33 of the insert 23 extends in the interruption 32 blocking further rotation of the grip 21 and the spindle 34 and holds the grip 21 in the given position.

[0021] The spindle 34 has a lower end 35 supporting a rotary contact bridge 36 with electrically conductive rotary contacts 37. Electrically conductive stationary contacts 38 are accommodated in the housing 39 within reach of the rotary contacts 37 of the rotary contact bridge 36. Rotating the spindle 34 will selectively move the rotary contacts 37 into positions where they connect with the stationary contacts 38 or disconnect the stationary contacts 38.

[0022] The insert 22 and the grip 21 are both provided with finger openings 40, 41, which are aligned when the insert 22 is fully inserted into the insert receiving recess 24. These finger openings 40, 41 can be used for a further lock, such as a pad lock (not shown).

[0023] In other embodiments the spindle may support two or more rotary contact bridges above one another for (dis)connecting respective stationary contacts, e.g., in a multi-deck switch.

Claims

1. Rotary switch comprising:

- a housing;
- a spindle rotatably accommodated in the housing with a spindle top end projection from a surface of the housing;
- a grip mounted to the spindle top end by means of a snap-fit connection.

2. Rotary switch according to claim 1, wherein the spindle top end comprises a projection, such as a cross-pin.

3. Rotary switch according to claim 2, wherein the grip comprises a recess for receiving the spindle top end, the recess comprising a constriction engaging the projection of the spindle top end to form the snap fit connection upon passage of the projection during insertion of the spindle top end into the recess.

4. Rotary switch according to claim 3, wherein the constriction is a gradually narrowing space between two opposite inner walls or linings of the recess receiving the spindle top end.

5. Rotary switch according to claim 4, wherein the constriction comprises two elastically compressible opposite inner walls of the recess receiving the spindle top end.

6. Rotary switch according to any one of the preceding

claims, wherein the grip comprises an access port allowing access to the spindle top end for a tool to release the snap-fit connection.

7. Rotary switch according to any one of the preceding claims, further comprising a safety lock blocking rotation of the switch. 5
8. Rotary switch according to claim 7, wherein the lock comprises an insert, received in an insert receiving recess of the grip, and engaging a stop on the surface of the housing. 10
9. Rotary switch according to claim 8, wherein the stop is a ridge, e.g., an annular ridge around the spindle top end, with one or more interruptions allowing passage of the insert during insertion of the insert into the insert receiving recess. 15
10. Rotary switch according to claim 8 or 9, wherein the insert comprising a projection blocking release of the snap fit connection when the insert is in the insert receiving recess of the grip. 20
11. Rotary switch according to claim 10, wherein the projection of the insert is received in an opening in the spindle top end upon insertion of the insert into the insert receiving recess. 25
12. Rotary switch according to any one of claims 8 - 11, wherein the insert of the safety lock and the grip comprise openings which are aligned when the insert is received in the insert receiving recess of the grip. 30

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Fig. 1

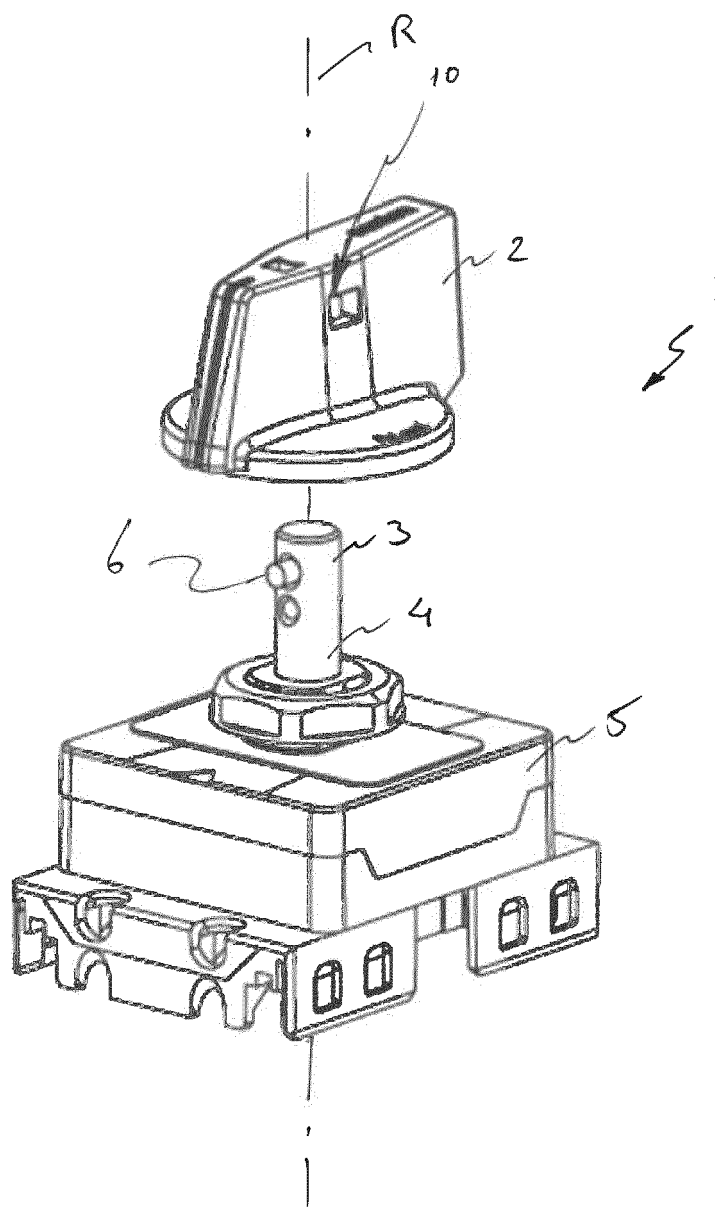


Fig. 3

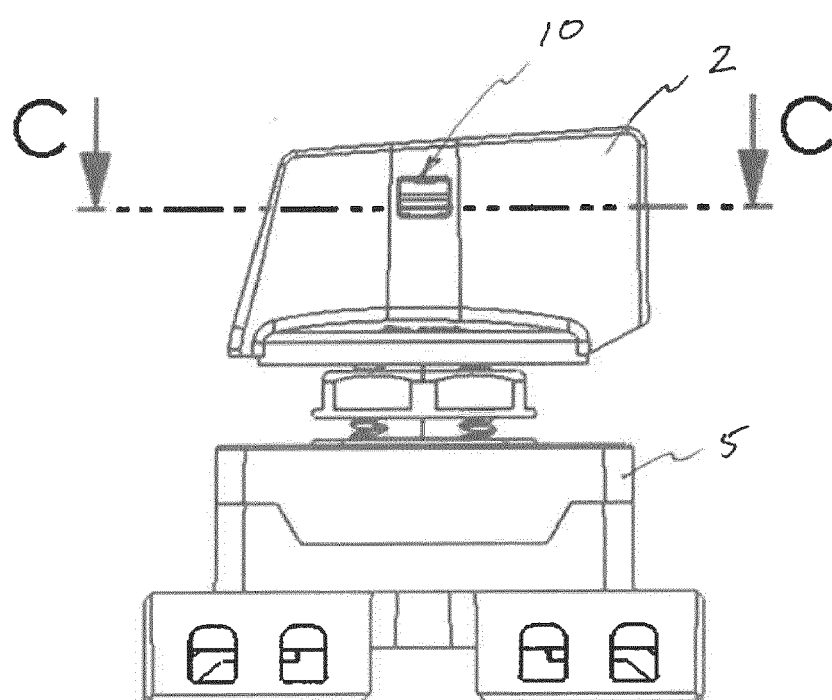
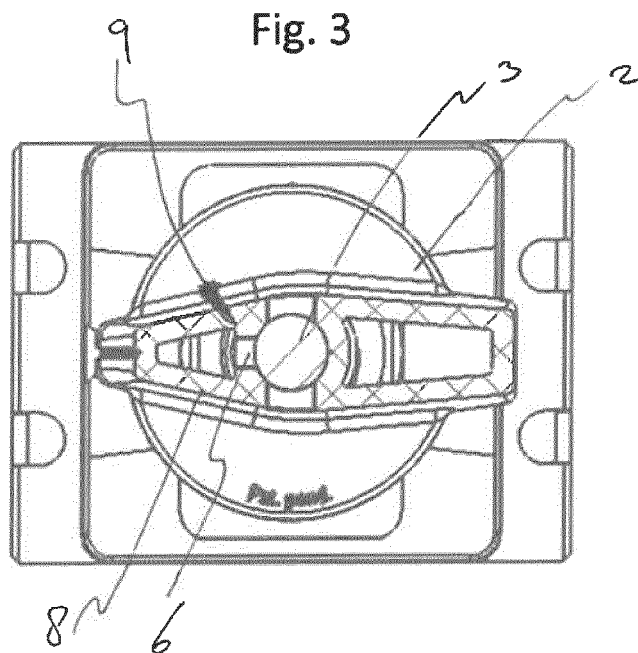


Fig. 2

Fig. 4

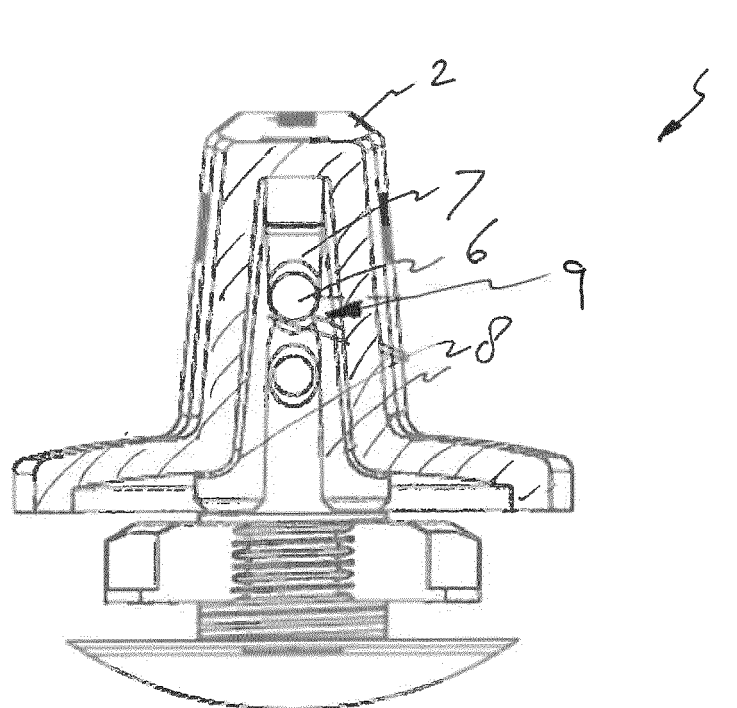


Fig. 5

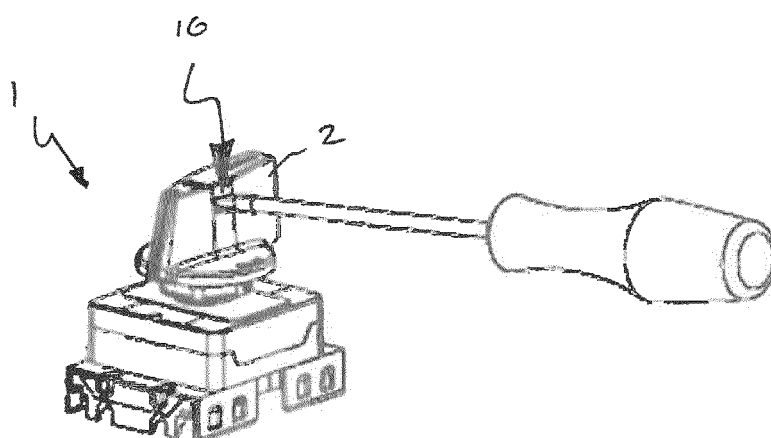


Fig. 6

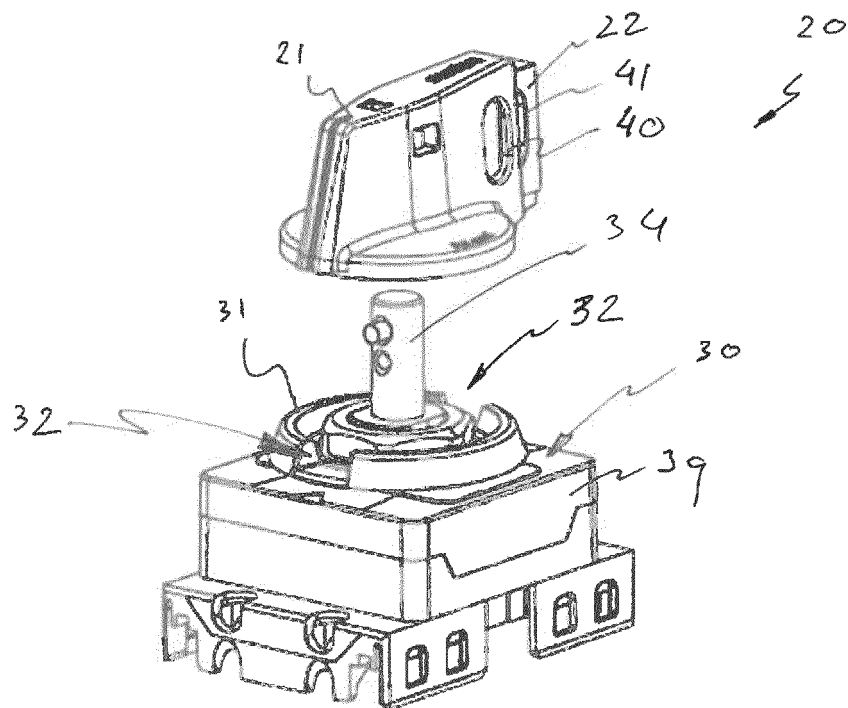
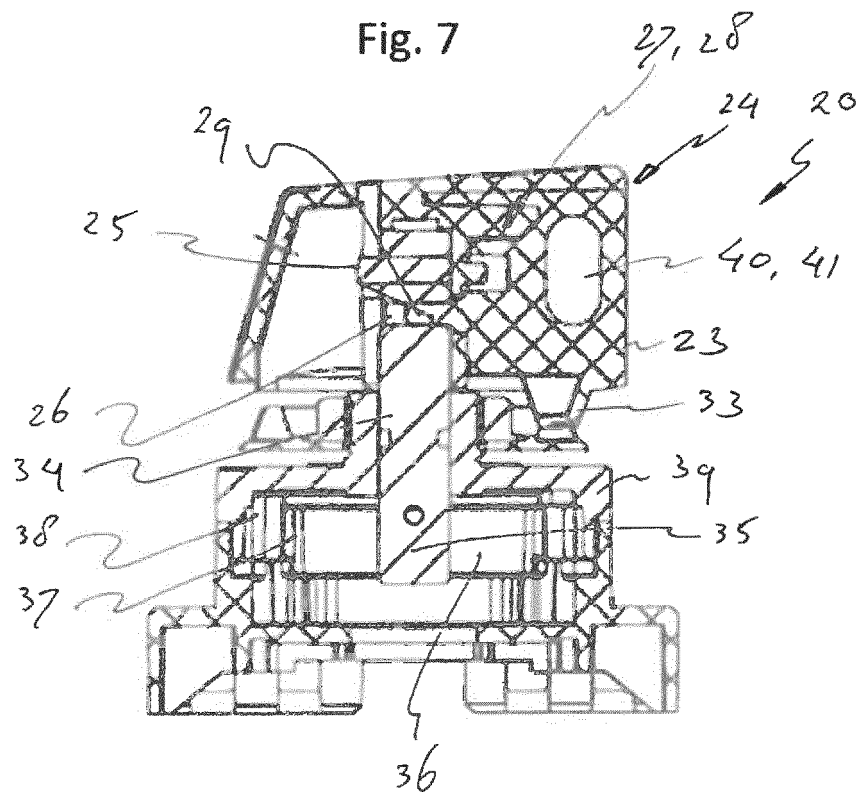


Fig. 7





EUROPEAN SEARCH REPORT

Application Number

EP 23 18 0364

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Y	* paragraphs [0001], [0002], [0009] - [0016], [0025] - [0026], [0030] *	10, 11	H01H9/28
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Y,D	DE 42 06 378 A1 (KLOECKNER MOELLER GMBH [DE]) 2 September 1993 (1993-09-02) * abstract; claim 3; figures 2-4 * * column 1, lines 1-50 * -----	10, 11	
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 7 November 2023	Examiner Bauer, Rodolphe
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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EP 23 18 0364

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