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Remarks:
Amended claims in accordance with Rule 137(2) EPC.

(54) Switching and/or adjusting element for an appliance, especially for a domestic appliance

(57) The invention relates to a switching and/or adjusting element (1) for an appliance, especially for a domestic appliance, for switching and/or adjusting an operation parameter of the appliance by rotating an adjusting knob (2) around an axis (3), having a switch (4) being located below a plate element (5) and having an axle (6) extending through a bore (7) in the plate element (5), wherein the adjusting knob (2) is mounted at the distal end of the axle (6) above the plate element (5) and remote from the switch (4). To facilitate the mounting of such a switching and/or adjusting element, the invention suggests that the passage of the axle (6) through the bore (7) in the plate element (5) is equipped with means (8, 9) for excentrically arranging the axle (6) relatively to the bore (7).

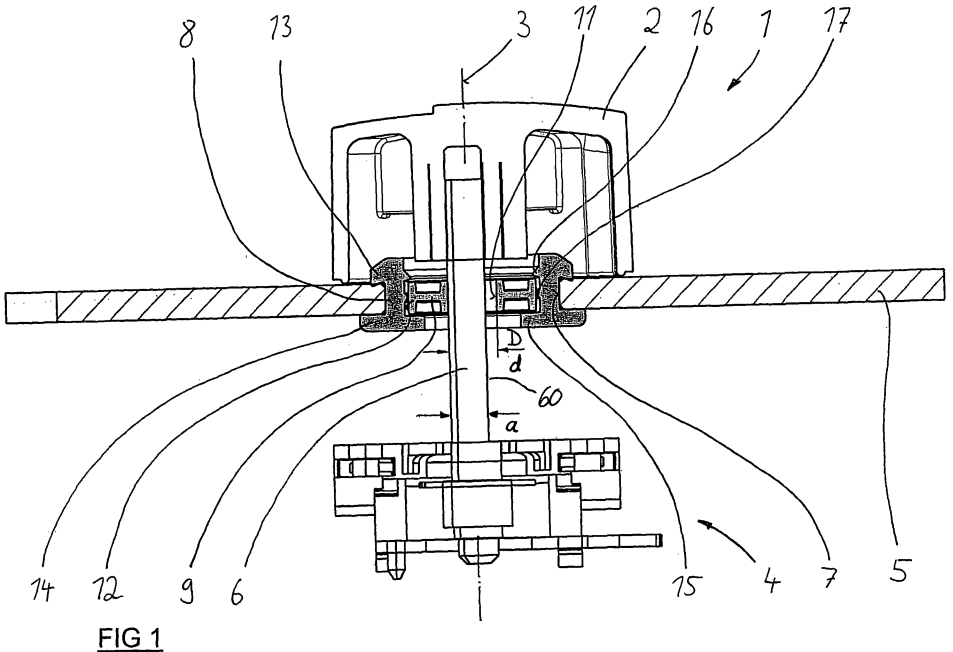

FIG 1

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Description

[0001] The invention relates to a switching and/or adjusting element for an appliance, especially for a domestic appliance, for switching and/or adjusting an operation parameter of the appliance by rotating an adjusting knob around an axis, having a switch being located below a plate element and having an axle extending through a bore in the plate element, wherein the adjusting knob is mounted at the distal end of the axle above the plate element and remote from the switch.

[0002] Especially domestic appliances often need a switching element of the kind mentioned above. For example the temperature or intensity of a heating element of a domestic oven can be selected or adjusted by turning a disc to a definite angular position. After the respective position is reached a pushbutton can be pressed to e. g. activate the power supply.

[0003] In pre-known designs the inner parts of a hob are mounted and wired into a container. The assembly the gets covered by a metal or ceramic plate. An autarchy hob gets its own electrical switches, either a so-called touch-electronics or an electromechanical one. The latter shows an axis, controlled by an attached knob and causes deviation in term of concentricity between the knob and symbol printing on the plate, reasoned by indirect positioning between the switch axis and the plate bore.

[0004] Therefore, it is an object of the invention to improve a switching and/or adjusting element of the kind mentioned above so that the mounting is facilitated and an optimized operation is possible. The axle of the switch should be well guided through the passage of the plate.

[0005] The solution of this object according to the invention is characterized in that the passage of the axle through the bore in the plate element is equipped with means for arranging the axle relatively to the bore.

[0006] Preferably, the means for arranging the axle relatively to the bore comprises a socket element being fixed in the bore in the plate element and further comprises a bush element being insertable into the socket element.

[0007] The bush element can have an outer circumference and a bore, wherein the outer circumference is arranged concentrically in a reception in the socket element.

[0008] The axle has in one embodiment a cylindrical outer surface or a circular cross-section.

[0009] In a preferred embodiment an outer surface of the axle has a cylindrical part of a diameter, measured between two opposite points through and orthogonally to the cylinder axis, and a flat part having a distance, measured through and orthogonally to the cylindrical axis or rotational axis, to the opposite line on the cylindrical part. In other words, the outer surface of the axle has a cylindrical basic shape of diameter and a cut away flat portion at one side spaced away, again at a distance from an opposite line on the cylindrical basic shape, or the axle has a circumference in cross-section composed of a circular section of diameter and a linear section being spaced away at a distance from an opposite point on the circular section. The distance of the flat or linear part is smaller than the (cylindrical) diameter of the axle.

[0010] The bore in the bush element preferably has a diameter which is essentially the same as the (cylindrical) diameter of the axle, in particular by a tolerance of at most 5 %, preferably at most 2 %. In the aforementioned asymmetric embodiment of the axle with the flat or linear part of the axle outer surface there is enough degree of freedom for insertion of the axle due to the space in between the flat part and the inner surface of the bore, but the axle is nevertheless radially fixed and stabilised along the rotational axis and held in the bore along its cylindrical surface.

[0011] The socket element can have at least one sealing section extending radially outwards and extending radially beyond the bore in the plate element. In particular, one sealing section can be arranged above and one sealing section can be arranged below the plate element.

[0012] The socket element can further have a bearing section extending radially inwards for supporting the bush element. It can further have a fixing section extending radially inwards for securing the bush element inserted into the socket element axially. Finally, it can have a centre section extending radially inwards for centering the bush element when inserted into the socket element. The bush element can have a double-T-shape in axial or cross section.

[0013] The socket element is preferably made from rubber material. The bush element can be made from plastic material; the plastic material can be a thermoplastic material.

[0014] The plate element is preferably a glass plate, a ceramic plate or a metal plate.

[0015] The switch can also have a switching function when the axle is pressed in axial direction by the adjusting knob.

[0016] The preferred application of the suggested switching and/or adjusting element is a domestic oven.

[0017] By fixing a mechanical switch with degrees of freedom in x- and y-direction (i. e. in the plane of the plate element) into the container in a direct or indirect way, possibilities for adjustment in terms of concentricity to pass-through-hole (passage) and therefore to the printed design on the cooker plate (plate element) are given.

[0018] For the mentioned implementation, a common used overflow socket, preferably made from rubber, can be arranged in the plate hole (bore) and got additional inner geometry to work as a resilient intake for the radial guide bush made preferably from plastic.

[0019] These two parts provide the mentioned guiding and positioning features for the switch axle and in the end for the attached knob. Thus, freedom in x-and y-direction (i. e. in the plane of the plate element) and z-fixation (i. e. perpendicular to the plate element) is defined by a carrier, which provides a panel for mounting the switches in their correct depth as well as for positioning of printed circuit boards, equipped e. g. with LEDs and

showing an operation status.

[0020] The proposed implementation considers production tolerances and fulfils high demands in terms of haptical appearance.

[0021] Thus, concentricity is ensured and the haptical performance is improved. Because the axis protrusion gets stiffness the attached knob reduces the tendency to wobble. The mounting direction and wiring remain inside the container, which holds the switch.

[0022] In the drawings an embodiment of the invention is depicted.

FIG 1 shows a cross sectional side view through a switching and/or ad- justing element of a domestic oven,

FIG 2 shows an exploded view of the switching and/or adjusting ele- ment in a first state of assembly,

FIG 3 shows the view according to FIG 2 in a second, later state of as- sembly,

FIG 4 shows the view according to FIG 2 in a third, later state of as- sembly,

FIG 5 shows the view according to FIG 2 in a fourth, later state of as- sembly,

FIG 6 shows a perspective view of the switching and/or adjusting ele- ment fully mounted.

[0023] In FIG 1 a switching and/or adjusting element 1 of a domestic oven is shown by which an operation parameter of the domestic appliance can be adjusted and activated. For adjusting the parameter an adjustment knob 2 is employed. The adjustment knob 2 has a substantial cylindrical shape. In FIG 2 till FIG 5, the knob 2 is show from the top side 2' as well as from the bottom side 2". The knob 2 can be turned around an axis 3 which is arranged vertically. The knob 2 is connected with an axle 6 which in turn is connected with a switch 4.

[0024] The axle 6 penetrates a plate element 5 which is a ceramic plate of a hob in the specific embodiment. Consequently, the knob 2 is above the plate element 5, the switch 4 is below it.

[0025] For penetration of the axle 6, the plate element 5 has a bore 7 of substantial circular shape.

[0026] To allow a relative movement of the axle 6 during assembly of the system in the plane of the plate element 5 (which is often defined as the x-y-plane) means 8, 9 are supplied for arranging the axle 6 relatively to the bore 7.

[0027] Those means 8, 9 consist of a socket element 8 in which a bush element 9 is inserted. The specific and preferred design becomes apparent from the figures.

[0028] The bush element 9 has an outer circumference 10 of substantial cylindrical shape. Furthermore, there is a cylindrical bore 11 in the bush element 9. As can be seen in FIG 1 the bush element 9 has a double-T-shaped cross section.

[0029] The socket element 8 has a reception 12 for receiving the bush element 9. More specifically, the bush element 9 can be inserted into the socket element 8 as shown in FIG 1. For securely holding and positioning the bush element 9 in the reception 12 of the socket element 8 the socket element 8 has a bearing section 15 which is formed as a extension of the socket element 8 extending radially inwards and forming an axial support for the bush element 9.

[0030] Furthermore, for centering the bush element 9 in the reception 12 of the socket element 8 a centre section 17 is provided in the socket element 8 which is a nose-like protuberance which makes sure that the bush element 9 is located concentrically to the reception 12 of the socket element 8.

[0031] Finally, to ensure that the inserted bush element 9 remains in place the socket element 8 has a fixing section 16, which is a protrusion extending radially inwards and being located in the axial end region of the bush element 9 when being inserted into the socket element 8. Consequently, the fixing section 16 acts as a snap-fit connection when the bush element 9 is pushed into its final position.

[0032] To make sure that the socket element 8 is arranged in a leak-proof manner, it has two sealing sections 13 and 14. The sealing section 13 is arranged in the upper axial end region of the socket element 8 and seals the upper surface of the plate element 5 to the socket element 8. The sealing section 14 is arranged in the lower axial end region of the socket element 8 and seals the lower surface of the plate element 5.

[0033] The axle 6 shown has a cylindrical outer surface having a diameter denoted with d and a flat or cut away part extending along its length or axially having a distance a to the furthest line or point of the cylindrical part. The diameter of the bore 11 in the bush element 9 is marked with D, see FIG 1. This diameter D of the bore 11 is essentially the same as the diameter d, with a tolerance of at most 5 % or 2 %, typically at most 1 %. Although the axle 6 is held at its cylindrical surface in the bore 11 and stabilised in its position with respect to the rotational axis it nevertheless is spaced apart by the distance D-a from the other side of the bore 11 facilitating insertion of the axle 6.

[0034] Thus, the passage of the axle 6 through the bore 7 in the plate element 5 is equipped with the means 8, 9 for arranging the axle 6 relatively to the bore 7. More specifically, those means comprises the socket element 8 being fixed in the bore 7 in the plate element 5 and the bush element 9 being insertable into the socket element 8.

[0035] In FIG 1 not depicted is a container which holds and fixes the switch 4 relatively to the plate element 5.

[0036] FIG 2 till FIG 6 show the different stages during assembly of the switching and/or adjusting element 1.

[0037] In FIG 2 a fully exploded view is depicted whish

shows the single parts of the element 1.

[0038] According to FIG 3 the socket element 8 is inserted into the bore 7 in the plate element 5. As can be seen in FIG 4, the bush element 9 is inserted into the socket element 8.

[0039] Then, the axle 6 connected to the switch 4 is pushed from the bottom side of the plate element 5 through the bush element 9, see FIG 5. Then, the switch 4 is fixed by means of a container (not depicted).

[0040] Finally, the knob 2 is mounted at the distal end of the axle 6 to complete the assembly of the whole switching and/or adjusting element 1.

Reference Numerals

[0041]

1	switching and/or adjusting element
2	adjusting knob
2'	top side
2"	bottom side
3	axis
4	switch
5	plate element
6	axle
7	bore
8	socket element
9	bush element
10	outer circumference
11	bore in the bush element
12	reception
13	sealing section
14	sealing section
15	bearing section
16	fixing section
17	centre section

D	diameter of the bore in the bush element
d	diameter of the axle
a	distance

Claims

1. Switching and/or adjusting element (1) for an appliance, especially for a domestic appliance, for switching and/or adjusting an operation parameter of the appliance by rotating an adjusting knob (2) around an axis (3), having a switch (4) being located below a plate element (5) and having an axle (6) extending through a bore (7) in the plate element (5), wherein the adjusting knob (2) is mounted at the distal end of the axle (6) above the plate element (5) and remote from the switch (4),
characterized in that
the passage of the axle (6) through the bore (7) in the plate element (5) is equipped with means (8, 9) for arranging the axle (6) relatively to the bore (7).

2. Switching and/or adjusting element according to claim 1, **characterized in that** the means (8, 9) for arranging the axle (6) relatively to the bore (7) comprise a socket element (8) being fixed in the bore (7) in the plate element (5) and further comprise a bush element (9) being insertable or inserted into the socket element (8).

3. Switching and/or adjusting element according to claim 2, **characterized in that** the bush element (9) has an outer circumference (10) and a bore (11), wherein the outer circumference (10) is arranged concentrically in a reception (12) in the socket element (8).

4. Switching and/or adjusting element according to any of the preceding claims, **characterized in that** the axle (6) has a cylindrical outer surface or a circular cross-section having a diameter (d).

5. Switching and/or adjusting element according to any of the preceding claims, **characterized in that** an outer surface of the axle (6) has a cylindrical part of diameter (d) and a flat part having a distance (a) to the opposite line on the cylindrical part or **in that** the outer surface of the axle (6) has a cylindrical basic shape of diameter (d) and a cut away flat portion at one side spaced away at a distance (a) from an opposite line on the cylindrical basic shape or **in that** the axle (6) has a circumference in cross-section composed of a circular section of diameter (d) and a linear section being spaced away at a distance (a) from an opposite point on the circular section, wherein said distance (a) is smaller than said diameter (d) of the axle (6).

6. Switching and/or adjusting element according to claim 4 or claim 5, **characterized in that** the bore (11) in the bush element (9) has a diameter (D) which is essentially the same as the diameter (d) of the axle (6).

7. Switching and/or adjusting element according to at least one of claims 2 to 6, **characterized in that** the socket element (8) has at least one sealing section (13, 14) extending radially outwards and extending radially beyond the bore (7) in the plate element (5).

8. Switching and/or adjusting element according to claim 7, **characterized in that** one sealing section (13) is arranged above and that one sealing section (14) is arranged below the plate element (5).

9. Switching and/or adjusting element according to at least one of claims 2 to 8, **characterized in that** the socket element (8) has a bearing section (15) extending radially inwards for supporting the bush element (9).

10. Switching and/or adjusting element according to at least one of claims 2 to 9, **characterized in that** the socket element (8) has a fixing section (16) extending radially inwards for securing the bush element (9) inserted into the socket element (8), in particular in axial direction .

11. Switching and/or adjusting element according to at least one of claims 2 to 10, **characterized in that** the socket element (8) has a centre section (17) extending radially inwards for centering the bush element (9) when inserted into the socket element (8).

12. Switching and/or adjusting element according to at least one of claims 2 to 11, **characterized in that** the bush element (9) has a double-T-shape in longitudinal section or axial cross section.

13. Switching and/or adjusting element according to at least one of claims 2 to 12, **characterized in that** the socket element (8) is made from rubber or elastomere material.

14. Switching and/or adjusting element according to at least one of claims 2 to 13, **characterized in that** the bush element (9) is made from plastic material, in particular thermoplastic material.

15. Switching and/or adjusting element according to at least one of claims 1 to 15, **characterized in that** the plate element (5) is a glass plate ore a ceramic plate or a metal plate.

16. Switching and/or adjusting element according to at least one of claims 1 to 15, **characterized in that** the switch (4) has also a switching function when the axle is pressed in axial direction by the adjusting knob (2) and/or that it is part of a domestic oven.

Amended claims in accordance with Rule 137(2) EPC.

1. Switching and/or adjusting element (1) for an appliance, especially for a domestic appliance, for switching and/or adjusting an operation parameter of the appliance by rotating an adjusting knob (2) around an axis (3), having a switch (4) being located below a plate element (5) and having an axle (6) extending through a bore (7) in the plate element (5), wherein the adjusting knob (2) is mounted at the distal end of the axle (6) above the plate element (5) and remote from the switch (4) and wherein the passage of the axle (6) through the bore (7) in the plate element (5) is equipped with means (8, 9) for excentrically arranging the axle (6) relatively to the bore (7), **characterized in that**
the means (8, 9) for excentrically arranging the axle (6) relatively to the bore (7) comprises a socket element (8) being fixed in the bore (7) in the plate element (5) and further comprises a bush element (9) being insertable into the socket element (8), wherein the bush element (9) has an outer circumference (10) and a bore (11), wherein the outer circumference (10) is arranged concentrically in a reception (12) in the socket element (8) and wherein the bore (11) in the bush element (9) has a diameter (D) which is between 110% and 200 % of the diameter (d) of the axle (6).

2. Switching and/or adjusting element according to claim 1, **characterized in that** the diameter (D) of the bore (11) is between 115% and 140 % of the diameter (d) of the axle (6).

3. Switching and/or adjusting element according to claim 1 or 2, **characterized in that** the socket element (8) has at least one sealing section (13, 14) extending radially outwards and extending radially beyond the bore (7) in the plate element (5).

4. Switching and/or adjusting element according to claim 3, **characterized in that** one sealing section (13) is arranged above and that one sealing section (14) is arranged below the plate element (5).

5. Switching and/or adjusting element according to at least one of claims 1 to 4, **characterized in that** the socket element (8) has a bearing section (15) extending radially inwards for supporting the bush element (9).

6. Switching and/or adjusting element according to at least one of claims 1 to 5, **characterized in that** the socket element (8) has a fixing section (16) extending radially inwards for securing the bush element (9) inserted into the socket element (8).

7. Switching and/or adjusting element according to at least one of claims 1 to 6, **characterized in that** the socket element (8) has a centre section (17) extending radially inwards for centering the bush element (9) when inserted into the socket element (8).

8. Switching and/or adjusting element according to at least one of claims 1 to 7, **characterized in that** the bush element (9) has a double-T-shape in cross section.

9. Switching and/or adjusting element according to at least one of claims 1 to 8, **characterized in that** the socket element (8) is made from rubber material.

10. Switching and/or adjusting element according to at least one of claims 1 to 9, **characterized in that** the bush element (9) is made from plastic material,

in particular a thermoplastic material.

11. Switching and/or adjusting element according to at least one of claims 1 to 10, **characterized in that** the plate element (5) is a glass plate.

12. Switching and/or adjusting element according to at least one of claims 1 to 10, **characterized in that** the plate element (5) is a ceramic plate.

13. Switching and/or adjusting element according to at least one of claims 1 to 10, **characterized in that** the plate element (5) is a metal plate.

14. Switching and/or adjusting element according to at lest one of claims 1 to 13, **characterized in that** the switch (4) has also a switching function when the axle is pressed in axial direction by the adjusting knob (2).

15. Switching and/or adjusting element according to at least one of claims 1 to 14, **characterized in that** it is part of a domestic oven.

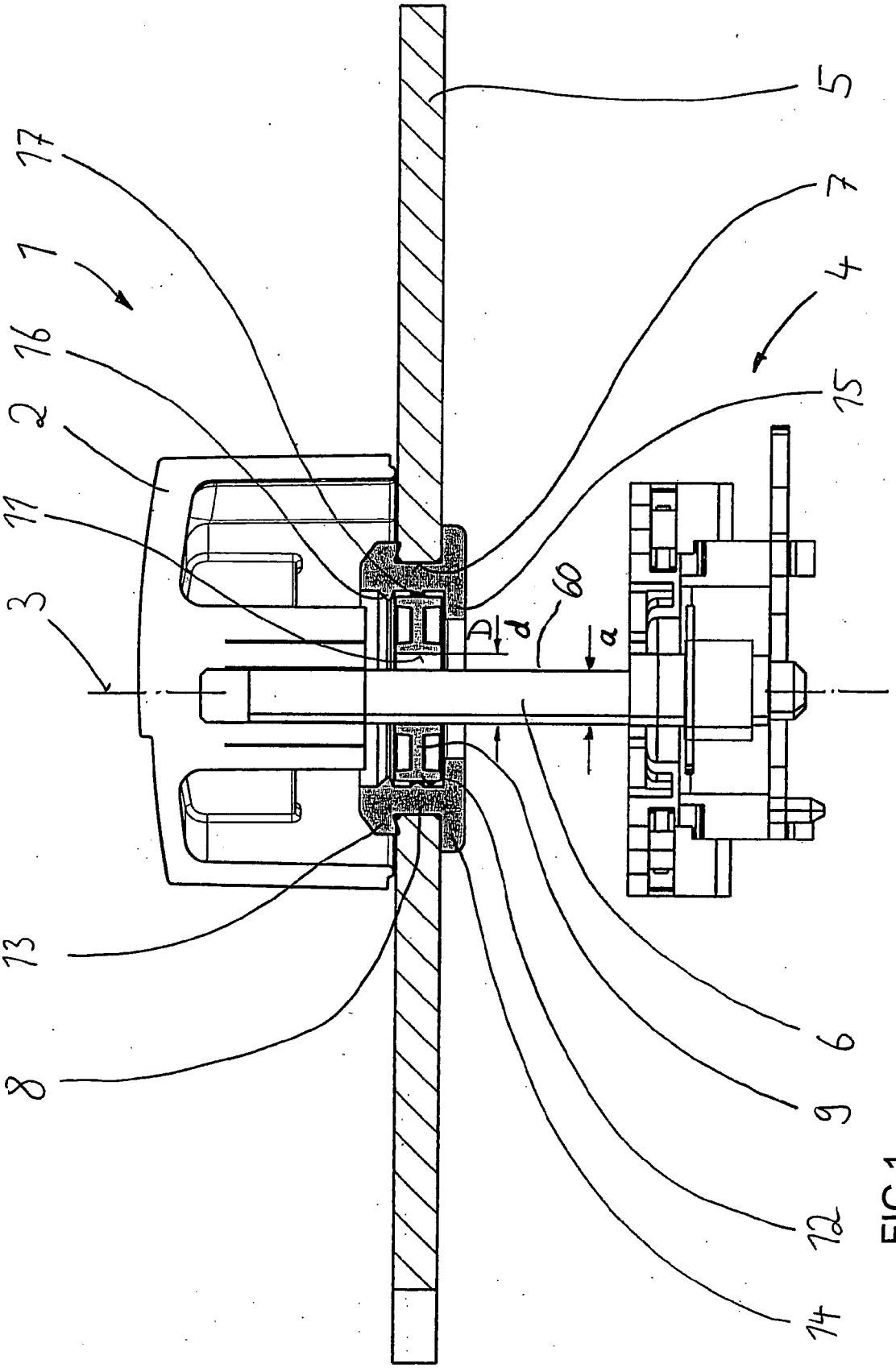

FIG 1

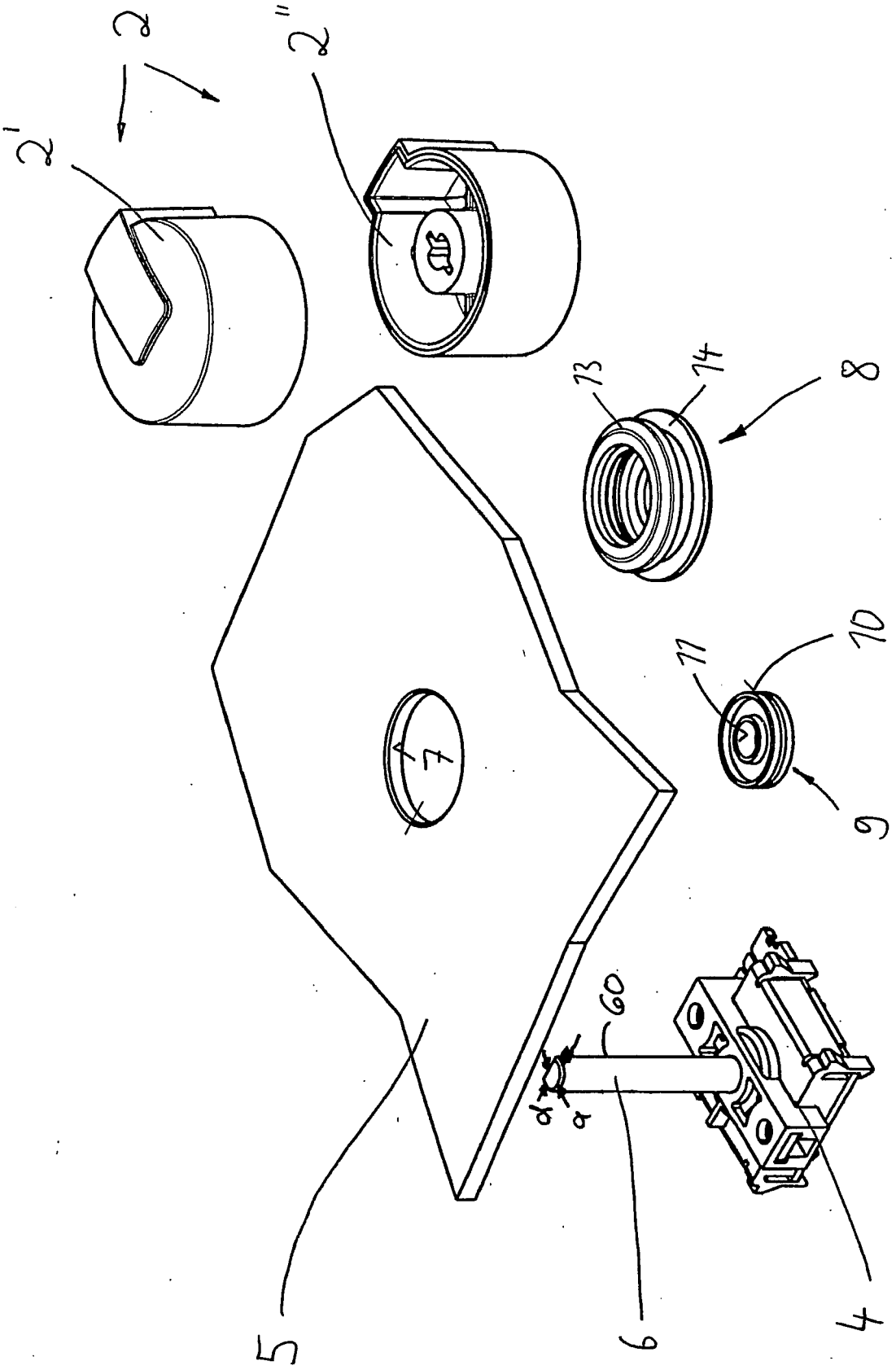

FIG 2

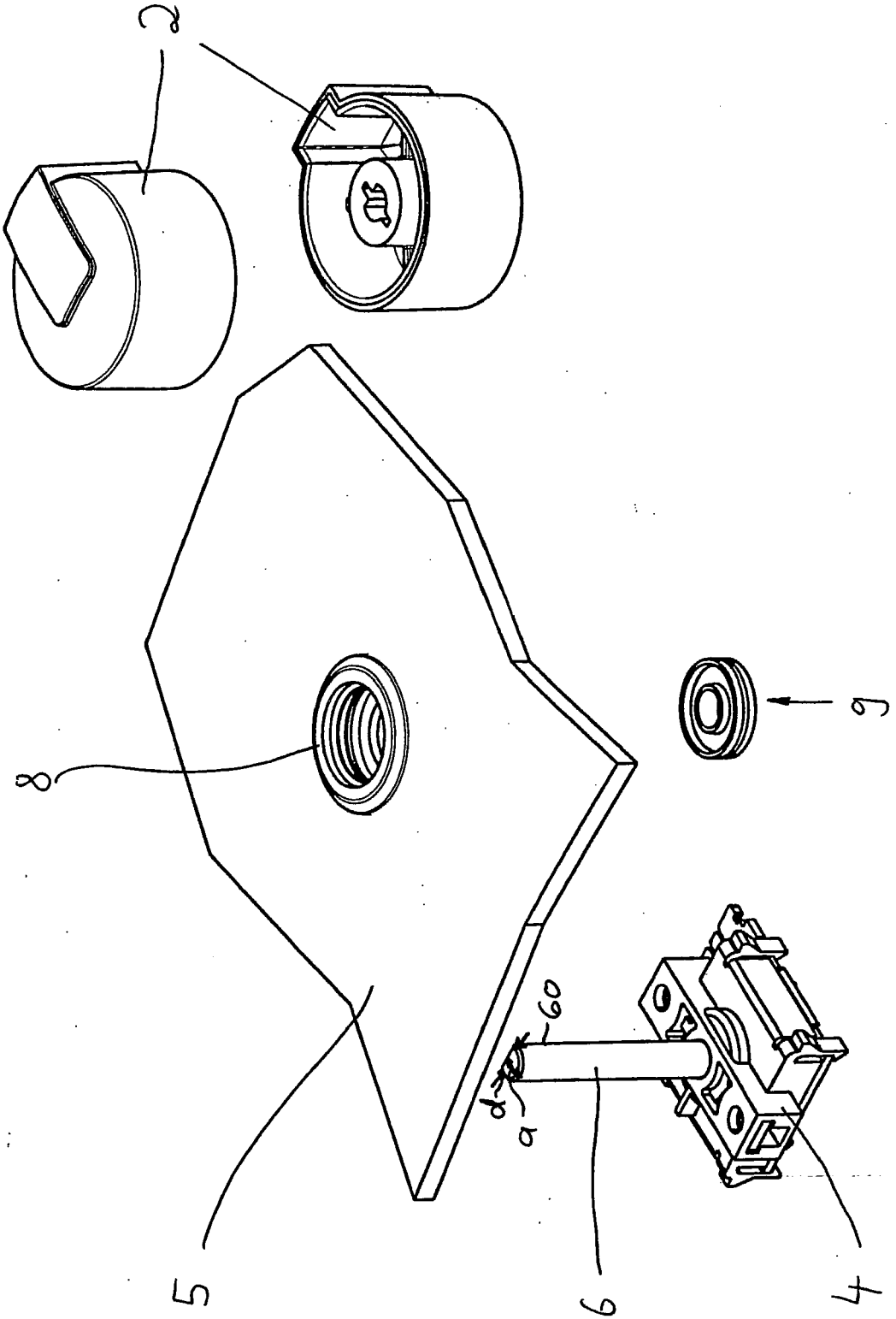

FIG 3

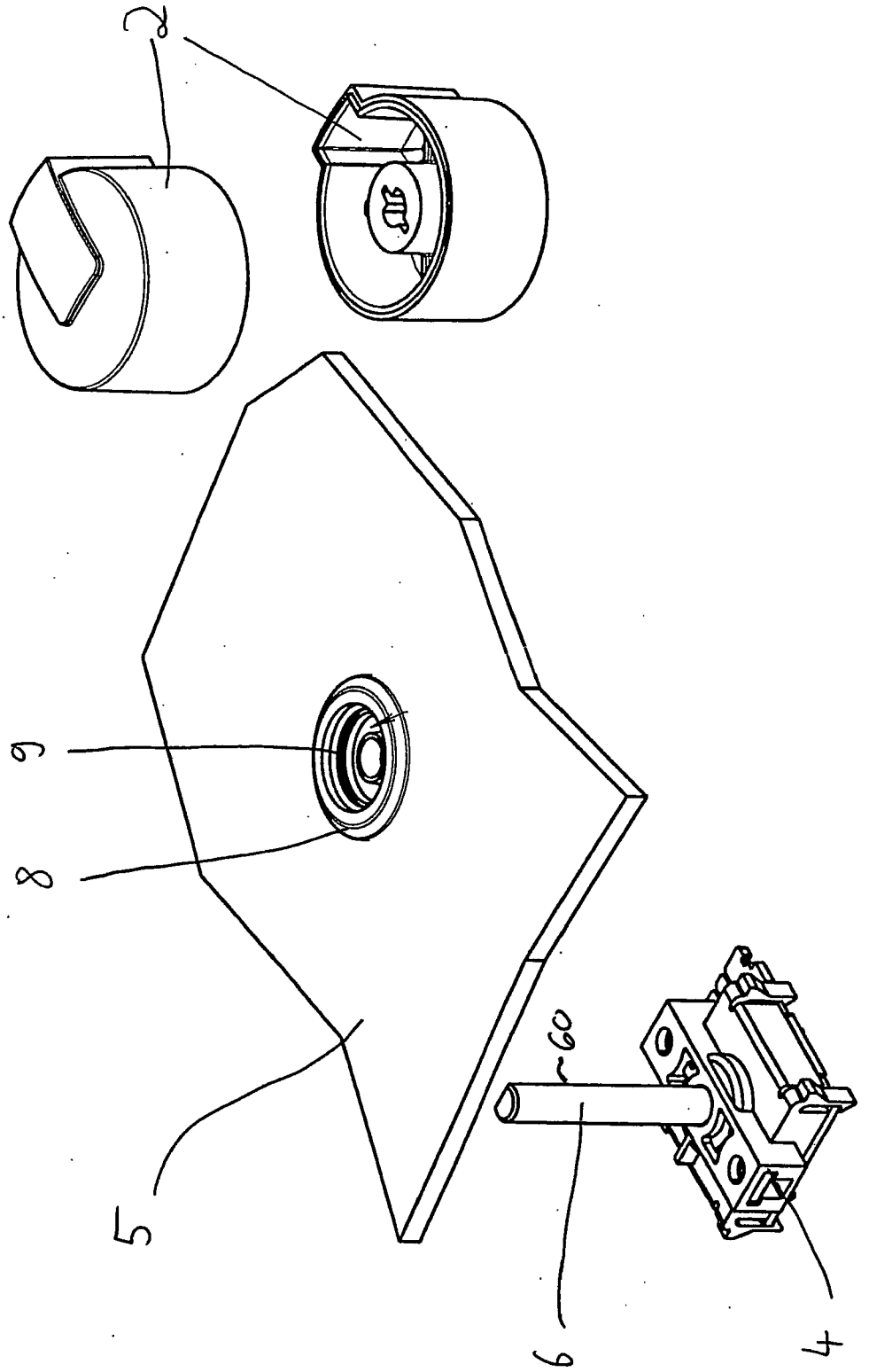

FIG 4

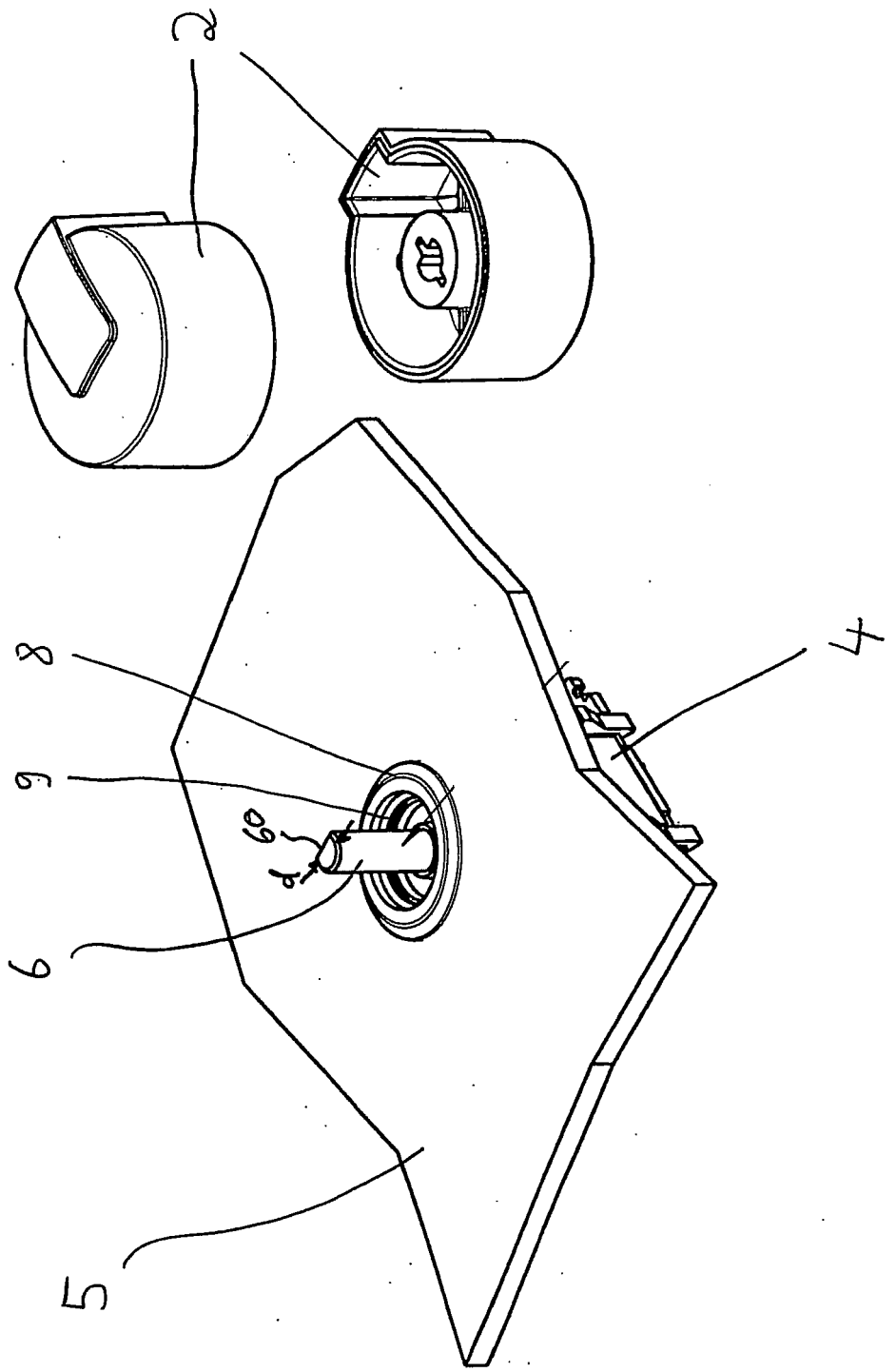

FIG 5

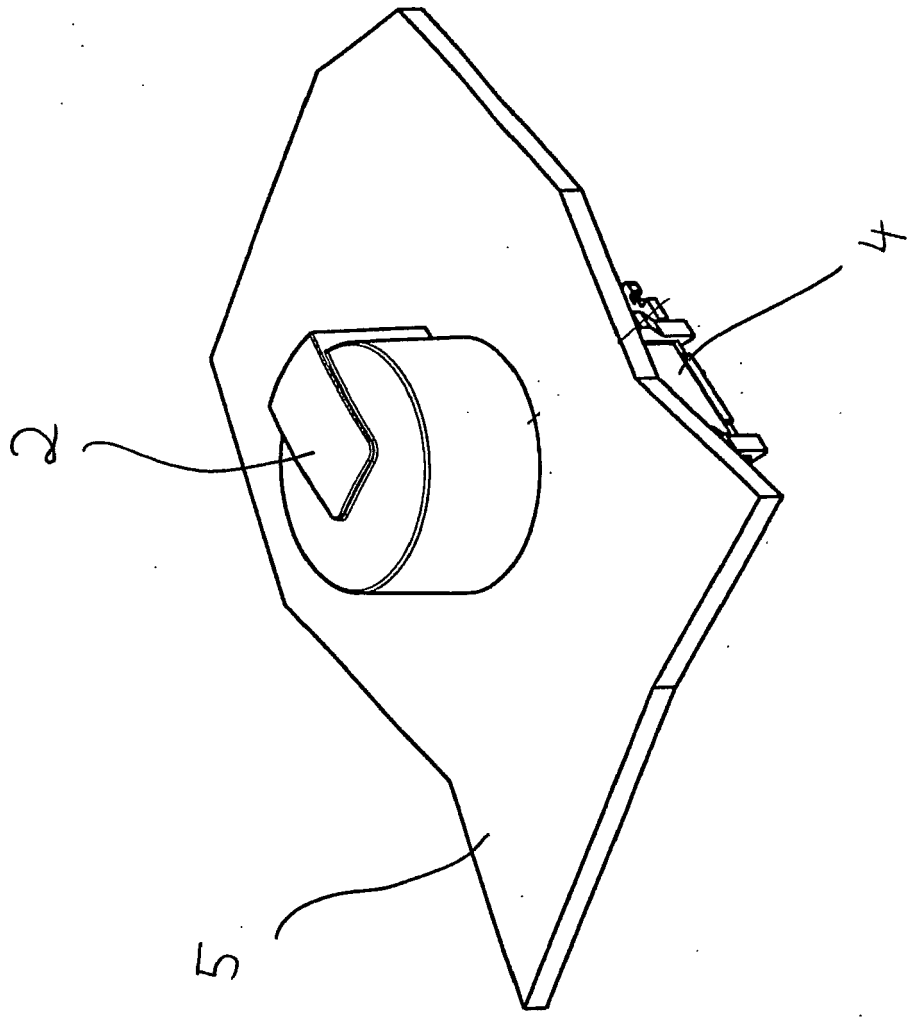

FIG 6

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EUROPEAN SEARCH REPORT

Application Number
EP 07 01 5382

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y	DE 39 39 717 A1 (ELEKTRA TAILFINGEN [DE]) 6 June 1991 (1991-06-06) * column 1, line 18 - column 2, line 52; figures * -----	1-4,6-14 5,15,16	INV. H01H19/06 H01H19/02
Y	GB 2 130 438 A (BOSCH SIEMENS HAUSGERAETE) 31 May 1984 (1984-05-31) * page 1, line 102 - page 2, line 16; figures 4,5 * -----	5,15,16	

TECHNICAL FIELDS SEARCHED (IPC)

H01H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	11 January 2008	Findeli, Luc

CATEGORY OF CITED DOCUMENTS

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