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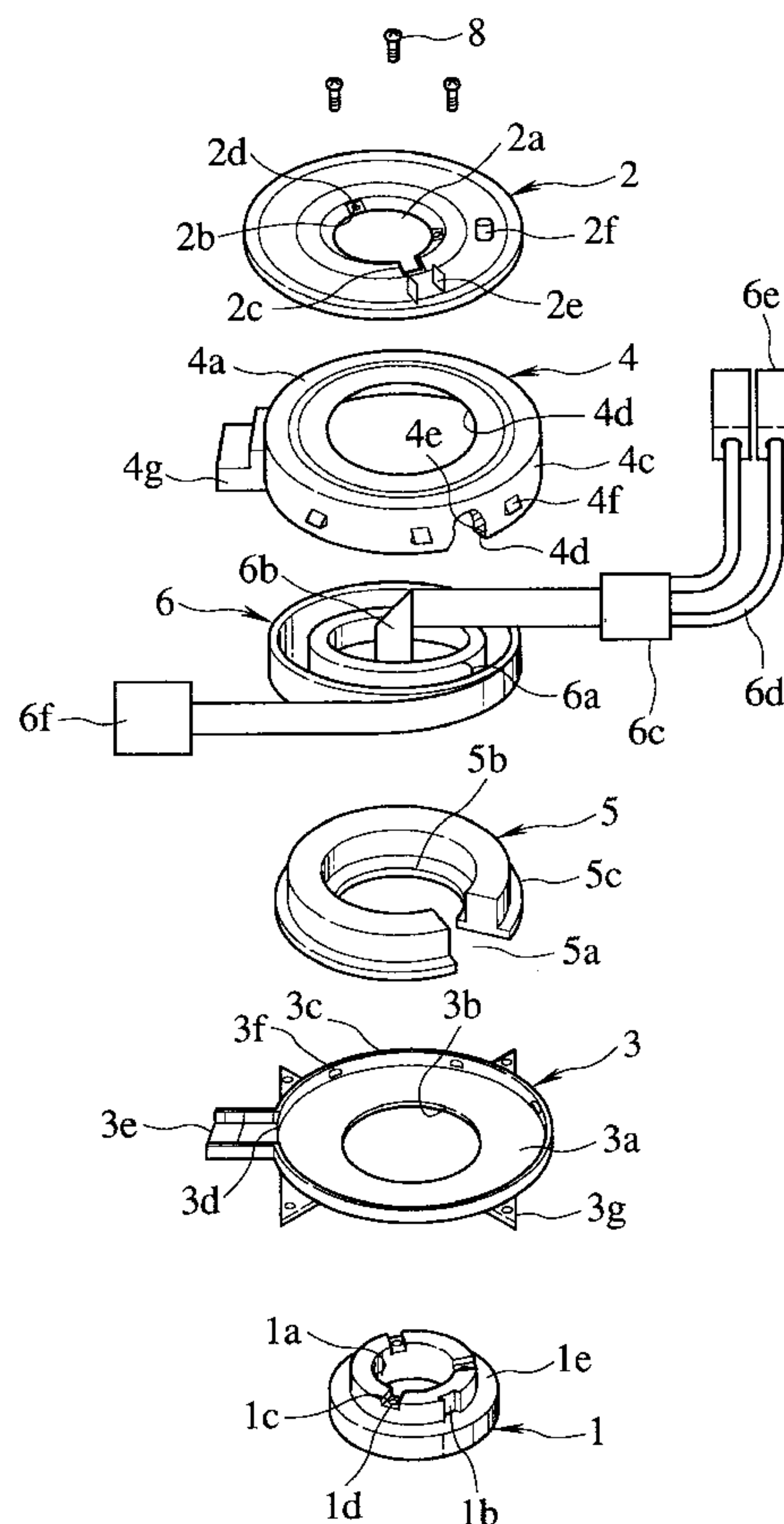
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(54) **APPAREIL SERVANT A ETABLIR UNE CONNEXION
ELECTRIQUE ENTRE UN ELEMENT FIXE ET UN ELEMENT
TOURNANT**

(54) **APPARATUS FOR ESTABLISHING ELECTRICAL
CONNECTION BETWEEN STATIONARY BODY AND
ROTATING BODY**



(57) An apparatus for establishing the electrical connection between a stationary body and a rotating body having flanges formed in the lower end portions of the inner portion and the outer portion of a carrier; and an annular and stepped restriction portion, the center of which is the center of rotation of the rotating body, and which is formed in either or both of the lower portions of the inner and outer portions of a cable accommodation chamber, wherein the flanges are accommodated and engaged to the lower portion of the restriction portion.

ABSTRACT OF THE DISCLOSURE

An apparatus for establishing the electrical connection between a stationary body and a rotating body having flanges formed in the lower end portions of the inner portion and the
5 outer portion of a carrier; and an annular and stepped restriction portion, the center of which is the center of rotation of the rotating body, and which is formed in either or both of the lower portions of the inner and outer portions of a cable accommodation chamber, wherein the flanges are
10 accommodated and engaged to the lower portion of the restriction portion.

**APPARATUS FOR ESTABLISHING ELECTRICAL CONNECTION BETWEEN
STATIONARY BODY AND ROTATING BODY**

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BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

The present invention relates to an apparatus for use in, for example, a steering apparatus for an automobile and
10 capable of establishing electrical connection between a stationary body and a rotating body by a flexible flat cable thereof.

DESCRIPTION OF THE RELATED ART

15 Hitherto, apparatuses for establishing the electrical connection between a stationary body and a rotating body such that electric parts mounted on an automobile and a portion for operating the electric parts provided for a steering wheel, as disclosed in, for example, Japanese Patent Laid-
20 Open No. 2-19291 or Japanese Patent Laid-Open No. 6-26185, include a structure arranged such that an internal cable-accommodation chamber formed into an annular shape by a rotating body and a stationary body accommodates a flexible flat cable in a state where the flexible flat cable is wound
25 in an inverted manner such that the inside portion and the outside portion of the flexible flat cable are wound in the opposite directions with respect to an intermediate position in the lengthwise direction. Moreover, an annular carrier, a

portion of which is divided by a cable guide groove, is disposed between the inside portion and the outside portion of the flexible flat cable so as to be capable of moving in the circumferential direction of the apparatus. The

5 intermediate portion of the flexible flat cable is allowed to pass through the cable guide groove of the carrier. When the rotating body is rotated, the carrier handles the flexible flat cable so as to make the flexible flat cable to be the inside portion or the outside portion. Thus, the inside and

10 outside portions of the flexible flat cable are wound and rewound with respect to the inside and outside portions of the cable accommodation chamber while preventing unraveling. Moreover, vertical movement of the carrier and collision of the same to the upper and lower walls of the cable

15 accommodation chamber occurring when the automobile is vibrated vertically is prevented which generates noise.

However, the apparatus for establishing the electrical connection disclosed in Japanese Patent Laid-Open No. 6-19291 has a complicated structure such that the carrier comprises

20 upper and lower support portions and an elastic member disposed to span the inner and outer portions of the upper and lower support portions. Thus, the cost of the apparatus cannot be reduced.

Also the apparatus for establishing the electrical

25 connection disclosed in Japanese Patent Laid-Open No. 6-26185 has a complicated structure such that an annular recess is formed in the top surface of the cable accommodation chamber and the top end portion of the carrier is rotatively received

in the annular recess. Thus, the cost reduction cannot be performed as required.

SUMMARY OF THE INVENTION

5 Accordingly, an object of the present invention is to provide a high-quality and satisfactorily reliable apparatus for establishing the electrical connection between a stationary body and a rotating body capable of preventing generation of noise occurring due to vertical vibrations of the carrier without use
10 of a special structure for preventing vibrations.

 As claimed in claim 1, according to one aspect of the present invention, there is provided an apparatus for establishing the electrical connection between a stationary body and a rotating body having a structure such that the
15 rotating body is coaxially and rotatively coupled to the stationary body to form an annular cable accommodation chamber for spirally accommodating a flexible flat cable in such a manner that an end of the flexible flat cable is secured to the stationary body and another end of the
20 flexible flat cable is engaged to the rotating body, an annular carrier, a portion of which is separated by a cable guide groove, is disposed between the inside portion and the outside portion of the flexible flat cable so as to be capable of moving in the circumferential direction, an
25 intermediate portion of the flexible flat cable is allowed to pass through the cable guide groove of the carrier to divide the inside portion and the outside portion of the flexible flat cable so as to wind and rewind the flexible flat cable

to and from the cable accommodation chamber, the apparatus for establishing the electrical connection between a stationary body and a rotating body comprising: flanges formed in the lower end portions of the inner portion and the
5 outer portion of the carrier; and an annular and stepped restriction portion, the center of which is the center of rotation of the rotating body, and which is formed in either or both of the lower portions of the inner and outer portions of the cable accommodation chamber, wherein the flanges are
10 accommodated and engaged to the lower portion of the restriction portion.

According to the structure claimed in claim 1, the flanges of the carrier can be accommodated and engaged in the lower portion of the restriction portion by only coaxially
15 and rotatively coupling the rotating body and the stationary body to each other in such a manner that the carrier is disposed in the cable accommodation chamber. Therefore, the restriction portion restricts the upper movement of the carrier. As a result, vibrations of the carrier can be
20 prevented.

As claimed in claim 2, there is provided an apparatus for establishing the electrical connection between a stationary body and a rotating body according to Claim 1, wherein either of the stationary body or the rotating body is vertically divided with
25 respect to the flanges of the carrier, the thickness of a peripheral wall of an upper divided member is made to be larger than that of a peripheral wall of a lower divided member, and

inner stepped portions of the peripheral walls are formed into restriction portions.

According to the structure as claimed in claim 2, the stepped portion in terms of the thickness of the peripheral
5 walls of the vertically-divided members is formed into the restriction portion. As a result, appropriate spaces for accommodating the flexible flat cable in the cable accommodation chamber can be maintained.

Other objects, features and advantages of the invention
10 will be evident from the following detailed description of the preferred embodiments described in conjunction with the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

15 Fig. 1 is a cross sectional view of a first embodiment of the present invention;

Fig. 2 is a perspective view of the first embodiment of the present invention;

20 Fig. 3 is an exploded perspective view of the first embodiment of the present invention;

Fig. 4 is a cross sectional view of a second embodiment of the present invention;

Fig. 5 is a cross sectional view of a third embodiment of the present invention;

25 Fig. 6 is an exploded perspective view of a rotator according to the third embodiment of the present invention; and

Fig. 7 is a cross sectional view of a fourth embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Preferred embodiments of the present invention will now be described with reference to the drawing.

5 Referring to Figs. 1 to 3, reference numeral 1 represents a rotator having, in a central portion thereof, a boss portion 1a into which, for example, a steering shaft of a steering apparatus (not shown) is rotatively inserted.

The boss portion 1a has, on the outer surface thereof, 10 engaging grooves 1b and a plurality of horizontal grooves 1c formed in the top end surface thereof. The horizontal grooves 1c have threaded holes 1d in the bottom surface thereof. Moreover, an annular flange 1e is integrally formed in the lower portion of the boss portion 1a to project 15 outwards over the outer surface of the boss portion 1a.

Reference numeral 2 represents an upper cover having, in the central portion thereof, an opening 2a having substantially the same size as that of the central hole formed in the boss portion 1a of the rotator 1. The upper 20 cover 2 has internal projections 2b formed on the inner surface thereof, which forms the opening 2a, the internal projections 2b projecting inwards to correspond to the horizontal grooves 1c of the rotator 1. Moreover, a cut portion 2c is formed in the foregoing inner surface to 25 correspond to the engaging grooves 1b of the rotator 1. The internal projections 2b have, in the bottom portion thereof, a plurality of through holes 2d which correspond to threaded holes 1d of the rotator 1 and receiving screws.

The upper cover 2 has, on the upper surface thereof, a holder portion 2e formed outer than the cut portion 2c in the radial direction and an external projection 2f for integrally and rotatively connecting the upper cover 2 to, for example,
5 a steering wheel of a steering apparatus (not shown), each of the holder portion 2e and the external projection 2f being formed integrally with the upper cover 2 to project over the foregoing upper surface.

The upper cover 2 is joined to the rotator 1 by
10 downwards inserting the internal projections 2b of the upper cover 2 into the horizontal grooves 1c of the rotator 1 and by inserting screws 8 into the threaded holes 1d of the rotator 1 through the through holes 2d of the upper cover 2. Thus, a rotating member is formed.

15 Reference numeral 3 represents an under cover formed into a circular tray like shape. A bottom wall 3a of the under cover 3 has an opening 3b in the central portion thereof, the opening 3b having size substantially the same as the outer diameter of the boss portion 1a of the rotator 1.

20 A peripheral wall 3c of the under cover 3 has a cut portion 3d. A holder portion 3e is formed integrally with the under cover 3 to horizontally project over the cut portion 3d.

A plurality of engaging recesses 3f are formed in the
25 inner surface of the peripheral wall 3c of the under cover 3. The peripheral wall 3c has, on the outer surface thereof, a plurality of attachment portions 3g formed integrally with

the peripheral wall 3c so as to be attached to, for example, a steering wheel of a steering apparatus (not shown).

Reference numeral 4 represents a cylindrical cover having an inner diameter which is substantially the same as the inner diameter of the peripheral wall 3c of the under cover 3. The upper wall 4a has, in the central portion thereof, an opening 4b, the size of which is smaller than the outer diameter of the boss portion 1a of the rotator 1.

A peripheral wall 4c of the cover 4 has, in the lower end portion of the inner surface thereof, an annular recess 4 having stepped portions so as to receive the outer end portion of a flange 5c formed in the outer peripheral portion of a carrier 5 to be described later, the outer end portion of the flange 5c being received in such a manner that the center of rotation of the rotating body is centered. The top surface of the recess 4 serves as a restricting portion 4e for restricting upward movement of the flange 5c.

The peripheral wall 4c of the cover 4 has a plurality of hook portions 4f at positions corresponding to the engaging recesses 3f of the under cover 3 and a cover portion 4g at a position corresponding to the holder portion 3e of the under cover 3, the hook portions 4f and the cover portion 4g being formed integrally with the peripheral wall 4c to project over the same.

The cover 4 is coupled to the under cover 3 by causing the peripheral wall 4c of the cover 4 to internally touch the inner surface of the peripheral wall 3c of the under cover 3 in a state where the cover portion 4g is allowed to face the

holder portion 3e of the under cover 3 and by causing the hook portions 4f to be hooked by the engaging recesses 3f of the under cover 3. Thus, a stationary body is formed.

The carrier 5 formed into an annular shape is
5 accommodated in an accommodation chamber 7 formed by the boss portion 1a of the rotator 1 and the foregoing stationary body so as to create a gap from the boss portion 1a of the rotator 1 for the purpose of accommodating the inner portion of a flexible flat cable 6 to be described later. Moreover, the
10 carrier 5 creates a gap from the peripheral wall 4c of the cover 4 for the purpose of accommodating the outer portion of the flexible flat cable 6.

The carrier 5 has a cable guide groove 5a formed by partially cutting the annular portion of the carrier 5, the
15 height of which is smaller than the height of the accommodation chamber 7.

A flange 5b is formed integrally with the lower portion of the inner surface of the carrier 5, the flange 5b having an inner diameter substantially the same as the outer
20 diameter of the boss portion 1a of the rotator 1. Moreover, a flange 5c is formed integrally with the outer portion of the lower portion of the carrier 5, the flange 5c having substantially the same size as the outer diameter of the recess 4 of the cover 4. The flanges 5b and 5c have
25 substantially the same heights.

The flexible flat cable 6 has a length which permits the flexible flat cable 6 to follow plural rotation operations of, for example, the steering wheel of the

steering apparatus. The flexible flat cable 6 is accommodated in the accommodation chamber 7 (see Fig. 1) formed by coaxially and rotatively coupling the rotating body, consisting of the rotator 1 and the upper cover 2, to the stationary body, consisting of the under cover 3 and cover 4. The flexible flat cable 6 is accommodated in such a manner that the inside portion and the outside portion are wound spirally in the opposite directions with respect to an inversion portion 6a in the form of a semicircular arc formed at an intermediate position in the lengthwise direction of the flexible flat cable 6.

The flexible flat cable 6 has a bent portion 6b in which the flexible flat cable 6 is bent in such a manner that the inside portion of the flexible flat cable 6 is bent diagonally to upwardly change the lengthwise direction of the flexible flat cable 6 by an angular degree of about 90 degrees (Fig. 3 shows a state where the direction is changed horizontally for convenience). The flexible flat cable 6 has cables 6d for establishing the connection to the outside, the cables 6d being connected to an upward end of the bent portion 6b through a support block 6c; connectors 6e connected to the ends of the cable 6d for establishing the connection to the outside; and a connector 6f connected to an outer end of the flexible flat cable 6.

The structure according to this embodiment is assembled in such a manner that the boss portion 1a of the rotator 1 is upwardly inserted into the opening 3b of the under cover 3, the bottom wall 3a of the under cover 3 is placed on the

flange 1e of the rotator 1 and the rotator 1 is rotatively mounted on the under cover 3, as shown in Fig. 1.

Then, the carrier 5 is accommodated between the boss portion 1a of the rotator 1 and the peripheral wall 3c of the under cover 3, and then placed on the bottom wall 3a of the under cover 3.

Subsequently, the bent portion 6b of the flexible flat cable 6 is inserted into and engaged by the engaging grooves 1b of the rotator 1. Then, the support block 6c is allowed to upwardly project over the rotator 1. The inside portion of the flexible flat cable 6 is, several times, wound around the boss portion 1a of the rotator 1, and then the intermediate portion of the flexible flat cable 6 is allowed to pass through the cable guide groove 5a of the carrier 5. The flexible flat cable 6 is subsequently bent in a direction opposite to the winding direction to form a semicircular arc so that the inversion portion 6a is formed. The outside portion of the flexible flat cable 6 continued from the inversion portion 6a is, several times, wound along the carrier 5 in the opposite direction. Then, the flexible flat cable 6 is drawn into the cut portion 3d of the under cover 3, and then the connector 6f is accommodated in the holder portion 3e of the under cover 3. Thus, the outer end of the flexible flat cable 6 is engaged to the under cover 3, followed by being ejected outwards.

Subsequently, the support block 6c, the cable 6d for establishing the connection to the outside and the connector 6e of the flexible flat cable 6, which upwards project over

the rotator 1, are, through the engaging grooves 1b of the rotator 1, drawn to a position upper than the cover 4 from the opening 4b of the cover 4. While accommodating the outside portion of the flexible flat cable 6 in the cover 4, the cover 4 is placed to internally touch the peripheral wall 3c of the under cover 3. Moreover, the cover portion 4g of the cover 4 is allowed to face the holder portion 3e of the under cover 3, and then the hook portions 4f of the cover 4 is hooked by the engaging recesses 3f of the under cover 3. Thus, the connector 6f accommodated in the holder portion 3e is covered with the cover portion 4g so that the cover 4 is integrally fixed to the under cover 3.

Moreover, the support block 6c, cable 6d for establishing the connection to the outside and the connector 6e of the flexible flat cable 6 outwards projecting over the cover 4 are drawn to a position upper than the upper cover 2 through the opening 2a of the upper cover 2. Then, while injecting, into the cut portion 2c of the upper cover 2, a portion of the flexible flat cable 6 placed near the top surface of the cover 4, the upper cover 2 is mounted on the cover 4. Subsequently, the internal projections 2b of the upper cover 2 are downwards inserted into the horizontal grooves 1c of the rotator 1. Then, the screws 8 are inserted into the threaded holes 1d of the rotator 1 through the through holes 2d of the upper cover 2 so that the upper cover 2 is coupled to the rotator 1. Moreover, the upper cover 2 covers the upper and side surfaces of the cover 4 in a non-contact manner.

Finally, the support block 6c of the flexible flat cable 6 drawn to the outside of the upper cover 2 is inserted and attached to the holder portion 2e of the upper cover 2. Thus, the following state is realized: the flexible flat cable 6 is placed on the flanges 5b and 5c of the carrier 5 shown in Fig. 1 and the flexible flat cable 6 is accommodated in the cable accommodation chamber 10 formed by the stationary body and the rotating body; the internal end of the flexible flat cable 6 is secured to the engaging grooves 1b of the rotator 1; the support block 6c is secured to the holder portion 2e of the upper cover 2; the connector 6e connected to the support block 6c is ejected outwards; the inside portion of the flexible flat cable 6 is wound along the outer surface of the rotator 1 in one direction; the inversion portion 6a of the flexible flat cable 6 is disposed in the cable guide groove 5a of the carrier 5; the outside portion of the flexible flat cable 6 is wound along the inner surface of the peripheral wall 4c of the cover 4 in the opposite direction to the direction, in which the inside portion of the flexible flat cable 6 is wound, with respect to the inversion portion inversion portion 6a; and the outer end of the flexible flat cable 6 is secured into the holder portion 3e of the under cover 3 and the cover portion 4g of the cover 4 and ejected outside.

25 In the foregoing state, when the rotation of the stationary body consisting of the under cover 3 and the cover 4 is restricted and the rotating body consisting of the rotator 1 and the upper cover 2 is rotated in one direction,

the portion of the flexible flat cable 6 wound around the boss portion 1a of the rotator 1 is unwound and wound around the inner surface of the peripheral wall 4c of the cover 4.

When the rotating body is rotated in a direction
5 opposite to the foregoing direction, the portion of the flexible flat cable 6 wound around the inner surface of the peripheral wall 4c of the cover 4 is unwound and wound around the outer surface of the boss portion 1a of the rotator 1.

At this time, the inversion portion 6a of the flexible
10 flat cable 6 is, in the state where it is allowed to pass through the cable guide groove 5a of the carrier 5, moves in the accommodation chamber 7 in the circumferential direction of the accommodation chamber 7 at the same speed as the rotational speed of the rotating body in the direction of the
15 rotation of the rotating body when the flexible flat cable 6 is uncoiled (rewound) or coiled (wound). Also the carrier 5 moves in the accommodation chamber 7 in the circumferential direction of the accommodation chamber 7 to follow the inversion portion 6a so that loosening of the flexible flat
20 cable 6 is prevented.

In the foregoing embodiment, the carrier 5 is inserted and placed between the boss portion 1a of the rotator 1 attached to the under cover 3 and the peripheral wall 3c of the under cover 3. Then, the cover 4 is mounted on the under
25 cover 3 to cover the same. Thus, the external portion of the flange 5c of the outer portion of the carrier 5 is accommodated in the recess 4d of the cover 4. The restricting portion 4e forming the top surface of the recess

4 is engaged in a state where the movements of the flange 5c of the outer portion of the carrier 5 and the carrier 5 are permitted so as to restrict the upward movement of the carrier 5. Therefore, generation of noise due to impact between the carrier 5 and the upper wall 4a of the cover 4 can be prevented.

Since the flexible flat cable 6 exists on the two sides of the carrier 5, the inner surface of the peripheral wall 4c and the outer surface of the boss portion 1a of the rotator 1 and an electrical insulating layer of the flexible flat cable 6 serves as a buffer, impact and contact between the side surfaces of the flanges 5b and 5c of the carrier 5 and the boss portion 1a of the rotator 1 and the inner surface of the recess 4 of the cover 4 can be prevented.

Moreover, only by inserting and placing the carrier 5 between the boss portion 1a of the rotator 1, attached to the under cover 3, and the peripheral wall 3c of the under cover 3 and by placing the cover 4 to cover the under cover 3, the restricting portion 4e of the cover 4 and the flange 5c of the outer portion of the carrier 5 can be engaged to each other. Therefore, the structure for restricting the vertical movement of the carrier 5 can significantly be simplified so that the cost of the apparatus can be reduced.

Since the flange 5b is formed on the inner surface of the carrier 5 and the inside portion of the flexible flat cable 6 is placed on the flange 5b, setting of the height of the flange 5b to be the same as the height of the flange 5c on the outer surface of the same enables the difference in

the height of the flexible flat cable 6 between the inner portion and the outer portion to be eliminated. Thus, the flexible flat cable 6 can smoothly be wound and rewound when the rotating body is rotated.

5 Although the foregoing embodiment has the structure such that the recess 4 is formed at the lower end of the inner surface of the peripheral wall 4c of the cover 4 disposed to internally touch the under cover 3 to form the top surface of the recess 4 as the restricting portion 4e, a
10 projecting restriction portion 4h, which is engaged to substantially the overall top surface of the flange 5c on the outer surface of the carrier 5, may be integrally formed with the inner surface of the lower end of the peripheral wall 4c of the cover 4 to place the outside portion of the flexible
15 flat cable 6 on the restriction portion 4h, as shown in Fig. 4.

 In the foregoing case, the thickness of the outer flange 5c is required to be smaller than that of the inner flange 5b. Moreover, the height of the top surface of the
20 inner flange 5b and that of the restricting portion 4h are required to be the same. Thus, the difference in the height of the flexible flat cable 6 between the inside and outside portions of the same can be eliminated.

 As shown in Figs. 5 to 6, another structure may be
25 employed in which the rotator 1 is formed into a cylindrical shape, the threaded holes 1d are formed on the top surface of the rotator 1, the stepped portion 1f for accommodating the inner portion of the cover 4 is formed in the outer portion

of the top surface of the rotator 1, the stepped portion 1g for accommodating the inner flange 5b of the carrier 5 and a stepped portion 1h for accommodating the inner portion of the under cover 3 to be continued from the stepped portion 1g are
5 formed on the outer portion of the lower end portion of the rotator 1 to form the top surface of the stepped portion 1g as a restriction portion 4i. Thus, the restriction portion 4i is engaged to the inner flange 5b of the carrier 5 to restrict the vertical movement of the carrier 5 so as to
10 prevent generation of noise due to vibrations of the carrier 5.

As shown in Fig. 7, another structure will now be described. The outer diameter of the peripheral wall 3c of the under cover 3 and that of the peripheral wall 4c of the
15 cover 4 are made to be substantially the same. Moreover, the thickness of the peripheral wall 3c of the under cover 3 is made to be smaller than that of the peripheral wall 4c of the cover 4. In a state where the peripheral wall 4c of the cover 4 vertically abuts the peripheral wall 3c of the under
20 cover 3, the cover 4 and the under cover 3 are integrally secured. Moreover, the lower end surface of the peripheral wall 4c of the cover 4 inwards projecting over the peripheral wall 3c of the under cover 3 is formed into a restriction portion 4j. Thus, spaces for accommodating the flexible flat
25 cable 6 can appropriately be formed between the carrier 5 and the boss portion 1a of the rotator 1 and between the carrier 5 and the peripheral wall 4c of the cover 4 without the

necessity of enlarging the size of the apparatus in the radial direction.

As described above, according to the present invention, the following advantages can be obtained.

5 As claimed in claim 1, only by coaxially and rotatively coupling the rotating body and the stationary body to each other in such a manner that the carrier is placed in the cable accommodation chamber, the flange of the carrier can be accommodated and engaged in the lower portion of the
10 restriction portion. Thus, the upward movement of the carrier can be prevented and vibrations of the carrier can be prevented. As a result, generation of noise can be prevented and, therefore, the reliability of the quality of the apparatus can be improved.

15 Since the electrical insulating layer of the flexible flat cable existing between the inner surface and the outer surface of the carrier and between the inner surface and the outer surface of the cable accommodation chamber serves as a buffer, impact and contact between the side surface of the
20 flange of the carrier and the inner and outer surfaces of the cable accommodation chamber can be prevented when the apparatus is vibrated horizontally. Thus, generation of noise due to impact and contact can be prevented.

 Since the flanges are formed on the inner and outer
25 portions of the carrier to prevent difference in the height of the flexible flat cable between the inner portion and the outer portion, the flexible flat cable can smoothly be wound and rewound when the rotating body is rotated.

As claimed in claim 2, since the stepped portion of the thickness of the peripheral wall of the vertically-divided portion is formed into the restriction portion, an appropriate space for accommodating the flexible flat cable
5 can be maintained in the cable accommodation chamber.

Although the invention has been described in its preferred form with a certain degree of particularity, it is understood that the present disclosure of the preferred form can be changed in the details of construction and in the
10 combination and arrangement of parts without departing from the spirit and the scope of the invention as hereinafter claimed.

WHAT IS CLAIMED IS:

1. An apparatus for establishing the electrical connection between a stationary body and a rotating body having a structure such that the rotating body is coaxially and rotatively coupled to the stationary body to form an annular cable accommodation chamber for spirally accommodating a flexible flat cable in such a manner that an end of said flexible flat cable is secured to said stationary body and another end of said flexible flat cable is engaged to said rotating body, an annular carrier, a portion of which is separated by a cable guide groove, is disposed between the inside portion and the outside portion of said flexible flat cable so as to be capable of moving in the circumferential direction, an intermediate portion of said flexible flat cable is allowed to pass through said cable guide groove of said carrier to divide the inside portion and the outside portion of said flexible flat cable so as to wind and rewind said flexible flat cable to and from said cable accommodation chamber, said apparatus for establishing the electrical connection between a stationary body and a rotating body comprising:

flanges formed in the lower end portions of the inner portion and the outer portion of said carrier; and

an annular and stepped restriction portion, the center of which is the center of rotation of said rotating body, and which is formed in either or both of the lower portions of the inner and outer portions of said cable accommodation chamber, wherein

said flanges are accommodated and engaged to the lower portion of said restriction portion.

2. An apparatus for establishing the electrical
5 connection between a stationary body and a rotating body
according to Claim 1, wherein either of said stationary body
or said rotating body is vertically divided with respect to
said flanges of said carrier, the thickness of a peripheral
wall of an upper divided member is made to be larger than
10 that of a peripheral wall of a lower divided member, and
inner stepped portions of said peripheral walls are formed
into restriction portions.

FIG.1

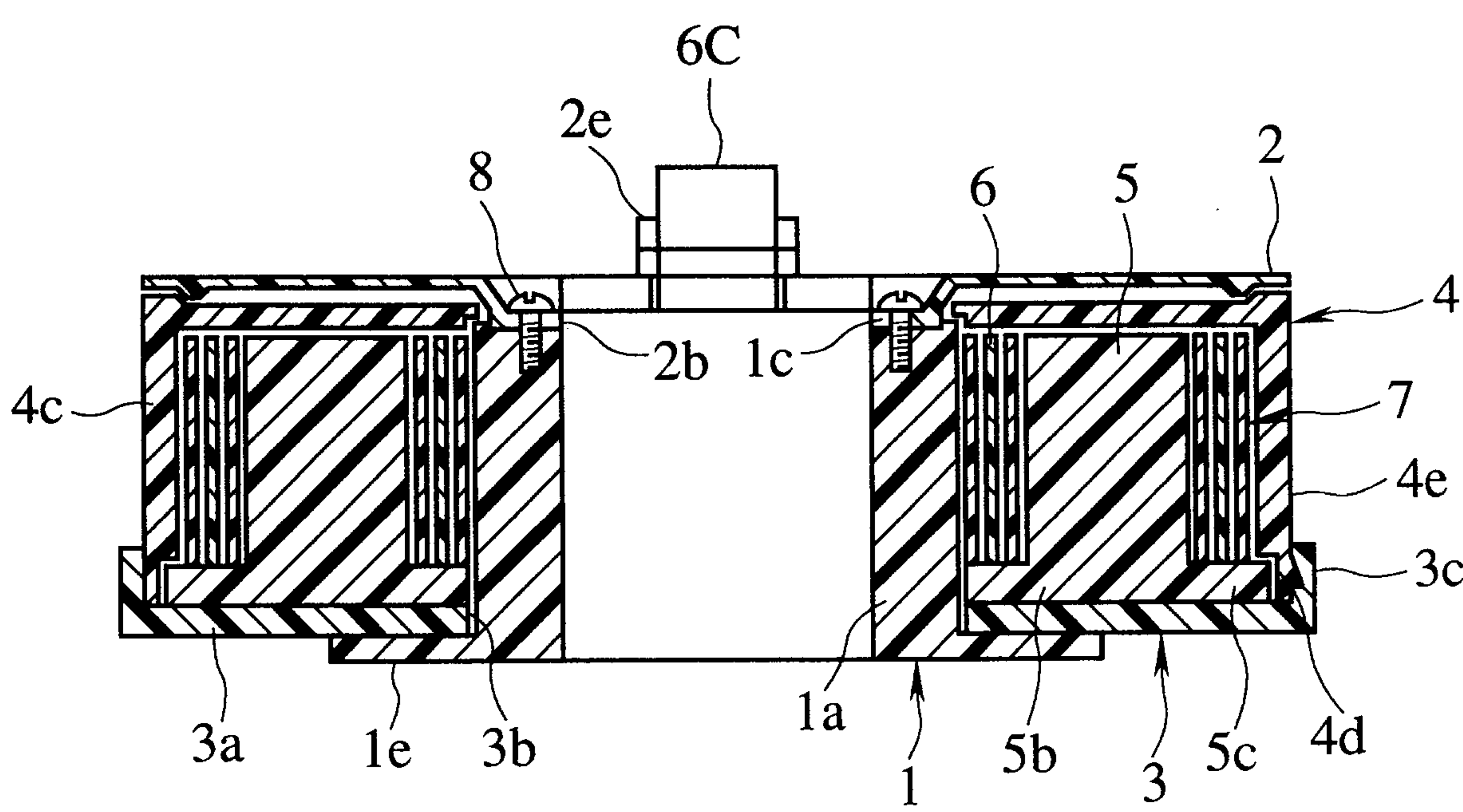


FIG.2

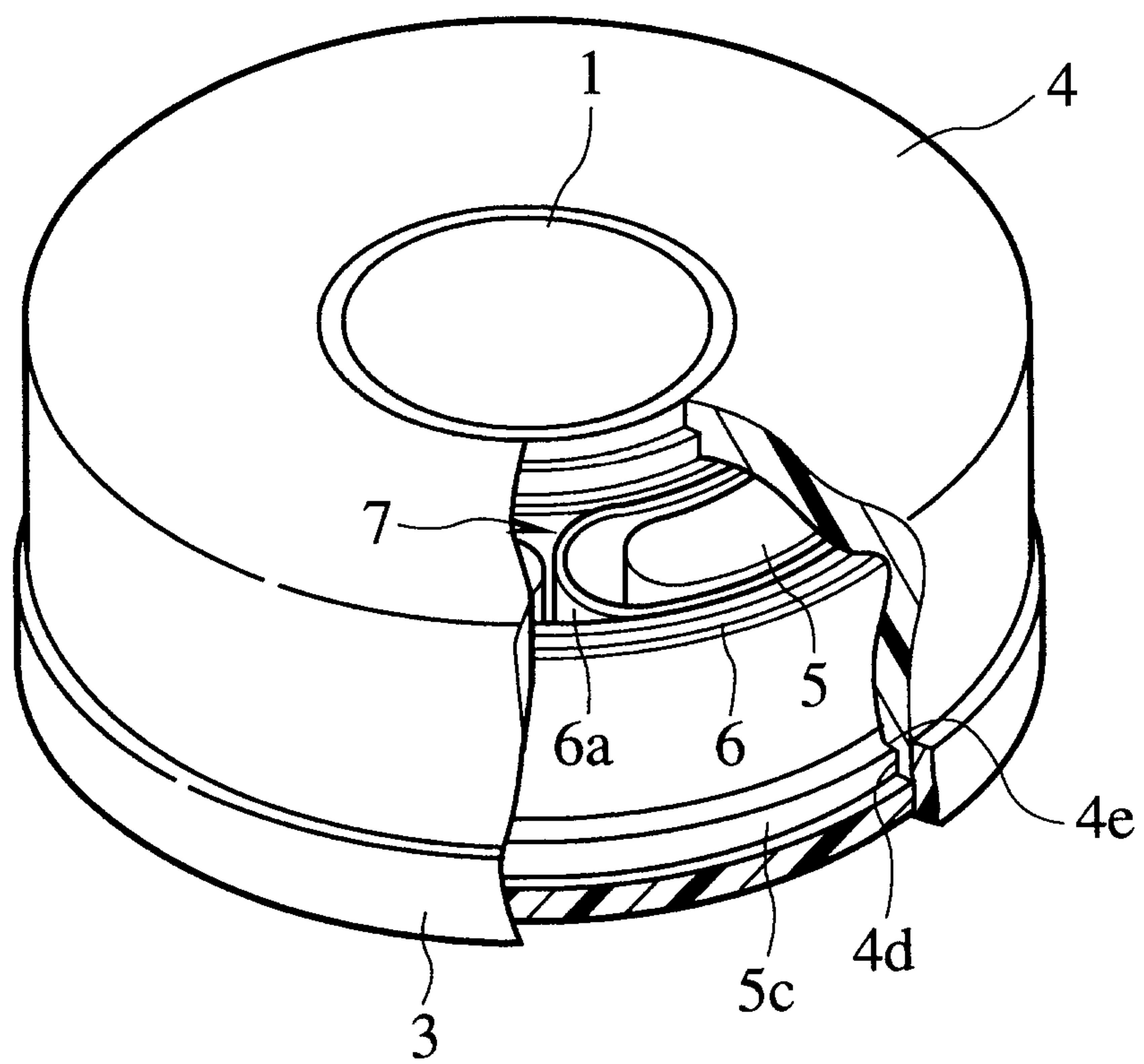


FIG. 3

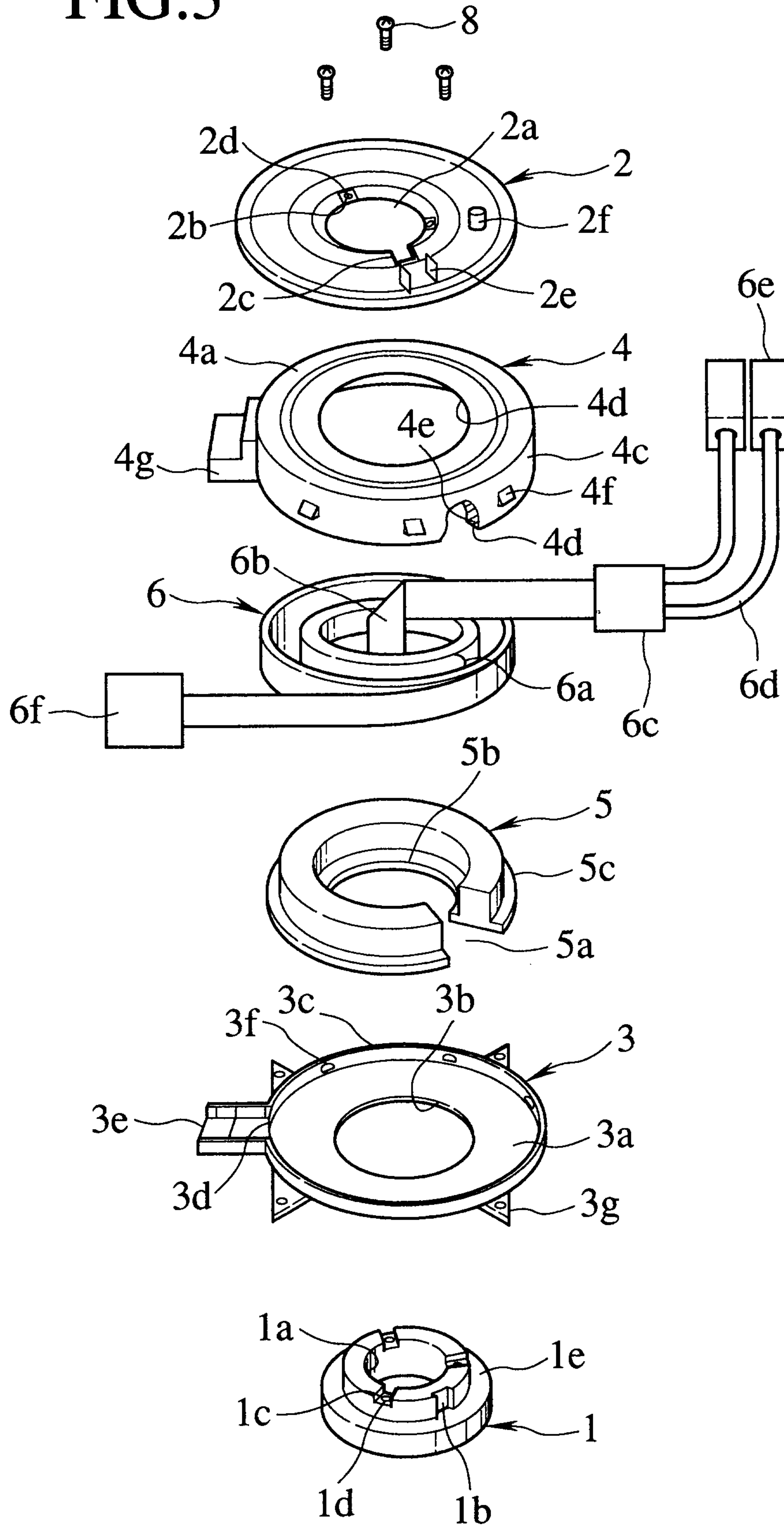


FIG.4

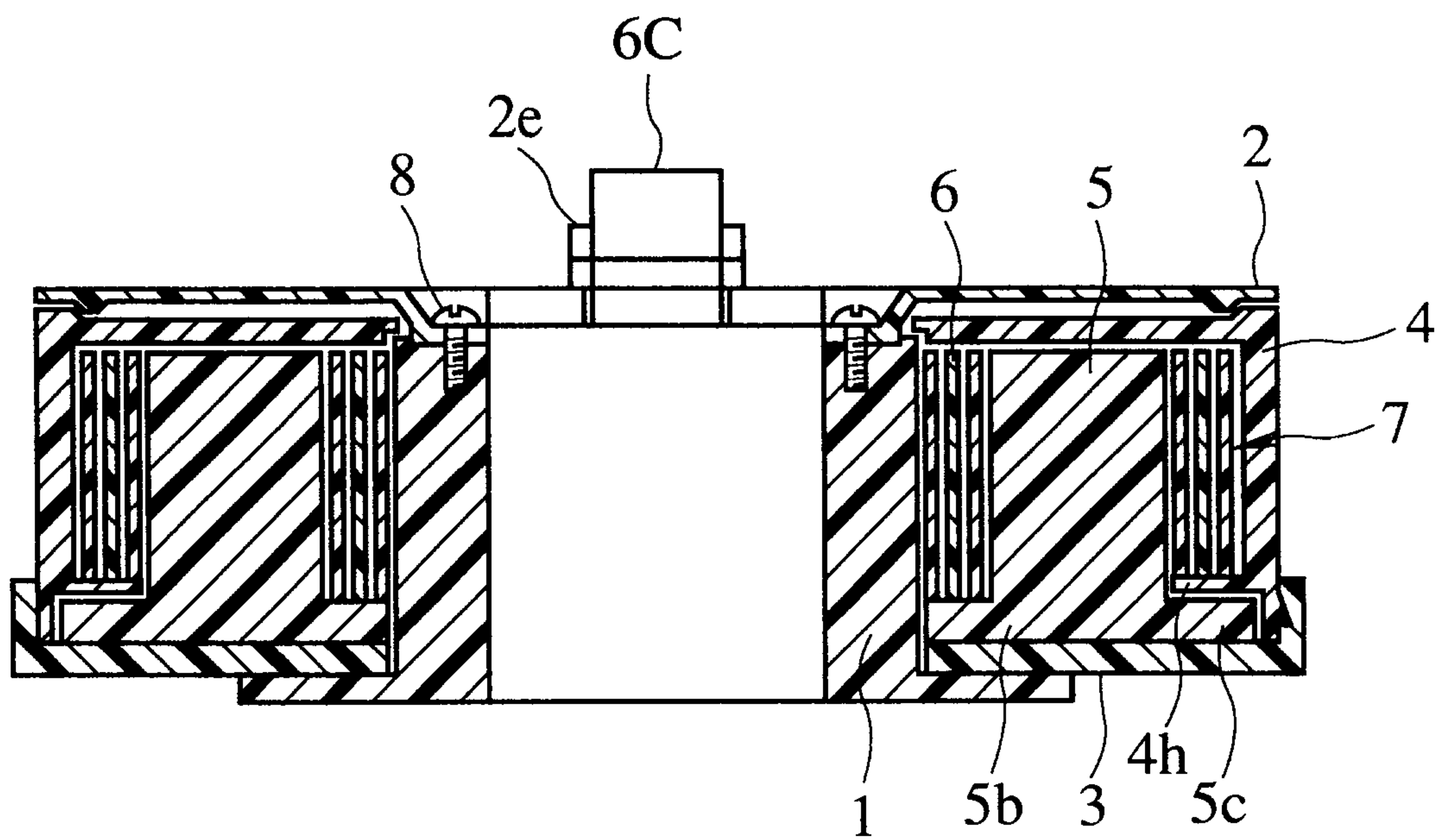


FIG.5

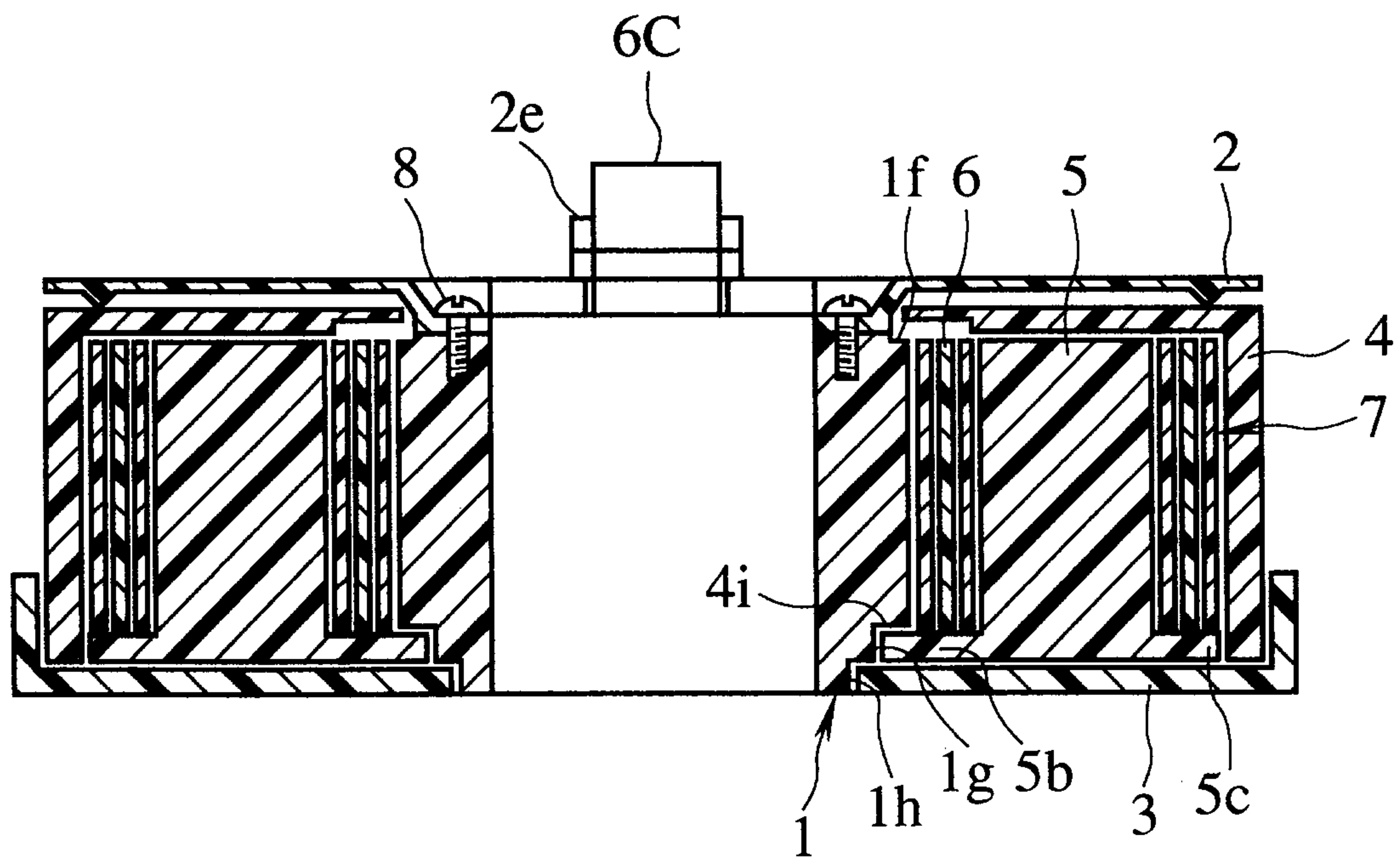


FIG.6

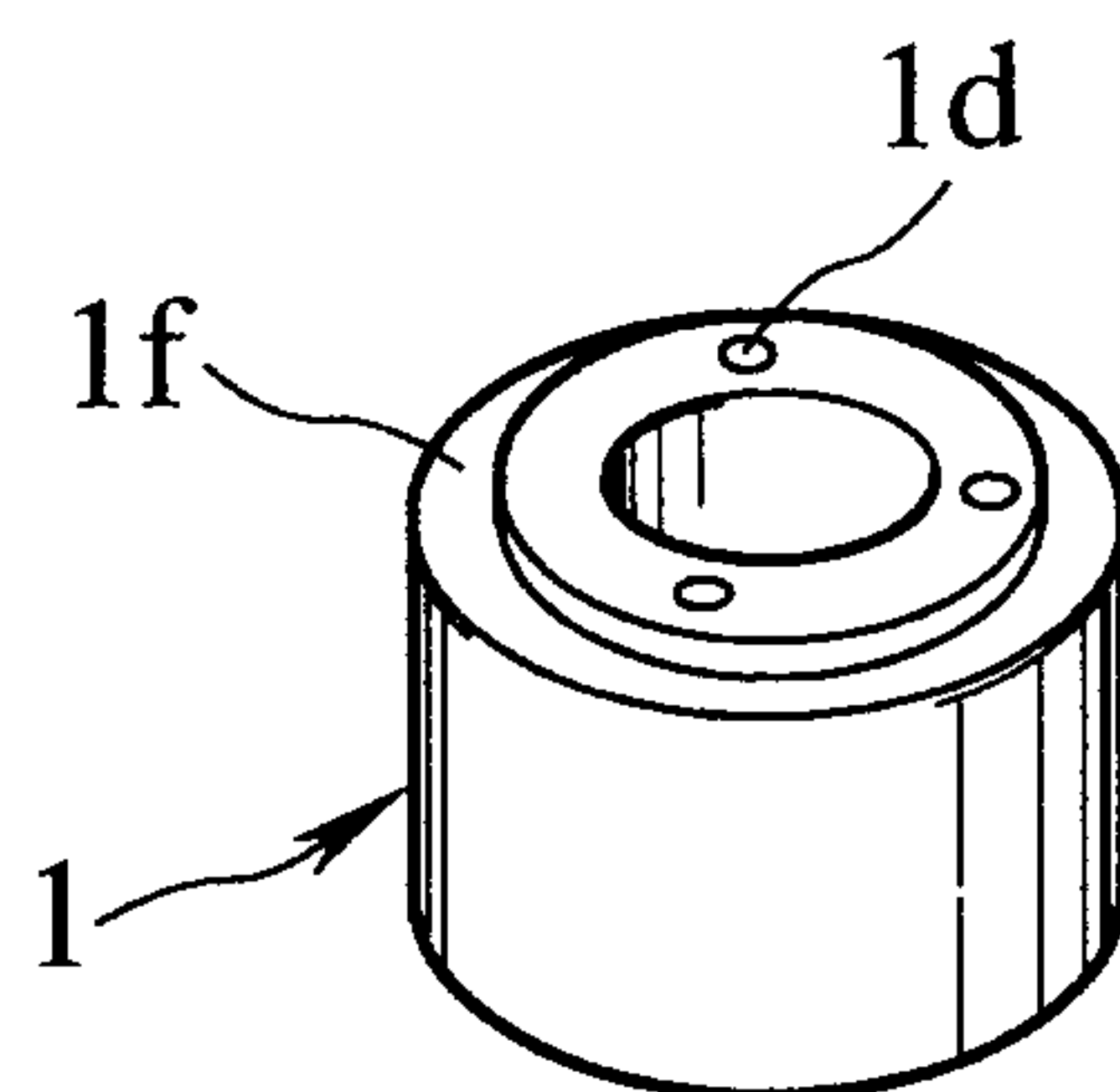


FIG.7

