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(54) COMMAND DEVICE FOR ELECTRICAL APPLIANCES, IN PARTICULAR FOR OVENS OR STOVETOPS

(57) Command device for electrical appliances, in particular for ovens or stovetops, comprising a rotatable knob (3), a rotary support shaft (4) fixed at a first end (4A) thereof to the knob (3), and a control device (5) associated with the second end (4B) of the support shaft (4) in order to detect the angular position thereof. The support shaft (4) comprises at least one damping portion (40) made of elastically pliable material, susceptible of reacting with an elastic response to bending stresses transverse to the rotation axis (Y) that are transmitted by the knob (3), for example following accidental impact exerted thereon by the operator. The invention also provides for a sealing system for limiting the infiltration of liquids and powders towards the control device (5).

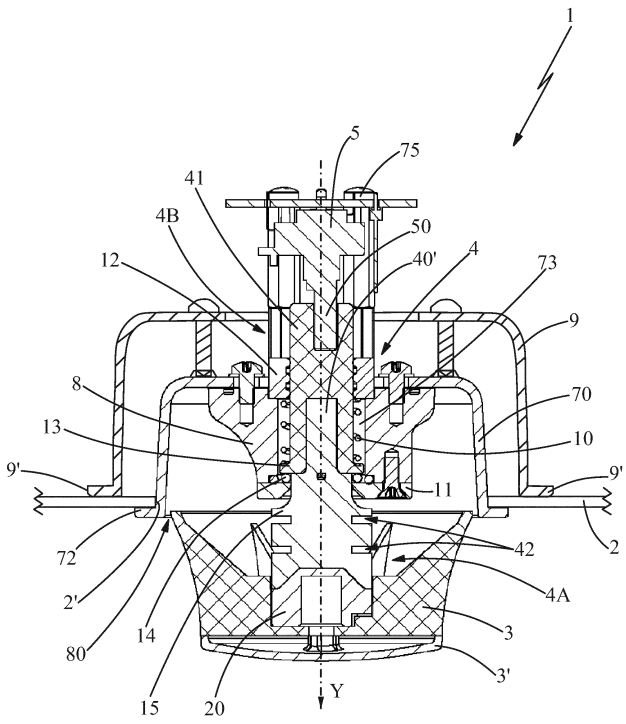

Fig. 5

EP 3 165 990 A1

Description

Field of application

[0001] The present invention refers to a command device for electrical appliances, in particular for ovens or stovetops, according to the preamble of the main independent claim.

[0002] The present device is intended to be mounted on control panels of electrical appliances in order to allow users to control functional members of the same electrical appliances, such as the electric heating element of an oven or the microwave generator of a microwave oven, or even the gas burner (or another heating means) of a stovetop of a kitchen, in particular for professional use.

[0003] The present invention is therefore inserted in the industrial field of production of electrical appliances and more particularly of accessories and components for electrical appliances.

State of the art

[0004] As is known, command devices are usually mounted on an interface panel of the electrical appliance, in particular in order to control a functional member thereof such as a gas burner or electrical heating means of a stovetop or of an oven. Such command devices conventionally comprise a knob, easily grippable by the user, in order to rotate it around a central axis thereof so as to make it assume different angular positions adapted to command the operations of a functional member, as mentioned above (e.g. the temperature of an oven).

[0005] More in detail, the knob usually cooperates with a control member capable of reading the angular position assumed by the knob and consequently commanding, through a control unit such as a circuit board, the functional member.

[0006] Such control member can for example be constituted by a rheostat or by an encoder connected to the circuit board in order to command in a controlled manner, in accordance with the angular position assumed by the knob, the functional member and hence for example vary the electrical power supply to an oven or to a heating plant or otherwise vary the opening and closing of an adjustable solenoid valve of the gas of the burner of a stovetop or of an oven. More in detail, the knob is usually coaxially fixed to the first end of a shaft, which, in turn, is associate at the other second end thereof to the control member, such that the latter can detect, through the reading of the shaft position, the angular position of the knob.

[0007] Such shaft is usually currently made in a single body, or otherwise it is interrupted by a switch in order to allow the knob to add to its conventional possibility of angular control, also a control function of on/off type.

[0008] In any case, the knob and the control member are mechanically connected in a rigid manner to each other, so as to obtain a substantially rigid transmission shaft.

[0009] More in detail, the shaft, in particular at its connection to the knob, is not free to be being, since it is rigid and additionally fittingly-guided by provided support means which allow a rotatable support thereof.

[0010] The command devices, of known type described briefly above, have in practice shown that they do not lack drawbacks.

[0011] A first main drawback thereof lies in the fact that the knob is susceptible of transmitting the impulse forces or the blows struck by the user following unintentional impact against the knob to the control member, breaking it or compromising the function thereof.

[0012] The rigidity of the shaft in fact involves that the stresses imparted at the knob are transmitted without damping to the control member which - comprising electrical and electronic components such as those of an encoder or of a rheostat, is thus subject to easy breakage.

[0013] Especially if the knob is associated with a professional electrical appliance intended to work for many hours, such as an oven or a stovetop of a restaurant kitchen, it frequently occurs that the user, i.e. the chef, in his/her normal work activity impacts the knobs, until the correct and complete original functionality is compromised.

[0014] The rigidity of the shaft can otherwise damage the support means associated therewith, the switch possibly interposed or even the permanent bending of the shaft with a consequent loss of axiality - indeed, there may be an imperfect rotation around the axis thereof.

[0015] A second drawback of the command devices of known type lies in the fact that along the shaft, liquids can flow with a certain ease, such as grease, water etc., along with solid particles which come to compromise the correct operation of the control member. Of course, in a work environment, like that of a professional kitchen, there may be vapors of foods being cooked, and the knobs can inadvertently come into contact with many food substances and/or liquids; also in the air, particles of many different foods can be diffused, such as flour, cacao, sugar etc. Consequently, the electronics of the control member of each command device, even if arranged in a position usually distal from the knob, can be easily dirtied if not suitably protected against the infiltration of liquids and powders of undesired particles.

[0016] Known from patent DE 1907904 is a knob intended to be mounted on a command device, which is made of a single body of plastic material.

[0017] The knob of known type described in this document is susceptible of absorbing stresses transverse to the rotation axis of the knob itself, by means of an elastic return of the plastic material that formed it.

[0018] Such knob of known type described briefly above has in practice shown that it does not lack drawbacks.

[0019] The main drawback lies in the fact that in order to provide such knob with high elasticity, so as to absorb impact with high motion, it is necessary to use plastic

materials with high resilience, which are quickly exhausted and little resistant to thermal stresses - which are frequent in electrical appliances such as an oven of an industrial kitchen.

Presentation of the invention

[0020] In this situation, the problem underlying the present invention is therefore that of overcoming the drawbacks manifested by the solutions of known type by providing a command device, in particular for ovens or stovetops, which supports the occasional impact transmitted by the user to a knob thereof projecting from an interface panel of the electrical appliance without compromising the function of the command device and in particular of its provided control member.

[0021] Another object of the present invention is to provide a command device which allows isolating the control member connected to the shaft of the knob, limiting infiltrations of liquids and undesired particles.

[0022] Further object of the present invention is to provide a command device which is simple and quick to install and entirely reliable in operation.

[0023] Another object of the present invention is to provide a command device which is inexpensive and practical to produce.

Brief description of the drawings

[0024] The technical characteristics of the finding, according to the aforesaid objects, can be clearly seen in the contents of the below-reported claims and the advantages thereof will be clearer from the following detailed description, made with reference to the enclosed drawings, which represent a merely exemplifying and non-limiting embodiment of the invention in which:

- figure 1 shows a first perspective view of the command device in particular for ovens or stovetops according to the present invention;
- figure 2 shows a second perspective view of the command device in particular for ovens or stovetops according to the present invention, with all the possible movements of a provided knob thereof reported with arrows;
- figure 3 shows a first perspective view of the command device in particular for ovens or stovetops according to the present invention, with a damping portion of the shaft of the aforesaid knob illustrated transparent;
- figure 4 shows a side view of the command device of figure 1;
- figure 5 shows a section view of the command device according to the invention, obtained according to line V-V of figure 4;
- figure 6 shows an exploded view of the command device according to the invention.

Detailed description of a preferred embodiment

[0025] In accordance with the figures of the enclosed drawings, reference number 1 overall indicates the command device, object of the present invention. Hereinbelow in the present description, reference will be made to a command device 1, particularly indicated for being mounted on an interface panel 2 (of which a portion is illustrated in figure 5) of an electrical appliance, advantageously constituted by an oven or by a stovetop in particular of a professional kitchen, for such purpose of controlling the electrical power supply to provided heating means of an oven or of a plate.

[0026] Nevertheless, without departing from the protective scope of the present patent, the command device 1 can also be intended for a different electrical appliance in order to command a relative different function thereof, for example in order to command the microwave generator of a microwave oven.

[0027] The command device 1 comprises, in a *per se* conventional manner, a knob 3, which is rotatably movable around an rotation axis Y (indicated with the arrow F in figure 2), advantageously centered with respect to the knob 3.

[0028] A support shaft 4 is fixed at a first end 4A thereof to the knob, coaxially with respect to the rotation axis Y, so as to be rotated together with the knob 3 when the latter is manually rotated by the user.

[0029] The knob 3 is externally covered by a cover 3' with the aesthetic function of concealing the fixing means of the support shaft 4, as better described hereinbelow.

[0030] The command device 1 also comprises a control device 5, which is associated with the second end 4B of the support shaft 4 and is fixed with respect to the latter in order to detect the angular position thereof.

[0031] More in detail, the control device 5 is integral with the support means 7 of the command device 5 indicated hereinbelow.

[0032] The control device 5 is advantageously constituted by an angular position transducer, or by an electronic or electromechanical device capable of converting the position or angular motion into a digital code. It can for example be constituted by a rheostat and preferably by a digital encoder capable of detecting the angular position of the support shaft 4 by means of a coupling, with the second end 4B of the support shaft 4, of mechanical, gravitation, magnetic, capacitive, optical type etc. in accordance with the type of transducer employed.

[0033] In operation, the control device 5 is susceptible of actuating an operative member of the electrical appliance, such as an electrical heating element or a microwave generator of an oven or a gas burner of a stovetop.

[0034] Preferably, the control device 5 controls the operative member of the electrical appliance through an electronic control unit, in particular constituted by a board 6, to which it is electrically connected.

[0035] In accordance with the idea underlying the present invention, the support shaft 4 comprises at least

one damping portion 40 made of elastically pliable material, which is capable of exerting an elastic response with respect to bending stresses transverse to the rotation axis Y which were transmitted to the shaft 4 by the knob 3.

[0036] Advantageously, for such purpose the aforesaid damping portion 40 of the support shaft 4 is made of a polymer material, advantageously made of an elastomer and in particular rubber.

[0037] The support shaft 4 is rotatably supported with respect to the interface panel 2 of the electrical appliance through support means 7. The latter, in accordance with the embodiment of the example illustrated in the enclosed figures, comprise a substantially cylindrical glass-shaped body 70 which is provided with a concavity 71 directed towards the knob 3, and is intended to be inserted in a circular opening 2' of the interface panel 2 in abutment against the latter with a projecting edge 72 thereof.

[0038] The support means 7 also comprise a support body 8, fixed within the concavity 71 of the glass-shaped body 70 and provided with a central through duct 73 acting as a guide, which is coaxially centered on the rotation axis Y and traversed by the shaft 4.

[0039] Advantageously, the support body 8 is fixed to the bottom of the concavity 71 of the glass-shaped body 70 by means of the first screws 74.

[0040] The support means 7 also comprise screws 75 for fixing the control device 5 and the relative circuit board 6 to the external face of the bottom of the glass-shaped body 70.

[0041] A shaped bracket 9 is also provided, which is arranged astride the command device 1, has the end feet 9' fixed to the interface panel 2 (e.g. by means of welding or screws) and supports glass-shaped body 70 by means of screws engaged at its bottom.

[0042] Advantageously, in accordance with a preferred embodiment of the invention, the damping portion 40 of the shaft 4 projects from the through duct 73 of the support body 8 towards the knob 3, since with this it can bend with respect to the end mouth of the through duct 73 which acts as a rotation pin for the bending oscillations of the aforesaid damping portion 40.

[0043] More clearly, following stresses transverse to the rotation axis Y (indicated with the arrows F1 and F2 in figure 2) exerted on the shaft 4 through the knob 3, the support shaft 4 oscillates with respect to its central position. In particular, since it is advantageously extended at least to the mouth of the through duct 73, its bending substantially starts from the same mouth, and from there continues towards the duct 73 fittingly engaged without the possibility of bending.

[0044] In order to increase the bending deformability of the shaft 4 following impact against the knob 3, the aforesaid damping portion 40 is provided with grooves 42 which are circumferentially extended for at least one angle and which delimit ribs between them.

[0045] The knob 3 has a concave form, in particular substantially frustoconical, at whose interior the damping portion 40 of the shaft 4 is substantially positioned.

[0046] The knob 3 is provided at the base with a perimeter edge, advantageously circular, which is separated from the edge of the opening of the concavity 71 of the glass-shaped body 70 by an annular slit 80 which allows the free tilt of the knob following the bending of the shaft 4.

[0047] The section of the damping portion 40 of the shaft 4 is sized (e.g. with diameter comprised between 5 and 20 mm) in order to be deformed in a negligible manner following torsional stresses transmitted by the rotation of the knob 3.

[0048] The same damping portion 40 of the shaft 4 is instead easily tiltable in the part that projects from the through duct 73, given that such part of the shaft 4 which projects from the duct 73 and which is substantially housed in the concavity of the knob 3 has a considerable length, e.g. 20-40 mm, such that a high bending moment is obtained in case of stresses exerted at the external ends of the knob 3, e.g. following impacts of the user, with respect to the pin tip of the shaft 4 that is substantially attained at the mouth of the duct 73 of the support body 8.

[0049] The damping portion 40 is for example centrally fixed within the concavity of the knob 3 by means of a connection mouth 20.

[0050] The latter is provided with a first shaped face which is fixed for gluing to the terminal face of the damping portion 40, advantageously counter-shaped with respect thereto, and a second face which is fixed by means of for example a screw to the bottom of the concavity of the knob 3.

[0051] Preferably, the connection mouth 20 is housed in a seat obtained on the bottom of the knob 3, or defined by a rib projecting from the bottom of the knob 3 and integral therewith, the latter being advantageously obtained via molding of plastic material.

[0052] Advantageously, the shaft 4 is also susceptible of guidedly sliding through the through duct 73 for an axial travel that is limited between two end stops, corresponding to an internal position and an external position of the same shaft 4 and of the knob 3 fixed thereto.

[0053] The end stops are defined through the interference between portions of the shaft 4 and of the support body 8.

[0054] At least one spring 10 is provided between the support body 8 and the shaft 4, which pushes the shaft towards the external position.

[0055] Following stresses of the knob in axial direction, e.g. due to impact by the user, the shaft slides through the duct 73 and through the spring 10 damps the impact without transmitting the impulse to the control device 5, thus preserving the integrity thereof.

[0056] Of course, an accidental impact of the user can be split, in the more general case, into an orthogonal component transverse to the rotation axis Y which will occur due to the elasticity of the damping portion 40 of the shaft 4, and an axial component which will be absorbed by the spring 10.

[0057] More in detail, the shaft 4 also comprises at least one rigid portion 41, which is axially mechanically connected to the damping portion 40, and delimits the second end 4B of the same shaft 4 which is associated with the control device 5. The mechanical coupling between the two portions 40, 41 of the shaft 4 can for example be obtained by fittingly inserting a projecting nose 40' of the damping portion 40 within a first head slot of the rigid portion 41 and fixing it therein, for example via gluing.

[0058] The rigid portion 41 of the shaft 4 is substantially not susceptible of being deformed to bend and is fittingly guided within the duct 73 along the axial travel of the shaft 4.

[0059] For such purpose, the duct 73 of the support body 8 is partially closed at the ends by a first and by a second annular cover 11, 12, respectively provided with a first and with a second hole traversed by the shaft 4 and placed aligned with the through duct 73 and with its narrowing, respectively in the face oriented towards the knob 3 and in the face of abutment against the bottom of the glass-shaped body 70.

[0060] Such covers 11 and 12 are fixed at the top and bottom of the support body 8 for example through screws, and act as first appendages internally projecting from the support body 8.

[0061] In accordance with the embodiment illustrated in the enclosed figures, the support shaft 4 is provided with an externally-projecting second appendage 13 obtained with a lap placed at the end of its rigid portion 41 of connection to the damping portion 40.

[0062] Such second appendage 13 is susceptible of interfering with the first annular cover 11 in order to determine the end stop of the shaft corresponding to its more external position.

[0063] Advantageously, between such second appendage 13 and the cover, a gasket 14 is interposed which prevents liquids and particles from axially sliding along the shaft 4 and hence reaching the control device 5.

[0064] The second end stop is for example advantageously obtained due to the interference of a further projecting second appendage 15 of the shaft 4, made with a rib of the damping portion 40 outside the duct 73.

[0065] In accordance with the aforesaid embodiment, therefore, the two second appendages 13, 15 externally projecting from the shaft 4 are spaced along the rotation axis Y and have the first appendage 11 represented by the first cover interposed.

[0066] The control device 5 advantageously comprises an encoder provided with a small shaft 50 thereof which is fixed to the second end 4B of the shaft 4, in particular being engaged in a second head slot thereof of the rigid portion 41, e.g. via screwing.

[0067] The control device 5, and in particular when incorporating the encoder, is susceptible of responding to an axial command of the knob 3 (see arrow F3 in figure 2) allowed by the sliding along the rotation axis of the engagement shaft 4. Such axial command determines a further command function of the knob 3, additional to that associated with the rotation of the knob 3 itself.

[0068] The finding thus conceived therefore attains the pre-established objects.

[0069] Of course, in the practical achievement thereof, it can also assume shapes and configurations that are different from that illustrated above, without departing from the present protective scope. In addition, all details can be substituted by technically equivalent elements and the shapes, sizes and materials used can be of any type in accordance with the requirements.

Claims

1. Command device, intended to be mounted on an interface panel (2) of an electrical appliance, comprising:

   - a knob (3), which is rotatably movable around a rotation axis (Y);
   - a rotary support shaft (4), fixed at a first end (4A) to said knob (3), coaxially with respect to said rotation axis (Y);
   - a control device (5) associated with the second end (4B) of said support shaft (4) and fixed with respect to the latter in order to detect the angular position thereof;

   characterized in that said support shaft (4) comprises at least one damping portion (40) made of elastically pliable material, susceptible of elastic response to bending stresses transverse to said rotation axis (Y) that are transmitted by said knob (3); said knob (3) having a concave form, at whose interior said damping portion (40) is substantially positioned, coaxially with respect to said rotation axis (Y).

2. Command device according to any one of the preceding claims, **characterized in that** said damping portion (40) is made of a polymer material, in particular rubber.

3. Command device according to any one of the preceding claims, **characterized in that** it comprises support means (7) adapted to rotatably support said support shaft (4) on the interface panel (2) of said electrical appliance, which comprise:

   - at least one glass-shaped body (70) provided with a concavity (71) directed towards said knob (3);
   - a support body (8), fixed within the concavity (71) of said glass-shaped body (70) and provided with a through duct (73) traversed by said support shaft (4).

4. Command device according to any one of the preceding claims, **characterized in that** said damping

portion (40) projects from the through duct (73) of said support body (8) towards said knob (3).

5. Command device according to claim 3, **characterized in that** said support shaft (4) is slidable through said through duct (73) for an axial travel between an internal position and an external position; at least one spring (10) being provided between said support body (8) and said support shaft (4) aimed to push the latter towards said external position.

6. Command device according to claim 3, **characterized in that** said support shaft (4) comprises at least one rigid portion that is axially mechanically connected to said damping portion (40), delimiting the second end of said support shaft (4) associated with said control device (5).

7. Command device according to claim 5, **characterized in that**:

said support body (8) is provided with at least one internally-projecting first appendage (11),
said support shaft (4) is provided with two externally-projecting second appendages (13, 15) arranged spaced along said rotation axis (Y) with said first appendage (11) interposed; the latter being adapted to interfere with said second appendages (13, 15) defining the end stops of said axial travel at said internal and external positions.

8. Command device according to claim 7, **characterized in that** at least one (13) of said externally-projecting second appendages (13, 15) of said support shaft (4) is contained in the through duct (73) of said support body (8); said first appendage (11) of said support body (8) being defined by a first annular cover provided with a first hole placed aligned with said through duct (73) in order to narrow the latter, such cover traversed by said support shaft (4) and fixed to said support body (8).

9. Command device according to any one of the preceding claims, **characterized in that** said damping portion (40) is fixed to said knob (3) by means of a connection mouth (20) provided with a first end shaped and fixed for gluing to the terminal face of said damping portion (40), and in particular countershaped with respect to said first shaped end, and a second end fixed by means of at least one screw to said knob (3), said connection mouth (20) being housed in a seat defined in said knob (3).

10. Command device according to any one of the preceding claims, **characterized in that** said damping portion (40) is provided with at least one groove (42) which is circumferentially extended for at least one angle.

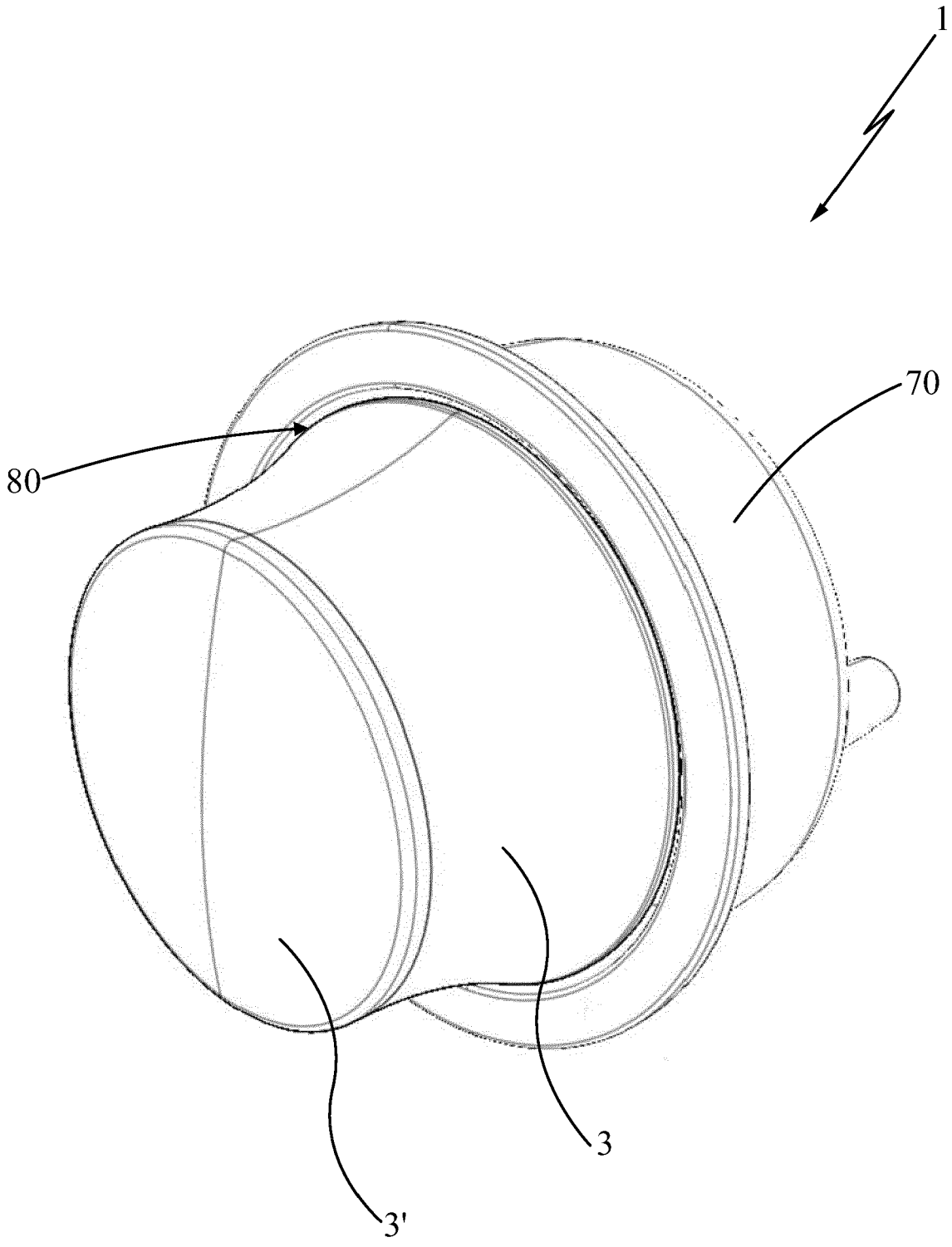

Fig. 1

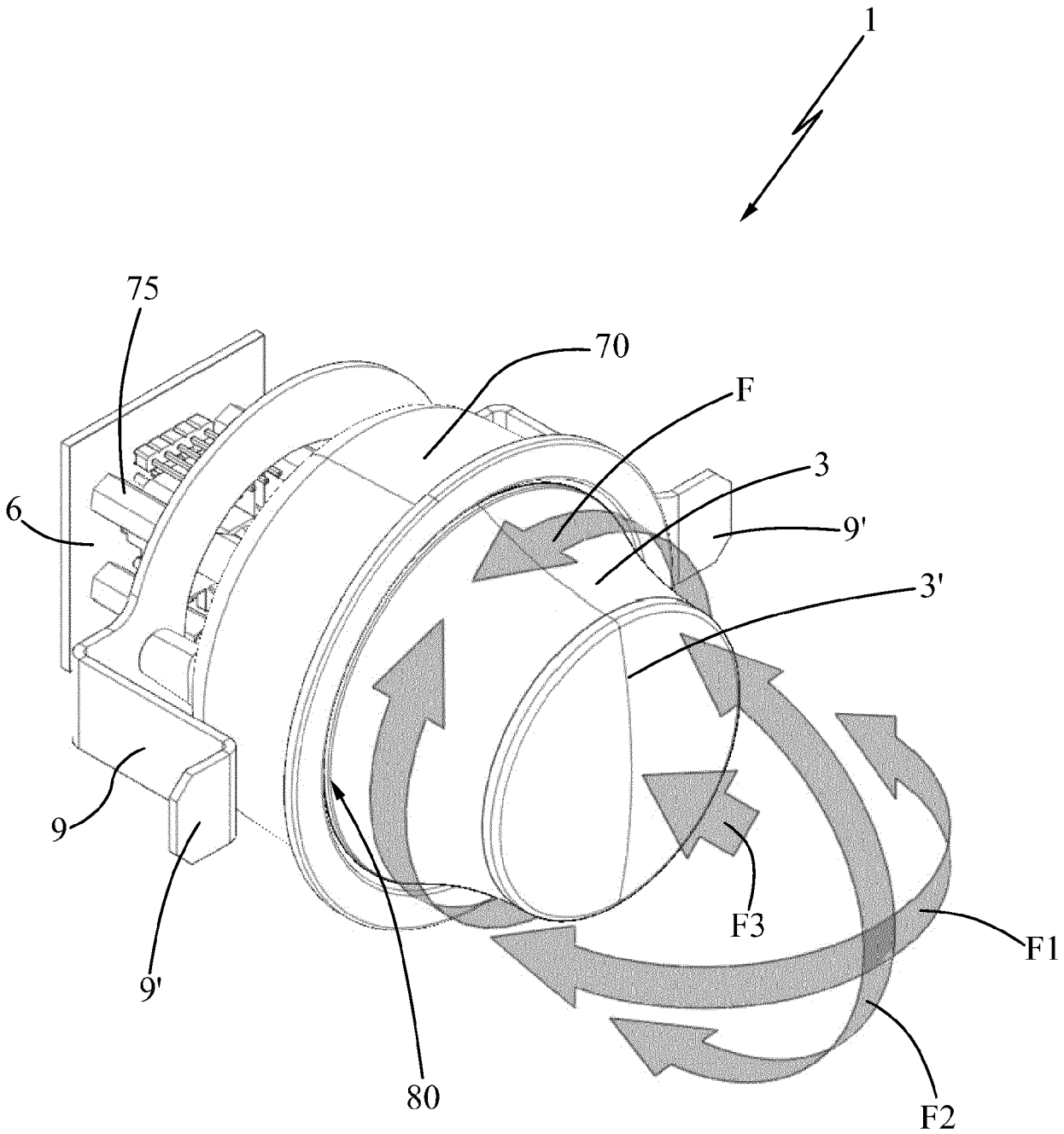

Fig. 2

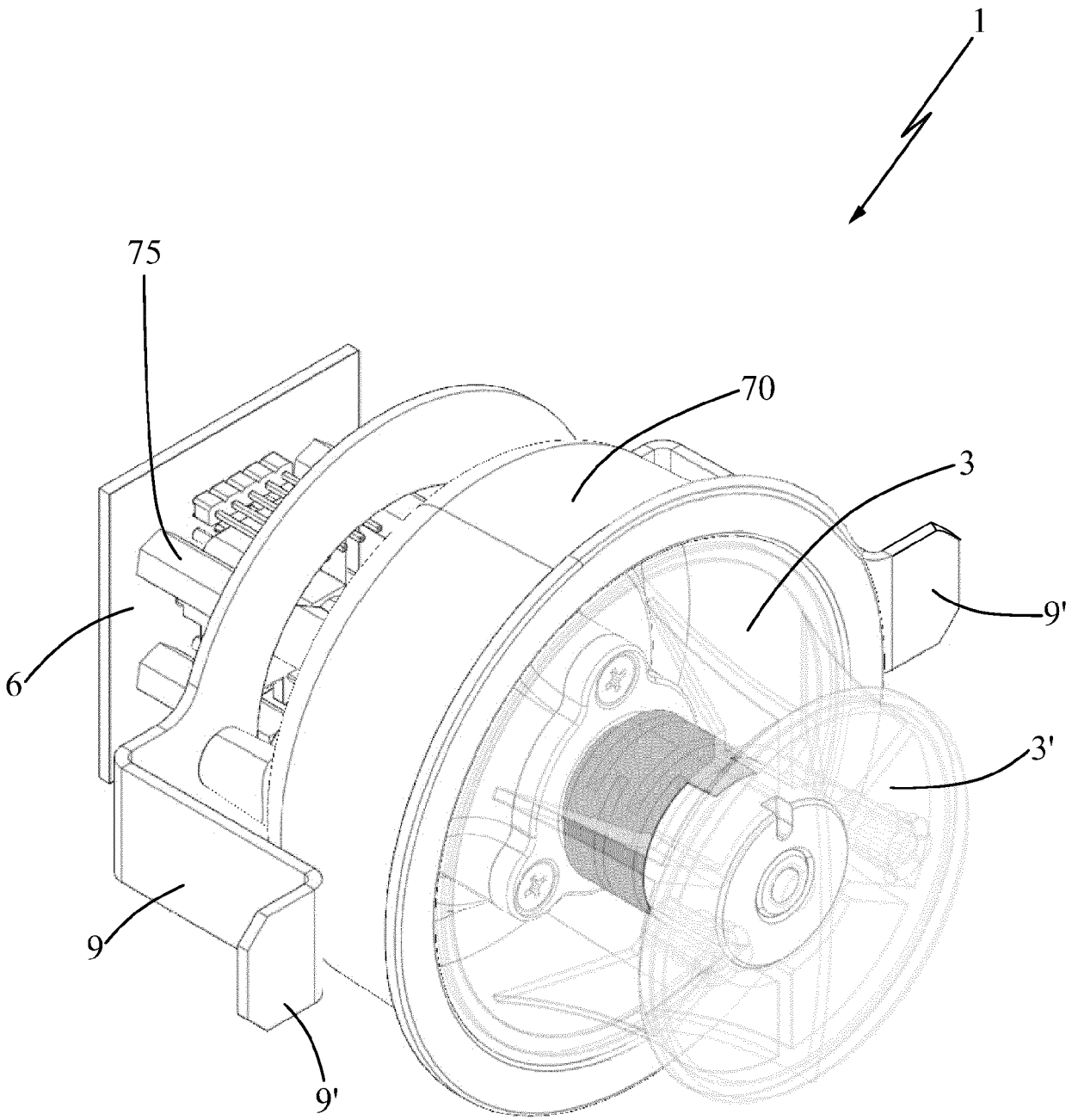

Fig. 3

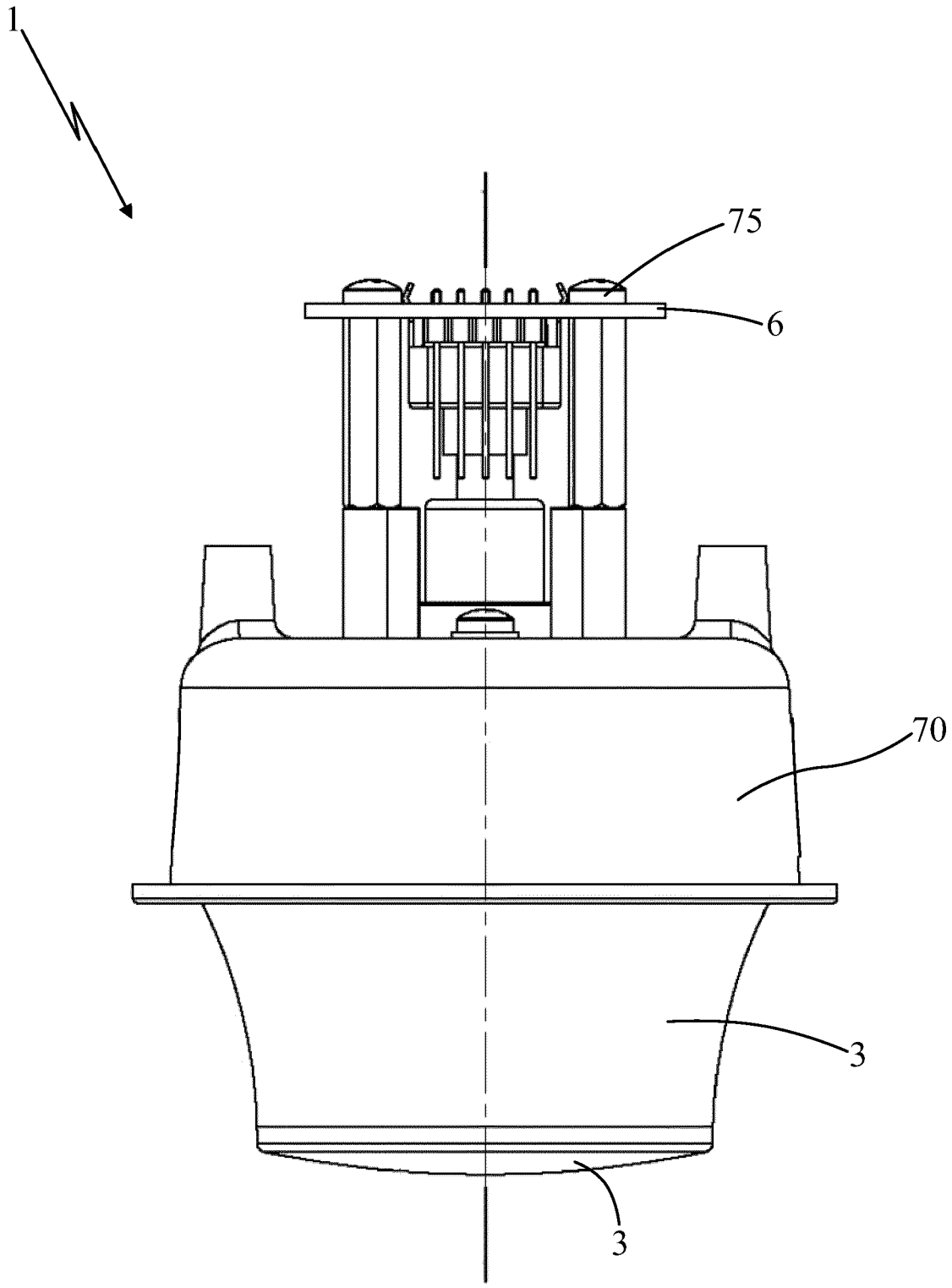

Fig. 4

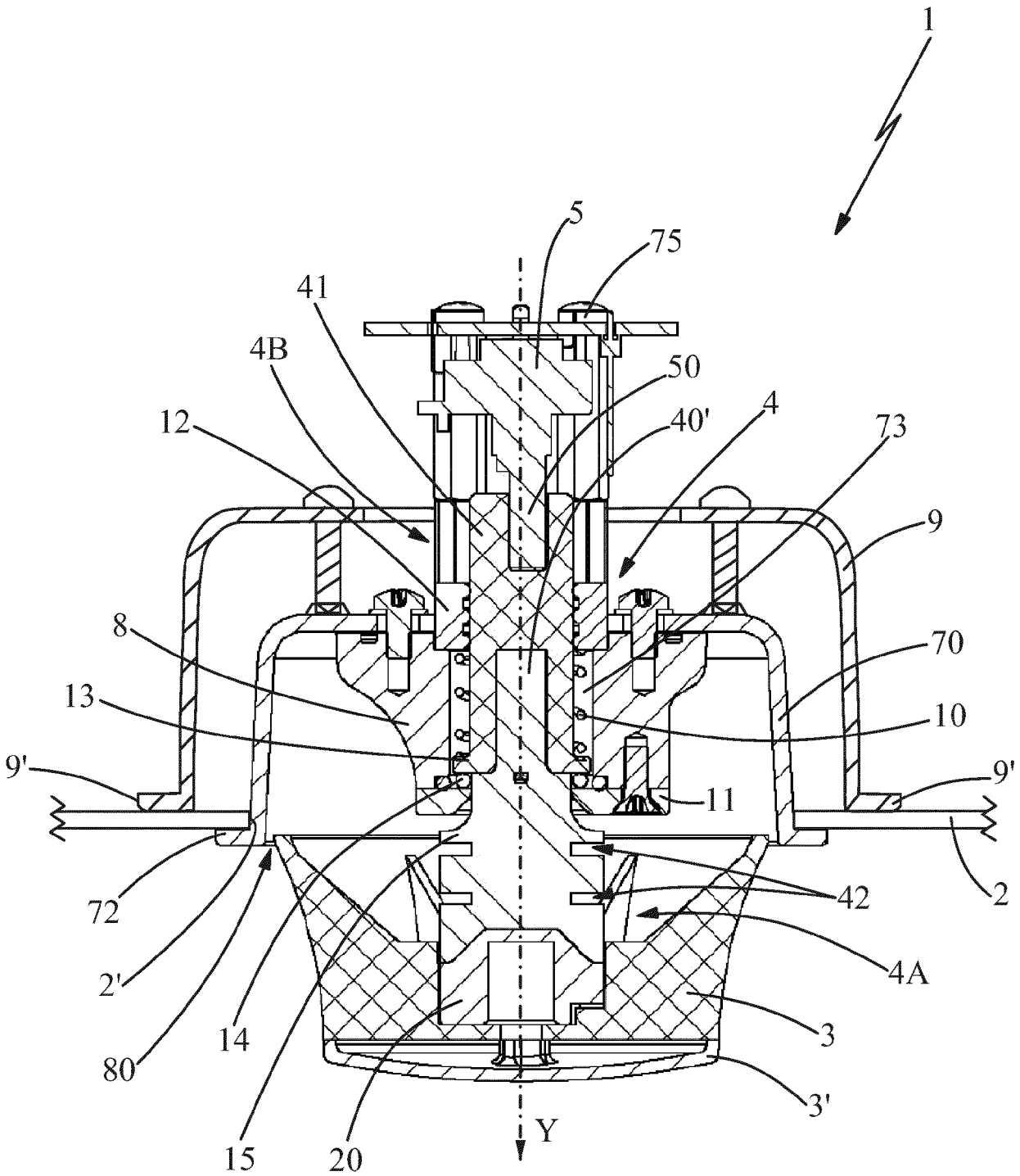

Fig. 5

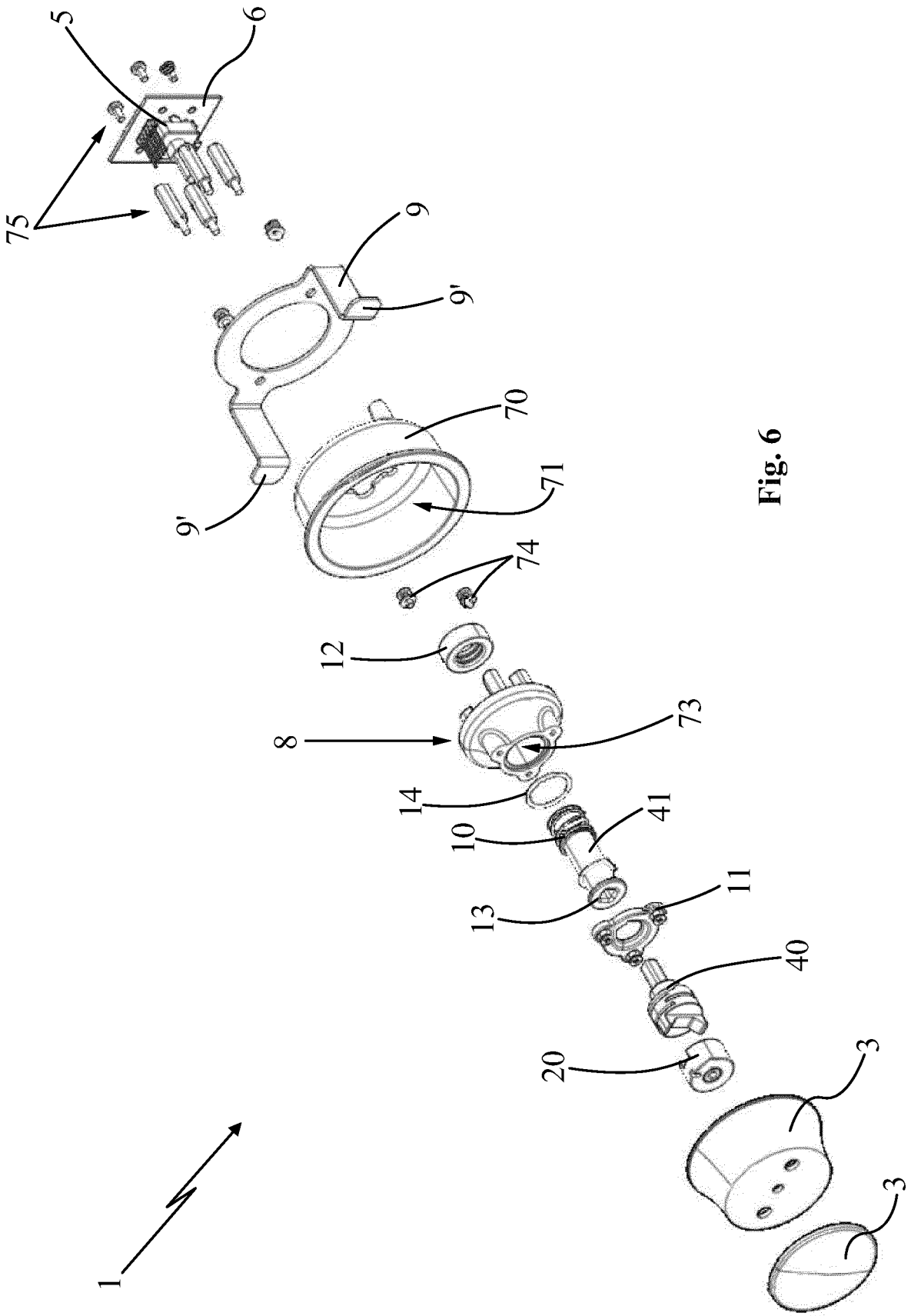

Fig. 6

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EUROPEAN SEARCH REPORT

Application Number
EP 16 19 3345

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TECHNICAL FIELDS SEARCHED (IPC)

G05G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	3 April 2017	de Beurs, Marco

CATEGORY OF CITED DOCUMENTS

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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