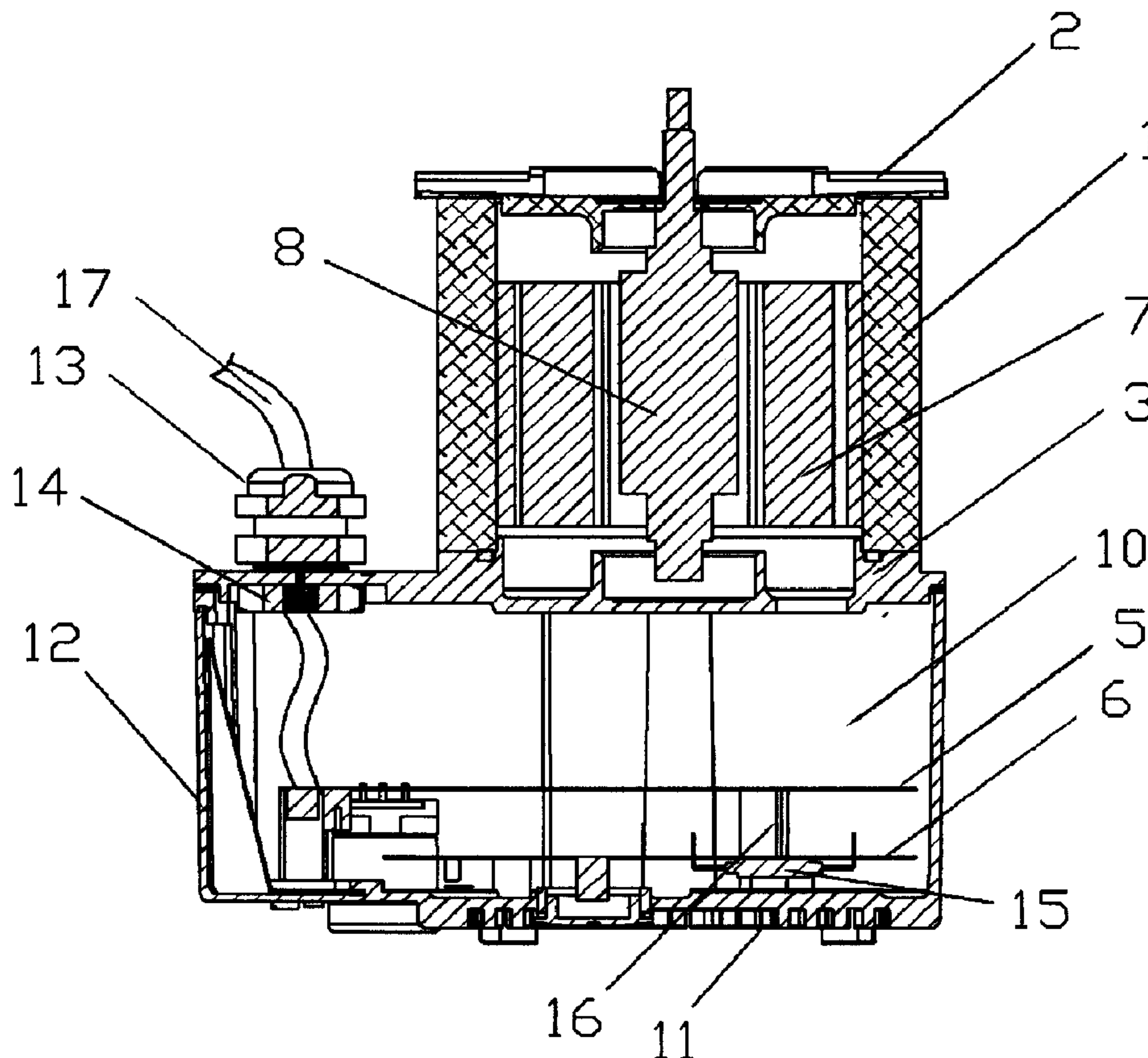




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(54) **Titre : UN MOTEUR COMPORTANT UNE BOITE DE COMMANDE**
(54) **Title: A MOTOR COMPRISING A CONTROL BOX**



(57) **Abrégé/Abstract:**

A motor is composed of a motor main body at the top and a controller at the bottom. The motor main body includes a housing, a stator (7) and a rotor (8). The controller includes a control box (4) and a control circuit board mounted in the control box (4). The

(57) Abrégé(suite)/Abstract(continued):

control box (4) protrudes from a side of the housing to form a platform (30). A control conductive line and a power line (17) enter the control box (4) from the platform (30) to be electrically connected with the control circuit board. The control conductive line and the power line (17) are sealed by a sealing spiral joint (13) and a nut (14). The layout of exposing positions of the power line and the control conductive line is reasonable, sealing performance is improved, and convenience is greatly provided to connect wires for customers.

ABSTRACT

A motor is composed of a motor main body at the top and a controller at the bottom. The motor main body includes a housing, a stator (7) and a rotor (8). The controller includes a control box (4) and a control circuit board mounted in the control box (4). The control box (4) protrudes from a side of the housing to form a platform (30). A control conductive line and a power line (17) enter the control box (4) from the platform (30) to be electrically connected with the control circuit board. The control conductive line and the power line (17) are sealed by a sealing spiral joint (13) and a nut (14). The layout of exposing positions of the power line and the control conductive line is reasonable, sealing performance is improved, and convenience is greatly provided to connect wires for customers.

A MOTOR COMPRISING A CONTROL BOX

FIELD OF THE INVENTION

[0001] The invention relates to a motor.

BACKGROUND OF THE INVENTION

[0002] Conventional pump motors normally use AC motors. The AC motors are power-consuming and not energy-saving and environmental friendly, and features large noise during operation, a small and inaccurate speed regulation range, and comparatively simple control functions, which make them unable to meet various requirements of users.

[0003] Nowadays, some motors appear. However, there are several problems with structure thereof: 1) since a power line and a control cable extend from sidewall of a control box, tightness thereof is not good enough, water drops enter a controller via the cable, and easily cause failure or damage thereof; in addition, leading out wires from the sidewall brings great inconvenience for installation and connection; 2) the control circuit board is disposed in the control box, since space is small and the air does not flow therein, heat dissipation is a big problem, since power and heat dissipation of the pump motor are large, temperature raises quickly and becomes very high during operation, which causes that heat is difficult to be dissipated; 3) control functions thereof are comparatively simple, which makes them unable to meet requirements of users; 4) no mounting debugging window is disposed on the control box, and connection between a control line or a signal line and a control circuit board is troublesome, parameters of electronic components cannot be adjusted, and an impeller is disposed at a shaft end of the motor, which makes it difficult to fix a rotating shaft during installation, and causes great inconvenience for installation; 5) structure thereof is unreasonable, control thereof is

quickly and becomes very high during operation, which causes that heat is difficult to be dissipated; 3) control functions thereof are comparatively simple, which makes them unable to meet requirements of users; 4) no debug window is disposed on the control box, and connection between a control line or a signal line and a control circuit board is troublesome, parameters of electronic components cannot be adjusted, and an impeller is disposed at a shaft end of the motor, which makes it difficult to fix a rotating shaft during installation, and causes great inconvenience for installation; 5) structure thereof is unreasonable, control thereof is comparatively simple, and no communication interface is left, which makes it inconvenient to communicate with the outside world; and 6) no structure for fastening heat dissipation is disposed at the bottom of the control box.

SUMMARY OF THE INVENTION

[0004] It is an objective of the invention to provide a motor, in which lead-out of a power line and a control cable is reasonable, that features good tightness, and brings great convenience for wire connection of users.

[0005] The invention is implemented as follows.

[0006] A motor, comprising: a body disposed at the top thereof, and a controller disposed at the bottom thereof, the body comprising a housing, a stator, and a rotor, and the controller comprising a control box, and a control circuit board

disposed in the control box, the control box extends from a side of the housing and forms a platform, a control cable and a power line enter the control box via the platform, and are electrically connected to the control circuit board, and the control cable and the power line are sealed via the sealing screw joint and the nut.

5 **[0007]** Advantages of the invention over the prior art comprise: the control box extends from the side of the housing and forms the platform, the control cable and the power line enter the control box via the platform, and are electrically connected to the control circuit board, and the control cable and the power line are sealed via a sealing screw joint and a nut, which improves tightness,
10 effectively prevents water drops from enter the controller via the cable, and protects normal operation of the controller; lead-out of the power line and the control cable is reasonable, and brings convenience for wire connection of users.

[0008] The control circuit board in the controller employs an overlapped structure comprising an upper layer, and a lower layer, the upper layer of the control circuit
15 board is a power board bearing a power conversion circuit, and the lower layer of the control circuit board is a control board bearing a direct current brushless motor control circuit, which make layout reasonable and structure compact, efficiently utilize space, reduce occupied area, and solve a problem that temperature of the controller raises fast and heat dissipation thereof is difficult.

20 **[0009]** The housing comprises an upper end cover, a metal case with a heat

dissipation fin, and a lower end cover, the lower end cover is disposed at the top of the control box and forms a top cover of the control box, the control cable and the power line are connected to the power board via a terminal, and the power board is connected to the control board via the terminal in a manner of insertion, 5 which makes structure simple, and features reasonable layout, and convenient installation.

[0010] The control cable and the power line are received in the sealing screw joint and the nut, the sealing screw joint is fixed on a lower end cover via the nut, and a lead is in a complete sealing condition.

10 **[0011]** A debug window is disposed on side wall or at the bottom of the control box, and a sealing cover is disposed on the debug window, which make it convenient to open the sealing cover, and to expose the control circuit board for wire connection, adjustment of parameters of electronic components, and fixation of a rotating shaft according to requirements of users for installation and use.

15 **[0012]** A rotary dip switch is disposed at the bottom of the control box, the rotary dip switch is electrically connected to a lower-layer control board, and the rotary dip switch controls different functions of the motor, which makes use thereof very convenient.

[0013] All heating components on the power board face upwards, a rectifier is 20 tightly attached to a flange on the side wall, an intelligent power module chip IPM

on the lower-layer circuit board is tightly attached to the bottom of the control box, and the control box is made of aluminum, and capable of speeding up heat dissipation.

5 **[0014]** A hole is disposed at the bottom of the control box, a serial port disposed on the control board is disposed in the hole, and connected to an external circuit, the hole is a screw hole, and the screw hole is sealed via a plastic nut, and a sealing ring, which makes it convenient to communicate with and exchange data with external electronic devices.

10 **[0015]** A hole is disposed at the bottom of the control box, and operates to receive a LED, the LED is electrically connected to the control board, multiple protruding parts are disposed at the bottom of the control box, and a sealing washer is disposed between the control box and the lower end cover.

BRIEF DESCRIPTION OF THE DRAWINGS

15 **[0016]** Further description of the invention will be given below in conjunction with accompanying drawings, in which:

[0017] FIG. 1 is a perspective view of the invention;

[0018] FIG. 2 is a cross-sectional view of the invention;

[0019] FIG. 3 is an exploded view of the invention;

[0020] FIG. 4 is a partially enlarged view of a controller of the invention;

[0021] FIG. 5 is a cross-sectional view of a control box of the invention; and

[0022] FIG. 6 is an exploded view of the invention from another angle.

5 SPECIFIC EMBODIMENTS

[0023] Further description of the invention will be given below in conjunction with specific embodiments and accompanying drawings.

[0024] As shown in FIGS. 1-6, a direct current brushless pump motor of the invention comprises a body disposed at the top thereof, and a controller disposed at the bottom thereof. The body comprises a housing, a stator 7, and a rotor 8. The housing comprises an upper end cover 2, a metal case 1 with a heat dissipation fin 9, and a lower end cover 3. The stator 7 and the rotor 8 are disposed in the metal case 1, and the upper end cover 2 and the lower end cover 3 each has a bearing chamber for installing the rotor 8.

[0025] A debug window 23 is disposed on side wall or at the bottom of the control box 4, a sealing cover 12 is disposed on the debug window 23, the sealing cover 12 can be opened, and the control circuit board can be exposed for wire connection, adjustment of parameters of electronic components, and fixation of a rotating shaft according to requirements of users for installation and use. A sealing

pad 24 is disposed between the sealing cover 12 and the control box 4.

[0026] The controller comprises a control box 4, and a control circuit board disposed in the control box 4. The control circuit board in the controller employs an overlapped structure comprising an upper layer, and a lower layer, the upper
5 layer of the control circuit board is a power board 5 bearing a power conversion circuit, and the lower layer of the control circuit board is a control board 6 bearing a direct current brushless motor control circuit. The lower end cover 3 is disposed at the top of the control box 4 whereby forming a top cover for the control box 4, which can be understood as follows: the lower end cover 3 is part of the housing,
10 and part of the control box 4, part of the control box 4 and that of the lower end cover 3 extend from a side of the metal case and form a platform 30, a control cable and a power line 17 enters the control box via the platform, and is electrically connected to the power board 5, and the power board 5 is connected to the control board 6 via a terminal 16 in a manner of insertion. The control cable
15 and the power line 17 are led out from the platform via a sealing screw joint 13 and a nut 14, the sealing screw joint 13 is fixed on the lower end cover 3 via the nut 14, and a lead is in a complete sealing condition. A rotary dip switch 22 is disposed at the bottom of the control box 4, the rotary dip switch 22 is electrically connected to a lower-layer control board 6, and the rotary dip switch 22 controls
20 different functions of the motor. All heating components on the power board 5 face

upwards, a rectifier **28** is tightly attached to a flange **27** on the side wall, an intelligent power module chip IPM **15** on the control board **6** is tightly attached to the bottom of the control box **4**, and the control box is made of aluminum, which features fast heat dissipation. A hole **19** is disposed at the bottom of the control box **4**, a serial port disposed on the control board **6** is disposed in the hole, and connected to an external circuit, the hole **19** is a screw hole, and the screw hole is sealed via a plastic nut **21**, and a sealing ring **20**. The upper end cover **2** and the lower end cover **3** are aluminum casting end covers, and the metal case **1** is an expanding aluminum case. An opening is disposed at the bottom of the control box **4**, and operates to receive a LED, the LED is electrically connected to the control board, multiple protruding parts **11** are disposed at the bottom of the control box **4**, and a sealing washer **18** is disposed between the control box **4** and the lower end cover **3**, and operates to solve a waterproof and dustproof problem.

[0027] If a sealing cover **12** of the debug window **23** on the side wall of the control box **4** is opened, a socket for a power line, and that for a control cable are exposed, and a control cable and a power line **17** can be connected thereto. The power line **17** is led out from the sealing screw joint **13** on the lower end cover **3**, the sealing screw joint **13** is fixed on the lower end cover **3** via the nut **14**, and the lead is in a complete sealing condition.

[0028] A groove **25** is disposed on one side of the control box **4**, and another

protruding part **29** is disposed on the control box **4**, and operates to attach surface of overheated electronic components to the protruding part **29** whereby speeding up heat dissipation. A mounting foot **26** is disposed at the bottom of the control box **4**, and multiple steps extend from inner side wall of the control box **4** and
5 operate to support the control board **6** and the power board **5**. A screw hole is disposed on top end surface of the step, and operates to fix the control board **6** and the power board **5** via a screw.

CLAIMS

1. A motor, comprising

a body, said body comprising a housing, a stator, and a rotor; and

a controller, said controller comprising a control box and a control circuit board disposed in said control box, said control box comprising a top, a side wall, and a bottom wall, said control circuit board comprising a serial port comprising a connecting end;

wherein:

said body is disposed on the top of said control box;

a hole is arranged through the bottom wall of said control box;

said serial port is disposed on said control circuit board;

said connecting end of said serial port is disposed in said hole and said serial port is adapted to be connected to an external circuit;

said control box extends laterally on a side of said housing to form a platform;

a control cable and a power line enter said control box via said platform, and are connected to said control circuit board; and

said control cable and said power line are sealed via a sealing screw joint and a nut.

2. The motor of claim 1, wherein

said control circuit board in said controller employs an overlapped structure comprising an upper layer and a lower layer;

said upper layer of said control circuit board is a power board bearing a power conversion circuit; and

said lower layer of said control circuit board is a control board bearing a direct current brushless motor control circuit.

3. The motor of claim 2, wherein

said housing comprises an upper end cover, a metal case with a heat dissipation fin, and a lower end cover;

said lower end cover is disposed at the top of said control box and forms a top cover of said control box;

said control cable and said power line are connected to said power board via a terminal; and

said power board is connected to said control board via said terminal in a manner of insertion.

4. The motor of claim 3, wherein

said control cable and said power line are received in said sealing screw joint and said nut;

said sealing screw joint is fixed on a lower end cover via said nut; and

a lead is in a complete sealing condition.

5. The motor of claim 1 or 2, wherein

a debug window is disposed on said side wall or at the bottom wall of said control box; and

a sealing cover is disposed on said debug window.

6. The motor of claim 1 or 2, wherein

a rotary dip switch is disposed at the bottom wall of said control box;

said rotary dip switch is electrically connected to a lower-layer control board; and

said rotary dip switch controls different functions of the motor.

7. The motor of claim 6, wherein

all heating components on said power board face upwards;

a rectifier is tightly attached to a flange on said side wall;

an intelligent power module chip (IPM) on said circuit board is tightly attached to the bottom wall of said control box; and

said control box is made of aluminum.

8. The motor of claim 1 or 2, wherein

said hole is a screw hole; and

said screw hole is sealed via a plastic nut, and a sealing ring.

9. The motor of claim 3, wherein

an opening is disposed at the bottom wall of said control box, and operates to receive an LED;

said LED is electrically connected to said control board;

multiple protruding parts are disposed at the bottom wall of said control box; and

a sealing washer is disposed between said control box and said lower end cover.

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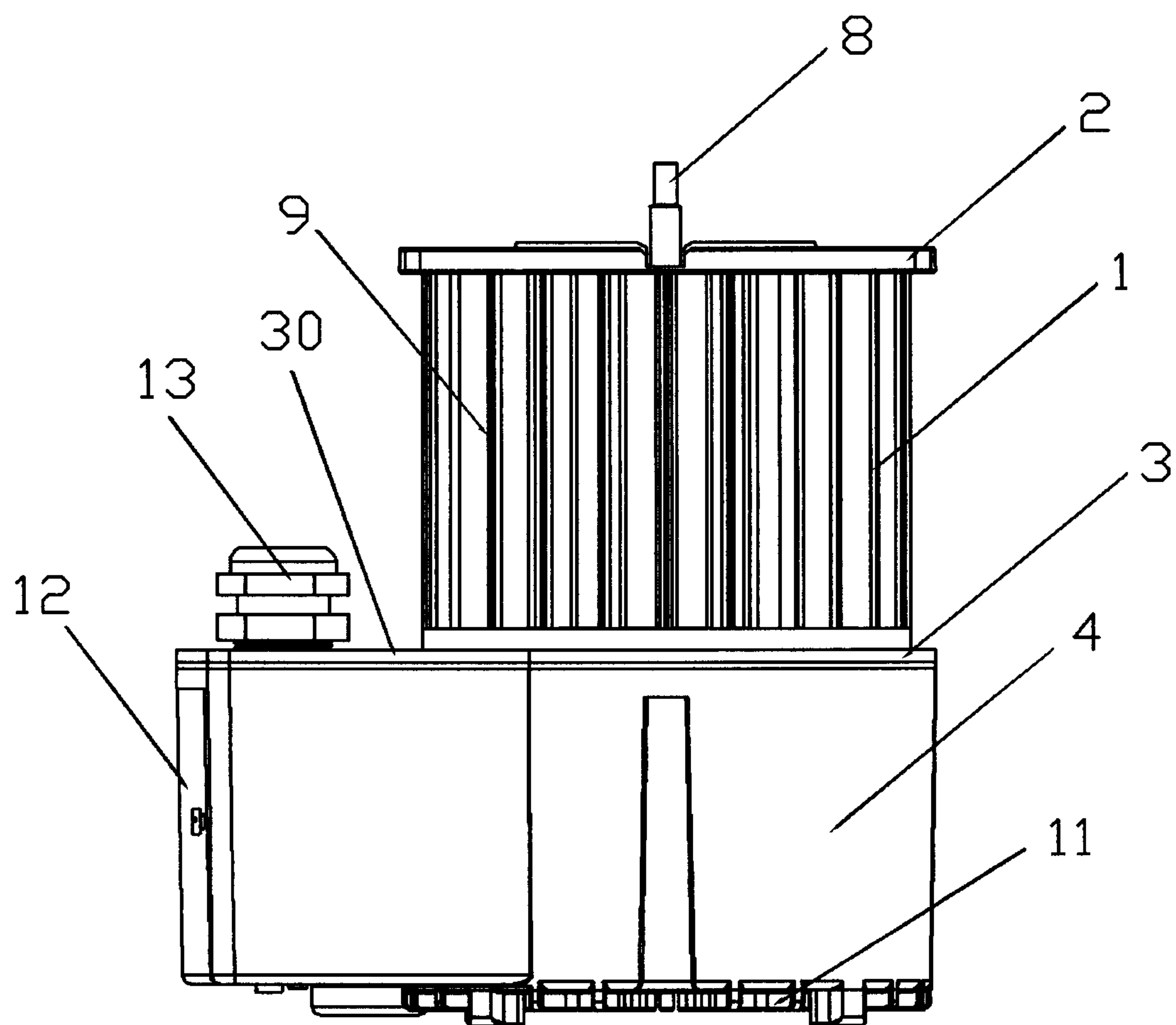


FIG. 1

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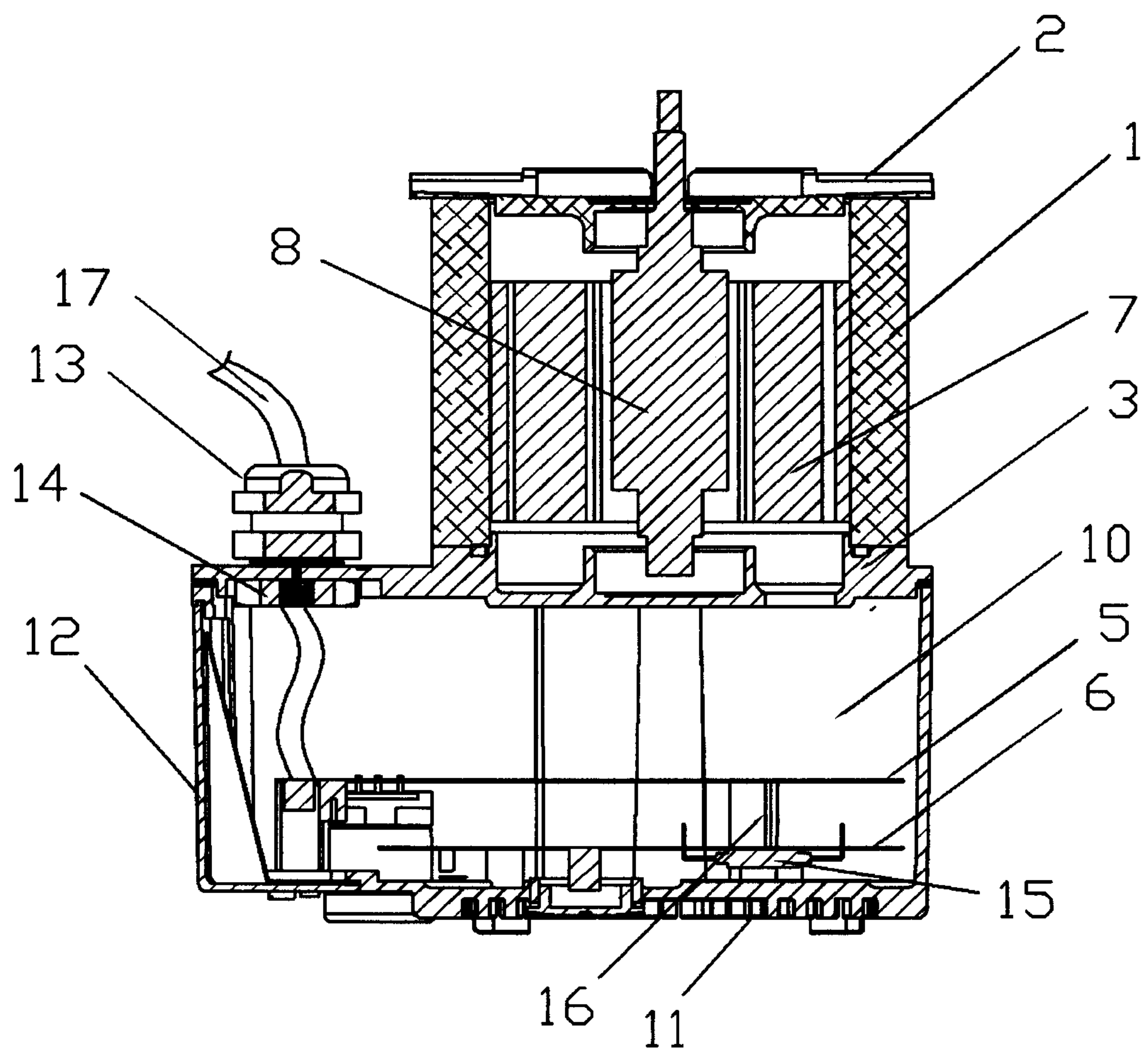


FIG. 2

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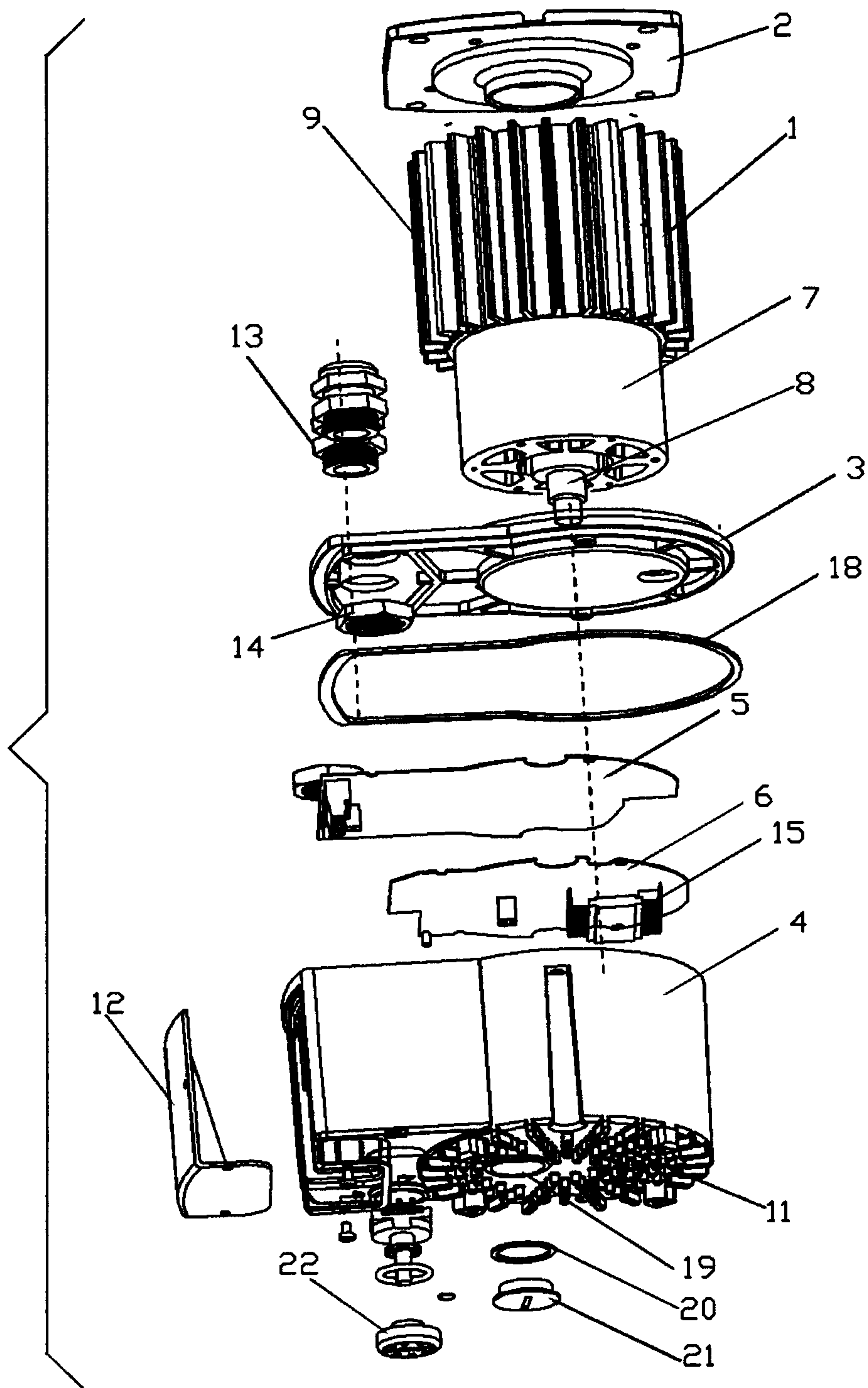


FIG. 3

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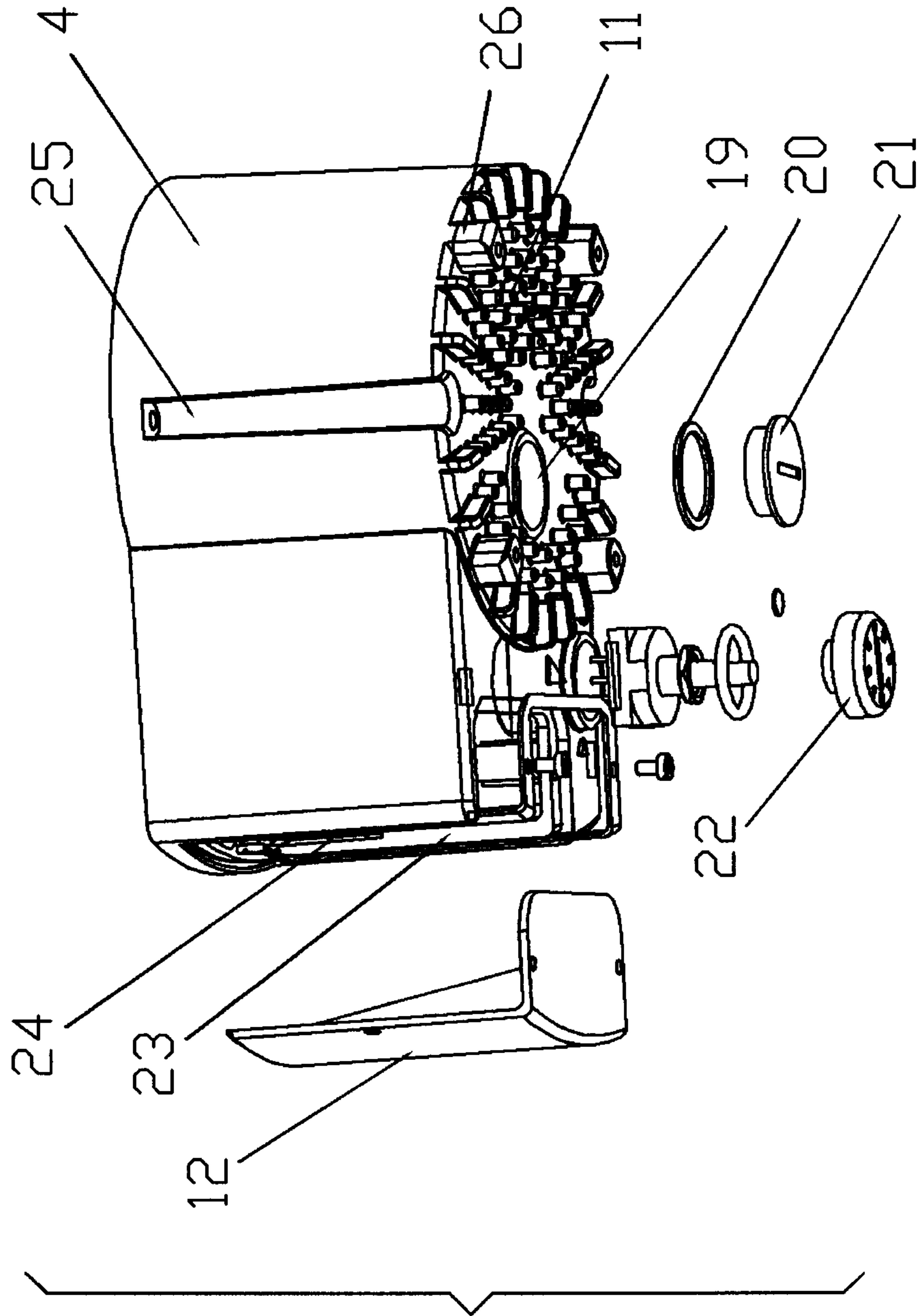
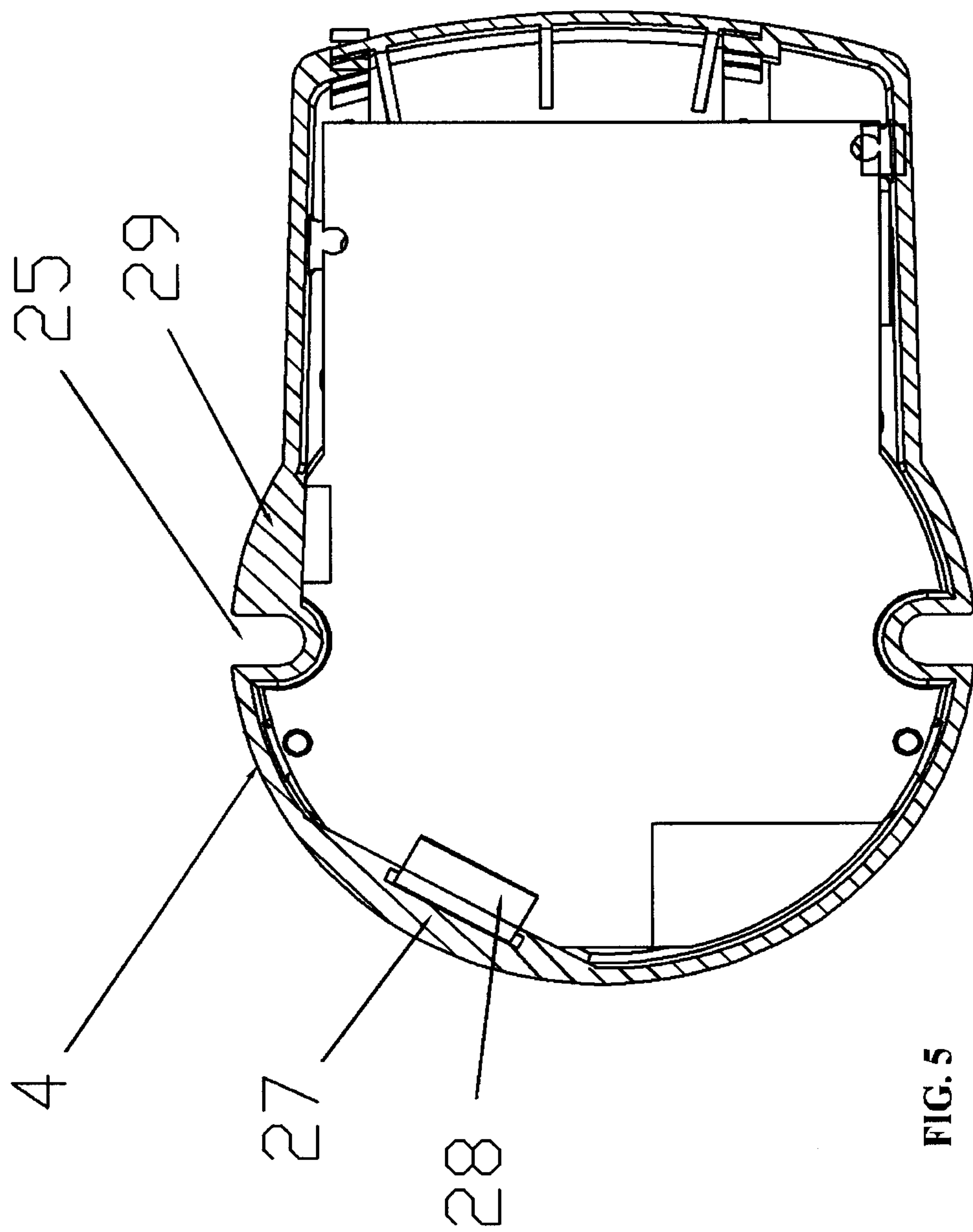


FIG. 4

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6/6

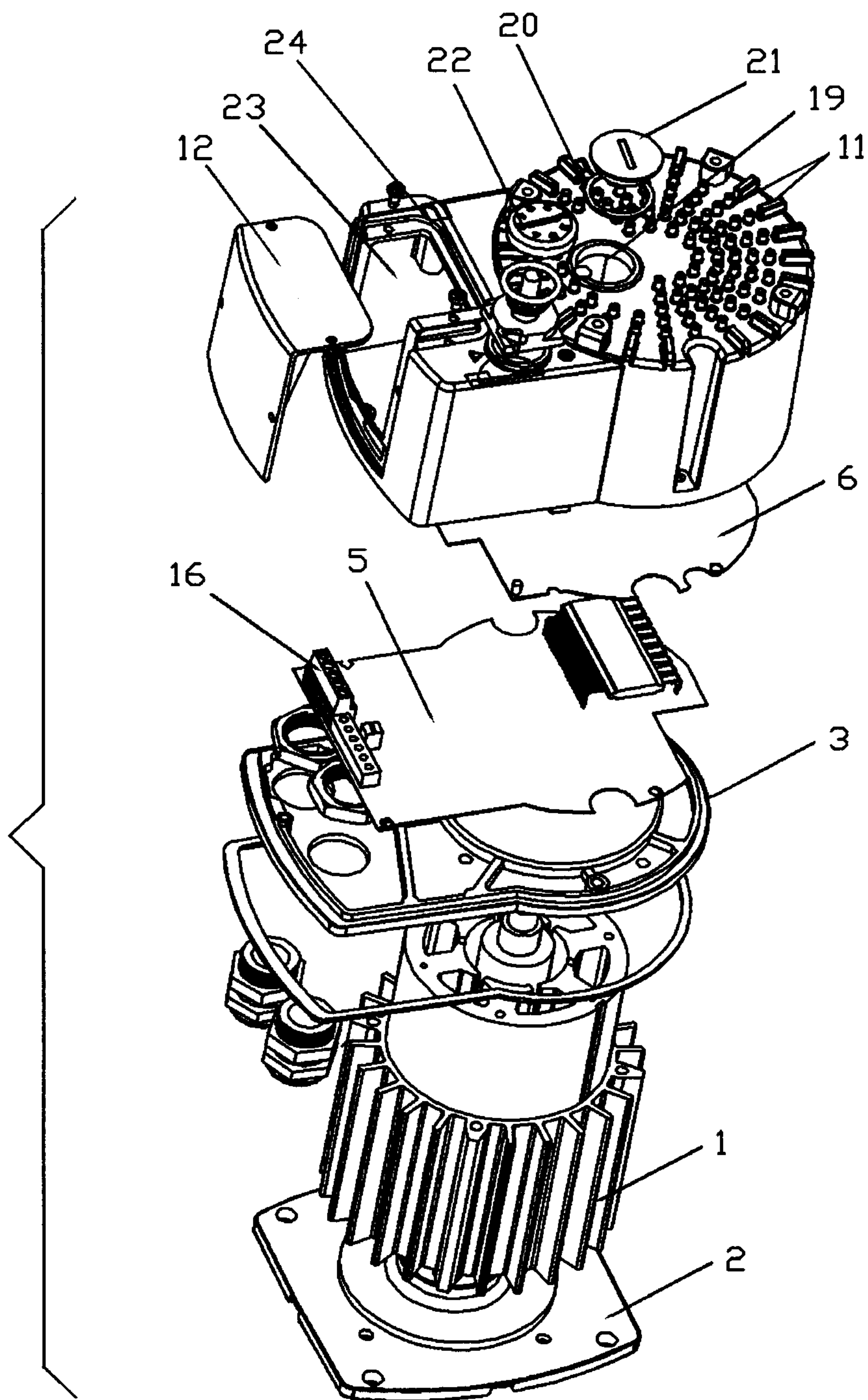


FIG. 6

