(19) Europäisches Patentamt
European Patent Office
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(11) **EP 4 474 105 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
11.12.2024 Bulletin 2024/50

(21) Application number: **23178049.5**

(22) Date of filing: **07.06.2023**

(51) International Patent Classification (IPC):
B24B 23/03 *(2006.01)*

(52) Cooperative Patent Classification (CPC):
B24B 23/03; B24B 47/26

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
KH MA MD TN

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(54) **RANDOM ORBITAL SANDING TOOL**

(57) A random orbital sanding tool (30) includes a power motor (31), a driving spindle (32) connected to the power motor (31), an eccentric block (33) connected to the driving spindle (32), a tool holder (34) disposed on the eccentric block (33), and a sanding pad (35) connected to the tool holder (34) and indirectly driven by the power motor (31). The random orbital sanding tool (30) includes a friction ring (37) disposed on the tool holder (34), the friction ring (37) contacts a surface of the eccentric block (33) facing the sanding pad (35), the friction ring (37) stops rotation of the tool holder (34) and the sanding pad (35) by a friction force exerting on the surface of the eccentric block (33) when the power motor (31) stops operation, the friction ring (37) includes a base part (371) protruding into a gap between the tool holder (34) and the eccentric block (33), a sleeve part (372) diverged and extended from the base part (371).

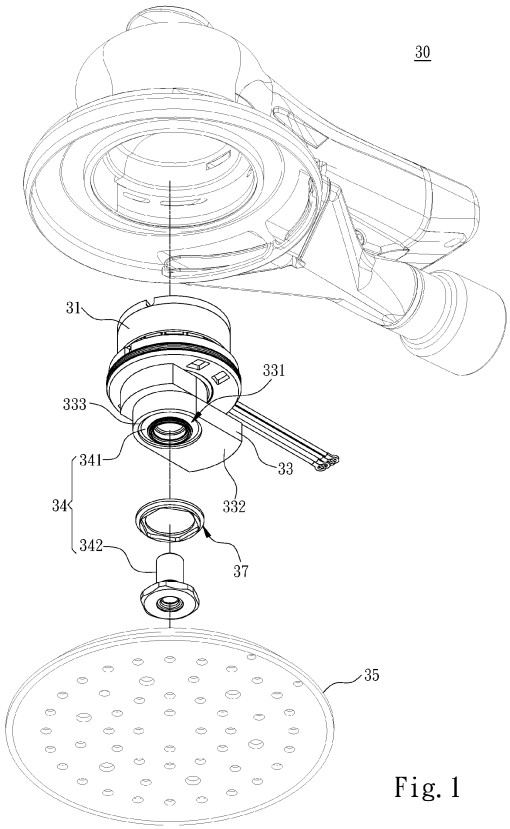

Fig. 1

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Description

FIELD OF THE INVENTION

[0001] The invention relates to a random orbital sanding tool, and more particularly to a random orbital sanding tool equipped with a friction ring for braking a sanding pad.

BACKGROUND OF THE INVENTION

[0002] Random orbital sander is composed of a balancer (commonly known as eccentric block) connected with a spindle of a power motor. The balancer is provided with a bearing housing, the bearing housing is provided for a tool holder (also called bearing) to dispose therein, a centerline of the bearing housing is parallel to but not coaxial with a centerline of the spindle of the power motor, that is, there is an eccentric distance between the two centerlines. In addition, a rotating spindle is disposed at a center of the bearing, and a sanding pad of the random orbital sander is connected to the rotating spindle through locking screws, so that an axis of the sanding pad and an axis of the power motor are also parallel to but not coaxial with each other. The eccentric distance between the two axes indicates that the sanding pad and the power motor are eccentrically linked with each other. Since the sanding pad is connected with the balancer via the bearing, the sanding pad is capable of revolving freely instead of being hard-linked with the power spindle.

[0003] When the power motor revolves, the motor spindle drives the balancer to revolve synchronously, and drives the sanding pad to revolve through the balancer. At this point, the sanding pad will produce two different motions: the first one is that the sanding pad maintains the eccentric distance from the spindle of the motor and revolves around the motor spindle, the orbital motion that revolves around the motor spindle is called "orbital revolution", and the revolving speed is synchronized with the revolving speed of the motor spindle and the revolving speed of the balancer.

[0004] The second is that the sanding pad revolutes on its own axis, which is called "rotation". The reason for rotation of the sanding pad is that the sanding pad is eccentrically linked to the motor spindle, and the sanding pad is capable of revolving freely on the bearing. When the sanding pad revolutes orbitally around the motor spindle, the inner and outer sides of the sanding pad receive different inertial forces. The outer part is farther away from the axis than the inner part, so the inertial force received is larger, and the sanding pad generates rotational motion along the orbital revolution direction. The rotational speed is mainly affected by the eccentric distance between the sanding pad axis and the motor axis. The larger the eccentric distance, the higher the rotational speed, and the smaller the eccentric distance, the lower the rotational speed.

[0005] Take a 5 mm random orbital sander (with an eccentricity of 2.5 mm) equipped with a 6" sanding pad as an example. When the motor spindle revolves at 10,000 rpm, the sanding pad performs a motion of orbital revolution with a diameter of 5 mm around the motor spindle at a position 2.5 mm away from the motor spindle. Under no-load conditions, the sanding pad also performs an eccentric rotational motion at about 5500 rpm at the same time. When the random orbital sander performs sanding, the friction force produced by a sanded object contacting the sanding pad will cause the rotational motion speed of the sanding pad to decrease. The heavier the load on the power tool, the greater the drop in the rotational speed of the sanding pad. For example, the rotational speed of the sanding pad is about 300 ~ 400 rpm under light load, and the rotational speed of the sanding pad is about 150 ~ 300 rpm under heavy load.

[0006] When the power motor stops revolving, the kinetic energy stored in the balancer during the previous revolving will drive the balancer to continue revolving for several seconds until the stored kinetic energy is consumed. At this point, the orbital revolution motion of the sanding pad stops. Take a 6" sanding pad mounted on a random orbit sander with an eccentric distance of 2.5 mm (diameter of revolutional orbit being 5 mm) as an example. When the motor stops revolving, the sanding pad will continue to revolve for 9 to 12 seconds before stopping completely. Under specific use conditions, when the random orbital sander is required to stop the power motor from operating, the sanding pad must stop revolving in a short time (1-3 seconds), and therefore it is required to install a brake mechanism on the tool.

[0007] The current main braking means is to dispose an elastic rubber ring on a windshield (or a shell) of the random orbital sander, one side of the elastic rubber ring is fixed on the windshield, and another side of the elastic rubber ring is pressed against the surface of the sanding pad by its own elasticity. Because the windshield is fixed and does not revolves, when the power motor is not revolving, the sanding pad is pressed by the elastic rubber ring and is prevented from moving. When the power motor is activated to revolve, force of the power motor exceeds the frictional force of the elastic rubber ring pressing on the sanding pad, it will be able to drag the sanding pad to revolve. When the power motor stops running, the sanding pad loses the dragging power of the power motor, and is affected by the frictional force generated by the elastic rubber ring to stop revolving in a short time. Related patents are: TWM279440, TWM574093, CN2858182Y, CN108290265B, CN213136241U, CN103813884B, CN1088001C, CN206393407U, CN110594316A, US5018314, US5317838, US5384984, US5392568, US5807169, US6503133, US6527631, US7104873, US7270598, US7371150, US10046433, US2010062695, US20220126417, JP4061053B2, WO2004030864, GB2359266.

[0008] However, if the elastic rubber ring drags and rubs on the surface of the sanding pad over a long duration, the elastic rubber ring will wear out soon and lose

its function. Furthermore, when the power motor is running, the elastic rubber ring keeps pressing on the sanding pad, which will not only increase the load of the power motor, reduce the revolving speed of the power motor and the revolutional speed of the sanding pad, but also reduce the rotational speed of the sanding pad, thus affecting the sanding efficiency and sanding quality.

[0009] In addition to the above patents, TWM279441 and US6110028 also disclose other forms of braking for the sanding pad, wherein when a grinding disc (i.e., the sanding pad) of TWM279441 rotates, due to centrifugal force, an elastic brake fin will be stretched to be horizontal. A friction part on the brake fin leaves a counterweight crankshaft part. When the polishing machine stops working, the brake fin will rebound upwards and abut against the counterweight crankshaft part. Although the design can reduce the power loss caused by braking on the sanding pad, the brake fin has the problem of unreliable restoration and affecting the braking effect, and the friction part can only restore the contact with the counterweight crankshaft part after the centrifugal force is reduced to a certain extent, causing a delay in the brake fin to apply friction to the counterweight crankshaft part, it means prolonging the stop time of the sanding pad, which is not conducive to implementation of the aforementioned specific use conditions.

SUMMARY OF THE INVENTION

[0010] A main object of the invention is to solve the problem caused by a sanding pad rotates when a power motor of a conventional random orbital sanding tool stops rotation.

[0011] In order to achieve the above object, the invention provides a random orbital sanding tool including a power motor, a driving spindle connected to the power motor, an eccentric block connected to the driving spindle, a tool holder disposed on the eccentric block, and a sanding pad connected to the tool holder and indirectly driven by the power motor. The random orbital sanding tool includes a friction ring disposed on the tool holder, the friction ring contacts a surface of the eccentric block facing the sanding pad, the friction ring stops a rotation of the tool holder and the sanding pad by a friction force exerting on the surface of the eccentric block when the power motor stops operation, the friction ring includes a base part protruding into a gap between the tool holder and the eccentric block, a sleeve part diverged and extended from the base part, and a friction part connected to the base part and constantly in contact with the surface of the eccentric block.

[0012] In one embodiment, the eccentric block includes an accommodating slot provided for disposal of the tool holder therein, and the friction part is in constant contact with an edge of a slot opening of the accommodating slot.

[0013] In one embodiment, a level height of the friction part in a free state is higher than that of the base part.

[0014] In one embodiment, the friction part includes a slope extended obliquely toward the eccentric block.

[0015] In one embodiment, the friction part is disc-shaped.

[0016] In one embodiment, a level height of a bottom edge of the friction ring is higher than that of the tool holder.

[0017] In one embodiment, the friction ring is made of rubber.

[0018] In one embodiment, the friction ring is recessed at a junction between the base part and the friction part.

[0019] In one embodiment, the friction ring includes a ring inner space, and a shape of the ring inner space in the base part is different from that in the sleeve part.

[0020] In one embodiment, the friction part is formed by a plurality of columns respectively connected to the base part and disposed at intervals.

[0021] In one embodiment, bottom edges of the plurality of columns are connected to the sleeve part.

[0022] In one embodiment, each of the plurality of columns is one of the following: cylinder and polygonal column.

[0023] Through the foregoing implementation, the invention has the following characteristics compared with the prior art: when the random orbital sanding tool of the invention stops the power motor from operating through the friction ring provided on the tool holder, the sanding pad is capable of stopping rotational motion quickly. In addition, the friction ring of the invention has a simple structure and is very easy to replace, and the friction ring is a small part with a relatively low cost.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024]

FIG. 1 is a perspective exploded view of structures of the invention.

FIG. 2 is a perspective exploded view of partial structures of the invention.

FIG. 3 is a cross-sectional view of partial structures of the invention.

FIG. 4 is a perspective structural view of a first embodiment of a friction ring of the invention.

FIG. 5 is a cross-sectional structural view of the first embodiment of the friction ring of the invention.

FIG. 6 is a perspective structural view of a second embodiment of the friction ring of the invention.

FIG. 7 is a perspective structural view of a third embodiment of the friction ring of the invention.

FIG. 8 is a schematic structural view of the invention equipped with an air flow generator.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0025] The detailed description and technical content of the invention are described below with reference to

the accompanying drawings.

[0026] Please refer to FIG. 1, FIG. 2 and FIG. 3, the invention provides a random orbital sanding tool 30, the random orbital sanding tool 30 includes a power motor 31, a driving spindle 32 connected to the power motor 31, an eccentric block 33 connected to the driving spindle 32, a tool holder 34 disposed on the eccentric block 33, and a sanding pad 35 connected to the tool holder 34. The power motor 31 can be implemented pneumatically or electrically. The driving spindle 32 drives the eccentric block 33 to rotate. The eccentric block 33 includes an accommodating slot 331 provided for disposal of the tool holder 34 therein. The tool holder 34 is disposed in the accommodating slot 331, the tool holder 34 includes a plurality of bearings 341 disposed in the accommodating slot 331, and a sanding pad connector 342 assembled with the bearings 341. A gap 36 is formed between the tool holder 34 and the eccentric block 33. When the gap 36 is not covered, an inner space of the accommodating slot 331 communicates with an outer area (which can be a space defined by a grinding shield of the random orbital sanding tool 30). On the other hand, the tool holder 34 is assembled with the sanding pad 35 through the sanding pad connector 342, and the tool holder 34 does not restrict rotation of the sanding pad 35, that is, the sanding pad 35 can still rotate when the power motor 31 is not rotating. The sanding pad 35 is indirectly driven by the power motor 31. During rotation of the power motor 31, the sanding pad 35 not only revolutes orbitally relative to the driving spindle 32 but also rotates.

[0027] Please refer to FIG. 3, FIG. 4 and FIG. 5, the random orbital sanding tool 30 of the invention includes a friction ring 37 disposed on the tool holder 34. Specifically, the friction ring 37 is disposed on the sanding pad connector 342. The friction ring 37 includes a base part 371 protruding into the gap 36, a sleeve part 372 diverged and extended from the base part 371, and a friction part 373 connected to the base part 371. In one embodiment, the friction ring 37 is a structure integrally formed and made of rubber. The friction ring 37 is disposed on the tool holder 34 with the sleeve part 372, the base part 371 contacts one side of the sanding pad connector 342 of the tool holder 34, and the friction part 373 is in constant contact with a surface 332 of the eccentric block 33.

[0028] When the power motor 31 of the random orbital sanding tool 30 is started, the eccentric block 33 rotates with the power motor 31. When rotation of the eccentric block 33 makes the sanding pad 35 bear a force larger than a frictional force the friction part 373 exerting on the surface 332, the sanding pad 35 rotates. When the power motor 31 is controlled to stop operation, the eccentric block 33 stops rotating with the power motor 31, and the sanding pad 35 continues to rotate due to inertial force. Although the friction ring 37 still rotates with the sanding pad 35 at the moment, the frictional force generated by the friction part 373 constantly contacting the surface 332 quickly stops the tool holder 34 from rotating, and the sanding pad 35 is braked to stop rotating.

[0029] The friction ring 37 of the invention can be a replaceable part, and a timing for replacement is when a braking force provided by the friction ring 37 declines obviously, or when the friction ring 37 is structurally damaged. A structure of the friction ring 37 of the invention is simple and very convenient to replace, and the friction ring 37 is a small part with a relatively low cost. In addition, the structure of the friction ring 37 of the invention is smaller than conventional ones.

[0030] Please refer to FIG. 3. In one embodiment, the friction part 373 is in constant contact with an edge of a slot opening 333 of the accommodating slot 331, and a structural length of the friction part 373 can be prevented from being too long by such arrangement, and the friction part 373 disconnects to the eccentric block 33 can also be avoided when the tool holder 34 rotates.

[0031] Please refer to FIG. 5, the friction ring 37 is not directly formed on the sanding pad connector 342 of the tool holder 34. In one embodiment, if observing that the friction ring 37 is not assembled with the tool holder 34, a level height of the friction part 373 in a free state is higher than that of the base part 371. When the friction ring 37 is assembled with the tool holder 34, the friction part 373 is pressed due to a distance between the sleeve part 372 and the eccentric block 33, thus ensuring that the friction part 373 is in constant contact with the surface 332 of the eccentric block 33. In addition, in one embodiment, a level height of a bottom edge of the friction ring 37 is higher than that of a bottom edge of the tool holder 34, that is, the friction ring 37 does not contact with the sanding pad 35.

[0032] Please refer to FIG. 3, FIG. 4 and FIG. 5, in one embodiment, the friction part 373 includes a slope extended obliquely toward the eccentric block 33. Compared with a design of the friction part 373 extended horizontally, a design of the friction part 373 extended obliquely is more capable of avoiding the problem of an edge of the friction part 373 sagged. In one embodiment, the friction part 373 is disc-shaped. The friction ring 37 provides the brake force on the sanding pad 35, and also serves as a dust-proof structure to the gap 36 by a continuous structure with the sleeve part 372, to block external dust or fine matters produced by grinding from entering the accommodating slot 331 through the gap 36, preventing the problem that the tool holder 34 becomes hot or does not revolve smoothly due to dust. Further, the base part 371 and the sleeve part 372 extend in different directions to contact different surfaces of the sanding pad connector 342, respectively. A divergent point between the base part 371 and the sleeve part 372 is regarded as a dust-proof point to block fine matters produced during grinding from entering the accommodating slot 331 through a small gap between the sleeve part 372 and the sanding pad connector 342. Further, in one embodiment, the friction ring 37 is recessed at a junction between the base part 371 and the friction part 373 (as indicated by 374 in FIG. 4 and FIG. 5) in order to reduce interference from the friction ring 37 and the eccentric

block 33.

[0033] Please refer to FIG. 6 and FIG. 7, in one embodiment, the friction part 373 is formed by a plurality of columns 375 connected to the base part 371 and disposed at intervals, respectively. Surfaces of the plurality of columns 375 are in constant contact with the surface 332 of the eccentric block 33. Further, each of the plurality of columns 375 can be one of the following: a cylinder (as shown in FIG. 6) and a polygonal column (as shown in FIG. 7). In this embodiment, a frictional force of the friction ring 37 on the eccentric block 33 can be determined by setting a contact area between the surfaces of the plurality of columns 375 and the surface 332 of the eccentric block 33, thereby reducing degrees of dynamic influence of the friction ring 37 on the sanding pad 35. Moreover, bottom edges of the plurality of columns 375 are connected to the sleeve part 372.

[0034] Please refer to FIG. 4 and FIG. 5, in one embodiment, the friction ring 37 includes a ring inner space 376 defined by the structure of the friction ring 37, and the ring inner space 376 is not in a single shape, a shape of the ring inner space 376 is different according to the structure of the friction ring 37. Specifically, the shape of the ring inner space 376 in the base part 371 is different from that in the sleeve part 372.

[0035] Please refer to FIG. 8, in one embodiment, the random orbital sanding tool 30 further includes an air flow generator 38 attached on the eccentric block 33.

Claims

1. A random orbital sanding tool (30), comprising a power motor (31), a driving spindle (32) connected to the power motor (31), an eccentric block (33) connected to the driving spindle (32), a tool holder (34) disposed on the eccentric block (33), and a sanding pad (35) connected to the tool holder (34) and indirectly driven by the power motor (31), wherein the random orbital sanding tool (30) comprises a friction ring (37) disposed on the tool holder (34), the friction ring (37) contacts a surface of the eccentric block (33) facing the sanding pad (35), the friction ring (37) stops rotation of the tool holder (34) and the sanding pad (35) by a friction force exerting on the surface of the eccentric block (33) when the power motor (31) stops operation; the friction ring (37) comprises a base part (371) protruding into a gap between the tool holder (34) and the eccentric block (33), a sleeve part (372) diverged and extended from the base part (371), and a friction part (373) connected to the base part (371) and constantly in contact with the surface of the eccentric block (373).

2. The random orbital sanding tool (30) as claimed in claim 1, wherein the eccentric block (33) comprises an accommodating slot (331) provided for disposal of the tool holder (34) therein, and the friction part (373) is in constant contact with an edge of a slot opening (333) of the accommodating slot (331).

3. The random orbital sanding tool (30) as claimed in claim 1 or claim 2, wherein a level height of the friction part (373) in a free state is higher than that of the base part (371).

4. The random orbital sanding tool (30) as claimed in claim 3, wherein the friction part (373) extends obliquely toward the eccentric block.

5. The random orbital sanding tool (30) as claimed in claim 4, wherein a level height of a bottom edge of the friction ring (37) is higher than that of the tool holder (34).

6. The random orbital sanding tool (30) as claimed in claim 4 or 5, wherein the friction ring (37) is made of rubber.

7. The random orbital sanding tool (30) as claimed in one of claims 3-5, wherein the friction part (373) is disc-shaped.

8. The random orbital sanding tool (30) as claimed in claim 1 or claim 2, wherein the friction ring (37) is recessed at a junction between the base part (371) and the friction part (373).

9. The random orbital sanding tool (30) as claimed in claim 1 or claim 2, wherein the friction ring (37) comprises a ring inner space (376), and a shape of the ring inner space (376) in the base part (371) is different from that in the sleeve part (372).

10. The random orbital sanding tool (30) as claimed in claim 1 or claim 2, wherein a level height of a bottom edge of the friction ring (37) is higher than that of the tool holder (34).

11. The random orbital sanding tool (30) as claimed in claim 1 or claim 2, wherein the friction part (373) is formed by a plurality of columns (375) connected to the base part (371) and disposed at intervals, respectively.

12. The random orbital sanding tool (30) as claimed in claim 11, wherein bottom edges of the plurality of columns (375) are connected to the sleeve part (372).

13. The random orbital sanding tool (30) as claimed in claim 11 or 12, wherein each of the plurality of columns (375) is one of the following: cylinder and polygonal column.

14. The random orbital sanding tool (30) as claimed in

one of claims 11-13, wherein a level height of a bottom edge of the friction ring (37) is higher than that of the tool holder (34).

15. The random orbital sanding tool (30) as claimed in one of claims 11-14, wherein the friction ring (37) is made of rubber.

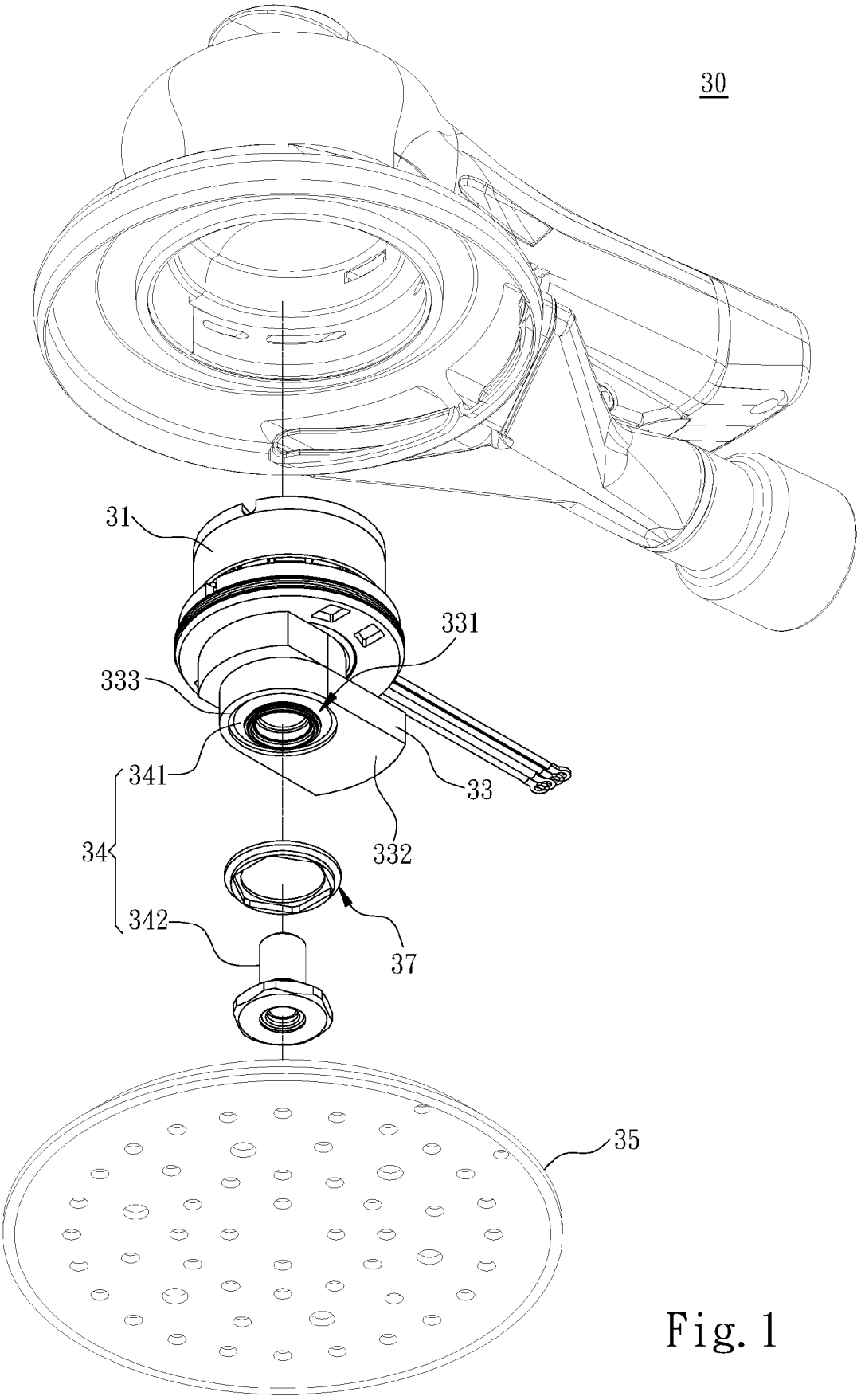

Fig. 1

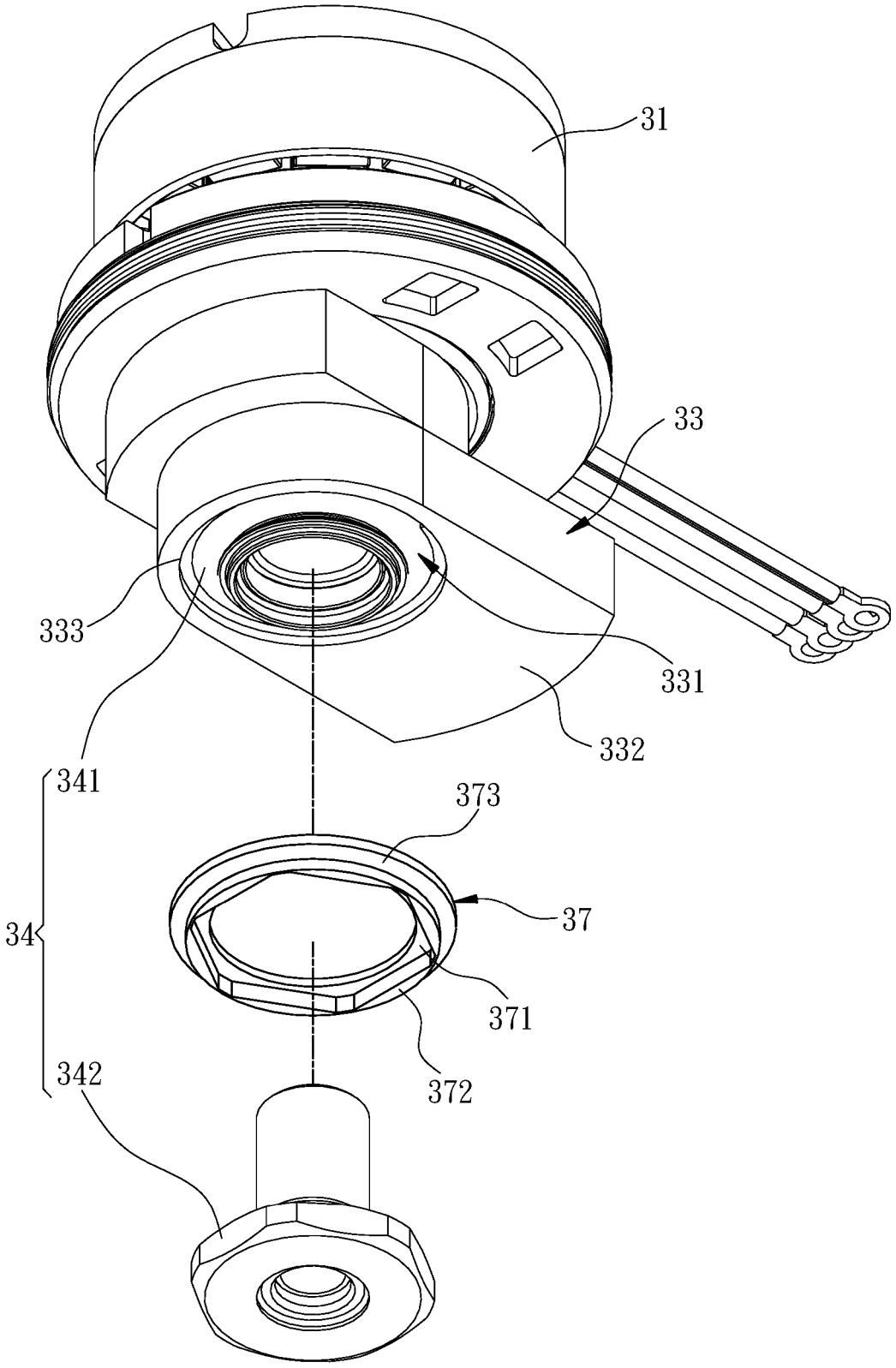

Fig. 2

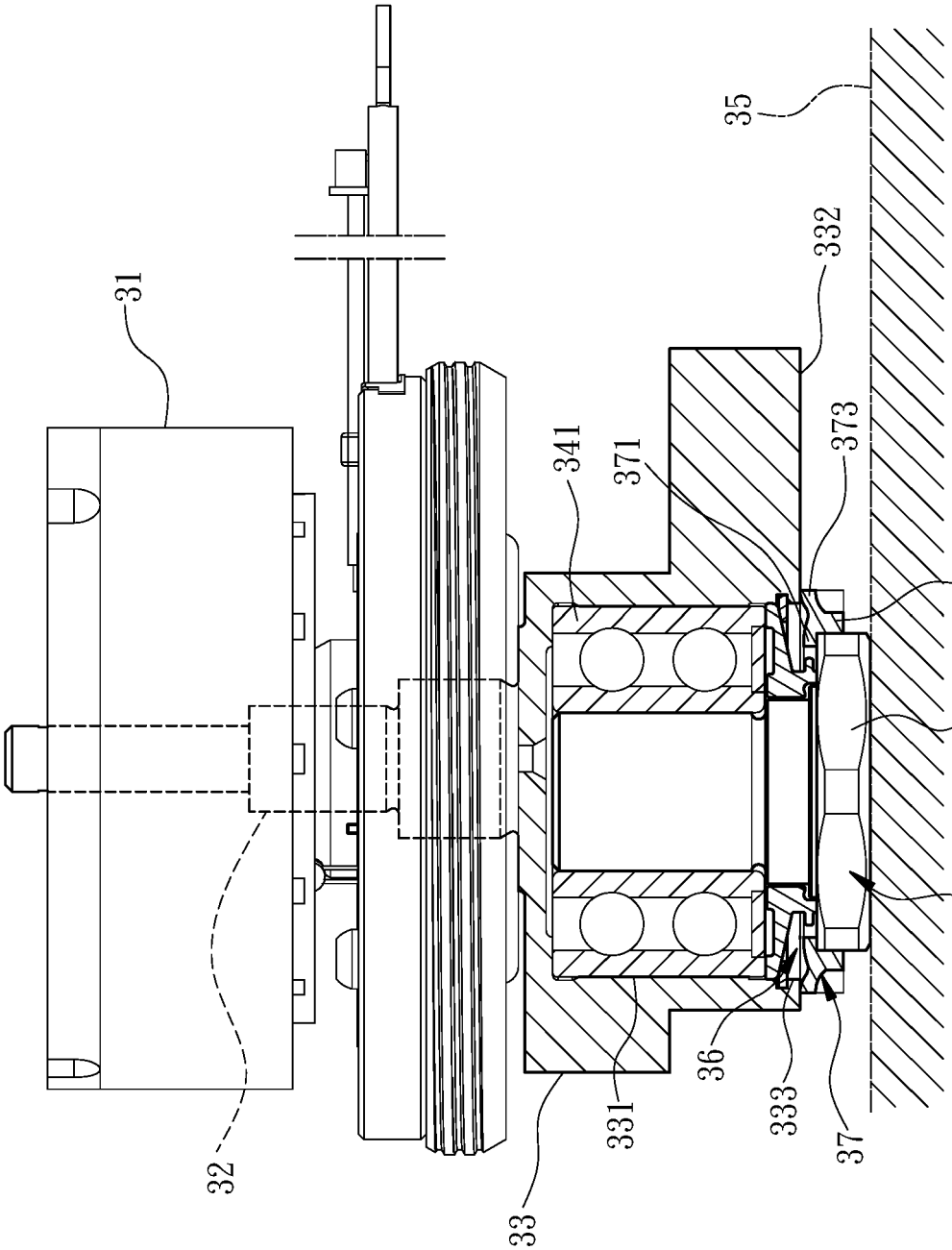

Fig. 3

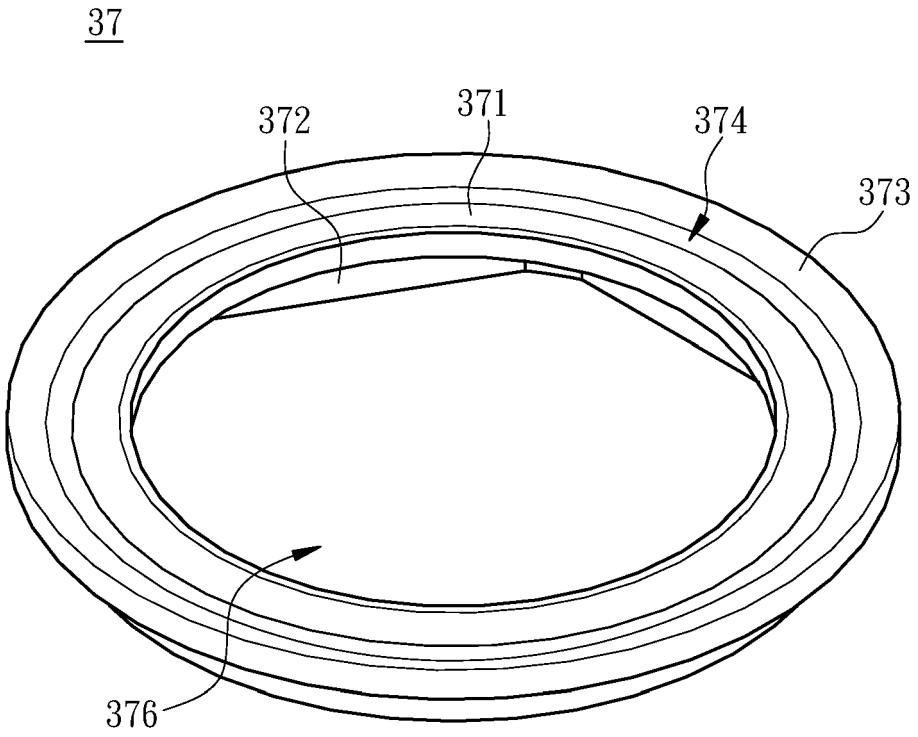

Fig. 4

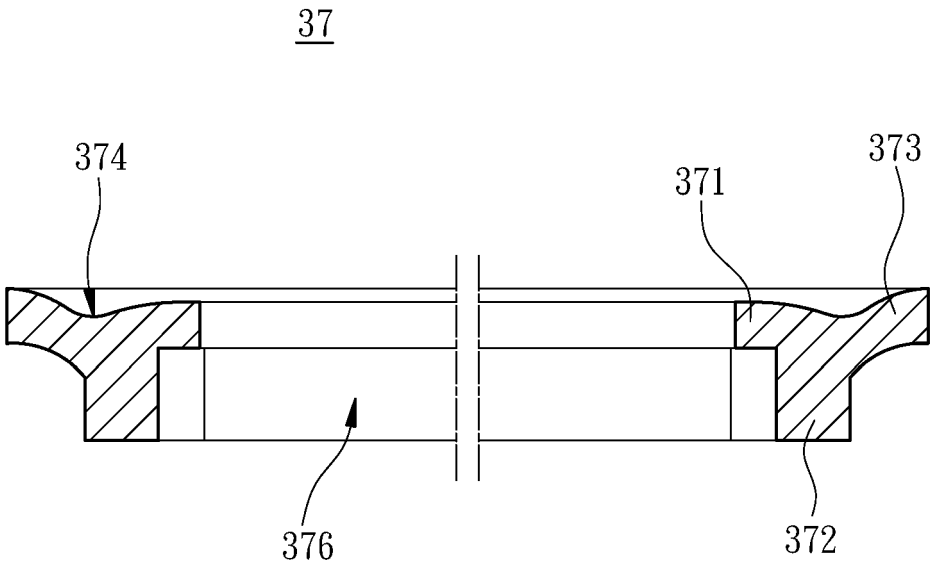

Fig. 5

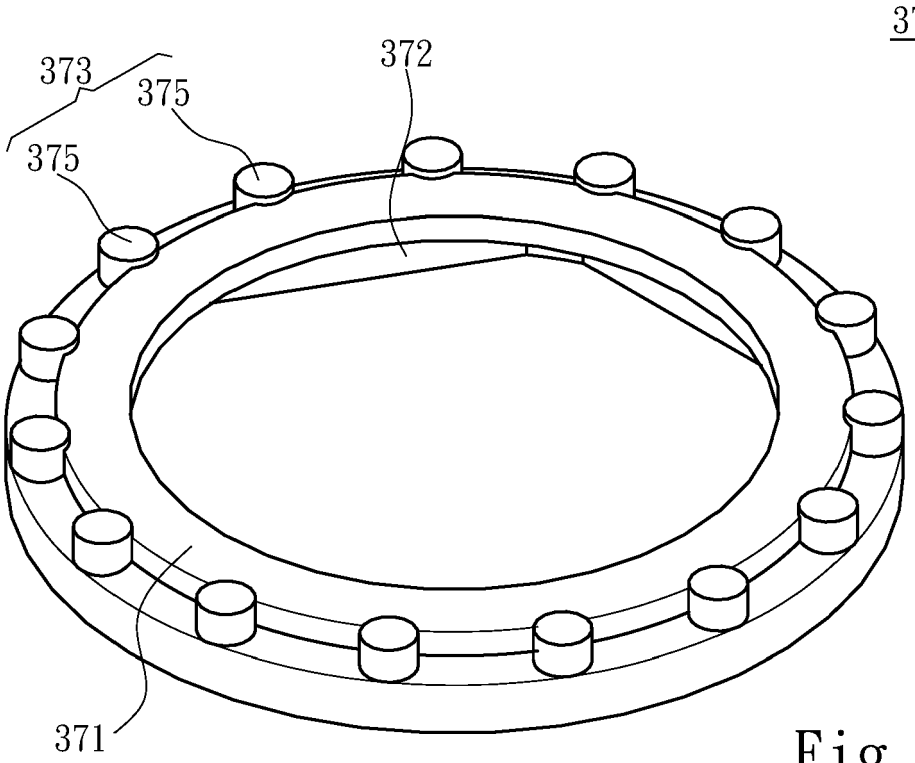

Fig. 6

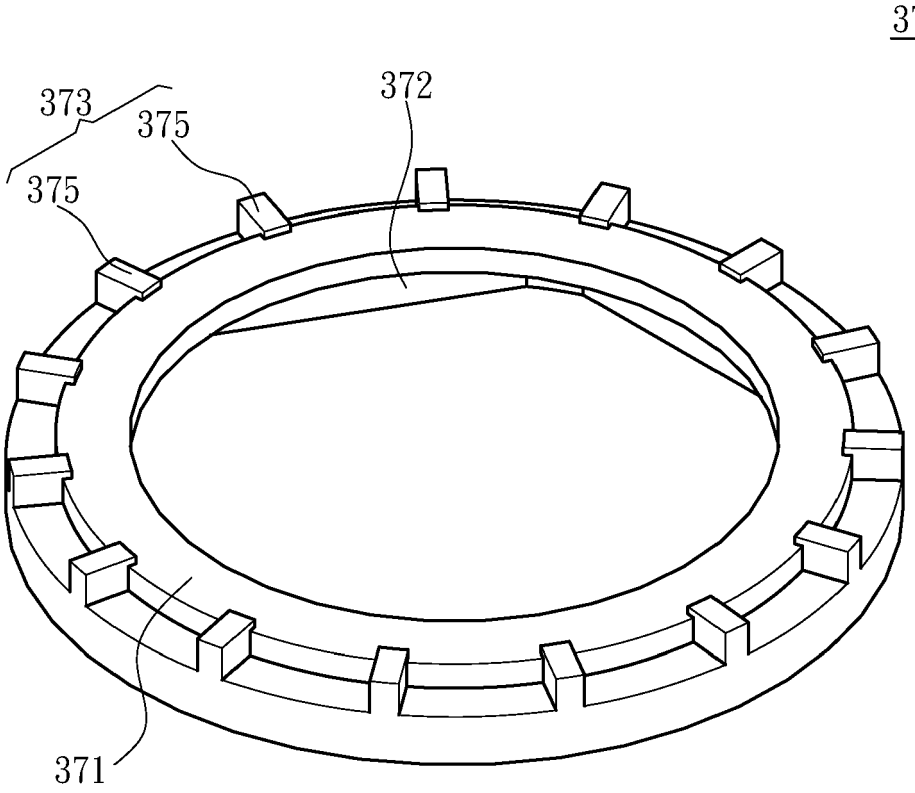

Fig. 7

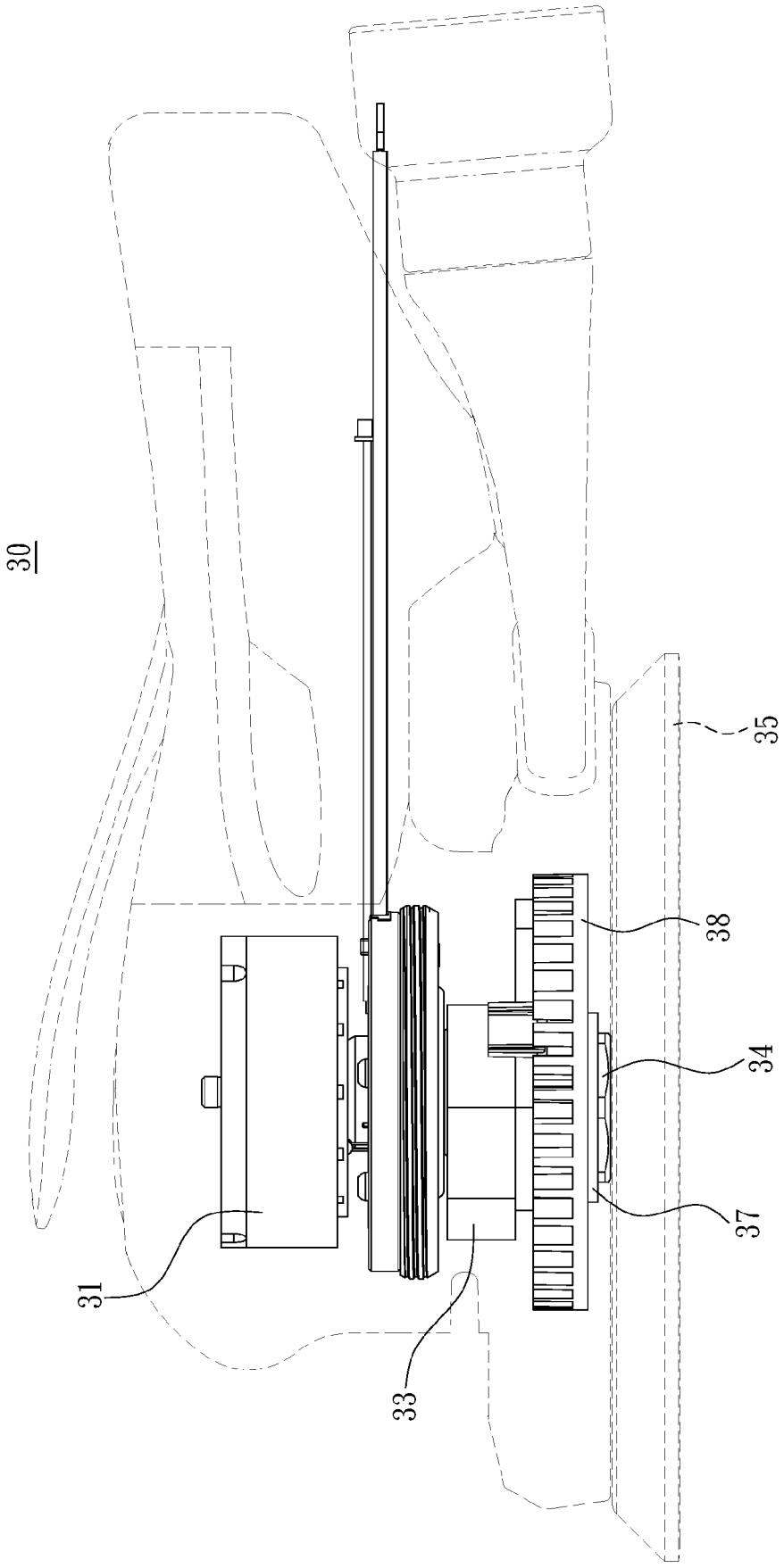

Fig. 8

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EUROPEAN SEARCH REPORT

Application Number
EP 23 17 8049

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	31 October 2023	Arhire, Irina

CATEGORY OF CITED DOCUMENTS

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31-10-2023

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

REFERENCES CITED IN THE DESCRIPTION

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