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(54) MULTI-SANDER KIT

(57) A multi-sander kit, comprises a multi-sander comprising a casing, an electric motor located in said casing, and a driving shaft driven by said electric motor and protruding out of said casing. An end of said driving shaft is adapted to allow a sanding pad to connect thereto. The casing further comprises an interface adjacent to said end of said driving shaft. The multi-sander kit also comprises a sander attachment which is adapted to be detachably installed to said multisander by connecting said sander attachment to said interface. The sander attachment covers at least partially said driving shaft or said sanding pad when said sander attachment and said sanding pad are installed to said multi-sander.

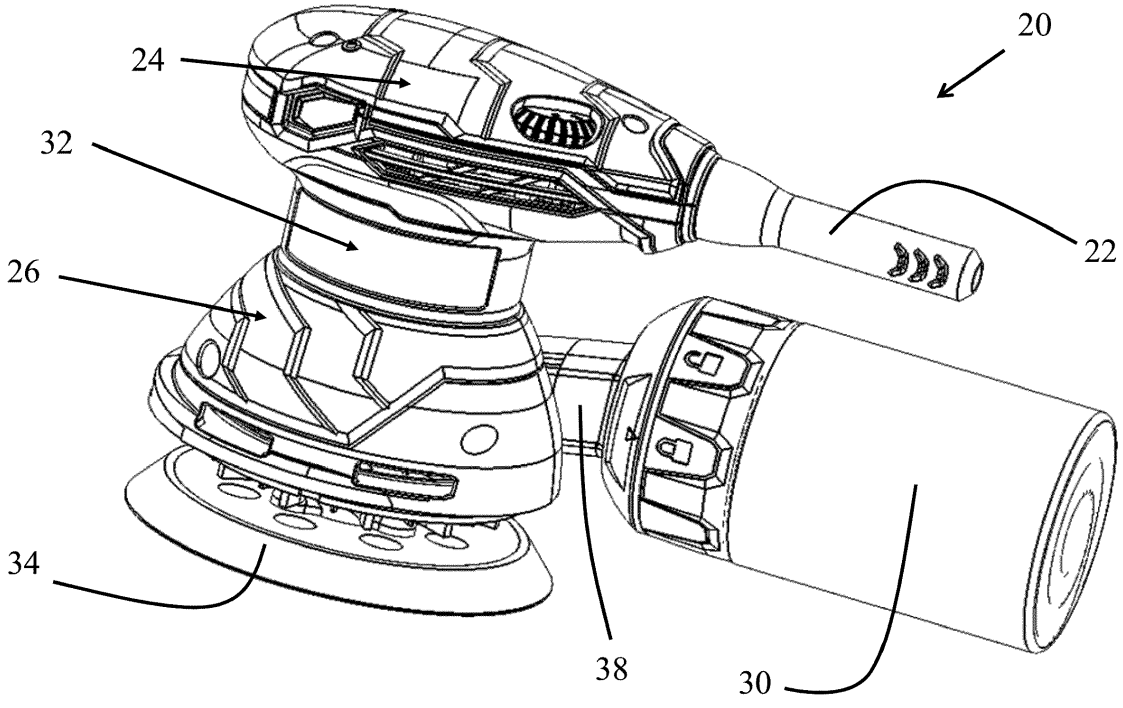

Fig.1

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Description

FIELD OF INVENTION

[0001] This invention relates to electronic power tools, and in particular power tools used to smooth surfaces by abrasion.

BACKGROUND OF INVENTION

[0002] Sanders are used commonly in various applications such as indoor decorations and material processing to smooth surfaces by abrasion with sandpaper. Sanders have a means to attach the sandpaper, for example a sanding pad to which the sandpaper can be adhered or otherwise secured, and a mechanism to move the sandpaper rapidly contained within a housing. There are many different types of electronically powered sanders for different purposes. For example, an orbital sander is used where the sandpaper delivers a random-orbit action for fine sanding or where little material needs to be removed. On the other hands, drywall sanders are used on the drywall and are usually designed with a particular emphasis on dust control to prevent generating a lot of dusts which contaminate the environment.

[0003] However, conventionally sanders made for different purposes are designed and sold separately. For example, existing orbital sanders and drywall sanders are two kinds of products on the market where the user has to purchase both units. The orbital sanders and drywall sanders cannot be used interchangeably. This is because conventional orbital sanders are not suitable to be used on drywall sanding where the drywall dust will damage the sander and the dust will spread around to the environment easily which can cause harm to the user's health.

SUMMARY OF INVENTION

[0004] In the light of the foregoing background, it is an object of the present invention to provide an alternate sander which eliminates or at least alleviates the above technical problems.

[0005] The above object is met by the combination of features of the main claim; the subclaims disclose further advantageous embodiments of the invention.

[0006] One skilled in the art will derive from the following description other objects of the invention. Therefore, the foregoing statements of object are not exhaustive and serve merely to illustrate some of the many objects of the present invention.

[0007] Accordingly, the present invention, in one aspect, is a multi-sander kit containing a multi-sander and a sander attachment. The multi-sander contains a casing, an electric motor located in the casing, and a driving shaft driven by the electric motor and protruding out of the casing. An end of the driving shaft is adapted to allow a sanding pad to connect thereto. The casing further contains an interface adjacent to the end of the driving shaft. The sander attachment is adapted to be detachably installed to the multi-sander by connecting the sander attachment to the interface. The sander attachment covers at least partially the driving shaft or the sanding pad when the sander attachment and the sanding pad are installed to the multi-sander.

[0008] Preferably, the casing further includes a cylindrical portion adjacent to the end of the driving shaft; the interface configured on a circumferential face of the cylindrical portion.

[0009] More preferably, the sander attachment is chosen from the group consisted of a random orbital (RO) attachment and a drywall attachment.

[0010] In one variation, the RO attachment is formed to cover only a part of the sanding pad when the sander attachment and the sanding pad are installed to the multi-sander.

[0011] Preferably, the RO attachment includes a first segment having a substantially arc shape; and a second segment having a substantially arc shape. The first segment and the second segment are adapted to be connected to each other in a head-to-tail manner, so as to circumferentially enclosing at least a part of the sanding pad when the sander attachment and the sanding pad are installed to the multi-sander.

[0012] More preferably, the first segment and the second segment each has a first end and a second end; the first end of the first segment capable of connecting to the first end of the second segment. The second end of the first segment is capable of connecting to the second end of the second segment.

[0013] In one implementation, the first end of the first segment is capable of connecting to the first end of the second segment via a pin-knuckle structure.

[0014] In another implementation, the second end of the first segment is capable of connecting to the second end of the second segment via a latch.

[0015] In one implementation, the interface is first geometric patterns formed on the circumferential face of the cylindrical portion. The first segment and the second segment contain second geometric patterns complementing the first geometric patterns whereby the first segment and the second segment are adapted to connect to the interface.

[0016] Preferably, the first and second geometric patterns contain grooves and protrusions extending along a circumferential direction.

[0017] More preferably, the second geometric patterns comprise at least one protrusion extending inwardly to the center of the sanding pad.

[0018] Most preferably, the second geometric patterns contain a plurality of protrusions, which extend inwardly to different extents, or which have different spans along the circumferential direction.

[0019] In one variation, one of the protrusions is placed between a lower part of the casing and the sanding pad when the sander attachment and the sanding pad are

installed to the multi-sander.

[0020] According to another variation, the drywall attachment is formed to fully cover the sanding pad on a circumferential direction when the sander attachment and the sanding pad are installed to the multi-sander.

[0021] Preferably, the drywall attachment further contains a rim of brush which fully covers the sanding pad on the circumferential direction.

[0022] More preferably, the rim of brush has a larger dimension compared to the sanding pad along the axial direction of the driving shaft.

[0023] In one implementation, the rim of brush contains nylon strip brushes.

[0024] According to one variation, the drywall attachment further includes a first segment having a substantially arc shape, a second segment having a substantially arc shape; and a third segment having a substantially arc shape. The first segment, the second segment and the third segment are adapted to be connected to each other in a head-to-tail manner, so as to fully cover the sanding pad on a circumferential direction when the sander attachment and the sanding pad are installed to the multi-sander.

[0025] Preferably, at least two of the first segment, the second segment and the third segment are connected to each other via a pin-knuckle structure or a hook-tab structure.

[0026] According to another variation, the interface is first geometric patterns formed on the circumferential face of the cylindrical portion. The first segment, the second segment and the third segment contain second geometric patterns complementing the first geometric patterns whereby the first segment, the second segment and the third segment are adapted to connect to the interface.

[0027] Preferably, the first and second geometric patterns contain grooves and protrusions extending along a circumferential direction.

[0028] More preferably, the second geometric patterns contain at least one protrusion extending inwardly to the center of the sanding pad.

[0029] Most preferably, the second geometric patterns contain a plurality of protrusions, which extend inwardly to different extents, or which have different spans along the circumferential direction.

[0030] In one variation, the sanding pad has a substantial truncated cone shape.

[0031] In another variation, the sanding pad has a polygonal cross-sectional shape.

[0032] Preferably, the sanding pad has a rectangular cross-sectional shape.

[0033] There are many advantages to the present invention, as one of the most apparent advantages is that the multi-sander provided in the present invention enables a single sander unit to be used with more than one optional accessory. The interchangeable design of the multi-sander allows the user to change their sander from an orbital sander to a drywall sander or reverse by replacing / attaching / removing the bottom parts. In "orbital sander mode", the sander can be used as a normal sander for sanding wood surface, etc. In "drywall sander mode", there is strip brush surrounding the sanding pad which can help to prevent dust from spreading out to the environment. Such a design is particularly suitable for working on drywall with the sander connected to a suction source, e.g. a vacuum source.

[0034] Another advantage of the present invention is that the user's expense involved in obtaining the sander for multiple purposes can be reduced. A user does not have to buy two separate sander units for different purposes such as drywall sanding and orbital sanding. Rather, the user could according to his requirement purchase the random orbital attachment, the drywall attachment, or both, for installing to the same multi-sander unit. Other types of attachments beside the random orbital attachment and the drywall attachment may also be designed to be used in the multi-sander. From the user's point of view, they do not need to buy a dedicated drywall sander for drywall work. In addition, by configuring a single sander unit with multiple, optional attachments, it is easier for storing and transporting the sander as the weight and occupying space of the sander kit in the present invention is apparently less than that of two separate sander units.

BRIEF DESCRIPTION OF FIGURES

[0035] The foregoing and further features of the present invention will be apparent from the following description of preferred embodiments which are provided by way of example only in connection with the accompanying figures, of which:

Fig. 1 is a perspective view of a multi-sander according to one embodiment of the present invention, without any attachment installed.

Fig. 2 is the perspective view of the multi-sander in Fig. 1 from another angle of view.

Fig. 3 is the perspective view of the multi-sander in Fig. 1 from a further angle of view, where the sanding pad is detached from the sander.

Fig. 4 is a perspective view of the multi-sander in Fig. 1 with a random orbital attachment installed according to one embodiment of the present invention.

Fig. 5 is the perspective view of the multi-sander with the random orbital attachment in Fig. 4 from another angle of view.

Fig. 6 shows the multi-sander in Fig. 4 where the random orbital attachment is dissembled and detached from the sander.

Fig. 7 is a cross-sectional view of the multi-sander

with the random orbital attachment in Fig. 4.

Figs. 8a-8d illustrate the steps of installing the random orbital attachment shown in Figs. 4-7 to the multi-sander.

Fig. 9 is a perspective view of the multi-sander in Fig. 1 with a drywall attachment installed according to one embodiment of the present invention.

Fig. 10 is the perspective view of the multi-sander with the drywall attachment in Fig. 9 from another angle of view.

Fig. 11 shows the multi-sander in Fig. 9 where the drywall attachment is dissembled and detached from the sander.

Fig. 12 is a cross-sectional view of the multi-sander with the drywall attachment in Fig. 9.

Figs. 13a-13f illustrate the steps of installing the drywall attachment shown in Figs. 9-12 to the multi-sander.

[0036] In the drawings, like numerals indicate like parts throughout the several embodiments described herein.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0037] In the claims which follow and in the preceding description of the invention, except where the context requires otherwise due to express language or necessary implication, the word "comprise" or variations such as "comprises" or "comprising" is used in an inclusive sense, i.e. to specify the presence of the stated features but not to preclude the presence or addition of further features in various embodiments of the invention.

[0038] Terms such as "horizontal", "vertical", "upwards", "downwards", "above", "below" and similar terms as used herein are for the purpose of describing the invention in its normal in-use orientation and are not intended to limit the invention to any particular orientation.

[0039] Referring now to Figs. 1-2, the first embodiment of the present invention is multi-sander which is capable of installing various attachments (not shown) to achieve different functions. The multi-sander **20** includes a casing which is consisted of an upper part **24,** a middle part **32** and a lower part **26.** The upper part **24** has a substantial water droplet shape, and is suitable for a user to hold it in order to manipulate the multi-sander **20.** The middle part **32** and lower part **26** both have round shape cross-sections in the horizontal planes, with the middle part **32** connecting the upper part **24** and the lower part **26** together. At the bottom end of the lower part **26,** there is removably connected a sanding pad **34** which has a truncated cone shape. The sanding pad **34** is used to attach a sandpaper (not shown) for the sanding operation. There is an electric motor (not shown) located in the casing, and in particular accommodated within the interior space of the middle part **32** and the lower part **26.** There is also a driving shaft (not shown) driven by the electric motor and protruding out of the casing for connecting the sanding pad **34** to an end of the driving shaft. The lower part **26** of the casing is also configured with an exhaust port **38** which is adapted to be connected to an adapter **30.** The other end of the adapter **30** away from the exhaust port **38** is adapted to be connected to an external suction source, for example a vacuum source, so as to suction the dust generated during the sanding operation, as those skilled in the art would understand.

[0040] In addition, the casing of the multi-sander **20** further contains an interface on the lower part **26** and adjacent to the end of the driving shaft to which the sanding pad **34** is connected. The interface is used for connecting various sanding attachments (which will be described by examples in details below) to the multi-sander **20** to perform different task. As shown in Fig. 2 and Fig. 3, the interface contains at least a groove **42** configured on a rim portion **36** of the lower part **26** and extending along the circumferential direction, and a stop face **38** which forms an angle with the rim portion **36.** There is also a generally circular protruding rim **48** formed on the lower part **26.** The groove **42,** the rim portion **36,** the stop face **40** and the protruding rim **48** are part of the first geometric patterns which form the interface on the sander casing.

[0041] In Fig. 3, the sanding pad **44** is shown to be removed from the multi-sander **20,** as the sanding pad **44** is adapted to be mounted to the sander **20** via screw connections. There are four through holes **46** formed symmetrically around the center on the sanding pad **44.** Correspondingly, at the bottom of the sander **20** there is a pad socket **50** which is drivably connected to the driving shaft of the sander **20.** There are also four through holes **51** formed on the pad socket **50** so that when the through holes **51** and **46** are aligned, the sanding pad **34** can be secured to the pad socket **50** by using screws (not shown) passing through the through holes **51** and **46.** Also, on the sanding pad **34** but radially outer than the through holes **46** are dust extraction holes **44** through which dusts generated during sanding operation can pass through with air stream generated by the suction source.

[0042] Figs. 4-5 show the multi-sander described above with a random orbit (RO) attachment installed to the sander. The sanding pad **34** is also installed in the illustrated sander. The RO attachment includes a first segment **52,** and a second segment **54.** The first segment **52** and the second segment **54** are in substantial arc shapes, and are configured in head-to-tail manner that is every end of the first segment **52** is connected to an end of the second segment **54** so that the first segment **52** and the second segment **54** adjoin each other along the circumferential direction. The first segment **52** and the second segment **54** together form a complete loop.

There is also a latch connecting one end of the first segment **52** and one end of the second segment **54.** As shown in the figures, the RO attachment fully covers the sanding pad **34** on a circumferential direction, but only partially covers the sanding pad **34** along the vertical direction. In particular, a skirt **58** consisted of two separate pieces extending respectively from the first segment **52** and the second segment **54** is arranged to cover only a part of the sanding pad **34** along the vertical direction (that is the axial direction of the driving shaft of the sander).

[0043] Turning to Fig. 6, the RO attachment in its disassembled state and removed from the sander **20** is shown to expose the sanding pad **34** installed on the sander **20.** Each of the first segment **52** and the second segment **54** is in a half-circle shape, which together form a complete loop. On the first segment **52,** there is a stop face **60** which complements the stop face **40** on the sander **20.** On both the first segment **52** and the second segment **54,** there are formed first protrusions **71,** second protrusions **72,** and third protrusions **66,** all of which extend inwardly along the radial direction of the first segment **52** and the second segment **54.** However, the spans of the first protrusions **71,** the second protrusions **72,** and the third protrusions **66** along the circumferential direction are not the same. The first protrusions **71** complement the groove **42** on the sander casing described previously, and have the smallest spans along the circumferential direction. The second protrusions **72** are adapted to be inserted between the protruding rim **48** (not shown, but see Fig. 3) and another circular surface on the sander casing. The second protrusions **72** have a larger span along the circumferential direction when compared to the first protrusions **71.The** third protrusions **66** are adapted to be inserted into the space between the lower part of the sander **20** and the sanding pad **34.** The second protrusions **72** actually form a complete loop and so are the third protrusions **66.** The first protrusions **71,** the second protrusions **72,** and the third protrusions **66** are part of the second geometric patterns which are designed to complement the first geometric patterns described above to connect the RO attachment including the first segment **52** and the second segment **54** to the interface of the sander casing.

[0044] The first segment **52** and the second segment **54** each have a first end and a second end as shown in Fig. 6. On a first end of the first segment **52,** there is formed a knuckle (not shown) which is configured to receive a pin **68** formed on a first end of the second segment **54** so as to pivotally connect the first ends of the segment **52** and the second segment **54.** On the other end, the latch **56** described above contains a hook **62** pivotally connected to a second end of the first segment **52,** and a recessed face **64** formed on a second end of the second segment **54** which is adapted to hold the hook **62** and thus close the latch **56.**

[0045] Fig. 7 shows the internal structure of the sander described above with the sanding pad **34** and the RO attachment installed. One can see that the motor **76** is connected to a driving shaft **74** where the end of the driving shaft **74** drivably connects to the sanding pad **34.** The first segment and the second segment of the RO attachment on one end are connected by the pin **68** and knuckle **70,** and on another end are connected by the latch **56.** On each of the first segment and the second segment there are formed the three parallel first protrusions **71,** second protrusions **72,** and third protrusions **66.** They match with the corresponding complementing shape of the interface on the sander casing as described above to firmly but detachably secure the RO attachment to the sander casing. The RO attachment also contains a skirt **58** which only partially covers the sanding pad **34** on the vertical direction.

[0046] Now turning to the installation of the RO attachment of the device described above, Figs. 8a-8d show how the sander according to the present invention may be installed with a RO attachment by the user without using any external tools. Start with a multi-sander 20 with only a sanding pad **34** installed, as shown in Fig. 8a the user firstly connects the first segment **52** of the RO attachment by aligning it and pushing it along the direction of the arrow **78** toward the lower part of the sander casing. In this process the above mentioned grooves and protrusions on the first segment **52** fit to their respective counterpart on the interface of the sander **20** so that the first segment **52** is installed precisely in the intended location. Next, as shown in Fig. 8b the user connects first ends of the first segment **52** and the second segment **54** together by moving the second segment **54** along the direction shown by arrow **80** toward the sander casing, and inserting the pin **68** downwardly along the direction shown by arrow **69** into the first end of the first segment **52** into the knuckle **70** on the first end of the second segment **54.** The second segment **54** is then connected to the first segment **52** at one point and able to pivot with respect to the pin **68.** Next, the user as shown in Fig. 8c closes the second segment **54** by rotating around the pin-knuckle structure above so that the second segment **54** moves in a rotating direction indicated by arrow **82** and finally close fully fit on the lower part of the sander casing, where the first segment **52** and the second segment **54** together form a complete loop. Note that like the case of first segment **52,** the second geometric patterns on the second segment **54** also complement the first geometric patterns on the interface on the sander casing as described above to firmly but detachably secure the RO attachment to the sander casing. Lastly, as shown in Fig. 8d the user closes the latch **56** along the direction indicated by the arrow **84** to securely connect the second ends of the first segment **52** and the second segment **54** together, thus completing the installation of the RO attachment to the sander.

[0047] Figs. 9-10 show the multi-sander described above with a drywall attachment installed to the sander. The sanding pad **34** is also installed in the illustrated sander. The drywall attachment includes a first segment

152, a second segment **154,** and a third segment **153.** The first segment **152,** the second segment **154** and the third segment **153** are configured in head-to-tail manner so that the first segment **152,** the second segment **154** and the third segment **153** adjoin each other along the circumferential direction. The first segment **152,** the second segment **154** and the third segment **153** together form a complete loop. Note that however first segment **152,** the second segment **154** themselves would be able to close the loop since they are adapted to be connected to each other on both ends, but the structure formed by only first segment **152** and second segment **154** contains a recess part which is to be complemented by the third segment **153** to form a complete circular shape.

[0048] There are two types of connections between the adjacent ends of every two of the first segment **152,** the second segment **154** and the third segment **153.** The first type of connection is the pin-knuckle connection consisted of a pin **168** and a knuckle **170** similar to the pin-knuckle described previously. The second type of the connection is a hook-tab structure **157,** which will be described in more details later. As shown in the figures, the drywall attachment not only fully covers the sanding pad **34** on a circumferential direction, but also fully covers the sanding pad **34** along the vertical direction by configuring a rim of brush **186.** The rim of brush **186** extends at least the same distance along the vertical direction compared to the sanding pad **34** and when the sander **20** is placed on a flat work surface the rim of brush **186** directly contacts the work surface.

[0049] Turning to Fig. 11, the drywall attachment in its disassembled state and removed from the sander **20** is shown to expose the sanding pad **34** installed on the sander **20.** Each of the first segment **152** and the second segment **154** is in a half-circle shape. As mentioned above although the first segment **152** and the second segment **154** themselves could form a complete loop, there is a recess part on the structure formed as such and the third segment **153** must be installed to form a complete structure. In particular, only installing the first segment **152** and the second segment **154** results in a rim of brush present for a part of the circumferential direction, and only with the third segment **153** the full circle of rim of brush would be made. On the third segment **153,** there is a stop face **160** which complements the stop face **40** on the sander **20.** On both the first segment **52** and the second segment **54,** there are formed second protrusions **172.** On the third segment **153,** there is formed a first protrusion **171** as well as the second protrusion **172.** Both the first protrusion **171** and the second protrusions **172** extend inwardly along the radial direction of the first segment **152,** the third segment **153,** and the second segment **154.** However, the spans of the first protrusion **171** and the second protrusions **172** along the circumferential direction are not the same. The first protrusion **171** on the third segment **153** complements the groove **42** on the sander casing described previously, and has the smaller spans along the circumferential direction. The second protrusions **172** are adapted to be inserted between the protruding rim **48** (not shown, but see Fig. 3) and another circular surface on the sander casing. The second protrusions **172** have a larger span along the circumferential direction when compared to the first protrusion **171.** The second protrusions **172** actually form a complete loop. The first protrusion **171** and the second protrusions **172** are part of the second geometric patterns which are designed to complement the first geometric patterns described above to connect the drywall attachment including the first segment **152** and the second segment **154** to the interface of the sander casing.

[0050] The first segment **152,** the second segment **154** and the third segment **153** each has a first end and a second end as shown in Fig. 11. They are also in substantial arc shapes. On a first end of the first segment **152,** there is formed a knuckle (not shown) which is configured to receive a pin **168** formed on a first end of the second segment **154** so as to pivotally connect the first ends of the segment **152** and the second segment **154.** On the other end, the latch **156** described above contains a hook **162** pivotally connected to a second end of the first segment **152,** and a recessed face **164** formed on a second end of the second segment **154** which is adapted to hold the hook **162** and thus close the latch **156.** In this way, the first segment **152** and the second segment **154** can be connected in a head-and-tail manner. In addition, the third segment **153** features hook-tab structures for connecting to both the first segment **152** and the second segment **154.** On the two ends of the third segment **153,** there are formed tabs **161** which contain small perforations. On the first segment **152** and the second segment **154** there are also formed corresponding hooks **159** for engaging the tabs **161.** Note that the hooks **159** are not located on the second ends of the first segment **152** and the second segment **154** as mentioned above, but rather they are placed at a predetermined distance away from the second end of the first segment **152** or the second segment **154** so that the circumferential span between the hooks **159** is made to be able to accommodate the third segment **153.**

[0051] Fig. 12 shows the internal structure of the sander described above with the sanding pad **34** and the drywall attachment installed. One can see that the motor **76** is connected to a driving shaft **74** where the end of the driving shaft **74** drivably connects to the sanding pad **34.** The first segment and the second segment of the drywall attachment on one end are connected by the pin **168** and knuckle **170,** and on another end are connected by the latch **156.** On each of the first segment and the second segment there is formed the second protrusions **172.** Additionally on the third segment **153** there is formed a first protrusion **171.** The first protrusion **171** and the second protrusions **172** match with the corresponding complementing shape of the interface on the sander casing as described above to firmly but detachably secure the drywall attachment to the sander casing. Since on each one of the first segment **152,** the second segment **154** and

the third segment **153** there are connected a rim of brush, the three segments together provide a full circle of rim of brush to prevent dust from going out of the sanding operation region. The rim of brush is preferably nylon strip brushes.

[0052] Now turning to the installation of the drywall attachment of the device described above, Figs. 13a-13d show how the sander according to the present invention may be installed with a drywall attachment by the user without using any external tools. Start with a multi-sander **20** with only a sanding pad **34** installed, as shown in Fig. 13a the user firstly connects the first segment **152** of the RO attachment by aligning it and pushing it along the direction of the arrow **178** toward the lower part of the sander casing. In this process the above mentioned grooves and protrusions on the first segment **152** fit to their respective counterpart on the interface of the sander **20** so that the first segment **152** is installed precisely in the intended location. Next, as shown in Fig. 13b the user connects first ends of the first segment **152** and the second segment **154** together by moving the second segment **154** along the direction shown by arrow **180** toward the sander casing, and inserting the pin **168** downwardly along the direction shown by arrow **169** into the first end of the first segment **152** into the knuckle **170** on the first end of the second segment **154.** The second segment **154** is then connected to the first segment **152** at one point and able to pivot with respect to the pin **168.** Next, the user as shown in Fig. 13c closes the second segment **154** by rotating around the pin-knuckle structure above so that the second segment **154** moves in a rotating direction indicated by arrow **182** and finally close fully fit on the lower part of the sander casing. The user then closes the latch **156** by moving it along the direction indicated by arrow **184** to securely connect the second ends of the first segment **152** and the second segment **154** together. Note that like the case of first segment **152,** the second geometric patterns on the second segment **154** also complement the first geometric patterns on the interface on the sander casing as described above to firmly but detachably secure the drywall attachment to the sander casing. As shown in Fig. 13d, the user then installs the third segment **153** to the sander casing by fitting it to the lower part of the sander casing along the direction indicated by the arrow **163.** In this process, one end of the third segment **153** is secured to the first segment **152** by locking the tab **161** on this end to the hook **159** on the first segment **152.** The user in the next step shown in Fig. 13e secures the other end of the third segment **153** in a similar manner by locking the tab **161** to the hook **159** on the second segment **154.** Finally, the installation of the drywall attachment is complete as shown in Fig. 13f.

[0053] The exemplary embodiments of the present invention are thus fully described. Although the description referred to particular embodiments, it will be clear to one skilled in the art that the present invention may be practiced with variation of these specific details. Hence this invention should not be construed as limited to the embodiments set forth herein.

[0054] While the invention has been illustrated and described in detail in the drawings and foregoing description, the same is to be considered as illustrative and not restrictive in character, it being understood that only exemplary embodiments have been shown and described and do not limit the scope of the invention in any manner. It can be appreciated that any of the features described herein may be used with any embodiment. The illustrative embodiments are not exclusive of each other or of other embodiments not recited herein. Accordingly, the invention also provides embodiments that comprise combinations of one or more of the illustrative embodiments described above. Modifications and variations of the invention as herein set forth can be made without departing from the spirit and scope thereof, and, therefore, only such limitations should be imposed as are indicated by the appended claims.

[0055] For example, although the sanding pad shown above has a circular cross-sectional shape, this should not be construed as a limitation to the present invention. One skilled art should realize that other shapes of sanding pad, for example a triangular one or a rectangular one as commonly seen in the field, can also be used together with the sander attachment provided by the present invention.

[0056] Also, although the specific geometric patterns are illustrated in preferred embodiments for aligning and securing the sander attachments to the interface of the sander casing lower part, one should understand that there can be other types of structures for installing the sander attachments. The important idea about the present invention is the detachable design of a sander attachment to perform different tasks on a same sander unit, and the way of installing the attachment, including the number of segments the attachment has, can be varied according to different requirement for different applications.

Claims

1. A multi-sander kit, comprising:

a) a multi-sander comprising a casing, an electric motor located in said casing, and a driving shaft driven by said electric motor and protruding out of said casing; an end of said driving shaft adapted to allow a sanding pad to connect thereto; wherein said casing further comprising an interface adjacent to said end of said driving shaft; and

b) a sander attachment which is adapted to be detachably installed to said multisander by connecting said sander attachment to said interface; said sander attachment covering at least partially said driving shaft or said sanding pad

when said sander attachment and said sanding pad are installed to said multi-sander.

2. The multi-sander kit of claim 1, wherein said casing further comprises a cylindrical portion adjacent to said end of said driving shaft; said interface configured on a circumferential face of said cylindrical portion.

3. The multi-sander kit of claim 1 or claim 2, wherein said sander attachment is chosen from the group consisted of a random orbital (RO) attachment and a drywall attachment.

4. The multi-sander kit of claim 3, wherein said RO attachment is formed to cover only a part of said sanding pad when said sander attachment and said sanding pad are installed to said multi-sander.

5. The multi-sander kit of claim 3 or claim 4, wherein said RO attachment further comprises:

a) a first segment having a substantially arc shape; and
b) a second segment having a substantially arc shape;

wherein said first segment and said second segment adapted to be connected to each other in a head-to-tail manner, so as to circumferentially enclosing at least a part of said sanding pad when said sander attachment and said sanding pad are installed to said multi-sander.

6. The multi-sander kit of claim 5, wherein said first segment and said second segment each has a first end and a second end; said first end of said first segment capable of connecting to said first end of said second segment; said second end of said first segment capable of connecting to said second end of said second segment; and, optionally, wherein said first end of said first segment is capable of connecting to said first end of said second segment via a pin-knuckle structure;
and, optionally, wherein said second end of said first segment is capable of connecting to said second end of said second segment via a latch.

7. The multi-sander kit of either claim 5 or claim 6, wherein said interface is first geometric patterns formed on said circumferential face of said cylindrical portion;
said first segment and said second segment comprising second geometric patterns complementing said first geometric patterns whereby said first segment and said second segment are adapted to connect to said interface;
and, optionally,
wherein said first and second geometric patterns comprise grooves and protrusions extending along a circumferential direction.

8. The multi-sander kit of claim 7,
wherein said second geometric patterns comprise at least one protrusion extending inwardly to the center of said sanding pad;
and/or
wherein said second geometric patterns comprise a plurality of protrusions, which extend inwardly to different extents, or which have different spans along said circumferential direction;
and/or
wherein one said protrusion is placed between a lower part of said casing and said sanding pad when said sander attachment and said sanding pad are installed to said multi-sander.

9. The multi-sander kit of claim 3, wherein said drywall attachment is formed to fully cover said sanding pad on a circumferential direction when said sander attachment and said sanding pad are installed to said multi-sander.

10. The multi-sander kit of claim 3 or claim 9, wherein said drywall attachment further comprises a rim of brush which fully covers said sanding pad on said circumferential direction; and, optionally,
wherein said rim of brush has a larger dimension compared to said sanding pad along the axial direction of said driving shaft;
and/or
wherein said rim of brush comprises nylon strip brushes.

11. The multi-sander kit of claim 3 or claim 10, wherein said drywall attachment further comprises:

a) a first segment having a substantially arc shape;
b) a second segment having a substantially arc shape; and
c) a third segment having a substantially arc shape;

wherein said first segment, said second segment and said third segment adapted to be connected to each other in a head-to-tail manner, so as to fully cover said sanding pad on a circumferential direction when said sander attachment and said sanding pad are installed to said multi-sander;
and, optionally,
wherein at least two of said first segment, said second segment and said third segment are connected to each other via a pin-knuckle structure or a hook-tab structure.

12. The multi-sander kit of claim 11, wherein said interface is first geometric patterns formed on said circumferential face of said cylindrical portion;
said first segment, said second segment and said third segment comprising second geometric patterns complementing said first geometric patterns whereby said first segment, said second segment and said third segment are adapted to connect to said interface.

13. The multi-sander kit of claim 12, wherein
said first and second geometric patterns comprise grooves and protrusions extending along a circumferential direction;
and/or
said second geometric patterns comprise at least one protrusion extending inwardly to the center of said sanding pad;
and/or
said second geometric patterns comprise a plurality of protrusions, which extend inwardly to different extents, or which have different spans along said circumferential direction.

14. The multi-sander kit of any one of the preceding claims,
wherein said sanding pad has a substantial truncated cone shape;
or
wherein said sanding pad has a polygonal cross-sectional shape; and optionally, wherein said sanding pad has a rectangular cross-sectional shape.

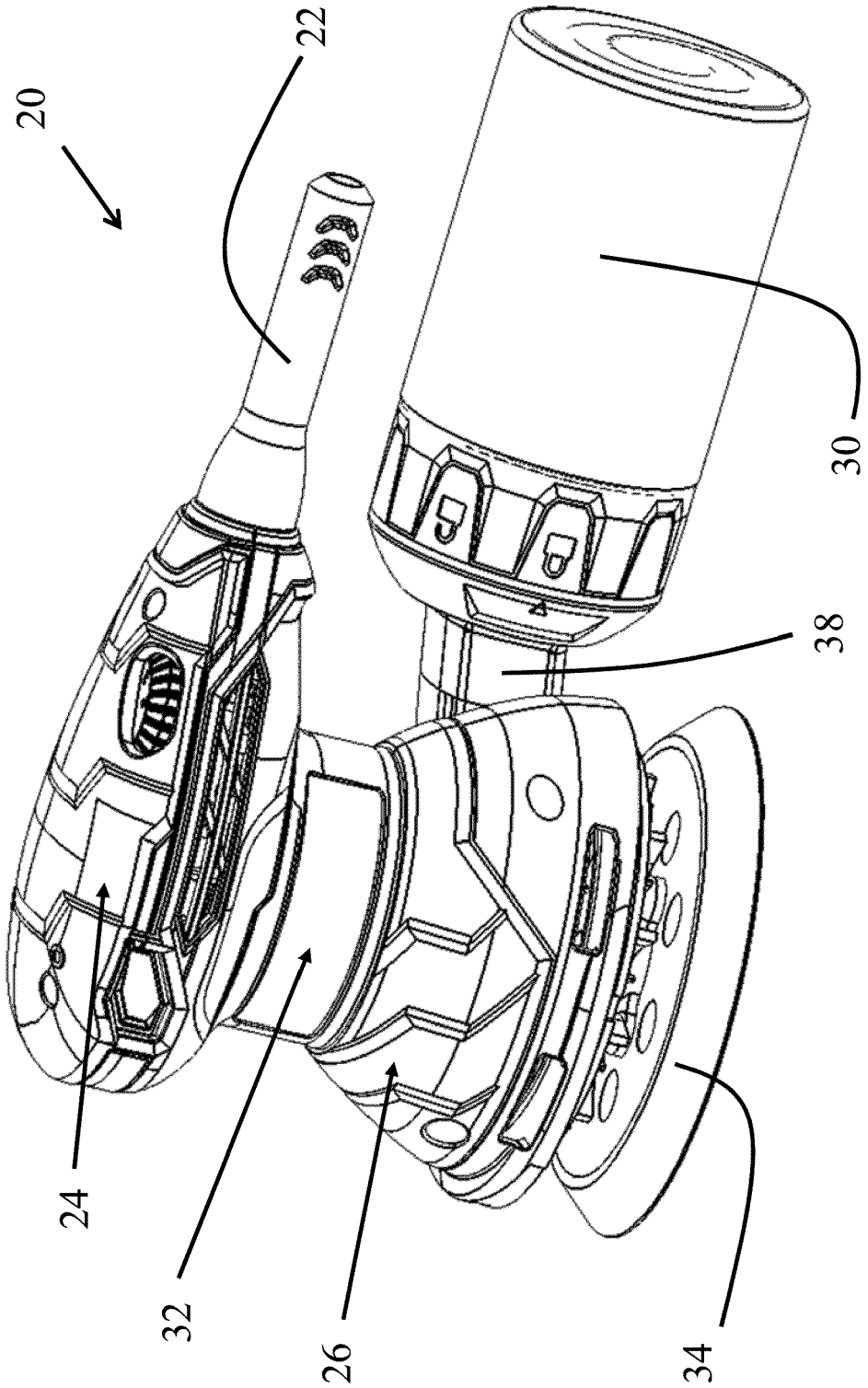

Fig.1

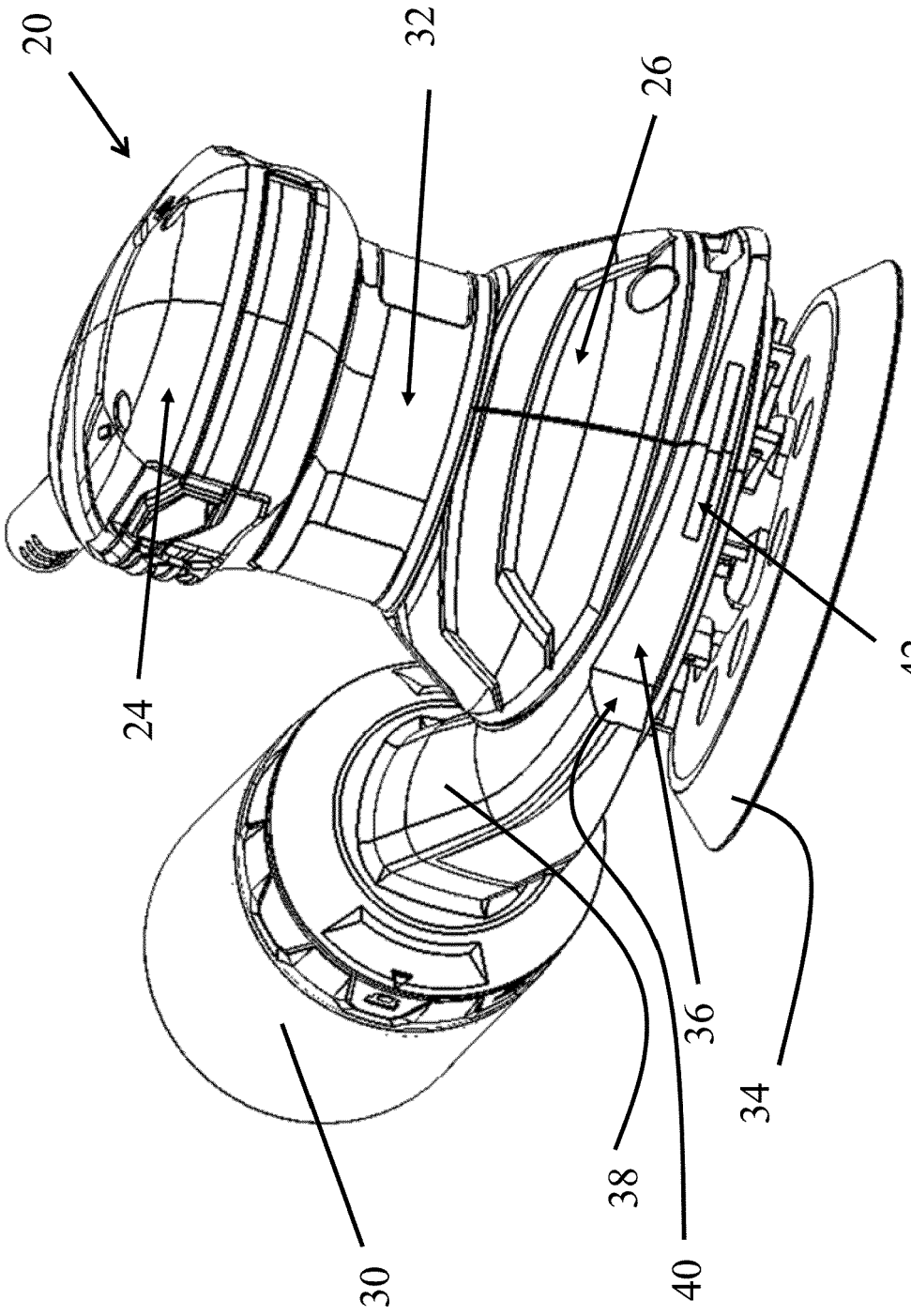

Fig.2

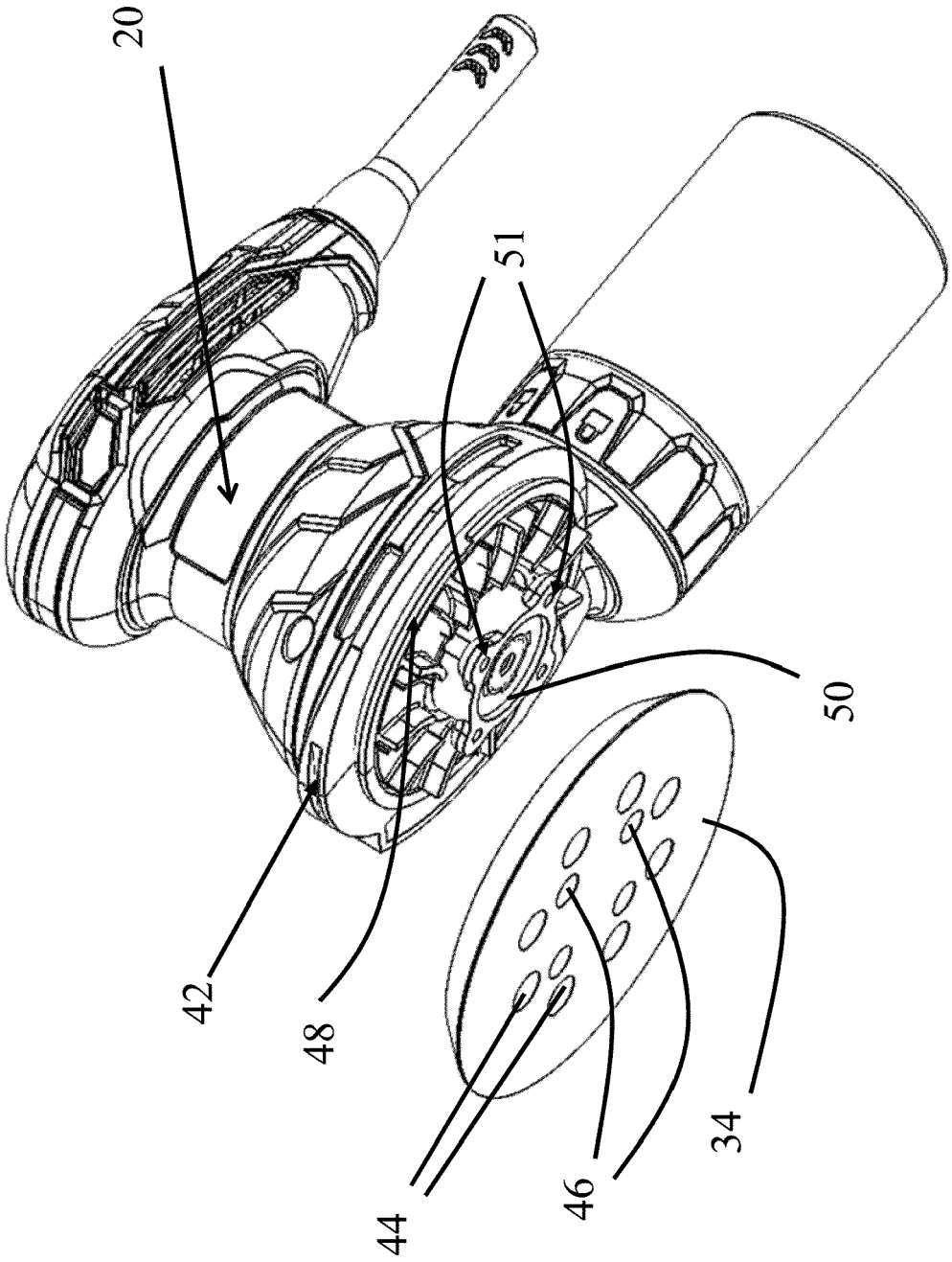

Fig.3

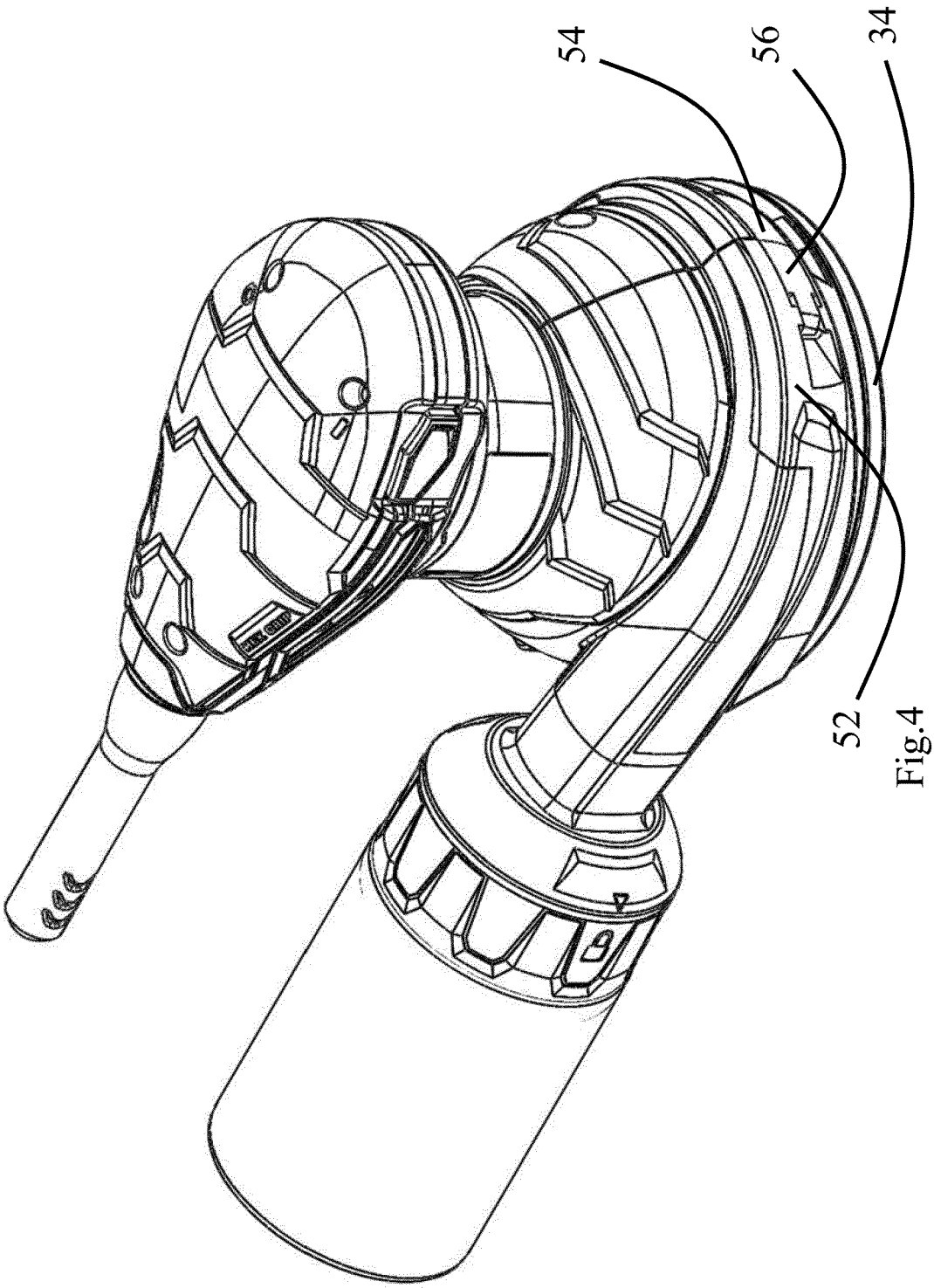

Fig.4

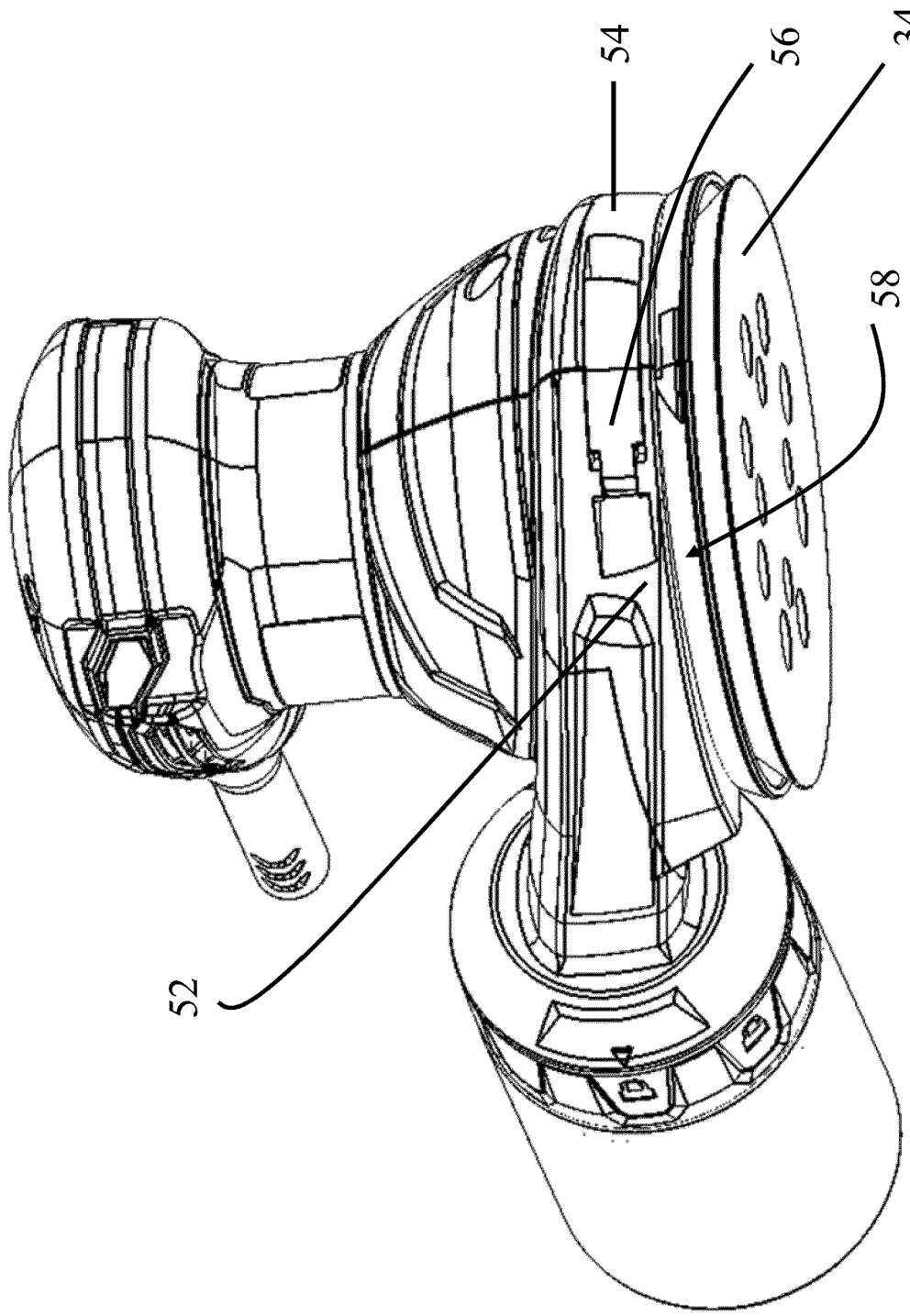

Fig.5

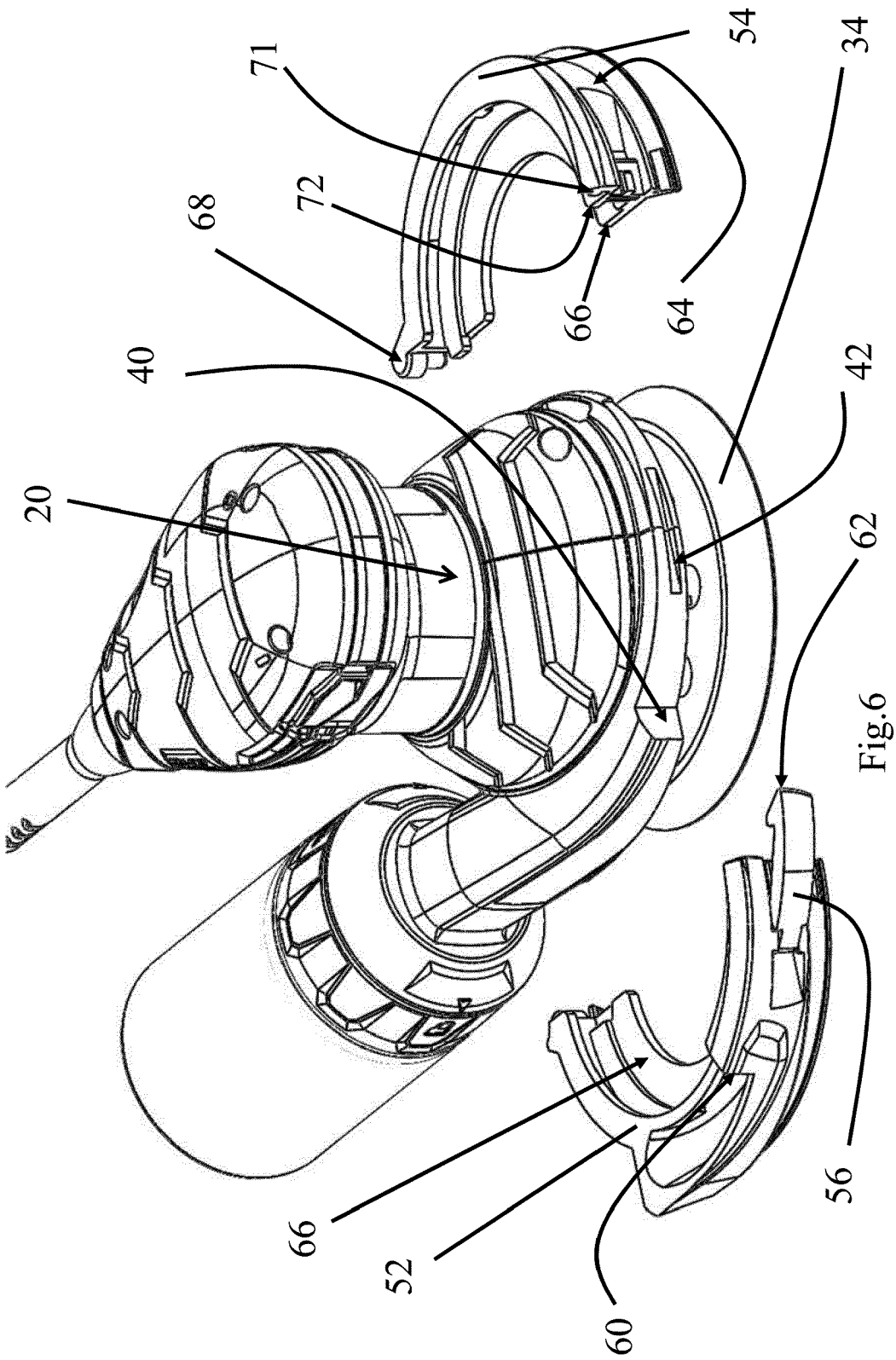

Fig.6

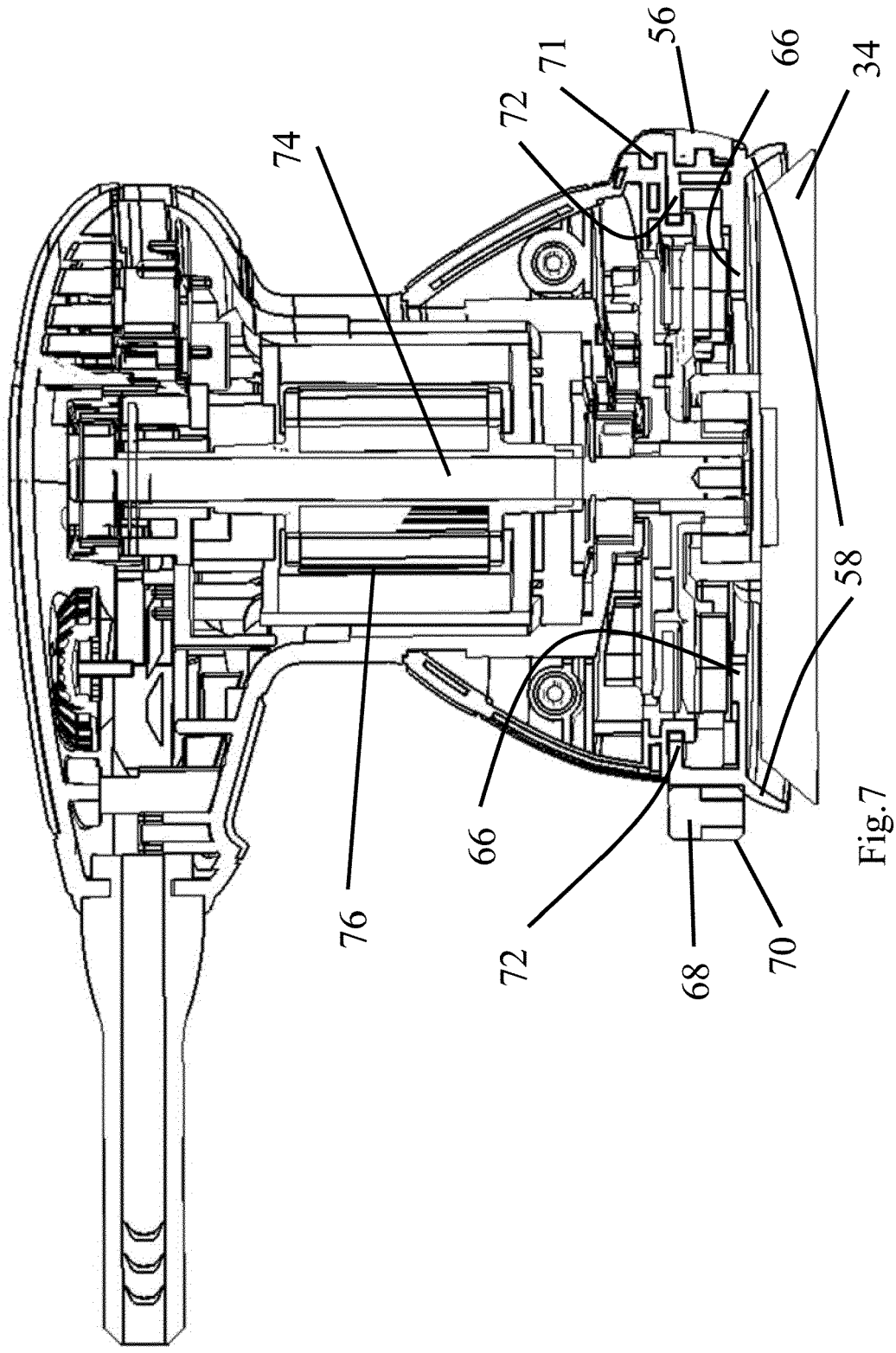

Fig.7

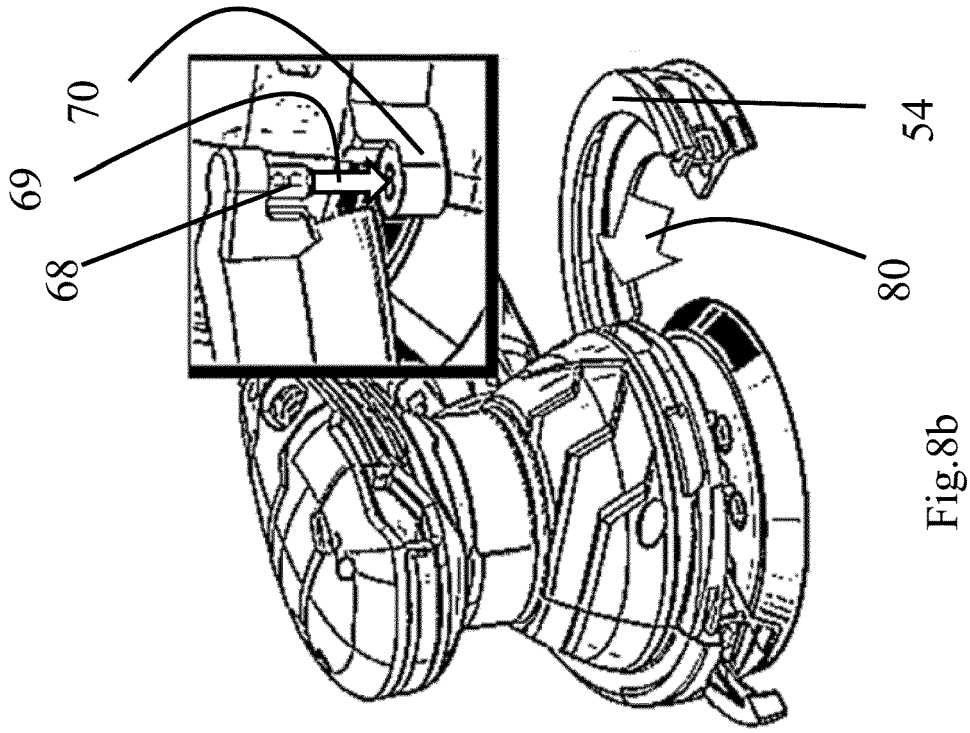

Fig.8b

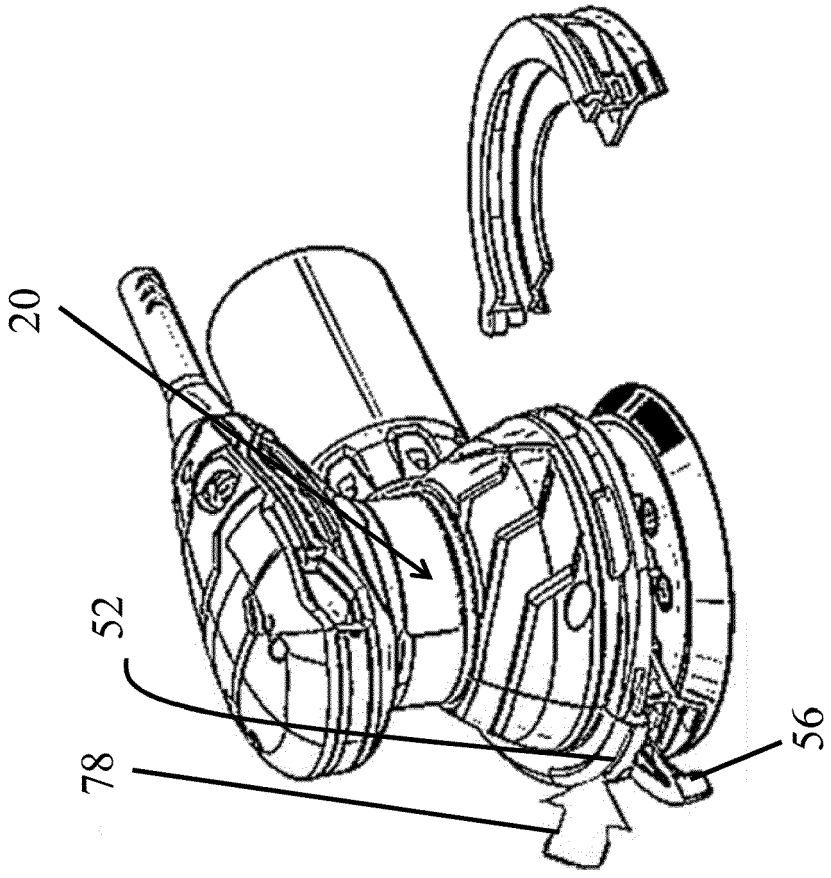

Fig.8a

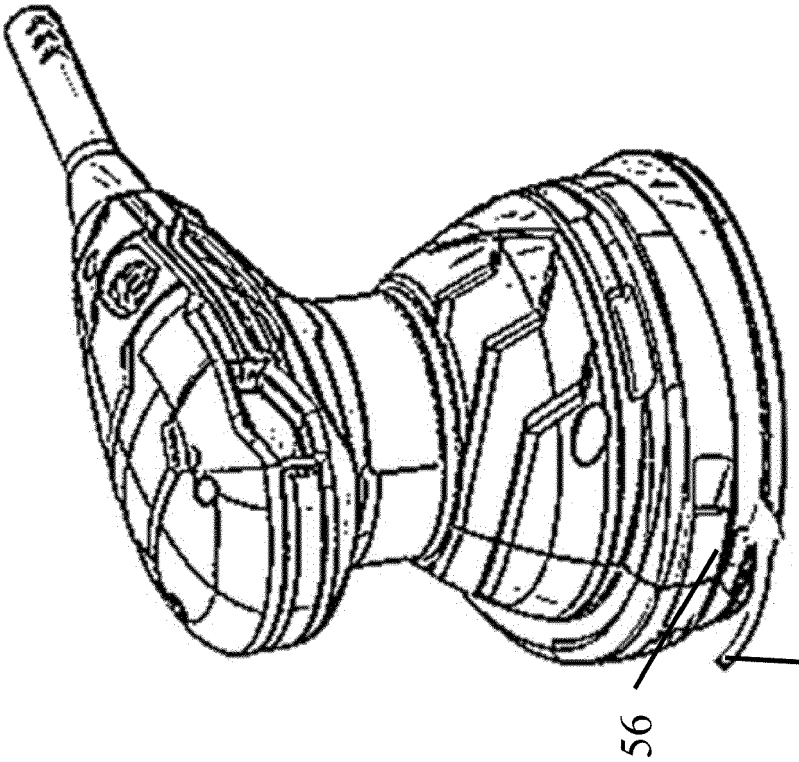

Fig.8d

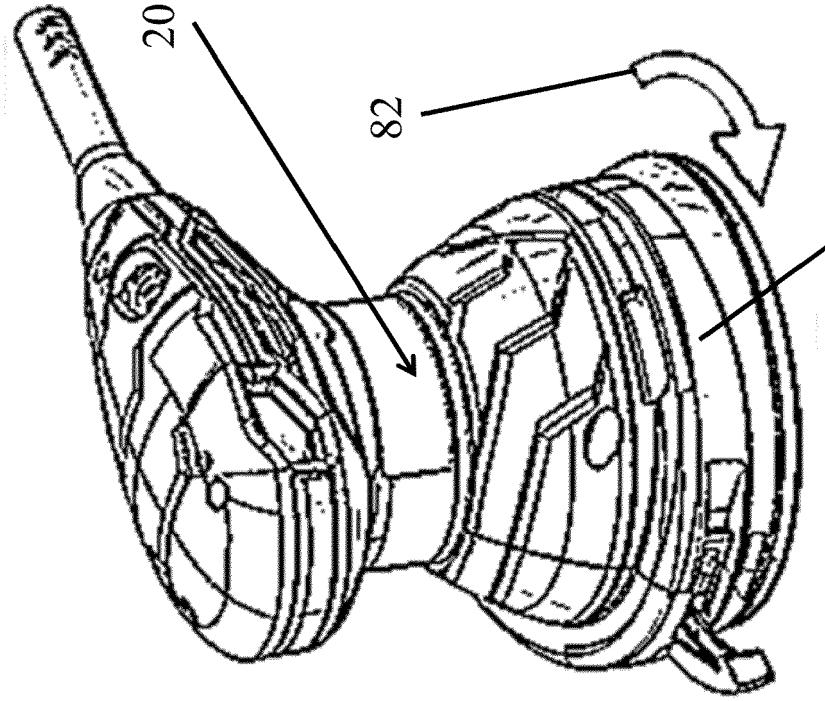

Fig.8c

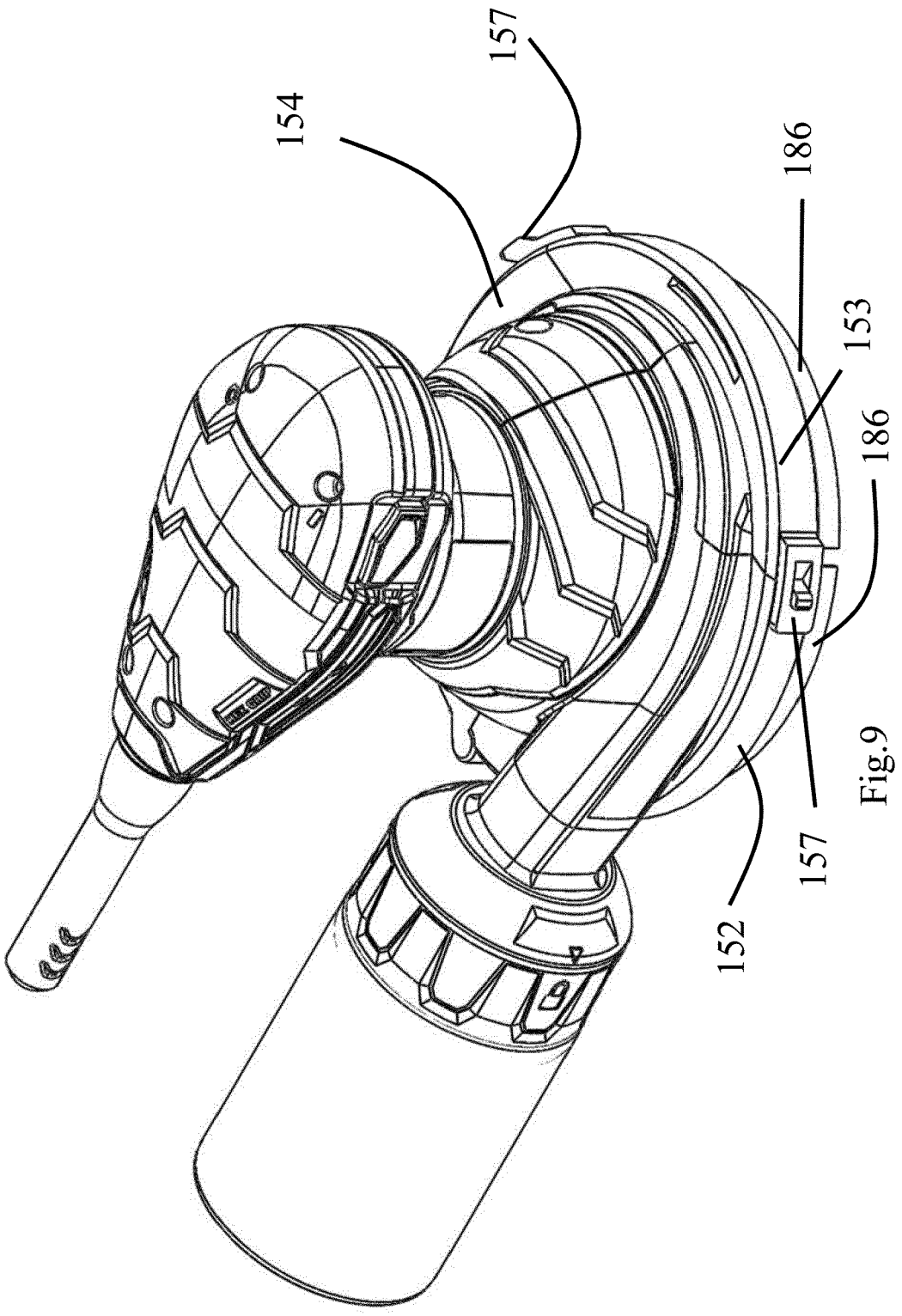

Fig.9

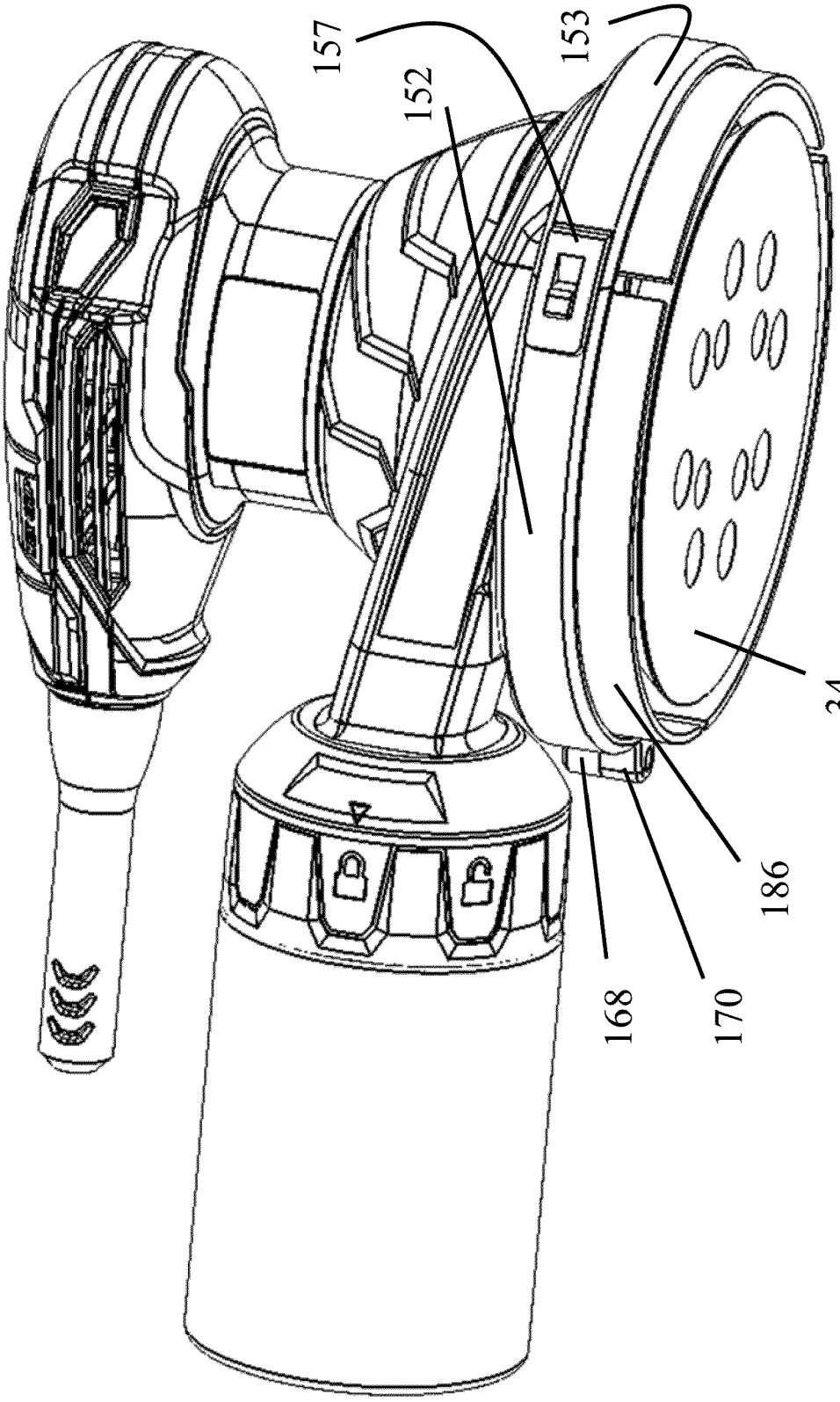

Fig.10

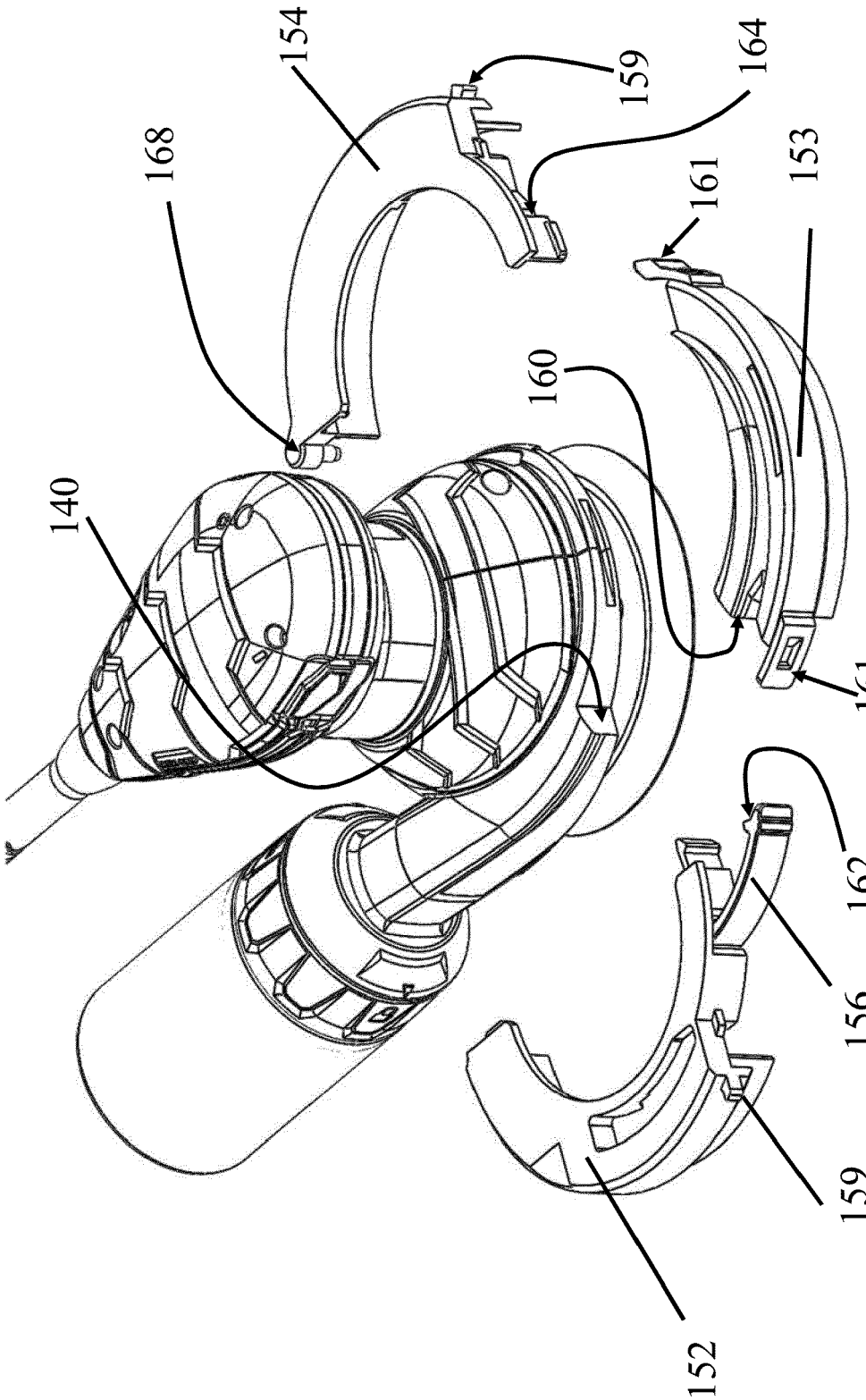

Fig.11

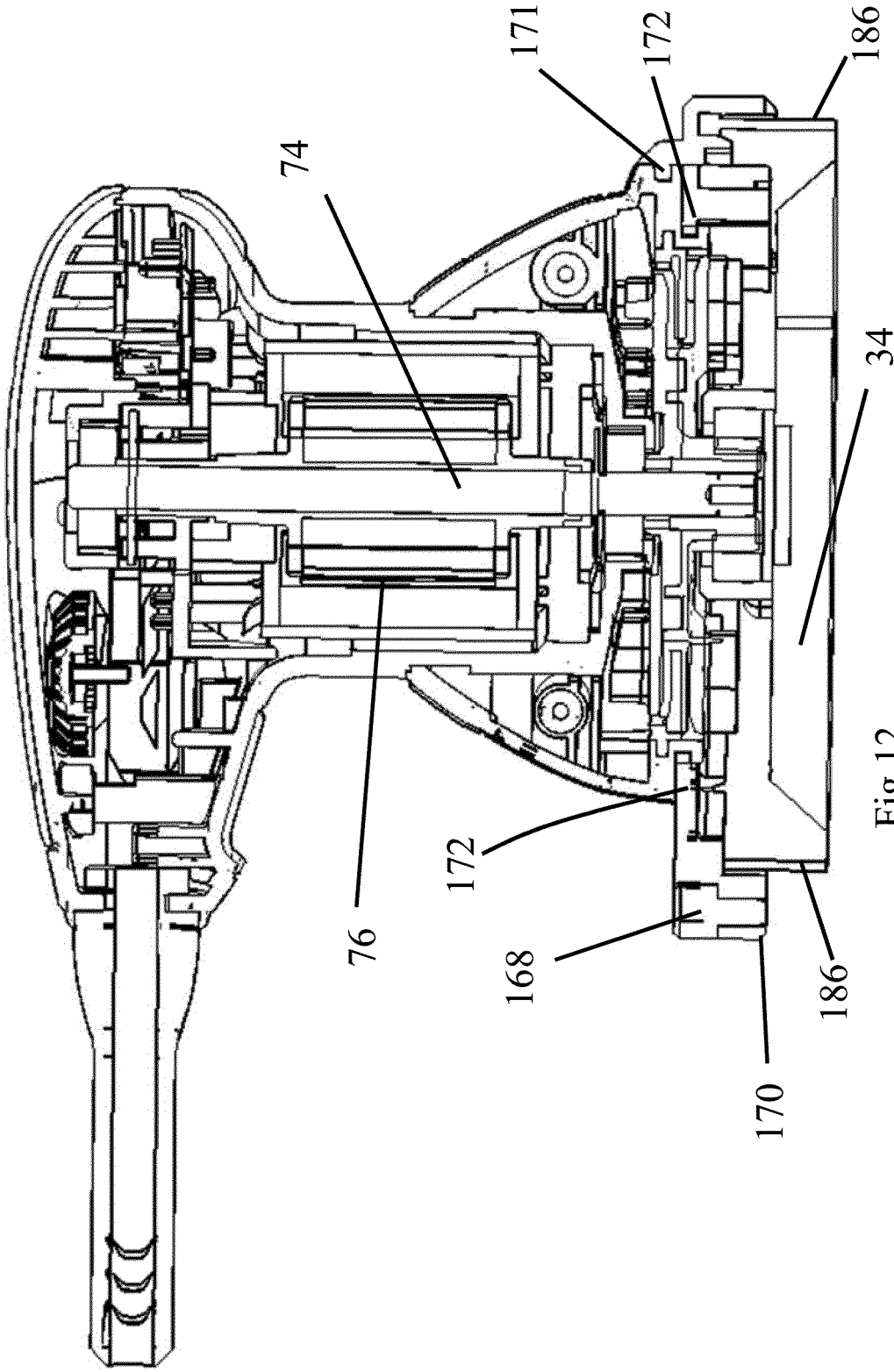

Fig.12

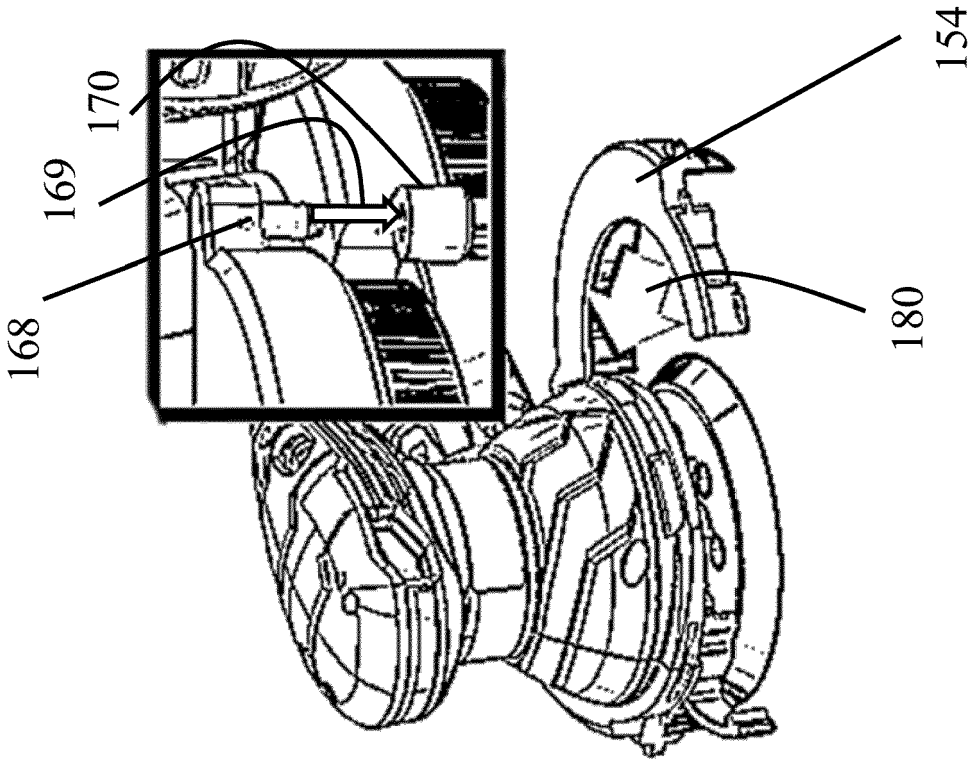

Fig.13b

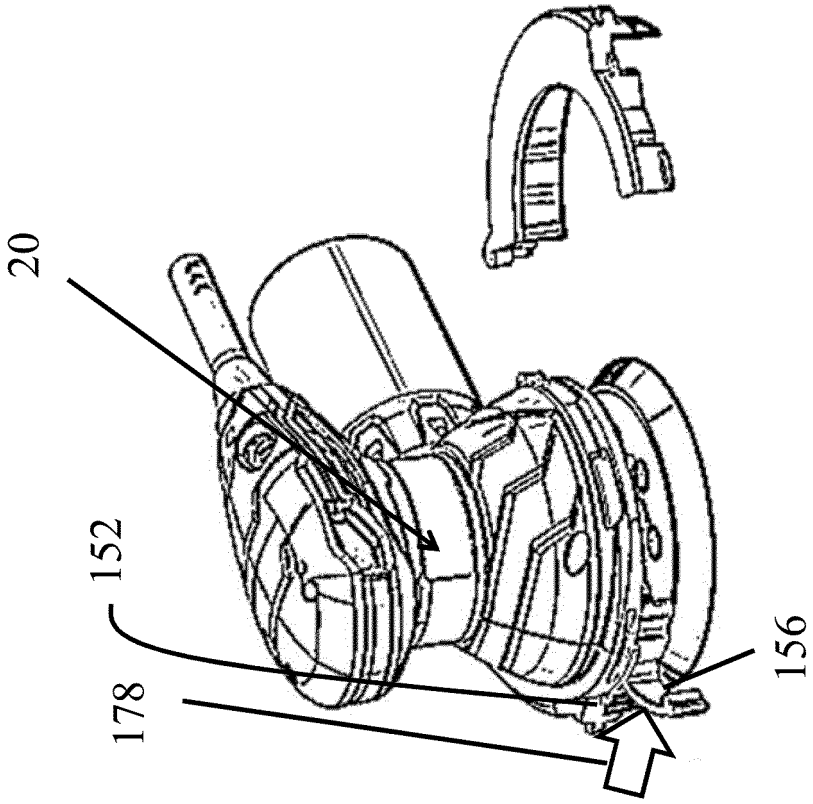

Fig.13a

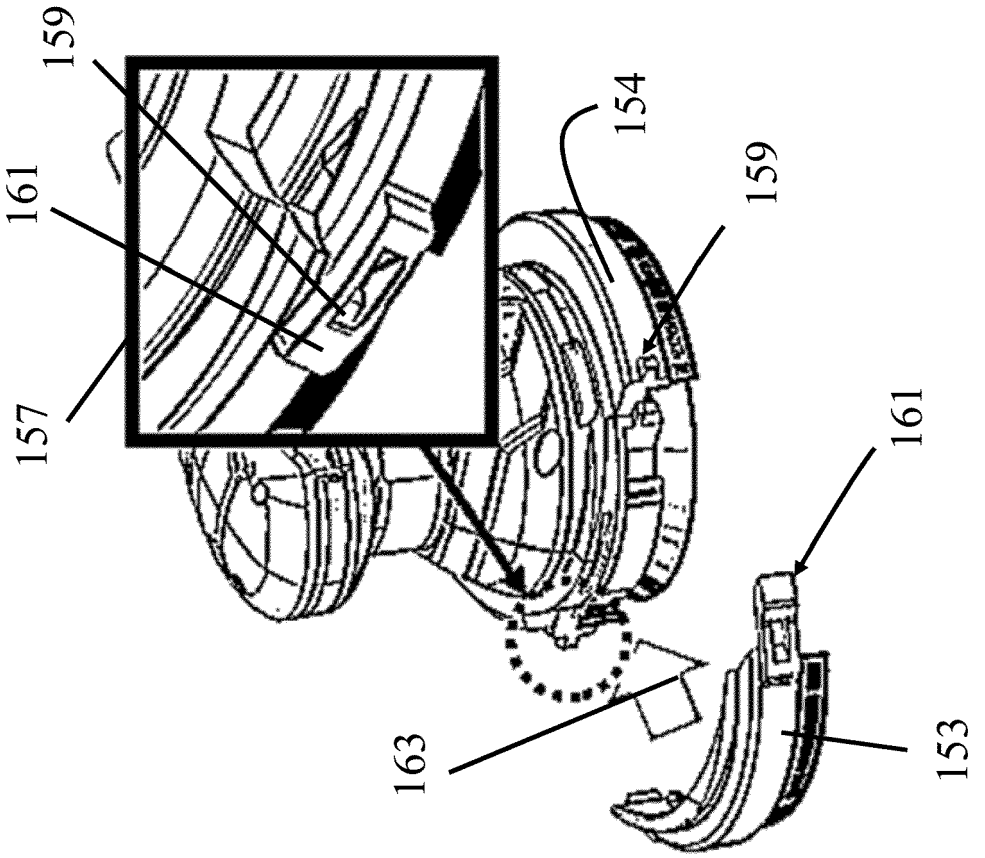

Fig.13d

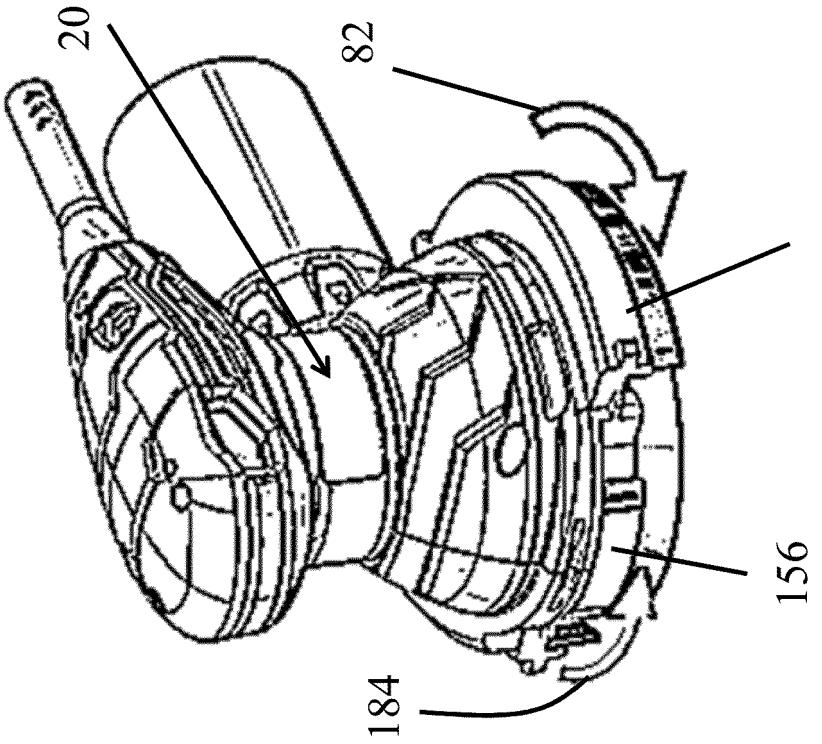

Fig.13c

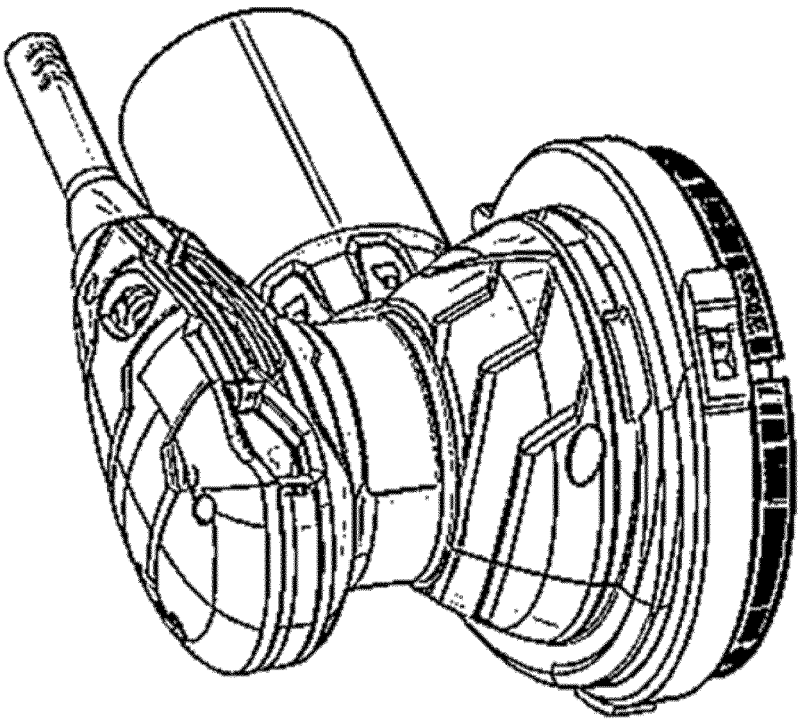

Fig.13f

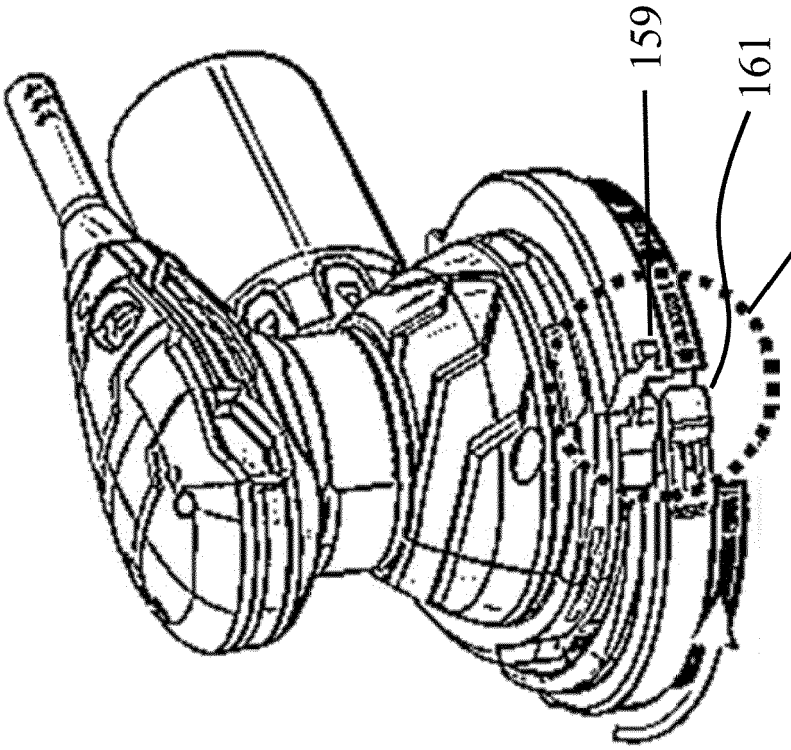

Fig.13e