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EP 1 707 323 B9

Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a handle which is removably mounted to a power tool and used to operate the power tool.

Description of the Related Art

[0002] Japanese non-examined laid-open Utility Patent Publication No. 2004-249430 discloses an auxiliary handle mounted to a body of an electric disc grinder and used to operate the disc grinder for grinding a workpiece. The known auxiliary handle includes a handle body fixedly mounted to the body of the electric disc grinder and a grip coupled to the handle body. The outer surface of the grip is covered with a non-slip rubber cover. A rubber isolator is disposed between the handle body and the grip and serves as vibration-proofing elastic element that applies a biasing force to the grip when the grip rotates with respect to the handle body. Besides such typical construction of the handle for a power tool, it is desired to seek for cost-effective rational structure of the handle for the power tool.
DE 90 04 091 U1 discloses a handle according to the preamble of claim 1.
DE 102 10032 C1, DE 101 26 491 A1, EP 1 462 222, EP 0 156 387, and DE 90 03 365 U1 provide further details of such a handle.

SUMMARY OF THE INVENTION

[0003] Accordingly, it is an object of the invention to provide an effective technique for reducing the manufacturing costs of a handle mounted to a power tool.

[0004] This is achieved by the present invention as defined in claim 1. Further advantageous embodiments are defined in the dependent claims. The "handle" according to the invention can be suitably applied to a rotary power tool such as a grinder and a polisher, which performs grinding or polishing operation on a workpiece by rotating a disc. Further, the representative handle can also be applied to an impact power tool such as an electric hammer or hammer drill, which performs fracturing or drilling operation on a workpiece by causing a tool bit to perform hammering movement in the axial direction or hammering movement and rotation in combination. Moreover, the representative handle can also be applied to cutting tools such as a reciprocating saw or a jig saw, which perform a cutting operation on a workpiece by causing a blade to perform a reciprocating movement, whereby causing a generally linear vibration.

[0005] As the specific manner of the grip that can move to the handle body, the grip may move linearly and in parallel to the handle body, the grip may rotate on one pivot, the grip may rotate on a plurality of pivots which cross each other or the grip may rotate on a spherical surface. The "elastic element" typically comprises a rubber or elastic resin. Further, as the specific manner of the elastic outer surface member that covers the outer surface of the grip, any one of covering part of the outer surface and covering the entire outer surface may be selected.

[0006] According to the representative invention, the elastic outer surface member that covers the outer surface of the grip is integrally formed with the elastic element disposed between the inner surface of the grip and the outer surface of the handle body. The elastic outer surface member and the elastic element may preferably be formed into one piece by using a mold. In this case, the method of insert molding may preferably be used. Specifically, a cylindrical member that forms the grip is placed in a mold in advance and then, the mold is charged with a liquid elastic material. The elastic outer surface member and the elastic element may preferably be formed into one piece by solidification of the liquid elastic material. As an alternative method, the elastic outer surface member and the elastic element may be formed into one piece by using a mold and then mounted to the cylindrical member that forms the grip.

[0007] According to the invention, the elastic outer surface member disposed outside the grip and the elastic element disposed inside the grip are formed into one piece and thus forms one part. As a result, the manufacturing costs can be reduced compared with known construction in which the elastic outer surface member and the elastic element are separately formed.

[0008] Other objects, features and advantages of the present invention will be readily understood after reading the following detailed description together with the accompanying drawings and the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009]

FIG. 1 is a plan view, partially in section, showing an entire electric disc grinder having an auxiliary handle according to an embodiment of the invention.
FIG. 2 is a sectional view of the auxiliary handle.
FIG. 3 is a sectional view taken along line III-III in FIG. 2.
FIG. 4 is a sectional view taken along line IV-IV in FIG. 2.
FIG. 5 is a longitudinal section showing a vibration-proof handle according to a second embodiment of the invention.
FIG. 6 is a longitudinal section showing the vibration-proof handle according to the second embodiment, with a weight shown mounted in a different position.

DETAILED DESCRIPTION OF THE INVENTION

[0010] Representative examples of the present invention, which examples utilized many of these additional features and method steps in conjunction, will now be described in detail with reference to the drawings. This detailed description is merely intended to teach a person skilled in the art further details for practicing preferred aspects of the present teachings and is not intended to limit the scope of the invention. Only the claims define the scope of the claimed invention. Therefore, combinations of features and steps disclosed within the following detailed description may not be necessary to practice the invention in the broadest sense, and are instead taught merely to particularly describe some representative examples of the invention, which detailed description will now be given with reference to the accompanying drawings.

(First Embodiment)

[0011] A first representative embodiment of the invention will now be described with reference to FIGS. 1 to 4. The representative embodiment is explained as to a vibration-proof handle when applied as an auxiliary handle for operating an electric disc grinder 101. FIG. 1 shows the entire auxiliary handle attached to the electric disc grinder, in section. FIG. 2 shows only the auxiliary handle in section. FIGS. 3 and 4 are sectional views taken along line III-III and line IV-IV in FIG. 2. The electric disc grinder 101 will be briefly explained with reference to FIG. 1. The electric disc grinder 101 comprises a body 103 that includes a motor housing 105 and a gear housing 107. The body 103 is a feature that corresponds to the "tool body" according to the invention. The motor housing 105 is generally cylindrically formed and houses a driving motor 111. The driving motor 111 is arranged such that the direction of the axis of rotation coincides with the longitudinal direction of the disc grinder 101.

[0012] A power transmitting mechanism 113 is disposed within the gear housing 107 coupled to the front end of the motor housing 105 to transmit the rotating output of the driving motor 111 to a tool bit defined as a grinding wheel 115. The rotating output of the driving motor 111 is transmitted to the grinding wheel 115 as rotation in the circumferential direction via the power transmitting mechanism 113. The grinding wheel 115 is disposed on the forward part of the disc grinder 101 in the longitudinal direction such that the axis of its rotation is perpendicular to the longitudinal direction of the disc grinder 101 (the axis of rotation of the driving motor 111). Further, a main handle 109 is coupled to the rear end of the motor housing 105, and an auxiliary handle 121 is removably mounted to the side of the gear housing 107. The main handle 109 is disposed such that the longitudinal direction of the main handle 109 coincides with the longitudinal direction of the disc grinder 101, while the auxiliary handle 121 is disposed such that the longitudinal direction of the auxiliary handle 121 is perpendicular to the longitudinal direction of the main handle 109. User holds the both handles 109 and 121 by hands when grinding a workpiece.

[0013] Next, the structure of the auxiliary handle 121 is explained with reference to FIGS. 2 to 4. The auxiliary handle 121 includes a generally cylindrical handle body 123 and a cylindrical grip 125 held by the user. The handle body 123 is removably mounted to a handle mounting portion 107a formed on the side of the gear housing 107. The handle mounting portion 107a comprises a threaded mounting hole of which axis extends perpendicularly to the longitudinal direction of the body 103.

[0014] The handle body 123 has a generally cylindrical shape which includes a threaded mounting portion 123a on one end (upper end as viewed in FIG. 2) in the longitudinal direction of the handle body 123, a spherical portion 123b in the middle and an engaging shank 123c on the other end, all of which are formed in one piece continuously in the axial direction. The handle body 123 is inserted into the cylindrical grip 125 and the spherical portion 123b is engaged with a spherical concave surface 125a that is formed on one end (upper end as viewed in FIG. 2) of the grip 125 in the longitudinal direction and with a spherical concave surface 127a that is formed in an end plate 127.

[0015] Thus, the grip 125 can be rotated at one longitudinal end around the center of the spherical portion 123b in all directions with respect to the handle body 123. The end plate 127 includes a cylindrical portion 127b having the concave surface 127a in the inner surface and a threaded portion on the outer surface. The end plate 127 is fixed to the grip 125 by screwing the cylindrical portion 127b into the threaded hole of the grip 125.

[0016] Further, as shown in FIG. 3 in section, a pair of flat surface portions 123d are formed in the spherical portion 123b of the handle body 123 parallel to each other on the both sides of the axis of the handle body 123. Correspondingly, a pair of flat surface portions 125b are formed on the both sides of the axis of the handle body 123. A sheet-like rubber elastic plate 129 is disposed between the opposed flat surface portions 123d and 125b and serves to absorb rattling which may be caused by a manufacturing error between the handle body 123 and the grip 125.

[0017] As shown in FIGS. 2 and 4, the engaging shank 123c on the other end of the handle body 123 is circular in section and extends into a bore 125c of the grip 125 through the center of the concave surface 125a of the grip 125. A generally ring-like shaped rubber isolator 131 is disposed within the bore 125c of the grip 125 between the inner surface of the bore 125c and the outer surface of the engaging shank 123c. The rubber isolator 131 is a feature that corresponds to the "clastic element" according to the invention. An axially extending engaging hole 131a is formed through the center of the rubber isolator 125c. The engaging shank 123c is tightly fitted into the engaging hole 131a. The rubber isolator 131 serves

to absorb vibration transmitted from the handle body 123 to the grip 125. Specifically, the rubber isolator 131 applies a biasing force to the grip 125 mainly in the radial direction between the grip 125 and the handle body 123 when the grip 125 rotates on the spherical portion 123b of the handle body 123 with respect to the handle body 123.

[0018] The grip 125 mainly comprises a cylindrical body 126 made of a rigid resin material. The outer surface of the cylindrical body 126 is generally entirely covered with a rubber elastic cover 133. The elastic cover 133 is a feature that corresponds to the "elastic outer surface member" according to the invention. The elastic cover 133 is connected, via a plurality of connecting portions 135, to the rubber isolator 131 disposed within the bore 125c of the grip 125 (the bore of the cylindrical body 126). Specifically, the elastic cover 133 and the rubber isolator 131 are integrally formed with each other via the connecting portions 135. The connecting portions 135 extend through a plurality of through holes 137 of the cylindrical body 126. As shown in FIG. 4, the through holes 137 (two in the drawing) are formed through the cylindrical body 126 at appropriate intervals in the circumferential direction and extend through the cylindrical body 126 in the radial directions perpendicular to the axial direction of the cylindrical body 126.

[0019] The elastic cover 133 and the rubber isolator 131 are formed using a mold, for example, by insert molding. Specifically, in order to form the elastic cover 133 and the rubber isolator 131, the cylindrical body 126 is placed within the mold formed into a predetermined shape and then, the mold is charged with liquid rubber. The elastic cover 133 and the rubber isolator 131 are formed by solidification of the liquid rubber. By this molding, the connecting portions 135 are formed within the through holes 137 of the cylindrical body 126 and connect the elastic cover 133 and the rubber isolator 131. In this manner, the grip 125 is formed as one part in which the elastic cover 133 and the rubber isolator 131 are fixed (joined) to the cylindrical body 126. A flange 126a is formed on the other axial end (lower end as viewed in FIG. 2) of the cylindrical body 126 and projects outward. The elastic cover 133 wraps the flange 126a and is thus prevented from separating from the cylindrical body 126. Further, the bore 125c of the cylindrical body 126 is closed by a cap 139.

[0020] The auxiliary handle 121 according to this embodiment is constructed as mentioned above and mounted in use to the disc grinder 101 as shown in FIG. 1. The auxiliary handle 121 is mounted to the disc grinder 101 by screwing the threaded mounting portion 123a of the handle body 123 into the handle mounting portion (threaded mounting hole) 107a formed in the body 103 of the disc grinder 101. With the auxiliary handle 121 according to this embodiment, if vibration is caused during the grinding operation by the disc grinder 101, such vibration is absorbed by the vibration absorbing function of the rubber isolator 131 when the vibration is transmitted from the body 103 to the grip 125 via the handle body 123 of the auxiliary handle 121. Thus, vibration of the grip 125 can be reduced. The grip 125 can be rotated in all directions with respect to the handle body 123 via the spherical surface. Therefore, the vibration absorbing function can be unerringly performed with respect to vibration transmitted to the grip 125 from varying directions and as a result, the auxiliary handle 121 provides ease of use. Further, with the construction in which the grip 125 can be rotated in all directions via the spherical surface, no limitation is imposed in the directions of mounting the handle to the body 103. Thus, a simple, low-cost mounting construction can be adopted in which the threaded mounting portion 123a is screwed into the handle mounting portion 107a.

[0021] In order to assemble the auxiliary handle 121 according to this embodiment, the handle body 123 is inserted from the engaging shank 123c into the grip 125 through one end of the grip 125. The end plate 127 is then placed over the end of the grip 125 and the cylindrical portion 127b of the end plate 127 is screwed into the threaded hole of the grip 125. At this time, the engaging shank 123c of the handle body 123 is tightly fitted into the engaging hole 131a of the rubber isolator 131. Thus, the rubber isolator 131 is disposed between the inner surface of the bore 125c and the outer surface of the engaging shank 123c.

[0022] In the process of manufacturing the grip 125, the rubber isolator 131 is integrally formed with the elastic cover 133 that covers the outer surface of the grip 125. In other words, the grip 125 is formed as one part in which the elastic cover 133 and the rubber isolator 131 are fixed to the cylindrical body 126. Therefore, the process of mounting the rubber isolator 131 to the grip 125 is not required. Thus, the number of man-hours needed to assemble the auxiliary handle 121 can be reduced compared with a construction which requires the process of mounting a rubber isolator as part of the operation of assembling an auxiliary handle. Thus, ease of assembly can be enhanced.

Further, the grip 125 can be formed by using only one mold because the elastic cover 133 and the rubber isolator 131 are formed in one piece. Therefore, compared with the case in which a rubber isolator and a grip are separately formed and thereafter assembled together, the number of molds and thus the number of man-hours can be reduced, so that the manufacturing costs can be reduced.

[0023] Further, because the elastic cover 133 on the outside of the grip 125 is connected to the rubber isolator 131 disposed inside the grip 125, via the connecting portions 135 that extend through the cylindrical body 126, the position of the rubber isolator 131 can be freely changed in the axial direction of the grip 125 by changing the position of the connecting portions 135. The rubber isolator 131 is located near the center of rotation of the grip 125 and by such placement of the rubber isolator 131, the engaging shank 123c of the handle body 123

can be shorter so that the weight of the handle body 123 can be reduced. Further, the thinner region of the cylindrical body 126 can be longer in the axial length, so that the weight of the cylindrical body 126 can be reduced. On the other hand, the position of the rubber isolator 131 can be changed to a position remote from the center of rotation of the grip 125 or to a position nearer to the cap 139 (on the lower side as viewed in FIG. 2). In this position, the vibration amplitude is at the maximum. Therefore, by this placement of the rubber isolator 131, vibration can be efficiently absorbed.

[0024] Further, when the handle body 123 is inserted into the grip 125 to mount the handle body 123 to the grip 125, the engaging shank 123c is inserted into the engaging hole 131a of the rubber isolator 131. Thus, the handle body 123 can be efficiently mounted to the grip 125. Further, when the engaging shank 123c is inserted into the engaging hole 131a of the rubber isolator 131 or when the engaging shank 123c is tightly fitted into the rubber isolator 131, the force of pressing the rubber isolator 131 in the axial direction acts on the rubber isolator 131. Because the rubber isolator 131 is connected to the elastic cover 133 via the connecting portions 135 that extend radially through the cylindrical body 126, the connecting portions 135 serve to prevent the axial movement of the rubber isolator 131. Thus, the rubber isolator 131 can be retained in a predetermined position so that the fit between the rubber isolator 131 and the engaging shank 123c can be insured. Further, the connecting portions 135 serve to prevent the elastic cover 133 of the grip 125 from separating from the cylindrical body 126. Specifically, the connecting portions 135 provide for the prevention of separation of the elastic cover 133 from the outer surface of the cylindrical body 126. Thus, the quality of the grip 125 can be maintained.

[0025] Further, the grip 125 is coupled to the handle body 123 such that it can be rotated in all directions via the spherical portion 123b with respect to the handle body 123. However, it may be constructed such that the grip 125 is rotated with respect to the handle body 123 on a plurality of pivots crossing with each other, or on a single pivot.

Further, while the electric disc grinder 101 is described as a representative example of application of the auxiliary handle 121, the auxiliary handle 121 may also be applied to a rotary power tool such as a polisher, a circular saw and a vibrating drill, which performs an operation on a workpiece by rotation of a tool bit. Further, it may also be applied to an impact power tool such as an electric hammer and a hammer drill, which performs fracturing or drilling operation on a workpiece by causing a tool bit to perform hammering movement in the axial direction or the hammering movement and rotation in combination. Moreover, it may also be applied to cutting tools such as a reciprocating saw or a jig saw, which perform a cutting operation on a workpiece by causing a blade to perform a reciprocating movement, whereby causing a substantially linear vibration.

[0026] Further, it may be constructed such that the rubber isolator 131 is disposed on the free end of the grip 125 and also serves as the cap 139 to close the bore 125c of the grip 125. In this case, the connecting portions 135 for connecting the rubber isolator 131 and the elastic cover 133 may be arranged to cover the axial end surface of the cylindrical body 126, instead of extending through the cylindrical body 126. Further, the elastic cover 133 and the rubber isolator 131 may be formed into one piece and thereafter fitted over the cylindrical body 126. Further, while a plurality of the through holes 137 are formed through the cylindrical body 126 of the grip 125, one through hole 137 may be provided instead.

(Second representative embodiment)

[0027] A handle according to a second representative embodiment of the invention is described with reference to FIGS. 5 and 6. The representative handle is defined as a vibration-proof handle and includes a handle body in the form of a generally cylindrical mounting rod 183 and a grip 185 held by the user. The mounting rod 183 can be mounted to a body of a power tool (not shown), such as an electric grinder. The mounting rod 183 includes a threaded mounting portion 183a formed on one end (upper end as viewed in FIG. 5) in its longitudinal direction, and a spherical portion 183b. The mounting rod 183 is inserted into the cylindrical grip 185 and the spherical portion 183b is engaged with a spherical concave surface 185a that is formed on one end (upper end as viewed in FIG. 2) of the grip 185 in the longitudinal direction and with a spherical concave surface 191a that is formed in an end plate 191. Thus, the grip 185 can be rotated at one longitudinal end around the center of the spherical portion 183b in all directions with respect to the mounting rod 183. The end plate 191 includes a cylindrical portion 191b having the spherical surface 191a in the inner surface and a threaded portion on the outer surface. The end plate 191 is fixed to the grip 185 by screwing the cylindrical portion 191b into the threaded hole of the grip 185.

[0028] A cushion rubber 193 is disposed between the grip 185 and the mounting rod 183 on the other axial end portion of the mounting rod 183. The cushion rubber 193 is a feature that corresponds to the "elastic element" according to the invention and serves to absorb vibration transmitted from the mounting rod 183 to the grip 185. Specifically, the cushion rubber 193 applies a biasing force to the grip 185 in the radial direction between the grip 185 and the mounting rod 183 when the grip 185 rotates on the spherical portion 183b with respect to the mounting rod 183. The grip 185 includes a grip body or a cylindrical body 187 and a rubber cover 189 that generally entirely covers the outer surface of the cylindrical body 187. The cover 189 is integrally formed with the vibration absorbing cushion rubber 193.

[0029] A weight mounting portion 185b for mounting the weight 195 is formed in the other axial end portion

(lower end portion as viewed in FIG. 2) of the grip 185. The weight mounting portion 185b comprises a hole threaded on the inner surface of the bore of the cylindrical body 187. The weight 195 comprises a cylindrical body having a male thread on the outer surface and can be removably mounted to the grip 185 by screwing into the threaded hole on the inner surface of the bore of the cylindrical body 187. The weight 195 is provided to change the position of the center of gravity of the grip 185 in the longitudinal direction. As one manner of such change, a plurality of the weights 195 of predetermined different weights are prepared and then, one of the weights 195 is selected and mounted in the weight mounting portion 185b. The weight difference of the weights 195 is created, for example, by changing the materials (for example, by making a resin weight and a metal weight) or by changing the axial depth of a recess 195a of the weight 195. As another manner of changing the position of the center of gravity of the grip 185, the mounting position of the weight 195 within the weight mounting portion 185b can be adjusted. Specifically, the threaded hole in the form of the weight mounting portion 185b extends an elongated distance from the other end surface of the cylindrical body 187 generally to the middle in the longitudinal direction. Thus, the position of mounting the weight 195 within the weight mounting portion 185b can be changed, for example, from the position shown in FIG. 5 to the position shown in FIG. 6, by changing the depth of screwing the weight 195 into the weight mounting portion 185b. The weight 195 also serves as a cap to close the bore of the grip 185.

[0030] The natural frequency of the grip 185 can be changed, for example, by changing the rigidity or the mass of the grip 185. The weight 195 to be mounted in the weight mounting portion 185b of the grip 185 of the auxiliary handle 181 can be selectively changed from one to another of different weight. Further or otherwise, the position of mounting the weight 195 within the weight mounting portion 185b can be adjusted. The position of the center of gravity of the grip 185 can be changed in the longitudinal direction by weight change of the weight 195 or by adjustment of the mounting position of the weight 195. In other words, the distance between the center of gravity and the center of rotation of the grip 185 that rotates (vibrates) around the center of the spherical portion 183b of the mounting rod 183, can be changed. Such change of the position of the center of gravity causes change of the rotating moment around the center of rotation of the grip 185 which acts on the center of gravity of the grip 185. By such change of the rotating moment, the natural frequency of the grip 185 that rotates around the center of the spherical portion 183b can be changed.

[0031] For example, when the auxiliary handle 181 is mounted to an electric grinder, the weight 195 is arranged such that the natural frequency of the grip 185 is displaced to a lower value than the frequency of vibration caused during operation of the grinder. As a result, vibration of the grip 185 caused by transmission of vibration from the body of the grinder to the grip 185 can be effectively reduced.

[0032] Generally, frequencies of vibration which is caused in a power tool and thus frequencies of vibration to be reduced vary by model or type of power tool. According to the representative auxiliary handle 181, the natural frequency of the grip 185 can be readily changed according to the model or the type of power tool to which the auxiliary handle 181 is mounted. In other words, one type of auxiliary handle 181 can be applied to different models or types of power tool. While the natural frequency of the grip 185 is changed by the manufacturer, such change can be made by the user of the grip 185.

[0033] The construction for mounting the weight 195 to the grip 185 is not limited to the type in which the weight 195 is screwed into the hole threaded on the inner surface of the bore of the grip 185. For example, the weight 195 may be fastened to the grip 185 by screws which are separately provided. Alternatively, an engaging claw may be provided on one of the inner surface of the bore of the grip 185 and the outer surface of the weight 195, and an engaging groove that can be engaged with the engaging claw may be provided on the other. The weight 195 is inserted into the bore of the grip 185 with the engaging claw and the engaging groove aligned with each other and then, the weight 195 is turned in the circumferential direction in such a manner as to prevent removal. Further, the weight 195 may be mounted on the outside of the grip 185.

[0034] It is explicitly stated that all value ranges or indications of groups of entities disclose every possible intermediate value or intermediate entity for the purpose of original disclosure as well as for the purpose of restricting the claimed invention, in particular as limits of value ranges.

Description of Numerals

[0035]

101	electric disc grinder (power tool)
103	body (tool body)
105	motor housing
107	gear housing
107a	handle mounting portion
109	main handle
111	driving motor
113	power transmitting mechanism
115	grinding wheel (tool bit)
121	auxiliary handle
123	handle body (mounting portion)
123a	threaded mounting portion
123b	spherical portion
123c	engaging shank
123d	flat surface portion
125	grip
125a	concave surface
125b	flat surface portion

125c	bore
126	cylindrical body
127	end plate
127a	concave surface
127b	cylindrical portion
129	elastic plate
131	rubber isolator (elastic element)
131a	engaging hole
133	elastic cover (elastic outer surface member)
135	connecting portion
137	through hole
139	cap

Claims

1. A handle comprising:

a handle body (123) that can be mounted to a power tool (101),
a hollow grip (125) into which the handle body (123) is inserted,
an elastic element (131) disposed between the inner surface of the grip (125) and the outer surface of the handle body (123),
an elastic outer surface member (133) that covers the outer surface of the grip (125),

characterized in that the elastic outer surface member (133) is integrally formed with the elastic element (131), by the grip (125) being coupled to the inserted handle body (123) such that the grip (125) can move with respect to the handle body (123), **in that** the elastic element (131) applies a biasing force to the grip (125) upon movement of the grip (125) with respect to the handle body (123) when vibration of the power tool is transmitted from the handle body (123) to the grip (125), and by further comprising a through hole (137) formed through the grip (125), the through hole extending in a direction crossing the axial direction of the grip (125), wherein the elastic element (131) and the elastic outer surface member (133) are connected to each other via a connecting portion (135) that lies in the through hole (137).

2. The handle as defined in claim 1, wherein the elastic element (131) is disposed within the grip (125) outward of a position of mounting the handle body (123) to the power tool (101).

3. The handle as defined in claim 1 or 2, further comprising a pivot section that couples the grip (125) to the handle body (123), wherein the pivot section allows the grip (125) to rotate with respect to the handle body (123) when vibration of the power tool (101) is transmitted from the handle body (123) to the grip (125), and wherein the elastic element (131) is disposed in a region outside the pivot section between the handle body (123) and the grip (125) and applies a biasing force to the grip (125) upon rotation of the grip (125) on the pivot with respect to the handle body (123) when vibration of the power tool (101) is transmitted from the handle body (123) to the grip (125).

4. The handle as defined in any one of claims 1 to 3, wherein the elastic element (131) is disposed outward of the pivot section within the grip (125).

5. The handle as defined in claim 1, wherein the elastic element (131) is fitted onto the outer surface of an inserted end of the handle body (123) when the handle body (123) is inserted into the grip (125) in the axial direction in order to mount the handle body (123) to the grip (125), and wherein the connecting portion (135) prevents the elastic element (131) to move in the axial direction.

6. The handle as defined in any one of claims 1 to 5, wherein the grip (125) is coupled to the handle body (123) such that the grip (125) can rotate in all directions with respect to the handle body (123), and wherein the elastic element (131) applies a biasing force to the grip (125) upon rotation of the grip (125) in all directions with respect to the handle body (123).

7. The handle as defined in claim 6, wherein one of the grip (125) and the handle body (123) has a spherical portion and the other of the grip (125) and the handle body (123) as a concave portion that is complementary to the spherical portion, and wherein the grip (125) is coupled to the handle body (123) via the spherical portion and the concave portion such that the grip (125) can be rotated in all directions with respect to the handle body (123).

8. The handle as defined in any one of claims 1 to 7, wherein the handle body (123) is selectively mounted to different kinds of power tools (101), and wherein the grip (125) is adapted and arranged such that the natural frequency of the grip (125) can be changed according to the kind of power tool (101) to which the handle is mounted.

9. The handle as defined in claim 8, further comprising a pivot that connects the grip (125) to the handle body, wherein the pivot allows the grip (125) to rotate on the pivot with respect to the handle body (123) when vibration of the power tool (101) is transmitted from the handle body (123) to the grip (125), and wherein the distance between the pivot and the center of gravity of the grip (125) can be changed in the grip (125) so that the natural frequency of the grip (125) can be changed by changing said distance with the handle body (123) mounted to the power tool (101).

10. The handle as defined in claim 8, wherein the change of the natural frequency of the grip (125) can be made by selectively mounting at least one of a plurality of, weights (195) of different kinds varying in weight and/or by adjusting the mounting position of the weight (195) in the grip (125) in the longitudinal direction of the grip (125).

Patentansprüche

1. Handgriff, mit:

einem Handgriffkörper (123), der an einem Elektrowerkzeug (101) befestigt werden kann,
einem hohlen Griff (125), in den der Handgriffkörper (123) eingesetzt wird,
einem elastischen Element (131), das zwischen der Innenfläche des Handgriffs (125) und der Außenfläche des Handgriffkörpers (123) angeordnet ist,
einem elastischen Außenflächenelement (133), das die Außenfläche des Griffs (125) bedeckt,

dadurch gekennzeichnet,
dass das elastische Außenflächenelement (133) integral mit dem elastischen Element (131) ausgebildet ist,
dass der Griff (125) mit dem eingesetzten Handgriffkörper (123) derart gekoppelt ist, dass sich der Griff (125) relativ zu dem Handgriffkörper (123) bewegen kann,
dass das elastische Element (131) bei der Bewegung des Griffs (125) relativ zu dem Handgriffkörper (123) eine Vorspannkraft auf den Griff (125) ausübt, wenn eine Vibration des Elektrowerkzeugs vom Handgriffkörper (123) auf den Griff (125) übertragen wird, und
dass er eine Durchgangsöffnung (137) aufweist, die durch den Griff (125) ausgebildet ist, wobei sich die Durchgangsöffnung in einer Richtung erstreckt, die die axiale Richtung des Griffs (125) kreuzt, wobei das elastische Element (131) und das elastische Außenflächenelement (133) durch einen Verbindungsabschnitt (135), der sich in der Durchgangsöffnung (137) befindet, miteinander verbunden sind.

2. Handgriff nach Anspruch 1, bei dem das elastische Element (131) im Griff (125), außerhalb einer Befestigungsposition des Handgriffkörpers (123) am Elektrowerkzeug (101), angeordnet ist.

3. Handgriff nach Anspruch 1 oder 2, der weiter einen Schwenkabschnitt aufweist, der den Griff (125) an den Handgriffkörper (123) koppelt, bei dem der Schwenkabschnitt es dem Griff (125) erlaubt, sich relativ zu dem Handgriffkörper (123) zu drehen, wenn die Vibration des Elektrowerkzeugs (101) vom Handgriffkörper (123) auf den Griff (125) übertragen wird, und bei dem das elastische Element (131) in einem Bereich außerhalb des Schwenkabschnitts zwischen dem Handgriffkörper (123) und dem Griff (125) angeordnet ist und bei Drehung des Griffs (125) um den Schwenkpunkt im Bezug auf den Handgriffkörper (123) eine Vorspannkraft an den Griff (125) ausübt, wenn eine Vibration des Elektrowerkzeugs (101) von dem Handgriffkörper (123) auf den Griff (125) übertragen wird.

4. Handgriff nach einem der Ansprüche 1 bis 3, bei dem das elastische Element (131) außerhalb des Schwenkabschnitts in dem Griff (125) angeordnet ist.

5. Handgriff nach Anspruch 1, bei dem das elastische Element (131) auf der Außenfläche eines eingesetzten Endes des Handgriffkörpers (123) angebracht ist, wenn der Handgriffkörper (123) in der axialen Richtung in den Griff (125) eingesetzt ist, um den Handgriffkörper (123) am Griff (125) zu befestigen, und bei dem der Verbindungsbereich (135) verhindert, dass sich das elastische Element (131) in der axialen Richtung bewegt.

6. Handgriff nach einem der Ansprüche 1 bis 5, bei dem der Griff (125) so an den Handgriffkörper (123) gekoppelt ist, dass sich der Griff (125) relativ zu dem Handgriffkörper (123) in allen Richtungen drehen kann, und bei dem das elastische Element (131) bei der Drehung des Griffs (125) in allen Richtungen im Bezug auf den Handgriffkörper (123) eine Vorspannkraft auf den Griff (125) ausübt.

7. Handgriff nach Anspruch 6, bei dem entweder der Griff (125) oder der Handgriffkörper (123) einen kugelförmigen Bereich aufweist, und der jeweils andere, der Griff (125) oder der Handgriffkörper (123), einen konkaven Bereich aufweist, der komplementär zum kugelförmigen Bereich ist, und bei dem der Griff (125) über den kugelförmigen Bereich und den konkaven Bereich so an den Handgriffbereich (123) gekoppelt ist, dass der Griff (125) in allen Richtungen relativ zu dem Handgriffkörper (123) gedreht werden kann.

8. Handgriff nach einem der Ansprüche 1 bis 7, bei dem der Handgriffkörper (123) wahlweise an verschiedenen Arten von Elektrowerkzeugen (101) befestigt ist, und bei dem der Griff (125) so angepasst und angeordnet ist, dass die Eigenfrequenz des Griffs (125) je nach Art des Elektrowerkzeugs (101), an dem der Handgriff befestigt ist, geändert werden kann.

9. Handgriff nach Anspruch 8, ferner mit einem Gelenkteil, das den Griff (125) mit dem Handgriffkörper verbindet, bei dem das Gelenkteil dem Griff (125) er-

laubt, sich relativ zum Handgriffkörper (123) auf dem Gelenkteil zu drehen, wenn die Vibration des Elektrowerkzeugs (101) vom Handgriffkörper (123) auf den Griff (125) übertragen wird, und bei dem der Abstand zwischen dem Schwenkpunkt und dem Schwerpunkt des Griffs (125) im Griff (125) so geändert werden kann, dass die Eigenfrequenz des Griffs (125) verändert werden kann, indem der Abstand geändert wird, wobei der Handgriffkörper (123) am Elektrowerkzeug (101) befestigt ist.

10. Handgriff nach Anspruch 8, bei dem die Eigenfrequenz des Griffs (125) geändert werden kann, durch wahlweise Befestigen zumindest eines einer Mehrzahl an Gewichten (195) verschiedener Art, die sich im Gewicht unterscheiden, und/oder durch Einstellen der Befestigungsposition des Gewichts (195) im Griff (125) in der Längsrichtung des Griffs (125).

Revendications

1. Poignée comprenant :

un corps de poignée (123) qui peut être monté sur un outil électrique (101),
un manche creux (125) dans lequel est inséré le corps de poignée (123),
un élément élastique (131) disposé entre la surface interne du manche (125) et la surface externe du corps de poignée (123),
un élément de surface externe élastique (133) qui couvre la surface externe du manche (125),

caractérisée en ce que l'élément de surface externe élastique (133) est formé d'un seul tenant avec l'élément élastique (131), **en ce que** le manche (125) est couplé au corps de poignée inséré (123) de telle sorte que le manche (125) peut se déplacer par rapport au corps de poignée (123), **en ce que** l'élément élastique (131) applique une force de sollicitation sur le manche (125) lors du mouvement du manche (125) par rapport au corps de poignée (123) lorsque la vibration de l'outil électrique est transmise du corps de poignée (123) au manche (125), et **en ce qu'**elle comprend en outre un trou traversant (137) formé à travers le manche (125), le trou traversant s'étendant dans une direction croisant la direction axiale du manche (125), l'élément élastique (131) et l'élément de surface externe élastique (133) étant connectés l'un à l'autre via une partie de connexion (135) qui se trouve dans le trou traversant (137).

2. Poignée selon la revendication 1, dans laquelle l'élément élastique (131) est disposé à l'intérieur du manche (125) vers l'extérieur d'une position de montage du corps de poignée (123) sur l'outil électrique (101).

3. Poignée selon la revendication 1 ou 2, comprenant en outre une section d'articulation qui couple le manche (125) au corps de poignée (123), dans laquelle la section d'articulation permet au manche (125) de tourner par rapport au corps de poignée (123), lorsqu'une vibration de l'outil électrique (101) est transmise du corps de poignée (123) au manche (125), et dans laquelle l'élément élastique (131) est disposé dans une région à l'extérieur de la section d'articulation entre le corps de poignée (123) et le manche (125) et applique une force de sollicitation sur le manche (125) lors de la rotation du manche (125) sur l'articulation par rapport au corps de poignée (123) lorsque la vibration de l'outil électrique (101) est transmise du corps de poignée (123) au manche (125).

4. Poignée selon l'une quelconque des revendications 1 à 3, dans laquelle l'élément élastique (131) est disposé vers l'extérieur de la section d'articulation à l'intérieur du manche (125).

5. Poignée selon la revendication 1, dans laquelle l'élément élastique (131) est fixé sur la surface externe d'une extrémité insérée du corps de poignée (123), lorsque le corps de poignée (123) est inséré dans le manche (125) dans la direction axiale afin de monter le corps de poignée (123) sur le manche (125), et dans laquelle la partie de connexion (135) empêche l'élément élastique (131) de se déplacer dans la direction axiale.

6. Poignée selon l'une quelconque des revendications 1 à 5, dans laquelle le manche (125) est couplé au corps de poignée (123), de telle sorte que le manche (125) peut tourner dans toutes les directions par rapport au corps de poignée (123), et dans laquelle l'élément élastique (131) applique une force de sollicitation sur le manche (125) lors de la rotation du manche (125) dans toutes les directions par rapport au corps de poignée (123).

7. Poignée selon la revendication 6, dans laquelle l'un parmi le manche (125) et le corps de poignée (123) a une partie sphérique et l'autre parmi le manche (125) et le corps de poignée (123) a une partie concave qui est complémentaire de la partie sphérique, et dans laquelle le manche (125) est couplé au corps de poignée (123) via la partie sphérique et la partie concave de telle sorte que le manche (125) peut tourner dans toutes les directions par rapport au corps de poignée (123).

8. Poignée selon l'une quelconque des revendications 1 à 7, dans laquelle le corps de poignée (123) est monté sélectivement sur différents types d'outils électriques (101), et dans laquelle le manche (125) est adapté et agencé de telle sorte que la fréquence

naturelle du manche (125) peut être modifiée selon le type d'outil électrique (101) sur lequel est montée la poignée.

9. Poignée selon la revendication 8, comprenant en outre une articulation qui connecte le manche (125) au corps de poignée, dans laquelle l'articulation permet au manche (125) de tourner sur l'articulation par rapport au corps de poignée (123) lorsqu'une vibration de l'outil électrique (101) est transmise du corps de poignée (123) au manche (125), et dans laquelle la distance entre l'articulation et le centre de gravité du manche (125) peut être modifiée dans le manche (125) de telle sorte que la fréquence naturelle du manche (125) peut être modifiée en modifiant ladite distance avec le corps de poignée (123) monté sur l'outil électrique (101).

10. Poignée selon la revendication 8, dans laquelle le changement de la fréquence naturelle du manche (125) peut être effectué en montant sélectivement au moins une pluralité de masses (195) de différents types à poids variable et/ou en réglant la position de montage de la masse (195) dans le manche (125) dans la direction longitudinale du manche (125).

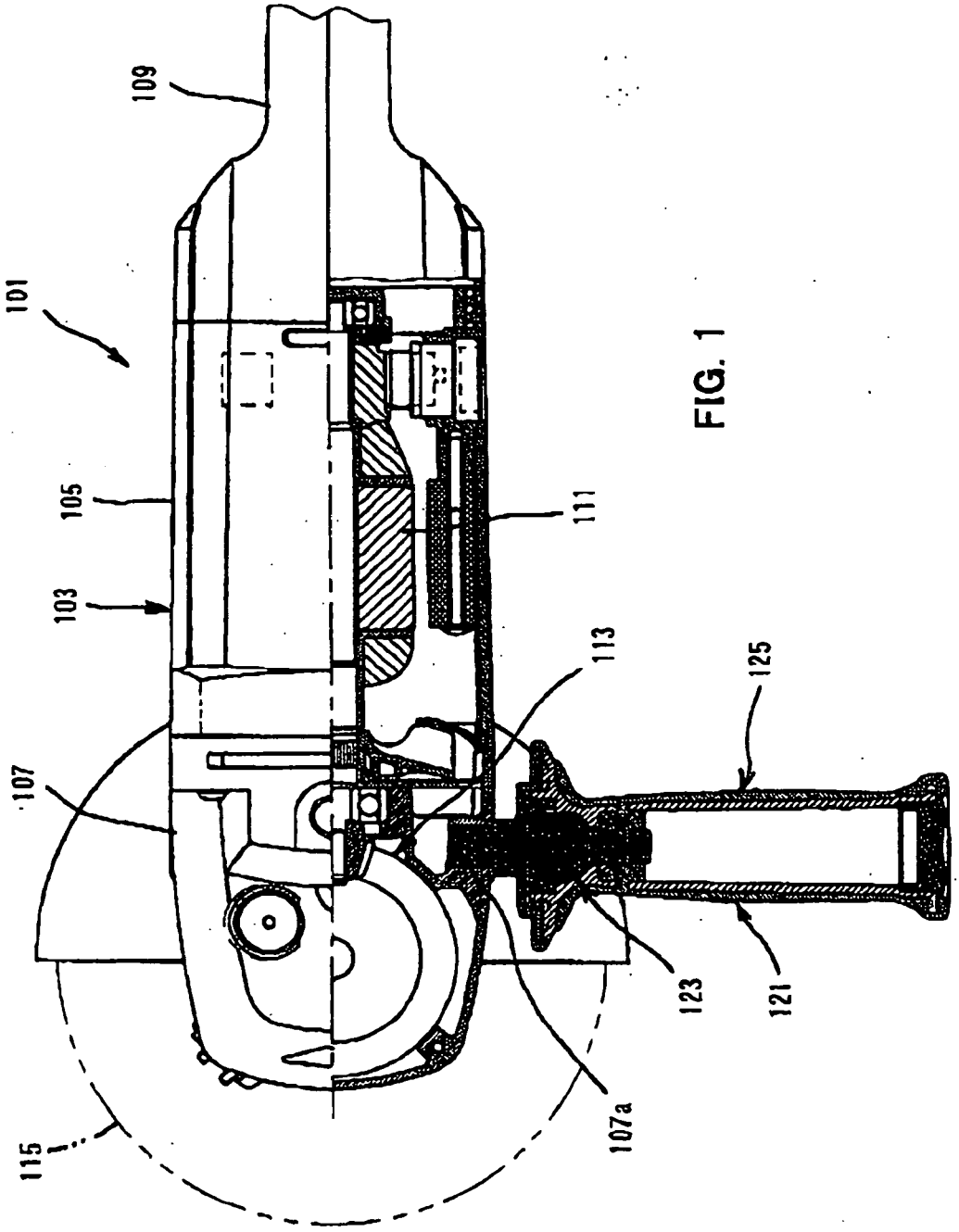


FIG. 1

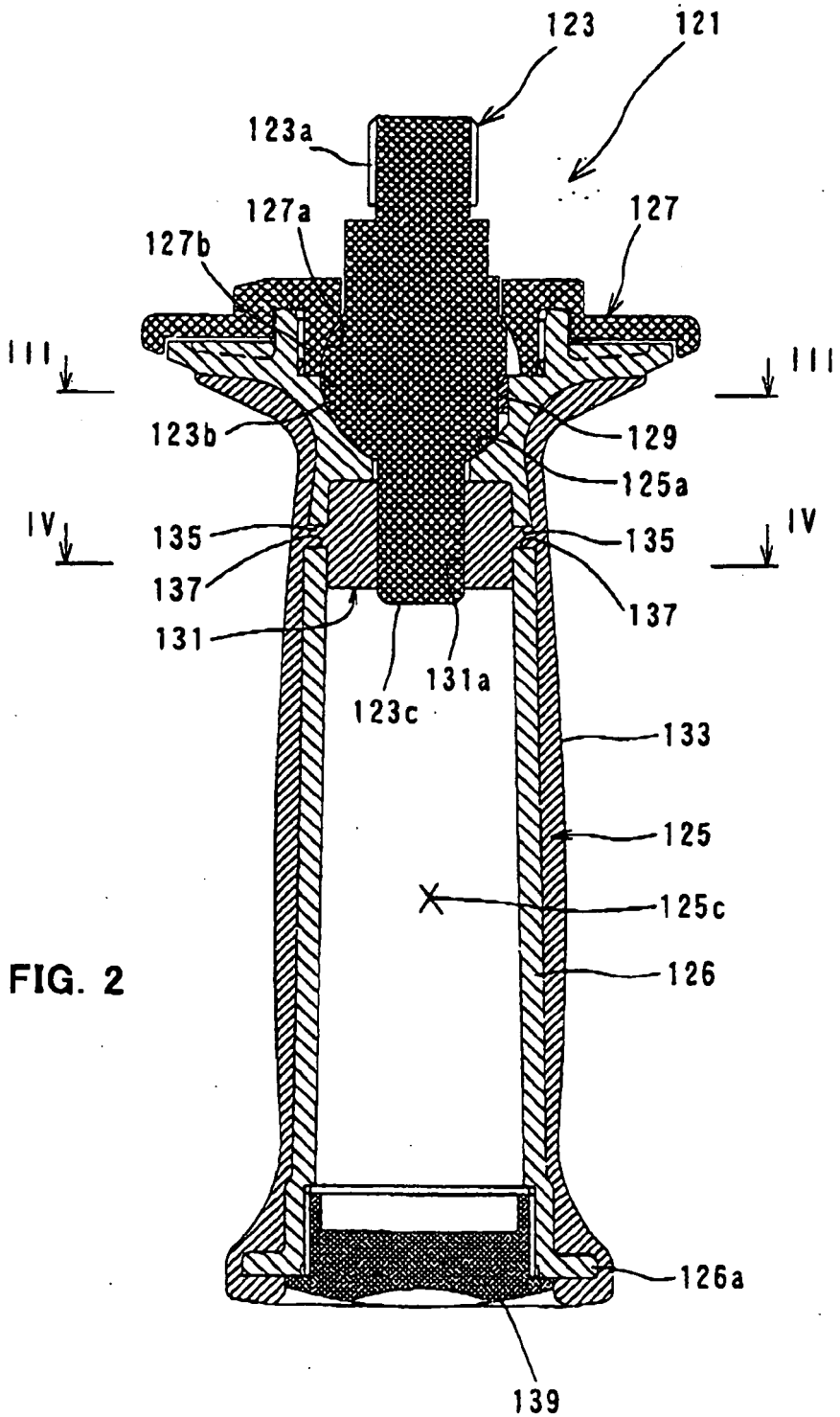

123
121
123a
127a
127
127b
III
III
123b
129
125a
IV
135
135
IV
137
137
131
131a
123c
133
125
125c
126
126a
139

FIG. 2

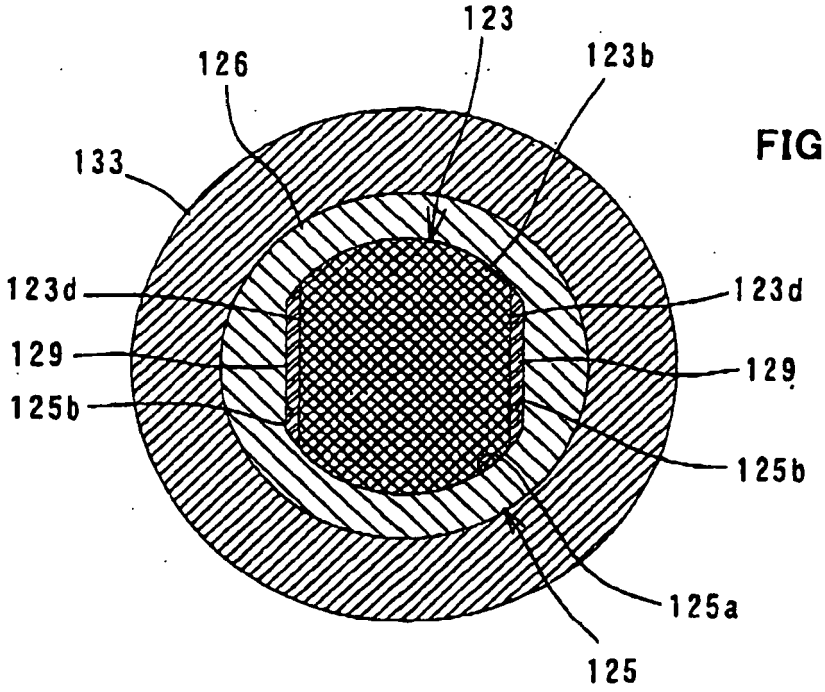

123
126
123b
133
123d
123d
129
129
125b
125b
125a
125

FIG. 3

FIG. 4

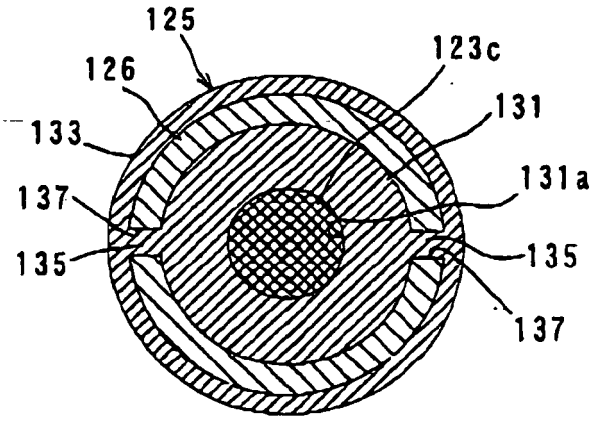
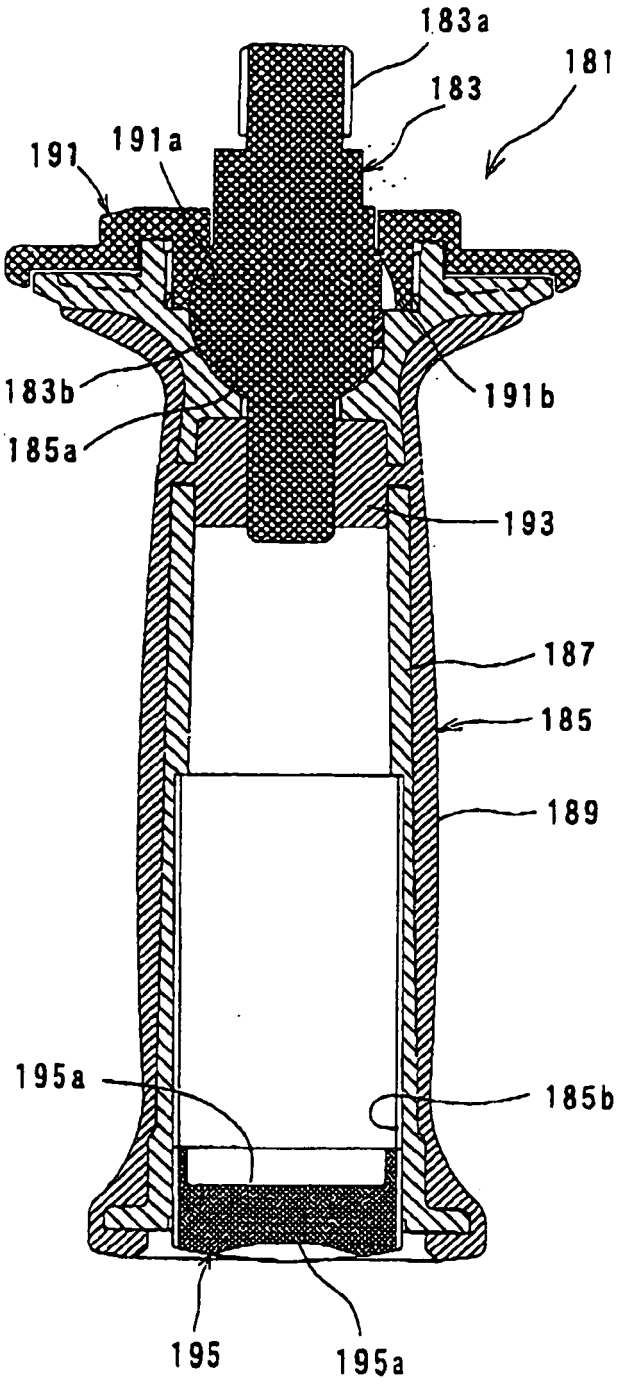

125
123c
126
131
133
131a
137
135
135
137

FIG. 5


183a
181
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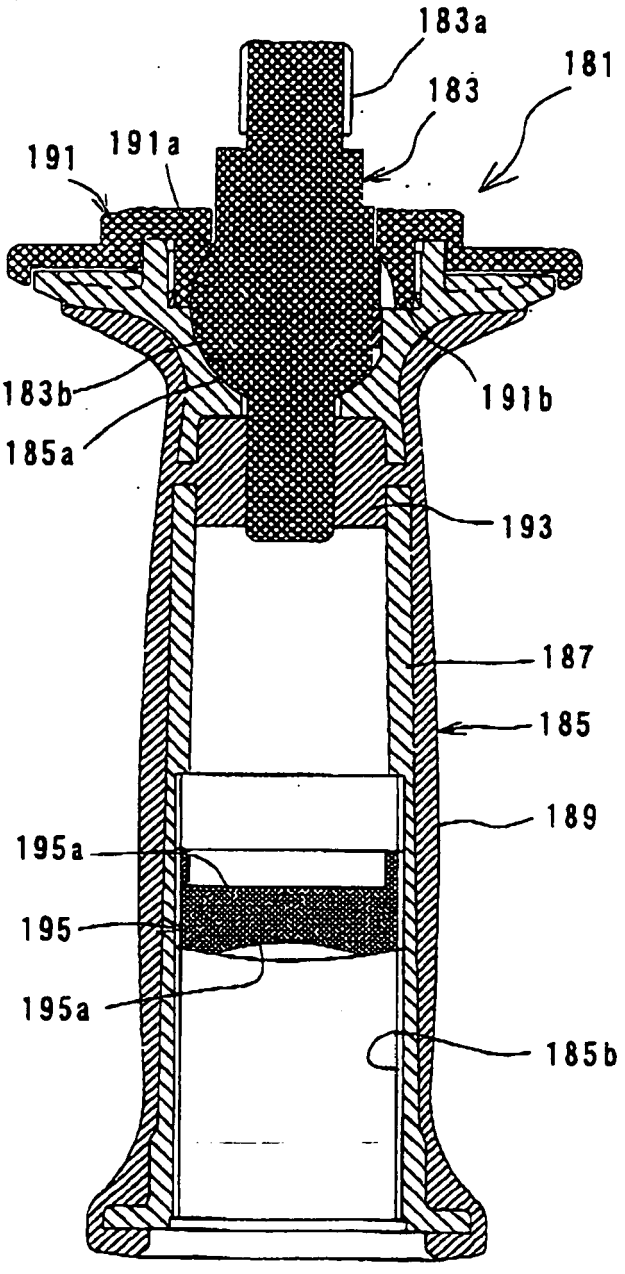
191a
183b
191b
185a
193
187
185
189
195a
185b
195
195a

FIG. 6


183a
181
183
191
191a
183b
191b
185a
193
187
185
189
195a
195
195a
185b

REFERENCES CITED IN THE DESCRIPTION

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