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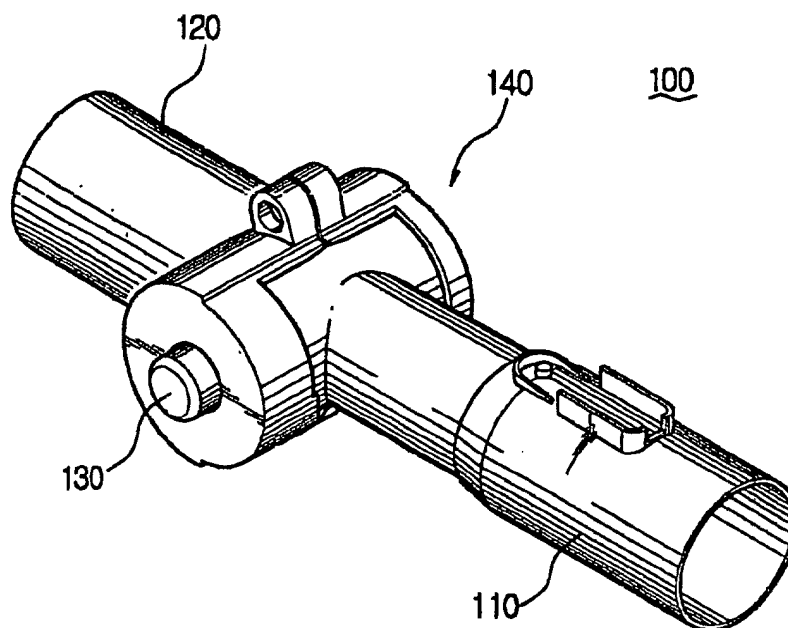
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(54) **Bendable extension pipe having joint for vacuum cleaner**

(57) A bendable extension pipe for a vacuum cleaner with a body bent by a button manipulation that forms a sealed fluid passage between a vacuum cleaner body and a suction brush, is disclosed. The bendable extension pipe includes a first extension pipe and a second extension pipe. The first and second extension pipes are

rotatably connected. A locking button is elastically disposed on the first extension pipe to restrict rotation of the first and the second extension pipes. A sealing cover prevents the locking button from moving out of joint of the first and second extension pipes and seals the first and the second extension pipes.

**FIG. 1**



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## Description

### REFERENCE TO RELATED APPLICATION

**[0001]** This application claims priority to copending Korean Patent Application No. 2003-72874 filed in the Korean Intellectual Property Office on October 20, 2003, the entire contents of which are incorporated herein by reference.

### CROSS REFERENCE TO RELATED APPLICATION

**[0002]** This application is related to the co-pending application entitled, "Bendable Nozzle For Vacuum Cleaner", (Korean Application 10-2003-72873, filed October 20, 2003) which disclosure is commonly owned by the same assignee as the present application and is entirely incorporated herein by reference.

### FIELD OF THE INVENTION

**[0003]** The present invention relates to a vacuum cleaner, and more particularly, to a bendable extension pipe of a vacuum cleaner which enables the operator of the cleaner to clean the small places underneath furniture such as a bed and a couch with convenience.

### BACKGROUND OF THE INVENTION

**[0004]** Generally, a vacuum cleaner draws in dust from a cleaning surface along with ambient air using a suction force which is generated by a suction motor provided inside a cleaner body. In order to allow drawn in air and dust to pass into the cleaner body, a fluid passage is sealingly formed connecting the cleaner body and the suction brush while contacting on the cleaning surface.

**[0005]** Various types of fluid passages are available. For example, a canister vacuum cleaner may include a flexible hose connecting the cleaner body with an operation handle, and an extension pipe connecting the operation handle with the suction brush. Generally, the extension pipe is formed in a telescopic manner, or formed from a plurality of assembly pipe parts to enable adjustment in length as necessary.

**[0006]** In the vacuum cleaner as described above, the extension pipe and the suction brush are usually at a fixed angle and as a result, it is inconvenient for an operator to clean lower places such as places underneath the bed or couch. That is, the operator has to lower his/her body, keep the suction brush in contact with the cleaning surface and turn the extension pipe to clean the underside places. Even with the extension pipe and the suction brush disposed at an adjustable angle, however, there still exists an inconvenience because the operator has to bend his body to put the suction brush underneath the furniture.

**[0007]** Thus, a heretofore unaddressed need exists in

the industry to address the aforementioned deficiencies and inadequacies.

### SUMMARY OF THE INVENTION

**[0008]** The present invention has been developed in order to solve the above drawbacks and other problems associated with the conventional arrangement. An object of the present invention is to provide a bendable extension pipe for a vacuum cleaner which has an improved structure to enable an operator to perform a cleaning operation without having to bend or lower his/her body, but bending the extension pipe through a simple manipulation of a few buttons.

**[0009]** The above aspects and/or other features of the present invention can be substantially achieved by providing a bendable extension pipe for a vacuum cleaner with a body bent by a button manipulation, the bendable extension pipe forming a sealed fluid passage between a vacuum cleaner body and a suction brush. The bendable extension pipe includes a first extension pipe, a second extension pipe rotatably connected with the first extension pipe, a locking button elastically disposed on the first extension pipe, to restrict rotation of the first and the second extension pipes, and a sealing cover for preventing the locking button from moving out of joint from the first and second extension pipes and sealing the first and the second extension pipes.

**[0010]** According to a preferred embodiment, the locking button is formed on a seating protrusion which is protruded from a side of an axis of a rotation of a joint which movably connects the first extension pipe and the second extension pipe. The locking button includes at least one interfering rib protruding along the outer circumference and a restriction projection for restricting the rotation of the first and the second extension pipes. The seating protrusion includes at least one guide projection formed on the outer circumference and a sliding groove formed in the locking button to coincide with the guide projection. With a push and release of the locking button, the sliding groove is guided by the guiding projection to prevent a rotation of the locking button. An elastic member is disposed between the locking button and the seating protrusion. With the push of the locking button, the elastic member exerts a recovery force in the direction of a release from the locking button.

**[0011]** The second extension pipe includes a slot plate with a sliding slot for a sliding engagement with the seating projection. The sliding slot includes one open end. A locking part is formed in a position corresponding to a restriction projection to selectively lock the restriction projection in accordance with a displacement of the restriction projection in an axial direction. The locking part is separated from the slot plate by a distance equal to, or greater than the thickness of the restriction projection.

**[0012]** The sealing cover includes a first cover with a button hole corresponding in size with the outer circum-

ference of the locking button, and a second cover engaged with the first cover and sealing connecting parts between the first and the second extension pipes.

**[0013]** Other systems, methods, features, and advantages of the present invention will be or become apparent to one with skill in the art upon examination of the following drawings and detailed description. It is intended that all such additional systems, methods, features, and advantages be included within this description, be within the scope of the present invention, and be protected by the accompanying claims.

#### BRIEF DESCRIPTION OF THE DRAWINGS

**[0014]** The above aspects and other features of the present invention will become more apparent by describing in detail certain embodiments thereof with reference to the attached drawings. The components in the drawings are not necessarily to scale, emphasis instead of being placed upon clearly illustrating the principles of the present invention. Moreover, in the drawings, like reference numerals designate corresponding parts throughout several views.

**[0015]** FIG. 1 is a drawing of a perspective view of a bendable extension pipe according to an embodiment of the present invention;

**[0016]** FIG. 2 is a drawing of an exploded perspective view of a bendable extension pipe according to an embodiment of the present invention;

**[0017]** FIG. 3 is a drawing of a perspective view illustrating a bendable extension pipe according to an embodiment of the present invention before the bending, with a sealing cover being omitted; and

**[0018]** FIG. 4 is a drawing of a perspective view illustrating a bendable extension pipe according to an embodiment of the present invention after the bending, with a sealing cover omitted.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

**[0019]** Certain embodiments of the present invention will be described in greater detail with reference to the accompanying drawings.

**[0020]** FIG. 1 is a perspective view illustrating a bendable extension pipe 100 for a vacuum cleaner according to an embodiment of the present invention. Referring to FIG. 1, the bendable extension pipe 100 includes first and second extension pipes 110, 120 which are bendably connected to each other according to a push and release of a locking button 130. A sealing cover 140 prevents a suction loss of the connecting parts and also prevents the locking button 130 from moving out of joint from the first and second extension pipes in the axial direction.

**[0021]** Referring to FIG. 2, the first extension pipe 110 includes a cylinder joint J1 which has an opening (not shown) at a side facing the second extension pipe 120,

and approximately at the center of the cylinder joint J1, a seating protrusion 111 is formed overlapping with the rotational axis. The locking button 130 is movably disposed on the seating protrusion 111 for the push and release movement, and in one example, the seating protrusion 111 may be inserted in the locking button 130 with the intervention of an elastic member S therebetween. As shown in FIG. 2, at least one guide projection 111a and sliding groove 130a are formed on each of the seating protrusion 111 and the locking button 130 in a complementary manner. Accordingly, when the locking button 130 is pushed or released by the guide projection 111a which is engaged in the sliding groove 130a in the outer circumference, the locking button 130 is guided such that the locking button 130 turns in association with the turning of the first extension pipe 110 to the same rotational angle.

**[0022]** An interfering rib 131 is formed on an outer circumference of the locking button 130 to prevent the locking button 130 from moving out in the axial direction, and a restriction projection 132 is formed also on the outer circumference of the locking button 130 to restrict the rotational angle of the first and the second extension pipes 110 and 120. At least one interfering rib 131 with a larger diameter than the locking button 130 may be formed in the circumferential direction as shown in FIG. 2, to prevent the locking button 130, which is exposed outside of the sealing cover 140, from moving out in the axial direction. In a preferred embodiment, the interfering rib 131 may be arranged symmetrically to be supported evenly on the sealing cover 140 and not to be tilted.

**[0023]** At least one restriction projection 132 may be formed in a circumferential direction, each on appropriate locations which do not coincide with the interfering rib 131. The restriction projection 132 may be formed with a smaller height than the interfering rib 131, and additionally, the restriction projection 132 may be tapered on a predetermined side to require less force of an operator in bending the first and the second extension pipes 110 and 120.

**[0024]** The second extension pipe 120 includes a cylinder joint receiving portion J2, which has a complementary shape as the cylinder joint J1 of the first extension pipe 110 for a turnable engagement. The cylinder joint receiving portion J2 includes a slot plate 121 which has a sliding slot 121a for a sliding engagement with the seating projection 111 to a proximity of the center of the second extension pipe 120, and a locking part 122 which selectively contacts with the restriction projection 132 to restrict a rotation of the first and the second extension pipes 110, 120, respectively.

**[0025]** The slot plate 121 includes a circular plate. The slot plate 121 has the same diameter as that of the cylinder joint J1 such that the inner circumference of the cylinder joint receiving portion J2 meets the outer circumference of the cylinder joint J1 in a tight contact. The sliding slot 121a includes the width that corresponds to

the diameter of the seating projection 111 so that the center of the seating projection 111 can coincide with the center part of the slot plate 121. A closed end of the first extension pipe 110 may have a circular arc as shown in FIG. 2 to enable the first extension pipe 110 to rotate on the seating projection 111.

**[0026]** The locking part 122 restricts the rotation of the first and the second extension pipes 110 and 120 by selectively contacting with the restriction projection 132. In the preferred embodiment, the locking part 122 may be formed at a predetermined distance from the slot plate 121 and the predetermined distance is larger than the thickness of the restriction projection 132. When the operator pushes the locking bottom 130, the restriction projection 132 is displaced in the axial direction, and moved out of contact with the locking part 122 to a position in which the restriction projection 132 can be passed through a space between the locking part 122 and the slot plate 121.

**[0027]** The sealing cover 140 prevents a suction loss from occurring between the cylinder joint J1 and the cylinder joint receiving portion J2, and between the first and the second extension pipes 110 and 120. In the preferred embodiment, the sealing cover 140 may have first and second covers 141, 142 to prevent the locking button 130 from moving out in the axial direction. The first cover 141 includes a button hole 141a to expose the locking button 130. The button hole 141a includes a size that corresponds to the outer circumference of the locking button 130. In the preferred embodiment, the button hole 141a may have a size equal to, or greater than the outer circumference of the locking button 130, and smaller than the outer circumference of the locking button 130 with the interfering rib 131, such that the interfering rib 131 is supposedly on an inner circumference of the first cover 141 to prevent the locking button 130 from moving out in the axial direction.

**[0028]** The operation of the bendable extension pipe for a vacuum cleaner according to one exemplary embodiment of the present invention will be described with reference to FIGS. 3 and 4.

**[0029]** FIG. 3 shows the first and the second extension pipes 110, 120 connected to each other at a 0° angle. For the convenience of explanation, the sealing cover 140 has been omitted from FIG. 3. In normal operation, i.e., when the vacuum cleaner is cleaning places such as floor, the first and second extension pipes 110, 120 are connected at an angle of 0° to each other. In such a state, the restriction projection 132 contacts one end 122a of the locking part 122 to prevent the first and second extension pipes 110, 120 from bending in the 'A' direction of FIG. 3, and the interfering rib 131 contacts the other end 122b of the locking part 122 to support and prevent the first and second extension pipes 110, 120 from bending in the 'B' direction of FIG. 3.

**[0030]** When the operator wants to clean places such as underneath a bed or a couch, the operator presses the locking button 130, and accordingly, the restriction

projection 132 is moved out of the locking part 122 to a position in which the restriction projection 132 can be passed through the space between the locking part 122 and the slot plate 121. When the operator bends the first or the second extension pipes 110 or 120 by pressing on the locking button 130, the restriction projection 132 contacts the inner circumference of the space defined between the locking part 122 and the slot plate 121 and becomes rotatable.

**[0031]** In another embodiment of the present invention, the first and the second extension pipes 110 and 120 are bent in relation to each other at an angle of approximately 45°, to which the operator is most comfortable in cleaning the underneath the furniture. When the first and second extension pipes 110, 120 are at an angle 0° relative to the center of the locking button 130, and, if the imaginary line connecting the end 122a in contact with the locking part 122 is at an angle of 45° with respect to the first and second extension pipes 110, 120, then an imaginary line connects to the other end 122b of the locking part 122 with an interior angle of 45°.

**[0032]** When the restriction projection 132 rotates by 45°, the tapered inclining end slides along the locking part 122 and urges the locking button 130 toward the release direction in which the recovery force of the elastic member S is exerted. As a result, the locking button 130 returns to the initial state, i.e., to the state before the operator presses the locking button 130 to bend the bendable extension pipe 100. The operator manipulates the extension pipe 100 in the reverse order to return the first and second extension pipes 110, 120 to the angle 0° to perform a normal cleaning operation. Accordingly, as the operator unbends the operation pipe 100 by pressing on the locking button 130, the recovery force of the elastic member S returns the locking button 130 to the initial position.

**[0033]** With the bendable extension pipe 100 as described above in a few embodiments of the present invention, operator convenience increases because the operator is not required to bend or lower his/her body to clean underneath furniture such as a bed and couch, but only requires the operator to make a simple button manipulation.

**[0034]** The foregoing embodiment and advantages are merely exemplary and are not to be construed as limiting the present invention. The present teaching can be readily applied to other types of apparatuses. Also, the description of the embodiments of the present invention is intended to be illustrative, and not to limit the scope of the claims, and many alternatives, modifications, and variations will be apparent to those skilled in the art.

## Claims

1. A bendable extension pipe for a vacuum cleaner with a body bent by a button manipulation, the bend-

able extension pipe forming a sealed fluid passage between a vacuum cleaner body and a suction brush, comprising:

a first extension pipe;

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a second extension pipe rotatably connected with the first extension pipe;

a locking button elastically disposed on the first extension pipe to restrict rotation of the first and the second extension pipes; and

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a sealing cover for preventing the locking button from moving out of joint of the first and second extension pipes and sealing the first and the second extension pipes.

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2. The bendable extension pipe of claim 1, wherein the locking button is formed on a seating protrusion which is protruded from a side of an axis of a rotation of a joint which movably connects the first extension pipe and the second extension pipe.

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3. The bendable extension pipe of claim 1 or 2, wherein the locking button comprises:

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at least one interfering rib protruding along an outer circumference; and

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a restriction projection for restricting the rotation of the first and the second extension pipes.

4. The bendable extension pipe of claim 2, or claim 3, when appendant to claim 2, wherein the seating protrusion comprises at least one guide projection formed on the outer circumference, and a sliding groove formed in the locking button to correspond to the guide projection such that, in accordance with a push and release of the locking button, the sliding groove is guided by the guiding projection to prevent rotation of the locking button.

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5. The bendable extension pipe of claim 2, 3, when appendant to claim 2, or 4, wherein an elastic member is disposed between the locking button and the seating protrusion such that, in accordance with the push of the locking button, the elastic member exerts a recovery force in a direction of releasing from the locking button.

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6. The bendable extension pipe of claim 3, or claim 4 or 5 when appendant to claim 3, wherein the second extension pipe comprises:

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a slot plate comprising a sliding slot for a sliding engagement with the seating projection, the sliding slot having one open end; and

a locking part formed in a position corresponding to the restriction projection, to selectively lock the restriction projection in accordance with a displacement of the restriction projection in an axial direction.

7. The bendable extension pipe of claim 6, wherein the locking part is separated from the slot plate by a distance equal to, or greater than a thickness of the restriction projection.

8. The bendable extension pipe of any preceding claim, wherein the sealing cover comprises a first cover with a button hole corresponding in size with an outer circumference of the locking button, and a second cover engaged with the first cover and sealing connecting parts between the first and the second extension pipes.

9. A bendable extension pipe for a vacuum cleaner with a body bent by a button manipulation, the bendable extension pipe forming a sealed fluid passage between a vacuum cleaner body and a suction brush, and comprising:

a first extension pipe comprising a seating protrusion formed on the center of a cylinder joint, with a locking button which is pushed and released by an elastic member, the cylinder joint having one open end;

a second extension pipe including a slot plate for a sliding engagement with the seating protrusion, and a locking part for selectively locking the locking button; and

a sealing cover for sealing connecting parts between the first and the second extension pipes, and including a button hole through which the locking button is exposed to the outside.

10. The bendable extension pipe of claim 9, wherein the locking button comprises:

at least one interfering rib protruding along the outer circumference; and

a restriction projection for restricting rotation of the first and the second extension pipes.

11. The bendable extension pipe of claim 9 or 10, wherein the seating protrusion comprises at least one guide projection formed on the outer circumference, and a sliding groove formed in the locking button to correspond to the guide projection such that, in accordance with a push and release of the locking button, the sliding groove is guided by the guiding projection to prevent rotation of the locking button.

12. The bendable extension pipe of claim 9, 10 or 11, wherein the second extension pipe comprises:

a slot plate comprising a sliding slot for a fitting-engagement with the seating protrusion; and 5

a locking part formed in the position corresponding to the restriction projection, to selectively lock the restriction projection in accordance with a displacement of the restriction projection in an axial direction. 10

13. The bendable extension pipe of claim 12, wherein the locking part is separated from the slot plate by a distance equal to, or greater than the thickness of the restriction projection. 15

14. The bendable extension pipe of claim 9, 10, 11, 12 or 13, wherein the sealing cover comprises a first cover including the button hole, and a second cover engaged with the connecting parts of the first cover to seal the first and the second extension pipes, respectively. 20

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FIG. 1

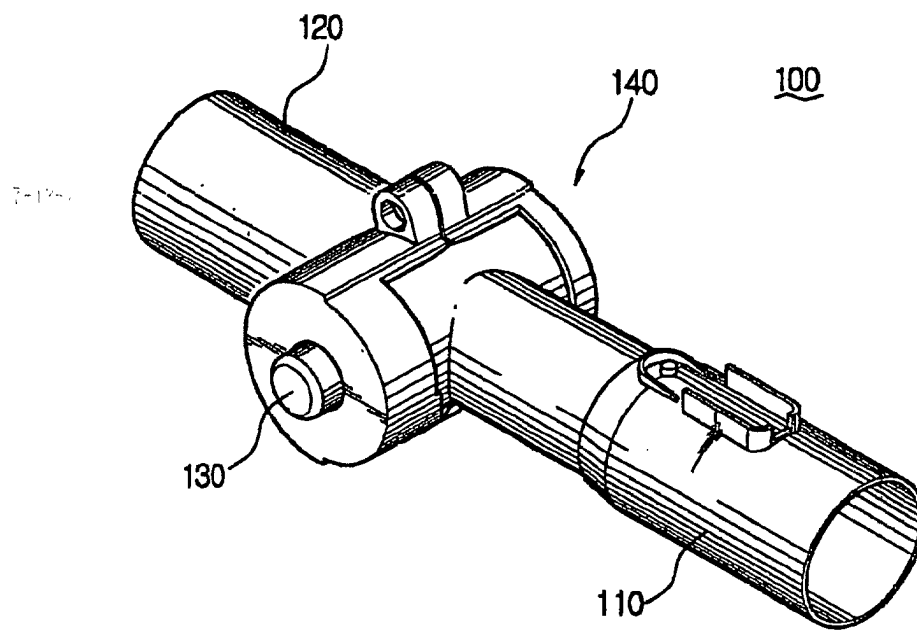


FIG. 21

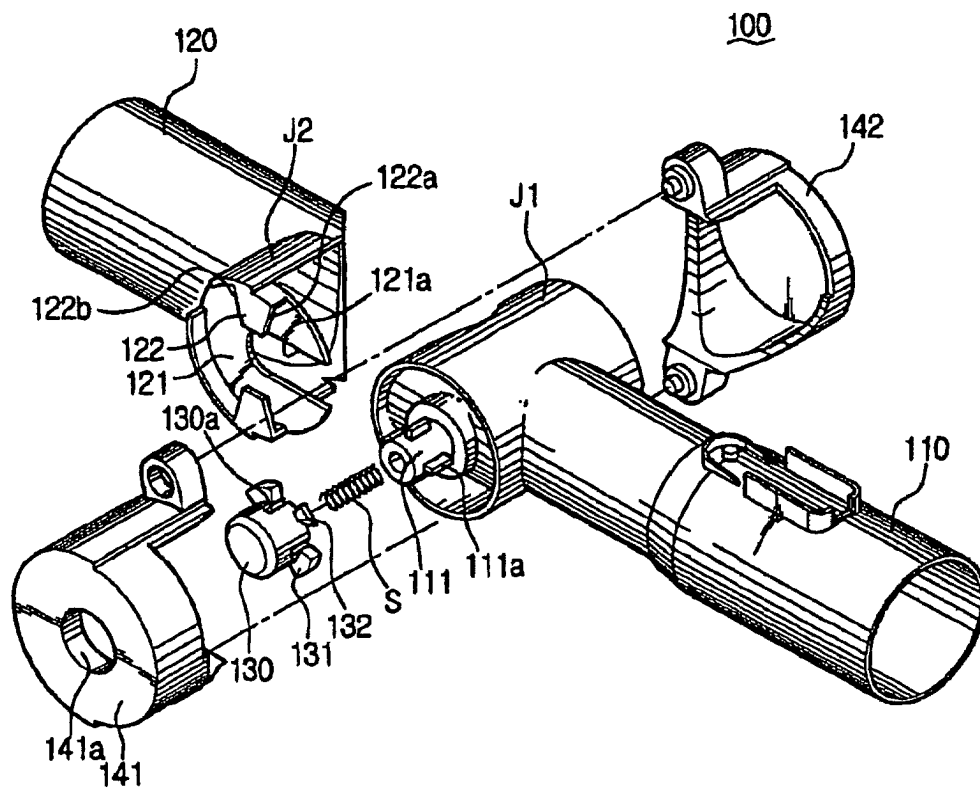


FIG. 31

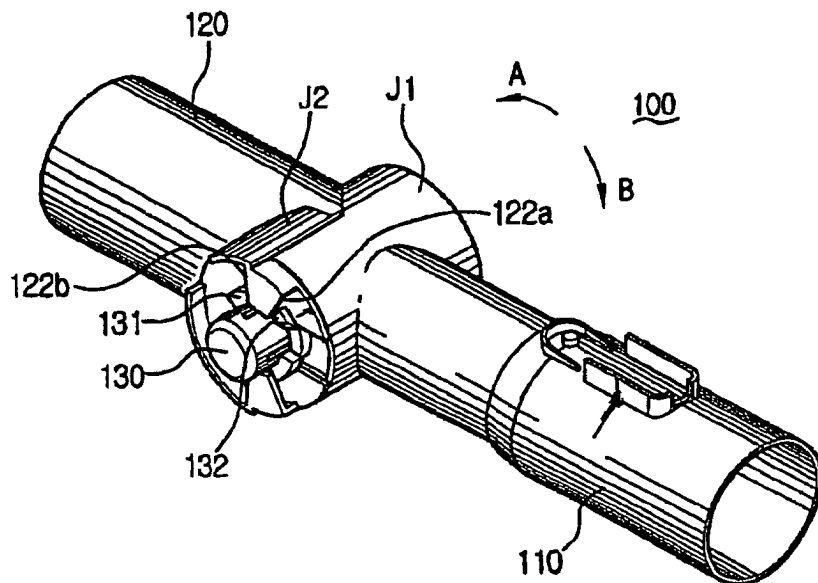


FIG. 4

