



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11)

EP 1 419 725 A2

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

19.05.2004 Bulletin 2004/21

(51) Int Cl.7: **A47L 9/24**

(21) Application number: **03257086.3**

(22) Date of filing: **11.11.2003**

(84) Designated Contracting States:

**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IT LI LU MC NL PT RO SE SI SK TR**

Designated Extension States:

AL LT LV MK

(72) Inventors:

- **Mimura, Yoshiyuki**
Matsumoto Nagano (JP)
- **Shimizu, Tetsuhiko**
Matsumoto Nagano (JP)

(30) Priority: **12.11.2002 JP 2002328242**

(74) Representative: **Jenkins, Peter David et al**

PAGE WHITE & FARRER

54 Doughty Street

London WC1N 2LS (GB)

(71) Applicant: **IZUMI PRODUCTS COMPANY**
Matsumoto, Nagano (JP)

(54) **Electric vacuum cleaner**

(57) An electric vacuum cleaner including a cleaner main body having a suction mechanism, a guide hose connected to the suction port of the cleaner main body and has a conductive wire disposed from one end to another end thereof, and a suction pipe which is connected to the guide hose and has an operating switch and suction head; and the guide hose is connected to the clean-

er main body in a rotatable manner via a connecting assembly that is formed of an inner tube and an outer tube which is fitted over the inner tube, the inner tube has metal rings on its outer circumferential portion, the outer tube has, on its inner circumferential portion, contacts which are in contact with the metal rings, and the operating switch and the suction mechanism are electrically connected constantly via the connecting assembly.

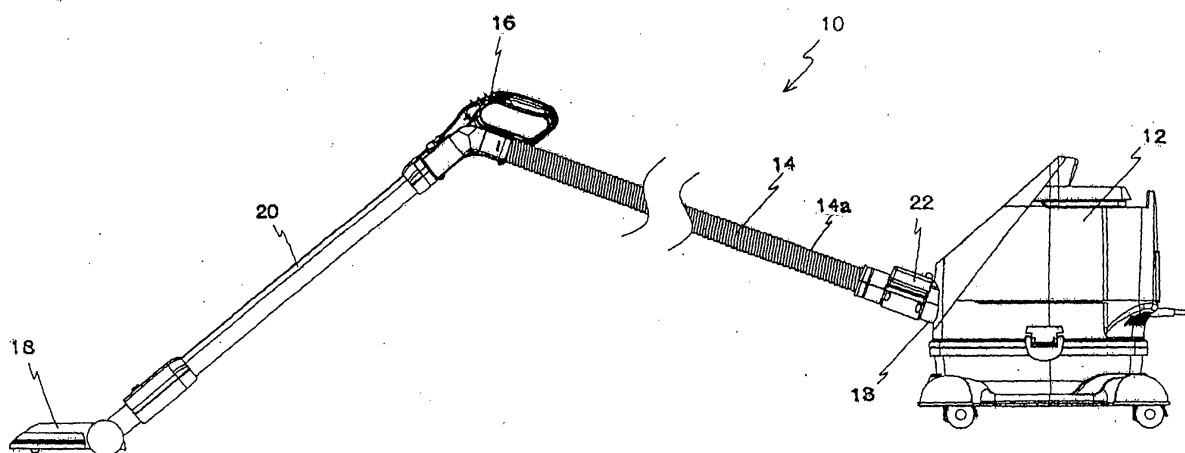


FIG. 1

EP 1 419 725 A2

Description

[0001] The present invention relates to an electric vacuum cleaner and more particularly to an electric vacuum cleaner that includes a cleaner main body, a guide hose which is connected at its one end to the suction port of this cleaner main body, and a suction pipe which is connected to another end of the guide hose and has a suction head.

[0002] A typical electric vacuum cleaner comprises a cleaner main body that has a suction port, a guide hose attached at its one end to the suction port, and a suction hose that is connected at its one end to the guide hose via a connecting assembly and has at its another a suction head. In this electric vacuum cleaner, the connecting portion between the suction port of the cleaner main body and the guide hose and the connecting portion between the guide hose and the suction pipe are rotatable in the circumferential directions so that no twisting occurs in the guide hose.

[0003] An operating switch for operating the driving of a suction mechanism that includes an electric motor, etc. installed in the cleaner main body is typically disposed on the suction pipe. This operating switch is ordinarily electrically connected to the suction mechanism via a conductive wire which is wrapped in a spiral form around the outer surface of the guide hose.

[0004] So as to secure the connection between the guide hose that has a conductive wire and the suction pipe in a rotatable fashion and electrically, a connecting assembly such as that shown in Figure 7 (disclosed in Japanese Patent Application Laid-Open (Kokai) No. 7-67817) is employed in conventional electric vacuum cleaners.

[0005] More specifically, the connecting assembly 100 of Figure 7 connects a guide hose 114 and a suction pipe 116. The connecting assembly 100 is comprised of a tubular rotating portion 104 which is attached to the guide hose 114 and a retaining part 102 which is disposed on the suction pipe 116, and the retaining part 102 is fitted over the rotating portion 104 so that the rotating portion 104 is supported rotatably.

[0006] In this connecting assembly 100, the conductive wire 120a of the operating switch 120 is connected to contacts 108 which are disposed on the inner circumferential portion of the retaining part 102, and a conductive wire 105 which is disposed on a projecting rib 114a that is formed in a spiral shape on the outer circumferential surface of the guide hose 114 is connected to a metal band 106 that is wrapped around the rotating portion 104. When the contacts 108 are pressed against the outer circumferential surface of the metal band 106, the operating switch 120 and suction mechanism are brought into an electrically connected state.

[0007] Figure 8 show the cross-section of the connecting assembly 100 of Figure 7. As seen from Figure 8, one end 106a of the metal band 106 is bent into an angled letter C-shape and anchored on the anchoring

portion 110 disposed on the rotating portion 104. The metal band 106 is wrapped around the outer circumferential surface of the rotating portion 104, and then the end surface of the end 106b is bent into an L shape in a state in which this end surface abuts the end 106a and is thus anchored to the outer circumferential portion of the rotating portion 104.

[0008] When the metal band 106 is wrapped around the rotating portion 104 and attached by causing the one end 106a and the other end 106b of the metal band 106 to abut each other as shown in Figure 8, a step or gap is generated in this abutment area 112, and this causes several problems.

[0009] Upon operation of the electric vacuum cleaner, when the contacts 108, which are moved while constantly making contact with the outer circumferential surface of the metal band 106, pass through the abutment area 112, the contacts become caught on the step or gap of the abutment area 112. Also, the rotating portion 104 is not rotated smoothly.

[0010] Furthermore, in the structure of Figure 8, when the metal band 106 is installed during assembling of the connecting assembly, it is necessary to wrap and fasten the metal band 106 around the rotating portion 104 in a state in which one end 106a and the other end 106b of the metal band 106 are brought into abutment to each other without any gap. Thus, installing the metal band 106 is complicated, and the assembling work is not performed efficiently.

[0011] The present invention is to solve these problems in the conventional electric vacuum cleaners.

[0012] The aim of the present invention is to provide an electric vacuum cleaner in which the rotation of the connected elements is smooth and required electrical connections are reliably maintained in the connecting portion where the guide hose is connected to other components.

[0013] The above aim is accomplished by a unique structure of the present invention for an electric vacuum cleaner that includes:

a cleaner main body that has a suction mechanism, a guide hose which is connected at its first end to a suction port of the cleaner main body and has a conductive wire extending from one end to another end of the guide hose, and

a suction pipe which is connected at one end thereof to the second end of the guide hose and has a suction head and an operating switch that electrically operates the suction mechanism via the conductive wire; and in the present invention, the guide hose is connected to the cleaner main body in a rotatable manner via a connecting assembly that is comprised of an inner tube and an outer tube that is fitted over the inner tube, metal rings which are integrally continuous in a circumferential direction are disposed on the outer circumferential portion of the inner tube of the con-

necting assembly,
contacts which are in contact with the outer circumferential surfaces of the metal rings are disposed on the inner circumferential portion of the outer tube of the connecting assembly, and
the operating switch and the suction mechanism are kept electrically connected via the connecting assembly.

[0014] In the above structure, the guide hose is connected to either one of the inner tube and outer tube, and the suction port is connected to the other of these two elements (inner tube and outer tube), so that the guide hose is connected to the cleaner main body rotatably.

[0015] The guide hose can be rotatably connected via the connecting assembly to the suction pipe.

[0016] Furthermore, in the present invention, the guide hose can be connected to either one of the inner tube and outer tube, and the suction pipe can be connected to the other of these two elements (inner tube and outer tube), so that the guide hose is connected to the suction pipe rotatably.

[0017] The metal rings are those formed by press working.

[0018] Embodiments of the present invention will now be described by way of example only, with reference to the accompanying drawings, in which:-

Figure 1 is an explanatory illustration of one embodiment of the electric vacuum cleaner according to the present invention;

Figure 2A is a perspective view of the connecting assembly used in the present invention, and Figure 2B is a sectional side view thereof;

Figure 3A is a rear perspective view of one of the metal rings used in the present invention, Figure 3B is a side view thereof shown in cross-section, and Figure 3C is a front view thereof;

Figure 4A is a side view of one of the spacers used in the present invention, and Figure 4B is a front view thereof;

Figure 5 is a side view of the inner tube of the shown embodiment;

Figure 6 is a disassembled perspective view of the cover of the connecting assembly;

Figure 7 shows in cross section a connecting assembly of a conventional vacuum cleaner; and

Figure 8 is an enlarged sectional view taken along the line 8-8 in Figure 7.

[0019] Preferred embodiments of the electric vacuum cleaner of the present invention will be described in detail below with reference to the accompanying drawings.

[0020] Figure 1 shows the overall structure of one embodiment of the electric vacuum cleaner of the present invention. The electric vacuum cleaner 10 comprises a cleaner main body 12, a guide hose 14 and a suction

pipe 20. The cleaner main body 12 is equipped with a suction mechanism such as an electrically driven blower, etc., and the guide hose 14 is connected at its one end to the suction port 13 of the cleaner main body 12.

The suction pipe 20 is connected at its one end to the other end of the guide hose 14, and it has at its other end a suction head 18 that sucks in air containing dust.

[0021] An operating switch 16 that operates the driving of the suction mechanism of the cleaner main body 12 is disposed on the suction pipe 20. This operating switch 16 is electrically connected to the cleaner main body 12 by a conductive wire 39b provided on the guide hose 14. The conductive wire 39b is disposed inside a projecting rib 14a which is formed in a manner to wrap in a spiral form around the outer surface of the guide hose 14; and one end of the conductive wire is connected to the cleaner main body 12, and the other end is connected to the operating switch 16.

[0022] In the electric vacuum cleaner 10 of the shown embodiment, the suction port 13 of the cleaner main body 12 and one end (base end) of the guide hose 14 are connected in a rotatable manner by a connecting assembly 22 so that twisting of the guide hose 14 is prevented. Figure 2A shows a perspective view of the connecting assembly in this embodiment, and Figure 2B is a sectional side view of the connecting assembly.

[0023] More specifically, as seen from Figures 2A and 2B, the connecting assembly 22 is comprised of an inner tube 26, which is in a tubular shape, and an outer tube 23, which is also a tubular shape and fitted over and attached to this inner tube 26. One end of the outer tube 23 is connected to the suction port 13, and one end of the inner tube 26 is connected to one end of the guide hose 14 in such a manner that the guide hose 14 is rotatable in its circumferential direction.

[0024] The outer tube 23 of the shown embodiment is comprised of a connecting pipe 24 and a cover 28. The connecting pipe 24 is connected at its one (first) end to the suction port 13, and the inner tube 26 is inserted into the other (second) end of the connecting pipe 24. The cover 28 is fitted over the connecting pipe 24 so that the inner tube 26 is prevented from slipping out of the connecting pipe 24.

[0025] As shown in Figure 2B, the inner tube 26 is inserted from the second end of the connecting pipe 24, and the edge of one (first) end of the inner tube 26 contacts an anchoring projection 38 which is disposed on the inside circumferential portion of the connecting pipe 24.

[0026] The portion of the inner tube 26 that is not in the connecting pipe 24 is covered by the cover 28 that is attached to the connecting pipe 24. The cover 28 has a diameter that is larger than the diameters of the inner tube 26 and connecting pipe 24. This cover 28 is provided so that the outer circumferential portion of the inner tube 26 and the inner circumferential portion of the cover 28 are separated with a gap in between.

[0027] An anchoring projecting part 36a which pro-

trudes inward is disposed on the inner circumferential portion of the cover 28. This anchoring projecting part 36a engages with a recess 36b formed in a circumferential configuration in the outer circumferential surface of the inner tube 26. As a result, the inner tube 26 and connecting pipe 24 are prevented from slipping out of each other and connected rotatably.

[0028] In the connecting assembly 22 of the shown embodiment, metal rings 40 are disposed on the outer circumferential portion of the inner tube 26; and contacts 42 that constantly contact the outer circumferential surfaces of the metal rings 40 are disposed on the inner circumferential portion of the cover 28. Thus, the operating switch 16 and the suction mechanism in the cleaner main body 12 are electrically connected.

[0029] In the structure above, a connecting portion which is kept in an electrical continuity is provided so as to be rotatable more smoothly than that of conventional cleaners. The structure of the connecting portion or the connecting assembly 22 will be described below in more detail.

[0030] As seen from Figure 2B, four metal rings 40 are attached to the inner tube 26. The shape of these metal rings 40 is shown in Figures 3A through 3C.

[0031] The metal ring 40 comprises a ring body 40a, which is formed in a ring shape with a specified width, and a flange portion 40b, which extends inward in the direction of diameter from one circumferential edge of this ring body 40a. The surface of the flange portion 40b faces in the axial direction. A conductive wire 39a which is connected to the above-described conductive wire disposed inside the guide hose 14 is attached to the flange portion 40b of this metal ring 40.

[0032] The metal rings 40 are formed by press working using a metal mold. Accordingly, there are no seams in each one of the metal rings 40, and these rings are obtained as rings that are integrally continuous in the circumferential direction.

[0033] As seen from Figure 2B, the metal rings 40 formed into the above-described shape are provided spacedly or with adjacent metal rings 40 being separated by means of spacers 44. Figures 4A and 4B show one of the spacers used in the shown embodiment.

[0034] As seen from Figure 4B, the spacer 44 is in the form of a C-shaped ring with one portion (44c) being separated by cutting, and anchoring portions 44d which protrude inward in the direction of the diameter are disposed on both end portions located on either side of the cut gap 44c. As seen from Figure 4A, the spacer 44 comprises an insertion section 44a and a separating section 44b that have different diameters in roughly the axial center of the spacer (or with respect to the direction of thickness).

[0035] The insertion section 44a has a diameter which is such that the outer circumferential surface of the insertion section 44a is in contact with the inner circumferential surface of the corresponding metal ring 40 when the spacer 44 is inserted and engaged from the

open side 40d of the metal ring 40. The separating section 44b of the spacer 44 has a diameter that is larger than that of the insertion section 44a and protrudes from the open side 40d of the corresponding metal ring 40 when the metal ring 40 and the spacer 44 are engaged together.

[0036] When the spacer 44 and the metal ring 40 are brought into tight engagement, the gap 44c of the spacer 44 is set so that the conductive wire 39a of the metal ring 40 is in the gap 44c of the spacer 44.

[0037] The ring units 52 in which the metal rings 40 and spacers 44 are engaged are fitted on the inner tube 26 from one end of the inner tube 26 and attached to the outer circumferential portion of the inner tube 26. Figure 5 shows the inner tube 26 on which the ring units 52 are to be mounted.

[0038] As seen from Figure 5, the inner tube 26 is in a tubular shape, and a reference flange 46 that serves as a reference position for attaching the ring units 52 is disposed on the outer circumferential surface of the inner tube 26 so that this flange portion 46 protrudes around the circumference. Ring supporting plates 48, which are projecting plates extending for a specified length in the axial direction of the inner tube 26 from the reference flange 46, are disposed at positions where the ring units 52 are spacedly provided in order from the reference flange 46. The ring supporting plates 48 are disposed at specified intervals in the circumferential direction, and they support the ring units 52 thereon by contacting the inner circumferential portions of the ring units 52.

[0039] The ring units 52 fitted on the ring supporting plates 48 are disposed so that there is a gap between the ring units 52 and the outer circumferential surface of the inner tube 26, and the conductive wires 39a of the metal rings 40 extend toward the guide hose 14 side through this gap. In the shown embodiment, the ring supporting plates 48 are disposed adjacent to each other in the area formed by the gap, and the conductive wires 39a of the metal rings 40 are guided toward the guide hose 14 through grooves 50 formed between the ring supporting plates 48 and connected to the conductive wire 39b provided along the guide hose 14.

[0040] Furthermore, spacer guides 54 are disposed adjacent to the grooves 50 of the inner tube 26. These spacer guides 54 guide the spacers 44 with their guide projections 54a that protrude so as to clamp the anchoring portions 44d of the spacers 44 from both sides in the circumferential direction. The spacers 44 that are guided by these spacer guides 54 are secured without positional deviation, since the rotation of the spacers 44 in the circumferential direction is restricted by the spacer guides 54.

[0041] The ring units 52, each comprising the metal ring 40 and the spacer 46, are mounted on the inner tube 26 that is formed as described above in the following manner: A first ring unit 52 is fitted over the inner tube 26 from one end of the inner tube 26 with the flange

portion 40b of the metal ring 40 first and then the ring body 40, and this first ring unit 52 is moved toward the reference flange 46 while the conductive wire 39a of the metal ring 40 is inserted into the grooves 50. Then, the flange portion 40b of the metal ring 40 of the first ring unit 52 is brought to contact with the reference flange 46, and this first ring unit 52 is secured in a position where the anchoring portions 44d of the corresponding spacer 44 is anchored by the spacer guide 54. Next, a second ring unit 52 is likewise fitted over the inner tube 26 in the same manner as the first one above and is secured adjacent to the previously attached first ring unit 52. The metal ring 40 of the preceding or the first ring unit and the metal ring 40 of the following or the second ring unit are thus spacedly disposed on the inner tube 26 by the separating sections 44b of the spacers 44.

[0042] A total of four ring units 52 in the shown embodiment are thus successively fitted on the inner tube 26 in this manner; and after the fourth ring unit 52 is installed, a fastening ring 60 (see Figure 2B) is attached in order to prevent the ring units 52 from slipping out.

[0043] As shown in Figure 4, a projection 44e which protrudes in the axial direction of the spacer 44 is formed on the circumferential side surface of the separating section 44b of each one of the spacers 44. In addition, as seen from Figure 3C, a cut-out 40c is formed in the flange portion 40b of the metal ring 40. The cut-out 40c is formed by cutting out a part of the flange portion 40b of the metal ring 40. Accordingly, the projection 44e of the spacer 44 of the ring unit 52 installed first and the cut-out 40c of the metal ring 40 of the ring unit 52 installed second are brought into an engagement with each other, so that adjacent ring units 52 are connected to each other on the inner tube 26. The second and third ring units 52, and the third and fourth ring units 52 are likewise engaged each other via the projections 44e and the cut-out 40c and connected.

[0044] As seen from the above, the metal rings 40 and spacers 44 are thus set on the inner tube 26 and attached thereon in a state in which these metal rings 40 and spacers 44 are in an engagement with each other to form a single unit. Thus, the metal rings 40 are stably supported and easily installed spacedly from other metal rings 40. Accordingly, assembling of the connecting assembly 22 is easy. Furthermore, since the metal rings 40 are supported by the spacers 44, the ring bodies 40a of the metal rings 40 are reinforced, and deformation of the metal rings 40 is prevented.

[0045] Furthermore, since the flange portions 40b are formed on the metal rings 40, these flange portions 40b are clamped between the spacers 44 of the ring units 52 that are successively inserted; as a result, positional deviation of the metal rings 40 in the axial direction can be prevented.

[0046] Next, the cover 28 that has the contacts 42 which constantly contact the outer circumferential surfaces of the metal rings 40 will be described.

[0047] As shown in Figure 2A, the cover 28 is formed by combining a cover upper section 28a and a cover lower section 28b. The cover upper section 28a is formed in a semicircular shape (or a half-cylinder shape) and a portion of the outer circumferential surface thereof is caused to bulge outward. The cover lower section 28b is also formed in a semicircular shape (or a half-cylinder shape) and covers the opposite side of the cover upper section 28a.

[0048] Figure 6 shows the cover upper section 28a.

[0049] A contact attachment plate 56 is provided inside the cover upper section 28a, and plate springs 58 used as an urging element that is constantly urged toward the metal rings 40 are attached to the contact attachment plate 56.

[0050] The these plate springs 58 have attachment portions 58a which are anchored on the contact attachment plate 56. Each plate spring 58 is formed so that it branches out in a bifurcated manner toward the metal ring 40 from the attachment portion 58a. Contacts 42 which protrude toward the metal rings 40 are disposed on both end portions of the bifurcated plate springs 58. The contacts 42 constantly contact the outer circumferential surfaces of the metal rings 40.

[0051] The attachment portions 58a of the plate springs 58 attached to the contact attachment plate 56 are connected to terminal pins 34 by conductive wires 62 (see Figure 2B). As seen from Figure 2A, the terminal pins 34 protrude from the cover 28 in the direction of insertion into the suction port 13 of the cleaner main body 12. The cover 28 has a hook 32. The hook 32 causes the suction port 13 and connecting assembly 22 to engage with each other when the connecting assembly 22 is attached to the suction port 13. Using the hook 32, the suction port 13 and the connecting assembly 22 are freely connected to and disconnected from each other.

[0052] In the connecting assembly 22 as described above, one end (right end in Figure 2B) of the connecting pipe 24 is connected to the suction port 13 of the cleaner main body 12, and the terminal pins 34 installed in its cover 28 are plugged into and connected to terminal pin receivers (not shown in the drawings) disposed in the vicinity of the suction port 13.

[0053] As a result of the terminal pins 34 connected to the terminal pin receivers, the terminal pins 34 and the suction mechanism installed in the cleaner main body 12 are electrically connected. Since the terminal pins 34 are connected to the contacts 42, and the contacts 42 are in constant contact with the metal rings 40 to which the conductive wire of the guide hose 14 is connected, the suction mechanism and the operating switch 16 to which the conductive wire at the other end of the guide hose 14 is connected are kept in an electrical continuity.

[0054] In the shown embodiment, each of the metal rings 40 that are provided on the inner tube 26 of the connecting assembly 22 is formed as a ring smoothly continuous in its circumferential direction. Accordingly,

the contacts 42 are moved smoothly along the outer circumferential surfaces of the metal rings 40 and not caught thereby unlike in the conventional connecting assembly 100 shown in Figure 8. As a result, the guide hose 14 connected to the connecting assembly 22 is rotated smoothly, and the electric vacuum cleaner is used without paying attention to twisting of the guide hose 14.

[0055] In the electric vacuum cleaner 10 of the shown embodiment, the suction head 18 is provided as a power nozzle that has a brush rotated by a motor (not shown in the drawings). Accordingly, the suction head 18 is electrically connected by the conductive wire that is provided to extend from the operating switch 16 to the suction head 18 through the suction pipe 20. However, the present invention is not limited to a configuration in which the suction head 18 is electrically connected.

[0056] In the above electric vacuum cleaner, the connecting assembly which is rotatable is provided between one end of the guide hose 14 and the suction port 13 of the cleaner main body 12. However, the present invention is not limited to this structure, and it is possible to provide the connecting assembly between the guide hose 14 and the suction pipe 20 in a rotatable fashion.

[0057] Furthermore, in the shown embodiment, one end of the connecting assembly 22 is connected to the suction port 13, and the other end of the connecting assembly 22 is connected to one end of the guide hose 14. However, in the present invention, it is also possible to connect one end of the connecting assembly 22, i.e. one end of the outer tube 23, to one end of the guide hose 14, and to connect the other end of the connecting assembly 22, i.e. one end of the inner tube 26, to the suction port 13. Furthermore, there is likewise no limitation on the direction of attachment of the connecting assembly 22 in cases where the connecting assembly 22 is provided between the guide hose 14 and the suction pipe 20.

[0058] In addition, in the connecting assembly 22 described above, the hook 32 is disposed on the cover 28, so that the connecting assembly 22 is, at its one end, freely attached and detached. However, it is possible that the connecting assembly 22 be integrally connected and not detachable with reference to the suction port 13 or the guide hose 14.

[0059] Each one of the metal rings 40 can be without the flange portion 40b, and the metal rings 40 thus can be formed by the ring bodies 40a only.

[0060] As seen from the above, in the electric vacuum cleaner of the present invention, the guide hose is connected (to the suction port or to the suction hose) by a connecting assembly, which is made of an outer tube and an inner tube, in a rotatable manner. The circumferentially continuous metal rings having no seams therein are disposed on the outer circumferential portion of the inner tube, and the contacts disposed on the inner circumferential portion of the outer tube are in constant contact with the outer circumferential surfaces of the metal rings, so that the metal rings and the contacts are

electrically connected at all times. Accordingly, electrical contact between the metal rings and the contacts is accomplished smoothly, the inner tube is rotated easily with respect to the outer tube in the connecting assembly, and the electric vacuum cleaner is used in a pleasant manner without the guide hose being twisted.

Claims

1. An electric vacuum cleaner comprising:

a cleaner main body that has therein a suction mechanism,
a guide hose which is connected at a first end thereof to a suction port of said cleaner main body and is provided with a conductive wire disposed from one end to another end thereof, and a suction pipe which is connected at a first end thereof to a second end of said guide hose and is provided with an operating switch that electrically operates said suction mechanism via said conductive wire; wherein
said guide hose is connected to said cleaner main body in a rotatable manner via a connecting assembly that is comprised of an inner tube and an outer tube which is fitted over said inner tube,
said inner tube is provided on an outer circumferential portion thereof with metal rings,
said outer tube is provided on an inner circumferential portion thereof with contacts which are in contact with outer circumferential surfaces of said metal rings, and
said operating switch and said suction mechanism are electrically connected via said connecting assembly.

2. The electric vacuum cleaner according to Claim 1, wherein

said guide hose is connected to either one of said inner tube and said outer tube,
said suction port is connected to another one of said inner tube and outer tube, and
said guide hose is rotatably connected to said cleaner main body.

3. An electric vacuum cleaner comprising:

a cleaner main body that has therein a suction mechanism,
a guide hose which is connected at a first end thereof to a suction port of said cleaner main body and is provided with a conductive wire disposed from one end to another end thereof, and a suction pipe which is connected at a first end thereof to a second end of said guide hose and is provided with an operating switch that elec-

trically operates said suction mechanism via
said conductive wire; wherein
said guide hose is connected to said suction
pipe in a rotatable manner via a connecting as-
sembly that is comprised of an inner tube and 5
an outer tube which is fitted over said inner
tube,
said inner tube is provided on an outer circum-
ferential portion thereof with metal rings,
said outer tube is provided on an inner circum- 10
ferential portion thereof with contacts which are
in contact with outer circumferential surfaces of
said metal rings, and
said operating switch and said suction mecha- 15
nism are electrically connected via said con-
necting assembly.

4. The electric vacuum cleaner according to Claim 3,
wherein
 said guide hose is connected to either one of 20
said inner tube and said outer tube,
 said suction pipe is connected to another one
of said inner tube and said outer tube, and
 said guide hose is rotatably connected to said
suction pipe. 25
5. The electric vacuum cleaner according to Claim 1,
2, 3 or 4, wherein said metal rings are formed by
press working. 30

35

40

45

50

55

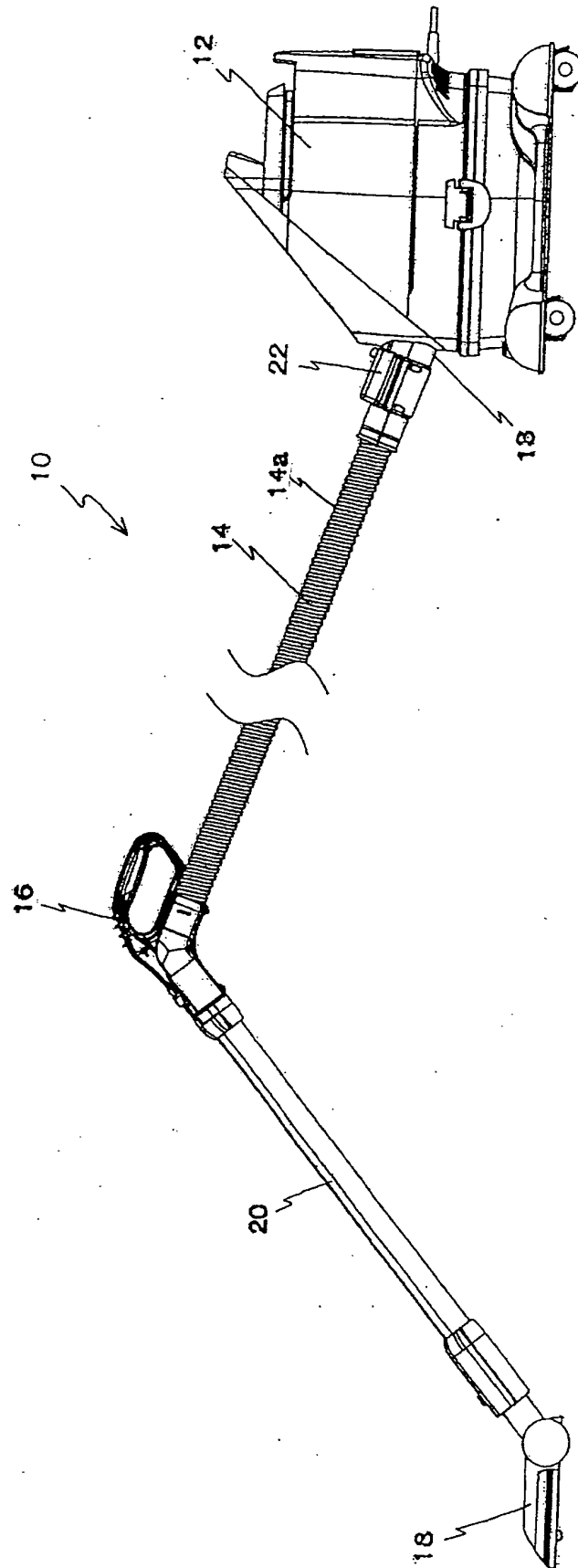


FIG. 1

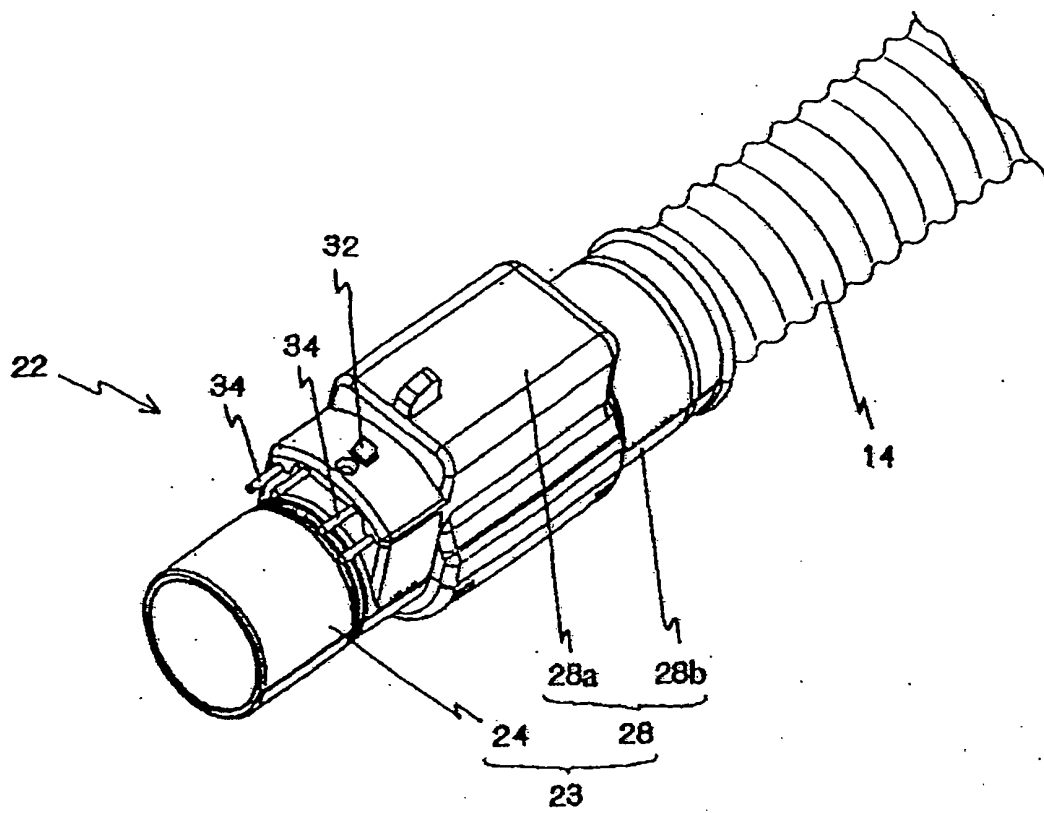


FIG. 2A

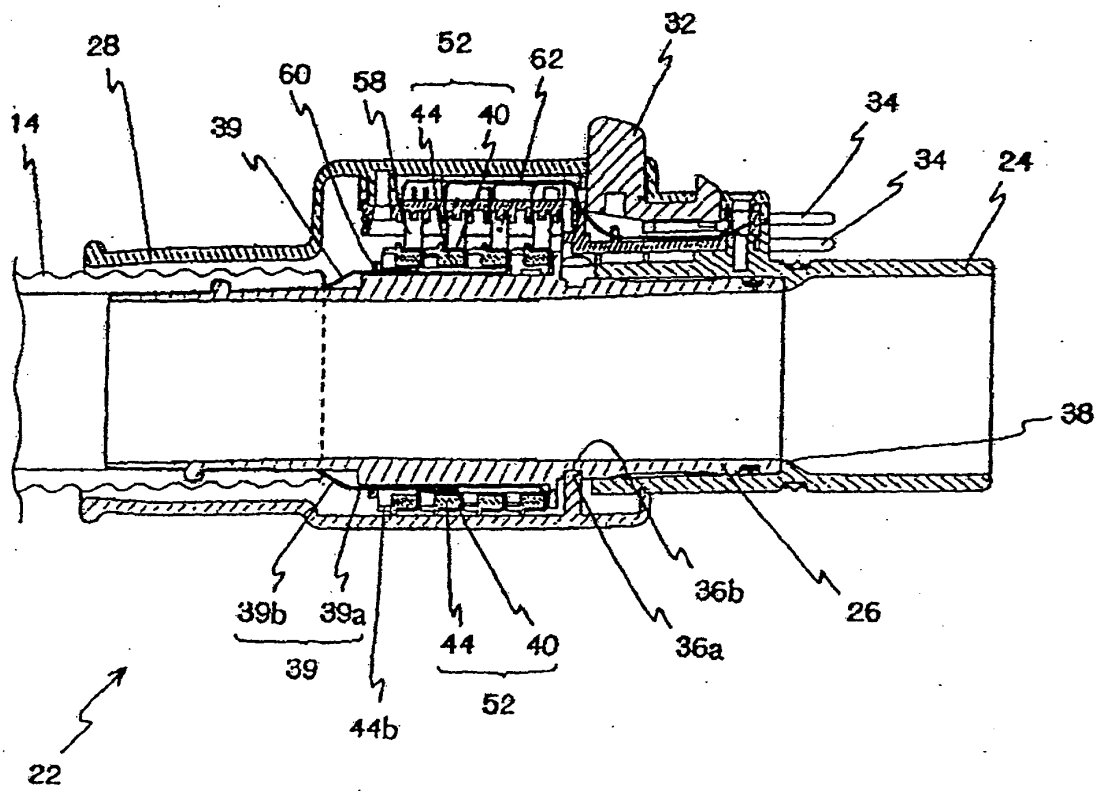


FIG. 2B

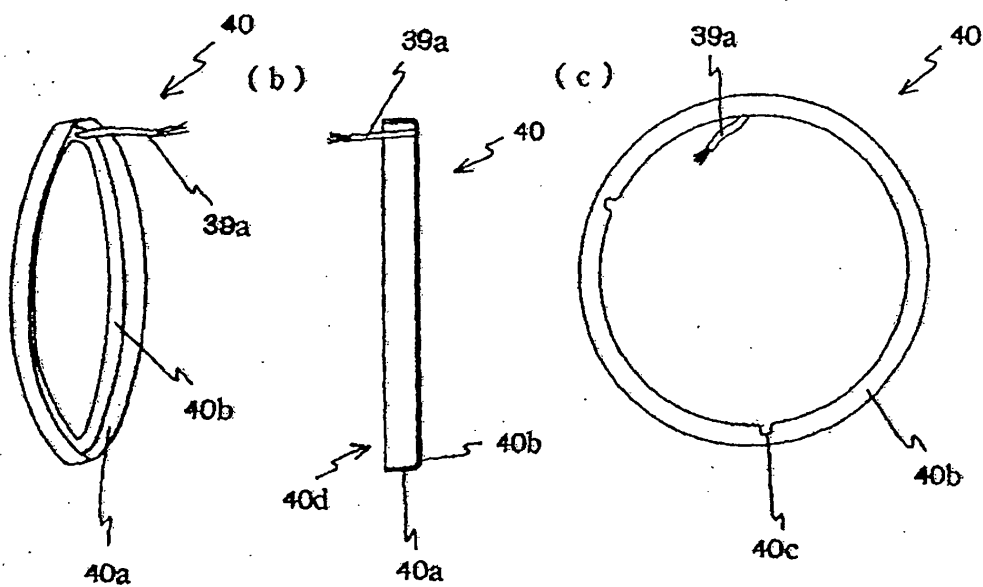


FIG. 3A

FIG. 3B

FIG. 3C

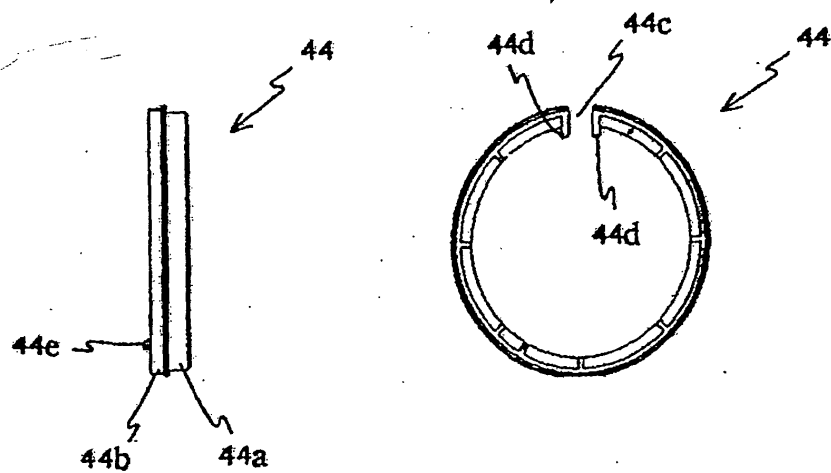


FIG. 4A

FIG. 4B

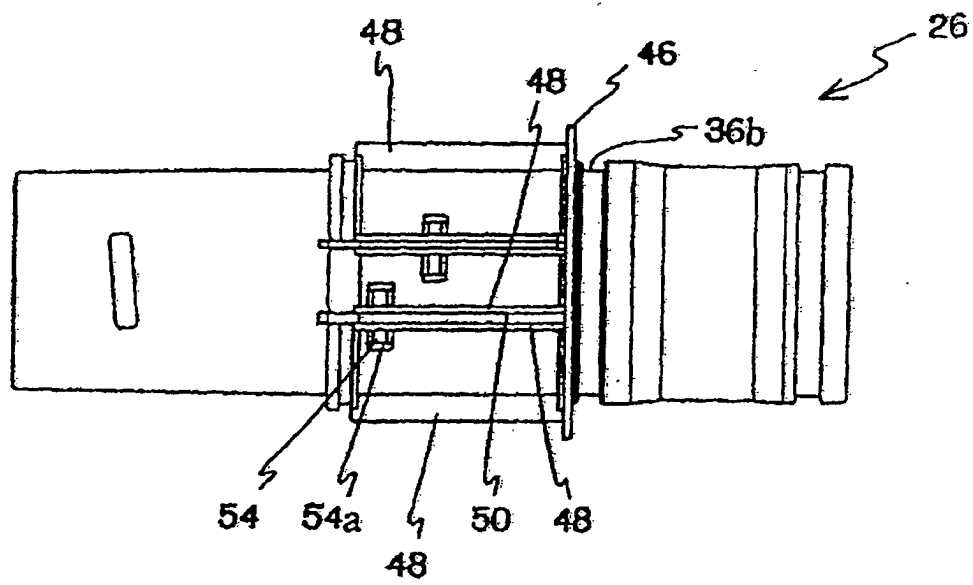


FIG. 5

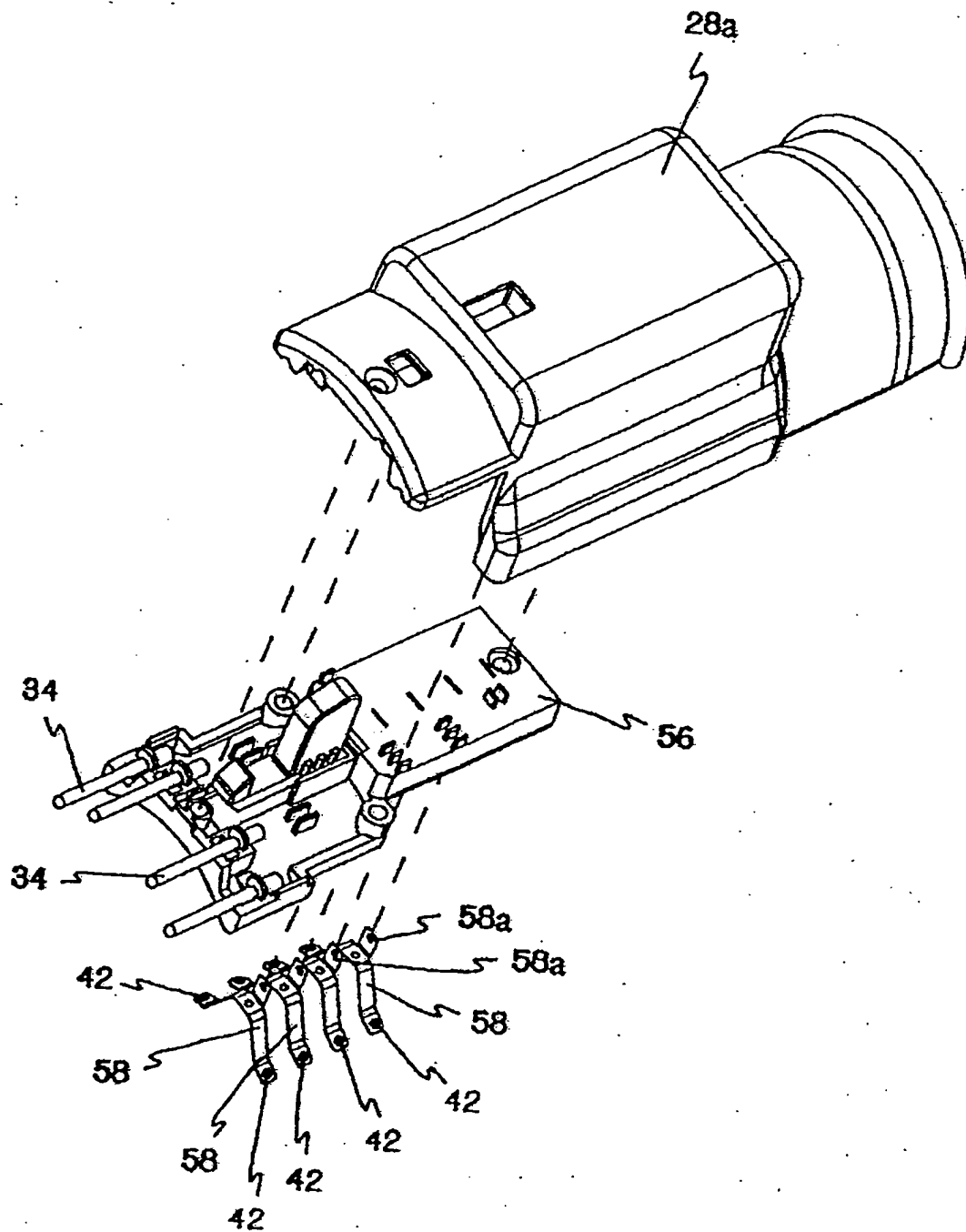


FIG. 6

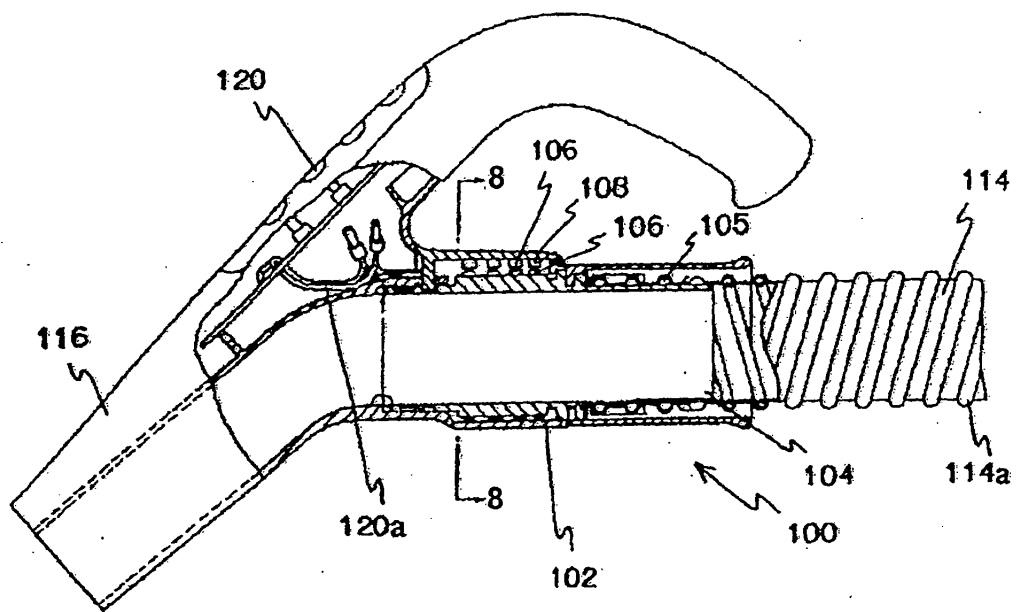


FIG. 7
PRIOR ART

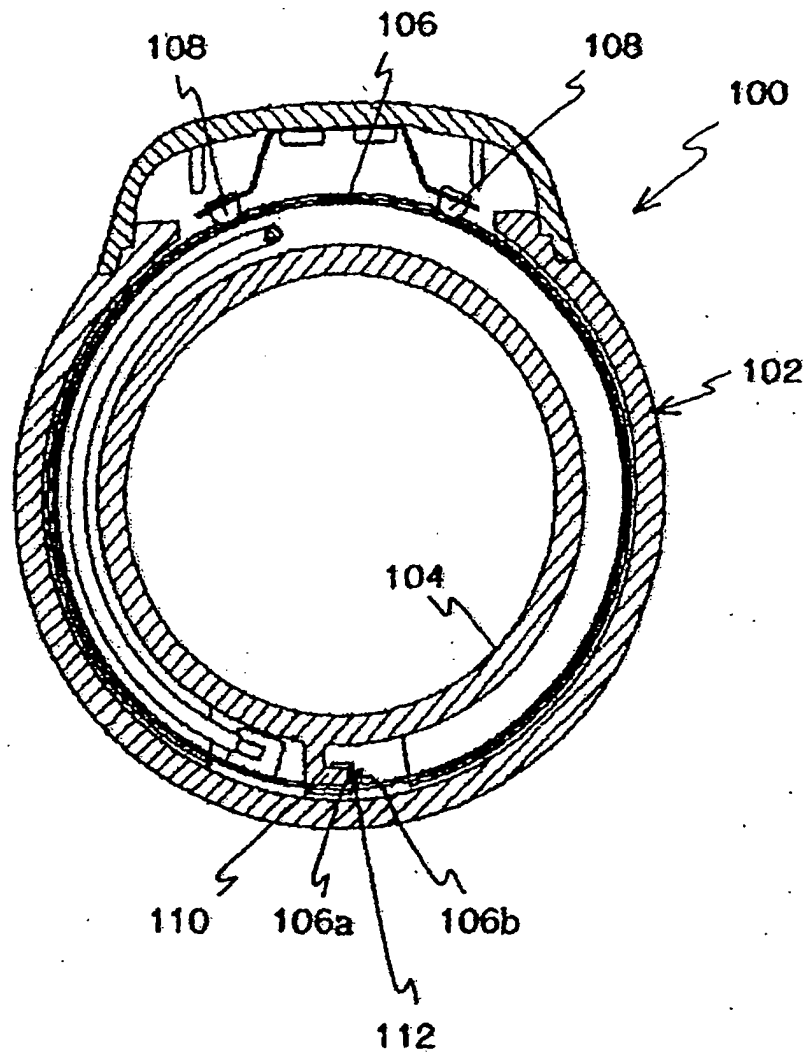


FIG. 8
PRIOR ART