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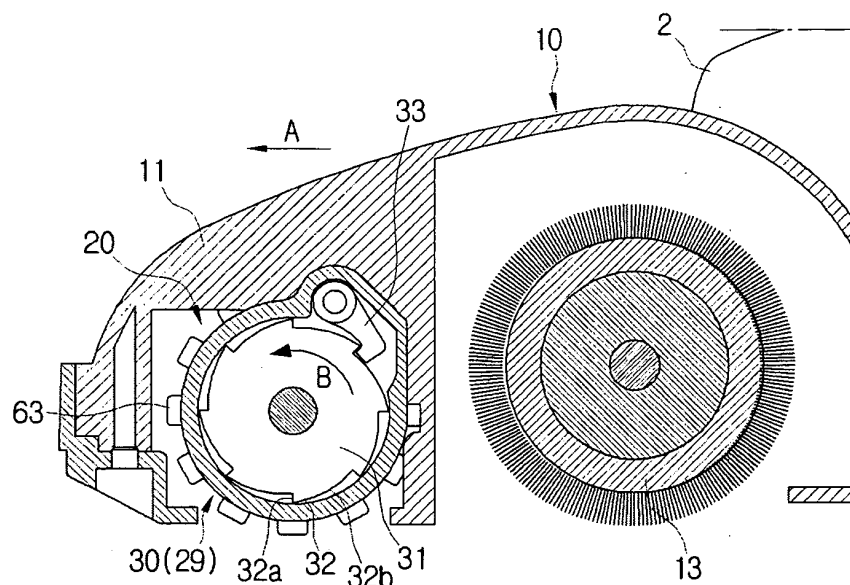
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(54) **Suction nozzle assembly for a vacuum cleaner**

(57) A suction nozzle assembly for a vacuum cleaner includes a nozzle body (2,101) with a contaminants suction opening, and a rotation drum (20,120) rotatably disposed at the contaminants suction opening of the nozzle body (2,101) with a plurality of protrusions (62-69) formed

on an outer circumferential surface of the rotation drum (20,120). When the nozzle body (2,101) moves on a surface to be cleaned, the rotation drum (20,120) is rotated by friction force of the plurality of protrusions (62-69) against the surface to be cleaned.

FIG. 3



Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present disclosure relates to a vacuum cleaner. More particularly, the present disclosure relates to a suction nozzle assembly for a vacuum cleaner.

2. Description of the Related Art

[0002] Generally, vacuum cleaners have a suction nozzle assembly that can draw in contaminants with air from a surface to be cleaned.

[0003] The suction nozzle assembly is provided with a contaminants suction opening that faces the surface to be cleaned and draws in contaminants from the surface to be cleaned. When a vacuum generator in a cleaner body operates to generate suction force, the contaminants on the surface to be cleaned are drawn-in through the contaminants suction opening. The term "contaminants" will be used herein to refer collectively to dust, dirt, particulates, debris, and other similar matter that can be entrained with the air drawn in by the vacuum cleaner.

[0004] However, when cleaning the surface to be cleaned such as a carpet using only the suction force, thin contaminants such as hair of human, fur of pets, etc. cannot effectively be removed. To effectively remove hair of human, fur of pets, etc., it is preferable that the thin contaminants such as hair of human, fur of pets, etc. on the surface to be cleaned are collected in a lump, and then guided toward the contaminants suction opening.

SUMMARY OF THE INVENTION

[0005] The invention is defined in claims 1 and 10, respectively. Particular embodiments are set out in the dependent claims.

[0006] The present disclosure has been developed in order to overcome the above drawbacks and other problems associated with the conventional arrangement. An aspect of the present disclosure is to provide a suction nozzle assembly for a vacuum cleaner that can effectively draw in thin contaminants such as hair of human, fur of pets, etc. from a surface to be cleaned.

[0007] The above aspect and/or other feature of the present disclosure can substantially be achieved by providing a suction nozzle assembly for a vacuum cleaner, which includes a nozzle body with a contaminants suction opening; and a rotation drum rotatably disposed at the contaminants suction opening of the nozzle body with a plurality of protrusions formed on an outer circumferential surface of the rotation drum, wherein when the nozzle body moves on a surface to be cleaned, the rotation drum is rotated by friction force of the plurality of protrusions against the surface to be cleaned.

[0008] Also, the suction nozzle assembly may include:

a rotation restricting member to restrict the rotation drum to rotate.

[0009] The rotation restricting member may allow the rotation drum to rotate only in one direction.

5 **[0010]** The rotation restricting member may include a ratchet wheel disposed integrally with the rotation drum; and a ratchet pawl disposed at the nozzle body to allow the ratchet wheel to rotate only in one direction.

10 **[0011]** The rotation restricting member may allow the rotation drum to rotate when pushing the nozzle body forward.

[0012] Furthermore, the rotation restricting member may allow the rotation drum to rotate in clockwise and counterclockwise directions within a predetermined angle.

15 **[0013]** The rotation drum may include a drum body; and a removing member disposed at the drum body with the plurality of protrusions.

20 **[0014]** The plurality of protrusions may be formed in a substantially stick shape, a substantially block shape, or a substantially loop shape.

25 **[0015]** The plurality of protrusions may be formed in a substantially block shape, and some of the plurality of protrusions may be formed in a substantially slit block shape.

[0016] The suction nozzle assembly may include a brush rotatably disposed at one side of the rotation drum in the nozzle body.

30 **[0017]** According to another aspect of the present disclosure, a suction nozzle assembly for a vacuum cleaner may include: a nozzle body with a contaminants suction opening; and a pair of rotation drums rotatably disposed at the contaminants suction opening of the nozzle body with a plurality of protrusions formed on an outer circumferential surface of each of the rotation drums, wherein when the nozzle body moves on a surface to be cleaned, the pair of rotation drums is rotated by friction force of the plurality of protrusions against the surface to be cleaned.

35 **[0018]** The suction nozzle assembly may include a rotation restricting member to restrict each of the pair of rotation drums to rotate.

40 **[0019]** The rotation restricting member may be configured so that when the nozzle body moves in one direction a first rotation drum of the pair of rotation drums rotates and a second rotation drum does not rotate, and when the nozzle body moves in a reverse direction the first rotation drum does not rotate and the second rotation drum rotates.

45 **[0020]** The rotation restricting member may include a ratchet wheel disposed integrally with each of the pair of rotation drums; and a ratchet pawl disposed at the nozzle body to restrict rotation of the ratchet wheel.

50 **[0021]** Other objects, advantages and salient features of the disclosure will become apparent from the following detailed description, which, taken in conjunction with the annexed drawings, discloses preferred embodiments of the disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] These and/or other aspects and advantages of the disclosure will become apparent and more readily appreciated from the following description of the embodiments, taken in conjunction with the accompanying drawings of which:

FIG. 1 is a partial perspective view illustrating a upright vacuum cleaner with a suction nozzle assembly according to an exemplary embodiment of the present disclosure;

FIG. 2 is a bottom view illustrating the upright vacuum cleaner of FIG. 1;

FIG. 3 is a sectional view illustrating a brush unit of the suction nozzle assembly of FIG. 2 taken along a line III-III in FIG. 2;

FIGS. 4A and 4B are sectional views illustrating another rotation restricting member used in a rotation drum of FIG. 3, FIG. 4A illustrates the rotation drum to rotate, and

FIG. 4B illustrates the rotation drum not to rotate;

FIG. 5 is a sectional view illustrating another rotation restricting member used in a rotation drum of FIG. 3;

FIGS. 6A and 6B are perspective views illustrating a drum body of a rotation drum of FIG. 3;

FIG. 7 is a perspective view illustrating a removing member of a rotation drum of FIG. 3;

FIG. 8 is an enlarged perspective view illustrating the portion of the removing member of FIG. 7 illustrated in circle X;

FIGS. 9A to 9F are partial perspective views illustrating various protrusions of a removing member of a rotation drum of FIG. 3;

FIG. 10 is a perspective view illustrating another removing member of a rotation drum of FIG. 3;

FIG. 11 is a bottom view illustrating a suction nozzle assembly according to another embodiment of the present disclosure;

FIG. 12 is a bottom view illustrating a suction nozzle assembly according to another embodiment of the present disclosure;

FIGS. 13A and 13B are views schematically illustrating operation of a rotation drum of FIG. 12; and

FIG. 14 is a conceptual view schematically illustrating the suction nozzle assembly of FIG. 12 having another rotation restricting member.

[0023] Throughout the drawings, like reference numerals will be understood to refer to like parts, components and structures.

DETAILED DESCRIPTION OF THE EXEMPLARY EMBODIMENTS

[0024] Hereinafter, certain exemplary embodiments of the present disclosure will be described in detail with reference to the accompanying drawings.

[0025] The matters defined in the description, such as a detailed construction and elements thereof, are provided to assist in a comprehensive understanding of the disclosure. Thus, it is apparent that the present disclosure may be carried out without those defined matters. Also, well-known functions or constructions are omitted to provide a clear and concise description of exemplary embodiments of the present disclosure.

[0026] FIG. 1 is a perspective view illustrating a suction nozzle assembly 1 according to an embodiment of the present disclosure disposed in an upright vacuum cleaner, and FIG. 2 is a bottom view of the suction nozzle assembly 1 of FIG. 1.

[0027] Referring to FIGS. 1 and 2, the suction nozzle assembly 1 for a vacuum cleaner according to the embodiment of the present disclosure includes a nozzle body 2, and a brush unit 10.

[0028] The nozzle body 2 is provided with a contaminants suction pathway (not illustrated). The brush unit 10 is disposed in a front end of the nozzle body 2. Also, the nozzle body 2 is provided with a pair of wheels 4 to allow the suction nozzle assembly 1 to move on a surface to be cleaned. The nozzle body 2 is connected with a cleaner body 5 of the vacuum cleaner.

[0029] This embodiment is referred to the suction nozzle assembly 1 used in the upright vacuum cleaner. Therefore, when a vacuum generator (not illustrated) disposed in the cleaner body 5 of the upright vacuum cleaner generates suction force, contaminants are drawn in from the surface to be cleaned via a contaminants suction opening 14 of the brush unit 10.

[0030] The brush unit 10 is disposed in the front end of the nozzle body 2. The contaminants suction opening 14 is formed on a bottom surface of the brush unit 10, and in fluid communication with the contaminants suction pathway of the nozzle body 2. At this time, the brush unit 10 may be configured to pivot with respect to the nozzle body 2 by a predetermined angle.

[0031] Referring to FIGS. 2 and 3, the brush unit 10 includes a brush 13, a rotation drum 20, and a housing 11.

[0032] The brush 13 is rotatably disposed at the contaminants suction opening 14 of the housing 11, and has a plurality of bristles that is formed on a surface of the brush 13 to contact the surface to be cleaned. Therefore,

when the brush 13 rotates, contaminants can be removed from the surface to be cleaned.

[0033] The rotation drum 20 is rotatably disposed in front of the brush 13 at the housing 11 and, thus in front of the suction opening 14. The rotation drum 20 collects thin contaminants such as hair of human, fur of animals, etc. on the surface to be cleaned in a lump, and then, guides the collected thin contaminants in a lump toward the brush 13. The rotation drum 20 includes a rotation restricting member 29, a drum body 50 (refer to FIG. 6A), and a removing member 60 (refer to FIG. 7).

[0034] The rotation restricting member 29 may be configured to allow the rotation drum 20 to rotate in a first direction but not to rotate in a reverse direction of the first direction according to a moving direction of the suction nozzle assembly 1. Alternatively, the rotation restricting member 29 may be configured to allow the rotation drum 20 to rotate in both directions within a predetermined angle. The rotation restricting member 29 may be disposed in at least one side of the drum body 50.

[0035] In FIG. 3, a ratchet part 30 is illustrated as one example of the rotation restricting member 29. In FIG. 3, the ratchet part 30 is configured to allow the rotation drum 20 to rotate only in one direction. The ratchet part 30 of FIG. 3 includes a ratchet wheel 31, which is disposed coaxially with the rotation drum 20 to rotate integrally with the rotation drum 20, and a ratchet pawl 33 that is disposed at one side of the ratchet wheel 31 at either of the housing 11 or the nozzle body 2. The ratchet pawl 33 is disposed not to rotate although the rotation drum 20 rotates.

[0036] The ratchet wheel 31 is provided with a plurality of inclined teeth 32 on an outer circumferential surface thereof. When the ratchet wheel 31 receives force in an inclined direction of each of the teeth 32, the teeth 32 of the ratchet wheel 31 are not hooked on the ratchet pawl 33 so that the ratchet wheel 31 can rotate. When the ratchet wheel 31 receives force in a reverse direction, a vertical side 32a of any of the teeth 32 of the ratchet wheel 31 is hooked on the ratchet pawl 33 so that the ratchet wheel 31 cannot rotate. In other words, the rotation drum 20 can rotate in a direction of an inclined surface 32b of the teeth 32 of the ratchet wheel 31, but cannot rotate in the reverse direction. Therefore, in FIG. 3, the ratchet wheel 31 is hooked on the ratchet pawl 33 in a clockwise direction (in a direction of arrow B) so that the rotation drum 20 does not rotate, but in a counterclockwise direction (in a direction opposite arrow B) the ratchet wheel 31 is not hooked on the ratchet pawl 33 so that the rotation drum 20 rotates. In other words, as illustrated in FIG. 3, when pushing the suction nozzle assembly 1 forward (in a direction of arrow A), the rotation drum 20 rotates in the counterclockwise direction as arrow B. However, when pulling the suction nozzle assembly 1 backward (in a direction opposite arrow A), the rotation drum 20 does not rotate.

[0037] Referring to FIGS. 4A and 4B, another ratchet part 40 as the rotation restricting member 29 is illustrated.

In FIG. 4A, a ratchet wheel 41 of the ratchet part 40 is similar to the ratchet wheel 31 of the above-described ratchet part 30, but a ratchet pawl 43 is configured to move up and down. Therefore, when the ratchet wheel 41 receives force in the clockwise direction as arrow F illustrated in FIG. 4B, a vertical side 42a of any of teeth 42 of the ratchet wheel 41 is hooked on the ratchet pawl 43 so that the ratchet wheel 41 cannot rotate. When the ratchet wheel 41 receives force in the counterclockwise direction (in a direction of arrow D) illustrated in FIG. 4A, inclined sides 42b of the teeth 42 of the ratchet wheel 41 are not hooked on the ratchet pawl 43 so that the ratchet wheel 41 can rotate.

[0038] In the above description, the ratchet parts 30 and 40 are configured so that when the suction nozzle assembly 1 is pushed forward (refer to arrows A and C in FIGS. 3 and 4A) the rotation drum 20 rotates, and when the suction nozzle assembly 1 is pulled backward (refer to arrow E in FIG. 4B) the rotation drum 20 does not rotate. Alternatively, the ratchet parts 30 and 40 may be configured to the contrary. In other words, the ratchet parts 30 and 40 may be configured so that when the suction nozzle assembly 1 is pushed forward the rotation drum 20 does not rotate, and when the suction nozzle assembly 1 is pulled backward the rotation drum 20 rotates.

[0039] On the other hand, the rotation restricting member 29 may be configured so that the rotation drum 20 can rotate within a predetermined angle. In other words, the rotation drum 20 cannot continuously rotate but rotate by a predetermined angle in a first direction. Also, the rotation drum 20 can rotate by a similar angle in a reverse direction of the first direction. Referring to FIG. 5, an example of the rotation restricting member 29 having the above-described structure is illustrated.

[0040] Referring FIG. 5, the rotation restricting member 29 includes a rotation wheel 45 and a stopper 46. The rotation wheel 45 is formed to rotate integrally with the rotation drum 20 (refer to FIG. 2) coaxially with the rotation drum 20. A plurality of grooves 45a is formed on an outer circumferential surface of the rotation wheel 45. The stopper 46 is disposed inside anyone of the plurality of grooves 45a formed on the outer circumferential surface of the rotation wheel 45. The stopper 46 is fixed to the housing 11 of the suction nozzle assembly 1 so that when the rotation drum 20 rotates, the stopper 46 does not rotate. As a result, a rotation range of the rotation wheel 45 is restricted by the stopper 46 that positions inside one of the grooves 45a of the rotation wheel 45. Referring to FIG. 5, the rotation wheel 45 has five grooves 45a, and the stopper 46 positions inside anyone of the five grooves 45a. As a result, the rotation drum 30 disposed integrally with the rotation wheel 45 can rotate in the clockwise and counterclockwise directions (refer to arrow G in FIG. 5) within a predetermined angle determined by the groove 45a of the rotation wheel 45 and the stopper 46.

[0041] The drum body 50 and 50' may be formed in a

hexagonal column shape or in a cylindrical shape as illustrated in FIGS. 6A and 6B. The drum body 50 and 50' may be formed integrally with or detachably from the ratchet wheel 31 and 41 or the rotation wheel 45 of the rotation restricting member 29. In this embodiment, the ratchet wheel 31 and 41 and the rotation wheel 45 are formed separately from the drum body 50 and 50'.

[0042] The removing member 60 collects thin contaminants such as hair of human, fur of animals, etc. on the surface to be cleaned in a lump, and then, guides the collected thin contaminants toward the contaminants suction opening 14.

[0043] The removing member 60 is inserted in the drum body 50 and 50', and is configured of a bottom plate 61 and a plurality of protrusions 62. The bottom plate 61 is formed in a hexagonal column shape or a cylindrical shape corresponding to the shape of the drum body 50 and 50'. In FIGS. 7 and 10, the removing members 60 and 60' with the bottom plate 61 in the hexagonal column shape are illustrated.

[0044] The plurality of protrusions 62 contacts the surface to be cleaned, collects thin contaminants on the surface to be cleaned in a lump, and guides the collected thin contaminants in a lump toward the contaminants suction opening 14 (refer to FIG. 2). The plurality of protrusions 62 may be formed in various shapes as long as they are capable of performing the above-described functions.

[0045] Referring FIG. 7, the removing member 60 with the plurality of protrusions 62 having a substantially stick shape is illustrated. The plurality of protrusions 62 having the stick shape may be arranged in various patterns. In FIG. 7, the plurality of protrusions 62 is disposed in three rows on one side surface of the bottom plate 61 with the hexagonal column shape. Referring to FIG. 8, each of the protrusions 62 is formed in a mountain peak with a ball. However, this is only exemplary embodiment and is not intended to be limiting; therefore, the protrusions 62 with the substantially stick shape may be formed in various shapes.

[0046] Referring to FIGS. 9A to 9F, protrusions 63, 64, 65, 66, 67, and 68 with a substantially block shape are illustrated. Here, the term "block shape" refers to a shape of the protrusions that rise up from the bottom plate 61 in a substantially longish rectangular parallelepiped shape. The plurality of block shaped protrusions 63, 64, 65, 66, 67, and 68 may be arranged in various patterns. Referring to FIG. 9A, the plurality of blocks 63 is arranged to be parallel to a rotation axis (refer to CL in FIGS. 2 and 7) of the rotation drum 20. Referring to FIG. 9B, the plurality of blocks 64 is arranged in a substantially V shape, and referring to FIG. 9C, the plurality of blocks 65 is arranged to be inclined with respect to the rotation center CL of the rotation drum 20. Referring to FIG. 9D, the plurality of blocks 66 is arranged in one row on one side surface of the hexagonal column of the bottom plate 61. At this time, the plurality of blocks 66 is formed to be symmetrically inclined with respect to a centerline 61a of

the one side surface of the hexagonal column of the bottom plate 61.

[0047] Referring to FIGS. 9E and 9F, the plurality of block shaped protrusions 63 and 64 is arranged in a similar pattern to those of FIGS. 9A and 9B, respectively, exception that some protrusions 67 and 68 are formed in a split block shape. Here, the term "split block shape" refers to a block shape having split in a plurality of portions in a lengthwise direction of the block shape. In FIGS. 9E and 9F, each of the split blocks 67 and 68 is split of three portions; however, this is only an exemplary embodiment and not intended to be limiting.

[0048] Additionally, the plurality of protrusions 69 may be substantially formed in a loop shape as illustrated in FIG. 10. Referring to FIG. 10, the plurality of loop shaped protrusions 69 are arranged in two rows on each of side surfaces of the bottom plate 61 of the hexagonal column.

[0049] In above-description, the removing member 60 is formed separately from the drum body 50. Alternatively, the removing member 60 may be formed integrally with the drum body 50.

[0050] Furthermore, the removing member 60 may be formed of elastic material such as rubber, urethane, etc. Especially, the plurality of protrusions 62, 63, 64, 65, 66, 67, and 68 of the removing member may be formed of felt.

[0051] Referring to FIGS. 2 and 3, the housing 11 supports the brush 13 and the rotation drum 20 to rotate, and is provided with the contaminants suction opening 14 in fluid communication with the contaminants suction pathway of the nozzle body 2.

[0052] Hereinafter, operation of the suction nozzle assembly 1 according to an embodiment of the present disclosure will be explained with reference to FIGS. 2 and 3.

[0053] When a user turns on the vacuum cleaner and pushes the suction nozzle assembly 1 forward, that is, pushes the brush unit 10 in the direction of arrow A in FIG. 3, the brush 13 rotates and contaminants are drawn into the suction nozzle assembly 1 from the surface to be cleaned via the contaminants suction opening 14 by suction force.

[0054] When the suction nozzle assembly 1 moves forward, the rotation drum 20 disposed in front of the brush 13 rotates in the counterclockwise direction (refer to arrow B) due to friction against the surface to be cleaned. At this time, the ratchet wheel 31 of the ratchet part 30 of the rotation drum 20 is not hooked on the ratchet pawl 33 so that the rotation drum 20 can rotate in the counterclockwise direction. When the rotation drum 20 rotates in the counterclockwise direction, thin contaminants on the surface to be cleaned are moved toward the brush 13.

[0055] However, when the user pulls the suction nozzle assembly 1 backward, that is, pulls the brush unit 10 in the reverse direction of arrow A in FIG. 3, the rotation drum 20 does not rotate. In other words, when the suction nozzle assembly 1 moves in the reverse direction of arrow A, the rotation drum 20 receives force to cause the rotation drum 20 to rotate in the clockwise direction due to friction against the surface to be cleaned. However,

the ratchet wheel 31 of the ratchet part 30 of the rotation drum 20 is hooked on the ratchet pawl 33 so that the rotation drum 20 cannot rotate in the clockwise direction and maintains in a stationary state. When pulling the suction nozzle assembly 1 with the stopped rotation drum 20, the plurality of protrusions 63 of the rotation drum 20 rubs against the surface to be cleaned to collect thin contaminants such as hair of human, fur of animals, etc. When the thin contaminants are collected in a lump by the plurality of protrusions 63, the collected thin contaminants are easily drawn into the contaminants suction opening 14 by the suction force.

[0056] In the above description, the suction nozzle assembly 1 has the brush 13; however, this is only exemplary and not intended to be limiting. Alternatively, the suction nozzle assembly 1 according to an embodiment of the present disclosure may have no brush 13.

[0057] FIG. 11 is a bottom view illustrating a suction nozzle assembly 100 for the vacuum cleaner with no brush.

[0058] Referring to FIG. 11, the suction nozzle assembly 100 includes a nozzle body 101, and a rotation drum 120. The nozzle body 101 is provided with a contaminants suction opening 102, and supports the rotation drum 120 to rotate.

[0059] Contaminants are drawn into the contaminants suction opening 102 by the suction force generated in the vacuum generator (not illustrated). The contaminants suction opening 102 may be formed so that contaminants can be drawn in front of and behind the rotation drum 120 as illustrated in Fig. 11. In other words, the rotation drum 120 may be disposed in the middle of the contaminants suction opening 102.

[0060] Also, although not illustrated, the contaminants suction opening 102 may be formed only in front of the rotation drum 120. Alternatively, the contaminants suction opening 102 may be formed only behind the rotation drum 120.

[0061] Structure and operation of the rotation drum 120 are the same as those of the rotation drum 20 of the suction nozzle assembly 1 according to above-described embodiment. Therefore, detail descriptions thereof are omitted.

[0062] FIG. 12 is a bottom view illustrating a suction nozzle assembly 200 for the vacuum cleaner according to another embodiment of the present disclosure.

[0063] Referring to FIG. 12, the suction nozzle assembly 200 for the vacuum cleaner according to the embodiment of the present disclosure includes a nozzle body 201, and a pair of rotation drums 221 and 222.

[0064] The nozzle body 201 is provided with a contaminants suction pathway (not illustrated) in fluid communication with a cleaner body (not illustrated) of the vacuum cleaner. A contaminants suction opening 202 through which contaminants are drawn in is formed on a bottom surface of the nozzle body 201.

[0065] The pair of rotation drums 221 and 222 is rotatably disposed in the contaminants suction opening 202

of the nozzle body 201. The pair of the rotation drums 221 and 222 rubs against the surface to be cleaned, and causes thin contaminants such as hair of human or/and fur of animals on the surface to be cleaned to be collected in a lump and drawn into the contaminants suction opening 202. Therefore, the pair of rotation drums 221 and 222 may be disposed in the middle of the contaminants suction opening 202 so that maximum suction force can be applied to between the pair of the rotation drums 221 and 222.

[0066] Each of the pair of rotation drums 221 and 222 includes a rotation restricting member 231 and 232, a drum body, and a removing member. The rotation restricting members 231 and 232, drum body, and removing member are similar to the rotation restricting member 29, drum body 50, and removing member 60 of the rotation drum 20 according to the above-described embodiment; therefore, detail descriptions thereof are omitted. However, the rotation restricting members 231 and 232 of the suction nozzle assembly 200 according to this embodiment are configured so that when one of the pair of rotation drums 221 and 222 rotates, the other rotation drum 222 and 221 is stopped. Structure of the rotation restricting members 231 and 232 is illustrated in FIGS. 13A and 13B.

[0067] Referring to FIGS. 12, 13A, and 13B, the first rotation restricting member 231 is disposed coaxially with the first rotation drum 221, that is, the front one 221 of the pair of rotation drums 221 and 222, and allows the first rotation drum 221 to rotate in the counterclockwise direction (refer to arrow K in FIG. 13B) but not to rotate in the clockwise direction. Also, the second rotation restricting member 232 is disposed coaxially with the second rotation drum 222, that is, the rear one 222 of the pair of rotation drums 221 and 222, and allows the second rotation drum 222 to rotate in the clockwise direction (refer to arrow I in FIG. 13A) but not to rotate in the counterclockwise direction.

[0068] Therefore, if the first and second rotation restricting members 231 and 232 are configured of ratchet parts as illustrated in FIGS. 13A and 13B, a first ratchet wheel 233 of the first rotation drum 221 is disposed to rotate in the counterclockwise direction but not to rotate in the clockwise direction. Also, a second ratchet wheel 237 fixed coaxially with the second rotation drum 222 is disposed to rotate in the clockwise direction but not to rotate in the counterclockwise direction.

[0069] Hereinafter, operation of the suction nozzle assembly 200 for the vacuum cleaner having the above-described structure will be explained with reference to FIGS. 12, 13A, and 13B.

[0070] FIG. 13B illustrates operation of the first and second rotation restricting members 231 and 232 disposed at each of the pair of rotation drums 221 and 222 when pushing the suction nozzle assembly 200 for the vacuum cleaner forward.

[0071] When a user pushes the suction nozzle assembly 200 forward as arrow J illustrated in FIG. 13B, the

first and second rotation drums 221 and 222 tend to rotate in the counterclockwise direction due to friction force against the surface to be cleaned. The first rotation restricting member 231 allows the first rotation drum 221 to rotate in the counterclockwise direction (refer to arrow K) so that when the suction nozzle assembly 200 moves forward, the first rotation drum 221 rotates in the counterclockwise direction. However, the second rotation restricting member 232 prevents the second rotation drum 222 from rotating in the clockwise direction so that when the suction nozzle assembly 200 moves forward, the second rotation drum 222 maintains in a stationary state.

[0072] Since when the user moves the suction nozzle assembly 200 forward as arrow J the second rotation drum 222 maintains in a stationary state, the plurality of protrusions 242 formed on the outer circumstance of the second rotation drum 222 rubs against the surface to be cleaned to collect thin contaminants in a lump. At this time, the first rotation drum 221 rotates in the counterclockwise direction as arrow K, thereby pushing up the contaminants to be collected in a lump by the second rotation drum 222 inside the contaminants suction opening 202. Therefore, the suction nozzle assembly 200 can effectively draw in thin contaminants.

[0073] On the other hands, FIG. 13A illustrates operation of the first and second rotation restricting members 231 and 232 disposed at each of the pair of rotation drums 221 and 222 when the user pulls the suction nozzle assembly 200 for the vacuum cleaner backward.

[0074] When the user pulls the suction nozzle assembly 200 backward as arrow H, the first and second rotation drums 221 and 222 tend to rotate in the clockwise direction (refer to arrow I) due to the friction force against the surface to be cleaned. The first rotation restricting member 231 prevents the first rotation drum 221 from rotating in the clockwise direction so that when the suction nozzle assembly 200 moves backward, the first rotation drum 221 maintains in a stationary state. However, the second rotation restricting member 232 allows the second rotation drum 222 to rotate in the clockwise direction so that when the suction nozzle assembly 200 moves backward, the second rotation drum 222 rotates in the clockwise direction.

[0075] Therefore, since when the user pulls the suction nozzle assembly 200 backward as arrow H the first rotation drum 221 maintains in a stationary state, the plurality of protrusions 241 formed on the outer circumstance of the first rotation drum 221 rubs against the surface to be cleaned to collect thin contaminants in a lump. At this time, the second rotation drum 222 rotates in the clockwise direction as arrow I, thereby pushing up the contaminants to be collected in a lump by the first rotation drum 221 inside the contaminants suction opening 202.

[0076] If the suction nozzle assembly 200 is provided with the pair of rotation drums 221 and 222 as this embodiment, one rotation drum 221 and 222 collects contaminants and the other rotation drum 222 and 221 pushes up the collected contaminants into the contaminants

suction opening 202. Therefore, the suction nozzle assembly 200 with the pair of rotation drums 221 and 222 can more effectively draw in thin contaminants from the surface to be cleaned than the suction nozzle assembly 1 with one rotation drum 20 as described above.

[0077] FIG. 14 is a conceptual view schematically illustrating a suction nozzle assembly 200 having a rotation restricting member different from that of the suction nozzle assembly 200 of FIG. 12 with the pair of rotation drums 221 and 222.

[0078] Referring to FIG. 14, the rotation restricting member according to this embodiment includes first and second rotation preventing parts 251 and 252 that are disposed at the nozzle body 201 (refer to FIG. 12) to prevent first and second rotation drums 261 and 262 from rotating. Each of the first and second rotation drums 261 and 262 includes a plurality of protrusions 261a and 262a that is disposed to be inclined in a rotation direction of the rotation drum 261 and 262 and made of felt. In other words, the plurality of protrusions 261a on the first rotation drum 261 is disposed to be inclined so that when the first rotation drum 261 rotates in the counterclockwise direction, the plurality of protrusions 261a is not caught by the first rotation preventing part 251. Also, the plurality of protrusions 262a on the second rotation drum 262 is disposed to be inclined so that when the second rotation drum 262 rotates in the clockwise direction, the plurality of protrusions 262a is not caught by the second rotation preventing part 252.

[0079] Therefore, as illustrated in FIG. 14, when a user pushes the suction nozzle assembly 200 (refer to FIG. 12) forward as arrow L so that the first and second rotation drums 261 and 262 receive force to cause the first and second rotation drums 261 and 262 to rotate in the counterclockwise direction (refer to arrow M), the plurality of protrusions 261a of the first rotation drum 261 is not caught by the first rotation preventing part 251, so the first rotation drum 261 rotates in the counterclockwise direction. However, the plurality of protrusions 262a of the second rotation drum 262 is caught by the second rotation preventing part 252, so the second rotation drum 262 does not rotate in the counterclockwise direction and maintains in a stationary state.

[0080] On the other hands, when the user pulls the suction nozzle assembly 200 backward so that the first and second rotation drums 261 and 262 receive force to cause the first and second rotation drums 261 and 262 to rotate in the clockwise direction, the plurality of protrusions 261a of the first rotation drum 261 is caught by the first rotation preventing part 251, so the first rotation drum 261 does not rotate in the clockwise direction and maintains in a stationary state. However, the plurality of protrusions 262a of the second rotation drum 262 is not caught by the second rotation preventing part 252, so the second rotation drum 262 rotates in the clockwise direction.

[0081] When the first and second rotation drums 261 and 262 rotate in the inclined direction of the plurality of

protrusions 261a and 262a, the felt protrusions 261a and 262a on the outer circumferential surface of each of the first and second rotation drums 261 and 262 are elastically deformed by the first and second rotation preventing parts 251 and 252, and then restored in an original state. However, when the first and second rotation drums 261 and 262 rotate in a reverse direction of the inclination of the plurality of protrusions 261a and 262a, the first and second rotation preventing parts 251 and 252 are caught in lower portions of the plurality of protrusions 261a and 262a of the first and second rotation drums 261 and 262 so that the first and second rotation drums 261 and 262 cannot rotate.

[0082] As described above, a suction nozzle assembly for a vacuum cleaner according to an embodiment of the present disclosure has a rotation drum that can rotate due to friction force against a surface to be cleaned when pushing or pulling the suction nozzle assembly, thereby effectively drawing in thin contaminants such as hair of human, fur of animals, etc. from the surface to be cleaned.

[0083] A suction nozzle assembly for a vacuum cleaner according to an embodiment of the present disclosure has a rotation drum that can rotate in one direction and maintain a stationary status in a reverse direction so that it can easily collect thin contaminants in a lump on a surface to be cleaned, and draw in the collected thin contaminants in a lump.

[0084] A suction nozzle assembly for a vacuum cleaner according to an embodiment of the present disclosure has a pair of rotation drums configured so that when pushing or pulling the suction nozzle assembly, one rotation drum rotates and the other rotation drum maintains in a stationary state. Therefore, the suction nozzle assembly can effectively draw in thin contaminants from a surface to be cleaned.

[0085] While the embodiments of the present disclosure have been described, additional variations and modifications of the embodiments may occur to those skilled in the art once they learn of the basic inventive concepts. Therefore, it is intended that the appended claims shall be construed to include both the above embodiments and all such variations and modifications that fall within the scope of the disclosure.

Claims

1. A suction nozzle assembly for a vacuum cleaner, comprising:

a nozzle body (2, 101) with a contaminants suction opening (14, 102); and
a rotation drum (20, 120) rotatably disposed at the contaminants suction opening (14, 102), the rotation drum (20, 120) having a plurality of protrusions (62-69) formed on an outer circumferential surface,

wherein, when the nozzle body (2, 101) moves on a surface to be cleaned, the rotation drum (20, 120) is rotated by friction force of the plurality of protrusions (62-69) against the surface to be cleaned.

2. The suction nozzle assembly of claim 1, further comprising:

a rotation restricting member (29, 129) to restrict rotation of the rotation drum (20, 120).

3. The suction nozzle assembly of claim 2, wherein the rotation restricting member (29, 129) allows the rotation drum (20, 120) to rotate only in one direction.

4. The suction nozzle assembly of claim 2 or 3, wherein the rotation restricting member (29, 129) comprises:

a ratchet wheel (31, 41) disposed integrally with the rotation drum (20, 120); and
a ratchet pawl (33, 43) disposed at the nozzle body (2, 101) to allow the ratchet wheel (31, 41) to rotate only in one direction.

5. The suction nozzle assembly of any of claims 2 - 4, wherein the rotation restricting member (29, 129) allows the rotation drum (20, 120) to rotate when pushing the nozzle body forward.

6. The suction nozzle assembly of any of claims 2 - 5, wherein the rotation restricting member (29, 129) allows the rotation drum (20, 120) to rotate in clockwise and counterclockwise directions within a predetermined angle.

7. The suction nozzle assembly of any of claims 1 - 6, wherein the rotation drum (20, 120) comprises:

a drum body (50, 50'); and
a removing member (60, 60') disposed at the drum body (50, 50'), the removing member (60, 60') having the plurality of protrusions (62-69).

8. The suction nozzle assembly of any of claims 1 - 7, wherein the plurality of protrusions (62-69) comprise a shape selected from the group consisting of a substantially stick shape, a substantially block shape, a substantially loop shape, and any combinations thereof.

9. The suction nozzle assembly of any of claims 1 - 8, further comprises:

a brush (13) rotatably disposed at one side of the rotation drum (20, 120) in the nozzle body (2, 101).

- 10.** A suction nozzle assembly for a vacuum cleaner, comprising:

a nozzle body (201) with a contaminants suction opening (202); and 5
 a pair of rotation drums (221, 222, 261, 262) rotatably disposed at the contaminants suction opening (202) of the nozzle body (201), each rotation drum (221, 222, 261, 262) of the pair of rotation drums (221, 222, 261, 262) having a plurality of protrusions (241, 242, 261a, 262a) formed on an outer circumferential surface, wherein, when the nozzle body (201) moves on a surface to be cleaned, the pair of rotation drums (221, 222, 261, 262) are rotated by friction force of the plurality of protrusions (241, 242, 261a, 262a) against the surface to be cleaned. 10 15

group consisting of a substantially stick shape, a substantially block shape, a substantially loop shape, and any combinations thereof.

- 11.** The suction nozzle assembly of claim 10, further comprising: 20

a rotation restricting member (231, 232) to restrict each of the pair of rotation drums (221, 222, 261, 262) to rotate. 25

- 12.** The suction nozzle assembly of claim 11, wherein the rotation restricting member (231, 232) is configured so that, when the nozzle body (201) moves in one direction, a first rotation drum (221, 261) of the pair of rotation drums (221, 222, 261, 262) rotates and a second rotation drum (222, 262) does not rotate, and when the nozzle body (201) moves in a reverse direction, the first rotation drum (221, 261) does not rotate and the second rotation drum (222, 262) rotates. 30 35

- 13.** The suction nozzle assembly of claim 11 or 12, wherein the rotation restricting member (231, 232) comprises: 40

a ratchet wheel (233, 237) disposed integrally with each of the pair of rotation drums (221, 222); and
 a ratchet pawl (235, 239) disposed at the nozzle body (201) to restrict rotation of the ratchet wheel (233, 237). 45

- 14.** The suction nozzle assembly of any of claims 10 - 13, wherein each of the pair of rotation drums (221, 222, 261, 262) comprises; 50
 a drum body (50, 50'); and
 a removing member (60, 60') disposed at the drum body (50, 50'), the removing member (60, 60') having the plurality of protrusions (241, 242, 261a, 262a). 55

- 15.** The suction nozzle assembly of any of claims 10 - 14, wherein the plurality of protrusions (241, 242, 261a, 262a) comprise a shape selected from the

FIG. 1

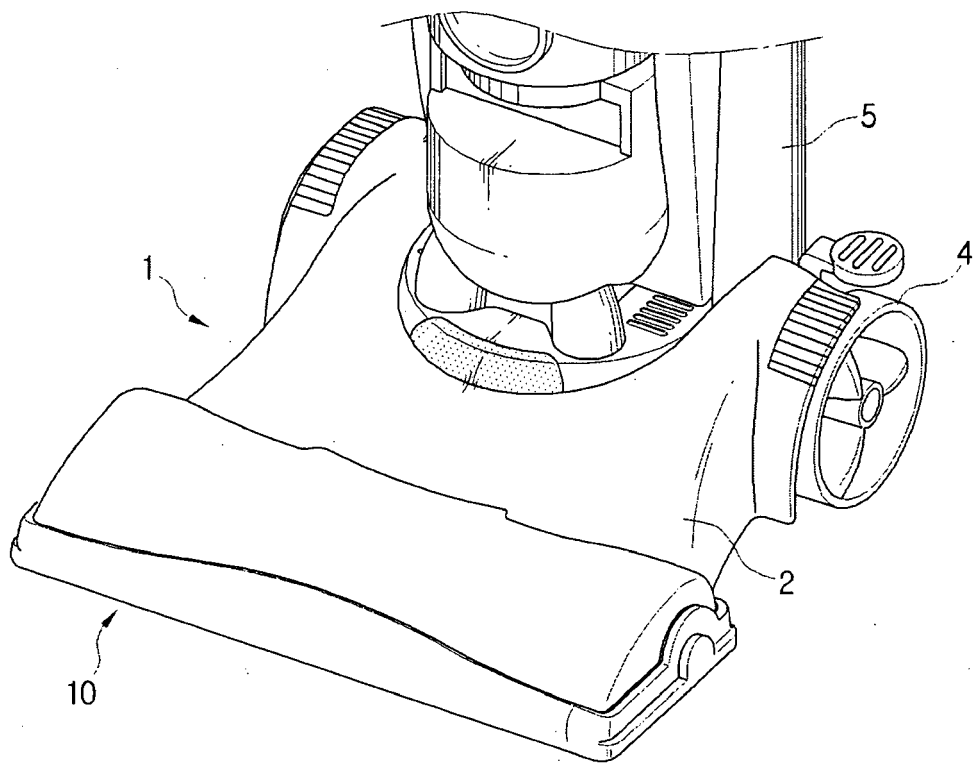


FIG. 2

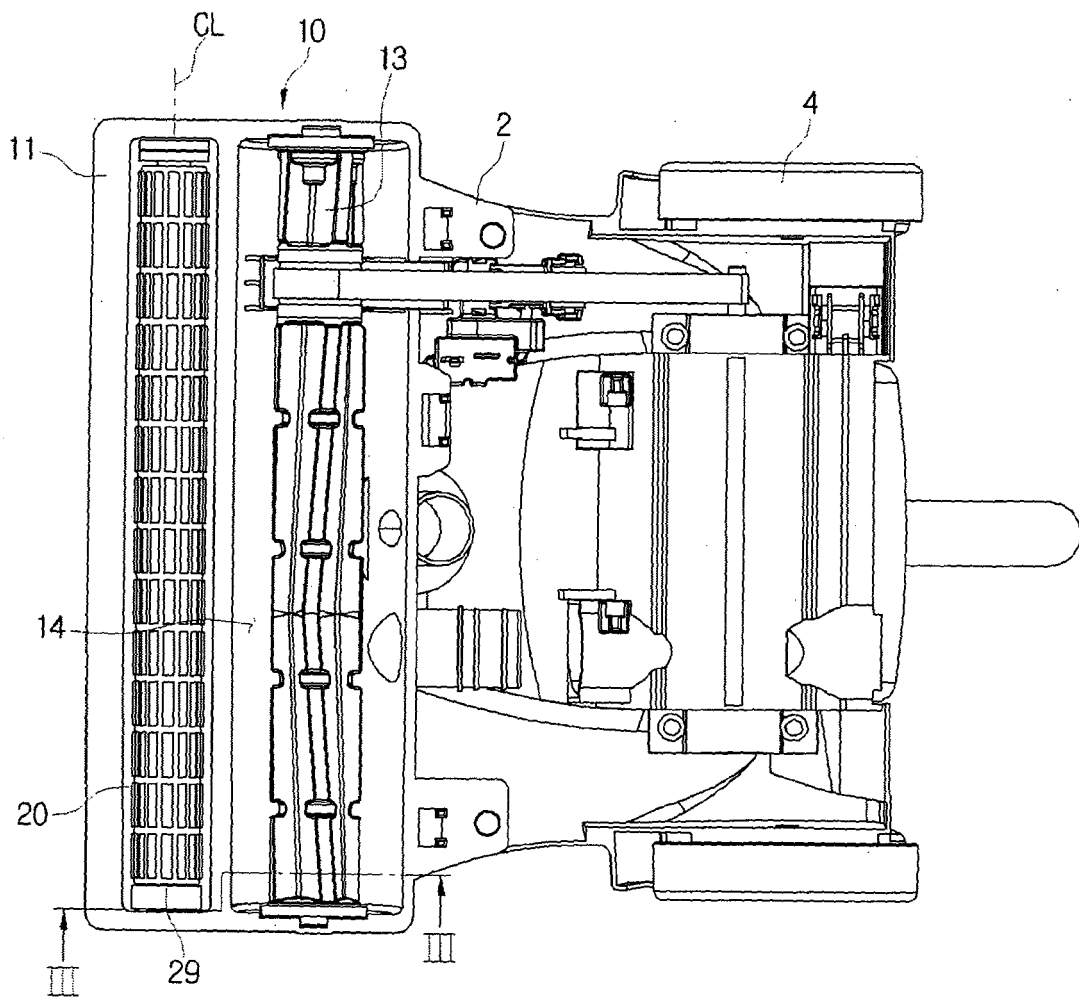


FIG. 3

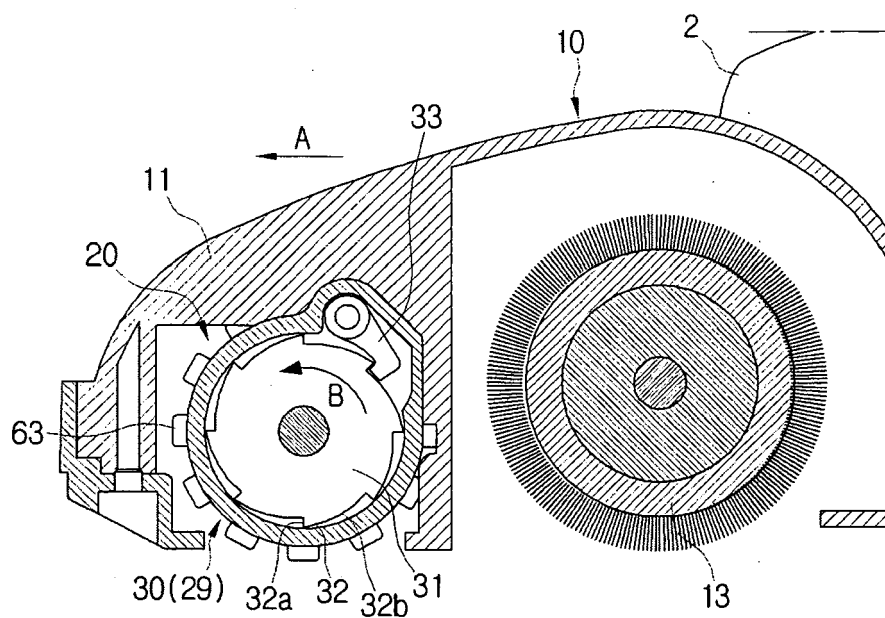


FIG. 4A

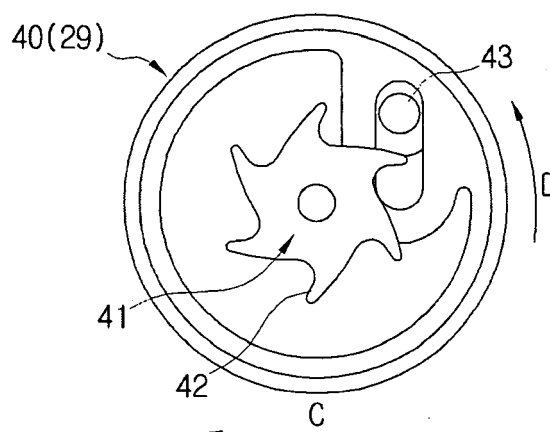


FIG. 4B

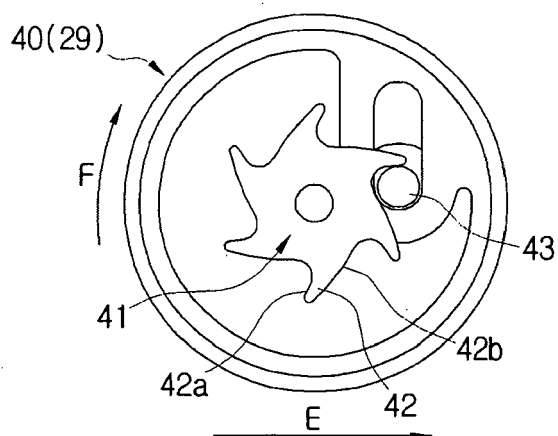


FIG. 5

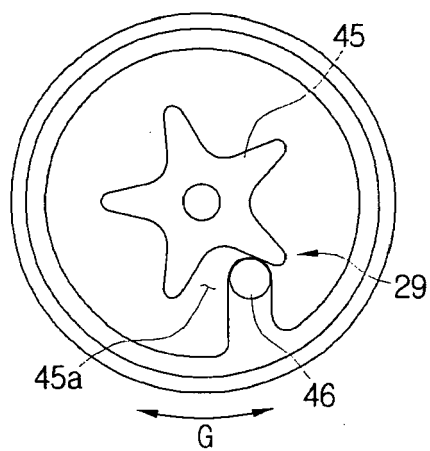


FIG. 6A

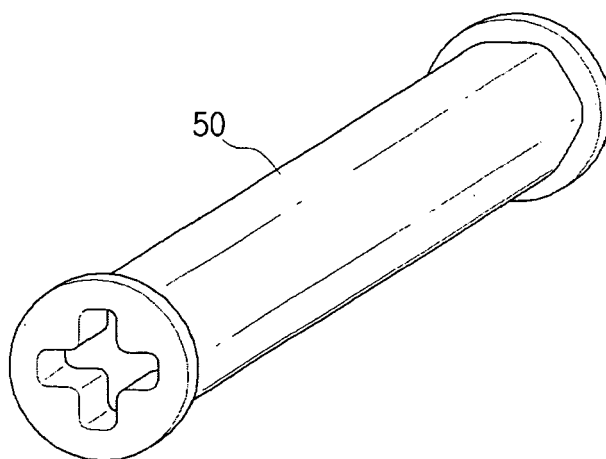


FIG. 6B

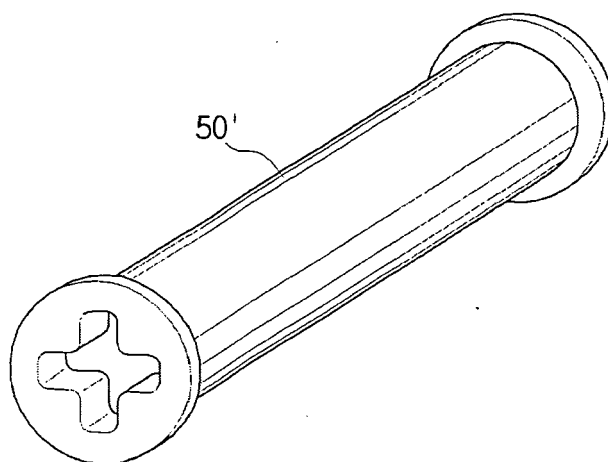


FIG. 7

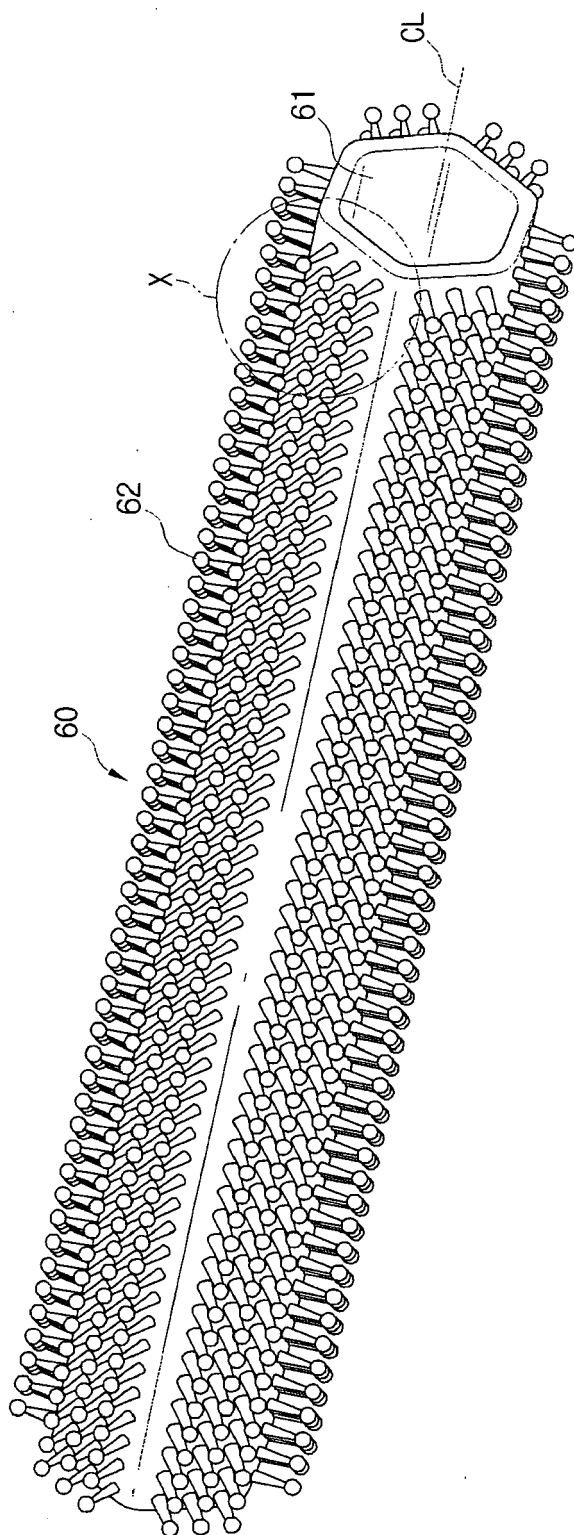


FIG. 8

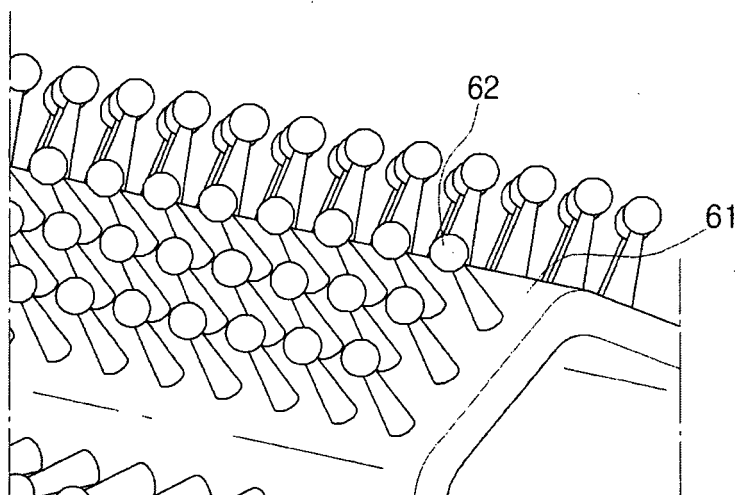


FIG. 9A

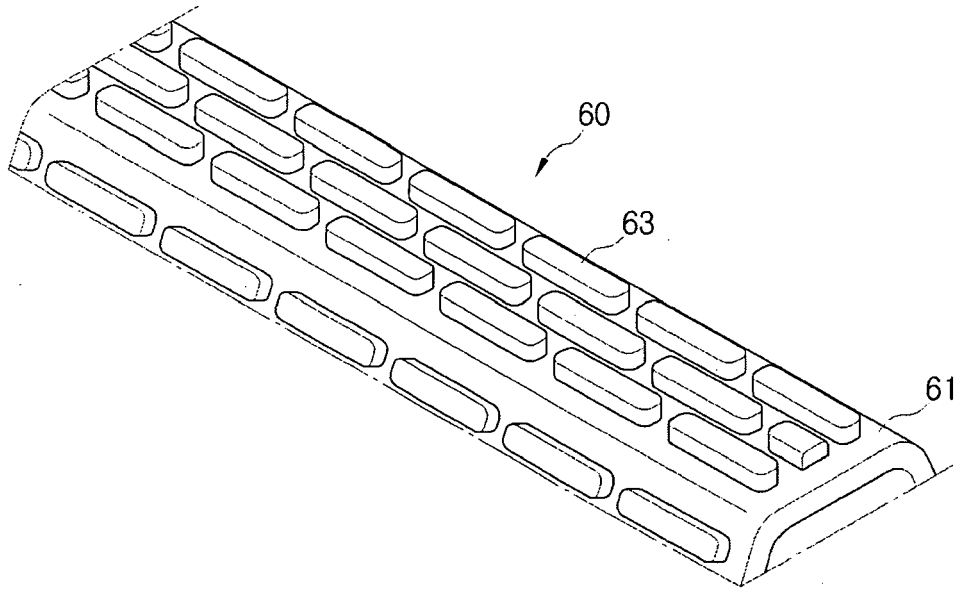


FIG. 9B

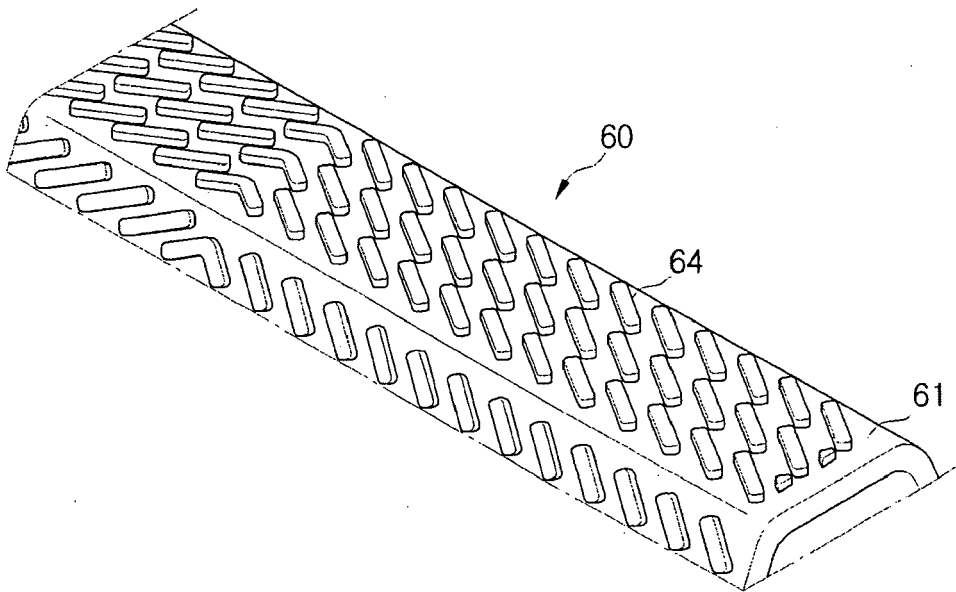


FIG. 9C

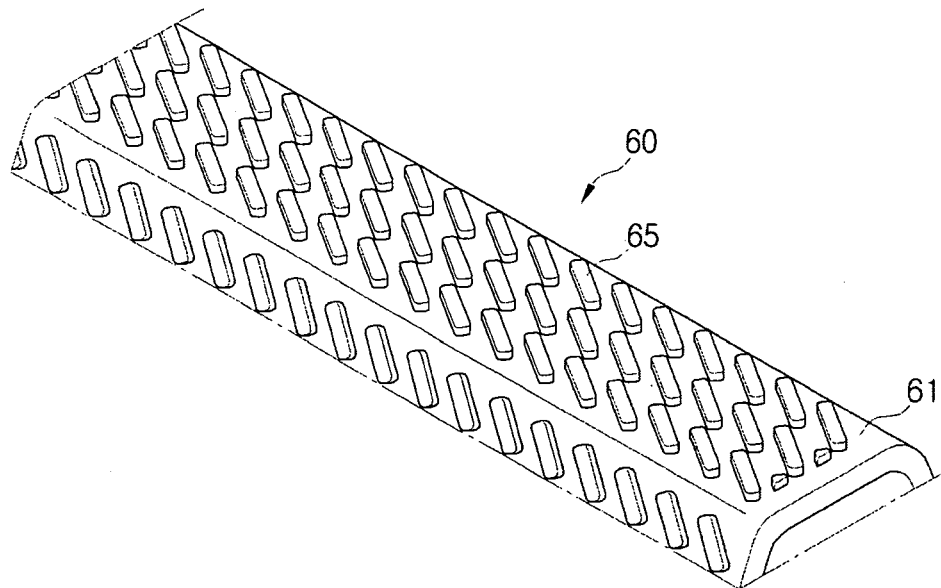


FIG. 9D

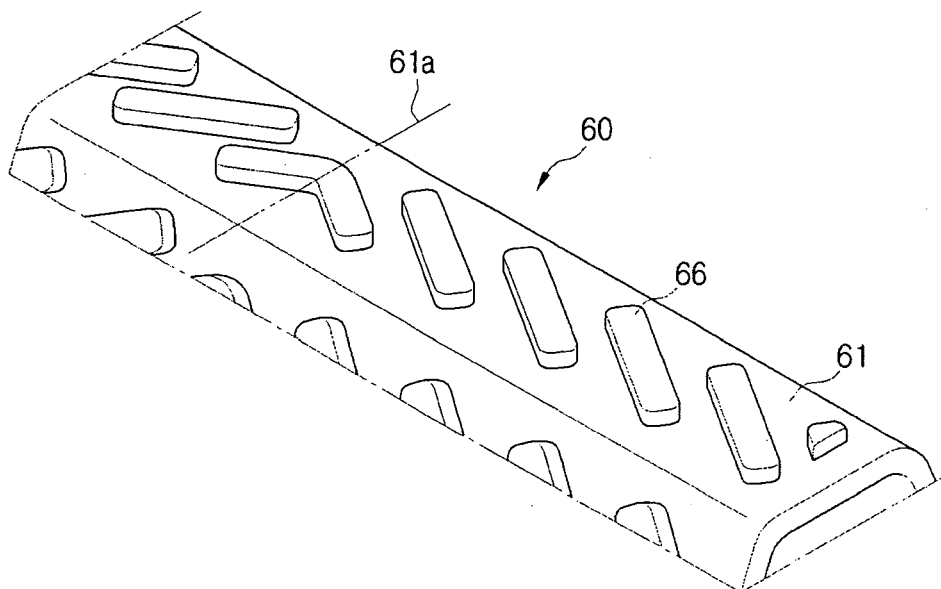


FIG. 9E

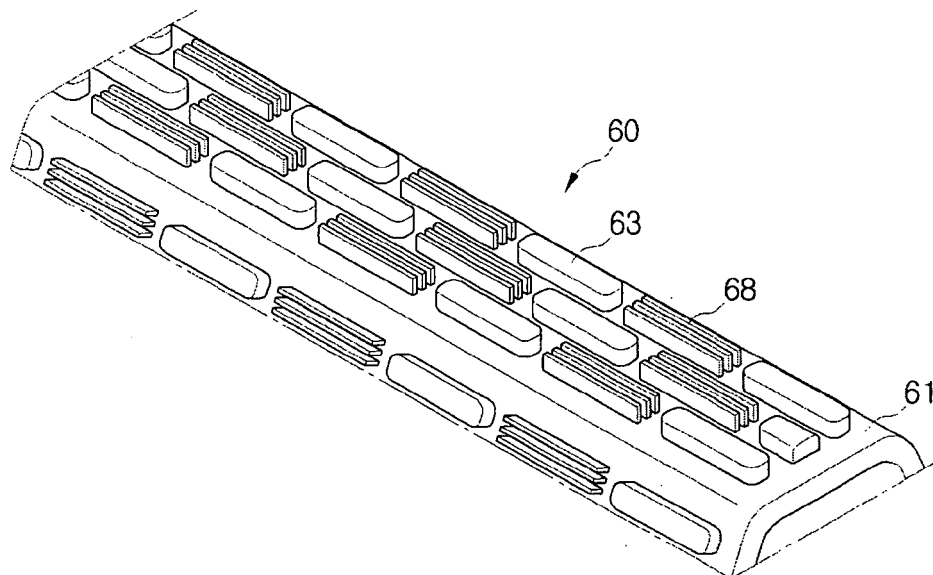


FIG. 9F

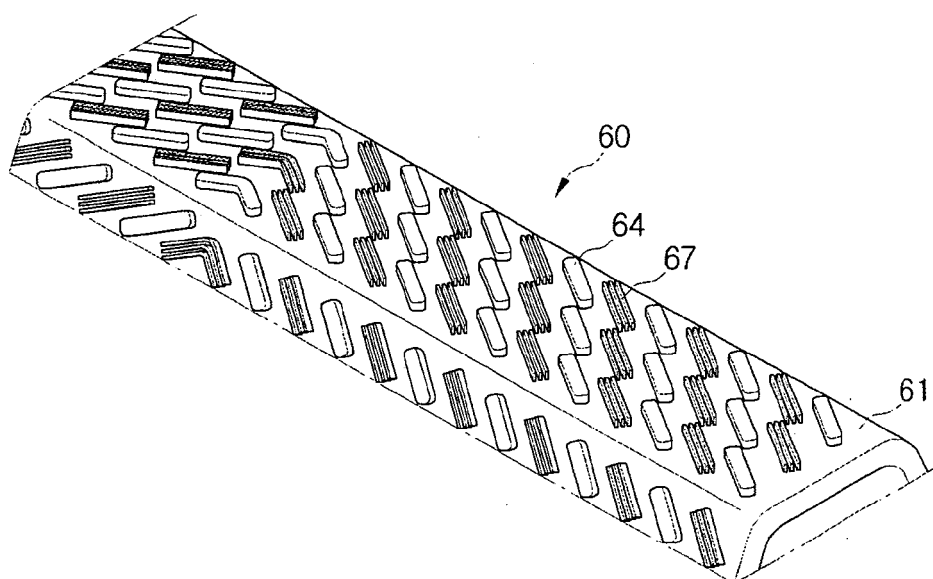


FIG. 10

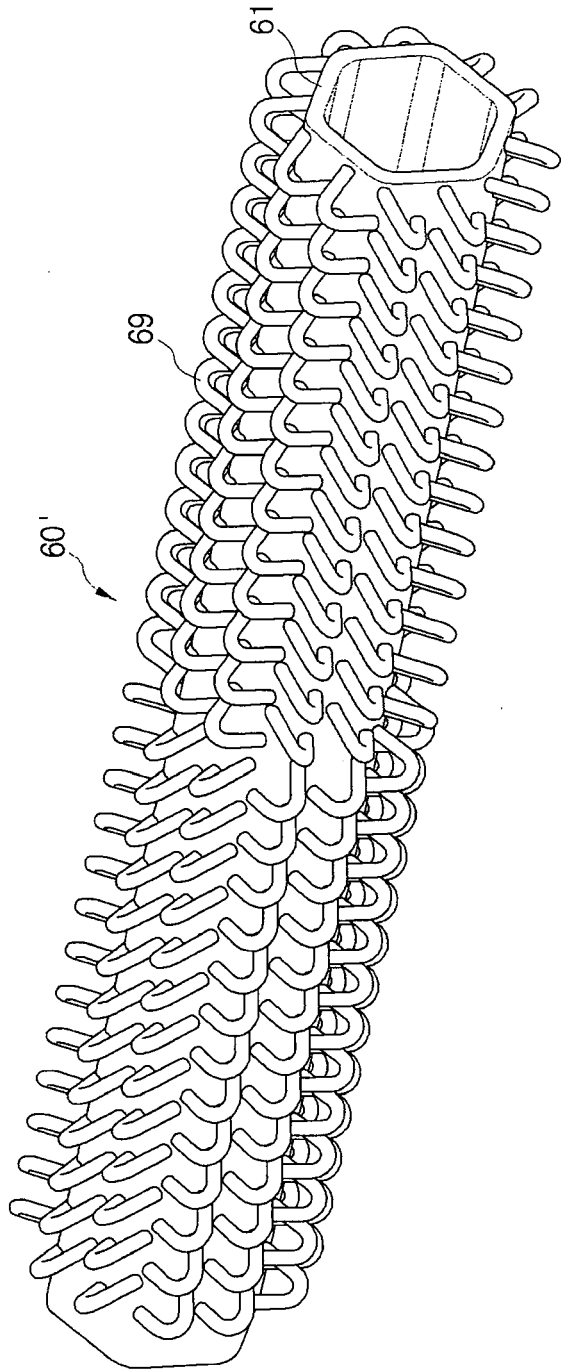


FIG. 11

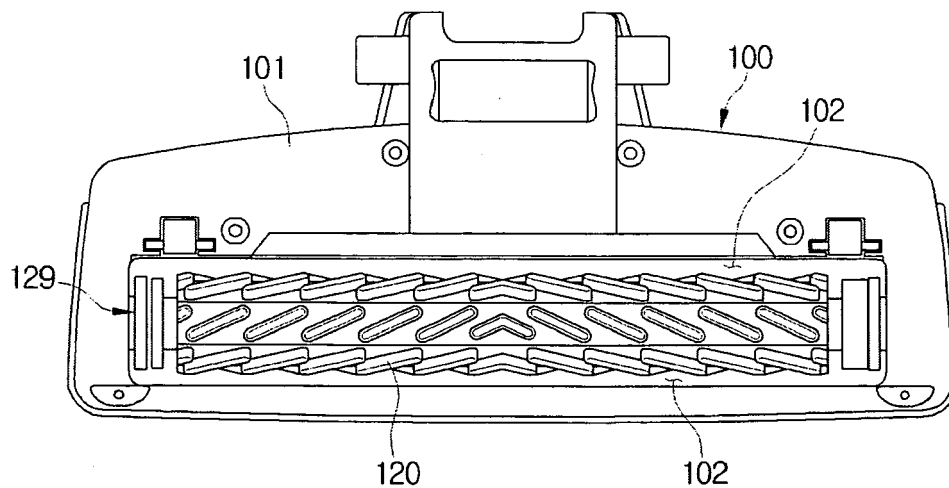


FIG. 12

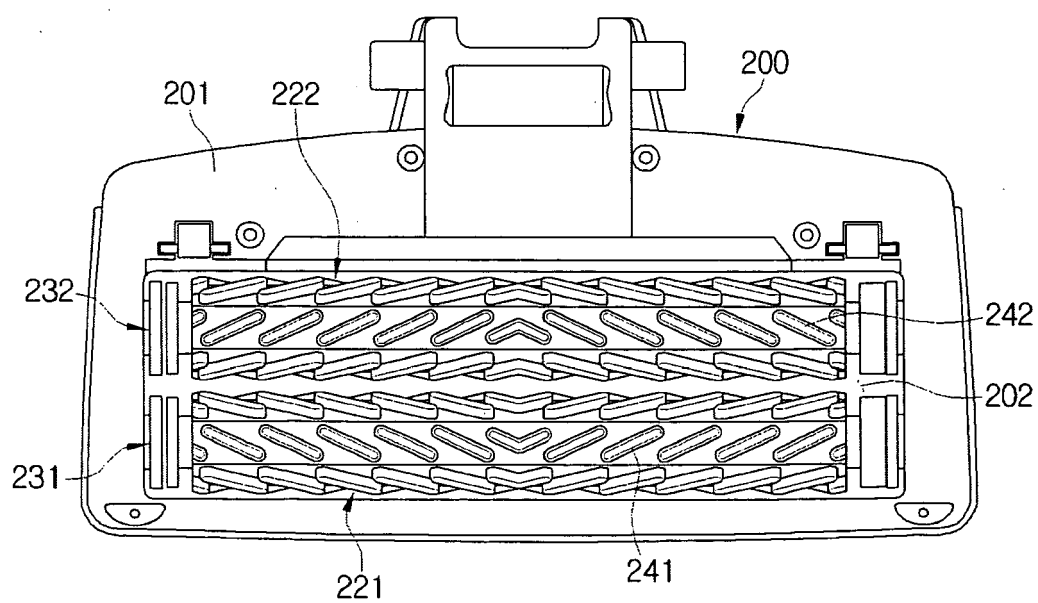


FIG. 13A

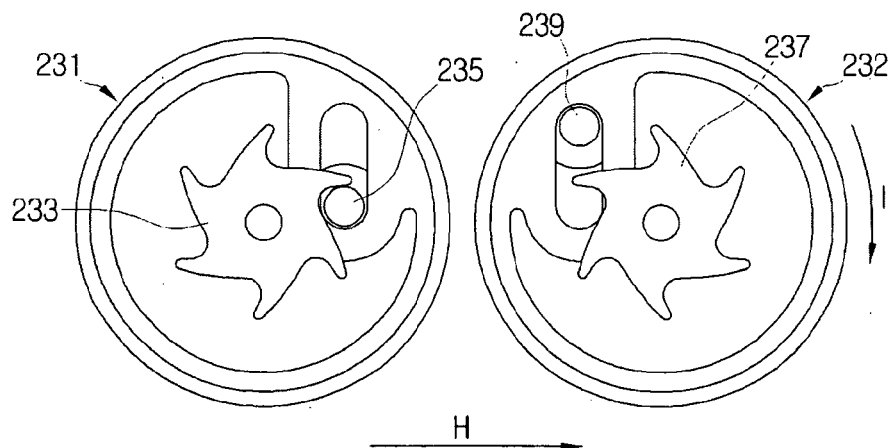


FIG. 13B

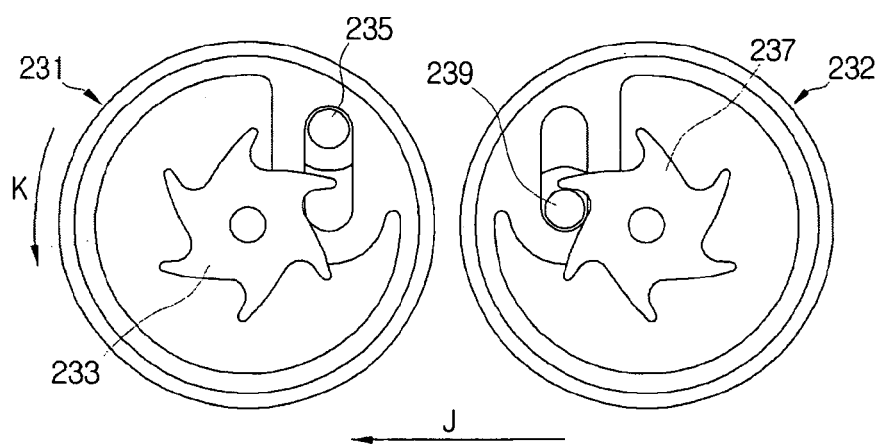
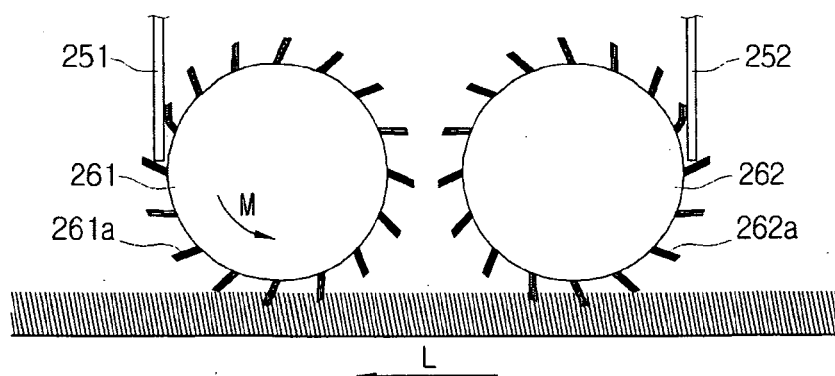


FIG. 14





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 01 9520

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2001/042282 A1 (SJOGREEN JORGEN [DK]) 22 November 2001 (2001-11-22) * paragraphs [0006], [0007], [0009], [0013], [0015] *	1-3,5, 7-11,14, 15	INV. A47L9/04
Y	* figures 1,2,5 *	4,6,13	
Y	----- GB 1 323 259 A (WESSEL H) 11 July 1973 (1973-07-11) * page 1, column 1, lines 41-47 * * page 2, column 1, lines 38-65 * * figure 5 *	4,13	
Y	----- GB 2 266 230 A (GOLD STAR CO [KR]) 27 October 1993 (1993-10-27) * page 20, lines 1-17 * * page 23, lines 1-5 * * page 23, line 21 - page 24, line 15 * * figures 7b,9-11 * -----	6	
			TECHNICAL FIELDS SEARCHED (IPC)
			A47L
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 15 May 2008	Examiner Cescutti, Gabriel
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 07 01 9520

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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15-05-2008

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