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(54) **Autonomous cleaning device**

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(73) Proprietor: **Samsung Electronics Co., Ltd.**
Gyeonggi-do 16677 (KR)

(72) Inventors:
• **Kim, Bo Sang**
Gwangju (KR)

• **Kim, Myeong Ho**
Gwangju (KR)
• **Jeon, Sang Cheon**
Gwangju (KR)

(74) Representative: **Walaski, Jan Filip et al**
Venner Shipley LLP
200 Aldersgate
London EC1A 4HD (GB)

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Description

[0001] The present invention relates to an autonomous cleaning device, and more particularly, an autonomous cleaning device in which the structure of a blade assembly is improved, thereby reducing noise that occurs during cleaning.

[0002] An autonomous mobile robot is a device that travels about an arbitrary area to perform a predetermined task without user manipulation. The robot may travel autonomously to a considerable extent, and autonomous travel may be embodied in various manners. For example, the robot may travel along a predetermined route using a map or may travel using a sensor to sense surroundings thereof without following a predetermined route.

[0003] An autonomous cleaning device travels about an area to be cleaned so as to clean a floor without user manipulation. Specifically, the autonomous cleaning device may function to remove dust or clean a floor at home. Here, dust may include, for example, dirt, motes, powder, fragments and other dust particles that may be collected by a vacuum cleaning device, an automatic or semiautomatic cleaning device.

[0004] The autonomous cleaning device includes a brush unit to sweep up dust and a blade to guide the dust to a dust box. In the related art, when an unevenness floor area is cleaned, noise occurs due to friction between the blade and the floor.

[0005] The document EP 2 443 978 A2 describes an autonomous cleaning device according to the preamble of independent claim 1.

[0006] Therefore, it is an aspect of one or more embodiments to provide an autonomous cleaning device that may reduce noise caused by friction with a floor.

[0007] Additional aspects and/or advantages of one or more embodiments will be set forth in part in the description which follows and, in part, will be apparent from the description, or may be learned by practice of one or more embodiments of disclosure. One or more embodiments are inclusive of such additional aspects.

[0008] In accordance with one or more embodiments, there is provided an autonomous cleaning device that may include: a main body having an opening; a brush unit that is rotatably disposed in the opening of the main body; and a blade assembly that may guide introduction of dust swept up by the brush unit, wherein the blade assembly may include: a blade that may guide dust toward an inner side of the main body; a support member that may be coupled to the blade so as to support the blade and that may have one side in which a coupling groove is formed; and an insertion member that may be inserted into the coupling groove of the support member.

[0009] A coupling jaw may be disposed at one side of the insertion member and may be coupled to the coupling groove.

[0010] The support member may include at least one deviation prevention jaw so as to possibly prevent devi-

ation of the insertion member.

[0011] The at least one deviation prevention jaw may be disposed at both sides of the coupling groove so as to face each other based on the coupling groove.

5 **[0012]** The insertion member may include a plate coupled to the support member and a contact part coupled to the plate.

[0013] The contact part may be formed of a flexible material.

10 **[0014]** The blade assembly may further include a fixing member that is disposed adjacent to the blade so that at least a portion of the blade may closely contact a floor.

[0015] The blade assembly may further include at least one elastic member that is coupled to an end of the blade so that the blade may move in a forward/backward direction of a direction in which the autonomous cleaning device travels.

[0016] One side of the at least one elastic member may be coupled to an end of the blade, and the other side of the at least one elastic member may be coupled to the fixing member. The blade may be formed of an elastic material so that the blade may move in a forward/backward direction of a direction in which the autonomous cleaning device travels.

20 **[0017]** The blade may include at least one movement part that moves in a forward/backward direction of a direction in which the autonomous cleaning device travels.

[0018] The fixing member and the support member may be integrally injection molded.

30 **[0019]** The fixing member and the support member may be integrally injection molded, and the blade may be injection molded between the fixing member and the support member.

[0020] The blade may include a first part fixed to the main body and a second part that extends from the first part to the floor, and the support member may include a first support part that contacts the first part of the blade and a second support part that is disposed adjacent to the second part of the blade.

40 **[0021]** The fixing member may include a first fixing part that contacts the first part of the blade and a second fixing part that is disposed adjacent to the second part of the blade. In accordance with one or more embodiments, there is provided an autonomous cleaning device that may include: a main body having an opening; a brush unit that is rotatably disposed in the opening of the main body; and a blade assembly that may guide introduction of dust swept up by the brush unit, wherein the blade assembly may include: a blade that may guide dust toward an inner side of the main body; a support member that may be coupled to the blade so as to support the blade; and an insertion member that may be coupled to one side of the support member so as to possibly prevent noise caused by friction between the support member and a floor.

55 **[0022]** The insertion member may be disposed at a rear of the support member so as to be positioned in a space between the support member and the floor.

[0023] The insertion member may include a plate coupled to the support member and a contact part coupled to the plate and formed of a flexible material, and the insertion member may be inserted into and coupled to one side of the support member.

[0024] A coupling groove may be disposed in one side of the support member so that the insertion member may be inserted into the support member through the coupling groove, and a coupling jaw may be disposed at one side of the insertion member so that the insertion member may be coupled to the support member through the coupling jaw.

[0025] A deviation prevention jaw may be disposed at both sides of the coupling groove so as to possibly prevent deviation of the insertion member.

[0026] In accordance with one or more embodiments, there is provided an autonomous cleaning device that may include: a main body having an opening; a brush unit that is rotatably disposed in the opening of the main body; and a blade assembly that may guide introduction of dust swept up by the brush unit, wherein the blade assembly may include: a blade that may guide dust toward an inner side of the main body and may include at least one wrinkle part so as to be movable in a forward/backward direction of a direction in which the autonomous cleaning device travels; and a support member that may be coupled to the blade so as to support the blade.

[0027] The at least one wrinkle part may include at least one of a mount-shaped part that protrudes from an upper side of the blade and a valley-shaped part that protrudes from a lower side of the blade.

[0028] The autonomous cleaning device may further include an insertion member having a coupling jaw through which the insertion member is inserted into a coupling groove, and the support member may include the coupling groove.

[0029] The support member may include at least one deviation prevention jaw that may be disposed facing each other based on the coupling groove so as to possibly prevent deviation of the insertion member.

[0030] The insertion member may include a plate coupled to the support member and a contact part coupled to the plate, and the contact part may be formed of a flexible material.

[0031] The blade may be formed of an elastic material so as to be movable in a forward/backward direction of a direction in which the autonomous cleaning device travels.

[0032] The blade may be formed of hydrogenated nitrile butadiene rubber (HNBR).

[0033] The blade assembly may further include a fixing member that may be disposed adjacent to the blade so that at least a portion of the blade can closely contact a floor.

[0034] These and/or other aspects will become apparent and more readily appreciated from the following description of embodiments, taken in conjunction with the

accompanying drawings in which:

FIG. 1 is a perspective view illustrating an autonomous cleaning device according to one or more embodiments;

FIG. 2 is a cross-sectional view illustrating autonomous cleaning device one or more embodiments;

FIG. 3 is a bottom perspective view illustrating an autonomous cleaning device one or more embodiments;

FIG. 4 is an enlarged cross-sectional view illustrating a blade assembly according to one or more embodiments;

FIG. 5 is a perspective view illustrating a rear side of a blade assembly according to one or more embodiments, such as the blade assembly illustrated in FIG. 4;

FIG. 6 is a view illustrating a state in which an insertion member is separated from a support member, according to one or more embodiments;

FIG. 7 is a view illustrating portions of an insertion member and a support member according to one or more embodiments, such as the insertion member and the support member illustrated in FIG. 6;

FIG. 8 is a view illustrating a state in which an insertion member is separated from a support member, according to one or more embodiments;

FIG. 9 is a view illustrating portions of an insertion member and a support member according to one or more embodiments, such as the insertion member and the support member illustrated in FIG. 8;

FIG. 10 is an enlarged cross-sectional view illustrating a blade assembly according to one or more embodiments;

FIG. 11 is an exploded view illustrating a blade assembly according to one or more embodiments, such as the blade assembly illustrated in FIG. 10;

FIG. 12 is an enlarged view illustrating a blade according to one or more embodiments;

FIG. 13 is a cross-sectional view illustrating a blade in a latitudinal direction according to one or more embodiments;

FIG. 14 is a cross-sectional view illustrating a blade in a latitudinal direction according to one or more embodiments;

FIG. 15 is an enlarged cross-sectional view illustrating a blade assembly according to one or more embodiments;

FIG. 16 is an exploded view illustrating a blade assembly according to one or more embodiments, such as the blade assembly illustrated in FIG. 15; and

FIG. 17 is an enlarged cross-sectional view of a blade assembly according to one or more embodiments.

[0035] Reference will now be made in detail to one or more embodiments, illustrated in the accompanying drawings, wherein like reference numerals refer to like elements throughout. In this regard, embodiments of the

present invention may be embodied in many different forms and should not be construed as being limited to embodiments set forth herein, as various changes, modifications, and equivalents of the systems, apparatuses and/or methods described herein will be understood to be included in the invention as defined by the claims by those of ordinary skill in the art after embodiments discussed herein are understood. Accordingly, embodiments are merely described below, by referring to the figures, to explain aspects of the present invention.

[0036] FIG. 1 is a perspective view illustrating an autonomous cleaning device 10 according to one or more embodiments, FIG. 2 is a cross-sectional view illustrating an autonomous cleaning device according to one or more embodiments, such as the autonomous cleaning device 10 illustrated in FIG. 1, and FIG. 3 is a bottom perspective view illustrating an autonomous cleaning device according to one or more embodiments, such as the autonomous cleaning device 10 of FIG. 1.

[0037] As illustrated in FIGS. 1 through 3, the autonomous cleaning device 10 may include a main body 11, a driving unit 20, a cleaning unit 30, and a controller (not shown). The main body 11 may be configured in various forms. For example, the main body 11 may be configured in a circular form. The circular main body 11 may have a uniform radius of rotation, and therefore, the main body 11 may avoid contact with surrounding obstacles and may change course. Also, during travel, the main body 11 may be prevented from being caught by surrounding obstacles.

[0038] Various components, such as the driving unit 20, the cleaning unit 30, various sensors 12 and 13, a display unit 14, and the controller (not show), to perform cleaning may be disposed at the main body 11.

[0039] The driving unit 20 may enable the main body 11 to travel about an area to be cleaned. The driving unit 20 may include left and right drive wheels 21a and 21b and a caster 22. Power from a motor (not shown) may be supplied to the left and right drive wheels 21a and 21b. Also, the left and right drive wheels 21a and 21b may be mounted at the middle region of the bottom of the main body 11, and the caster 22 may be mounted at the front region of the bottom of the main body 11 so that the main body 11 may maintain a stable posture.

[0040] The left and right drive wheels 21a and 21b and the caster 22 may constitute a single assembly, which may be detachably mounted to the main body 11.

[0041] The cleaning unit 30 may remove dust from a floor on which the main body 11 is positioned and surroundings thereof. The cleaning unit 30 may include a side brush 40, a brush drum unit 50, and a dust box 60.

[0042] The side brush 40 may be rotatably mounted at one side of the edge of the bottom of the main body 11. The side brush 40 may deviate from the middle region of the main body 11 with an inclination to the front F of the main body 11.

[0043] The side brush 40 may move dust collected around the main body 11 to an area of a floor where the

main body 11 is positioned. The side brush 40 may extend a cleaning range to an area around the floor where the main body 11 is positioned. In particular, the side brush 40 may remove dust collected from a corner, which is a boundary between the floor and walls.

[0044] The brush drum unit 50 may be mounted at a position deviating from the middle region of the bottom of the main body 11. The brush drum unit 50 may deviate from the left and right drive wheels 21a and 21b mounted at the middle region of the bottom of the main body 11 toward the rear R of the main body 11.

[0045] The brush drum unit 50 may remove dust collected on the floor where the main body 11 is positioned. The brush drum unit 50 may include a dust introduction channel 50a forming a dust introduction route. Also, the brush drum unit 50 may include a brush unit 51 disposed in the dust introduction channel 50a to sweep dust off of the floor.

[0046] The brush unit 51 may include a roller 51a and a brush 51b formed at an outer circumferential surface of the roller 51a. Power from a motor (not shown) may be supplied to the roller 51a. As the roller 51a rotates, the brush 51b may sweep up dust collected on the floor. The roller 51a may be formed of a rigid body. However, aspects of embodiments are not limited thereto. The brush 51b may be formed of various materials exhibiting high elasticity.

[0047] The brush unit 51 may be driven at uniform speed to maintain uniform cleaning performance. When a floor surface that is not smooth, for example, such as a carpet, is cleaned, the rotational speed of the brush unit 51 may be lower than the rotational speed of the brush unit 51 when a smooth floor surface is cleaned. At this time, additional current may be supplied to possibly allow the rotational speed of the brush unit 51 to be uniformly maintained.

[0048] The dust box 60 may be mounted at the rear R of the main body 11. An introduction port 64 of the dust box 60 may communicate with the dust introduction channel 50a of the brush drum unit 50. Thus, dust swept by the brush unit 51 may be stored in the dust box 60 via the dust introduction channel 50a.

[0049] The dust box 60 may be divided into a large dust box 61 and a small dust box 62 by a partition wall 63. Correspondingly, the introduction port 64 may be divided into a first introduction port 64a disposed at an inlet of the large dust box 61 and a second introduction port 64b disposed at an inlet of the small dust box 62.

[0050] The brush unit 51 may sweep relatively large dust particles into the large dust box 61. A blowing unit 52 may suction relatively small airborne dust, such as hair, into the small dust box 62. In particular, a brush cleaning member (not shown) may be disposed at a position adjacent to the second introduction port 64b to separate hair from the brush unit 51. The hair separated from the brush unit 51 by the brush cleaning member (not shown) may be stored in the small dust box 62 by suction force of the blowing unit 52. Also, a dust amount detection

unit 65 may be disposed in the dust box 60 to detect whether the dust box 60 is filled with dust. The dust amount detection unit 65 may include a light emitting part 65a to emit a beam and a light receiving part 65b to receive the beam. When the amount of light received by the light receiving part 65b is equal to or less than a predetermined value, it may be determined that the dust box 60 is filled with dust.

[0051] The brush drum unit 50, the brush unit 51, and the dust box 60 may constitute a single assembly, which may be detachably mounted to the main body 11.

[0052] The sensors 12 and 13 may include, for example, a proximity sensor 12 and/or an optical sensor 13. For example, when the autonomous cleaning device 10 travels in an arbitrary direction without a predetermined route, i.e. in a cleaning system having no map, the autonomous cleaning device 10 may travel about an area to be cleaned using the proximity sensor 12. On the other hand, when the autonomous cleaning device 10 travels along a predetermined route, i.e. in a cleaning system having a map, the optical sensor 13 may be disposed to receive position information of the autonomous cleaning device 10 and create a map. The optical sensor 13 may correspond to an embodiment of a location recognition system. Other various methods may be provided.

[0053] The display unit 14 may display various states of the autonomous cleaning device 10. For example, the display unit 14 may display a battery charge state, whether the dust box 60 is filled with dust, and a cleaning mode or a resting mode of the autonomous cleaning device 10, etc.

[0054] The controller (not shown) may control the driving unit 20 and the cleaning unit 30 to efficiently perform a cleaning task. The controller (not shown) may receive signals from the sensors 12 and 13 to avoid an obstacle or change travel modes.

[0055] Also, the controller (not shown) may receive a signal from the dust amount detection unit 65. If it is determined that the dust box 60 is filled with dust, the controller (not shown) may dock with a maintenance station (not shown) to automatically remove dust from the dust box 60 or may sound an alarm to notify a user.

[0056] Also, the controller (not shown) may receive a signal from a dust introduction detection unit (not shown) to distinguish between an area from which dust is introduced and an area from which dust is not introduced. For example, an area may be travelled over repeatedly, a travel speed may be reduced or rotational force of the brush unit 51 or the suction force of the blowing unit 52 may be increased to improve cleaning efficiency at an area from which dust is introduced. On the other hand, a cleaning sequence may be delayed or the number of times of travel may be reduced at an area from which dust is not introduced.

[0057] FIG. 4 is an enlarged cross-sectional view illustrating a blade assembly 80 according to one or more embodiments.

[0058] As illustrated in FIG. 4, the blade assembly 80

may be disposed in the main body 11 so as to guide introduction of dust. The blade assembly 80 may be mounted at the rear of the brush unit 51 to serve as a kind of dustpan when the brush unit 51 sweeps dust. The blade assembly 80 may include a blade 82, a fixing member 81, and a support member 83.

[0059] The blade 82 may be fixed to the main body 11 and may guide dust toward an inner side of the main body 11. The blade 82 may include a first part 82a that constitutes an upper part thereof and a second part 82b that may extend from the first part 82a toward a floor side. The second part 82b of the blade 82 may be inclined downward. The second part 82b of the blade 82 may extend from the floor to a guide 82d for guiding introduction of dust. Dust may be introduced into the main body 11 along the guide 82d. A bent part 82c may be formed between the guide 82d and the second guide 82b so as to adjust an angle between the guide 82d and the floor. Thus, introduction of dust may be guided. Although not shown, a plurality of guides may be disposed spaced apart from each other by a predetermined gap.

[0060] The blade 82 may be formed of a flexible material, such as rubber, and may be inclined downward toward the floor. In this case, an end of the blade 82 may closely contact the floor.

[0061] The support member 83 may restrict movement of the blade 82 to within a predetermined range and may be coupled to the blade 82. The support member 83 may be coupled to a lower part of the blade 82. The fixing member 81 may be disposed adjacent to the blade 82 so that at least a portion of the blade closely contacts the floor. The fixing member 81 may be coupled to the upper part of the blade 82. The fixing member 81 and the support member 83 may be installed so that the blade 82 exhibits rigidity and flexibility. As a result, the performance of the blade 82 may be increased to improve cleaning efficiency.

[0062] The first part 82a of the blade 82 may be tightly fixed by a first fixing part 81a of the fixing member 81 and a first support part 83a of the support member 83. That is, the first part 82a of the blade 82 may be inserted and supported between the first fixing part 81a of the fixing member 81 and the first support part 83a of the support member 83. Thus, the first part 82a of the blade 82 may not be moved.

[0063] A second fixing part 81b of the fixing member 81 may be disposed adjacent to an upper part of the second part 82b of the blade 82. A second support part 83b of the support member 83 may be disposed adjacent to the lower part of the second part 82b of the blade 82. As a result, the second part 82b of the blade 82 may be moved between the second fixing part 81b of the fixing member 81 and the second support part 83b of the support member 83, of which movement may be restricted to within a predetermined range. In particular, the second support part 83b of the support member 83 may prevent the second part 82b of the blade 82 from being bent in an opposite direction to a direction of travel of the main

body 11, thereby possibly securing operational reliability of the blade 82.

[0064] An insertion member 90 may be disposed at one side of the support member 83 so as to possibly prevent noise from occurring due to friction between the support member 83 and the floor. The insertion member 90 may be disposed at a rear side of the support member 83 so as to be positioned in a space between the support member 83 and the floor. The blade 82 may contact the floor while the autonomous cleaning device 10 travels. Thus, when a rugged tatami floor is cleaned, an end of the second part 82b of the blade 82 may fall into valleys of the tatami floor and may collide with ridges of the tatami floor, and the blade 82 may be damaged. This may cause damage of the tatami floor and the occurrence of noise while cleaning is performed using the autonomous cleaning device 10. The insertion member 90 may be disposed to prevent such damage and noise. Since the insertion member 90 may be disposed at the rear side of the support member 83, noise may be reduced while the autonomous cleaning device 10 travels.

[0065] Although the insertion member 90 is disposed on the support member 83, aspects of one or more embodiments are not limited thereto. For example, the insertion member 90 may be disposed on an end of the blade 82.

[0066] FIG. 5 is a perspective view illustrating a rear side of a blade assembly according to one or more embodiments, such as the blade assembly 80 illustrated in FIG. 4. FIG. 6 is a view illustrating a state in which an insertion member 90 is separated from a support member 83, according to one or more embodiments. FIG. 7 is a view illustrating portions of an insertion member and a support member, such as the insertion member 90 and the support member 83 illustrated in FIG. 6.

[0067] As illustrated in FIGS. 5 through 7, the fixing member 81 may be disposed with a protrusion 81c having a screw groove. The blade 82 and the support member 83 may have holes 82e and 83d through which the protrusion 81a of the fixing member 81 may be inserted. The protrusion 81c of the fixing member 81 may be sequentially inserted through the hole 82e of the blade 82 and the hole 83d of the support member 83, and then a screw S may be coupled to the protrusion 81c of the fixing member 81, thereby completing the blade assembly 80.

[0068] The insertion member 90 may be inserted into and coupled to one side of the support member 83; however, aspects of one or more embodiments are not limited thereto. The insertion member 90 may, for example, be disposed at the second support part 83b of the support member 83 and may face the floor.

[0069] According to one or more embodiments, the insertion member 90 may include a plate 90a coupled to the support member 83 and a contact part 90b coupled to the plate 90a. The contact part 90b may be formed of a flexible material, such as a brush, rubber, sponge or fiber, so as to possibly reduce damage to the floor.

[0070] A coupling part 91 may be disposed at a contact

surface between the insertion member 90 and the support member 83 so as to couple the insertion member 90 to the support member 83. The coupling part 91 may include a coupling jaw 91a disposed at one side of the insertion member 90 and a coupling groove 91b formed in one side of the support member 83. As shown in Fig. 7, the coupling groove 91b may be disposed in the rear side of the support member 83 and may have one side that is open. The coupling jaw 91a of the insertion member 90 may be coupled to the open side of the coupling groove 91b. The coupling jaw 91a of the insertion member 90 may be disposed on the plate 90a to have a shape corresponding to the coupling groove 91b. As shown in Fig. 7, the coupling groove 91b and the coupling jaw 91a may be rectangular; however, aspects of one or more embodiments are not limited thereto.

[0071] FIG. 8 is a view illustrating a state in which an insertion member 190 is separated from a support member 183, according to one or more embodiments, and FIG. 9 is a view illustrating portions of an insertion member and a support member according to one or more embodiments, such as the insertion member 190 and the support member 183 illustrated in FIG. 8.

[0072] As illustrated in FIGS. 8 and 9, a coupling part 191 may include a deviation prevention jaw 192. At least one deviation prevention jaw 192 may be disposed on the support member 183 so as to possibly prevent deviation of the insertion member 190. The deviation prevention jaw 192 may be disposed at an outer side of a coupling groove 191b, i.e., may be disposed at both sides of the coupling groove 191b in a state in which the coupling groove 191b is interposed between the deviation prevention jaws 192. The deviation prevention jaw 192 disposed at one side of both sides of the coupling groove 191b is referred to as a first deviation prevention jaw 192a, and the deviation prevention jaw 192 disposed at the other side thereof is referred to as a second deviation prevention jaw 192b.

[0073] The first deviation prevention jaw 192a and the second deviation prevention jaw 192b may be disposed facing each other based on the coupling groove 191b. However, aspects of one or more embodiments are not limited thereto, and the first deviation prevention jaw 192a and the second deviation prevention jaw 192b may be disposed crossing each other. A plurality of deviation prevention jaws 192 may be provided as a plurality of pairs of deviation prevention jaws. The plurality of first deviation prevention jaws 192a and the plurality of second deviation prevention jaws 192b may be positioned at the same intervals. Due to the deviation prevention jaw 192, the insertion member 90 may possibly be prevented from being deviated from time when an autonomous cleaning device travels.

[0074] FIG. 10 is an enlarged cross-sectional view illustrating a blade assembly 280 according to one or more embodiments. FIG. 11 is an exploded view illustrating a blade assembly according to one or more embodiments, such as the blade assembly 280 illustrated in FIG. 10.

FIG. 12 is an enlarged view illustrating a blade 282 according to one or more embodiments.

[0075] As illustrated in FIGS. 10 through 12, the blade assembly 280 may be configured such that the blade 282 may be moved in a forward/backward direction of a direction in which an autonomous cleaning device travels. As illustrated in FIGS. 10 through 12, the blade 282 may include at least one wrinkle part 282b and 282c. The wrinkle parts 282b and 282c may include a mount-shaped part 282b that protrudes from the upper part of the blade 282, and a valley-shaped part 282c that protrudes from the lower part of the blade 282. Thus, as the autonomous cleaning device 10 travels, the wrinkle parts 282b and 282c may have predetermined mobility. Also, the blade 282 may be formed of an elastic material. According to one or more embodiments, the blade 282 may be formed of hydrogenated nitrile butadiene rubber (HNBR). Since HNBR has flexibility and simultaneously has mechanical characteristics and strength, an autonomous cleaning device may not be damaged due to friction with the floor. Also, when an autonomous cleaning device travels over a cracked or rough floor, the blade 282 may be moved to some extent due to mobility of the wrinkles 282b and 282c and HNBR so that cleaning may be efficiently performed using the autonomous cleaning device. Thus, the autonomous cleaning device may be used in various floor conditions.

[0076] In addition, a blade contact surface 282d that contacts the floor may be somewhat inclined and may serve as a guide that guides introduction of dust on the floor toward an inner side of the main body. A support member 283 may restrict movement of the blade 282 to within a predetermined range. To this end, a protrusion 281c of a fixing member 281 may be inserted through a hole 282a formed in the blade 282. Also, after the blade 282 is inserted, the protrusion 281c of the fixing member 281 may be inserted through a hole 283c of the support member 283. The hole 282a of the blade 282 may be formed in such a way that the blade 282 may be moved relative to the fixing member 281.

[0077] FIG. 13 is a cross-sectional view illustrating a blade 382 in a latitudinal direction according to one or more embodiments, and FIG. 14 is a cross-sectional view illustrating a blade 482 in a latitudinal direction according to one or more embodiments.

[0078] As illustrated in FIGS. 13 and 14, the blades 382 and 482 may be configured in various forms.

[0079] According to one or more embodiments, such as illustrated in FIG. 13, the blade 382 may include a wrinkle part 382a including only an upwardly-protruding mount-shaped part 382a. The blade 382 may extend from the mount-shaped part 382a to a blade contact surface 382c via an inclination 382b. In this case, the blade 382 may be more easily processed as compared to other embodiments.

[0080] According to one or more embodiments, such as illustrated in FIG. 14, the blade 482 may include a plurality of wrinkle parts 482a, 482b, and 482c. Thus,

mount-shaped parts 482a and 482b and valley-shaped parts 482b may be alternately arranged. A first mount-shaped part 482a may be positioned, and a second mount-shaped part 482c may be positioned between the valley-shaped parts 482b. Thus, mobility of the blade 482 may be relatively large.

[0081] FIG. 15 is an enlarged cross-sectional view illustrating a blade assembly 580 according to one or more embodiments, and FIG. 16 is an exploded view illustrating a blade assembly according to one or more embodiments, such as the blade assembly 580 illustrated in FIG. 15.

[0082] As illustrated in FIGS. 15 and 16, the blade assembly 580 may include at least one elastic member 584 that may be coupled to an end of a blade 582 so as to move in the forward/backward direction of the direction in which the autonomous cleaning device travels. The elastic member 584 may be a spring.

[0083] One side of the elastic member 584 may be coupled to the end of the blade 582, and the other side of the elastic member 584 may be coupled to a fixing member 581. Since the elastic member 584 may be inserted into a protrusion 581c of the fixing member 581 and the blade 582 may be coupled to the protrusion 581c of the fixing member 581, the blade 582 may be moved relative to the fixing member 581. At least one elastic member 584 may be provided. According to one or more embodiments, the elastic member 584 may be coupled to both sides of the blade 582.

[0084] An insertion member 590 may be inserted in the lower side of a support member 583 so as to alleviate frictional force with the floor, like in other embodiments. FIG. 17 is an enlarged cross-sectional view of a blade assembly according to another embodiment of the present invention.

[0085] As illustrated in FIG. 17, a support member and a fixing member 681 may be integrally injection molded. A blade 682 may be injection molded between the support member 683 and the fixing member 681. A mold(not shown) may be disposed between the support member 683 and the fixing member 681 to have a shape corresponding to that of the blade 682. Thus, a resin that is a material for the blade 682 may be forcibly inserted into the mold(not shown).

[0086] A coupling groove 691b may be integrally injection molded in one side of the support member 683 that contacts the floor so that an insertion member 690 may be inserted into the support member 683 through the coupling groove 691b. A coupling jaw 691a may be disposed on the insertion member 690, as in other embodiments, and the insertion member 690 may be inserted into the support member 683 so that the coupling jaw 691a may contact the coupling groove 691b.

[0087] As described above, in an autonomous cleaning device according to an embodiment of the present invention, noise may be prevented from occurring due to abnormal contact between a blade and a floor while the autonomous cleaning device travels.

[0088] While aspects of the present invention has been particularly shown and described with reference to differing embodiments thereof, it should be understood that these embodiments should be considered in a descriptive sense only and not for purposes of limitation. Descriptions of features or aspects within each embodiment should typically be considered as available for other similar features or aspects in the remaining embodiments. Suitable results may equally be achieved if the described techniques are performed in a different order and/or if components in a described system, architecture, device, or circuit are combined in a different manner and/or replaced or supplemented by other components or their equivalents.

[0089] Thus, although a few embodiments have been shown and described, with additional embodiments being equally available, it would be appreciated by those skilled in the art that changes may be made in these embodiments without departing from the principles of the invention, the scope of which is defined in the claims.

Claims

1. An autonomous cleaning device (10) comprising:
 - a main body (11) having an opening;
 - a brush unit (50) rotatably disposed in the opening of the main body; and
 - a blade assembly (80) to guide introduction of dust swept up by the brush unit,
 wherein the blade assembly comprises:
 - a blade (82) to guide dust toward an inner side of the main body;
 - a support member (83) coupled to the blade so as to support the blade and having one side in which a coupling groove (91b) is formed; **characterised in that** the blade assembly comprises further an insertion member (90) inserted into the coupling groove of the support member.
2. The autonomous cleaning device according to claim 1, wherein a coupling jaw (90a) is disposed at one side of the insertion member and is coupled to the coupling groove.
3. The autonomous cleaning device according to claim 1 or 2, wherein the support member comprises at least one deviation prevention jaw (192) to prevent deviation of the insertion member.
4. The autonomous cleaning device according to claim 3, wherein the at least one deviation prevention jaw is disposed at both sides of the coupling groove so as to face each other based on the coupling groove.
5. The autonomous cleaning device according to any one of the preceding claims, wherein the insertion member comprises a plate (90a) coupled to the support member and a contact part (90b) coupled to the plate.
6. The autonomous cleaning device according to claim 5, wherein the contact part is formed of a flexible material.
7. The autonomous cleaning device according to any one of the preceding claims, wherein the blade assembly further comprises a fixing member disposed adjacent to the blade so that at least a portion of the blade contacts a floor.
8. The autonomous cleaning device according to any one of the preceding claims, wherein the blade assembly further comprises at least one elastic member coupled to an end of the blade so that the blade is movable in a forward/backward direction of a direction in which the autonomous cleaning device travels.
9. The autonomous cleaning device according to claim 8, wherein one side of the at least one elastic member is coupled to an end of the blade and the other side of the at least one elastic member is coupled to the fixing member.
10. The autonomous cleaning device according to any one of claims 1 to 7, wherein the blade is formed of an elastic material so that the blade is movable in a forward/backward direction of a direction in which the autonomous cleaning device travels.
11. The autonomous cleaning device according to claim 10, wherein the blade comprises at least one movement part that moves in a forward/backward direction of a direction in which the autonomous cleaning device travels.
12. The autonomous cleaning device according to claim 7, wherein the fixing member and the support member are integrally injection molded.
13. The autonomous cleaning device according to claim 12, wherein the blade is injection molded between the fixing member and the support member.
14. The autonomous cleaning device according to claim 1, wherein the blade comprises a first part fixed to the main body and a second part that extends from the first part to the floor and the support member comprises a first support part that contacts the first part of the blade and a second support part disposed adjacent to the second part of the blade.

15. The autonomous cleaning device according to claim 14, wherein the fixing member comprises a first fixing part that contacts the first part of the blade and a second fixing part disposed adjacent to the second part of the blade.

Patentansprüche

1. Eigenständige Reinigungsvorrichtung (10), die Folgendes umfasst:

einen Hauptteil (11) mit einer Öffnung, eine Bürsteneinheit (50), die drehbar in der Öffnung des Hauptteils angeordnet ist, und eine Blattbaugruppe (80) zum Leiten des Zuführens von Staub, der von der Bürsteneinheit aufgekehrt wird,

wobei die Blattbaugruppe Folgendes umfasst:

ein Blatt (82) zum Leiten von Staub zur Innenseite des Hauptteils, ein Halteelement (83), das so mit dem Blatt verbunden ist, dass es das Blatt hält, und eine Seite aufweist, in der eine Verbindungsnut (91b) ausgebildet ist,

dadurch gekennzeichnet, dass die Blattbaugruppe ferner ein Einsetzelement (90) umfasst, das in die Verbindungsnut des Halteelements eingesetzt ist.

2. Eigenständige Reinigungsvorrichtung nach Anspruch 1, wobei eine Verbindungsbacke (90a) auf einer Seite des Einsetzelements angeordnet und mit der Verbindungsnut verbunden ist.
3. Eigenständige Reinigungsvorrichtung nach Anspruch 1 oder 2, wobei das Halteelement mindestens eine Abweichungsverhinderungsbacke (192) zum Verhindern einer Abweichung des Einsetzelements umfasst.
4. Eigenständige Reinigungsvorrichtung nach Anspruch 3, wobei die mindestens eine Abweichungsverhinderungsbacke auf beiden Seiten der Verbindungsnut so angeordnet ist, dass sie sich auf der Grundlage der Verbindungsnut gegenüberliegen.
5. Eigenständige Reinigungsvorrichtung nach einem der vorhergehenden Ansprüche, wobei das Einsetzelement eine Platte (90a), die mit dem Halteelement verbunden ist, und einen Kontaktteil (90b) umfasst, der mit der Platte verbunden ist.
6. Eigenständige Reinigungsvorrichtung nach Anspruch 5, wobei der Kontaktteil aus einem flexiblen Material gebildet ist.

7. Eigenständige Reinigungsvorrichtung nach einem der vorhergehenden Ansprüche, wobei die Blattbaugruppe ferner ein Fixierelement umfasst, das so neben dem Blatt angeordnet ist, dass zumindest ein Abschnitt des Blatts einen Boden berührt.

8. Eigenständige Reinigungsvorrichtung nach einem der vorhergehenden Ansprüche, wobei die Blattbaugruppe ferner mindestens ein elastisches Element umfasst, das so mit einem Ende des Blatts verbunden ist, dass das Blatt in einer Richtung, in der sich die eigenständige Reinigungsvorrichtung fortbewegt, vorwärts beziehungsweise rückwärts beweglich ist.

9. Eigenständige Reinigungsvorrichtung nach Anspruch 8, wobei eine Seite des mindestens einen elastischen Elements mit einem Ende des Blatts und die andere Seite des mindestens einen elastischen Elements mit dem Fixierelement verbunden ist.

10. Eigenständige Reinigungsvorrichtung nach einem der Ansprüche 1 bis 7, wobei das Blatt aus einem elastischen Material gebildet ist, so dass das Blatt in einer Richtung, in der sich die eigenständige Reinigungsvorrichtung fortbewegt, vorwärts beziehungsweise rückwärts beweglich ist.

11. Eigenständige Reinigungsvorrichtung nach Anspruch 10, wobei das Blatt mindestens einen Bewegungsteil umfasst, der sich in einer Richtung, in der sich die eigenständige Reinigungsvorrichtung fortbewegt, vorwärts beziehungsweise rückwärts bewegt.

12. Eigenständige Reinigungsvorrichtung nach Anspruch 7, wobei das Fixierelement und das Halteelement einstückig spritzgegossen sind.

13. Eigenständige Reinigungsvorrichtung nach Anspruch 12, wobei das Blatt zwischen dem Fixierelement und dem Halteelement spritzgegossen ist.

14. Eigenständige Reinigungsvorrichtung nach Anspruch 1, wobei das Blatt einen an dem Hauptteil fixierten ersten Teil und einen zweiten Teil umfasst, der von dem ersten Teil bis zum Boden verläuft, und das Halteelement einen ersten Halteteil, der den ersten Teil des Blatts berührt, und einen zweiten Halteteil umfasst, der neben dem zweiten Teil des Blatts angeordnet ist.

15. Eigenständige Reinigungsvorrichtung nach Anspruch 14, wobei das Fixierelement einen ersten Fixierteil, der den ersten Teil des Blatts berührt, und einen zweiten Fixierteil umfasst, der neben dem zweiten Teil des Blatts angeordnet ist.

Revendications

1. Dispositif de nettoyage autonome (10) comprenant :
- un corps principal (11) présentant une ouverture ;
 - une unité de balai (50) disposée avec faculté de rotation dans l'ouverture du corps principal ; et
 - un ensemble de lame (80) pour guider l'introduction de la poussière balayée par l'unité de balai,
- dans lequel l'ensemble de lame comprend :
- une lame (82) pour guider la poussière vers un côté interne du corps principal ;
 - un élément de support (83) couplé à la lame de manière à supporter la lame et présentant un côté dans lequel est formée une rainure d'accouplement (91b) ;
 - caractérisé en ce que** l'ensemble de lame comprend en outre un élément d'insertion (90) inséré dans la rainure d'accouplement de l'élément de support.
2. Dispositif de nettoyage autonome selon la revendication 1, dans lequel une mâchoire d'accouplement (90a) est disposée au niveau d'un côté de l'élément d'insertion et est accouplée à la rainure d'accouplement.
3. Dispositif de nettoyage autonome selon la revendication 1 ou 2, dans lequel l'élément de support comprend au moins une mâchoire anti-déviaton (192) pour empêcher une déviation de l'élément d'insertion.
4. Dispositif de nettoyage autonome selon la revendication 3, dans lequel l'au moins une mâchoire anti-déviaton est disposée des deux côtés de la rainure d'accouplement de manière à se faire face l'une l'autre par rapport à la rainure d'accouplement.
5. Dispositif de nettoyage autonome selon l'une quelconque des revendications précédentes, dans lequel l'élément d'insertion comprend une plaque (90a) accouplée à l'élément de support et une pièce de contact (90b) accouplée à la plaque.
6. Dispositif de nettoyage autonome selon la revendication 5, dans lequel la pièce de contact est formée en un matériau flexible.
7. Dispositif de nettoyage autonome selon l'une quelconque des revendications précédentes, dans lequel l'ensemble de lame comprend en outre un élément de fixation disposé adjacent à la lame de telle sorte qu'au moins une partie de la lame fasse contact
- avec un sol.
8. Dispositif de nettoyage autonome selon l'une quelconque des revendications précédentes, dans lequel l'ensemble de lame comprend en outre au moins un élément élastique accouplé à une extrémité de la lame de telle sorte que la lame puisse se déplacer vers l'avant/vers l'arrière d'un sens de déplacement du dispositif de nettoyage autonome.
9. Dispositif de nettoyage autonome selon la revendication 8, dans lequel un côté de l'au moins un élément élastique est accouplé à une extrémité de la lame et l'autre côté de l'au moins un élément élastique est accouplé à l'élément de fixation.
10. Dispositif de nettoyage autonome selon l'une quelconque des revendications 1 à 7, dans lequel la lame est formée d'un matériau élastique de telle sorte que la lame puisse se déplacer vers l'avant/vers l'arrière d'un sens de déplacement du dispositif de nettoyage autonome.
11. Dispositif de nettoyage autonome selon la revendication 10, dans lequel la lame comprend au moins une pièce de déplacement qui se déplace vers l'avant/vers l'arrière d'un sens de déplacement du dispositif de nettoyage autonome.
12. Dispositif de nettoyage autonome selon la revendication 7, dans lequel l'élément de fixation et l'élément de support sont intégralement moulés par injection.
13. Dispositif de nettoyage autonome selon la revendication 12, dans lequel la lame est moulée par injection entre l'élément de fixation et l'élément de support.
14. Dispositif de nettoyage autonome selon la revendication 1, dans lequel la lame comprend une première pièce fixée au corps principal et une seconde pièce qui s'étend depuis la première pièce jusqu'au sol et l'élément de support comprend une première pièce de support qui fait contact avec la première pièce de la lame et une seconde pièce de support disposée adjacente à la seconde pièce de la lame.
15. Dispositif de nettoyage autonome selon la revendication 14, dans lequel l'élément de fixation comprend une première pièce de fixation qui fait contact avec la première pièce de la lame et une seconde pièce de fixation qui fait contact avec la seconde pièce de la lame.

FIG. 1

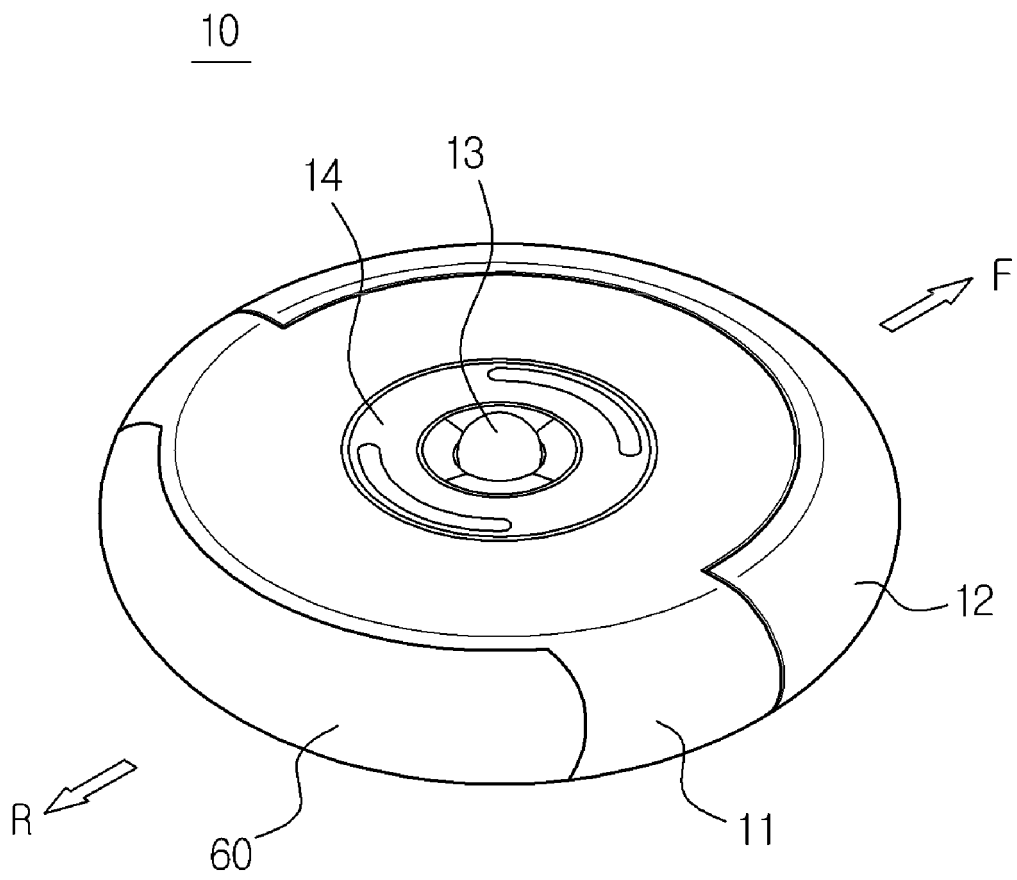


FIG.2

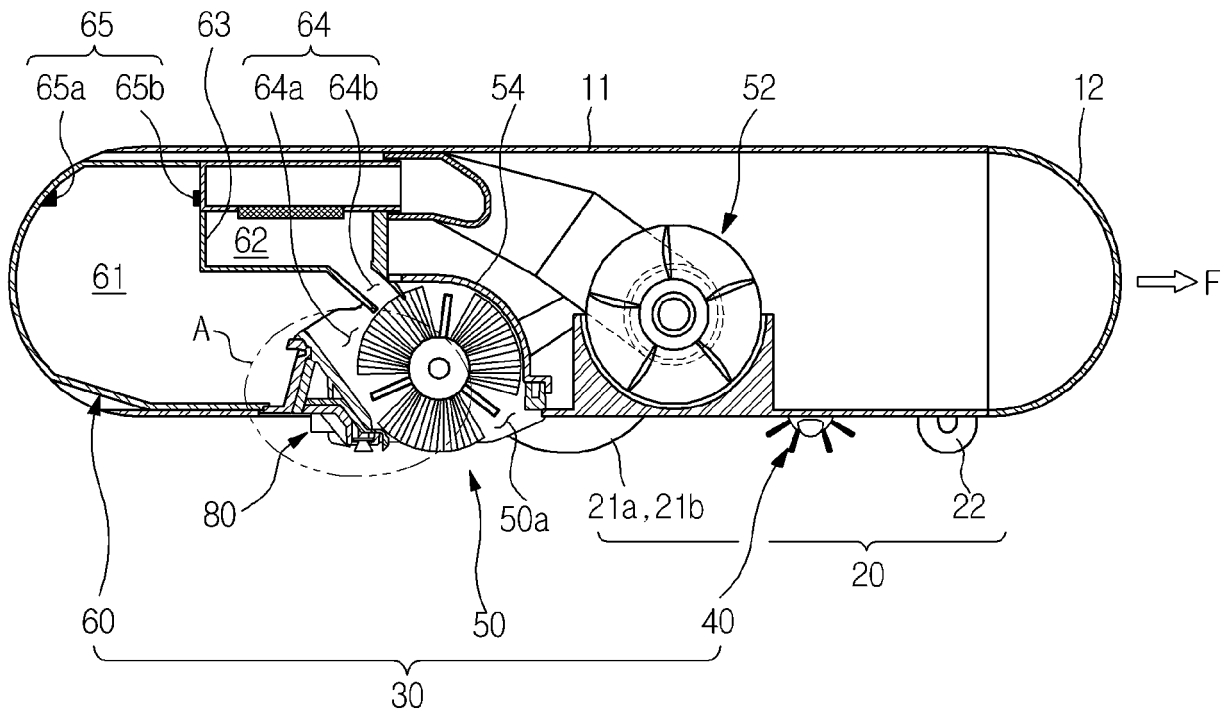


FIG.3

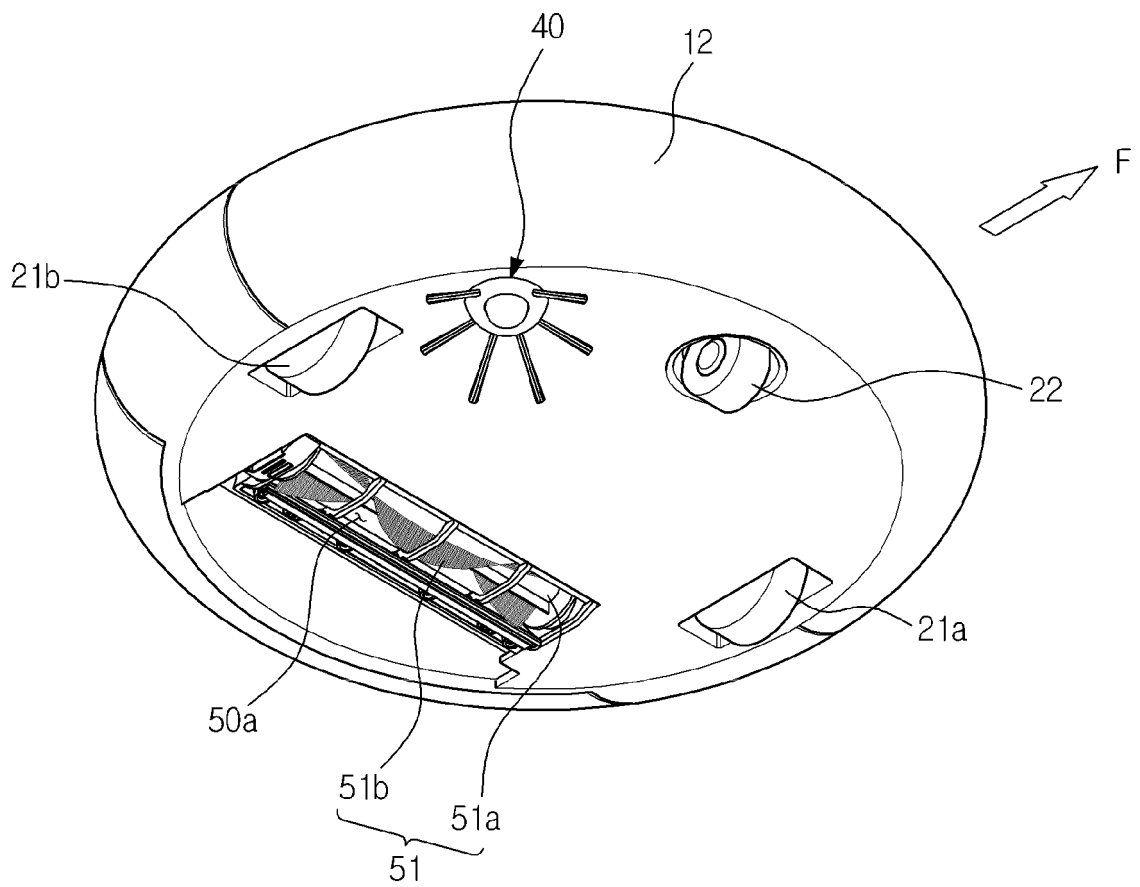


FIG.4

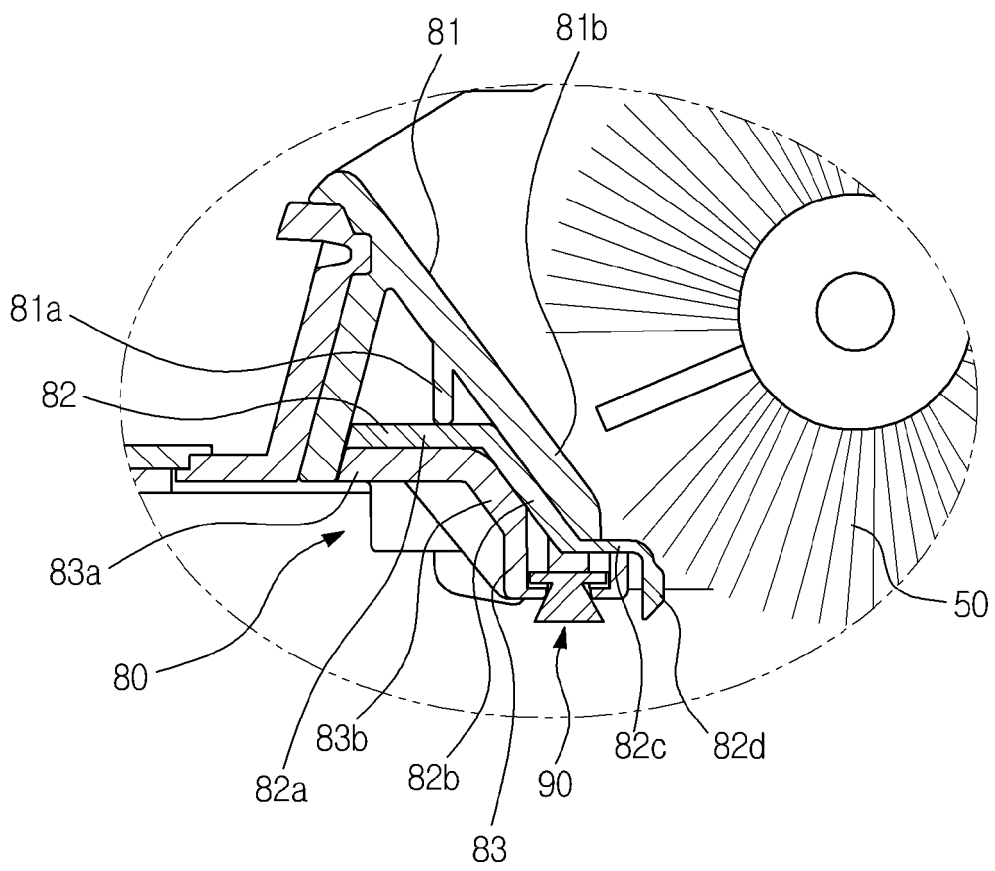


FIG.5

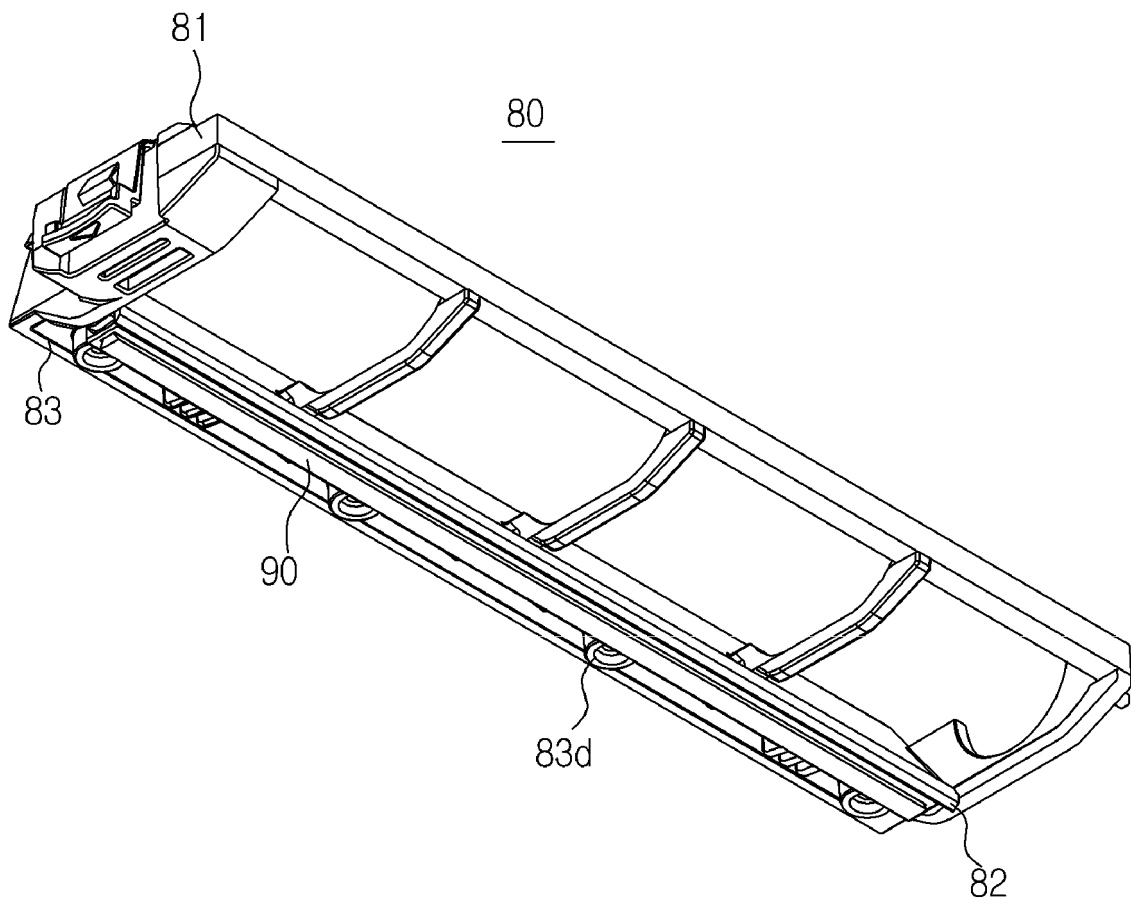


FIG.6

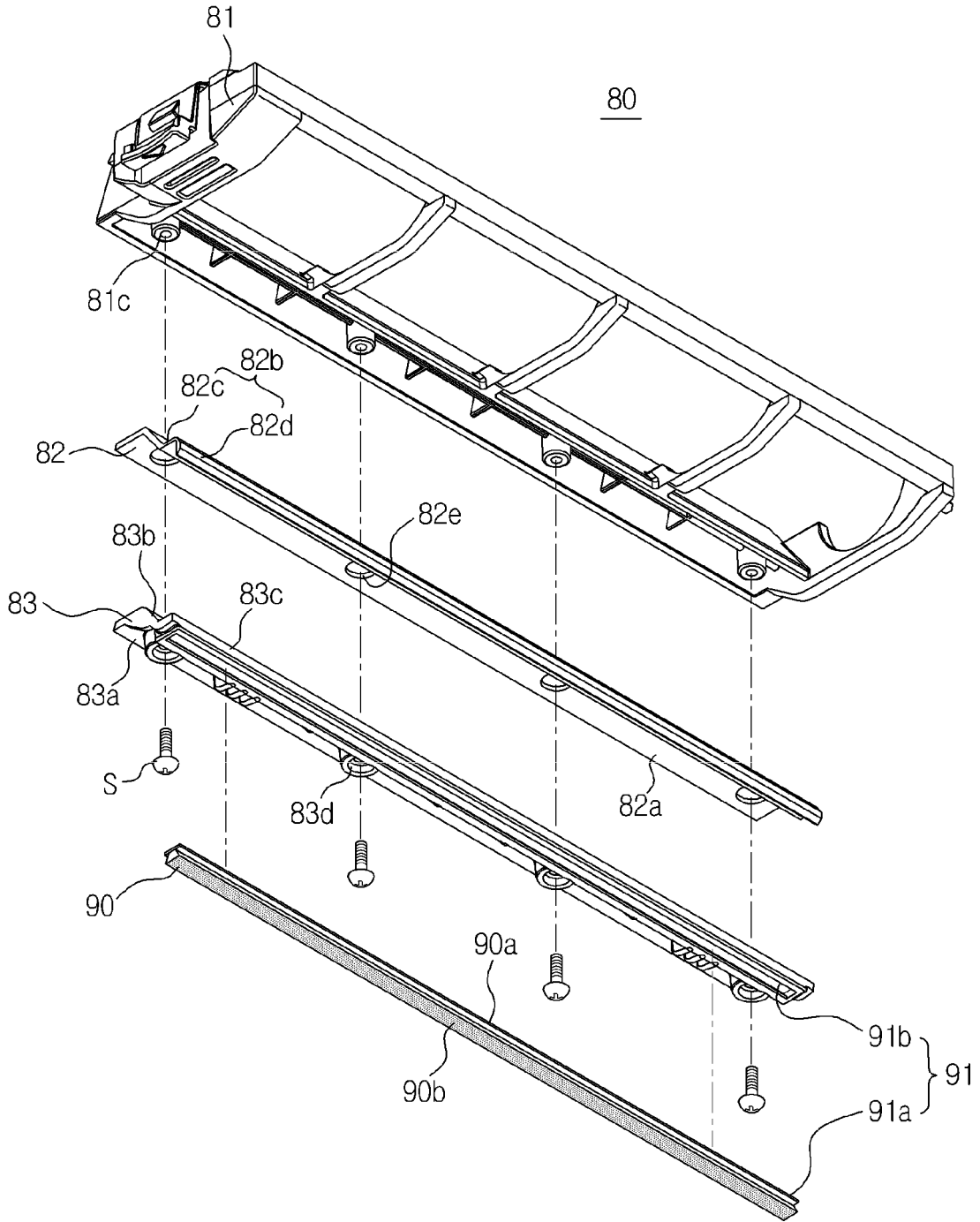


FIG.7

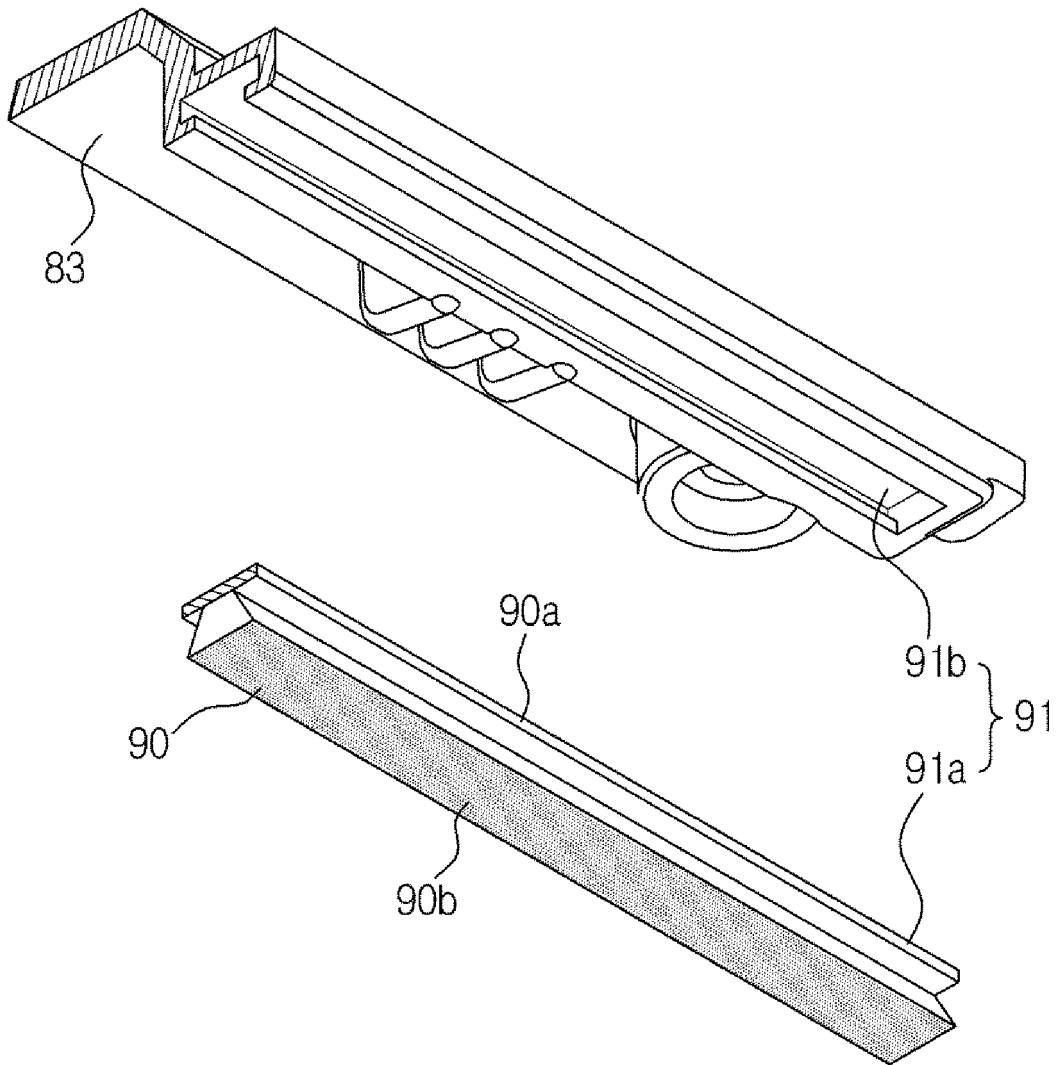


FIG.8

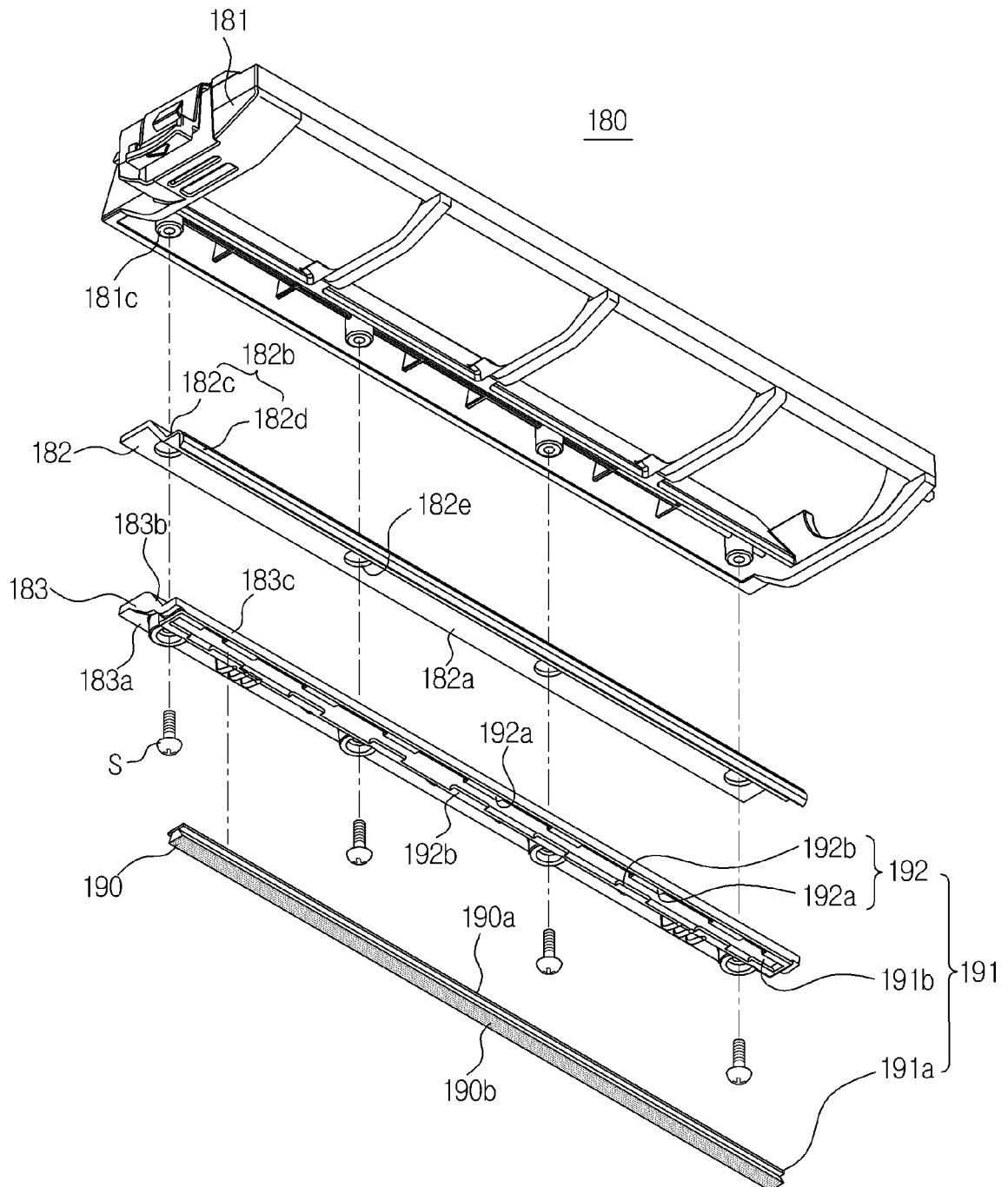


FIG.9

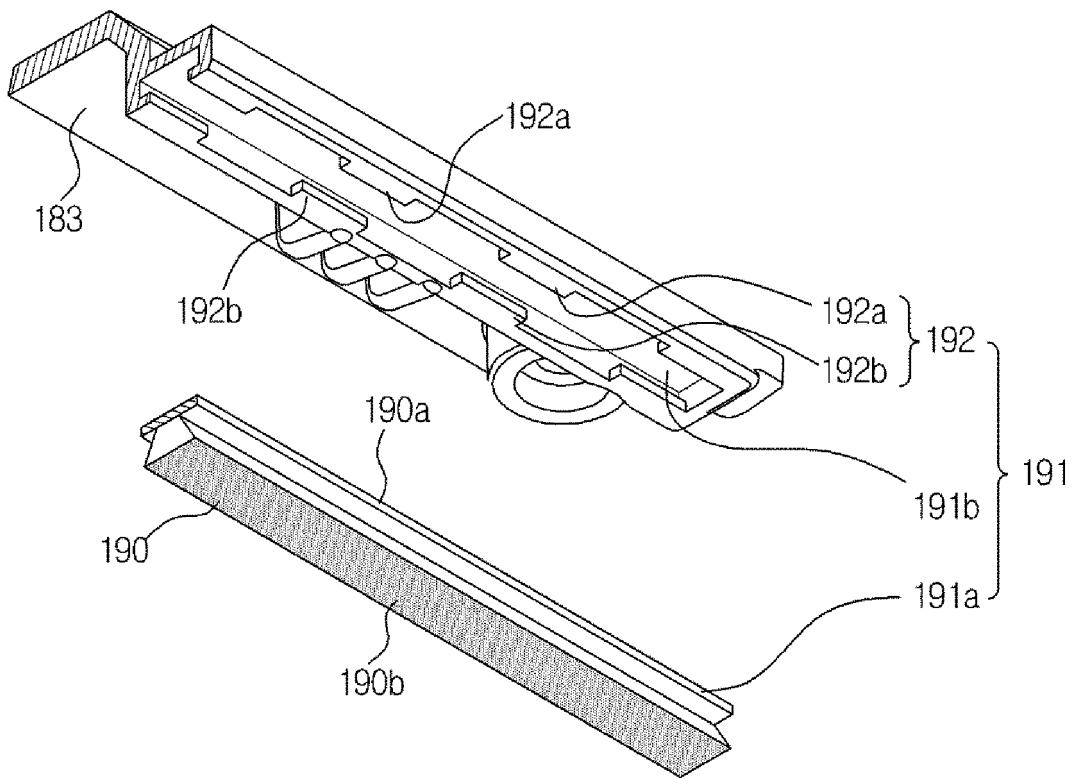


FIG.10

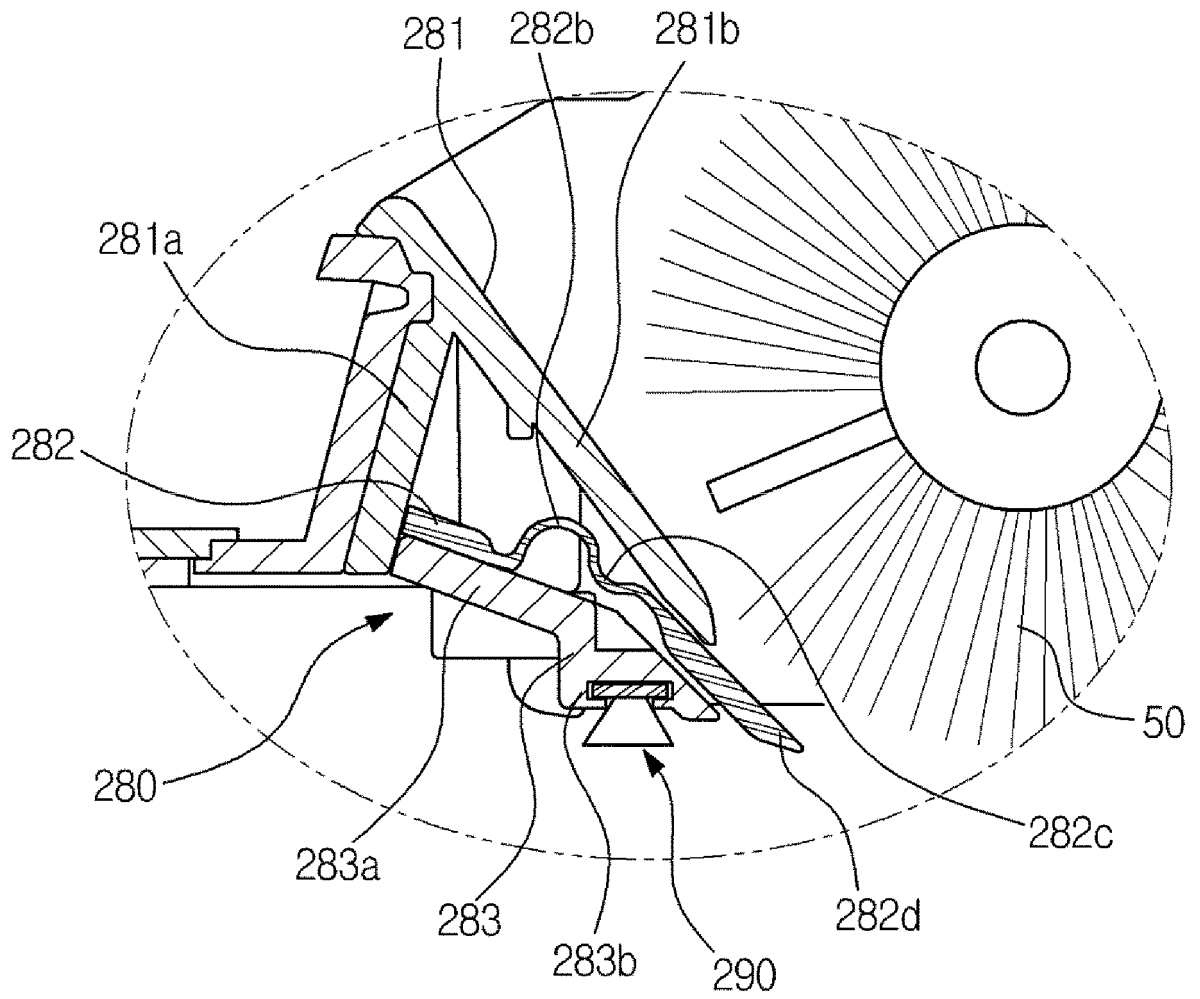


FIG.11

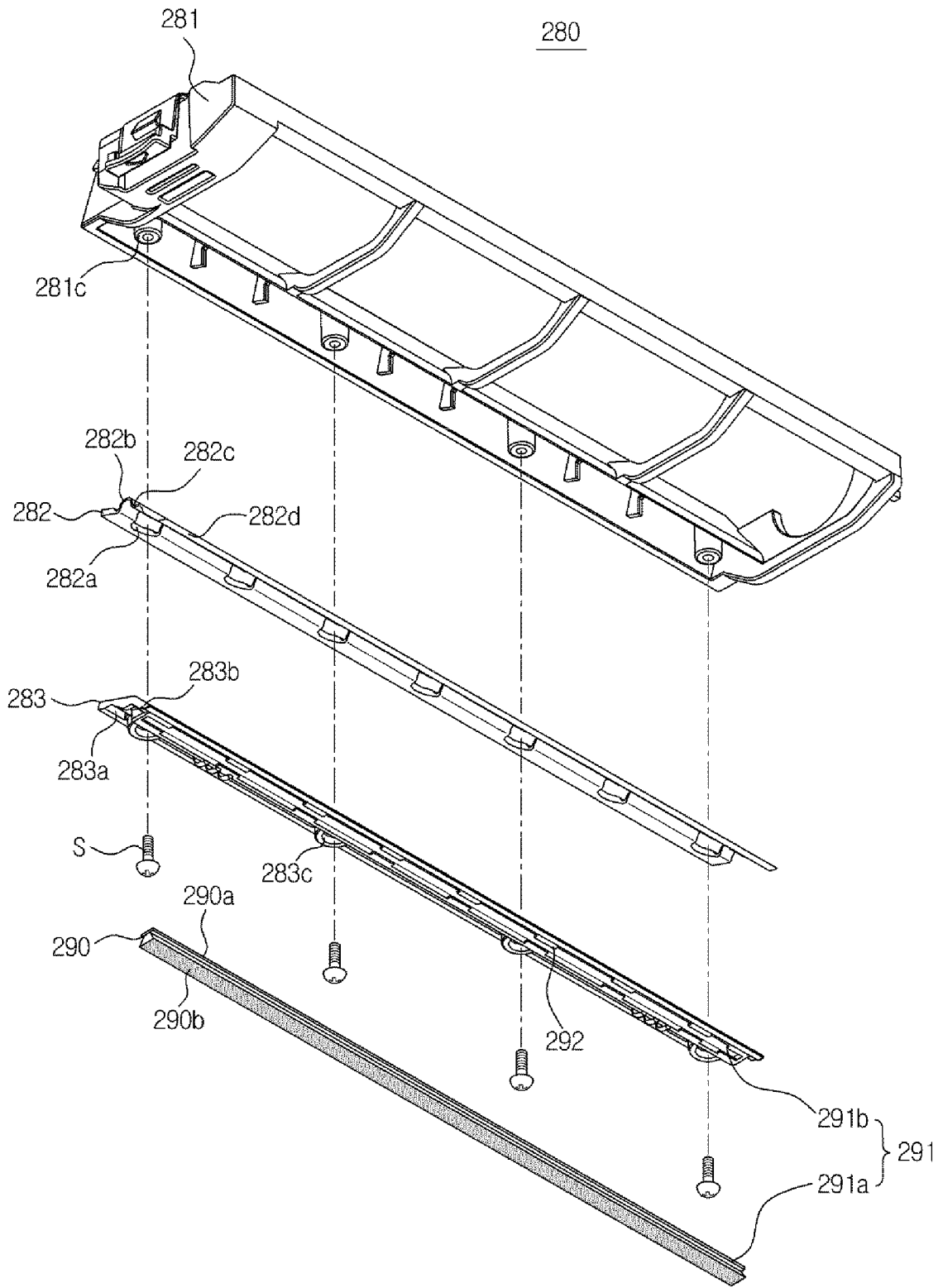


FIG.12

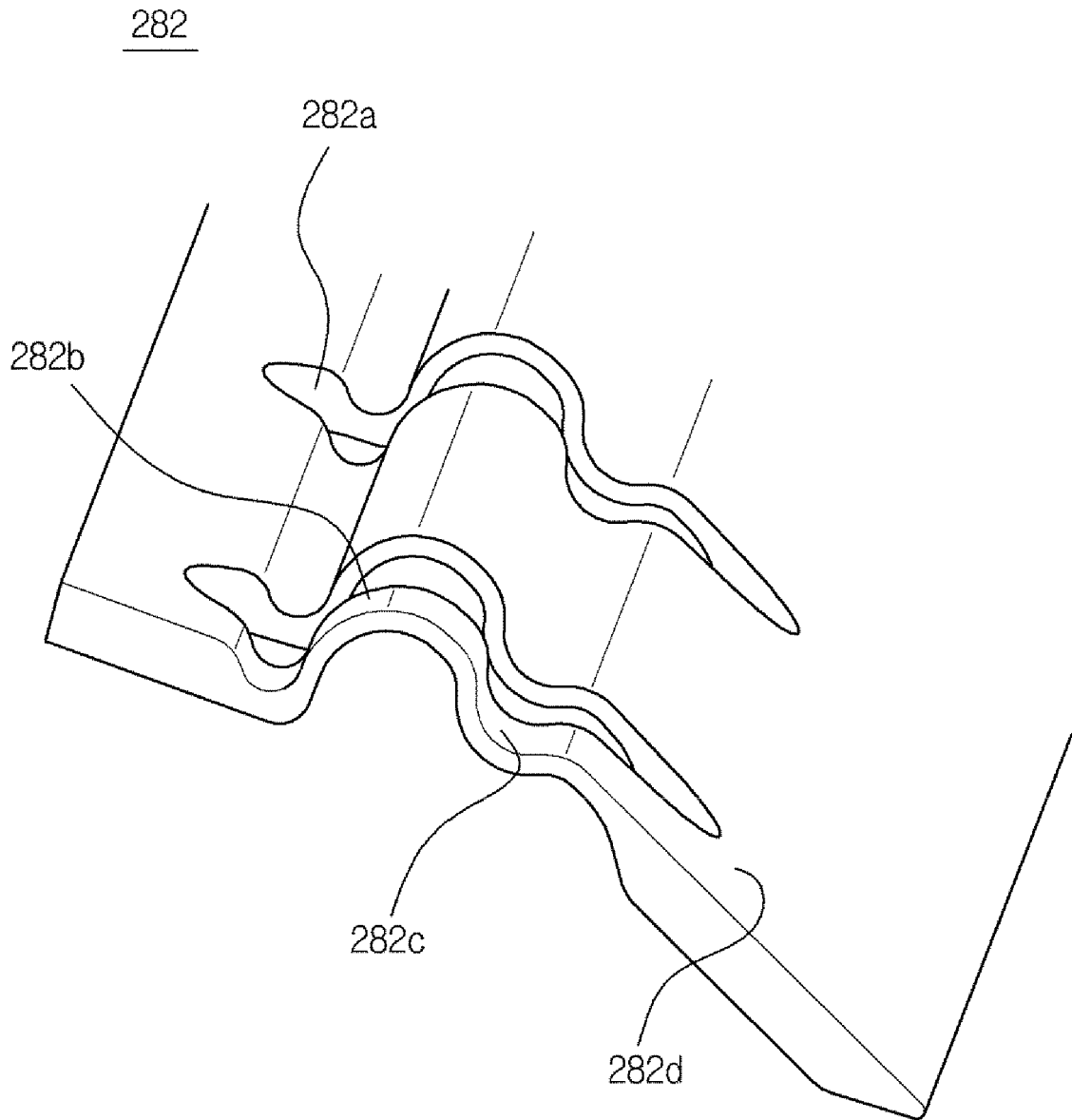


FIG.13

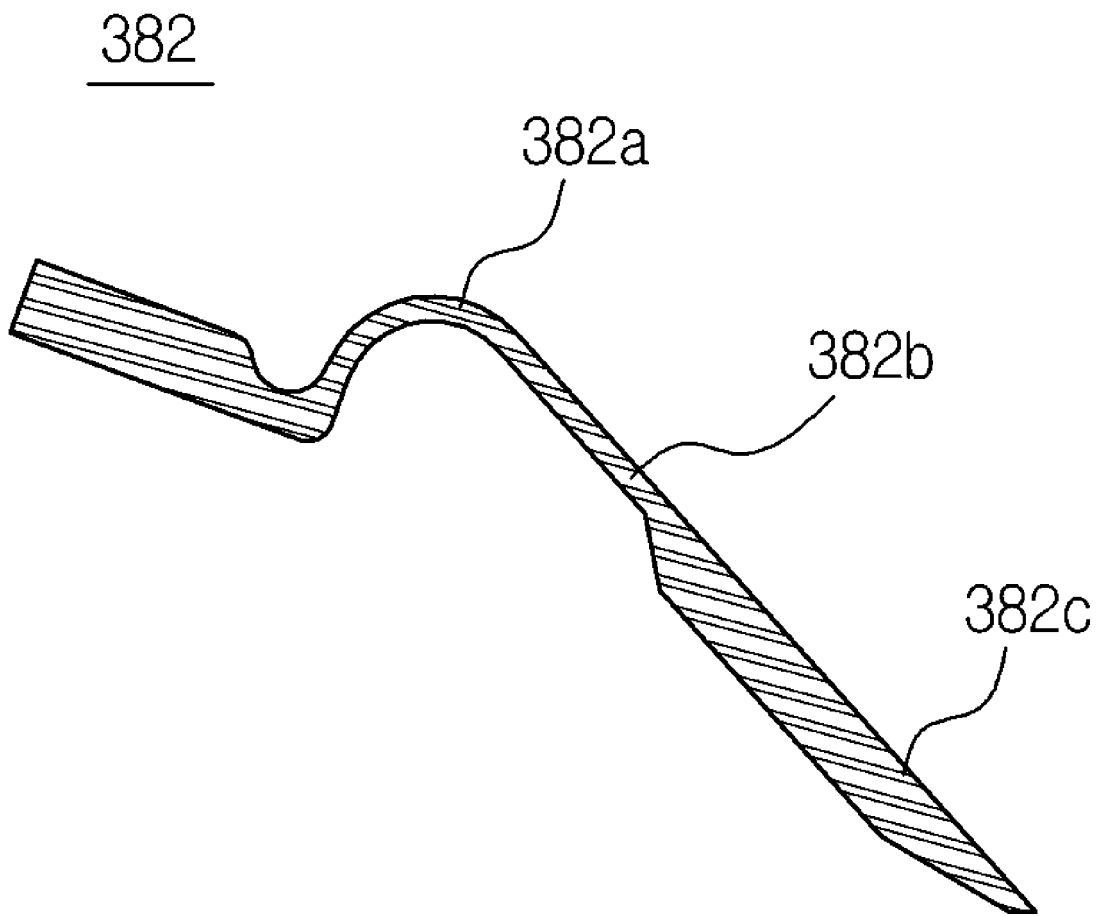


FIG.14

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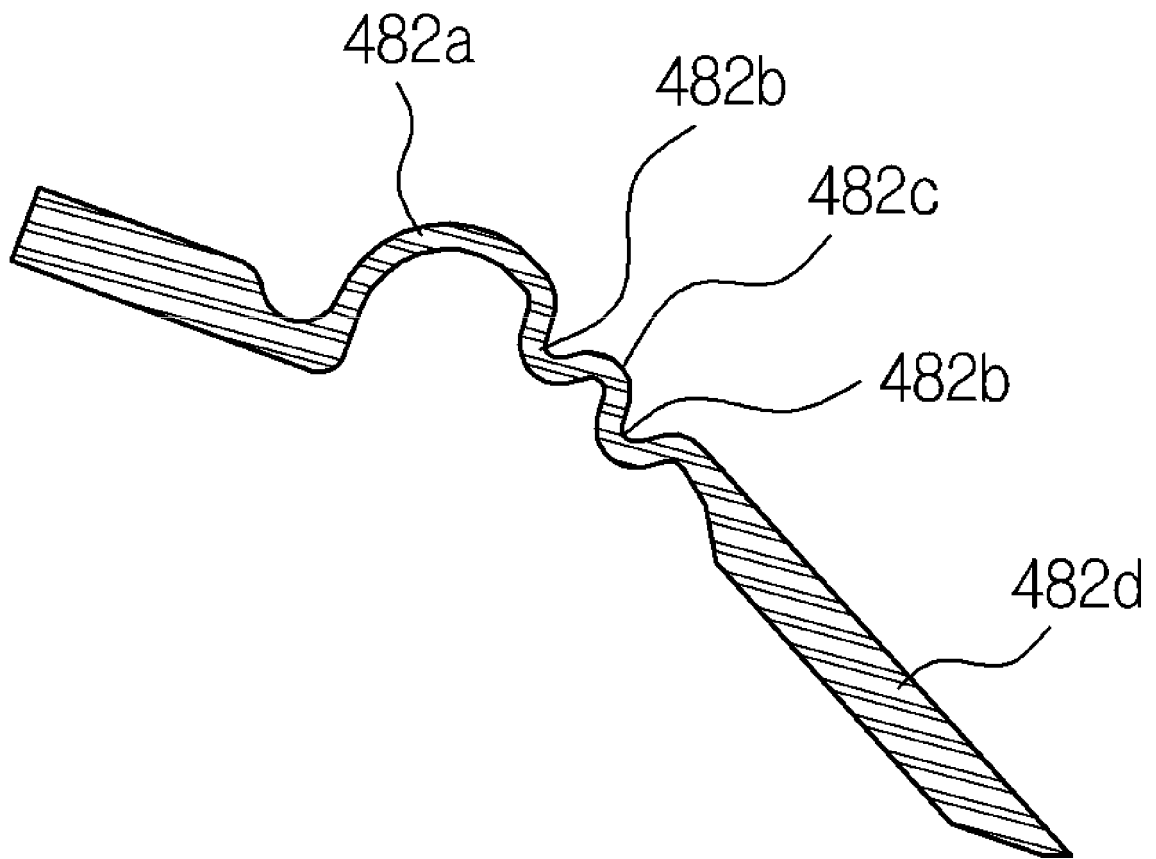


FIG.15

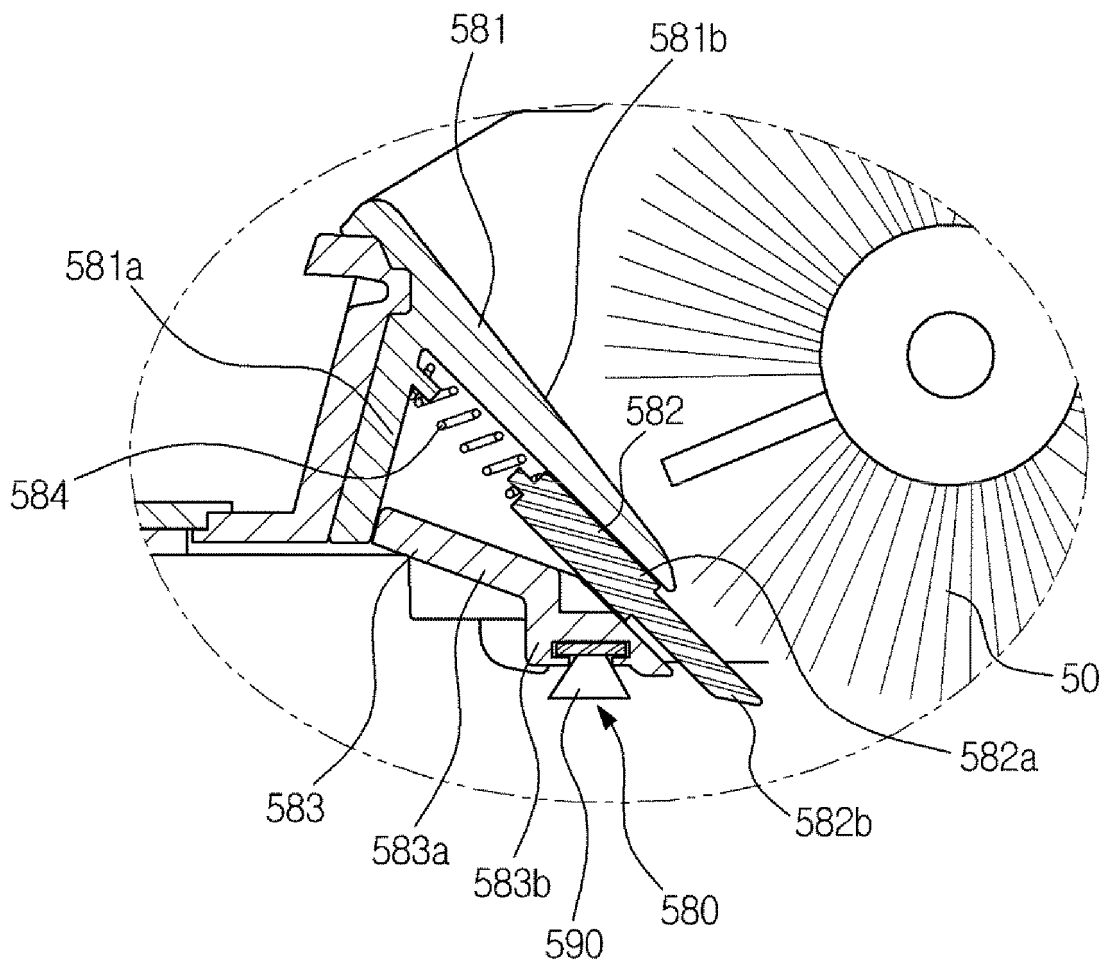


FIG.16

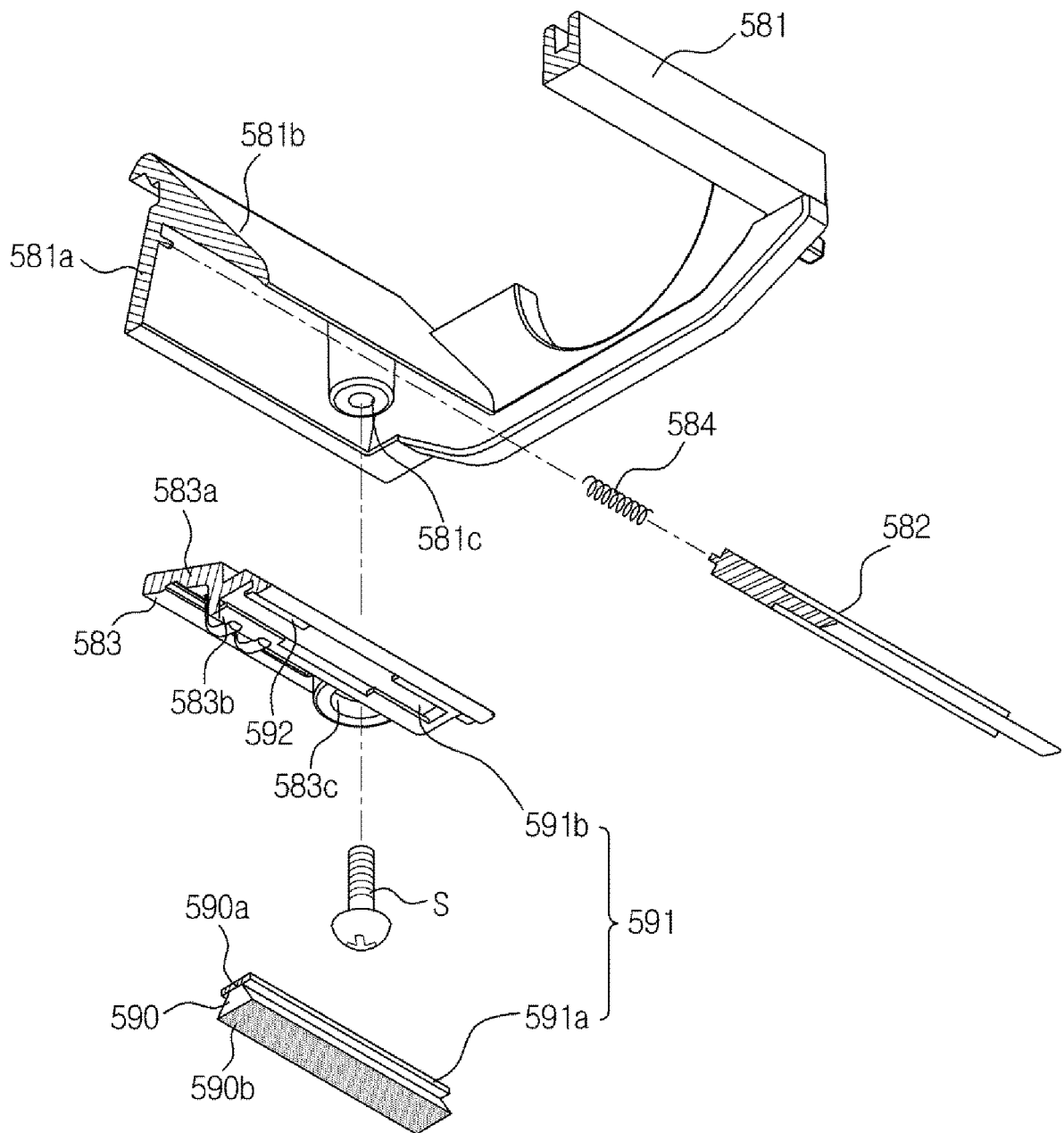
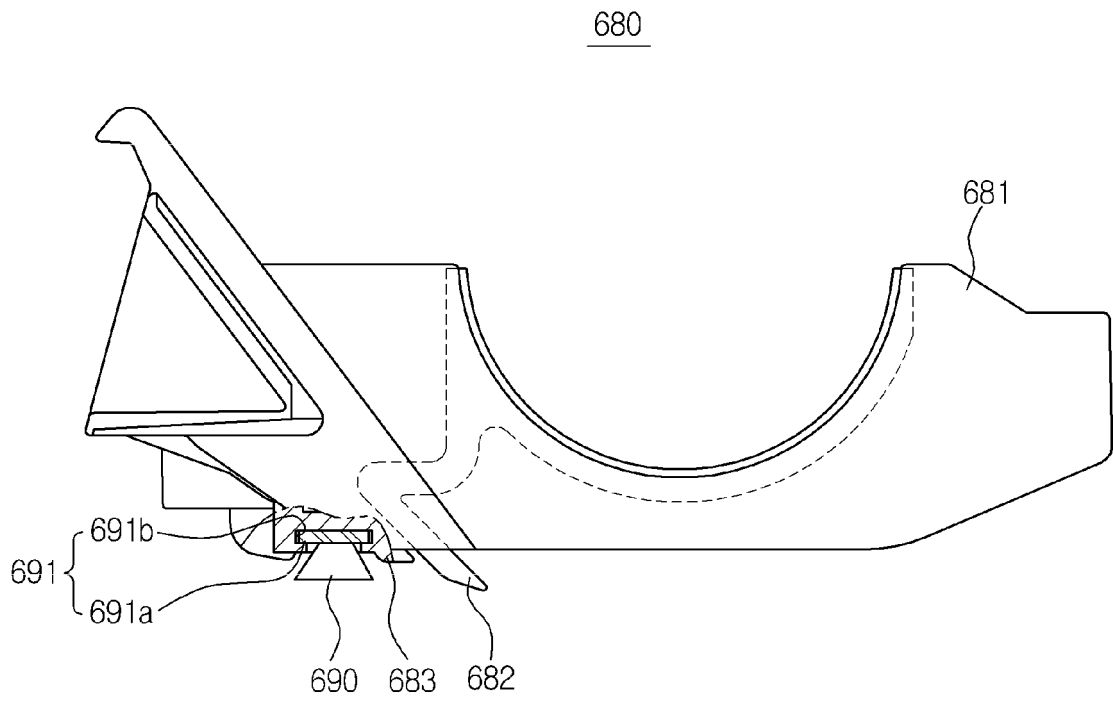


FIG.17



REFERENCES CITED IN THE DESCRIPTION

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