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(71) Applicant: **Black & Decker Inc.**
New Britain, CT 06053 (US)

(72) Inventor: **LAGEAT, Emilie**
Bishop Auckland, DL13 4LY (GB)

(74) Representative: **SBD IPAdmin**
270 Bath Road
Slough, Berkshire SL1 4DX (GB)

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(54) **BRUSH ASSEMBLY FOR A FLOOR CLEANING APPARATUS**

(57) A vacuum cleaner is described and comprises a handle portion and a housing containing a collection apparatus for removing contaminants from an airstream. Base portion has a suction inlet arranged to draw air into the base portion. At least one, and preferably two brush assemblies are rotatably mounted to the underside of base portion. Each brush assembly comprises a body portion around the circumference of which a plurality of

bristles, preferably clumped in bristle tufts are mounted. On the underside of each body portion, a plurality of floor engaging members are disposed. Floor engaging members are configured to engage a surface on which the vacuum cleaner is placed such that when the vacuum cleaner is advanced forward, the floor engaging members grip the surface to cause rotation of the body portion and therefore brush assemblies.

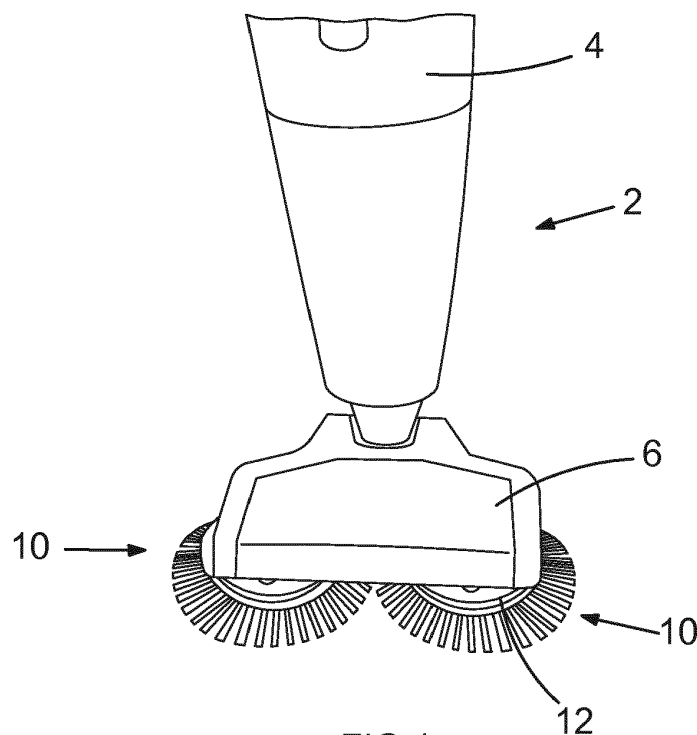


FIG.1

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Description

[0001] The present invention relates to a brush assembly for a floor cleaning apparatus, such as a vacuum cleaner or sweeper. In particular, but not exclusively, the present invention relates to a floor cleaning apparatus comprising one or more brush assemblies which rotate on movement of the floor cleaning apparatus to agitate dust and contaminants on a surface on which the floor cleaning apparatus is disposed.

[0002] Beater bars are known for use on many types of vacuum cleaners, particularly upright vacuum cleaners in which a suction head is moved around the floor by a user pushing and pulling an upright handle. Such beater bars are generally driven by a drive belt powered by a motor. The bar is usually cylindrical and has tufts of bristles disposed around its outer circumference which contact the floor as the bar rotates. The axis of rotation of the cylindrical bar is usually parallel to the surface to be cleaned. This agitates dust and other contaminants to increase the likelihood that they are sucked into the suction inlet of the vacuum cleaner.

[0003] EP2561785 discloses a different type of auxiliary beater brush assembly for an upright vacuum cleaner. The auxiliary brushes comprise tufts of bristles mounted around the circumference of a circular body, two of which are rotatably mounted on brackets projecting from the sides of the suction head. The brackets are angled downwardly such that the outermost edges of the auxiliary brushes are in contact with the floor. Pushing and pulling the suction head rotates the brushes to agitate the surface on which the vacuum cleaner is disposed.

[0004] It is desirable to provide an improved brush assembly which does not require motor power and is able to reliably rotate and agitate dust and other contaminants on a surface being cleaned. Further still, it is desirable to direct dust and other contaminants towards the suction inlet of a vacuum cleaner or the contaminant inlet of a sweeper.

[0005] According to an aspect, there is provided a brush assembly for a floor cleaning apparatus, the brush assembly comprising: a body portion rotatably mountable to an underside of a floor cleaning apparatus; a plurality of bristles disposed around the edge of the body portion, said plurality of bristles being configured to engage a surface to be cleaned; and a plurality of floor engaging members projecting from the underside of the body portion, each said floor engaging member being capable of frictionally engaging the surface on which the brush assembly is disposed to cause rotation of the body portion as the brush assembly is moved along said surface.

[0006] This provides the advantage of a brush assembly for a floor cleaning apparatus that has been found to reliably rotate on both carpets of all thicknesses and uncarpeted surfaces. By providing a plurality of floor engaging members rather than a continuous floor engaging surface, this provides the advantage of improving grip

and ensuring reliable rotation when the vacuum cleaner is moved.

[0007] In a preferred embodiment, each said floor engaging member comprises an elastomeric finger.

5 **[0008]** This provides the advantage of a configuration of floor engaging member that has been found to be particularly effective in driving motion of the brush assembly when moved. Furthermore, the elastomeric fingers may be flexible. This allows the fingers to grip a range of surfaces including wooden or tiled surfaces without damaging the surface.

10 **[0009]** In a preferred embodiment, a longitudinal axis of each said engaging member is non-perpendicular to the underside of said body portion.

15 **[0010]** This provides the advantage that if the brush is mounted to the underside of a vacuum cleaner in a tilted configuration, contact between the end of the fingers and the floor is improved by mounting the fingers in a non-perpendicular configuration to the underside of the body of the brush.

20 **[0011]** In a preferred embodiment, the brush assembly further comprises bearing means arranged to allow rotation of said at least one brush assembly in a first direction, but prevent rotation of said at least one brush assembly in a second direction, opposite to said first direction.

25 **[0012]** This provides the advantage of preventing the brush assembly from directing dust and other contaminants away from the suction inlet when the vacuum cleaner is pulled towards the user. Furthermore, when the floor engaging member is an elastomeric finger, and when rotation is prevented, the flexible elastomeric finger can be moved across the floor surface without damaging the surface.

30 **[0013]** The axis of rotation of the body portion may be non-parallel to said surface.

35 **[0014]** According to another aspect, there is provided a vacuum cleaner comprising: a handle portion; a collection apparatus for removing contaminants from an airstream; a base portion configured to be moved along a surface to collect contaminants therefrom, the base portion comprising a suction inlet; and at least one brush assembly as defined above rotatably mounted to the underside of said base portion.

40 **[0015]** In a preferred embodiment, the axis of rotation of said at least one brush assembly is arranged such that a first side of said at least one brush assembly closest to said suction inlet is tilted towards a surface on which the vacuum cleaner is disposed and a second side of said at least one brush assembly, opposite said first side, is tilted away from said surface.

45 **[0016]** This provides the advantage of a tilted configuration of brush assembly that has been found to be particularly effective at both rotating when the vacuum cleaner is pushed forwardly and directing dust and contaminants towards the suction inlet.

50 **[0017]** The vacuum cleaner may further comprise first and second brush assemblies rotatably mounted to the

underside of said base portion, wherein the axis of rotation of each said brush assembly is arranged such that a first side of each said brush assembly closest to said suction inlet is tilted towards a surface on which the vacuum cleaner is disposed and a second side of each said brush assembly, opposite said first side, is tilted away from said surface.

[0018] According to a further aspect, there is provided a vacuum cleaner comprising: a handle portion; a collection apparatus for removing contaminants from an airstream; a base portion configured to be moved along a surface to collect contaminants therefrom, the base portion comprising a suction inlet; and at least one brush assembly rotatably mounted to the underside of said base portion, wherein the axis of rotation of said at least one brush assembly is arranged such that a first side of said at least one brush assembly closest to said suction inlet is tilted towards the surface and a second side of said at least one brush assembly, opposite said first side, is tilted away from said surface.

[0019] This provides the advantage of a tilted configuration of brush assembly that has been found to be particularly effective at both rotating when the vacuum cleaner is pushed forwardly and directing dust and contaminants towards the suction inlet.

[0020] According to another aspect, there is provided a vacuum cleaner comprising: a handle portion; a collection apparatus for removing contaminants from an airstream; a base portion configured to be moved along a surface to collect contaminants therefrom, the base portion comprising a suction inlet; at least one brush assembly rotatably mounted to the underside of said base portion; and bearing means arranged to allow rotation of said at least one brush assembly in a first direction, but prevent rotation of said at least one brush assembly in a second direction, opposite to said first direction.

[0021] This provides the advantage of preventing the brush assembly from directing dust and other contaminants away from the suction inlet when the vacuum cleaner is pulled towards the user.

[0022] The axis of rotation of the at least one brush assembly may be non-parallel to the surface.

[0023] In a preferred embodiment, the axis of rotation of said at least one brush assembly is arranged such the axis is tilted forwardly and towards a front edge of the base portion. Preferably, the axis of rotation of said at least one brush assembly is arranged such that the part of said at least one brush assembly projecting forwardly of the front edge of said base portion is tilted towards said surface on which the vacuum cleaner is disposed.

[0024] This provides the advantage of a tilted configuration of brush assembly that has been found to be particularly effective at both rotating when the vacuum cleaner is pushed forwardly and directing dust and contaminants towards the suction inlet.

[0025] According to another aspect, there is provided a vacuum cleaner comprising: a handle portion; a collection apparatus for removing contaminants from an air-

stream; a base portion configured to be moved along a surface to collect contaminants therefrom, the base portion comprising a suction inlet and a front edge; and at least one brush assembly rotatably mounted to the underside of said base portion, wherein the axis of rotation of said at least one brush assembly is tilted forwardly and towards the front edge.

[0026] This provides the advantage of a tilted configuration of brush assembly that has been found to be particularly effective at both rotating when the vacuum cleaner is pushed forwardly and directing dust and contaminants towards the suction inlet.

[0027] In a preferred embodiment, said at least one brush assembly comprises: a body portion; a plurality of bristles disposed around the edge of the body portion, said plurality of bristles being configured to engage a surface on which the brush assembly is disposed; and a plurality of floor engaging members projecting from the underside of the body portion, each said floor engaging member arranged to frictionally engage a surface on which the brush assembly is disposed to cause rotation of the body portion as the brush assembly is moved along said surface.

[0028] This provides the advantage of a brush assembly for a vacuum cleaner that has been found to reliably rotate on both carpets of all thicknesses and uncarpeted surfaces. By providing a plurality of floor engaging members rather than a continuous floor engaging surface, this provides the advantage of improving grip and ensuring reliable rotation when the vacuum cleaner is moved.

[0029] In a preferred embodiment, each said floor engaging member comprises an elastomeric finger.

[0030] This provides the advantage of a configuration of floor engaging member that has been found to be particularly effective in driving motion of the brush assembly when moved.

[0031] In a preferred embodiment, a longitudinal axis of each said elastomeric finger is non-perpendicular to the underside of said body portion.

[0032] This provides the advantage that if the brush is mounted to the underside of a vacuum cleaner in a tilted configuration, contact between the end of the fingers and the floor is improved by mounting the fingers in a non-perpendicular configuration to the underside of the body of the brush.

[0033] In a preferred embodiment, the vacuum cleaners described above further comprise bearing means arranged to allow rotation of said at least one brush assembly in a first direction, but prevent rotation of said at least one brush assembly in a second direction, opposite to said first direction.

[0034] This provides the advantage of preventing the brush assembly from directing dust and other contaminants away from the suction inlet when the vacuum cleaner is pulled towards the user.

[0035] Embodiments of the present invention will now be described by way of example only, and not in any limitative sense, with reference to the accompanying

drawings in which:

Figure 1 is a perspective view of the front of an upright vacuum cleaner comprising a brush assembly embodying the present invention;

Figure 2 is a view of the underside of the vacuum cleaner of Figure 1;

Figure 3 is a top view of the base portion of the vacuum cleaner of Figure 1 shown moving forwardly;

Figure 4 is a top view of the base portion of the vacuum cleaner of Figure 1 shown moving rearwardly;

Figure 5 is a front view of the base portion of the vacuum cleaner of Figure 1;

Figure 6 is a view of the underside of the vacuum cleaner of Figure 1;

Figure 7 is a cross-sectional view of one side of the base portion of the vacuum cleaner of Figure 1 viewed from the front;

Figure 8 is a partial cross-section of the base portion of the vacuum cleaner of Figure 1 viewed from the side;

Figure 9 is a partial cross-section of the base portion of the vacuum cleaner of Figure 1 viewed from the side;

Figure 10 is a front perspective view of the base portion of the vacuum cleaner of Figure 1; and

Figure 11 is a view from the top of one side of the base portion of the vacuum cleaner of Figure 1.

[0036] The following describes a vacuum cleaner with a brush assembly for agitating dirt and other contaminants on a surface to be cleaned. Although the following description relates to a vacuum cleaner, the brush assembly can be implemented on other types of floor cleaning apparatuses, such as a sweeper or a steam mop.

[0037] Referring to Figures 1 and 2, a vacuum cleaner 2 comprises a handle portion (not shown) and a housing 4 containing a collection apparatus for removing contaminants from an airstream. Types of collection apparatus will be familiar to persons skilled in the art. For example, the collection apparatus for separating contaminants from the airstream could take the form of a cyclone separator, a filter bag, or a combination of cyclone separator and filter arrangements.

[0038] Vacuum cleaner 2 also comprises a base portion 6 having a suction inlet 8 arranged to draw air into the base portion 6 on operation of the motor (not shown) of the vacuum cleaner 2. At least one, and preferably two

brush assemblies 10 are rotatably mounted to the underside of base portion 6. Each brush assembly 10 comprises a body portion 12 around the circumference of which a plurality of bristles 14, preferably clumped in bristle tufts are mounted. On the underside of each body portion 12, a plurality of floor engaging members 16 are disposed. Eight floor engaging members are shown spaced equiangularly from the centre of the body portion 12, although more or less floor engaging members could be used depending on the size of the body portion 12. Floor engaging members 16 are configured to engage a surface on which the vacuum cleaner 2 is placed such that when the vacuum cleaner is advanced forward, the floor engaging members 16 grip the surface to cause rotation of the body portion 12 and therefore brush assemblies 10. In a preferred embodiment, each floor engaging member comprises a finger. For example, each finger could be made from rubber or another elastomeric polymer or another suitable material such as a plastic.

[0039] Referring to Figures 5 to 7, each brush assembly 10 (shown without bristles for clarity) comprises a shaft 18 keyed to the body portion 12 to enable the body portion 12 to be rotatably mounted to the base portion 6 of the vacuum cleaner 2. Shaft 18 is disposed non-rotatably in one-way bearing 20 which permits rotation in only one direction as will be further explained below. Referring to Figure 7, the axis of rotation R is offset from the vertical Y by an angle α such that a first side 10a of the brush assembly closest to suction inlet 8 is tilted towards a surface S on which the vacuum cleaner is disposed. In this configuration, the second side 10b opposite first side 10a of the brush assembly 10 is tilted away from surface S such that elastomeric fingers 16 are out of contact with the surface S on the second side 10B. Preferably, angle α is between 2 and 10 degrees and, more preferably, between 3 and 6 degrees. In particular, an angle between 4 and 5 degrees has been found to be optimal for providing a large contact zone for the brush and the rubber fingers, as shown in figure 10.

[0040] It can also be seen in Figure 7 that each elastomeric finger 16 is mounted non-perpendicularly to a plane P defined by body portion 12. This ensures that the ends of elastomeric fingers 16 make the best contact with surface S. Alternatively, each finger 16 could be mounted perpendicularly to plane P for ease of manufacture. Referring to Figure 5, it can be seen that both brush assemblies 10 are mounted on axes of rotation that are non-parallel to the vertical axis of body portion 6 such that sides 10a of the brush assemblies 10 closest to suction inlet 8 are tilted towards surface S. Also, the axes of rotation of the brush assemblies are non-parallel to the surface S and to the horizontal axis of the body 6.

[0041] Referring to Figures 8 and 9, shaft 18 and one-way bearing 20 are also arranged such that the part of each brush assembly 10 forward of the shaft 18 is tilted towards the surface S. This is achieved by tilting the axis of rotation of the brush assembly, which runs longitudinally along the shaft 18, forwardly and towards the front

edge 6a. As shown, the part projecting forwardly of the front edge 6a of base portion 6 is tilted towards the surface S on which the vacuum cleaner 2 is disposed. In other words, an angle β is formed between a horizontal axis X of the body portion and the plane of rotation of the brush assembly 10. Preferably, angle β is between 1 and 4 degrees and, more preferably between 2 and 3 degrees. This provides an optimal contact area forward of the front edge whilst preventing the brush from digging too deep into carpet when the vacuum cleaner is pushed forwardly.

[0042] Referring to Figures 10 and 11, due to the angular offset of the axis of rotation R of each brush assembly 10, only the bristles 14 and around the region forwardly of the shaft 18 and closest to suction inlet 8 are in contact with the floor in normal use. Also referring to Figures 5 and 6, due to the angular offset of the axis of rotation R of each brush assembly 10, only the fingers 16 closest to suction inlet 8 are in contact with the floor in normal use.

[0043] Referring to Figures 2, 3, 4 and 11, operation of vacuum cleaner 2 and brush assemblies 10 will now be described. When the vacuum cleaner 2 is pushed forwardly in the direction of arrow A of Figure 3, elastomeric fingers 16 in the zone of contact with the floor closest to suction inlet 8 grip the floor and cause rotation of the brush assemblies 10. This rotation is in the clockwise sense for the left hand brush assembly 10 of Figure 3 and in the anti-clockwise sense for the right hand brush assembly of Figure 3. This causes dust in the area where the bristles contact the floor to be flicked towards the suction inlet. Since the bristles 14 on the outer sides of base portion 6 are raised away from the floor, no contact is made such that dust and other contaminants are not flicked away from the base portion 6.

[0044] When the base portion 6 is pulled rearwardly in the direction of arrow B of Figure 4, the one-way bearing 20 of each brush assembly 10 prevents rotation which therefore prevents dust being flicked away from the suction inlet 8. On further advancement of the vacuum cleaner 2 in the direction of arrow A, brush assemblies 10 will continue to rotate.

[0045] It has been found that projecting fingers 16 are effective on various thicknesses of carpet as well as hard floors to provide improved drive of the brush assemblies 10 when compared with use of a continuous ring of frictionally engaging material. Improved cleaning has also been found resulting from prevention of rotation of the brush assemblies on a rearward stroke.

[0046] It will be appreciated by persons skilled in the art that the above embodiments have been described by way of example only and not in any limitative sense, and that various alterations and modifications are possible without departure from the scope of the invention as defined by the appended claims.

Claims

1. A brush assembly for a floor cleaning apparatus, the brush assembly comprising:
 - a body portion rotatably mountable to an underside of a floor cleaning apparatus;
 - a plurality of bristles disposed around the edge of the body portion, said plurality of bristles being configured to engage a surface to be cleaned; and
 - a plurality of floor engaging members projecting from the underside of the body portion, each said floor engaging member being capable of frictionally engaging the surface on which the brush assembly is disposed to cause rotation of the body portion as the brush assembly is moved along said surface, wherein each said floor engaging member comprises an elastomeric finger.
2. A brush assembly according to claim 1, wherein a longitudinal axis of each said floor engaging member is non-perpendicular to the underside of said body portion.
3. A brush assembly according to claim 1 or 2, further comprising bearing means arranged to allow rotation of said brush assembly in a first direction, but prevent rotation of said brush assembly in a second direction, opposite to said first direction.
4. A vacuum cleaner comprising:
 - a handle portion;
 - a collection apparatus for removing contaminants from an airstream;
 - a base portion configured to be moved along a surface to collect contaminants therefrom, the base portion comprising a suction inlet; and
 - at least one brush assembly according to any one of the preceding claims rotatably mounted to the underside of said base portion.
5. A vacuum cleaner according to claim 4, wherein the axis of rotation of said at least one brush assembly is arranged such that a first side of said at least one brush assembly closest to said suction inlet is tilted towards the surface to be cleaned and a second side of said at least one brush assembly, opposite said first side, is tilted away from said surface.
6. A vacuum cleaner according to claim 4 or 5, further comprising first and second brush assemblies rotatably mounted to the underside of said base portion, wherein the axis of rotation of each said brush assembly is arranged such that a first side of each said brush assembly closest to said suction inlet is tilted

towards the surface and a second side of each said brush assembly, opposite said first side, is tilted away from said surface.

7. A vacuum cleaner comprising: 5

- a handle portion;
- a collection apparatus for removing contaminants from an airstream;
- a base portion configured to be moved along a surface to collect contaminants therefrom, the base portion comprising a suction inlet; and 10
- at least one brush assembly rotatably mounted to the underside of said base portion, wherein the axis of rotation of said at least one brush assembly is arranged such that a first side of said at least one brush assembly closest to said suction inlet is tilted towards the surface and a second side of said at least one brush assembly, opposite said first side, is tilted away from said surface. 20

8. A vacuum cleaner comprising: 25

- a handle portion;
- a collection apparatus for removing contaminants from an airstream;
- a base portion configured to be moved along a surface to collect contaminants therefrom, the base portion comprising a suction inlet; 30
- at least one brush assembly rotatably mounted to the underside of said base portion; and bearing means arranged to allow rotation of said at least one brush assembly in a first direction, but prevent rotation of said at least one brush assembly in a second direction, opposite to said first direction. 35

9. A vacuum cleaner according to claim 8, wherein the axis of rotation of the at least one brush assembly is non-parallel to the surface. 40

10. A vacuum cleaner according to any one of claims 4 to 9, wherein the axis of rotation of said at least one brush assembly is arranged such the axis is tilted forwardly and towards a front edge of the base portion. 45

11. A vacuum cleaner comprising: 50

- a handle portion;
- a collection apparatus for removing contaminants from an airstream;
- a base portion configured to be moved along a surface to collect contaminants therefrom, the base portion comprising a suction inlet and a front edge;and 55
- at least one brush assembly rotatably mounted

to the underside of said base portion, wherein the axis of rotation of said at least one brush assembly is tilted forwardly and towards the front edge.

12. A vacuum cleaner according to any one of claims 8 to 11, wherein the axis of rotation of said at least one brush assembly is arranged such that a first side of said at least one brush assembly closest to said suction inlet is tilted towards the surface and a second side of said at least one brush assembly, opposite said first side, is tilted away from said surface.

13. A vacuum cleaner according to any one of claims 7 to 12, wherein said at least one brush assembly comprises:

- a body portion;
- a plurality of bristles disposed around the edge of the body portion, said plurality of bristles being configured to engage the surface; and
- a plurality of floor engaging members projecting from the underside of the body portion, each said floor engaging member being capable of frictionally engaging the surface to cause rotation of the body portion as the brush assembly is moved along said surface.

14. A vacuum cleaner according to claim 13, wherein each said floor engaging member comprises an elastomeric finger.

15. A vacuum cleaner according to claim 13 or 14, wherein a longitudinal axis of each said floor engaging member is non-perpendicular to the underside of said body portion.

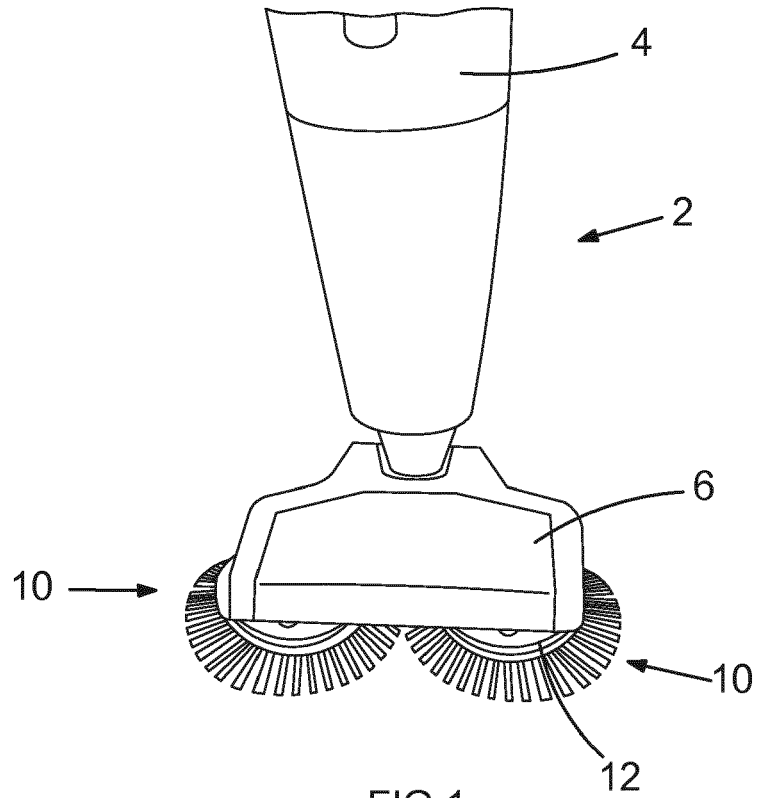


FIG. 1

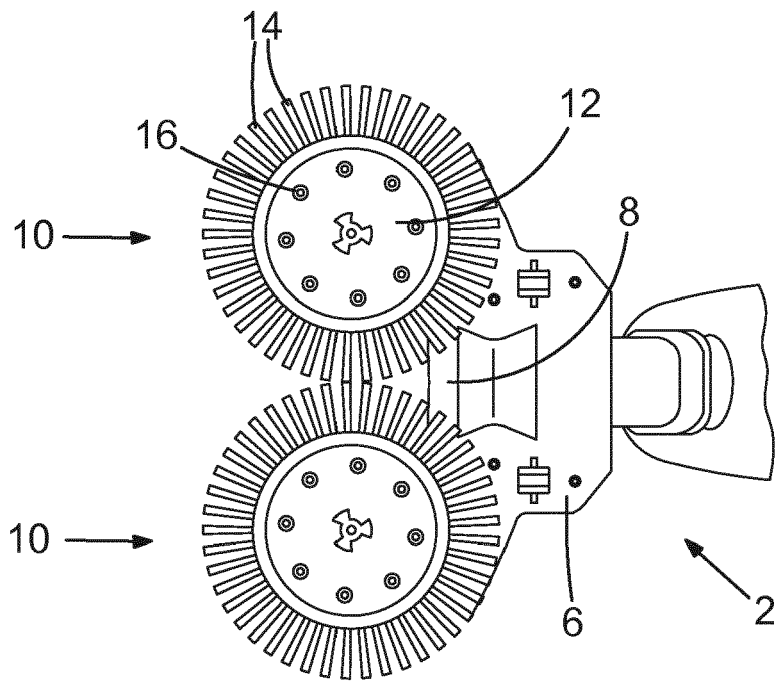


FIG. 2

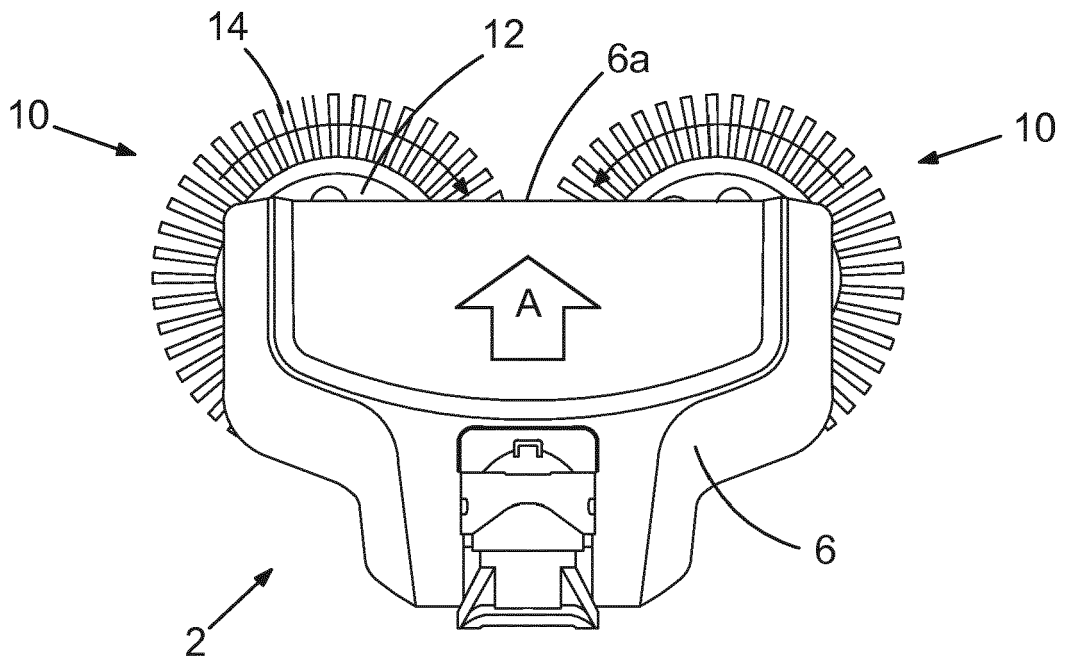


FIG.3

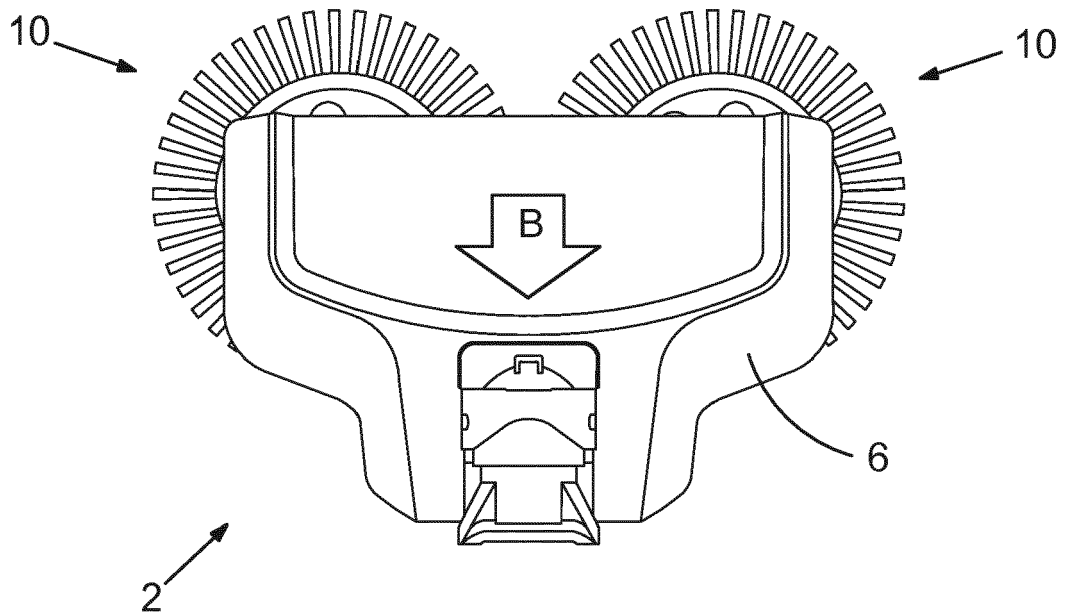
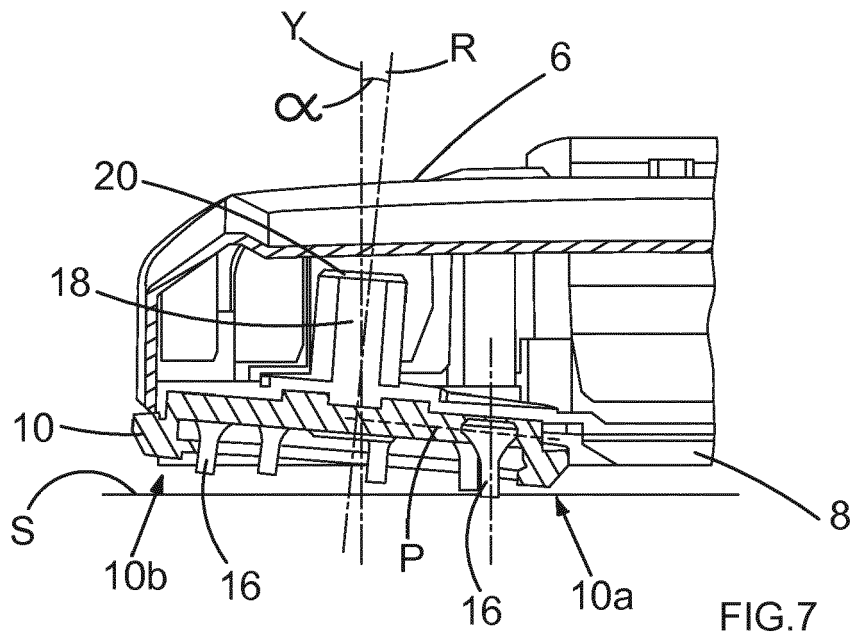
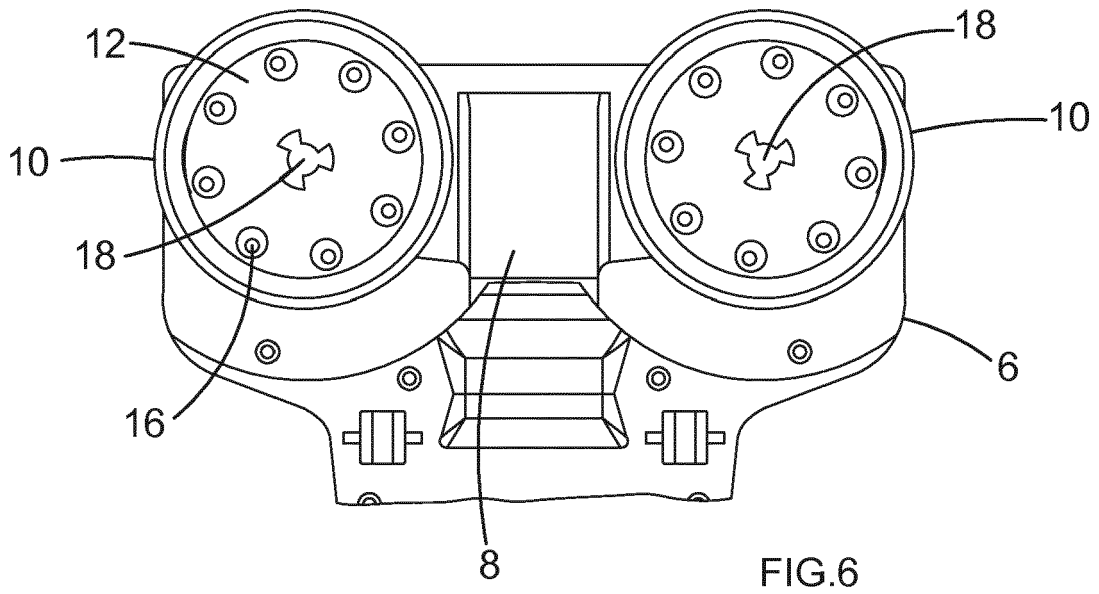
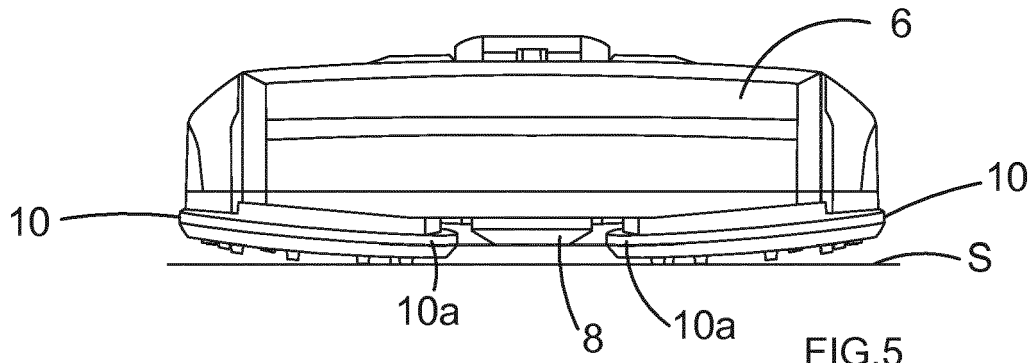


FIG.4



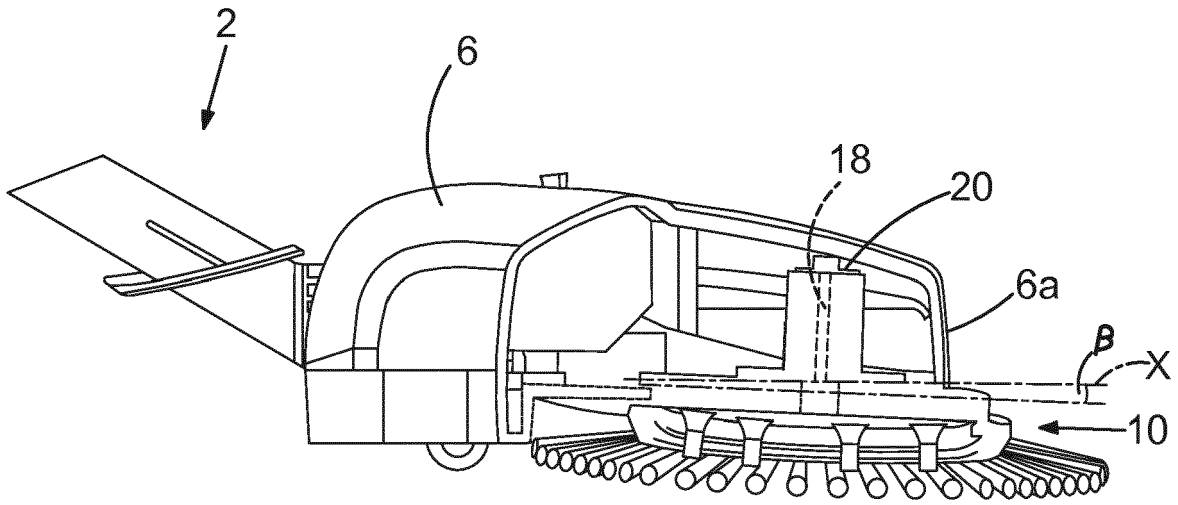


FIG. 8

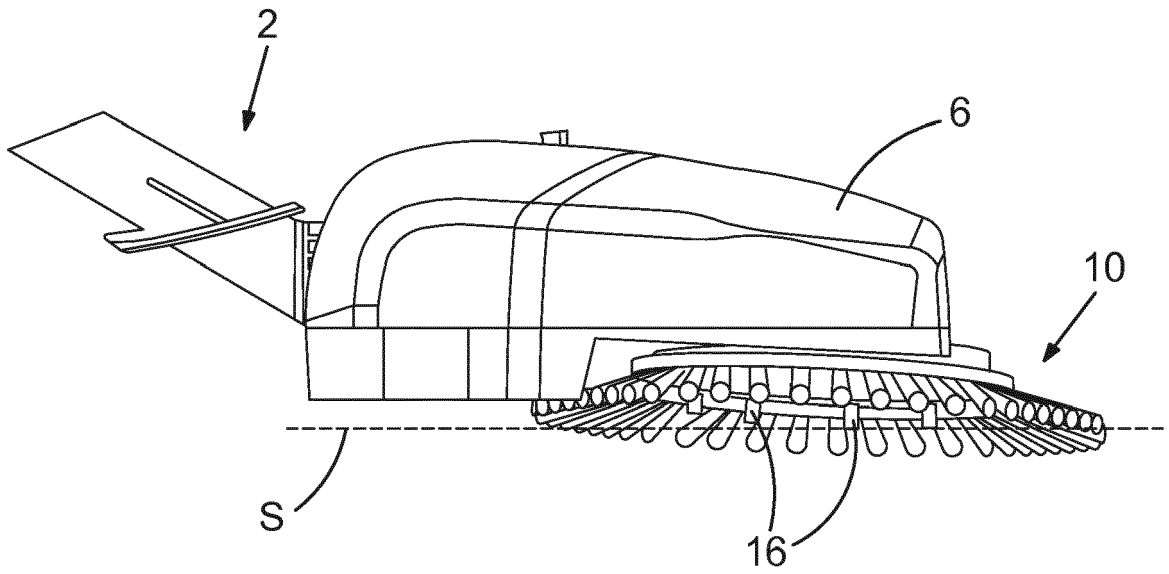


FIG. 9

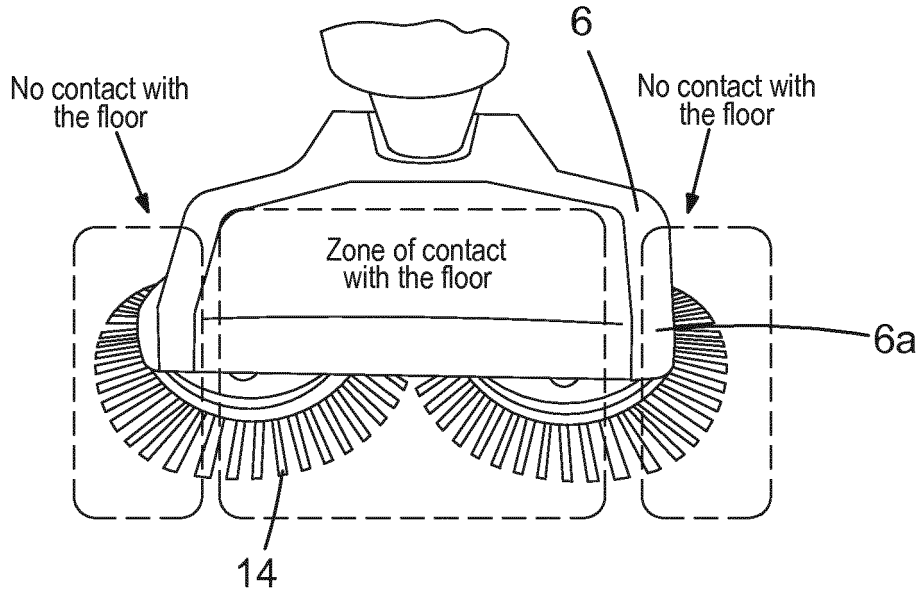


FIG. 10

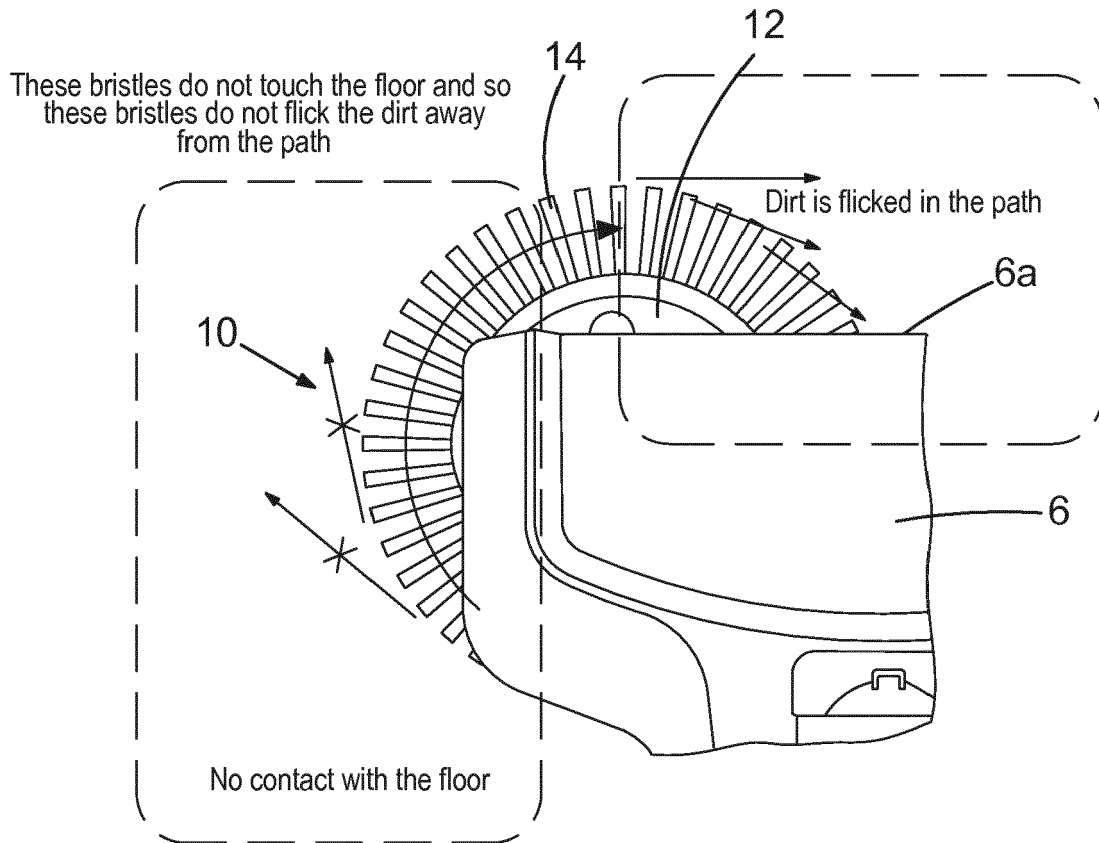


FIG. 11

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 2561785 A [0003]