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(54) **Cleaning device with rotating brushes**

Reinigungsvorrichtung mit Bürstenrollen

Dispositif de nettoyage avec brosses rotatives

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Description

FIELD OF THE INVENTION

[0001] The invention relates to a cleaning device for cleaning a surface, the cleaning device comprises at least one brush rotatable in a rotation direction and movable over the surface to be cleaned and at least one deflector contacting the bristles of the brush at a location, seen in the rotation direction, before the location where the bristles contact the surface to be cleaned.

[0002] The invention also relates to a vacuum cleaner.

BACKGROUND OF THE INVENTION

[0003] By such a device which is known from WO 2005/053498 a rotatable brush is being used to aid in the loosening and removal of dirt and foreign material from the surface to be cleaned. To perform the cleaning action the brush is pressed against the surface. To improve the cleaning of the surface, a cleaning liquid is being used. The cleaning liquid is removed from the surface by means of the rotating brush, together with the dirt. Droplets of the cleaning liquid on the inside of the housing of the brush are guided back to the brush by means of the deflector. To ensure that no droplets will fall back on the cleaned surface, the deflector must be pressed firmly against the brush. This has the disadvantage that the power needed to rotate the brush is increased and brush wear will be more. However, if the deflector is not sufficiently pressed against the brush, droplets will fall back to the surface, which will negatively effects the cleaning result.

SUMMARY OF THE INVENTION

[0004] It is an object of the invention to provide a cleaning device whereby the contact between the brush and the deflector is being improved.

[0005] This object is achieved by the cleaning device according to the invention in that the deflector is movable against spring force when the bristles of the brush are getting in contact with the deflector when the brush is being rotated.

[0006] Both the deflector and the bristles of the brush will be moved when getting in contact with each other when the brush is being rotated. If the brush is worn or deformed, the deflector is will still keep in touch with the brush, although in this situation the deflector will be moved less. In case that the diameter of the brush is larger than expected, for example due to production tolerances, the deflector will be moved more.

[0007] By the movable deflector an optimal balance between a sufficient contact with the brush to prevent droplets on the cleaned surface and minimum power dissipation by the motor due to the contact between the brush and the deflector can be obtained.

[0008] In case that the cleaning device is being used

for cleaning a surface with liquid whereby the water or cleaning liquid must be removed from the surface, the deflector can be used for preventing droplets of water or cleaning liquid from falling back on the cleaned surface.

[0009] However, the cleaning device is also suitable for cleaning without cleaning liquid. The bristles are pressed together by the deflector, whereby air will be pushed out of the area between the bristles. Between the deflector and the surface to be cleaned, the bristles will be moved apart and the area between the bristles will increase so that air will be sucked into the brush. Because the air is sucked into the brush close to the position where the brush is pressed together by the surface to be cleaned, the blowing of air caused by the surface to be cleaned is compensated for. Also in this case, an optimal balance between a sufficient contact with the brush to create suction and a minimum power dissipation by the motor due to the contact between the brush and the deflector can be obtained.

[0010] The deflector itself can be relatively stiff and be mounted by means of springs to the housing of the brush or the deflector can be flexible and be moved with respect to the brush by being bent.

[0011] Another embodiment of the cleaning device according to the invention is characterized in that the deflector comprises at least one flexible plate-shaped element being bendable against spring force of the plate-shaped element.

[0012] Such a deflector is relatively cheap and can easily be mounted to the housing. The plate-shaped element can be made of a plastic like silicon rubber, a polymer or any other suitable material like natural rubber.

[0013] A further embodiment of the cleaning device according to the invention is characterized in that the stiffness of the deflector is less than $200 \cdot 10^{-3}$ N/mm, preferably $20 \cdot 10^{-3}$ N/mm and more preferably $2 \cdot 10^{-3}$ N/mm per millimetre length of the brush.

[0014] With such a stiffness it is possible that the deflector extends relatively far into the brush, for example 2 mm or more, when the brush is not rotated so that a good contact between the deflector and brush during rotation is ensured, whereby nearly no wear of the brush due to the contact with the deflector will occur and the power dissipation of the motor due to this contact will be relatively low. Preferably the deflector is very elastic, and has a stiffness of less than $2 \cdot 10^{-3}$ N/mm per millimetre length of the brush. At a brush with a length of 250 mm, the total stiffness is $2 \cdot 10^{-3}$ N/mm $\cdot$ 250 mm is 0,5 N/mm. The stiffness of the deflector can be determined, for example, by exerting a bending force, i.e. a force having the effect that the deflector is subjected to a bending deformation, on the end of the deflector extending in normal use into the brush until the end has moved 1 mm.

[0015] Another embodiment of the cleaning device according to the invention is characterized in that the bristles are bent by the deflector to an extend that suction between the bristles when losing contact with the deflector is larger than expellation of air from between the bristles.

ties when contacting the surface to be cleaned.

[0016] With such bending of the bristles by the deflector a net air flow towards the brush will occur near the surface.

[0017] The axle of the brush is kept at a certain predetermined distance from the surface, for example by means of wheels connected to a housing of the cleaning device.

[0018] Another embodiment of the cleaning device according to the invention is characterized in that the bending of the bristles by the deflector is larger than the bending of the bristles by the surface to be cleaned.

[0019] Also in this situation the net air flow by the brush will be directed towards the brush.

[0020] A further embodiment of the cleaning device according to the invention is characterized in that the cleaning device comprises at least two brushes rotatable in opposite directions directed towards each other at the surface to be cleaned, whereby at least two deflectors are provided pressing against the bristles of the brushes, each deflector is located on a side of a brush remote from the other brush.

[0021] Due to the two brushes rotating in opposite direction a very effective cleaning operation is obtained since each location on the surface to be cleaned will be contacted by both brushes. Furthermore the dirt will be collected between the brushes and can easily be moved in an upwards direction to a debris collecting chamber.

[0022] A further embodiment of the cleaning device is characterized in that the deflector is adjustable with respect to the brush. In this manner the pressure between the deflector and the brush can be varied. Moreover one can compensate for possible wear of the bristles.

[0023] To prevent dripping from water near ends of the brush, an embodiment of the cleaning device according to the invention is characterized in that the cleaning device is provided with at least one side deflector pressing against the bristles of the brush located near an end of the brush.

[0024] Water inside the housing of the cleaning device will fall either on the deflector or on the side deflector and will be guided back into the brush. No stripes or droplets will occur on the cleaned surface. If droplets on the surface will occur, this will be an indication that the brushes have been worn and should be replaced by new fresh brushes.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025] The invention will be explained in more detail with reference to the drawings, in which

Fig. 1 is a side view of a rotatable brush according to the prior art,

Fig. 2 is a perspective view of a cleaning device according to the invention,

Fig. 3 is a schematic side view of a part of the cleaning device as shown in Fig. 2,

Figs. 4A and 4B are respectively a schematic side view of a brush with a deflector according to the invention and a graph indicating the volume between the bristles of the brush while rotating the brush,

Figs. 5A and 5B are a schematic side view and bottom view of the cleaning device according to the invention,

Figs. 6-8 are bottom views of the several other embodiments of the deflectors according to the invention,

Figs. 9-11 are perspective views of other embodiments of the deflector according to the invention.

[0026] Like parts are indicated by the same reference numbers in the figures.

DETAILED DESCRIPTION OF EMBODIMENTS

[0027] Fig. 1 is a side view of a rotatable brush according to the prior art. As is schematically illustrated, air will be expelled from the rotating brush in the direction indicated by arrow P1 when contact is made at position A with the surface to be cleaned. The air will be expelled from the brush from the position A to position B. From position B, air will be sucked in a direction indicated by arrow P2 into the brush to compensate for the increasing volume between the bristles, until the bristles have lost contact with the surface (position C). The airflow in the direction indicated by arrow P2 towards the brush aids the cleaning action of the brush. However the airflow in the direction indicated by arrow P1 away from the brush is detrimental to the cleaning action since dirt will be blown away.

[0028] Fig. 2 shows a perspective view of a cleaning device 1 according to the invention, comprising a housing 2 in which two brushes 3, 4 are rotatably mounted around axles 5, 6. The brushes 3, 4 are driven by a motor (not shown). The motor might be located on any suitable position whereby via gears or belts the brushes 3, 4 are being rotated with a speed of 5000-10,000 rotations per minute. The axle of the motor can also be directly connected to the axle of the brush, whereby the motor can be placed inside the brush, for example. The diameter of the brushes for example is 4 cm à 6 cm. The length of the brush is for example about 25 cm. Brush 3 is rotatable in a clockwise direction, indicated by arrow P3 and brush 4 is rotatable in a counter clockwise direction, indicated by arrow P4 around the respective axles 5, 6. The housing 2 is provided with wheels (not shown) keeping the axles 5, 6 at a predetermined distance of the surface to be cleaned. The housing 2 is connected via a steering joint to a stick 7 which is provided on a side remote of the housing 2 with a handle 8. The cleaning device 1 is furthermore provided with a tank 9 for water or other cleaning liquid. A power cord 10 enters the handle 8 and is guided through the stick 7 to the motor for rotating the brushes 3, 4 and the device (not shown) for feeding water from the container 9 into a brush from which it is spread

on to the surface to be cleaned.

[0029] The housing 2 comprises a debris collecting chamber 11, the entrance 12 of which is located between the brushes 3, 4. The brushes 3, 4 are fully enclosed except at the bottom by the housing 2. For sake of clarity the side cover has been removed. Near the bottom of the housing 2 two longitudinal flexible deflectors 13, 14 are provided extending parallel to the axles 5, 6 and partly into the brushes 3, 4. The function of the deflectors 13, 14 will now be explained with reference to the drawings 3, 4A and 4B.

[0030] As can be seen in fig. 3 the brushes 3, 4 rotate in opposite directions P3, P4, which directions are directed towards each other near the surface to be cleaned 16. The bristles 17 of the brushes 3, 4 rub over the surface to be cleaned 16 and the dirt and other materials are being disconnected from the surface to be cleaned 16 and are being moved upwards in the direction of arrow P5 into the entrance 12 of the debris collecting chamber 11. When the bristles 17 of the brushes 3, 4 reach the deflectors 13, 14 the bristles 17 are pressed together whereby the volume between the bristles is being reduced. Hereby air is being expelled from the brushes 3, 4, which air is guided along the walls 18 of the housing 2. By further rotating of the brushes 3, 4 the bristles 17 lose contact with the deflectors 13, 14 whereby the area between the bristles is being enlarged and air will be sucked into the brushes 3, 4. By further rotating the bristles 17 will be pressed against the surface to be cleaned 16 whereby air will be expelled from the area between the bristles 3,4. The net air flow between the deflectors 13, 14 and the surface to be cleaned 16 is in the directions indicated by the arrows P6, P7 towards the brushes 3, 4 respectively. Such a net air intake by the brushes 3, 4 will for example occur if the bending of the brushes 3, 4 by the deflectors 13, 14 is greater than the bending of the brushes 3, 4 by the surface to be cleaned 16. The bending by the deflectors 13, 14 of the brushes 3, 4 is for example 5 mm while the surface to be cleaned 16 bends the brushes 3, 4 for example only 3 mm. The deflectors press against the bristles of the brush at a location before the location where the bristles contact the surface to be cleaned as seen in the direction of rotation.

[0031] Fig. 4A shows brush 3 and different angles φ whereby the bristles come in contact with the deflector 13 (near $\varphi = a$), lose contact with the deflector 13 ($\varphi = b$), start with losing contact with the surface to be cleaned 16 ($\varphi = c$) and have fully lost contact with the surface to be cleaned 16 ($\varphi = d$). When moving from $\varphi = b$ to $\varphi = d$ the volume between the bristles is at its minimum at $\varphi = c$.

[0032] Fig. 4B shows a graph whereby the volume between the bristles 17 is indicated at different angles φ . As is clearly visible in the graph the volume between the bristles 17 is being reduced between the angles $\varphi = a$ and $\varphi = b$ whereby air is blowing in the direction indicated by arrow P8 along the walls 18 of the housing 2. Between the angles $\varphi = b$ and $\varphi = c$ air is being sucked towards the brush 3 in the direction indicated by arrow P6. Also

between the angles $\varphi = c$ and $\varphi = d$ air is being sucked towards the brush 3 however now in the direction indicated by arrow P7.

[0033] The cleaning device 1 according to the invention can be used for cleaning soft surfaces with carpet and hard surfaces. It can be used by only rotating the brushes 3, 4 but the cleaning can be supported by sucking vacuum by means of vacuum device in the entrance 12. Furthermore the device 1 can be used for wet cleaning of for example hard surfaces whereby water or a cleaning liquid is guided from the container 9 towards the brushes 3, 4 and the surface 16 is being wetted by the brushes 3, 4. It is also possible to spray water on the surface by means of a separate device in which case the cleaning device need not to be provided with a container 9. It is important that as little as possible water or cleaning liquid remains on the surface 16. The water or cleaning liquid will be removed by the brushes 3, 4 and guided into the entrance 12 towards the debris collecting chamber 11. As can be seen in fig. 5A some of the water droplets 19 will be collected against the wall 18 of the housing 2 and will flow back along the wall 18 and over the deflectors 13, 14 into the brushes 3, 4. Hereby the water droplets 19 are prevented from being dropped back on the surface to be cleaned 16. Also water on the outside of the housing 2 will be guided back to the brushes 3, 4 due to the shape of the housing, whereby the ends of the deflectors 13, 14 located in the brushes 3,4, form the lowest part of the housing.

[0034] The deflectors 13, 14 form part of a bottom plate 21 as indicated in Fig. 5B. The bottom plate 21 can be made from flexible plastic being easily bendable. To prevent water droplets 19 to fall back on the surface 16 near ends 20 of the cylindrical brushes 3, 4 the bottom plate 21 comprises side edges 22, whereby the distance between opposite side-edges 22 is shorter than the length of the brush 3,4. Water droplets 19 will either be guided by the side edges 22 of the bottom plate 21 towards a V-shaped nose 23 from which the droplets 19 will fall between the brushes 3, 4 and will be picked up by the brushes 3, 4 during a next passage of the brushes 3, 4 or the droplets will be picked up by the brushes when moving towards the V-shaped nose 23. The V-shaped nose 23 can also be another kind of protruding element.

[0035] Fig. 6 shows a bottom view of another embodiment of the cleaning device 31 according to the invention whereby each deflector 13, 14 is connected to a carrier 32, 33 respectively. The carriers 32, 33 are connected to each other at their side edges by means of adjusting mechanisms 34. Each adjusting mechanism 34 comprises a rod 35 and an adjusting knob 36 whereby by rotating the adjusting knob 36 in or opposite to a direction indicated by arrows P9, P10 the deflectors 13, 14 will be moved apart or towards each other in the direction indicated by the double arrow P11. By adjusting the distance between the deflectors 13, 14 the pressure exerted on the brushes 3, 4 can be amended depending on the desired amount by which the bristles are pressed together.

If the bristles are firmly pressed together no unwanted blowing will occur. However this might lead to extensive wear of the brushes and to an increase in the power needed to rotate the brushes. In case that the deflectors 13, 14 do not press together the bristles enough to prevent all unwanted blowing, an additional fan can be used to apply vacuum near the surface 16, which vacuum will prevent together with the deflectors that unwanted blowing will occur. The deflectors 13, 14 will be bendable to accommodate for wear of the brush.

[0036] Fig. 7 shows another embodiment of the cleaning device 41 according to the invention whereby the carriers 32, 33 of the deflectors 13, 14 are connected near the side edges by means of springs 42. These springs 42 will determine the force by means of which the deflectors 13, 14 are pressed against the brushes 3, 4. In case for example that the brushes 3, 4 are replaced and the diameter of the brushes 3, 4 is slightly different due for example to production tolerances, the deflectors 13, 14 can be moved towards each other in the directions indicated by arrows P 12, P13 under the influence of the forces exerted by the springs 42 or can be moved apart against the forces exerted by the springs 42.

[0037] Fig. 8 shows a further embodiment of a device 51 according to the invention whereby the deflectors 52, 53 are being made of flexible elements 52, 53 which can accommodate the differences in the diameter of the brushes 3, 4 according to for example production tolerances. The flexible elements 52, 53 can be made of silicon rubber, EPDM or any other flexible polymer or material with desired mechanical and chemical properties.

[0038] Fig. 9 shows another embodiment of a deflector 61 of a cleaning device according to the invention which deflector 61 comprises a holder 62 which is connected with the housing 2 of the cleaning device 1 and flexible pens 63 extending parallel to each other. The pens 63 are pressed against the brushes 3, 4 with their ends remote from the holder 62. Depending of the thickness of the pens 63 and the distance between the pens 63 the deflector 61 will only function to prevent water being dropped back on the surface to be cleaned 16 or also for preventing unwanted blowing.

[0039] Fig. 10 shows another embodiment of a deflector 71 according to the invention whereby a holder 72 is provided with flexible wires 73 along which water is guided back to the brushes 3, 4. If the distance between the wires 73 is relatively small and the wires are stiff enough, the wires 73 will also diminish the unwanted blowing.

[0040] Fig. 11 shows an embodiment of a deflector 81 according to the invention whereby a holder 82 is provided with rigid pens 83. The deflector 81 will be mounted by means of a spring to the housing. Also this flexible deflector 81 will prevent the dripping of water and will diminish the unwanted blowing.

[0041] The bottom plate 21 and the deflectors 13, 14 can be made from any suitable material like metal or plastic. The deflectors 13, 14 can be formed as a strip connected to or integrated with the housing 2.

[0042] Other examples of flexible deflectors are filaments like yarns, arranged like a comb, adjacent individual segments from flexible material like thin spring metal sheet or plastic sheet, fabrics, grids or meshes etcetera.

[0043] It is possible to make the distance between the surface and the axles of the brushes 3, 4 adjustable to be able to amend the amount by which the bristles are pressed together. Preferably also the deflector is adjustable with respect to the brush to adjust the pressure between the deflector and the brush.

[0044] It is also possible to suck the debris and water away from the entrance 12 by means of a vacuum system.

[0045] For the bristles of the brush any kind of fibre, hair, wire-shaped element or other kind of element is suitable which will be pressed together when contacting a surface to be cleaned.

[0046] If the deflector does not press firmly enough against the bristles of the brushes, the airflow away from the brush might also be prevented by means of a vacuum system. In such a case the deflector still prevents the leakage of water.

[0047] It is also possible to connect each deflector with a spring to the housing. The forces exerted by the spring can be in vertical direction, horizontal direction or a combination thereof.

Claims

1. Cleaning device (1, 31, 41, 51) for cleaning a surface, the cleaning device comprises at least one brush (3, 4) rotatable in a rotation direction and movable over the surface to be cleaned and at least one deflector (13, 14, 52, 53, 71, 81) contacting the bristles (17) of the brush at a location, seen in the rotation direction, before the location where the bristles contact the surface to be cleaned (16), **characterized in that** the deflector (13, 14, 52, 53, 71, 81) is movable against spring force when the bristles of the brush are getting in contact with the deflector when the brush is being rotated.
2. Cleaning device (1, 31, 41, 51) according to claim 1, **characterized in that** the deflector comprises at least one flexible plate-shaped element being bendable against spring force of the plate-shaped element.
3. Cleaning device (1, 31, 41, 51) according to claim 1 or 2, **characterized in that** the stiffness of the deflector is less than $200 \cdot 10^{-3}$ N/mm, preferably $20 \cdot 10^{-3}$ N/mm and more preferably $2 \cdot 10^{-3}$ N/mm per millimetre length of the brush.
4. Cleaning device (1, 31, 41, 51) according to one of the preceding claims, **characterized in that** the bristles (17) are bent by the deflector (13, 14, 52, 53, 71,

81) to an extend that suction between the bristles when losing contact with the deflector is larger than expellation of the air from between the bristles when contacting the surface to be cleaned.

5. Cleaning device (1, 31, 41, 51) according to one of the preceding claims, **characterized in that** the bending of the bristles (17) by the deflector (13, 14, 52, 53, 71, 81) is larger than the bending of the bristles by the surface to be cleaned (16).

6. Cleaning device (1, 31, 41, 51) according to one of the preceding claims, **characterized in that** the cleaning device comprises at least two brushes (3, 4) rotatable in opposite directions directed towards each other at the surface to be cleaned (16), whereby at least two deflectors (13, 14, 52, 53, 71, 81) are provided pressing against the bristles (17) of the brushes, each deflector is located on a side of a brush remote from the other brush.

7. Cleaning device (1, 31, 41, 51) according to one of the preceding claims, **characterized in that** the cleaning device is provided with at least one side deflector pressing against the bristles of the brush located near an end of the brush.

8. Cleaning device (1, 31, 41, 51) according to one of the preceding claims, **characterized in that** the cleaning device comprises a cleaning fluid chamber (9).

9. Cleaning device (1, 31, 41, 51) according to one of the preceding claims, **characterized in that** the cleaning device comprises a debris collecting container (11).

10. Cleaning device (1, 31, 41, 51) according to one of the preceding claims, **characterized in that** the deflector comprises pen shaped elements (63, 83), the ends of which are being pressed against the bristles of the brush.

11. Cleaning device (31, 41) according to one of the preceding claims, **characterized in that** the deflector is adjustable with respect to the brush.

12. A vacuum cleaner comprising at least a vacuum source and a cleaning device according to one of the preceding claims.

Patentansprüche

1. Reinigungsvorrichtung (1, 31, 41, 51) zum Reinigen einer Oberfläche, wobei die Reinigungsvorrichtung wenigstens eine Bürste (3, 4) aufweist, die in einer Drehrichtung drehbar und über die zu reinigende

Oberfläche verlagerbar ist, sowie wenigstens einen Deflektor (13, 14, 52, 53, 71, 81) aufweist, der die Borsten (17) der Bürste berührt, und zwar an einer Stelle, gesehen in der Drehrichtung, vor der Stelle, wo die Borsten die zu reinigende Oberfläche (16) berühren, **dadurch gekennzeichnet, dass** der Deflektor (13, 14, 52, 53, 71, 81) entgegen Federkraft beweglich ist, wenn die Borsten der Bürste mit dem Deflektor in Berührung kommen, wenn die Bürste in Drehung gesetzt ist.

2. Reinigungsvorrichtung (1, 31, 41, 51) nach Anspruch 1, **dadurch gekennzeichnet, dass** der Deflektor wenigstens ein biegsames plattenförmiges Element aufweist, das entgegen Federkraft des plattenförmigen Elementes biegebar ist.

3. Reinigungsvorrichtung (1, 31, 41, 51) nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** die Starrheit des Deflektors weniger ist als $200 \cdot 10^{-3}$ N/mm vorzugsweise $20 \cdot 10^{-3}$ N/mm und am liebsten $2 \cdot 10^{-3}$ N/mm je mm Länge der Bürste.

4. Reinigungsvorrichtung (1, 31, 41, 51) nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** die Borsten (17) durch den Deflektor (13, 14, 52, 53, 71, 81) dermaßen gebogen werden, dass bei Kontaktverlust mit dem Deflektor die Saugkraft zwischen den Borsten größer ist als der Luftvertrieb aus den Borsten bei Kontakt mit der zu reinigenden Oberfläche.

5. Reinigungsvorrichtung (1, 31, 41, 51) nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** die Krümmung der Borsten (17) durch den Deflektor (13, 14, 52, 53, 71, 81) größer ist als die Krümmung der Borsten durch die zu reinigende Oberfläche (16).

6. Reinigungsvorrichtung (1, 31, 41, 51) nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** die Reinigungsvorrichtung wenigstens zwei Bürsten (3, 4) aufweist, die auf der zu reinigenden Oberfläche (16) in einander entgegengesetzten Richtungen auf einander zu drehbar sind, wobei wenigstens zwei Deflektoren (13, 14, 52, 53, 71, 81) vorgesehen sind, die gegen die Borsten (17) der Bürsten drücken, wobei jeder Deflektor an einer Seite einer Bürste vorgesehen ist, die von der anderen Bürste abgewandt ist.

7. Reinigungsvorrichtung (1, 31, 41, 51) nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** die Reinigungsvorrichtung mit wenigstens einem Seitendeflektor versehen ist, der gegen die Borsten in der Nähe eines Endes der Bürste drückt.

8. Reinigungsvorrichtung (1, 31, 41, 51) nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** die Reinigungsvorrichtung eine Reinigungsflüssigkeitskammer (9) aufweist.
9. Reinigungsvorrichtung (1, 31, 41, 51) nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** die Reinigungsvorrichtung einen Schmutzsammelbehälter (11) aufweist.
10. Reinigungsvorrichtung (1, 31, 41, 51) nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** der Deflektor stiftförmige Elemente (63, 83) aufweist, deren Enden gegen die Borsten der Bürste gedrückt werden.
11. Reinigungsvorrichtung (31, 41) nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** der Deflektor gegenüber der Bürste einstellbar ist.
12. Staubsauger mit wenigstens einer Saugquelle und einer Reinigungsvorrichtung nach einem der vorstehenden Ansprüche.

Revendications

1. Dispositif de nettoyage (1, 31, 41, 51) pour nettoyer une surface, le dispositif de nettoyage comprenant au moins une brosse (3, 4) qui peut tourner dans une direction de rotation et qui est mobile par-dessus la surface à nettoyer, et au moins un déflecteur (13, 14, 52, 53, 71, 81) qui est en contact avec les poils (17) de la brosse à un emplacement, vu dans la direction de rotation, devant l'emplacement où les poils entrent en contact avec la surface à nettoyer (16), **caractérisé en ce que** le déflecteur (13, 14, 52, 53, 71, 81) est mobile contre une force résiliente lorsque les poils de la brosse entrent en contact avec le déflecteur lorsque la brosse est en cours de rotation.
2. Dispositif de nettoyage (1, 31, 41, 51) selon la revendication 1, **caractérisé en ce que** le déflecteur comprend au moins un élément en forme de plaque flexible qui est pliable contre une force résiliente de l'élément en forme de plaque flexible.
3. Dispositif de nettoyage (1, 31, 41, 51) selon la revendication 1 ou selon la revendication 2, **caractérisé en ce que** la rigidité du déflecteur est inférieure à $200 \cdot 10^{-3}$ N/mm, de préférence égale à $20 \cdot 10^{-3}$ N/mm et plus préférentiellement égale à $2 \cdot 10^{-3}$ N/mm par millimètre de longueur de la brosse.
4. Dispositif de nettoyage (1, 31, 41, 51) selon une des revendications précédentes 1 à 3, **caractérisé en**

ce que les poils (17) sont pliés par le déflecteur (13, 14, 52, 53, 71, 81) dans une mesure que l'aspiration entre les poils lorsqu'ils perdent le contact avec le déflecteur est plus grande que l'expulsion de l'air à partir d'entre les poils lorsqu'ils entrent en contact avec la surface à nettoyer.

5. Dispositif de nettoyage (1, 31, 41, 51) selon une des revendications précédentes 1 à 4, **caractérisé en ce que** le pliage des poils (17) par le déflecteur (13, 14, 52, 53, 71, 81) est plus grand que le pliage des poils par la surface à nettoyer (16).
6. Dispositif de nettoyage (1, 31, 41, 51) selon une des revendications précédentes 1 à 5, **caractérisé en ce que** le dispositif de nettoyage comprend au moins deux brosses (3, 4) étant rotatives dans des directions opposées qui sont dirigées l'une vers l'autre à l'endroit de la surface à nettoyer (16), cas suivant lequel au moins deux déflecteurs (13, 14, 52, 53, 71, 81) sont prévus de manière à presser contre les poils (17) des brosses, chaque déflecteur étant situé d'un côté d'une brosse dans un sens s'éloignant de l'autre brosse.
7. Dispositif de nettoyage (1, 31, 41, 51) selon une des revendications précédentes 1 à 6, **caractérisé en ce que** le dispositif de nettoyage est pourvu d'au moins un déflecteur latéral pressant contre les poils de la brosse qui se situent près d'une extrémité de la brosse.
8. Dispositif de nettoyage (1, 31, 41, 51) selon une des revendications précédentes 1 à 7, **caractérisé en ce que** le dispositif de nettoyage comprend une chambre de fluide de nettoyage (9).
9. Dispositif de nettoyage (1, 31, 41, 51) selon une des revendications précédentes 1 à 8, **caractérisé en ce que** le dispositif de nettoyage comprend un récipient collecteur de débris (11).
10. Dispositif de nettoyage (1, 31, 41, 51) selon une des revendications précédentes 1 à 9, **caractérisé en ce que** le déflecteur comprend des éléments en forme de cheville (63, 83) dont les extrémités sont pressées contre les poils de la brosse.
11. Dispositif de nettoyage (31, 41) selon une des revendications précédentes 1 à 10, **caractérisé en ce que** le déflecteur est réglable par rapport à la brosse.
12. Aspirateur comprenant au moins une source à vide et un dispositif de nettoyage selon une des revendications précédentes 1 à 11.

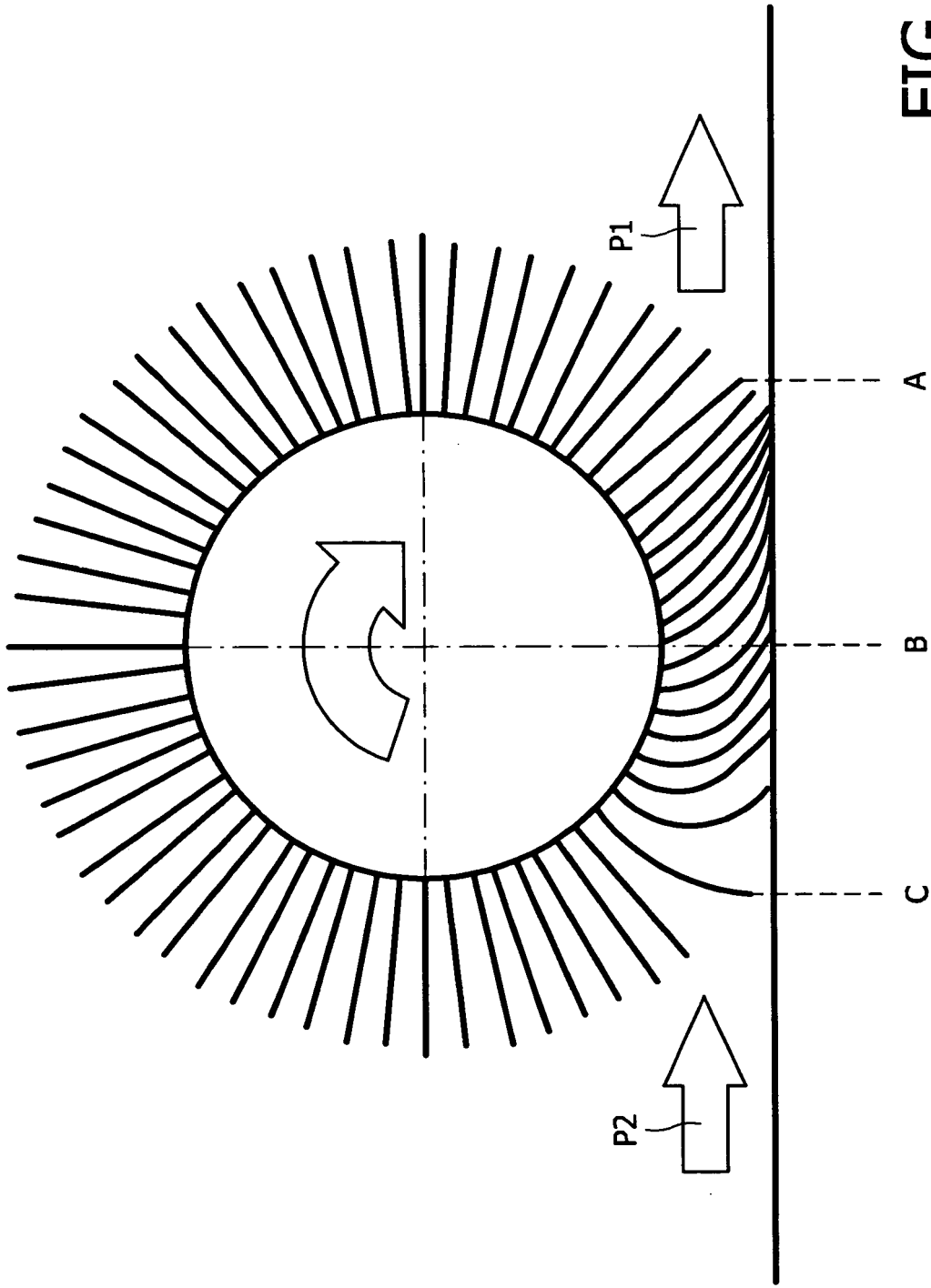


FIG. 1

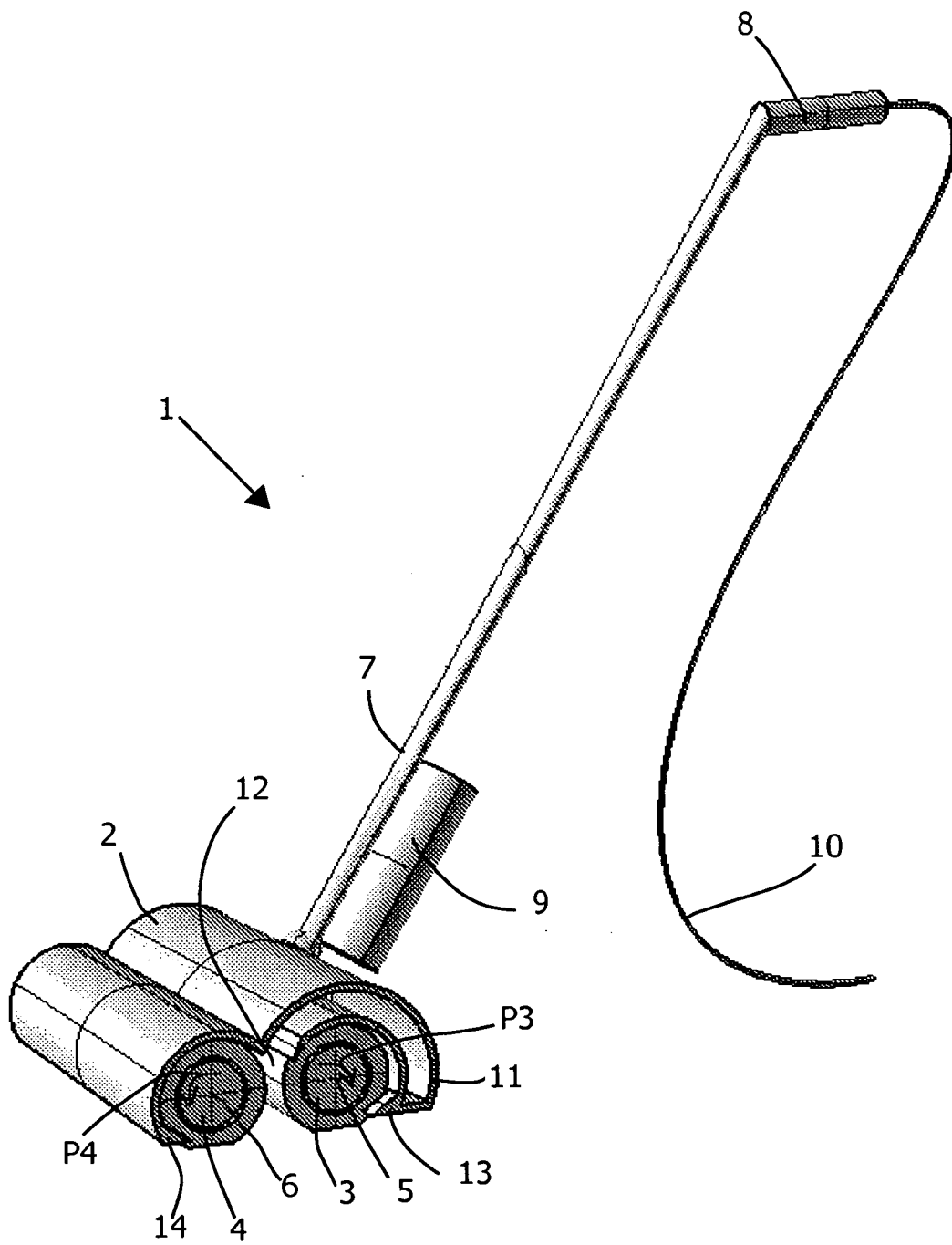


FIG. 2

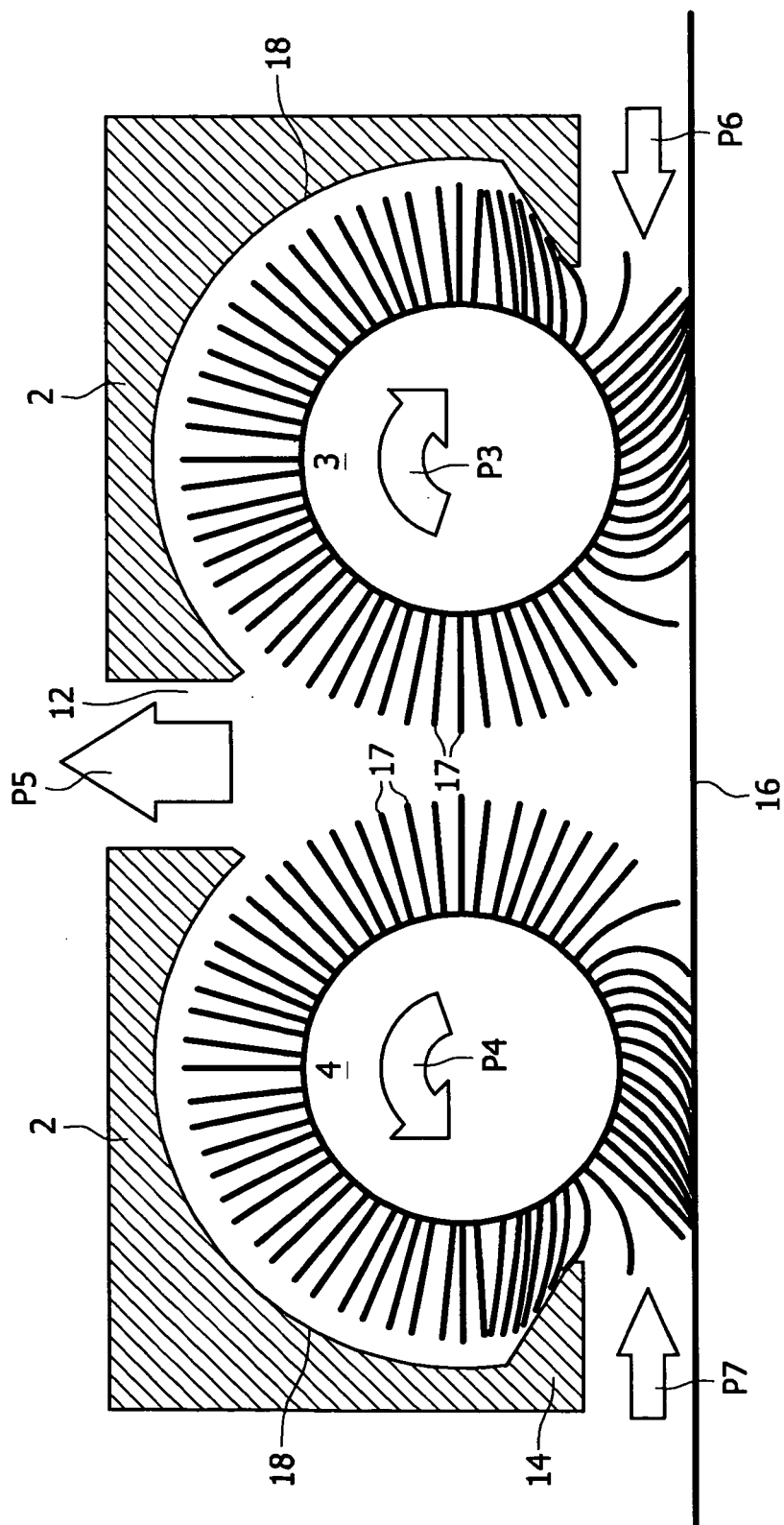


FIG. 3

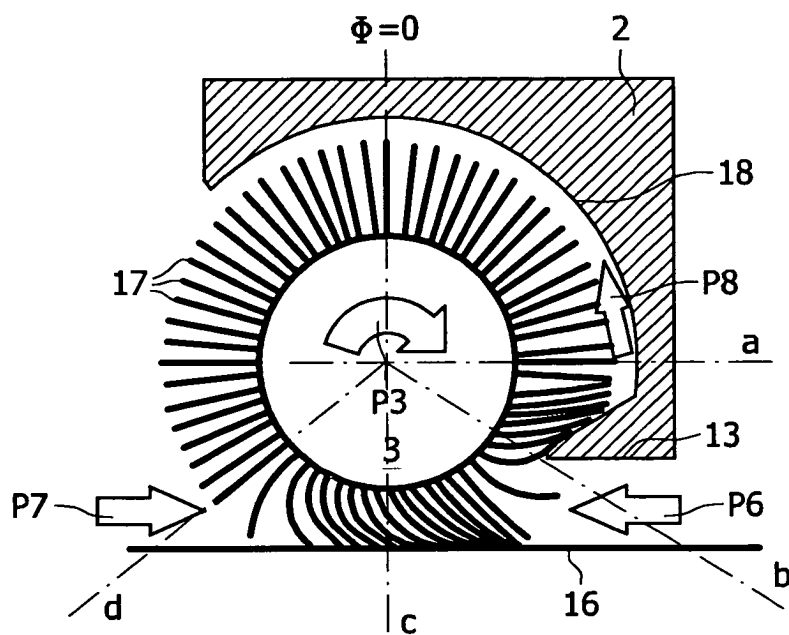


FIG. 4A

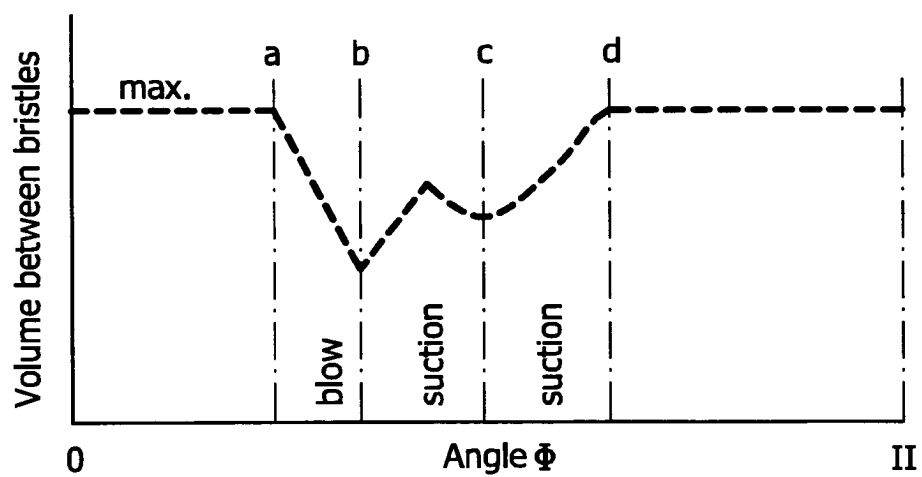


FIG. 4B

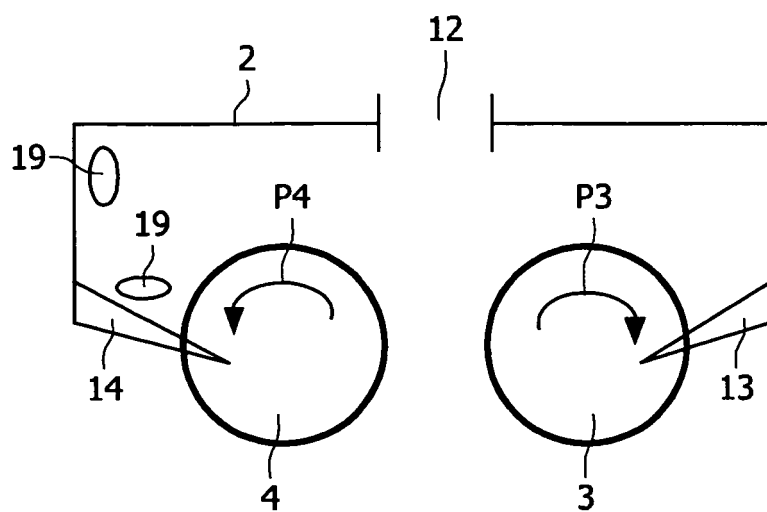


FIG. 5A

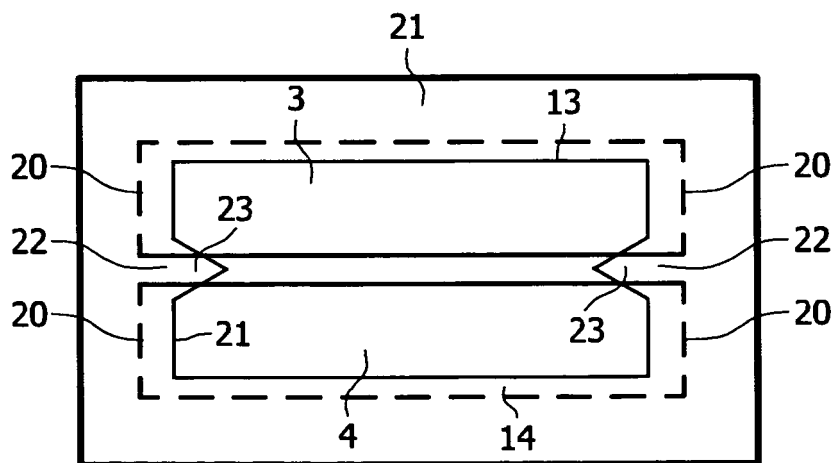


FIG. 5B

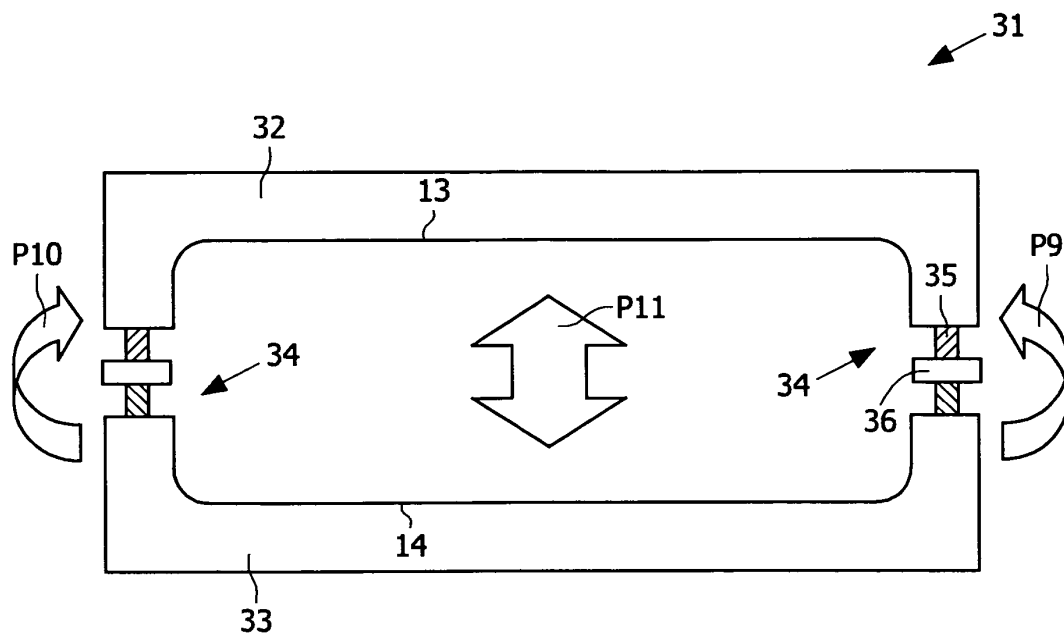


FIG. 6

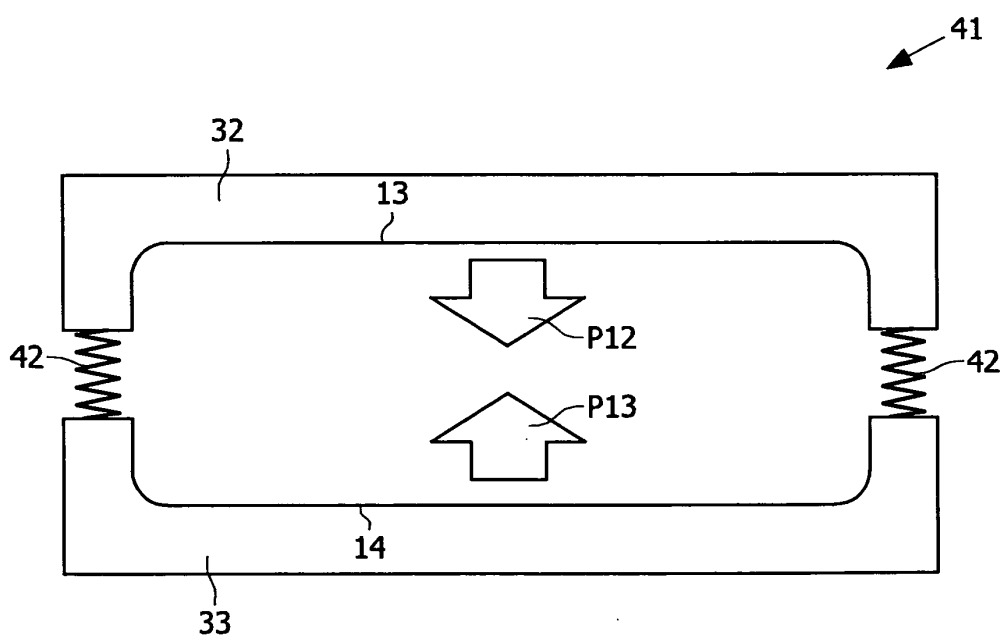


FIG. 7

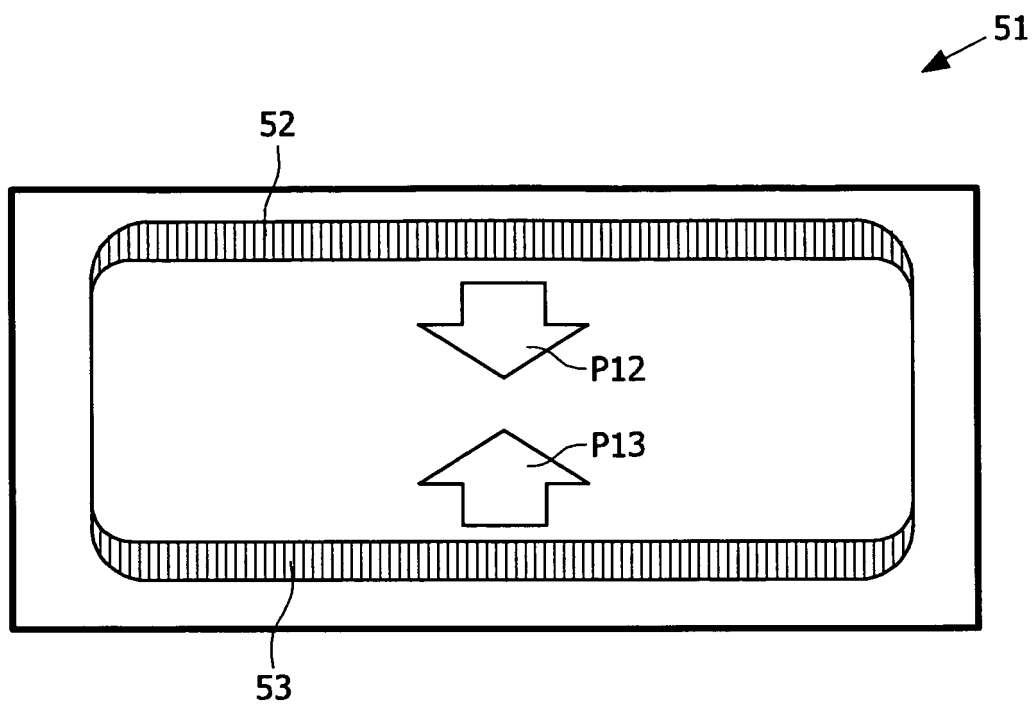


FIG. 8

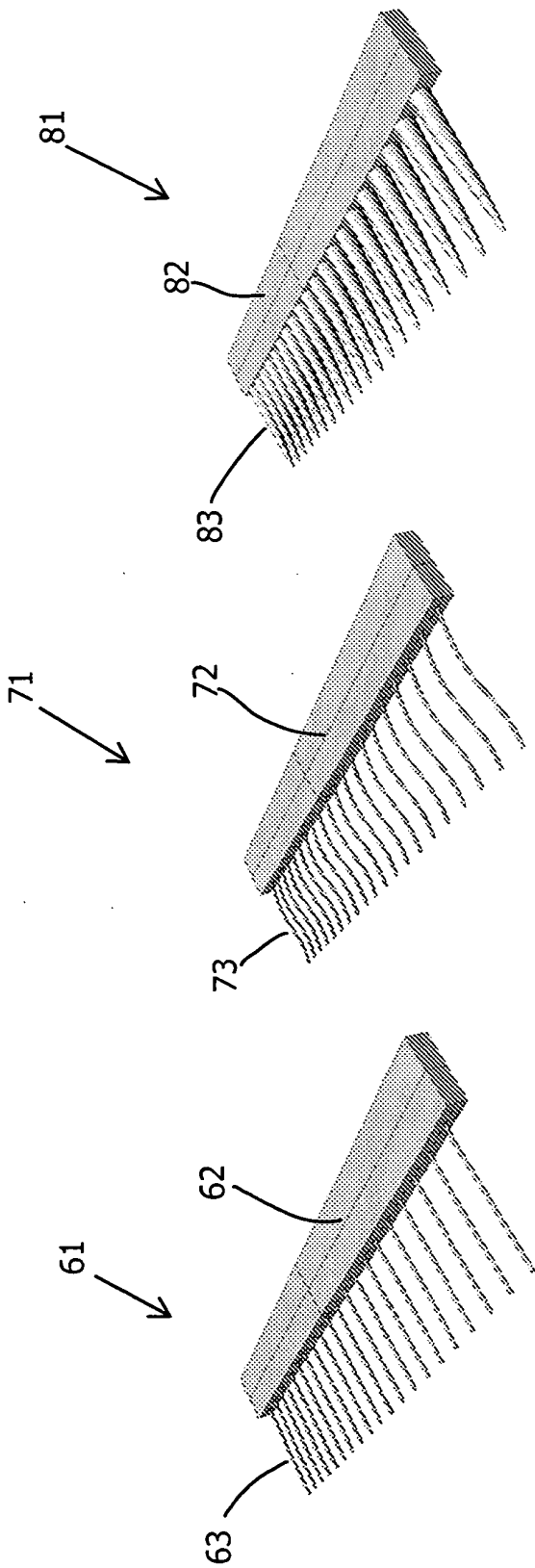


FIG. 9

FIG. 10

FIG. 11

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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