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(54) **ELECTRICALLY DRIVEN BRUSH DEVICE**

(57) There is provided an electrically driven brush device allowing a plurality of protrusions to be pressed evenly against an entire portion of a scalp. The electrically driven brush device comprises a device main body 2 serving as a drive section and a brush member 3 operated by the device main body 2. The brush member 3 comprises a body plate 4 made of a flexible material and a plurality of protrusions 5 protruding from a surface 4S

of the body plate 4. The device main body 2 is provided with a frame 6 holding an edge 4A of the body plate 4. The frame 6 is provided so as to be curved so that an outer section 6B thereof is formed further away from the device main body 2 than an inner section 6A thereof. As a result, even if the body plate 4 of the brush member 3 and the frame 6 holding the body plate 4 are formed in noncircular shapes, the uniformity of the pressing force of the protrusions 5 against the scalp S can be improved.

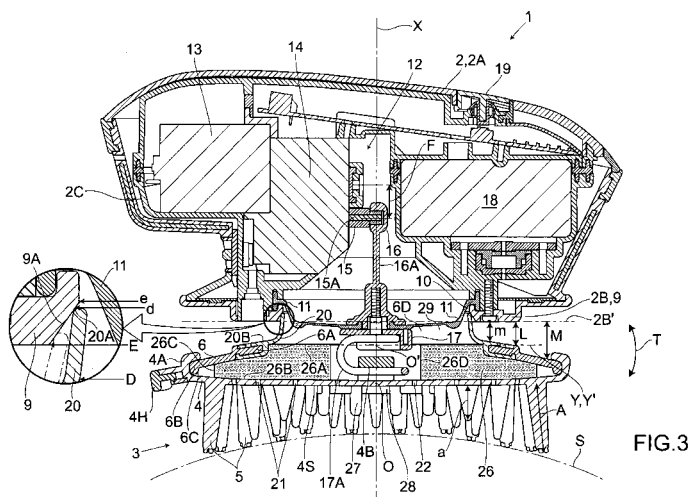


FIG.3

Description

TECHNICAL FIELD

[0001] The present invention relates to an electrically driven brush device, and more particularly to an electrically driven brush device capable of being used to wash and massage a scalp.

BACKGROUND ART

[0002] Conventionally, as such a kind of electrically driven brush device, there has been known a massaging device including a drive section and a treating section (corresponding to a brush member of the present invention) operated by the drive section. The drive section is provided with a frame that holds a peripheral edge of a body plate of the treating section in a freely detachable manner with the positional relationship of the treating section relative to the drive section being fixed. A reciprocating drive means which is connected to the center of the body plate and deflects the body plate in a direction orthogonal to a surface of the body plate is also provided, and the treating section includes the body plate formed of a flexible material and a plurality of protrusions protrudingly provided on the body plate. According to such a massaging device, a user grasps the drive section and then holds the drive section with the tips of the protrusions being pressed against a scalp S and the body plate of the treating section is deflected by the reciprocating drive means, so that a plurality of the protrusions provided on the body plate are repeatedly laid down and risen up in response to the deflection of the body plate and thereby repeatedly become close to and apart from one another. The scalp can be massaged in a complex manner so as to be kneaded, scrubbed and tapped by the protrusions allowed to become close to and apart from one another. As shown in FIG. 8 and FIG. 9, when a body plate 103 in a treating section 102 driven by the drive section 101 repeats deformation between a downwardly deflected curved convex state and a upwardly deflected curved concave state, a plurality of kinds of protrusions 104, 105 arranged ranging from the center of the body plate 103 to the periphery thereof moves in response to the deflection of the body plate 103, so that a scalp S is massaged by the protrusions 104, 105 pressed against the scalp S as if the scalp S is massaged by fingers. The periphery of the body plate 103 is attached to a frame 106, and a reservoir 108 for containing shampoo, for example, is arranged between the body plate 103 and a stretchable cover 107 above the body plate 103. The reservoir 108 is formed of marine sponge (natural sponge) or a synthetic sponge made of an interconnected-cell-type polyurethane foam or the like or foamed rubber. As shown in FIG. 8, when the body plate 103 is in the downwardly deflected curved convex state, the reservoir 108 is either slightly compressed or almost not compressed. In contrast, as shown in FIG. 9, when the body plate 103 is in

the upwardly deflected curved concave state, the reservoir 108 is compressed, thus causing a shampoo to be discharged to the outside of communicating portions 109 provided on the protrusions 105 (e.g., patent document 1).

[0003] Further, an electrically driven brush device is also known, which has an edge of a body plate freely slidable relatively to the frame of a drive section (e.g., patent document 2).

Related Art Document

Patent Document:

[0004]

Patent document 1: Japanese Unexamined Patent Application Publication No. 2008-228922

Patent document 2: Japanese Unexamined Patent Application Publication No. 2006-187544

DISCLOSURE OF THE INVENTION

25 Problem to be solved by the invention

[0005] While a human head to be washed or massaged tends to have a substantially curved convex shape, the frame 106 holding the body plate 103 is flat. For this reason, the frame 106 cannot be arranged so as to conform with the scalp S when applying the treating section 102 of the electrically driven brush device to the scalp S. Instead, the frame 106 is positioned in parallel to a tangent line on the scalp S without being positioned along the scalp S. As a result, depending on a certain shape of the body plate 103 of the treating section 102, even if the protrusions 104, 105 are pressed against the scalp S, the protrusions 104, 105 are not evenly pressed against the scalp S due to the fact that the frame 106 does not conform with the scalp S, so that an unstable usage condition of the electrically driven brush device with respect to the scalp S results, being forced for the electrically driven brush section to be used in such an unstable condition. Further, in such an electrically driven brush device, the deflection concentrically propagates with a central focus on the center of the body plate 103 where the amplitude of the body plate 103 is maximized. Therefore, if the body plate 103 does not have a circular shape when viewed from the top, there will occur areas on the body plate 103 where the deflection is less than the other areas. Then, the protrusions located in such areas are substantially motionless, thus resulting in a low washing or massaging effect.

[0006] Therefore, it is an object of the present invention to provide an electrically driven brush device with a brush member connected to a drive section, and capable of washing or massaging a scalp by allowing protrusions of the brush member to be pressed against the scalp as if

fingertips were used, thus enabling a plurality of the protrusions to be pressed against the scalp and effective washing or massaging to be realized.

Means for solving the problem

[0007] An electrically driven brush device according to a first aspect of the present invention, comprises a drive section provided with a frame for holding a peripheral edge of a body plate, and a brush member which is operated by the drive section and includes the body plate made of a flexible material; and a plurality of protrusions protruding from a surface of the body plate. In the electrically driven brush device, the frame has an outer section formed further away from the drive section than an inner section thereof and such an outer section is provided on an outer circumference of the inner section.

[0008] The invention according to a second aspect is the electrically driven brush device according to the first aspect, in which the frame is formed in a curved shape ranging from the inner section to the outer section thereof.

[0009] The invention according to a third aspect is the electrically driven brush device according to the second aspect, in which the frame is structured so that an outer edge conforms with one virtual spherical surface.

[0010] The invention according to a fourth aspect is the electrically driven brush device according to the second aspect or the third aspect, in which the body plate has an oval shape in planar view.

Effects of the invention

[0011] According to the electrically driven brush device of the first aspect of the invention, the outer section of the frame is formed further away from the drive section than the inner section thereof to cause the frame itself to conform with a scalp, thus allowing the frame and the body plate of the brush member attached thereto to conform with the scalp even when they are formed in non-circular shapes. As a result, a plurality of the protrusions of the brush member can be pressed evenly against to the scalp.

[0012] According to the electrically driven brush device of the second aspect of the invention, the frame is formed in the curved shape ranging from the inner section to the outer section thereof, thus making it easier for the brush member held by the frame to abut against the scalp formed in a curved convex shape.

[0013] According to the electrically driven brush device of the third aspect of the invention, the brush member is held by the frame having the outer edge conforming with one virtual spherical surface, thereby allowing the entire body plate of the brush member to be deflected if the body plate and the outer edge of the frame have a substantially identical shape in planar view to that of outer edge of the frame, thus making it possible to efficiently perform washing or massaging.

[0014] According to the electrically driven brush device

of the fourth aspect of the invention, the body plate has the oval shape in planar view, thus more effectively conforming with the scalp.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015]

FIG.1 is an overall perspective view showing from above a first embodiment of the present invention.

FIG.2 is an overall perspective view showing from underneath the first embodiment of the present invention.

FIG.3 is a cross-sectional view of the first embodiment of the present invention.

FIG.4 is an exploded perspective view showing the periphery of a frame of the first embodiment of the present invention.

FIG.5 is an exploded perspective view showing the periphery of a brush member of the first embodiment of the present invention.

FIG.6 is a cross-sectional view of a second embodiment of the present invention.

FIG.7 is an exploded perspective view showing the periphery of a frame of the second embodiment of the present invention.

FIG.8 is a cross-sectional view of the periphery of a curved convex brush member showing a conventional example.

FIG.9 is a cross-sectional view of the periphery of a curved concave brush member showing the conventional example.

BEST MODE FOR CARRYING OUT THE INVENTION

[0016] Preferred embodiments of the present invention are described hereunder with reference to the accompanying drawings. The embodiments shall not limit the contents of the present invention that are described in claims. Further, not all features described hereunder are necessarily essential elements of the present invention.

First embodiment

[0017] A first embodiment is shown in FIG.1 through FIG.5. In the present embodiment, upward and downward directions are defined based on a stationary posture of an electrically driven brush device shown in FIG.3. Reference numeral 1 represents the electrically driven brush device of the present invention. The electrically driven brush device 1 comprises a device main body 2 that is a drive section, and a brush member 3 freely detachably held at a lower side of the device main body 2.

[0018] The brush member 3 includes a body plate 4 and a plurality of protrusions 5 which are integrally formed on a surface 4S that is a bottom face of the body plate 4 so as to protrude in the downward direction that is a di-

rection orthogonal to the surface 4S. The body plate 4 is so formed that the surface 4S from which the protrusions 5 protrude is convexed in a natural state in which the body plate 4 is not connected to the device main body 2. Further, the body plate 4 has an oval shape in planar view, and is made of flexible and elastic elastomer. Furthermore, a plurality of the protrusions 5 is also integrally formed on the body plate 4. Particularly, a downward-protruding length "A" of a protrusion 5 on an outer side is greater than a downward-protruding length "a" of a protrusion 5 on an inner side ($a < A$). Furthermore, an edge 4A of the body plate 4 is fixed to an edge of a frame 6 provided on a bottom-face-2B side integrally formed on the device main body 2.

[0019] In addition, the term "fix" used here also includes a connection allowing slight movement. According to the present embodiment, the edge 4A of the body plate 4 is fitted into the frame 6, so that the edge and the frame can be detachably connected together around the whole circumference thereof. Further, a reference symbol "4H" in the drawings represents a grab integrally provided on one end of the body plate 4 in a longer diameter direction Y orthogonal to a center axis line X orthogonal to the center O of the plane of the body plate 4. Furthermore, reference symbol "Z" in the drawings represents a shorter diameter direction of the body plate 4.

[0020] The frame 6 is made of an elastically deformable synthetic resin, though not as easily deformable as the elastomer forming the brush member 3. Further, the frame 6 has an oval shape substantially identical to the shape of body plate 4 in planar view. Here, a center of the frame 6 in plain view is located on the center axis line X. The frame 6 is provided slightly below the bottom face 2B of the device main body 2 having a clearance L.

[0021] Further, the frame 6 is provided so as to be capable of wobbling to the device main body 2 through a support mechanism 7, which is arranged on both ends of a shorter diameter direction Z' orthogonal to the center line axis X of the body plate 4.

[0022] With regard to the shape of the frame 6 in a longer diameter direction Y', an outer section 6B positioned distantly from a center O' is formed so as to be located further away from the device main body 2 than an inner section 6A positioned nearer to the center O' through which the center axis line X passes. Particularly, as shown in FIG.3, a virtual horizontal plane 2B' including the horizontal bottom face 2B is considered as a reference plane in the longer diameter direction Y'. Then, a distance M between the outer section 6B and the virtual horizontal plane 2B' directly facing the outer section 6B, becomes progressively longer than a distance m between the inner section 6A positioned nearer to the center O' and the virtual horizontal plane 2B' directly facing the inner section 6A ($m < M$). Therefore, the frame 6 is formed in a substantially arc shape in the longer diameter direction Y' so as to be high in the inner section 6A positioned nearer to the center O' and become lower progressively toward the outer section 6B. A curvature of the arc of the

frame 6 is substantially identical to an average curvature of a scalp S, and an outer edge 6C of the frame 6 is configured to conform with one virtual spherical surface.

[0023] Meanwhile, with regard to the shape of the frame 6 in the shorter diameter direction Z', each section along the shorter diameter direction Z' is substantially equally distant, by a distance N, from the virtual horizontal plane 2B' directly facing such a section. Namely, the frame 6 is formed flatly in the shorter diameter direction Z'. However, the shape of the frame 6 in the shorter diameter direction Z' may be formed in an arc shape.

[0024] Further, a downward small protrusion is formed on the outer edge 6C of the outer section 6B of the frame 6. Accordingly, the edge 4A of the body plate 4 of the brush member 3 is allowed to engage with the outer edge 6C of the frame 6, while the edge 4A is formed in a toppled "U" shape or a "C" shape after being bended upwardly and then inwardly. A window opening 6D formed in an inward of the frame 6 has a circular shape in planar view with the center axis line X defined as a center. An after-mentioned packing 20 made of a flexible and elastic material such as an elastomer or the like, is provided between the window opening 6D and the bottom face 2B of a case main body 2A.

[0025] The support mechanism 7 is composed of shafts 8 and shaft bushes 8A. Each shaft 8 is provided on both left and right sides of a bottom plate 9 constructing the bottom face 2B of the device main body 2. Particularly, each of the shafts 8 outwardly protrudes from both sides of a wobble rotation center axis Z" parallel to and located slightly above the shorter diameter direction Z' orthogonal to the center line axis X. Further, each shaft bush 8A for receiving each shaft 8 is provided on both left and right sides of the frame 6. According to the present embodiment, the shaft bushes 8A are provided on upper sections of a pair of hanging members 6F protruding from an upper surface of the frame 6, in such a manner that the wobble rotation center axis Z" becomes parallel to the shorter diameter direction Z'. The shaft bushes 8A provided on the upper sections of the hanging members 6F allow the shafts 8 to be rotatably connected thereto, thus allowing the frame 6 to wobble with the shafts 8 serving as rotation centers. As shown in the drawings, a symbol "8B" represents a lid covering the outside of each shaft bush 8A.

[0026] The device main body 2 includes the case main body 2A that has an opened bottom-face side and is in a size holdable by one hand, and bottom face 2B that blocks off the opened bottom-face side of the case main body 2A. The bottom face 2B includes the bottom plate 9 and a cover 11. The bottom plate 9, when viewed from the top, has an oval shape substantially identical to an outer shape of the frame 6. The bottom plate 9 has an outer periphery fixed to a bottom edge of the case main body 2A, and is formed with a circular window opening 10 passing all the way through the center of the bottom plate 9 in the vertical direction. The cover 11 that is stretchable is provided so as to cover window opening

10. The cover 11 is a bellows film formed of a flexible material, such as a rubber, a synthetic rubber, or an elastomer, and water-tightly blocks off the window opening 10. Here, an outer edge of the cover 11 is held between a chassis 2C of the device main body 2 and the bottom plate 9, thus allowing the cover 11 to be air-tightly attached to the bottom plate 9.

[0027] A reciprocating drive means 12 that causes the center O of the body plate 4 to reciprocate in the vertical direction is provided on the chassis 2C disposed inside the device main body 2. The reciprocating drive means 12 includes a motor 13 that is a drive source, a crank 15 connected to a motor shaft (not shown) of the motor 13 through a reduction gear mechanism 14; a yoke 16 coupled to an eccentric shaft 15A of the crank 15; and a rod 16A formed integrally with the yoke 16. As described above, a so-called scotch-yoke mechanism is employed in the present embodiment, but a crank mechanism may be employed.

[0028] An interconnection member 17 is joined integrally to the cover 11 at the substantial center thereof. The interconnection member 17 holds and fixes the cover 11 water-tightly between an upper surface side of the interconnection member 17 and a lower end of the rod 16A, and is provided with a hook 17A at the bottom face side of interconnection member 17. A hook receiver 4B provided on the upper surface of the center of the body plate 4 is freely detachably coupled to the hook 17. Hence, the interconnection member 17 is reciprocated in the vertical direction as a rotational motion of the motor 13 is converted into a reciprocal motion by the crank 15 and the yoke 16. Accordingly, the position where the hook receiver 4B is provided becomes a maximum amplitude location of the body plate 4, and the amplitude thereof is twice as large as an eccentric distance F from the center axis of the crank 15 to the eccentric shaft 15A (i.e., 2F). Further, both the hook receiver 4B and the interconnection member 17 are arranged on the center axis line X. Furthermore, a battery 18 that supplies power to the motor 13 is provided on the chassis 2C provided inside the device main body 2, and a switch 19 for operating the motor 13 is provided on an upper surface of the device main body 2.

[0029] Next, the packing 20 is described. The packing 20 is made of a flexible material such as a rubber, a synthetic rubber, an elastomer or the like, and has a circular ring shape in planar view with the center axis line X defined as its center. The packing 20 is formed in a substantially truncated conical shape with a diameter "d" of an upper section 20A made larger than a diameter "D" of a lower section 20B ($d < D$). Further, the upper section 20A of the packing 20 is pressed against an inner periphery 9A of the bottom plate 9 in a line contact manner, thus allowing the both to be connected air-tightly to each other and demarcating an expandable and contractible space 29, described later. The inner peripheral surface 9A is formed in a tapered surface of a substantially truncated conical shape with a diameter "E" of a lower section

becoming progressively larger than a diameter "e" of an upper section ($e < E$). Particularly, as described later, the upper section 20A of the packing 20 is structured so as not to deviate from the inner periphery 9A as the body plate 4 repeatedly undergoes deformation between a curved convex state in which the body plate 4 is downwardly deflected and a curved concave state in which the body plate 4 is upwardly deflected, and as the frame 6 wobbles with the shafts 8 defined as a center. Therefore, the diameter "d" is formed so as to be either substantially equal to or larger than the diameter "e", and either substantially equal to or smaller than the diameter "E" ($e \leq d \leq E$). At the same time, the lower section 20B of the packing 20 is formed integrally with the inner section 6A of the frame 6 through insert molding.

[0030] First communicating portions 21 and second communicating portions 22 are further provided on the body plate 4. The first communicating portions 21 and second communicating portions 22 are small through-holes for allowing an interior region of the expandable and contractible space 29 and an exterior region thereof to communicate with each other. The expandable and contractible space 29 is surrounded by the frame 6; the packing 20 connected to an upper section of the frame 6; the bottom plate 9 in contact with the packing 20; the cover 11 connected air-tightly to the bottom plate 9; and the body plate 4 attached to a lower section of the frame 6. Further, a shampoo reservoir 26 is provided in the expandable contractible space 29 and communicates with both the first communicating portions 21 and the second communicating portions 22 and further is operated in response to a deflection of the body plate 4. Furthermore, a plurality of tiny protrusions 27 are provided annularly on the surface 4S of the body plate 4 around the center axis line X. Besides, an annular wall 28 is also provided on the surface 4S of the body plate 4 so as to connect adjoining tiny protrusions 27. The protrusive dimension of the annular wall 28 from the surface 4S is smaller than the protrusive dimension of the tiny protrusions 27. The tiny protrusions 27 and the annular wall 28 partition the internal side of the body plate 4 and the external side thereof. Further, the second communicating portions 22 are formed in a region surrounded by the tiny protrusions 27 and the annular wall 28. Conversely, the first communicating portions 21 are formed in a region outside the region surrounded by the tiny protrusions 27 and the annular wall 28.

[0031] The reservoir 26 repeats compression and restoration in response to the deflection of the body plate 4, thereby sucking or discharging the shampoo from the respective communicating portions 21, 22. The reservoir 26 is formed of marine sponge (natural sponge) or a synthetic sponge like interconnected-cell-type foamed polyurethane or a foamed rubber. When the body plate 4 is in a downwardly deflected curved convex state, the reservoir 26 becomes substantially non-compressed state or a slightly compressed state and is present in the expandable and contractible space 29. That is, when the

body plate 4 is in a downwardly deflected curved convex state, a top face 26A of the reservoir 26 contacts or is located near an under surface of the flame 6 and the cover 11, and an outer periphery 26C of the reservoir 26 contacts or is located near the downward tiny protrusions formed in the edge 4A of the body plate 4 and the outer edge 6C of the frame 6. Conversely, a through hole 26D is formed at the center of the reservoir 26 along the center axis line X. The hook receiver 4B and hook 17A can be joined together through the through hole 26D.

[0032] Next, the effect of the above-described configuration will be described. First of all, a user turns over the device main body 2 so as to place the reservoir 26 on the frame 6, then inserts the hook 17A through the through hole 26D of the reservoir 26 so as to allow the corresponding hook 17A to be connected to the hook receiver 4B of the body plate 4 of the brush member 3. Subsequently, the user engages the edge 4A of the body plate 4 of the brush member 3 with the outer edge 6C of the frame 6. In this way, the electrically driven brush device 1 is turned into a usable state. At that time, the body plate 4 of the brush member 3 is naturally in the curved convex state as mentioned earlier. However, the body plate 4 of the brush member 3 attached to the frame 6 is convexed less than a conventional configuration, in at least the longer diameter direction Y. This is because the frame 6 itself to which the brush member 3 is attached is in the curved concave state in the longer diameter direction Y'. In contrast, the body plate 4 of the brush member 3 is convexed more than the conventional configuration in a shorter diameter direction Z. Accordingly, in the curved convex state, the protrusions 5 in the longer diameter direction Y are slightly closer to one another as compared to the conventional configuration, and the protrusions 5 in the shorter diameter direction Z are slightly apart from one another as compared also to the conventional configuration. However, the protrusions 5 on both ends of the shorter diameter direction Z lean inwardly in the curved concave state by angles substantially identical to those of the conventional configuration.

[0033] Then, when attempting to wash or massage a scalp S, a user first puts an appropriate amount of water in the reservoir 26 beforehand. The water can be adsorbed in the reservoir 26 through respective communicating portions 21, 22 by dipping the electrically driven brush device 1 in water. Next, the electrically driven brush device 1 is turned over from a state shown in FIG.3 so as to turn up the surface 4S of the body plate 4, and then an appropriate amount of shampoo is poured from a shampoo container (not shown) into the region surrounded by the tiny protrusions 27 and the annular wall 28. At this time, no shampoo is poured into the region surrounded by the tiny protrusions 27 and the annular wall 28 outflows to the exterior region of the tiny protrusions 27 and the annular wall 28 as long as the amount is not excessive. The reservoir 26 is soaked with a tiny amount of shampoo through the second communicating portions 22.

[0034] Next, upon operating the switch 19, power is supplied from the battery 18, so that the motor 13 is operated and the motor shaft 13A rotates. In association with this rotation, the crank 15 connected to the motor shaft 13A through the reduction gear mechanism 14, also rotates, and the rotational motion of the motor shaft 13A is converted into a reciprocal motion by the crank 15 and the yoke 16 joined with the eccentric shaft 15A of the crank 15, thereby reciprocating, in the vertical direction, the interconnection member 17 attached to the lower end of the rod 16A formed integrally with the yoke 16. Next, the body plate 4 repeats deformation between a downwardly deflected curved convex state and an upwardly deflected curved concave state like the related art so that the hook receiver 4B connected to the hook 17A provided at the interconnection member 17, i.e., the center of the body plate 4 becomes a maximum amplitude location. The amplitude of the maximum amplitude location is twice as large as the eccentric distance F from the center axis of the crank 15 to the eccentric shaft 15A (i.e., 2F).

[0035] In this fashion, by the repetitive operation of the body plate 4 for causing the deformation between a downwardly deflected curved convex state and an upwardly deflected curved concave state, the expandable and contractible space 29 is led to repeating compression and restoration. As a result, the reservoir 26 inside the expandable and contractible space 29 repeats the same in response to the deflection of the body plate 4. When the reservoir 26 returns from the compressed state, the expandable and contractible space 29 transfers to a depressurized state, so that the shampoo poured into the region inside the annular tiny protrusions 27 and the annular wall 28 is suctioned through the second communicating portions 22 to inflow into the expandable and contractible space 29, thus being stored in the reservoir 26. Conversely, when the reservoir 26 is compressed, the shampoo stored in the reservoir 26 is discharged through the second communicating portions 22. The shampoo is mixed with air when pushed out through the second communicating portions 22 to be foamed. By the repetitive deformation of the reservoir 26 in this fashion, the shampoo continues to gradually spread from the center of the reservoir 26 to the periphery, thus causing the shampoo foamed to be pushed out also through the first communicating portions 21. In this fashion, in response to the deformation repeated between the curved convex state and the curved concave state, the reservoir 26 is led to repeat compression and restoration to foam the shampoo poured into the region inside the tiny protrusions 27 and the annular wall 28, being supplies to the exterior throughout the whole of the brush members 3. In addition, the shampoo is finely foamed when passing through the communicating portions 21 and 22. As a result, the smaller the diameter of the communicating portions 21 and 22, the finer the shampoo is foamed.

[0036] With the shampoo being foamed as described above, a user holds the device main body 2 to press the tips of the protrusions 5 against the scalp S and holds

the device main body 2 by a hand. Accordingly, mainly the protrusions 5 repeat inclination in the inward direction in relation to the center axis line X and rising thereafter, so that the scalp S is scrubbed and washed or massaged with stimulation.

[0037] According to the conventional configuration, though depending on the shape of a scalp S, the protrusions 5 on both ends of the shorter diameter direction Z tend to firmly press against the scalp S, whereas the protrusions 5 on both ends of the longer diameter direction Y tend to gently press against the scalp S. However, according to the present embodiment and as mentioned earlier, the protrusions 5 in the longer diameter direction Y are slightly closer to one another as compared to the conventional configuration, and the protrusions 5 in the shorter diameter direction Z are slightly further apart from one another as compared also to the conventional configuration. Accordingly, with regard to the present embodiment, the protrusions 5 on both ends of the longer diameter direction Y are pressed against the scalp S slightly more firmly, and the protrusions 5 on both ends of the shorter diameter direction Z are pressed against the scalp S slightly more gently, as compared to the conventional configuration. Namely, the protrusions 5 are caused to be pressed evenly against the scalp S, thus resulting in a more improved washing or massaging effect as compared to the conventional configuration.

[0038] Further, according to the conventional configuration, the deflection of the body plate 4 is concentrically propagated with a central focus on the center O. Therefore, both ends of the body plate 4 in the longer diameter direction Y of the brush member 3 are hardly deflected, thus causing the protrusions 5 provided on both the ends to hardly contribute to washing or massaging. However, according to the present embodiment and as mentioned earlier, the outer edge 6C of the frame 6 is configured to conform with the one virtual spherical surface. Namely, the deflection of the body plate 4 of the present embodiment is also propagated with a central focus on the center O as is the case with the conventional configuration. However, the deflection is propagated not concentrically, but can occur in the whole of the body plate 4. Accordingly, even the protrusions 5 hardly contributing to washing or massaging conventionally can now contribute to washing or massaging, thus improving the washing or massaging effect. Further, as mentioned earlier, when the body plate 4 is in the curved convex state, the protrusions 5 in the shorter diameter direction Z are slightly further apart from one another as compared to the conventional configuration. And, when the body plate 4 is in the curved concave state, the protrusions 5 lean by angles substantially identical to those of the conventional configuration. Therefore, the protrusions 5 are allowed to move widely in the shorter diameter direction Z. Due to a synergistic effect brought about by the aforementioned effects, the electrically driven brush device 1 of the present embodiment can achieve the more improved washing or massaging effect as compared to the con-

ventional configuration.

[0039] Further, it is necessary to allow a plurality of the protrusions 5 to uniformly abut against the scalp S by causing the brush member 3 to properly face the scalp S. However, it is difficult for a user to visually recognize this state precisely, so that the brush member 3 roughly faces the scalp S with the device main body 2 being held. However, when the brush member 3 does not properly face the scalp S (namely, the center axis line X is inclined relatively to the scalp S), as is indicated by an arrow T, by the wobbling operation of the brush member 3 with the wobbling center axis line Z" defined as a center, the brush member 3 comes to be capable of abutting against the scalp S while properly facing the scalp S automatically, so that a plurality of the protrusions 5 can uniformly wash and massage the scalp S.

[0040] Particularly, when the brush member 3 wobbles with the shafts 8 defined as a center, since the upper section 20A of the packing 20 comes to be in press-contact with the inner periphery 9A of the bottom plate 9 and is air-tightly connected thereto, the shampoo does not leak out of the packing 20. Here, the upper section 20A of the packing 20 is not fixed to the inner periphery 9A of the bottom plate 9 but is slidably in press-contact therewith. Therefore, in response to force by which the brush member 3 wobbles with the shafts 8 defined as a wobbling center, a kinematic frictional resistance or a static frictional resistance is generated in a location where the upper section 20A of the packing 20 is in press-contact with the inner periphery 9A of the bottom plate 9. Thus, a resistive force can be reduced as much as possible when applying the press-contact instead of the fixing. As a result, the brush member 3 is allowed to smoothly wobble with the shafts 8 defined as a wobbling center.

[0041] The head of a human is not in a simple shape in reality, so that even if the brush member 3 properly faces the head surface, i.e., the scalp S, it is not always true that the scalp S is washed and massaged well by the protrusions 5. However, as described above, since the frame 6 is configured to be elastically deformable as the frame 6 is made of synthetic resin, when the brush member 3 is pressed against the scalp S, the body plate of the brush member 3 deflects in accordance with the shape of the scalp S, the frame 6 that is fixing the brush member 3 also deflects in response to the deflection of the body plate 4. With the frame 6 deflected along the scalp S, the body plate 4 of the brush member 3 is then repeatedly deflected between the curved convex state and the curved concave state, thus allowing the brush member 3 to conform with the scalp S and favorably perform washing or massaging.

[0042] As described above, according to the present embodiment, the electrically driven brush device 1 includes the device main body 2 that is a drive section and the brush member 3 that is operated by the device main body 2. The brush member 3 includes the body plate 4 formed of a flexible material and a plurality of the protrusions 5 protrudingly provided on the surface 4S of the

body plate 4. According to the electrically driven brush device 1 including the frame 6 holding the edge 4A of the body plate 4, the outer section 6B of the frame 6 is positioned further away from the brush device main body 2 than the inner section 6A ($m < M$), thus allowing the frame 6 itself for holding the body plate 4 of the brush member 3 to be formed so as to conform with the scalp S. In this way, the protrusions 5, made of a deflectable and flexible elastomer integrally formed on the body plate 4, are allowed to substantially evenly press against the scalp S.

[0043] Further, the frame 6 is formed in a curved shape ranging from the inner section 6A to the outer section 6B, thereby causing the frame 6 itself to conform with the scalp S having a curved convex shape, thus allowing the brush member 3 to be pressed against the scalp S much more evenly.

[0044] Furthermore, the brush member 3 is held by the frame 6 having the outer edge 6C conforming with the identical virtual spherical surface. Therefore, the entire body plate 4 of the brush member 3 can be deflected if formed in a shape substantially identical to that of the outer edge 6C, thus making it possible to efficiently perform washing or massaging.

Second embodiment

[0045] A second embodiment is shown in FIG.6 and FIG.7. Here, elements identical to those of the first embodiment are expressed by symbols used to denote the corresponding identical elements in the first embodiment. And, descriptions of such elements are omitted hereunder. According to a support mechanism 7' of the second embodiment, shaft bushes 8A are provided on a bottom plate 9, and shafts 8 inserted through the shaft bushes 8A are provided on a frame 6. Further, with regard to a packing 20' of the second embodiment, an upper section 20A' thereof is fixed to the bottom plate 9, whereas a lower section 20B' thereof is slidably allowed to be in press-contact with an upper surface of an inner section 6A of a frame 6 in an airtight and line contact manner.

[0046] Here, the same effects as those of the first embodiment can be achieved with such a kind of modified embodiment.

DESCRIPTION OF THE SYMBOLS

[0047]

1	electrically driven brush device
2	device main body (drive section)
3	brush member
4	body plate
4S	surface
5	protrusion
6	frame
6A	inner section
6B	outer section
m M	distance

Claims

1. An electrically driven brush device comprising:

a drive section;
a brush member that is operated by said drive section, said brush member comprising a body plate formed of a flexible material and a plurality of protrusions protrudingly provided on a surface of said body plate; and a frame provided on said drive section to hold a peripheral edge of said body plate, **characterized in that** said frame is formed so that an outer section of said frame provided on an outer circumference of an inner section of said frame is formed further away from said drive section than said inner section.

2. The electrically driven brush device according to claim 1, **characterized in that** said frame is formed in a curved shape ranging from said inner section to said outer section thereof.

3. The electrically driven brush device according to claim 2, **characterized in that** said frame is structured so that an outer edge conforms with one virtual spherical surface.

4. The electrically driven brush device according to claim 2 or claim 3, **characterized in that** said body plate has an oval shape in planar view.

Amended claims under Art. 19.1 PCT

1. (Currently amended) An electrically driven brush device comprising:

a drive section;
a brush member that is operated by said drive section, said brush member comprising a body plate formed of a flexible material and a plurality of protrusions protrudingly provided on a surface of said body plate; and a frame provided on said drive section to hold a peripheral edge of said body plate, **characterized in that** said frame is formed in an oval annular shape in planar view, and further is formed, in a longer diameter direction of said frame, so that an outer section of said frame provided on an outer circumference of an inner section of said frame is formed further away from said drive section than said inner section.

2. (Currently amended) The electrically driven brush device according to claim 1, characterized in that said frame is formed in a curved shape ranging from said inner section to said outer section thereof in the long-

er diameter direction.

3. (Original) The electrically driven brush device according to claim 2, **characterized in that** said frame is structured so that an outer edge conforms with one virtual spherical surface. 5

4. (Currently amended) The electrically driven brush device according to claim 2 or claim 3, **characterized in that** said body plate has an oval shape in planar view substantially identical to a shape of said frame. 10

With regard to claim 1 of the present invention, it is made clear that the frame is formed in the oval shape in planar view, and that the outer section provided on the outer circumference of the inner section of the frame is formed further away from the drive section than the inner section of the frame in the longer diameter direction of the frame. 15

Japanese Unexamined Patent Application Publication No. 2006-116222 (hereunder, referred to as patent document 1) discloses an electrically driven brush device comprising a drive section and a brush member. The brush member is composed of a body plate and a plurality of protrusions, and the drive section is provided with a frame holding an edge of the body plate and having an oval shape in planar view. According to this electrically driven brush device, the deflection of the body plate is concentrically propagated with the center of the frame centered, the center being a location where the amplitude of the body plate is maximized. Therefore, if the frame has an annular oval shape in planar view and the body plate attached to an outer edge thereof has an oval shape in planar view, there will be areas on both ends of the body plate in a longer diameter direction, that are deflected less than others. In fact, the protrusions located in such areas are substantially motionless, thus resulting in a low washing or massaging effect. Japanese Unexamined Patent Application Publication (Translation of PCT Application) No. H8-507246 (hereunder, referred to as patent document 2) discloses a hair dryer accessory comprising components contacting with hair. Particularly, a wall is formed on a far end of the accessory flaring from a blowoff end. Further, the wall supports the components, such as fingers and bristles, contacting with hair. Furthermore, the wall is provided with a vibration mechanism rotating on a shaft fixed firmly to the wall. 20 25 30 35 40 45 50

However, since the accessory in the patent document 2 has a flared shape, the far end of the accessory is formed in an annular shape. Namely, the wall provided at the far end of the accessory has a circular shape in an axial direction. 55

According to claim 1 of the present invention, the frame is formed in the annular oval shape in planar view, and the outer section provided on the outer

circumference of the inner section is formed further away from the drive section than the inner section of the frame in the longer diameter direction of the frame. Therefore, the protrusions on the body plate attached to the frame are slightly closer to one another in the longer diameter direction, as compared to those of the conventional configuration. Therefore, the protrusions as a whole can be pressed evenly against the scalp, thus favorably washing or massaging the scalp. Further, according to claim 3 of the present invention, since the outer edge of the frame conforms with one virtual spherical surface, the body plate attached to the frame is entirely deflected, thus allowing efficient washing or massaging.

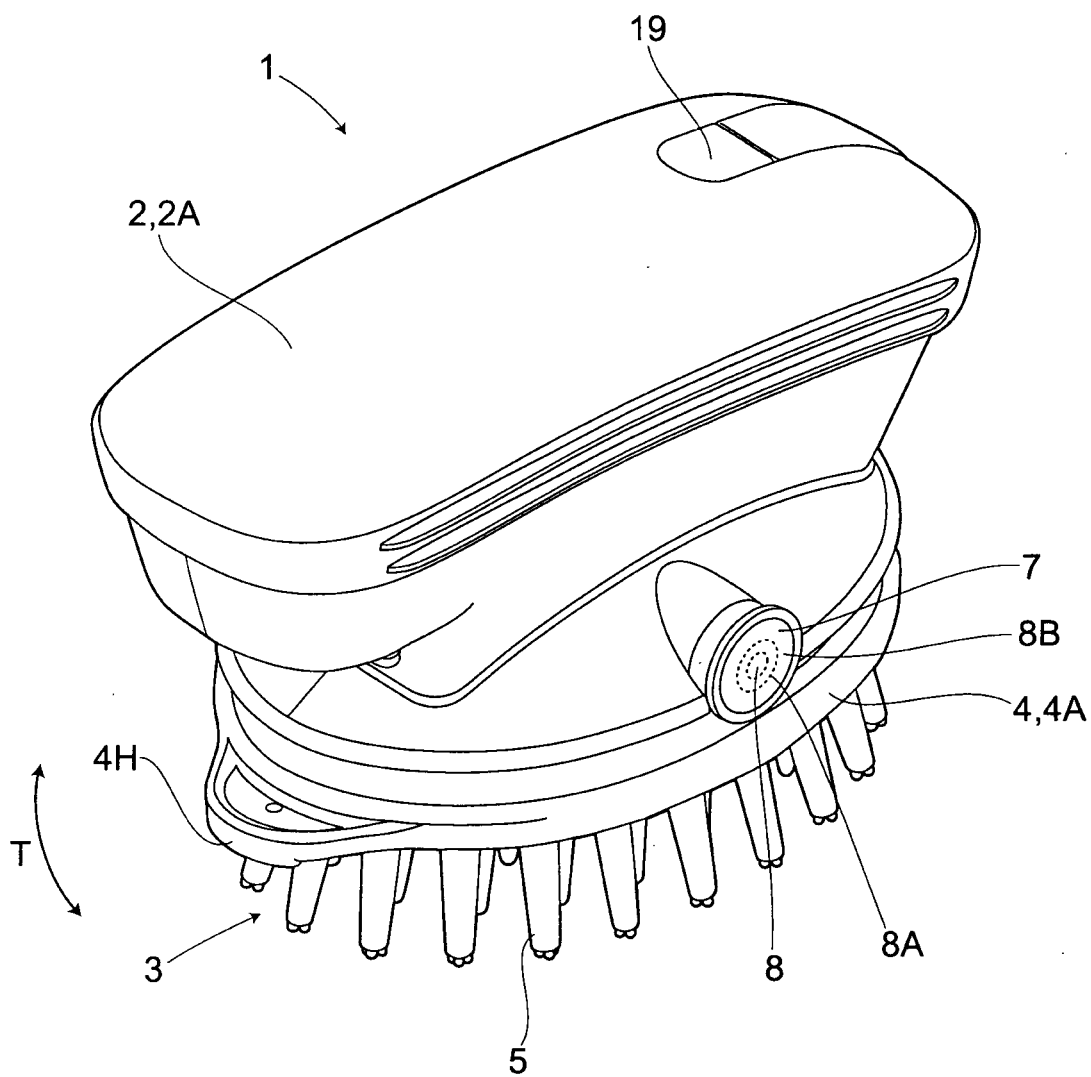


FIG.1

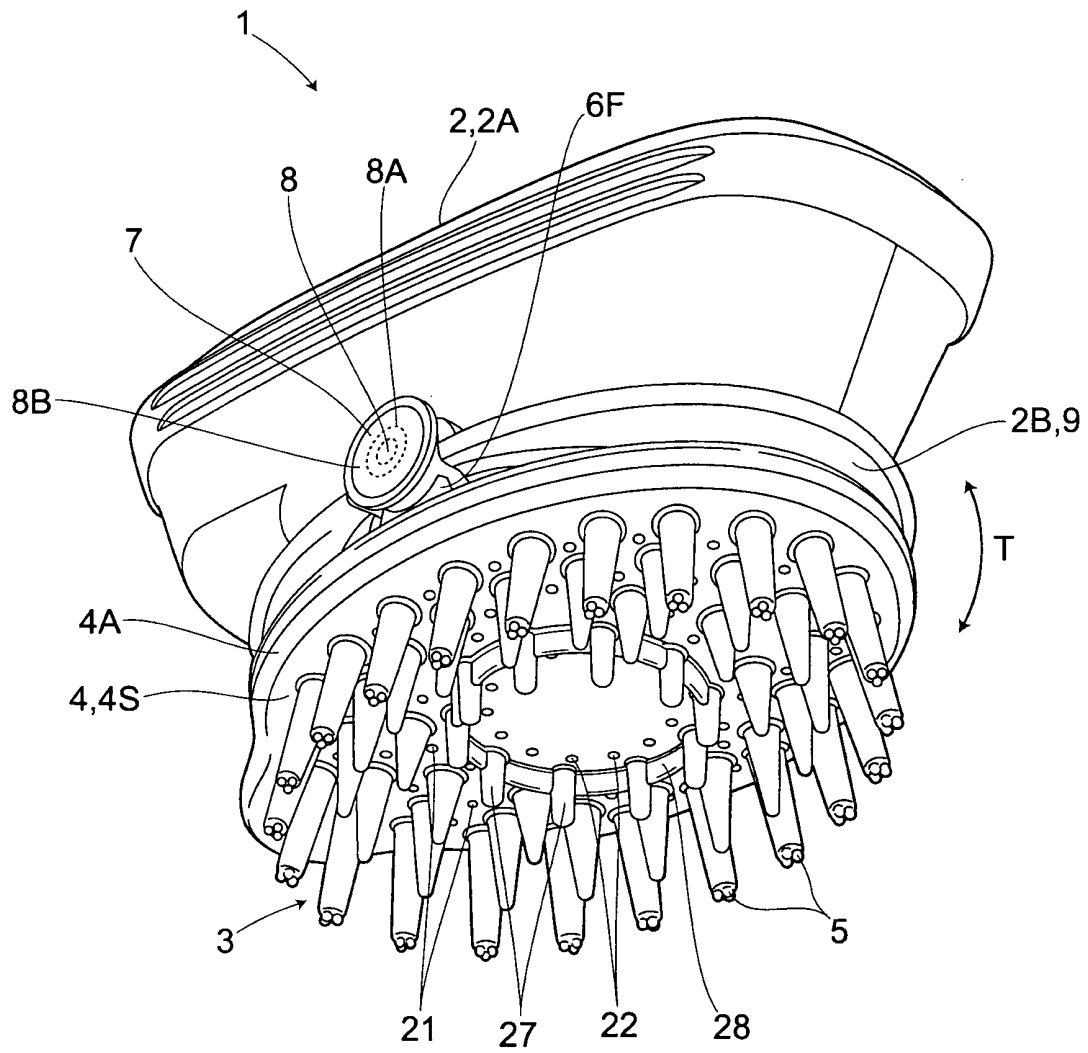
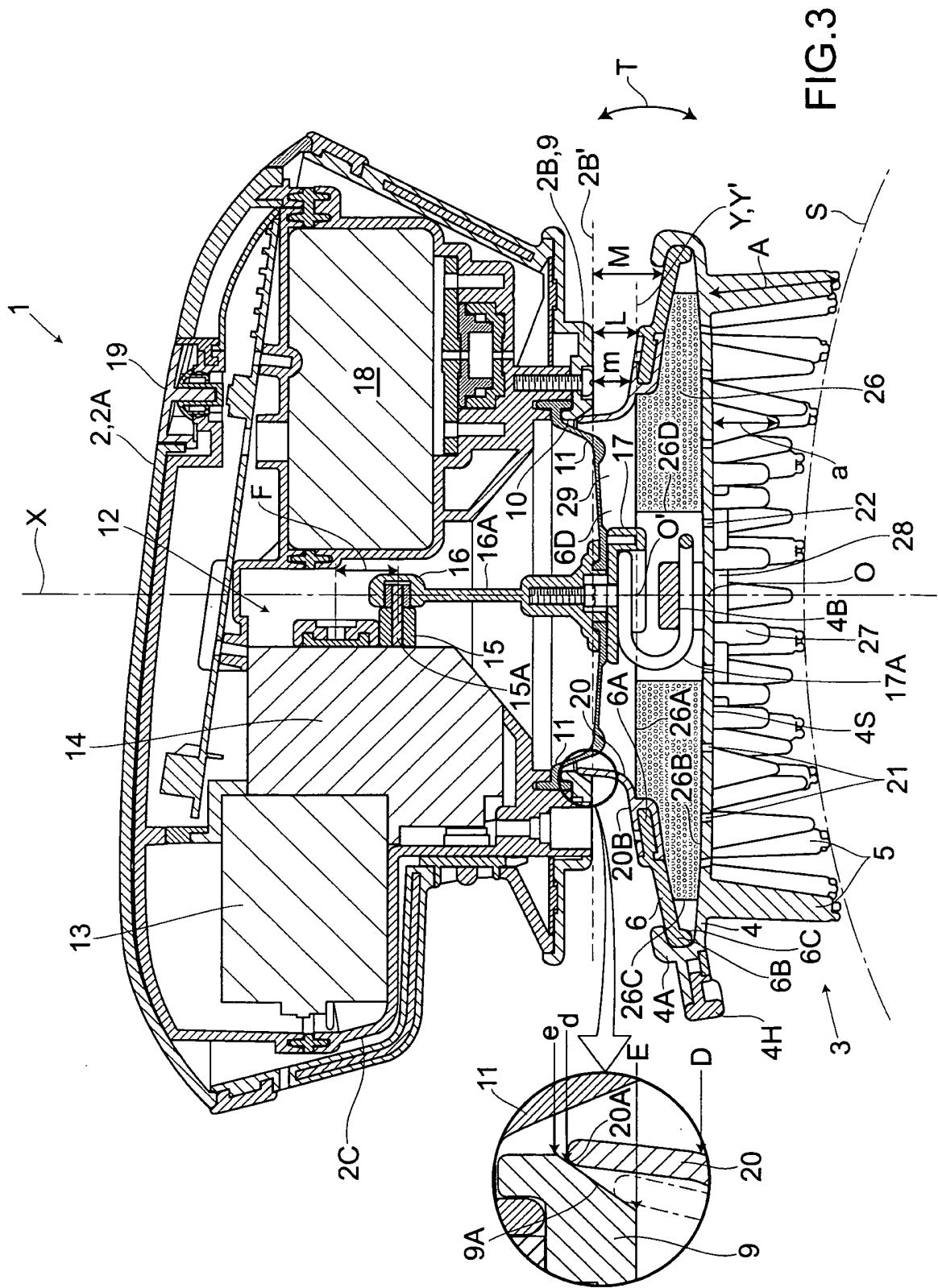
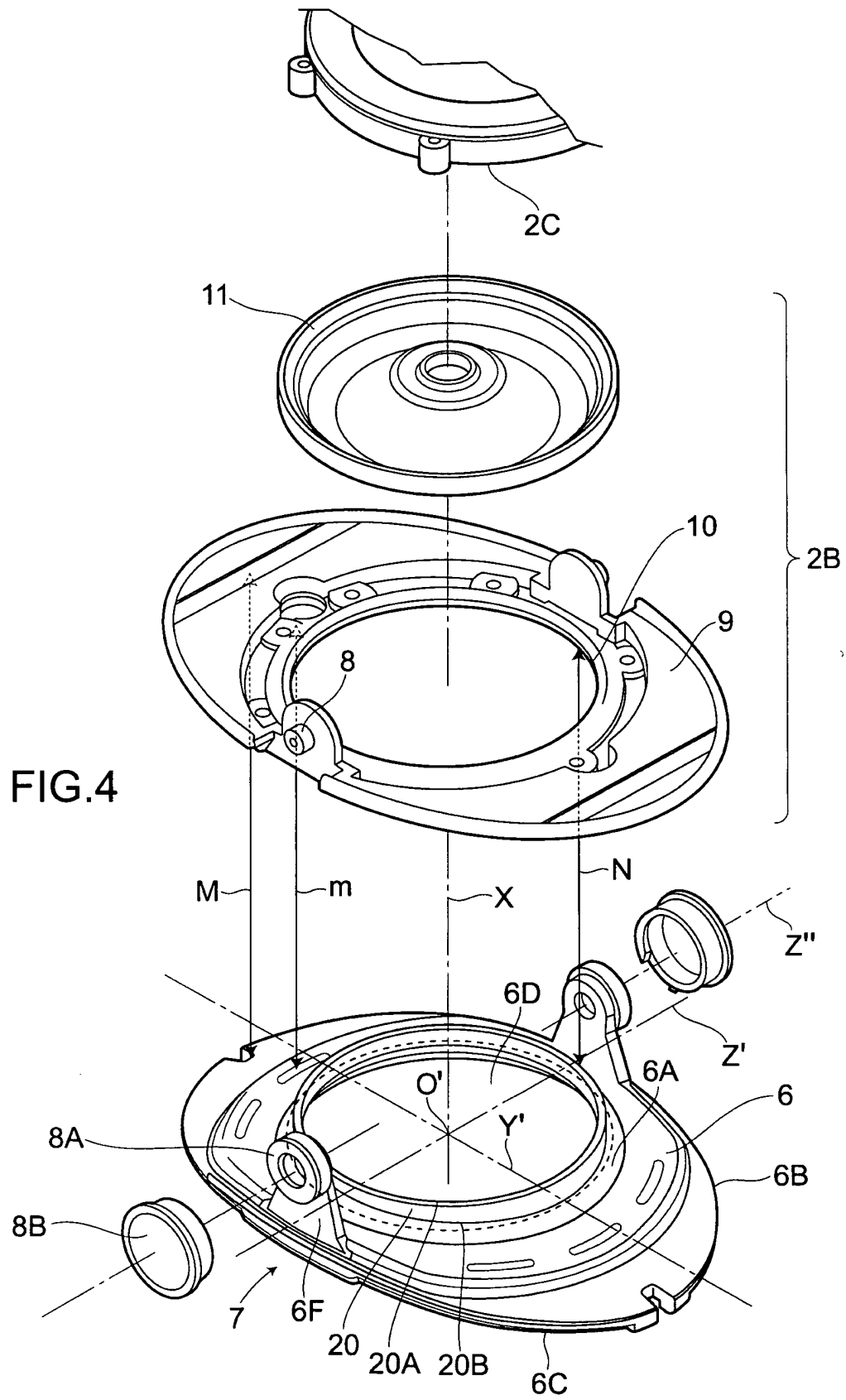


FIG.2





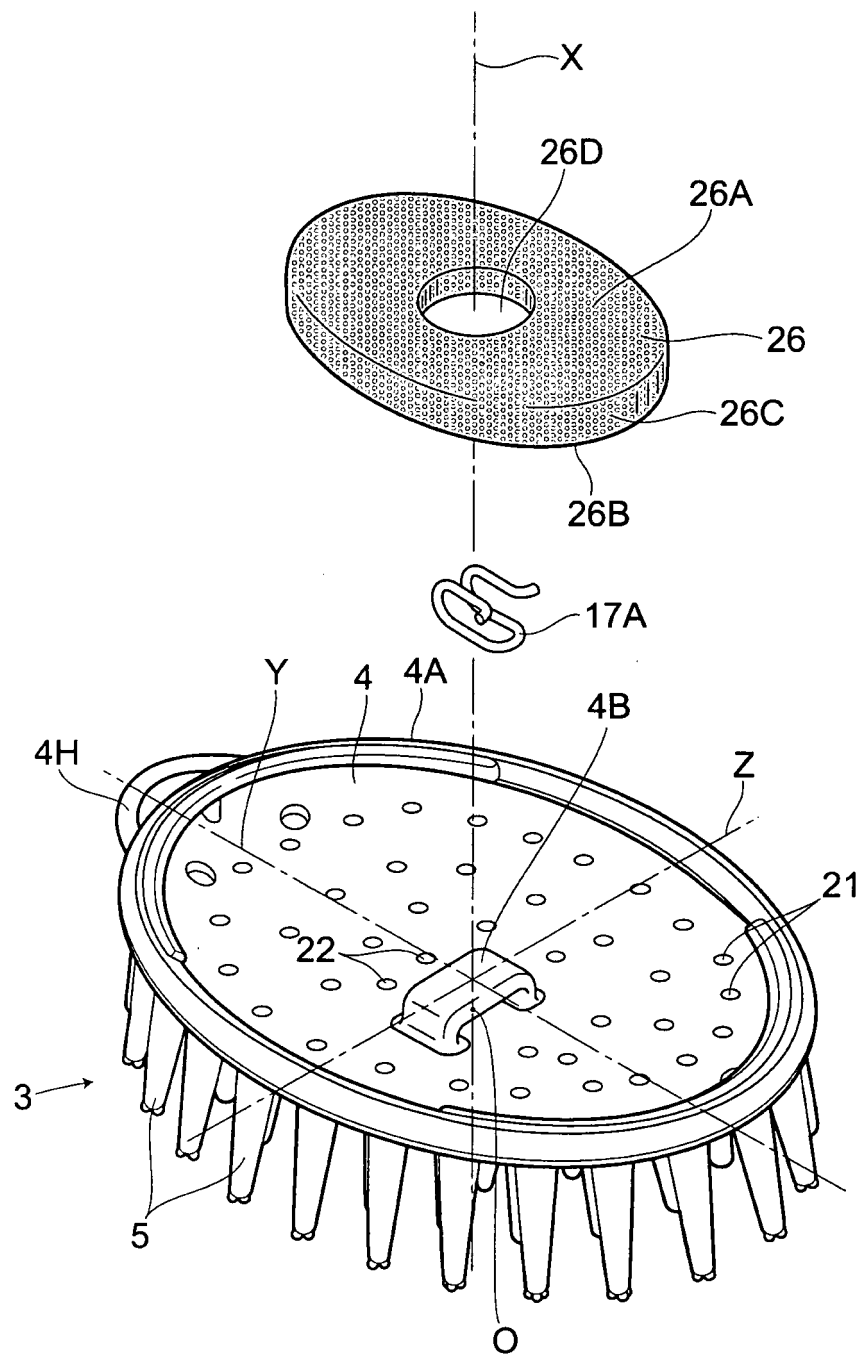
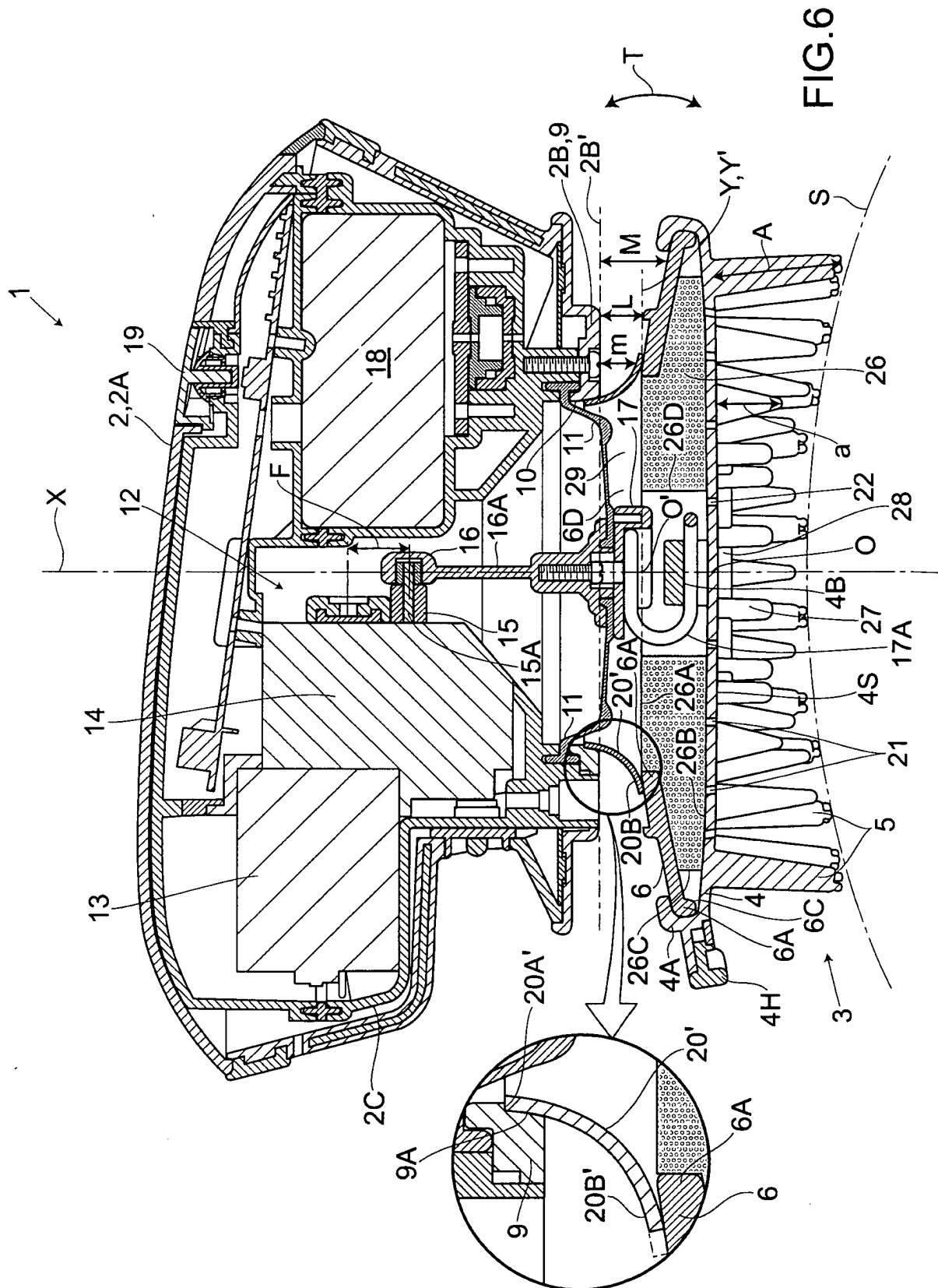
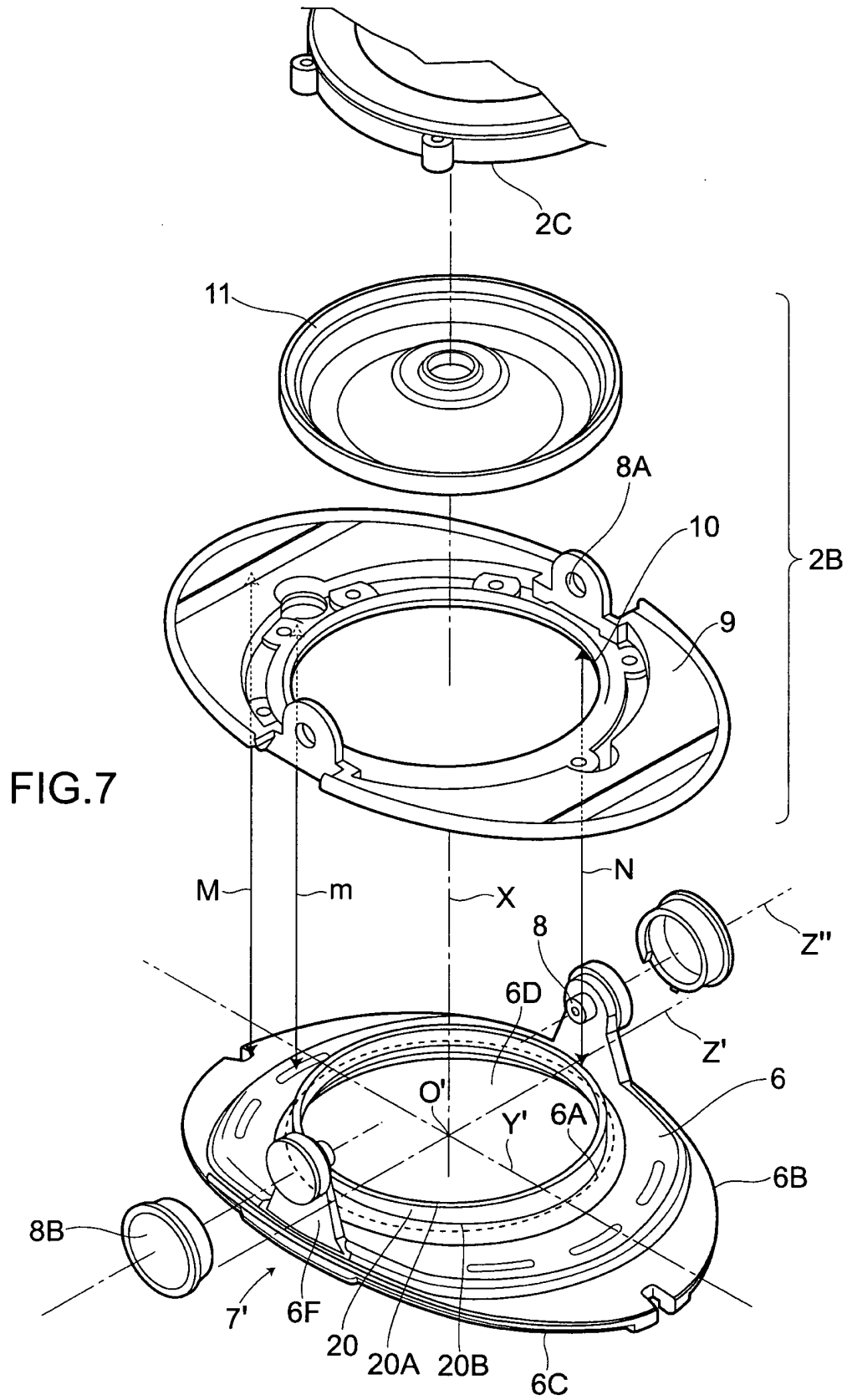


FIG.5





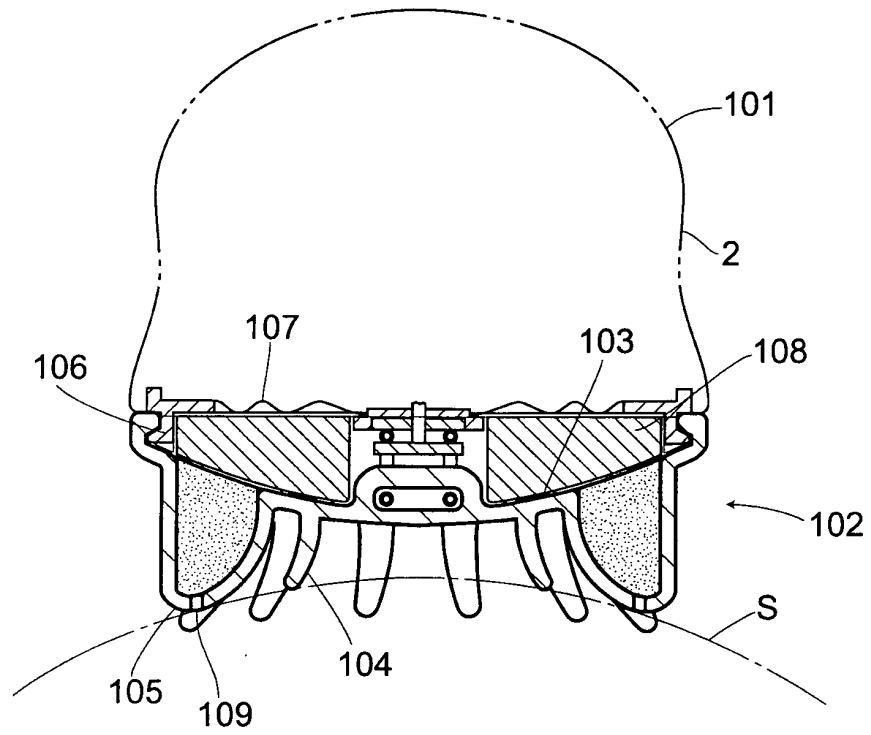


FIG. 8

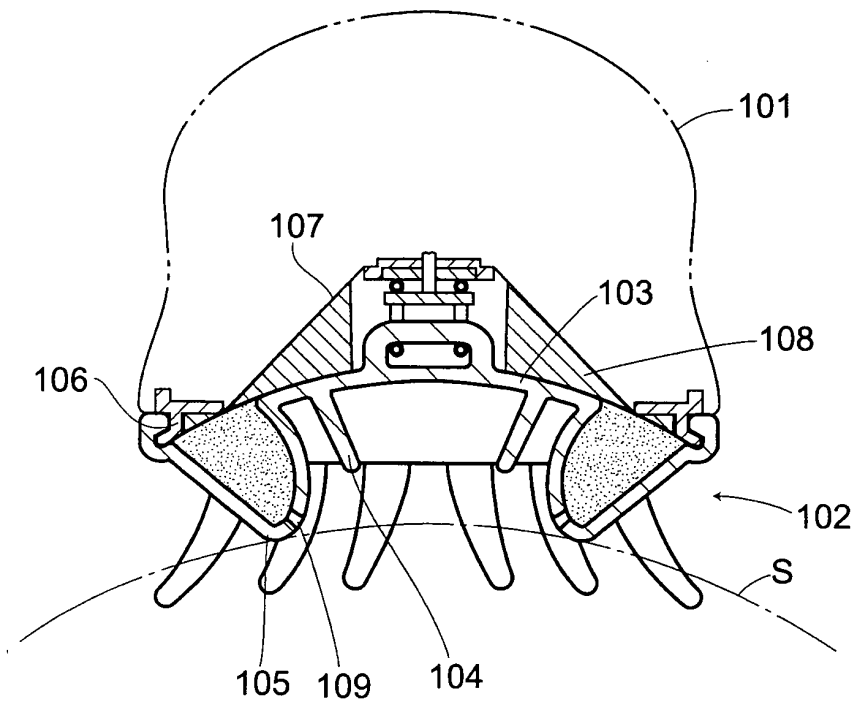


FIG. 9

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2010/060173

A. CLASSIFICATION OF SUBJECT MATTER A45D19/02 (2006.01) i, A46B13/02 (2006.01) i, A61H7/00 (2006.01) i According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) A45D19/02, A46B13/02, A61H7/00 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2010 Kokai Jitsuyo Shinan Koho 1971-2010 Toroku Jitsuyo Shinan Koho 1994-2010 Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2006-116222 A (Twinbird Corp.), 11 May 2006 (11.05.2006), paragraphs [0013] to [0015]; fig. 1 to 5 (Family: none)	1-4
Y	JP 8-507246 A (SEB S.A.), 06 August 1996 (06.08.1996), page 6, line 23 to page 8, line 21; fig. 1 & US 5671547 A & GB 9302622 D & EP 687151 A & WO 1995/017836 A1 & FR 2714580 A & CN 1117731 A	1-4
☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 05 July, 2010 (05.07.10)		Date of mailing of the international search report 13 July, 2010 (13.07.10)
Name and mailing address of the ISA/ Japanese Patent Office		Authorized officer
Facsimile No.		Telephone No.

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2010/060173

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 11174/1990 (Laid-open No. 101940/1991) (Einosuke FUJIMURA), 23 October 1991 (23.10.1991), entire text; all drawings (Family: none)	1-4

Form PCT/ISA/210 (continuation of second sheet) (July 2009)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2008228922 A [0004]
- JP 2006187544 A [0004]