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(54) Title: PERSONAL CARE DEVICE LIKE A SHAVING DEVICE, A HEAD STRUCTURE AND A BASE STRUCTURE FOR SUCH A PERSONAL CARE DEVICE, AS WELL AS A COUPLING STRUCTURE

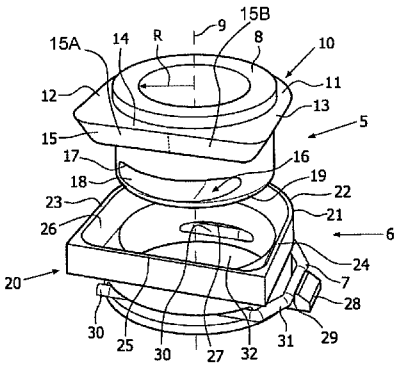

FIG. 3A

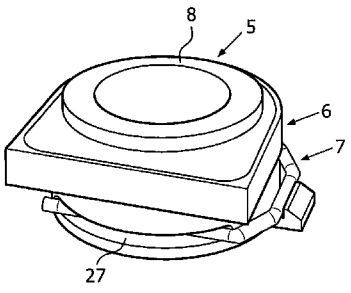

FIG. 5A

(57) Abstract: A personal care device like a shaving device (1) comprises a base structure (2) and a head structure (3). The head structure comprises a first coupling element (5) and at least a head support structure (4) configured to hold at least one treatment head (4'). The base structure comprises a second coupling element (6). The coupling elements can releasably be coupled to each other for coupling the head structure to the base structure. By rotating the coupled coupling elements with respect to each other in a first rotational direction about a central axis (9), a first inclined surface (15) of at least one of the first and second coupling elements cooperates with a first co-operating surface (26) of the other of the first and second coupling elements thereby driving the first and second coupling elements away from each other in an axial direction extending parallel to the central axis.

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Personal care device like a shaving device, a head structure and a base structure for such a personal care device, as well as a coupling structure

FIELD OF THE INVENTION

The invention relates to a personal care device like a shaving device comprising a base structure and a head structure, wherein the head structure comprises a first coupling element and at least a head support structure configured to hold at least one treatment head, whilst the base structure comprises a second coupling element, which coupling elements can releasably be coupled to each other for coupling the head structure to the base structure.

The invention also relates to a head structure and a base structure for such personal care device as well as to a coupling structure.

BACKGROUND OF THE INVENTION

EP2086729B1 discloses a shaving device comprising a head structure and a base structure. The head structure comprises a head support structure configured to hold at least one shaving head. The head structure also comprises a coupling element arranged in a central area of the head structure. The base structure comprises a retaining structure configured for releasably retaining the coupling element for coupling the head structure to the base structure.

The coupling element is substantially cylindrical and is kept in a retaining recess of the retaining structure by means of a spring element. The spring element abuts against a sloped surface of the coupling element. When a relatively large load, i.e. force or torque, is applied to the head structure e.g. due to an accidental misuse or fall of the shaving device, the spring element will shift off the sloped surface of the coupling element and the head structure will be released from the base structure.

The cylindrical coupling element extends along a central axis. The spring element will only shift off the sloped surface of the coupling element, if a force is applied on the coupling element parallel to the central axis and away from the retaining structure or a torque is applied about an axis extending perpendicular to the central axis.

When a relatively large torque in a rotational direction along the central axis is applied between the coupling element and the retaining structure, the spring element will not

shift off the sloped surface of the coupling element, the coupling element will not be disconnected from the retaining structure, and there is a risk that the head structure and base structure might get damaged.

US6378210B1 discloses a personal care device comprising a base unit with external threads and a shaver attachment housing with internal shaver attachment threads that are companionate with the base unit threads. The shaver attachment housing can be screwed on the base unit by rotating the shaver attachment housing in a first direction with respect to the base unit, and can be unscrewed from the base unit by rotating the shaver attachment housing in a second opposite direction with respect to the base unit.

In the personal care device known from US6378210B1, only by a rotation in the second direction the shaver attachment housing will be moved away from the base unit. When a relatively large torque in the first rotational direction along the central axis is applied between the shaver attachment housing and the base unit, the shaver attachment housing will be moved towards the base unit so that the shaver attachment housing will not be disconnected from the base unit, whereby the shaver attachment housing and the base unit might get damaged.

US3568313 discloses an electric shaver comprising a main housing accommodating a shaving unit and a battery compartment, which is coupled to the main housing by means of a bayonet catch including two oppositely disposed pins on the main housing co-operating with two oppositely disposed slots in the battery compartment. The battery compartment can be released from the main housing by rotation of the battery compartment relative to the housing in a prescribed direction so as to release the bayonet catch.

SUMMARY OF THE INVENTION

In view of the above, a general object of the present invention is to provide a personal care device wherein the head structure will be easily released from the base structure when a torque about the central axis is applied between the head structure and the base structure.

According to a first aspect, the invention provides a personal care device of the kind mentioned in the opening paragraph, wherein by rotating the coupled coupling elements with respect to each other in a first rotational direction about a central axis a first inclined surface of at least one of the first and second coupling elements cooperates with a first co-operating surface of the other of the first and second coupling elements thereby

driving the first and second coupling elements away from each other in an axial direction extending parallel to the central axis, and wherein by rotating the coupled coupling elements with respect to each other in a second rotational direction about the central axis, opposite to the first rotational direction, a second inclined surface of at least one of the first and second coupling elements cooperates with a second co-operating surface of the other of the first and second coupling elements thereby driving the first and second coupling elements away from each other in said axial direction, wherein the first and second inclined surfaces each include an obtuse angle with a tangential direction extending tangentially to the central axis, and wherein the first and second inclined surfaces are inclined in opposite directions relative to said tangential direction.

When rotating the coupling elements about the central axis, the first and second inclined surfaces will at least be moved in the tangential direction and, depending on the rotational direction, one of the first and second inclined surfaces will slide over the respective one of the first and second co-operating surfaces in the axial direction.

Due to the first and second inclined surfaces, the coupling elements will easily be driven away from each other in the axial direction, whereby the coupling between the coupling elements will be released.

Since there are at least two inclined surfaces on preferably each coupling element inclined in opposite directions relative to the tangential direction, the coupling elements will be driven apart and be released from each other by applying a torque in either a clockwise direction or a counter-clockwise direction about the central axis.

If the user wants to release the coupling elements, for example to be able to clean the head structure, he may apply a torque on purpose to cause to drive away the first and second coupling elements from each other and to cause a relative axial movement of the coupling elements. Due to the axial movement the user will have a tactile and visual feedback that the torque is sufficient for releasing the coupling elements.

The size of the obtuse angle will be one of the parameters defining the relation between the size of the torque and the amount of the corresponding displacement in axial direction. The obtuse angles included by the first and second inclined surfaces with the tangential direction may be equal or may be different from each other.

The user can apply the torque in a clockwise direction or in a counter-clockwise direction, whereby in both cases the coupling elements will be moved away from each other.

In an embodiment of the personal care device according to the invention, the first and second co-operating surfaces of the other of the first and second coupling elements cooperating with the first and second inclined surfaces are also inclined.

Since the inclined surfaces as well as the co-operating surfaces are inclined, the inclined surfaces and the respective co-operating surfaces can easily slide over each other.

In a further embodiment of the personal care device according to the invention, the first and second inclined surfaces and the first and second co-operating surfaces have corresponding inclinations.

By having corresponding inclinations, the inclined surfaces and the respective co-operating surfaces will abut against each other over a large contact area. As a result, the forces due to the relative rotation movement about the central axis will be divided over said large contact area, so that wear of the surfaces can be limited.

In a further embodiment of the personal care device according to the invention, the first and second inclined surfaces each include a further obtuse angle with a radial direction extending radially to the central axis.

In this embodiment the first and second inclined surfaces each include an obtuse angle with the tangential direction and a further obtuse angle with the radial direction. The obtuse angle and the further obtuse angle may be equal or different. In an example of this embodiment, the inclined surfaces are straight longitudinal surfaces extending tangentially with respect to a reference plane extending in a reference radial direction to the central axis. Seen in said reference plane the inclined surfaces only include an obtuse angle with the reference radial direction. At a distance from said reference plane and at both sides thereof, however, the inclined surfaces extend obliqueally with respect to a local radial direction. As a result, in these locations the inclined surfaces also include an obtuse angle with respect to a local tangential direction. Such inclined surfaces can easily be manufactured. The inclined surfaces may extend over a certain distance in a direction perpendicular to the radial direction. Such inclined surfaces will also be an external orientation cue for a user supporting the user when coupling the coupling elements to each other. When the inclined surfaces extend relatively far from the central axis, the forces, friction and wear on the inclined surfaces will be relatively low and it will provide more easily rotational stability.

In a further embodiment of the personal care device according to the invention, the head structure, when coupled to the base structure, is solely supported by the coupling elements.

In this embodiment there is no other supporting element between the head structure and the base structure. The head structure is enabled to move and transfer an external load to the coupling element and is thus enabled to enforce the release of the coupling element of the head structure from the coupling element of the base structure.

In a further embodiment of the personal care device according to the invention, the first coupling element and the second coupling element are configured to arrive from an uncoupled state into a coupled state relative to each other by driving the first and second coupling elements towards each other in a coupling direction opposite to the axial direction, and to arrive from the coupled state into the uncoupled state by driving the first and second coupling elements away from each other in the axial direction.

Since the first and second coupling elements are configured in this manner, the coupled coupling elements can be brought from the coupled state into the uncoupled state by driving the coupled coupling elements away from each other in the axial direction along the central axis. Due to the presence of the inclined surfaces and the co-operating surfaces, this can easily be accomplished by rotating the coupled coupling elements with respect to each other about the central axis in either the first or the second rotational direction.

In a further embodiment of the personal care device according to the invention, one of the first and second coupling elements comprises at least one protrusion cooperating with at least one complementary recess in the other of the first and second coupling elements, wherein the coupling elements can be coupled to each other only if the protrusion is located in the recess.

The combination of the protrusion and the recess defines a preferred and desired orientation of the coupling elements to each other. For a user this combination provides a tactile feedback, which is helpful when coupling the coupling elements to each other. Preferably the combination of the protrusion and the recess is visible for the user.

In a further embodiment of the personal care device according to the invention, said one of the first and second coupling elements comprises a number of protrusions, which are all different from each other, whilst the other of the first and second coupling elements comprises a number of recesses complementary to the protrusions. In this way, the coupling elements can only be coupled to each other in one preferred orientation.

In a further embodiment of the personal care device according to the invention, a position and an inclination of the first and second inclined surfaces is selected such that the first coupling element and the second coupling element arrive from the coupled state into the uncoupled state by rotating the coupled coupling elements with respect to each

other about the central axis in either the first or the second rotational direction over an angle smaller than 90°.

In this manner, the risk of damage of the first and second coupling elements during rotation of the coupled coupling elements with respect to each other about the central axis is limited. Since uncoupling of the coupling elements can be established by a mutual rotation of the coupling elements over an angle smaller than 90°, the uncoupling of the coupling elements can easily be performed by the user.

In a further embodiment of the personal care device according to the invention, one of the first and second coupling elements comprises a spring element extending perpendicularly to the central axis for cooperation with a groove extending perpendicularly to the central axis and provided in the other of the first and second coupling elements for releasably retaining the coupling elements when coupled to each other.

The spring element retains the coupling elements in a coupled position by cooperation with the groove. The user may release the coupling elements against the spring force, in particular by driving the coupling elements away from each other in the axial direction, preferably by mutually rotating the coupling elements about the central axis.

The invention also relates to a head structure and base structure for use in such a personal care device like a shaving device, wherein the head structure respectively the base structure comprises a coupling element. The coupling element comprises a first and a second inclined surface for cooperating, respectively, with a first and a second co-operating surface of a coupling element of a base structure respectively the head structure of the personal care device, wherein by rotating the coupled coupling elements with respect to each other in a first rotational direction about a central axis the first inclined surface cooperates with the first co-operating surface thereby driving the coupling elements away from each other in an axial direction extending parallel to the central axis, and wherein by rotating the coupled coupling elements with respect to each other in a second rotational direction about the central axis, opposite to the first rotational direction, the second inclined surface cooperates with the second co-operating surface thereby driving the coupling elements away from each other in said axial direction, wherein the first and second inclined surfaces each include an obtuse angle with a tangential direction extending tangentially to the central axis, and wherein the first and second inclined surfaces are inclined in opposite directions relative to said tangential direction.

It is possible to use such coupling elements for coupling parts of the personal care device like a trimmer, brush or shaving head or coupling such parts in other kind of personal care devices like grooming devices.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows a perspective view of a shaving device according to the invention,

Figure 2 shows a perspective view of a part of the shaving device as shown in figure 1,

Figure 3A shows a perspective view of a first embodiment of two cooperating coupling elements according to the invention, in an uncoupled position,

Figure 3B shows a schematic top view of one of the two cooperating coupling elements as shown in figure 3A,

Figures 4A-4D show perspective views of two coupling elements as shown in figure 3, in several steps during coupling of the two coupling elements,

Figure 5A and 5B show a perspective view and a cross section of two coupling elements as shown in figure 3, in a coupled position,

Figure 6 shows a perspective view of a second embodiment of two cooperating coupling elements according to the invention, in an uncoupled position,

Figures 7A-7B show perspective views of two coupling elements as shown in figure 6, in two steps during coupling of the two coupling elements,

Figure 8 shows a perspective view of two coupling elements as shown in figure 6, in a coupled position.

In the drawings, like reference numerals refer to like elements.

DESCRIPTION OF PREFERRED EMBODIMENTS

Figures 1 and 2 show respectively a perspective view of a shaving device 1 and a part thereof as an example of a personal care device according to the invention.

The shaving device 1 comprises a base structure 2 and a head structure 3. The head structure 3 supports and retains three head support structures 4 for rotary shaving heads 4' as an example of a treatment head. The head structure 3 comprises a first coupling element 5, whilst the base structure 2 comprises a second coupling element 6. The first coupling element 5 is partly inserted into the second coupling element 6 and is retained in the second

coupling element 6 by means of a spring element 7. Such kind of shaving device 1 is known from EP2086729B1 and will not further be explained.

The shaving device 1 according to the invention differs from the shaving device 1 as described in EP2086729B1, mainly by the design and function of the coupling elements 5, 6.

Figures 3A-5B show several views of a first embodiment of two cooperating coupling elements 5, 6 of the shaving device 1 according to the invention.

The first coupling element 5 comprises a tubular part 8 extending along a central axis 9. The tubular part 8 is provided with a ring-shaped collar 10. The ring-shaped collar 10 has a circular part 11 extending over 180 degrees along the central axis 9, straight parts 12, 13 connected to both ends of the circular part 11, and a straight part 14 extending between the straight parts 12, 13. The straight part 14 extends perpendicular to the straight parts 12, 13. The circular part 11 and the straight parts 12, 13, 14 are each provided on its outside with an inclined surface 15. Seen in a plane extending radially with respect to the central axis 9, the inclined surface 15 includes an obtuse angle A (see figure 5B) with a plane extending perpendicular to the central axis 9. The obtuse angle A is for example in a range between 95 and 140 degrees. The inclined surfaces 15 are directed towards the second coupling element 6.

Figure 3B shows a schematic top view of the first coupling element 5, with the straight part 14 provided with the inclined surface 15. A first inclined surface 15A of the inclined surface 15 is located on a left side whilst a second inclined surface 15B of the inclined surface 15 is located on a right side of a plane V extending radially with respect to the central axis 9 and perpendicularly to the straight part 14.

At each location L on the first and second inclined surface 15A, 15B, a tangential direction T extends perpendicularly to a radial direction between the central axis 9 and the location L. The first inclined surface 15A includes an obtuse angle with the tangential direction T. Since the inclined surface 15 includes an obtuse angle A with a plane extending perpendicularly to the central axis 9 as well as with a radial direction R extending radially to the central axis 9, the obtuse angle of the first inclined surface 15A with the tangential direction T will be different at different locations L on the first inclined surface 15A.

In the same manner, the second inclined surface 15B includes an obtuse angle with the tangential direction T, which will be different at different locations L on the second inclined surface 15B.

As will be clear from figure 3B, at each location L on the first inclined surface 15A the obtuse angle between the first inclined surface 15A and the tangential direction T is located on a side of the inclined surface 15 directed towards the central axis 9, whilst at each location L on the second inclined surface 15B the obtuse angle between the second inclined surface 15B and the tangential direction T is located on a side of the inclined surface 15 directed away from the central axis 9. Accordingly the first and second inclined surfaces 15A, 15B are inclined in opposite directions relative to said tangential direction T.

At a distance of the collar 10, the tubular part 8 is provided on its outside with two grooves 16 extending parallel to each other and perpendicular to the central axis 9. One of the grooves 16 extends parallel to the straight part 14. Each groove 16 comprises sloped surfaces 17, 18. An end 19 of the tubular part 8 near the grooves 16 is bevelled.

The second coupling element 6 comprises a tubular part 20 extending along the central axis 9. The internal diameter of the tubular part 20 of the second coupling element 6 is slightly larger than the external diameter of the tubular part of the first coupling element 5. The tubular part 20 is provided with a ring-shaped flange 21. The ring-shaped flange 21 has a circular part 22 extending over 180 degrees along the central axis 9, straight parts 23, 24 connected to both ends of the circular part 22, and a straight part 25 extending between the straight parts 23, 24. The straight part 25 extends perpendicular to the straight parts 23, 24. The circular part 22 and the straight parts 23, 24, 25 are each provided on its inside with an inclined surface 26. Seen in a plane extending radially with respect to the central axis 9, the inclined surface 26 includes an obtuse angle A (see figure 5B) with a plane extending perpendicularly to the central axis 9. The inclined surfaces 26 are directed towards the first coupling element 5.

At a distance of the flange 21, the tubular part 20 is provided with two slits 27 extending parallel to each other and perpendicular to the central axis 9. One of the slits 27 extends parallel to the straight part 25.

At an end of the tubular part 20 near the slits 27, the tubular part 20 is provided with a notch 28 and a recess 29 located between the notch 28 and the straight part 24.

A spring element 7 is connected to the second coupling element 6. The spring element 7 is U-shaped and comprises two leg portions 30 extending parallel to each other and a bridge portion 31 extending between the two leg portions 30. The leg portions 30 and bridge portion 31 extend perpendicular to the central axis 9. The leg portions 30 are located

in the slits 27 of the tubular part 20 and extend partially through the slits 27 into a cylindrical-shaped space 32 bounded by the tubular part 20.

The bridge portion 31 of the spring element 7 is located in the recess 29 between the notch 28 and the straight part 24.

The coupling and uncoupling of the coupling elements 5, 6 will now be explained with reference to the figures 4A-4D. As will be explained in detail in the following, the first coupling element 5 and the second coupling element 6 are configured to arrive from an uncoupled state into a coupled state relative to each other by driving the first and second coupling elements 5, 6 towards each other in the axial direction along the central axis 9, and to arrive from the coupled state into the uncoupled state by driving the first and second coupling elements 5, 6 away from each other in the axial direction along the central axis 9.

If a user wants to couple the first coupling element 5 of the head structure 3 to the second coupling element 6 of the base structure 2, he will place the first coupling element 5 above the second coupling element 6 and roughly align the central axis 9 of the first coupling element 5 with the central axis 9 of the second coupling element 6 (see figure 4A). He will than move the first coupling element 5 in a direction indicated by arrow P1 towards the second coupling element 6, whereby the tubular part 8 is inserted into the cylindrical space 32 bounded by the tubular part 20. The bevelled end 19 facilitates placing by seeking the location of the cylindrical shaped space 32. He will continue until the collar 10 abuts against the flange 21 (see figure 4B). The user will rotate the first coupling element 5 in a direction indicated by double arrow P2 along the central axis 9 with respect to the second coupling element 6 (see figure 4C). He will continue to rotate the first coupling element 5 until he sees and feels that the circular parts 11, 22, the straight parts 12, 23; 13, 24; 14, 25 are aligned (see figure 4D) and the inclined surfaces 15, 26 thereof can be moved further towards each other in the direction indicated by arrow P1 until the inclined surfaces 15, 26 are in abutment. During the movement in the direction indicated by arrow P1, the bevelled end 19 of the first coupling element 5 will force the leg portions 30 of the spring element 7 apart. The leg portions 30 of the spring element 7 will snap into the grooves 16 of the tubular part 8 as soon as the tubular part 8 as moved far enough into the tubular part 20. The spring element 7 retains the first and second coupling elements 5, 6 in the coupled position. This coupled position is shown in figures 5A and 5B.

If a relatively large pulling force is exerted on the head structure 3 in an axial direction parallel to the central axis 9, the leg portions 30 of the spring element 7 will slide

along the sloped surface 18 of the groove 16 and will be moved out of the groove 16 and the first coupling element 5 can easily be moved out of engagement with the second coupling element 6.

If a torque is exerted between the head structure 3 and the base structure 2, in for example a clockwise direction indicated by double arrow P2, the inclined surface 15 of the straight part 14 will be forced in a direction indicated by arrow P3 against the co-operating inclined surface 26 of the straight part 25. Due to this force, the inclined surface 15 will be moved in a direction indicated by arrow P4, extending parallel to the central axis 9 and away from the second coupling element 6. The same cooperation will occur between the other inclined surfaces 15, 26. During this movement, the spring element 7 will be disengaged from the grooves 16 in the same manner as described above. The first coupling element 5 will be driven by the cooperating inclined surfaces 15, 26 in the direction indicated by arrow P4, until the coupling elements 5, 6 are in the position as shown in figure 4C, in which the coupling elements 5, 6 are freely rotatable with respect to each other. Due to the uncoupling of the coupling elements 5, 6 under influence of the torque, no damage will occur on the head structure 3 and the base structure 2. To prevent damage of the coupling elements 5, 6 as a result of said torque, an inclination of the inclined surface 15, i.e. the obtuse angle A, is selected such that the first coupling element 5 and the second coupling element 6 arrive from the coupled state into the uncoupled state by rotating the coupled coupling elements 5, 6 with respect to each other about the central axis over an angle smaller than 90°, preferably smaller than 45°, and more preferably smaller than 3 0°.

It is noted that, instead of the first and second coupling elements 5, 6 comprising the spring element 7 and the slits 27 as described here before, other types of coupling elements may be used which are configured to arrive from an uncoupled state into a coupled state relative to each other by driving the coupling elements towards each other in the axial direction along the central axis, and to arrive from the coupled state into the uncoupled state by driving the coupling elements away from each other in the axial direction along the central axis. Examples of such alternative coupling elements are snap connections and snap couplings which are well known to the skilled person.

Figures 6-8 show several views of a second embodiment of two cooperating coupling elements 35, 36 of the shaving device 1 according to the invention.

The first coupling element 35 comprises a tubular part 38 extending along a central axis 9. The tubular part 38 is provided with a collar 40. The collar 40 comprises a first circular part 41 extending over about 180 degrees along the central axis 9 and a second

circular part 42 extending over about 60 degrees along the central axis 9. The first and second circular parts 41, 42 are separated by open spaces 43 extending over about 60 degrees along the central axis 9. On both ends of the first and second circular parts 41, 42 near the open spaces 43, the first and second circular parts 41, 42 are provided with an inclined surface 45, 46. The inclined surface 45, 46 includes an obtuse angle B (see figure 6) with a top side 47 of the collar 40. The top side 47 extends perpendicular to the central axis 9. Furthermore, the inclined surface 45, 46 includes the obtuse angle B with a tangential direction T extending tangential to the central axis 9 and from the respective inclined surface 45, 46. The obtuse angle B is for example in a range between 95 and d 140 degrees. The inclined surface 45, 46 are inclined in opposite directions. The inclined surfaces 45, 46 are directed towards the second coupling element 36.

At a distance of the collar 40, the tubular part 38 is provided on its outside with two grooves 16 extending parallel to each other and perpendicular to the central axis 9. Each groove 16 comprises sloped surfaces 17, 18.

An end 19 of the tubular part 38 near the grooves 16 is bevelled.

The second coupling element 36 comprises a tubular part 50 extending along the central axis 9. The internal diameter of the tubular part 50 of the second coupling element 36 is slightly larger than the external diameter of the tubular part 38 of the first coupling element 35. The tubular part 50 is provided with a first flange 51 and a second flange 52, each extending over about 60 degrees along the central axis 9. The first and second flanges 51, 52 are separated by open spaces 53, 54. The open space 53 extends over about 60 degrees along the central axis 9, whilst the open space 54 extends over about 180 degrees along the central axis 9.

On both ends of the first and second flanges 51, 52 near the open spaces 53, 54 the first and second flanges 51, 52 are provided with an inclined surface 55, 56. The inclined surface 55, 56 includes an obtuse angle B (see figure 6) with a plane perpendicular to the central axis 9. Furthermore, the inclined surface 55, 56 includes the obtuse angle B with a tangential direction T extending tangential to the central axis 9 and from the respective inclined surface 55, 56. The inclined surface 55, 56 are inclined in opposite directions. The inclined surfaces 45, 46 are directed towards the first coupling element 35.

The dimensions of the first and second circular parts 41, 42 and the spaces 43 of the first coupling element 35 and the first and second flanges 51, 52 of the second coupling element 36 are such that they match with each other as can be seen in the figures 7B and 8.

The coupling and uncoupling of the coupling elements 35, 36 will now be explained with reference to the figures 7A and 7B. As will be explained in detail in the following, the first coupling element 35 and the second coupling element 36 are configured to arrive from an uncoupled state into a coupled state relative to each other by driving the first and second coupling elements 35, 36 towards each other in the axial direction along the central axis 9, and to arrive from the coupled state into the uncoupled state by driving the first and second coupling elements 5, 6 away from each other in the axial direction along the central axis 9.

If a user wants to couple the first coupling element 35 of the head structure 3 to the second coupling element 36 of the base structure 2, he will place the first coupling element 35 above the second coupling element 36 and will roughly align the central axis 9 of the first coupling element 35 with the central axis 9 of the second coupling element 36 (see figure 7A). He will than move the first coupling element 35 in a direction indicated by arrow P1 towards the second coupling element 36 whereby the tubular part 38 is inserted into the tubular part 50. He will continue until the collar 40 abuts against the flanges 51, 52. The user will then rotate the first coupling element 35 in a direction indicated by double arrow P2 along the central axis 9 with respect to the second coupling element 36. He will continue to rotate the first coupling element 35 until he sees and feels that the circular parts 41, 42 are aligned with the flanges 51, 52. The inclined surfaces 45, 46; 55, 56 can then be moved further towards each other in the direction indicated by arrow P1 until the inclined surfaces 45, 55; 46, 56 are in abutment. During the movement in the direction indicated by arrow P1, the bevelled end 19 of the first coupling element 35 will force the leg portions 30 of the spring element 7 apart. The leg portions 30 of the spring element 7 will snap into the grooves 16 of the tubular part 38 as soon as the tubular part 8 as moved far enough into the tubular part 50. The spring element 7 retains the first and second coupling elements 35, 36 in the coupled position. This coupled position is shown in figures 7B and 8.

If a relatively large pulling force is exerted on the head structure 3 in an axial direction parallel to the central axis 9, the leg portions 30 of the spring element 7 will slide along the sloped surface 18 of the groove 16 and will be moved out of the groove 16 and the first coupling element 35 can easily be moved out of engagement with the second coupling element 36.

If a relatively large torque is exerted between the head structure 3 and the base structure 2, in for example a clockwise direction indicated by double arrow P2, the inclined surfaces 45 of the part 41, 42 will be forced in a direction indicated by arrow P3 against the

co-operating inclined surface 55 of the flanges 51, 52. Due to this force, the inclined surfaces 45 will be moved in a direction indicated by arrow P4, extending parallel to the central axis 9 and away from the second coupling element 36. During this movement, the spring element 7 will be disengaged from the grooves 16 in the same manner as described above. The first coupling element 35 will be driven by the cooperating inclined surfaces 45; 55 in the direction indicated by arrow P4, until the coupling elements 35, 36 are in the position in which the coupling elements 35, 36 are freely rotatable with respect to each other.

Due to the uncoupling of the coupling elements 35, 36 under influence of the torque, no damage will occur on the head structure 3 and the base structure 2. To prevent damage of the coupling elements 35, 36 as a result of said torque, an inclination of the inclined surfaces 45, 46, i.e. the obtuse angle B, is selected such that the first coupling element 35 and the second coupling element 36 arrive from the coupled state into the uncoupled state by rotating the coupled coupling elements 35, 36 with respect to each other about the central axis 9 over an angle smaller than 15°, and more preferably smaller than 10°.

In case that a torque is applied in a counter-clockwise direction, the inclined surfaces 46 will slide along the inclined surfaces 56.

The obtuse angle between the first inclined surface with the tangential direction T might be the same or different from the obtuse angle between the second inclined surface with the tangential direction T.

If a user wants to uncouple the coupling elements, he may apply a pulling force in axial direction at one coupling element to disengage the spring 7 from the groove 27 or he may apply a relatively large torque about the central axis 9. He can also apply such a pulling force as well as such a torque.

Due to the specific shape of the collars 10, 40 and the ring-shaped flange 21 respectively the flanges 51, 52, the first and second coupling elements 5, 6; 35, 36 can be connected to each other in only one specific orientation with respect to each other. For a user this specific orientation is clearly visible and the user will get tactile feedback when connecting the coupling elements to each other.

The flanges and circular parts form protrusions, which fit in recesses formed by the spaces between the flanges and the circular parts, wherein the coupling elements can only be coupled to each other if each protrusion is located in the correct recess.

It is also possible that due to the shape, dimensions and locations of the protrusions and recesses the coupling elements can be coupled to each other in two or more

different orientations with respect to each other, wherein in each orientation the coupling elements are correctly coupled to each other.

It is possible to use the coupling elements for coupling parts of a personal care device of another type than the shaving device described here before, for example a trimmer, brush or shaving head, or for coupling parts in such kind of personal care devices like grooming devices.

The person skilled in the art will realize that the present invention is by no means limited to the preferred embodiments. Other variations to the disclosed embodiments can be understood and effected by those skilled in the art in practicing the claimed invention, from a study of the drawings, the disclosure, and the appended claims.

In the claims, the word "comprising" does not exclude other elements or steps, and the indefinite article "a" or "an" does not exclude a plurality. The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measures cannot be used to advantage. Any reference signs in the scope should not be construed as limiting the scope of the claims.

LIST OF REFERENCE SIGNS

1	shaving device
2	base structure
3	head structure
4	head support structure
4'	rotary shaving head
5	first coupling element
6	second coupling element
7	spring element
8	tubular part
9	central axis
10	ring-shaped collar
11	circular part
12	straight part
13	straight part
14	straight part
15	inclined surface
15A	first inclined surface

15B	second inclined surface
16	groove
17	sloped surface
18	sloped surface
19	end
20	tubular part
21	ring-shaped flange
22	circular part
23	straight part
24	straight part
25	straight part
26	inclined surface
27	slit
28	notch
29	recess
30	leg portion
31	bridge portion
32	cylindrical-shaped space
35	first coupling element
36	second coupling element
38	tubular part
40	collar
41	first circular part
42	second circular part
43	open space
45	inclined surface
46	inclined surface
47	top side
50	tubular part
51	first flange
52	second flange
53	open space
54	open space
55	inclined surface

56	inclined surface
A	angle
B	angle
L	locations
P1	arrow
P2	arrow
P3	arrow
P4	arrow
R	radial direction
T	tangential direction
V	plane

CLAIMS:

1. A personal care device like a shaving device (1) comprising a base structure (2) and a head structure (3), wherein the head structure (3) comprises a first coupling element (5, 35) and at least a head support structure (4) configured to hold at least one treatment head, whilst the base structure (2) comprises a second coupling element (6, 36), which coupling elements (5, 6; 35, 36) can releasably be coupled to each other for coupling the head structure (3) to the base structure (2), wherein by rotating the coupled coupling elements with respect to each other in a first rotational direction about a central axis (9) a first inclined surface (15, 26; 45, 46; 55, 56) of at least one of the first and second coupling elements (5, 6; 35, 36) cooperates with a first co-operating surface of the other of the first and second coupling elements (5, 6; 35, 36) thereby driving the first and second coupling elements (5, 6; 35, 36) away from each other in an axial direction extending parallel to the central axis (9), and wherein by rotating the coupled coupling elements with respect to each other in a second rotational direction about the central axis (9), opposite to the first rotational direction, a second inclined surface (15, 26; 45, 46; 55, 56) of at least one of the first and second coupling elements (5, 6; 35, 36) cooperates with a second co-operating surface of the other of the first and second coupling elements (5, 6; 35, 36) thereby driving the first and second coupling elements (5, 6; 35, 36) away from each other in said axial direction, wherein the first and second inclined surfaces (45, 46, 55, 56) each include an obtuse angle with a tangential direction extending tangentially to the central axis (9), and wherein the first and second inclined surfaces are inclined in opposite directions relative to said tangential direction.

2. A personal care device according to claim 1, wherein the first and second co-operating surfaces of the other of the first and second coupling elements (5, 6; 35, 36) cooperating with the first and second inclined surfaces (15, 26; 45, 46; 55, 56) are also inclined.

3. A personal care device according to claim 2, wherein the first and second inclined surfaces (15, 26; 45, 46; 55, 56) and the first and second co-operating surfaces have corresponding inclinations.

4. A personal care device according to claim 1, 2 or 3, wherein the first and second inclined surfaces (15, 26) each include a further obtuse angle with a radial direction extending radially to the central axis (9).

5. A personal care device according to one of the preceding claims, wherein the head structure, when coupled to the base structure (2), is solely supported by the coupling elements (5, 6; 35, 36).

6. A personal care device according to one of the preceding claims, wherein the first coupling element (5, 35) and the second coupling element (6, 36) are configured to arrive from an uncoupled state into a coupled state relative to each other by driving the first and second coupling elements towards each other in a coupling direction opposite to the axial direction, and to arrive from the coupled state into the uncoupled state by driving the first and second coupling elements away from each other in the axial direction.

7. A personal care device according to claim 6, wherein one of the first and second coupling elements (5, 6; 35, 36) comprises at least one protrusion cooperating with at least one complementary recess in the other of the first and second coupling elements (5, 6; 35, 36), wherein the coupling elements (5, 6; 35, 36) can be coupled to each other only if the protrusion is located in the recess.

8. A personal care device according to claim 7, wherein said one of the first and second coupling elements (5, 6; 35, 36) comprises a number of protrusions, which are all different from each other, whilst the other of the first and second coupling elements (5, 6; 35, 36) comprises a number of recesses complementary to the protrusions.

9. A personal care device according to claim 6, wherein a position and an inclination of the first and second inclined surfaces is selected such that the first coupling element (5, 35) and the second coupling element (6, 36) arrive from the coupled state into the uncoupled state by rotating the coupled coupling elements with respect to each other about

the central axis in either the first or the second rotational direction over an angle smaller than 90°.

10. A personal care device according to claim 6, wherein one of the first and second coupling elements (5, 6; 35, 36) comprises a spring element (7) extending perpendicularly to the central axis (9) for cooperation with a groove (27) extending perpendicularly to the central axis (9) and provided in the other of the first and second coupling elements (5, 6; 35, 36) for releasably retaining the coupling elements (5, 6; 35, 36) when coupled to each other.

11. A head structure (3) for use in a personal care device like a shaving device (1) according to one of the preceding claims, the head structure (3) comprising a coupling element (5, 35) and at least a head support structure (5) configured to hold at least one treatment head, which coupling element (5, 35) comprises a first and a second inclined surface (15, 45, 46) for cooperating, respectively, with a first and a second co-operating surface of a coupling element (6, 36) of a base structure (2) of the personal care device, wherein by rotating the coupled coupling elements with respect to each other in a first rotational direction about a central axis (9) the first inclined surface cooperates with the first co-operating surface thereby driving the coupling elements away from each other in an axial direction extending parallel to the central axis (9), and wherein by rotating the coupled coupling elements with respect to each other in a second rotational direction about the central axis (9), opposite to the first rotational direction, the second inclined surface (15, 26; 45, 46; 55, 56) cooperates with the second co-operating surface thereby driving the coupling elements away from each other in said axial direction, wherein the first and second inclined surfaces (45, 46, 55, 56) each include an obtuse angle with a tangential direction extending tangentially to the central axis (9), and wherein the first and second inclined surfaces are inclined in opposite directions relative to said tangential direction.

12. A base structure (2) for use in a personal care device like a shaving device (1) according to one of the claims 1 to 10, the base structure (2) comprising a coupling element, which coupling element comprises a first and a second inclined surface (26; 55, 56) for cooperating, respectively, with a first and a second co-operating surface of a coupling element (5, 35) of a head structure (3) of the personal care device, wherein by rotating the coupled coupling elements with respect to each other in a first rotational direction about a

central axis (9) the first inclined surface cooperates with the first co-operating surface thereby driving the coupling elements away from each other in an axial direction extending parallel to the central axis (9), and wherein by rotating the coupled coupling elements with respect to each other in a second rotational direction about the central axis (9), opposite to the first rotational direction, the second inclined surface (15, 26; 45, 46; 55, 56) cooperates with the second co-operating surface thereby driving the coupling elements away from each other in said axial direction, wherein the first and second inclined surfaces (45, 46, 55, 56) each include an obtuse angle with a tangential direction extending tangentially to the central axis (9), and wherein the first and second inclined surfaces are inclined in opposite directions relative to said tangential direction.

13. A coupling structure comprising at least a first coupling element (5, 35) and a second coupling element (6, 36), which coupling elements can releasably be coupled to each other, wherein by rotating the coupled coupling elements (5, 6; 35, 36) with respect to each other in a first rotational direction about a central axis (9) a first inclined surface (15, 26; 45, 46; 55, 56) of at least one of the first and second coupling elements (5, 6; 35, 36) cooperates with a first co-operating surface of the other of the first and second coupling elements (5, 6; 35, 36) thereby driving the first and second coupling elements (5, 6; 35, 36) away from each other in an axial direction extending parallel to the central axis (9), and wherein by rotating the coupled coupling elements with respect to each other in a second rotational direction about the central axis (9), opposite to the first rotational direction, a second inclined surface (15, 26; 45, 46; 55, 56) of at least one of the first and second coupling elements (5, 6; 35, 36) cooperates with a second co-operating surface of the other of the first and second coupling elements (5, 6; 35, 36) thereby driving the first and second coupling elements (5, 6; 35, 36) away from each other in said axial direction, wherein the first and second inclined surfaces (45, 46, 55, 56) each include an obtuse angle with a tangential direction extending tangentially to the central axis (9), and wherein the first and second inclined surfaces are inclined in opposite directions relative to said tangential direction.

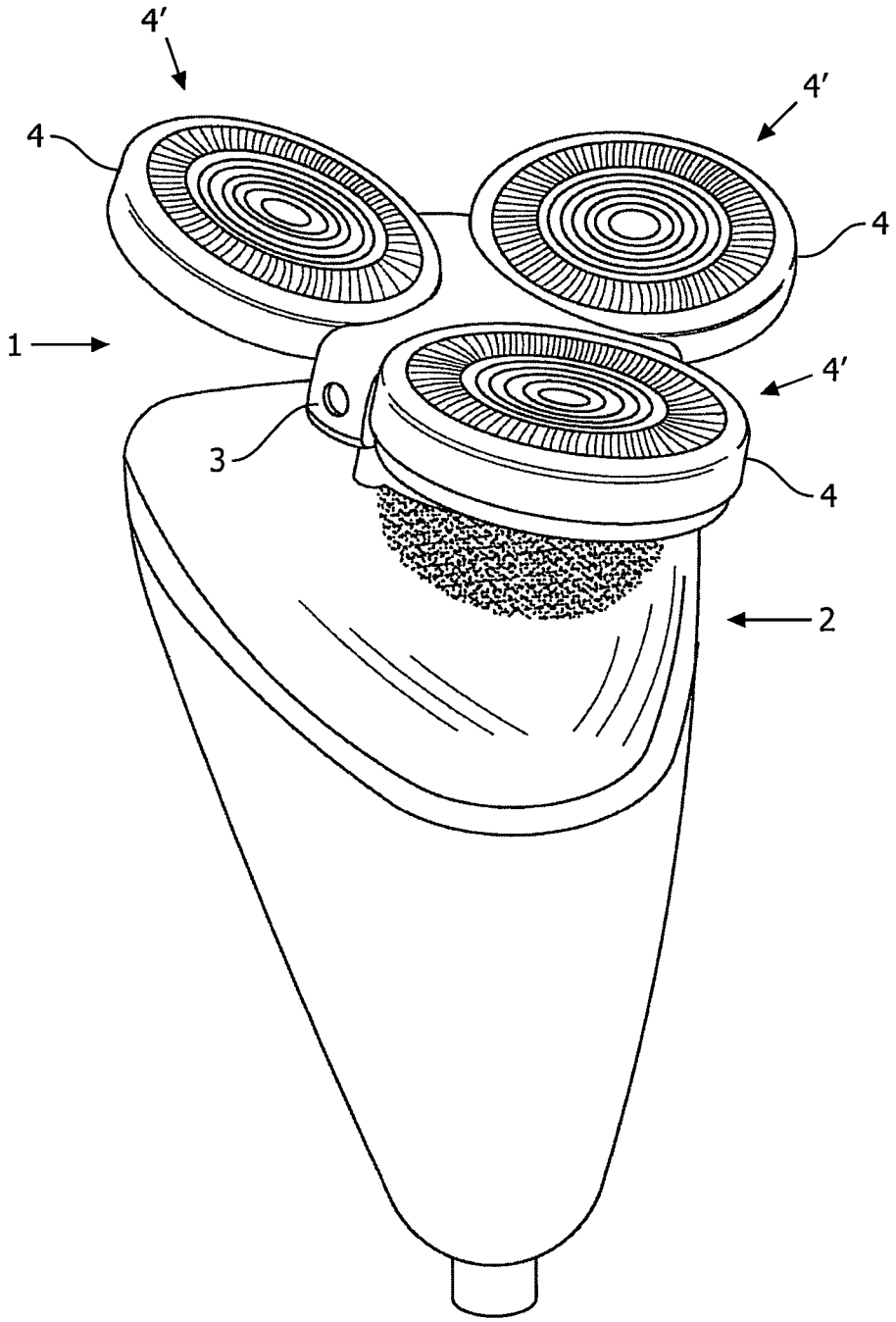

FIG. 1

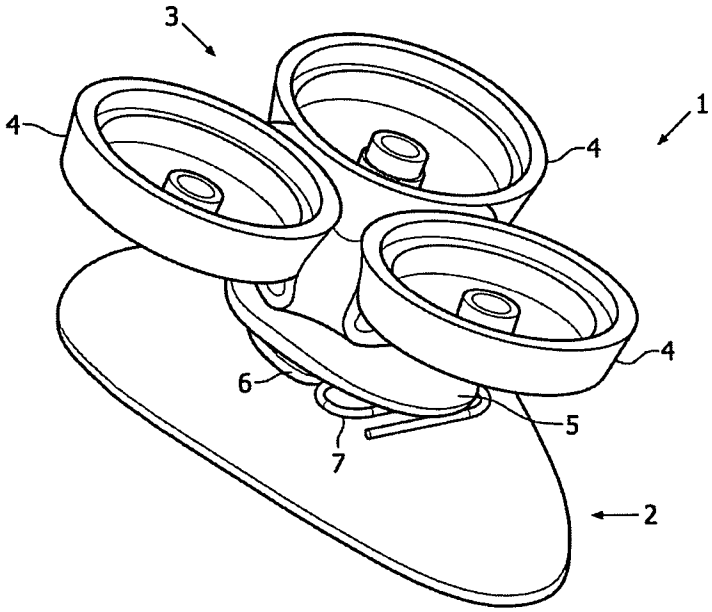
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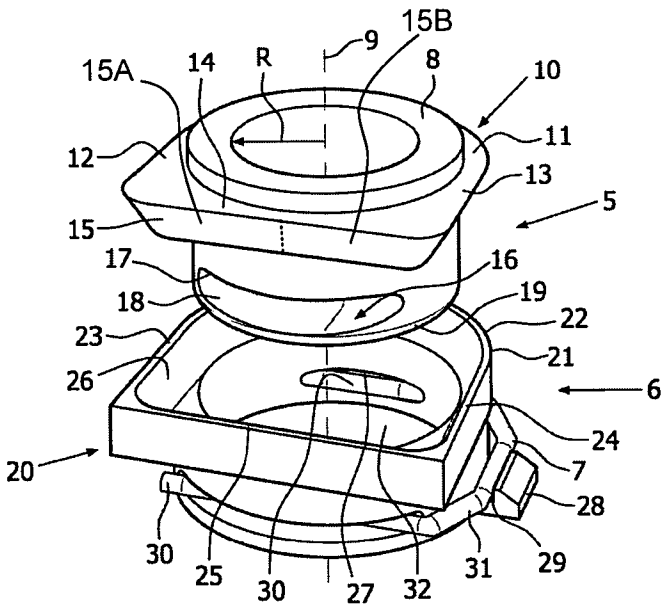
FIG. 2


15B
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15A
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R
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FIG. 3A

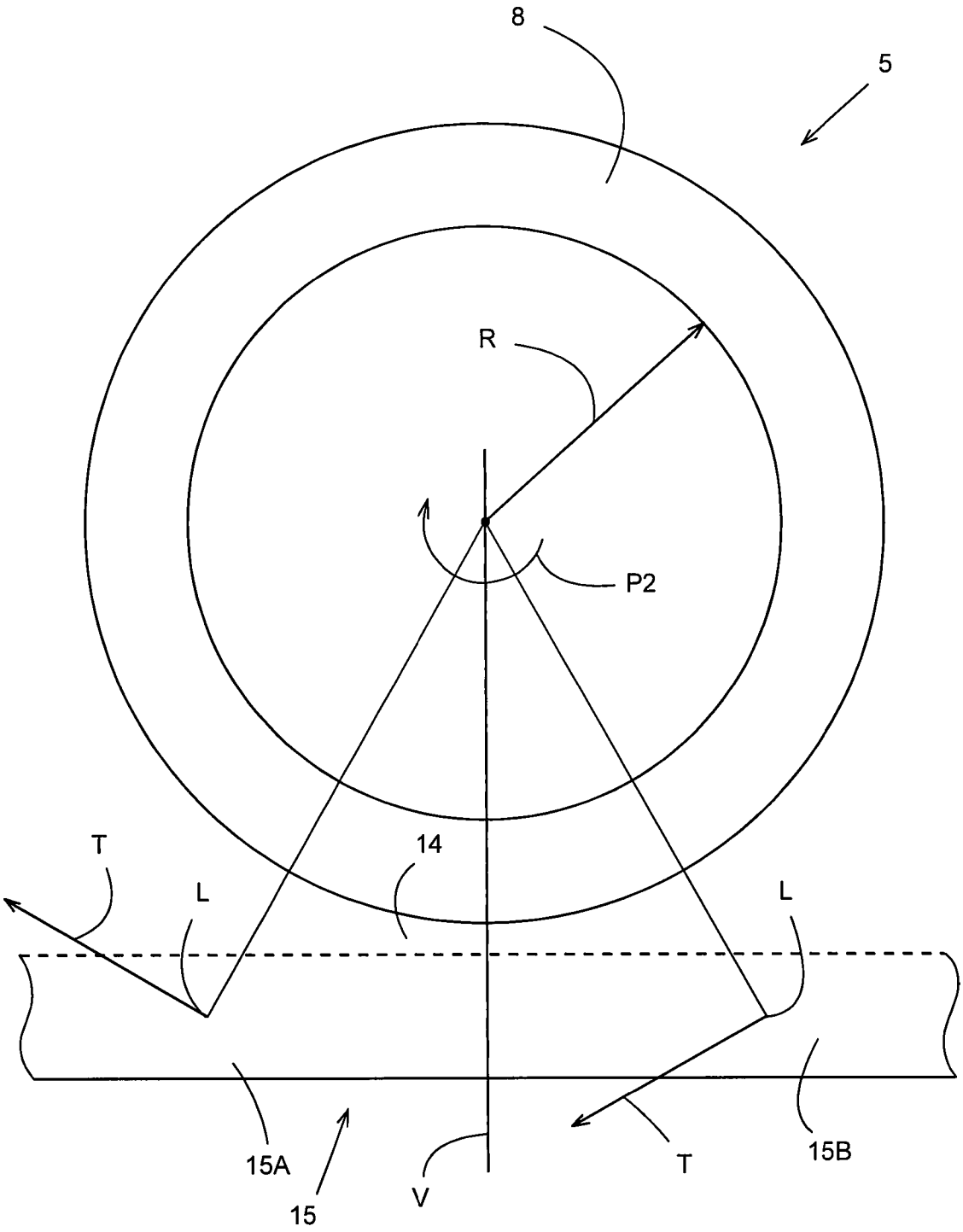

Fig. 3B

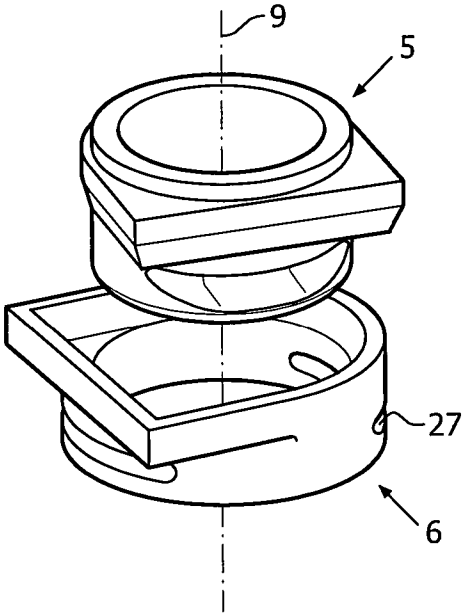

FIG. 4A

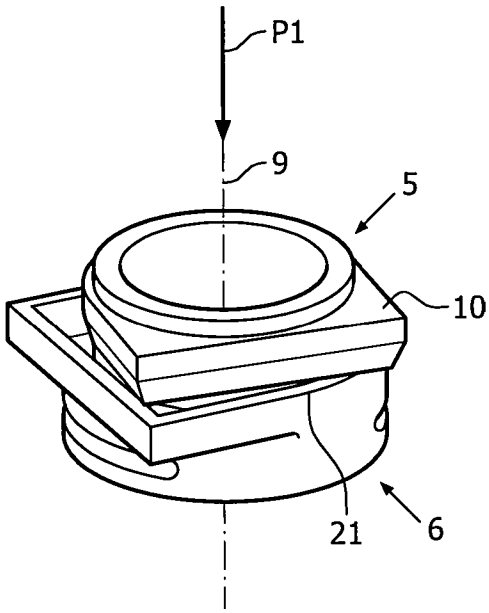

FIG. 4B

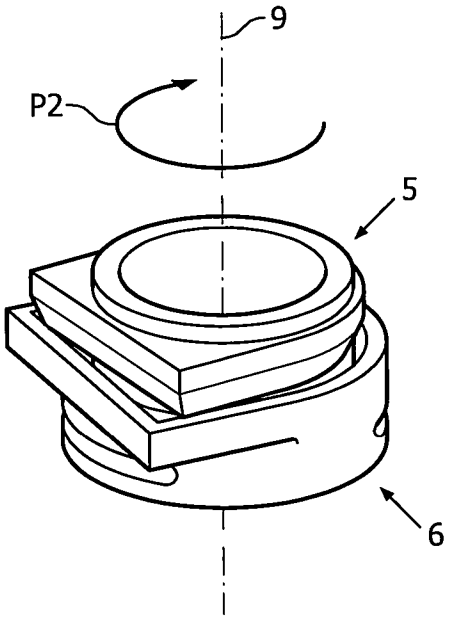

FIG. 4C

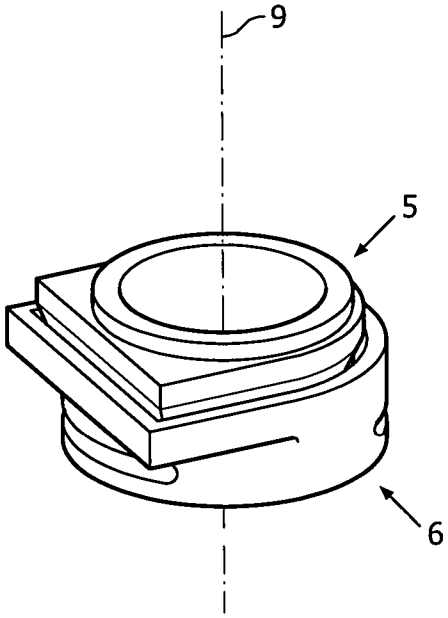

FIG. 4D

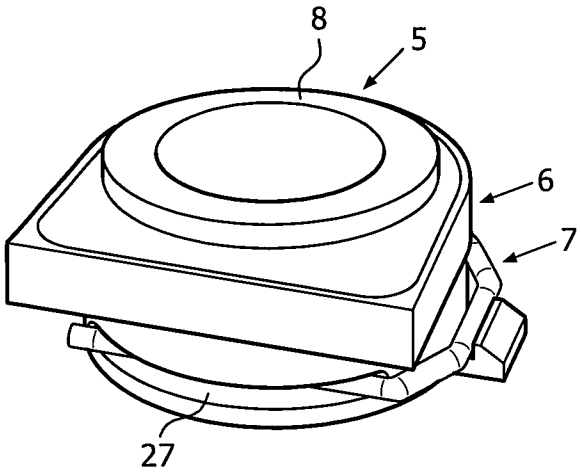

FIG. 5A

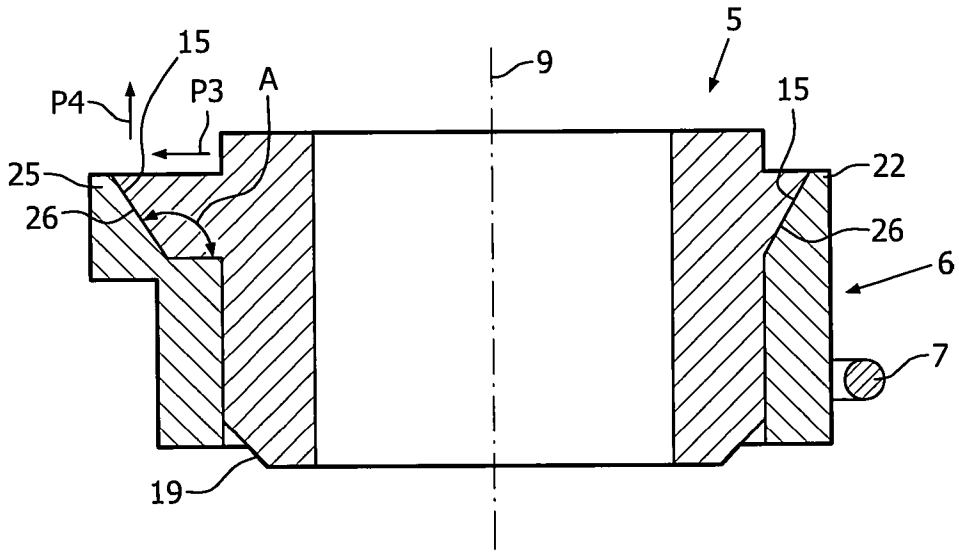

FIG. 5B

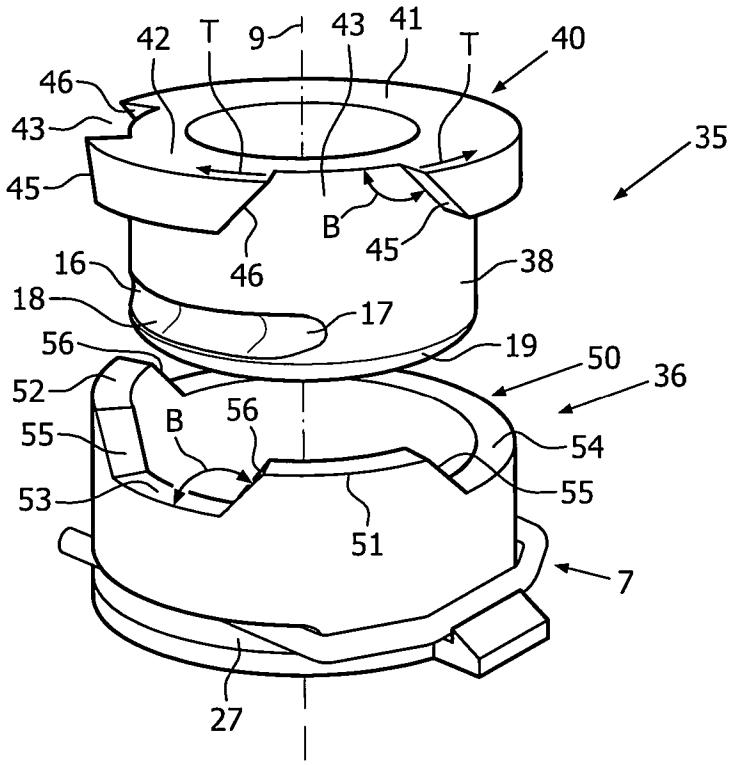

FIG. 6

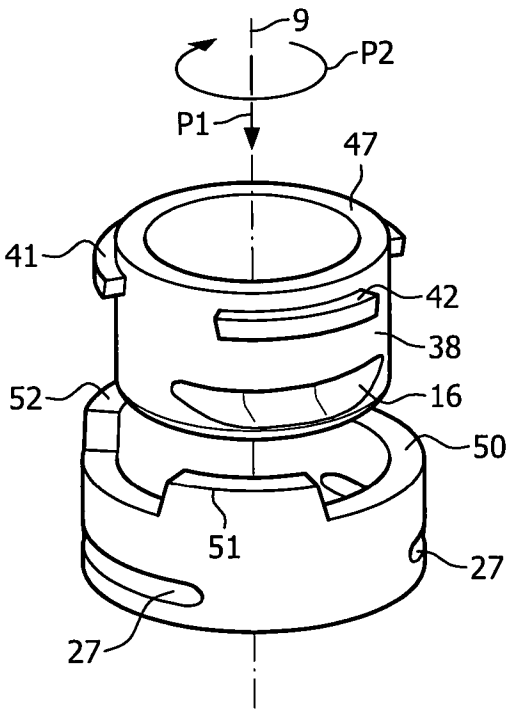

FIG. 7A

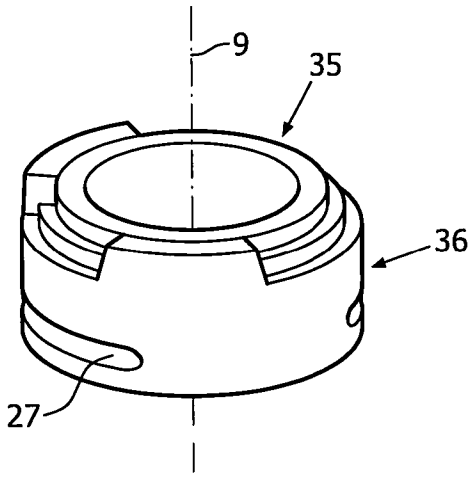

FIG. 7B

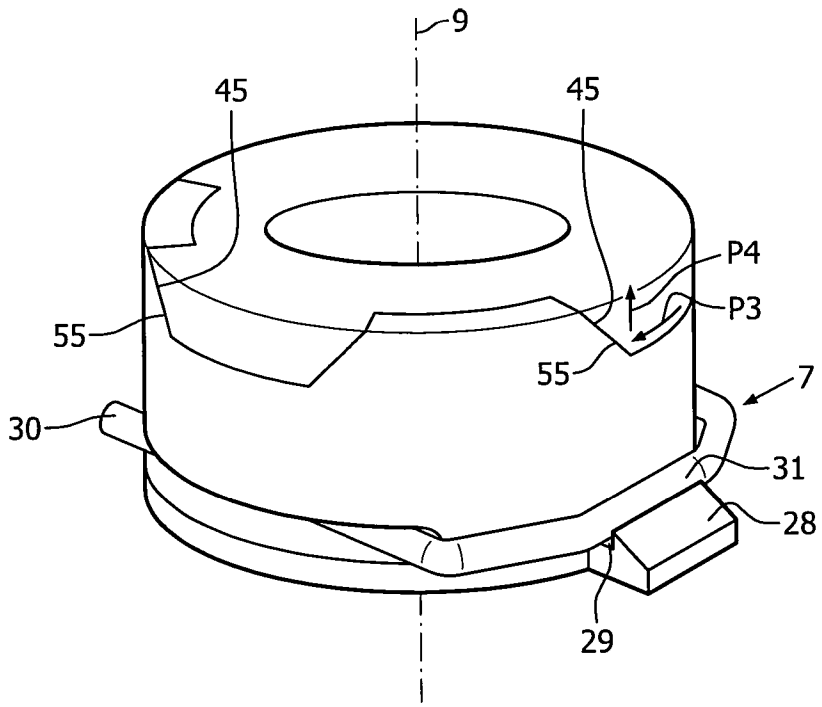

FIG. 8

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2014/060388

A. CLASSIFICATION OF SUBJECT MATTER
INV. B26B19/38 B26B21/40
ADD.

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)
B26B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2010/299927 A1 (FISCHER UWE [DE] ET AL) 2 December 2010 (2010-12-02)	1-3,5-13
A	paragraphs [0049] - [0054]; figures 1-7	4
A	US 6 378 210 B1 (BICKFORD ROY L [US]) 30 April 2002 (2002-04-30) column 3, lines 47-67; figure 1	1-13
A	US 3 568 313 A (HUTTER BEDA) 9 March 1971 (1971-03-09) column 1, lines 63-71; figures 1,2	1-13
A	EP 2 086 729 B1 (KONINKL PHILIPS ELECTRONICS NV [NL]) 23 May 2012 (2012-05-23) cited in the application paragraphs [0021] - [0026]; figures 2A, 2B	1-13

☐ 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	Date of mailing of the international search report
23 July 2014	30/07/2014

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Rattenberger, B

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
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