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This invention relates to a dry shaving apparatus having a housing, a removable cutting head frame supporting the upper cutter and a device for locking and unlocking the cutting head frame, composed of locking elements which are movably mounted in the housing, are subject to spring pressure and project from the narrow sides of the housing, and of operating elements which are disposed in the end cheeks of the cutting head frame and act on the locking elements.

A dry shaving apparatus according to the preamble of claim 1 is known from DE-A-25 19 881. The disadvantages of such a design are that in order to overcome the lock, compressive forces and tensile forces acting in opposite direction have to be applied simultaneously to the cutting head frame and the housing, with the added aggravation that the force component of the compressed locking spring acts upon the operating element via the locking element at right angles which adversely affects the withdrawal process. Since the tensile forces to be applied to the cutting head frame and the housing have to be greater than the force components of the locking springs, the unlocking process proceeds discontinuously, which is perceived as unpleasant by the user.

It is an object of the present invention to provide a device for locking and unlocking a cutting head frame which does not suffer from the disadvantages identified above. The device is intended in particular to ensure that the cutting head frame is readily removable from and installable on, the housing.

This object is accomplished by the invention in that ascending ramps leading to the locked position of the locking elements are provided on the inner walls of the end cheeks and that radially movable operating elements are provided in the end cheeks, the walls of said elements acting on the locking elements and forming descending ramps for the locking elements in the actuated state.

The ascending ramps provided on the inner walls of the end cheeks of the cutting head frame and leading to the locked position of the locking elements facilitate the mounting of the cutting head frame on the housing because the locking elements are slid

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into the locked position over a prolonged distance having a corresponding slope, with the shoulders resulting at the ends of the ascending ramps and leading to the end cheeks being advantageously used as detent stops for the locking elements.

The ease with which the cutting head frame can be removed from the housing is achieved by the operating elements disposed in the end cheeks, said elements bending or turning about their fastening point under the impact of pressure and forming in this state descending ramps for the locking elements forced out of their locked positions in the course of this process. The operating elements forced into the cutting head frame are brought into abutment with the locking elements at an angle, whereby the force component resulting from this angular position pushes the cutting head frame away from the housing via the descending ramps.

The operating element preferably consists of a resilient or pivotally mounted lever arm which is disposed in a recess provided in the end cheek of the cutting head frame.

The lever arm has its one end suitably fastened to a cross member provided in the recess and, in the state of rest, has its end which acts on the locking element in abutment with the inner wall of the end cheek.

In accordance with a preferred embodiment, the inner wall of the lever arm serves as a descending ramp the inclination of which depends, according to the invention, on the radial deflection of the lever arm during its actuation.

Preferably, the ramp inclination of the descending ramp of the lever arm is variable beyond the detent action of the ascending ramp. It is to be considered a special advantage of this arrangement that the separation process of the cutting head frame from the housing as the locking elements glide along the descending ramps of the lever arms can be accelerated by an increase in the radial deflection of the lever arms and the resultant change in the ramp inclination.

In accordance with the invention, an ascending ramp is provided on the end cheeks of the cutting head frame on both sides of an operating element.

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Preferably, the walls extending from the ends of the slopes of the ascending ramps to the inner walls are constructed as detent stops for the locking elements.

Further advantages and details of the invention will be apparent from the subsequent description and the drawings illustrating preferred embodiments. In the drawings,

FIG. 1 shows a part of a shaver housing with the cutting head frame mounted thereon, in a front view and in partial section;

FIG. 2 is a longitudinal section through one of the two identically constructed end cheeks of a cutting head frame as well as a partial section through the shaver housing in the region of one of the identically constructed locking elements;

FIG. 3 is a longitudinal section and partial section as shown in FIG. 2, with one operating element shown in operating condition; and

FIG. 4 is an exploded view of a cutting head frame as well as of the upper part of a shaver housing shown in perspective.

FIG. 1 shows a dry shaving apparatus with a cutting head frame 2 removable from a housing 1. Fastened in the cutting head frame 2 is an upper cutter 3 which cooperates with a lower cutter 4 which is caused to reciprocate via a rocking lever 5 by a motor, not shown, disposed in the housing 1. A helical spring 6 urges the lower cutter 4 against the upper cutter 3 in known fashion.

The ends 7 and 8 of the housing 1 as well as the end cheeks 20, 21 of the cutting head frame being of identical construction, only one of the ends and one of the end cheeks will be referred to and described in more detail in the following. As best seen in FIGS. 2, 3 or 4, locking elements 9 project from both ends 7 and 8 of the housing 1. As shown in FIG. 2, for example, the locking elements 9, together with the compression springs 11 acting thereon, are received in recesses 13 in the housing 1 and are prevented from falling out of the recesses 13 and from twisting by resilient detent means 15 which engage grooves 17 of predetermined length provided in the walls of the recesses 13. The end of the locking elements 9 projecting

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from the recesses 13 is conical and the apex of the cone may be flattened or rounded.

In the region of the cutting head frame 2, the wall of the housing 1 is slightly offset inwardly, producing a circumferential ledge 19 which serves as a stop for the cutting head frame 2 as it is placed onto the housing 1.

Narrow U-shaped recesses 22 extending in the longitudinal direction of the end cheeks and leading from the end of the cutting head frame 2 seated on the ledge 19 up to the level of the locking elements 9 are provided in the two end cheeks 20 and 21 of the cutting head frame 2. An operating element 24 in the form of an elongated button is disposed rotatably or, as shown, resiliently, in each of the recesses 22. For this purpose, a broad cross member 42 is provided in the recesses 22, with the operating elements 24, made of a springy material, being secured thereto by a clip connection, for example. It is to be understood that the cross members 42 may also be configured as round rods and may be rotatably carried in the recesses to provide a rotatable deflection of, for example, rigidly constructed operating elements.

The ends of the operating elements 24 remote from the ledge 19 are in abutting engagement with the locking elements 9 on the one side and with the inner walls 26 of the end cheeks 20 and 21 on the other side, with the operating elements 24 as well as the inner walls 26 being provided with interlocking shoulders 28 and 30 in the abutment area.

Projections 32 are provided on the operating elements 24 and protrude out of the recesses 22 or out of the outer contour of the end cheeks 20 and 21 when the cutting head frame 2 and the housing 1 are in the locked state. The projections 32 identify the pressure range for the unlocking process on the operating elements 24.

On either side of the recesses 22 and extending parallel thereto, ascending ramps 34 and 35 having a predetermined slope are formed on the inner walls 26. The ascending ramps 34 and 35 terminate in the area of the locking elements 9.

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The return of the slope ends of the ascending ramps 34 and 35 to the inner walls 26 produces shoulders which serve as detent stops 38 and 39 for the locking elements 9, these detent stops being provided with a bevel that matches the conical shape of the locking elements 9, which has a favorable effect on the unlocking and locking processes.

When the operating elements 24 provided in the end cheeks 20 and 21 are actuated via the projections 32, the former will bend, as shown in FIG. 3, around the cross members 42 radially inwardly into the cutting head frame 2, urging the locking elements 9 against the pressure of the springs 11 away from the detent stops 38 and 39 into the recesses 13. The walls of the operating elements 24 acting on the locking elements 9 then assume an inclined position corresponding to the radial deflection, thus forming descending ramps 44 for the locking elements 9. If the descending ramps 44 and the ascending ramps 34 and 35 are on the same plane, the unlocked locking elements 9 will glide along the descending ramps under the action of force components that result from the actuating pressure exerted on the operating elements 24. The cutting head frame 2 is then lifted clear of the ledge 19 of the housing 1. As the resilient action of the operating elements 24 intensifies during this downward sliding process, the inclination of the descending ramps is increased, which has an accelerating effect on the downward sliding process.

The unlocking process is initially aided and facilitated by the fact that in the locked condition of the cutting head frame 2 on the housing 1, the available contact pressure of the lower cutter 4 on the upper cutter 3 fastened to the cutting head frame 2 can be utilized in addition.

When the cutting head frame 2 is placed on the housing 1, the operating elements 24 are in the position shown in FIG. 2, that is, in abutting engagement with the inner walls 26 of the end cheeks 20 and 21. The cutting head frame 2 is slid over the recessed part of the housing 1, causing the locking elements 9 to come to rest against the ascending ramps 34, 35 whose constant slopes push the locking elements 9 into the recesses 13 in opposition to the pressure of the compression springs 11. After the slope ends of the ascending ramps 34 and 35 are overtraveled, the compression springs 11 urge the locking elements 9

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partially out of the recesses 13 into the locked position, this process being aided by the beveled detent stops 38 and 39 and the inclined surfaces provided on the locking elements 9.

FIG. 4 shows a portion of the housing 1 of the shaver, with a locking element 9 projecting from the end 8, the ends of which element are beveled and extend transversely to the end 8. A locking element of identical construction is provided in the end 7. The end cheeks 20 and 21 of the cutting head frame 2 are joined together by a front wall 36, shown cut away, and a rear wall 37.

Provided on the inner wall 26 of the end cheek 20 are two ascending ramps 34 and 35 the slopes of which increase in the direction of withdrawal. The return of the ascending ramps to the inner wall 26 produces detent stops 38 and 39 with beveled walls corresponding to the bevels on the ends of the locking elements 9 which abut against these detent stops when in the locked position. The resilient or pivotable operating element 24 is disposed in a U-shaped recess between the two ascending ramps 34 and 35, the end of said element lying in the removal direction abutting either the inner wall 26 of the end cheek 20 or, as shown in this Figure, the non-movable base of another operating element 25.

The end cheek 21 whose inner wall is not visible because of the perspective representation is of a construction identical to the inner wall 26 of the end cheek 20. This is also true of the outer walls of the end cheeks 21 and 20 which show only the operating elements 24 and 25 extending lengthwise of the end cheeks with their respective projections 32 and 33.

List of References

- 1 Housing
- 2 Cutting Head Frame
- 3 Upper Cutter
- 4 Lower Cutter
- 5 Rocking Lever
- 6 Helical Spring
- 7)
- 8) Ends
- 9 Locking Elements
- 11 Compression Springs
- 13 Recesses
- 15 Detent Means
- 17 Grooves
- 19 Ledge
- 20)
- 21) End Cheeks
- 22 U-shaped Recesses
- 24)
- 25) Operating Element
- 26 Inner Walls
- 28)
- 30) Shoulders
- 32)
- 33) Projections
- 34)
- 35) Ascending Ramps
- 36 Front Wall
- 37 Rear Wall
- 38)
- 39) Detent Stops
- 42 Cross Members
- 44 Descending Ramps



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Patent Claims

1. A dry shaving apparatus having a housing (1), a removable cutting head frame (2) supporting the upper cutter (3) and a device for locking and unlocking the cutting head frame (2), composed of locking elements (9) which are movably mounted in the housing (1), are subject to spring pressure and project from the narrow sides of the housing (1), and of operating elements (24, 25) which are disposed in the end cheeks (20, 21) of the cutting head frame (2) and act on the locking elements (9), characterized in that ascending ramps (34 and 35) leading to the locked position of the locking elements (9) are provided on the inner walls (26) of the end cheeks (20, 21) and that radially movable operating elements (24) are provided in the end cheeks (20, 21), the walls of said elements acting on the locking elements (9) and forming descending ramps (44) for the locking elements (9) in the actuated state.

2. A device as claimed in claim 1, characterized in that the operating element (24) consists of a resilient or pivotally mounted lever arm which is disposed in a recess (22) provided in the end cheek (20, 21) of the cutting head frame (2).

3. A device as claimed in any one of the preceding claims, characterized in that the lever arm (24) has its one end fastened to a cross member (42) provided in the recess (22) and has its end which acts on the locking element (9) in abutment with the inner wall (26) of the end cheek (20, 21) in the state of rest.

4. A device as claimed in any one of the preceding claims, characterized in that the inner wall of the lever arm (24) is provided as a descending ramp (44) the inclination of which is variable in dependence on the radial deflection of the lever arm.

5. A device as claimed in any one of the preceding claims, characterized in that the ramp inclination of the descending ramp (44) of the lever arm (24) is variable beyond the detent action of the ascending ramp (34 and 35).

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6. A device as claimed in any one of the preceding claims, characterized in that an ascending ramp (34, 35) is provided on the end cheek (20, 21) on both sides of the recess (22) or of the operating element (24).

7. A device as claimed in any one of the preceding claims, characterized in that the walls extending from the slope ends of the ascending ramps (34 and 35) to the inner walls (26) are constructed as detent stops (38 and 39) for the locking elements (9).

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