

SPECIFICATION

Cutting member for a dry-shaving apparatus

- 5 The invention relates to a cutting member for a dry-shaving apparatus of the kind (hereinafter referred to as "the kind described") having a shear plate with hair-entry apertures and a cutting member which is reciprocable relative to the shear plate and
- 10 is in sliding contact therewith, and comprises cutting elements and hair-pulling members which are movable relative to the cutting elements.

A shaving apparatus of this kind is known from, for example, United States Patent Specification

15 3,088,205. In this known apparatus hairs which are caught in the hair-entry apertures are pushed away by the hair-pulling members in the direction of movement of the cutting member. As a result of this the hairs assume a position which does not facilitate

20 cutting.

According to the invention there is provided a cutting member for a dry-shaving apparatus of the kind described, comprising a plurality of cutting elements each having a first face for sliding contact

25 with the shear plate of the apparatus and a second face on which is slidably guided a plurality of hair-pulling members and which forms an acute angle with the first face of the respective cutting element at an edge of the element which forms a

30 cutting edge thereof, the hair-pulling members being slidable on said second face in directions away from and towards said cutting edge.

The hairs are pulled inwards by the hair-pulling members in a movement which is directed away

35 from the shear plate, which is the most effective direction for obtaining the closest possible shave. Moreover, the hairs are then oriented in this direction and thus assume the most favourable position for cutting.

40 In a preferred embodiment of the invention the hair-pulling members which are slidably guided on the second face of each cutting element form portions of a single element associated with the respective cutting element, said portions being

45 resiliently movable relative to the remainder of said single element and independently of one another.

The single elements associated with the cutting elements may all be formed from one sheet of resilient material so that they are integrally connected to one another.

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Embodiments of the cutting member according to the invention will now be described with reference to the accompanying drawings, in which

Figure 1 is a perspective view of a dry-shaving apparatus of the kind described having a cutting member according to one embodiment of the invention,

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Figure 2 is a side view, partly in section and partly in elevation, of the apparatus of Figure 1 drawn to a larger scale,

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Figure 3 is a cross-section taken on the line III-III in Figure 2,

Figures 4 and 5 show a detail of Figure 3 to an enlarged scale and illustrate the operation of the

65 hair-pulling members,

Figure 6 shows a cross-section of another embodiment of the cutting member according to the invention, and,

Figure 7 is a cross-section taken on the line VII-VII in Figure 6, and drawn to an enlarged scale.

The shaving apparatus shown in Figures 1 and 2 comprises a housing 1 with a detachable shaving head 2. The shaving head 2 is provided with a shear plate 3 in the form of a flexible shear foil with hair-entry apertures 4. For the attachment of the shear plate 3 to the frame of the shaving head 2 this frame is provided with hook-shaped projections 5 which engage with corresponding openings in the shear plate. On the inner side of the shear plate there is disposed a cutting member 6 which is reciprocable relative to the shear plate. The cutting member 6 is provided with arcuate cutting elements 7 of trapezoidal cross-section (Figure 3). At their ends the cutting elements 7 are secured to two parallel bars 8.

85 These bars 8 are interconnected at the ends by cross-pieces 9, so that a rectangular frame is formed. This frame 8, 9 is provided with a transverse pin 10 for coupling the cutting member 6 to a vibrator motor 12 of the shaving apparatus via a drive spindle 11. In the assembled condition the pin 10 passes through an aperture 13 in the spindle 11. A bore 14 in the spindle 11 contains a coil spring 15, which is compressed between the spindle 11 and the pin 10, so that the cutting member 6 is urged against the inner side of the shear plate 3 and supports the plate in an arched position.

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A slot 16 in the end of the spindle 11 enables portions 17 and 18 of the spindle 11 on opposite sides of the slot 16 to move apart elastically when manual force is exerted on the cutting member in the longitudinal direction of the spindle 11. The pin 10 can then pass through the slot 16, so that the cutting member 6 can be mounted or removed in a simple manner.

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Each of the cutting elements 7 (see also Figures 4 and 5) is provided with hair-pulling members 19 on both sides. These hair-pulling members are formed by portions of the side walls of a basically channel-shaped element 20 of arcuate form which is made from resilient strip material and which fits over the cutting element on the inner side thereof. The element 20 comprises a central or bottom portion 21 which extends between the side walls of the element and which is secured by, for example, spot-welding to the radially inner face 22 of the cutting element.

115 The hair-pulling members 19 are formed by cutting a series of slots 23 in each side wall of the element 20, the portions between the slots forming the hair-pulling members. Each hair-pulling member has a serpentine portion 24 adjoining the central portion 21 of the element 20 so that the hair-pulling member is elastically movable relative to the associated cutting element 7. The hair-pulling members are slidably guided on inclined guide faces 27 of the cutting element, which guide faces are formed by the two side faces of the cutting element. These two faces are inclined relative to the shear plate 3, each forming an acute angle α (Figure 4) with the radially outer face 28 of the respective cutting element, which face is in sliding contact with the inner side of

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the shear plate. The hair-pulling members can slide on the guide faces 27 in directions away from and towards the shear plate. The edges 29 at which the faces 27 of each cutting element meet the face 28 thereof are the cutting edges of the cutting element, and each hair-pulling member 19 has a sharp edge 26 which precedes the adjacent cutting edge 29 of the respective cutting element in the operative stroke of that cutting edge.

The operation of the above apparatus is as follows. When a hair 25 is caught in a hair-entry aperture 4 of the shear plate 3, the sharp leading edge 26 of one of the hair-pulling members 19, moving in the direction of arrow P, will contact the hair 25 and will slightly penetrate the hair without cutting it off. The reaction force which is exerted on this hair-pulling member 19 by the hair 25 will in general be directed oppositely to the direction of movement P. This force is to be compensated for by the component N_1 of the normal force N which is exerted on the hair-pulling member by the associated guide face 27 of the respective cutting element 7. For the sake of simplicity the small frictional forces between the hair-pulling member and the cutting element have been neglected. The component N_2 of the normal force N will cause the hair-pulling member 19 to slide over the guide face 27 in the direction away from the shear plate 3.

Owing to the natural elasticity of the user's skin the hair 25 will be pulled up from the skin by the hair-pulling member 19 until the adjacent cutting edge 29 of the respective cutting element 7 has reached the hair (Figure 5). The hair will then be cut off by the cutting element 7 in cooperation with the shear plate 3. Thus, the hairs are cut more closely and a better shaving result is obtained than with a similar shaving apparatus which does not have hair-pulling members.

The displacement of the hair-pulling member relative to the shear plate is the sum of the displacement of the hair-pulling member relative to the associated cutting element and the displacement of the hair-pulling member with the cutting element in the direction of movement P. In the situation of Figures 4 and 5 the hair-pulling member has moved relative to the shear plate in a direction normal to the shear plate. In general the movement of the hair-pulling member will be directed away from the shear plate and towards the interior of the apparatus, so that the pulling action of the hair-pulling member is most effective. Moreover, the hair-pulling member will bring hairs which are positioned obliquely relative to the shear plate into a position which more closely approximates to the position normal to the shear plate, which is more favourable for cutting.

The inclined guide faces 27 on both sides of each cutting element 7 have the form of part of a conical surface. By employing a plurality of hair-pulling members 19 of small width on each side of each cutting element 7, each part of each guide face 27 which directly faces a hair-pulling member may be regarded as an approximately plane surface.

In the embodiment illustrated in Figures 6 and 7 the cutting member has arcuate cutting elements 30 of segmental cross-section each provided on both

sides with hair-pulling members 31. These members are formed by portions of a basically channel-shaped element 33 of arcuate form which is made from resilient strip material and which fits over the inner side of the cutting element 30, the element 33 having a cross-section which conforms to the shape of the inner side of the cutting element. The hair-pulling members 31 are formed by cutting transverse slots 32 in the element 33, each slot opening out of one edge of the element. As shown in Figure 6, alternate slots may open out of opposite edges of the element 33. The hair-pulling members are slidable away from and towards the shear plate 3 on guide faces 34 of the cutting element, which faces form acute angles with the radially outer face of the cutting element at the cutting edges of the element.

In its rest position each hair-pulling member 31 is wholly in contact with the inner side of the associated cutting element 30. Upon contacting a hair in the operation of the apparatus, the hair-pulling member will slide over the associated guide face 34 of the cutting element away from the shear plate 3, and a clearance 35 (Figure 7) will thereby be formed between the hair-pulling member and the cutting element.

In both of the above embodiments the elements 20 and 33 respectively on which the hair-pulling members are formed may be formed from separate strips of resilient material or they may all be formed from one sheet of resilient material so that they are integrally connected to one another to form a unit which can be bodily mounted on and removed from the cutting member.

100 CLAIMS

1. A cutting member for a dry-shaving apparatus of the kind described, comprising a plurality of cutting elements each having a first face for sliding contact with the shear plate of the apparatus and a second face on which is slidably guided a plurality of hair-pulling members and which forms an acute angle with the first face of the respective cutting element at an edge of the element which forms a cutting edge thereof, the hair-pulling members being slidable on said second face in directions away from and towards said cutting edge.

2. A cutting member as claimed in Claim 1, wherein the hair-pulling members which are slidably guided on the second face of each cutting element for portions of a single element associated with the respective cutting element, said portions being resiliently movable relative to the remainder of said single element and independently of one another.

3. A cutting member as claimed in Claim 2, wherein the single elements associated with the cutting elements are all formed from one sheet of resilient material so that they are integrally connected to one another.

4. A cutting member as claimed in Claim 1, 2 or 3, wherein each hair-pulling member is pressed by resilient means against the second face of the respective cutting element.

5. A cutting member substantially as herein described with reference to Figures 2 to 5 or Figures



the shear plate. The hair-pulling members can slide on the guide faces 27 in directions away from and towards the shear plate. The edges 29 at which the faces 27 of each cutting element meet the face 28 thereof are the cutting edges of the cutting element, and each hair-pulling member 19 has a sharp edge 26 which precedes the adjacent cutting edge 29 of the respective cutting element in the operative stroke of that cutting edge.

The operation of the above apparatus is as follows. When a hair 25 is caught in a hair-entry aperture 4 of the shear plate 3, the sharp leading edge 26 of one of the hair-pulling members 19, moving in the direction of arrow P, will contact the hair 25 and will slightly penetrate the hair without cutting it off. The reaction force which is exerted on this hair-pulling member 19 by the hair 25 will in general be directed oppositely to the direction of movement P. This force is to be compensated for by the component N_1 of the normal force N which is exerted on the hair-pulling member by the associated guide face 27 of the respective cutting element 7. For the sake of simplicity the small frictional forces between the hair-pulling member and the cutting element have been neglected. The component N_2 of the normal force N will cause the hair-pulling member 19 to slide over the guide face 27 in the direction away from the shear plate 3.

Owing to the natural elasticity of the user's skin the hair 25 will be pulled up from the skin by the hair-pulling member 19 until the adjacent cutting edge 29 of the respective cutting element 7 has reached the hair (Figure 5). The hair will then be cut off by the cutting element 7 in cooperation with the shear plate 3. Thus, the hairs are cut more closely and a better shaving result is obtained than with a similar shaving apparatus which does not have hair-pulling members.

The displacement of the hair-pulling member relative to the shear plate is the sum of the displacement of the hair-pulling member relative to the associated cutting element and the displacement of the hair-pulling member with the cutting element in the direction of movement P. In the situation of Figures 4 and 5 the hair-pulling member has moved relative to the shear plate in a direction normal to the shear plate. In general the movement of the hair-pulling member will be directed away from the shear plate and towards the interior of the apparatus, so that the pulling action of the hair-pulling member is most effective. Moreover, the hair-pulling member will bring hairs which are positioned obliquely relative to the shear plate into a position which more closely approximates to the position normal to the shear plate, which is more favourable for cutting.

The inclined guide faces 27 on both sides of each cutting element 7 have the form of part of a conical surface. By employing a plurality of hair-pulling members 19 of small width on each side of each cutting element 7, each part of each guide face 27 which directly faces a hair-pulling member may be regarded as an approximately plane surface.

In the embodiment illustrated in Figures 6 and 7 the cutting member has arcuate cutting elements 30 of segmental cross-section each provided on both

sides with hair-pulling members 31. These members are formed by portions of a basically channel-shaped element 33 of arcuate form which is made from resilient strip material and which fits over the inner side of the cutting element 30, the element 33 having a cross-section which conforms to the shape of the inner side of the cutting element. The hair-pulling members 31 are formed by cutting transverse slots 32 in the element 33, each slot opening out of one edge of the element. As shown in Figure 6, alternate slots may open out of opposite edges of the element 33. The hair-pulling members are slidable away from and towards the shear plate 3 on guide faces 34 of the cutting element, which faces form acute angles with the radially outer face of the cutting element at the cutting edges of the element.

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In both of the above embodiments the elements 20 and 33 respectively on which the hair-pulling members are formed may be formed from separate strips of resilient material or they may all be formed from one sheet of resilient material so that they are integrally connected to one another to form a unit which can be bodily mounted on and removed from the cutting member.

100 CLAIMS

1. A cutting member for a dry-shaving apparatus of the kind described, comprising a plurality of cutting elements each having a first face for sliding contact with the shear plate of the apparatus and a second face on which is slidably guided a plurality of hair-pulling members and which forms an acute angle with the first face of the respective cutting element at an edge of the element which forms a cutting edge thereof, the hair-pulling members being slidable on said second face in directions away from and towards said cutting edge.

2. A cutting member as claimed in Claim 1, wherein the hair-pulling members which are slidably guided on the second face of each cutting element are portions of a single element associated with the respective cutting element, said portions being resiliently movable relative to the remainder of said single element and independently of one another.

3. A cutting member as claimed in Claim 2, wherein the single elements associated with the cutting elements are all formed from one sheet of resilient material so that they are integrally connected to one another.

4. A cutting member as claimed in Claim 1, 2 or 3, wherein each hair-pulling member is pressed by resilient means against the second face of the respective cutting element.

5. A cutting member substantially as herein described with reference to Figures 2 to 5 or Figures



(17)

6 and 7 of the accompanying drawings.

6. A dry-shaving apparatus of the kind described having a cutting member as claimed in any of the preceding claims.

- 5 7. A dry-shaving apparatus substantially as herein described with reference to Figures 1 to 5 or Figures 1 to 5 when modified in accordance with Figures 6 and 7.

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