

Cutting Member for a Dry-Shaving Apparatus

The invention relates to a cutting member for a dry-shaving apparatus of the kind (hereinafter referred to as "the kind described") comprising a shear plate formed with a plurality of hair-entry apertures which are arranged in a circle, and a cutting member which is rotatable relative to the shear plate and comprises a central body and a plurality of cutters distributed around the circumference of the central body for cooperation with the shear plate to cut off hairs which protrude through the hair-entry apertures of the shear plate in the operation of the shaving apparatus.

A shaving apparatus having such a cutting member is described in our prior United Kingdom Patent Specification No. 1,439,275. The cutting member of this known apparatus is provided with six cutters spaced at regular intervals around the circumference of the central body. If the number of hair-entry apertures in the shear plate is an integral multiple of the number of cutters, and the hair-entry apertures are all equally spaced around the shear plate, as is usually the case, it is possible during use of the apparatus for several hairs to be cut at the same instant. This results in undesired peak loading of the drive mechanism of the apparatus.

According to the invention there is provided a cutting member for a dry-shaving apparatus of the kind described, which cutting member comprises a central body and a plurality of cutters distributed around the circumference of the central body, wherein the cutters are arranged in groups with equal intervals between adjacent cutters of individual groups, the groups being spaced around the circumference of the central body at intervals which differ from the intervals between adjacent cutters of any individual group.

According to a preferred embodiment of the invention, in a cutting member for a dry-shaving apparatus of the kind described in which the hair-entry apertures in the shear plate are equally spaced from one another, which cutting member comprises a central body and a plurality of cutters distributed around the circumference of the central body, the cutters are arranged in groups with equal intervals between adjacent cutters of each individual group and with intervals between adjacent groups which differ from the interval between adjacent cutters of any individual group, and none of the intervals between adjacent cutters of individual groups and/or none of the intervals between adjacent groups is a integral multiple of the interval between adjacent hair-entry apertures.

In one embodiment of the invention the groups comprise equal numbers of cutters and are equally spaced around the circumference of the central body.

Alternatively, the intervals between adjacent groups may be different.

The invention further provides a dry-shaving apparatus of the kind described having a cutting member according to the invention.

An embodiment of the invention will now be described by way of example with reference to the

accompanying drawings, in which

Figure 1 is a front elevation of a shaving apparatus of the kind described having three shear plates and associated cutting members,

Figure 2 is a side elevation of the shaving apparatus of Figure 1, showing one of the shear plates and cutting members and an associated driving means in cross-section, the section being taken on the line II-II in Figure 1,

Figure 3 is a plan view of an embodiment of a cutting member according to the invention for the shaving apparatus shown in Figures 1 and 2,

Figure 4 is a cross-section taken on the line IV-IV in Figure 3 and

Figure 5 is a plan view of a flat blank from which the cutting member of Figures 3 and 4 is produced in the manufacture of the cutting member.

The shaving apparatus shown in Figures 1 and 2 comprises a housing 1 on which is mounted a shear plate holder 2 for three stationary shear plates 3. The shear plates 3 are of circular form and each have hair-entry apertures in the form of slots 4, also arranged in a circle.

A rotary cutting member 5 (Figure 2) is disposed on the inner side of each shear plate 3 for cooperation therewith. One of the cutting members is shown schematically in Figure 2 and in detail and on an enlarged scale in Figures 3 and 4.

The cutting members 5 are rotated relative to the shear plates by an electric motor 10 to which each cutting member is coupled by an associated hollow spindle 6 (Figure 2) and gear wheel 7 and a gear wheel 8 fixed on the shaft 9 of the motor 10. The gear wheels 7 are each rotatably journaled on an associated spindle 11 which is fixed in a mounting plate 12. The gear wheel 7 has a cavity 13 which is closed by a cover plate 14. This cavity accommodates a flange 15 formed at the end of the hollow spindle 6. The flange 15 has a non-circular, for example, square, shape and the cavity 13 is shaped accordingly, so that a coupling is established for the transmission of the rotary movement of the gear wheel 7 to the spindle 6. A coil spring 16, which for the greater part is situated in the hollow spindle 6 and which is compressed between an end wall of the hollow spindle 6 and an end wall of the cavity 13 in the gear wheel 7, exerts a force on the spindle 6 in the direction of the cutting member 5. A conical portion 17 of the spindle 6 bears against the cutting member 5 to transmit this force to the cutting member and *via* the cutting member to the shear plate 3, so that a flange 18 around the periphery of the shear plate is urged against the shear plate holder 2. During use of the shaving apparatus, the shear plates 3, together with the associated cutting members 5 and spindles 6, can be pressed inwards against the action of the springs 16 under the pressure with which the shear plates are held against the user's skin.

A coupling for the transmission of the rotary movement of each spindle 6 to the associated cutting member 5 is formed by an end portion 19 of the spindle 6 of substantially rectangular cross-section engaging in a central coupling aperture 20.

(14)

of corresponding shape in the cutting member 5.

All three cutting members of the apparatus shown in Figures 1 and 2 are coupled to the motor 10 in the above manner, the three gear wheels 7 meshing with the one centrally disposed gear wheel 8 on the motor shaft 9.

Each cutting member 5, as shown in Figures 3 and 4, comprises a central body 21 in which the coupling aperture 20 is formed, and a plurality of cutters, in this case fifteen distributed around the periphery of the central body 21. The cutters, designated 22', 22'', 22''', are connected to the central body 21 by arms 23 and are provided with cutting edges 24 for cooperation in known manner with the edges of the associated shear plate 3 at the boundaries of the hair-entry apertures 4 therein. The cutting member is made in one piece, for example from sheet material which is initially flat. The fifteen cutters are disposed on a circle H having a centre M which lies at the centre of the central body 21, and are arranged in three groups of five cutters. For convenience the three groups will be referred to as the "first", "second" and "third" groups, comprising the cutters 22', 22'' and 22''' respectively.

The cutting edges 24 of the cutters 22' of the first group lie on radii of the circle H which are equally spaced from one another by the angle α . The interval between adjacent cutters of the first group, as represented by the length of arc A of circle H which corresponds to angle α , is therefore constant. Similarly, the cutting edges of the cutters 22'' and 22''' of the second and third groups lie on radii of the circle H which are equally spaced from one another by the angle β in the case of the cutters 22'' and the angle γ in the case of the cutters 22'''. The intervals between adjacent cutters of the second group and adjacent cutters of the third group are represented by the lengths of arcs B and C of circle H which correspond to the angle β and γ respectively. The angles α , β and γ and thus the lengths of arcs A, B and C are equal to each other in the present embodiment, but arcs A, B and C may alternatively be of different lengths.

The intervals between the groups of cutters are determined by the angles δ , ϵ and φ between the radii containing the cutting edges 24 of the adjacent cutters of adjacent groups and are represented by the lengths of arcs D, E and F of circle H which correspond to angles δ , ϵ and γ and γ respectively. In the present embodiment the angles δ , ϵ and γ and thus the lengths of arcs D, E and F are equal to each other, so that the cutter groups are equally spaced about the axis of rotation 25 of the cutting member, which axis passes through M (Figure 4). The arcs D, E and F may alternatively be of different lengths. The lengths of arcs D, E and F differ from the length of arc between adjacent cutters of any groups of cutters.

If the cutting member is used with a shear plate having, for example, ninety hair-entry apertures which are all equally spaced around the shear plate, the number of cutters that can simultaneously contact hairs and sever them in cooperation with the shear plate can be substantially reduced by so

selecting the intervals represented by the lengths of arcs D, E and F that in an arbitrary position of the cutting member relative to the shear plate in which the cutting edge 24 of each cutter of each group of cutters extends over a hair-entry aperture 4 (shown in broken lines in Figure 3), the distance G' from the cutting edge 24 of each cutter 22' of the first group of cutters to the edge 26 of the shear plate at the boundary of the hair-entry aperture 4 over which that cutting edge 24 extends, the edge 26 being the edge with which the cutting edge 24 cooperates in its cutting action, differs from the corresponding distances G'' and G''' in the other two groups of cutters. Thus, none of the intervals D, E and F between the groups of cutters is an integral multiple of the interval between adjacent hair-entry apertures. Also, or alternatively, the intervals A, B and C between adjacent cutters of individual groups are so selected that the distance G' differs from cutter to cutter of the first group of cutters, the distance G'' differs from cutter to cutter of the second group of cutters and the distance G''' differs from cutter to cutter of the third group of cutters, so that none of the intervals A, B and C is an integral multiple of the interval between adjacent hair-entry apertures.

Thus, peak loading of the electric motor 10 such as might occur if several hairs in different hair-entry apertures were to be contacted simultaneously by cutters so that the motor has to supply at the same time instant the energy for cutting several hairs in different hair-entry apertures being contacted by cutters at the same instant increases as the number of cutters on cutting member increases. The arrangement of the cutters in groups will therefore be increasingly advantageous as the number of cutters increases.

The invention offers an additional advantage in the manufacture of the cutting member, which generally starts from a strip of sheet material from which are obtained several flat blanks each having the form of a development of the cutting member onto a flat surface. Such a blank, designated 27, is shown in Figure 5. *Inter alia* for conveyance along a production line, it is often desirable that during the first stage of manufacture the blanks remain attached to the strip. The intervals D, E and F, which will generally be greater than the intervals A, B and C, now also provide sufficient space for narrow connecting links by means of which the blank can remain connected to the remainder of the strip. At a later stage of manufacture this connecting link may be removed. In Figure 5 a part of each of the connecting links 28 is represented by broken lines.

120 CLAIMS

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CLAIMS

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cent cutters of any individual group.

2. A cutting member for a dry-shaving apparatus of the kind described in which the hair-entry apertures in the shear plate are equally spaced

- 5 from one another, which cutting member comprises a central body and a plurality of cutters distributed around the circumference of the central body, wherein the cutters are arranged in groups with equal intervals between adjacent cutters of
- 10 each individual group and with intervals between adjacent groups which differ from the interval between adjacent cutters of any individual group, and wherein none of the intervals between adjacent cutters of individual groups and/or none of the
- 15 intervals between adjacent groups is an integral multiple of the interval between adjacent hair-entry apertures.

3. A cutting member as claimed in Claim 1 or 2, wherein the groups comprise equal numbers of
- 20 cutters and are equally spaced around the circumference of the central body.

4. A cutting member as claimed in Claim 1 or 2, wherein the intervals between adjacent groups are different.

- 25 5. A cutting member substantially as herein described with reference to Figures 3, 4 and 5 of the accompanying drawings.

6. A dry-shaving apparatus of the kind described having a cutting unit as claimed in any of
- 30 Claims 1 to 5.

7. A dry-shaving apparatus substantially as herein described with reference to Figures 1 to 5 of the accompanying drawings.