

PATENT SPECIFICATION

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DRAWINGS ATTACHED

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(54) IMPROVEMENTS RELATING TO SHAVER HEADS

(71) I, GOICHI YAMAOKA, a Japanese citizen, of 3572, Minato-ku, Okaya-shi, Nagano-ken, Japan, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to shaver heads, particularly, though not exclusively, to such heads adapted to be mounted on electric dry shavers.

One type of well-known electric dry shaver includes a frame which carries a reciprocatory cutter cooperating with a foil mounted in a shaver head, the foil being a thin flexible metallic foil formed with openings through which the whiskers to be shaved extend. Reciprocation of the cutter relative to the foil provides a shearing action which cuts the whiskers.

It has been found that to provide good shaving action, the foil and the cutter must cooperate very precisely so that there is substantially uniform sliding contact therebetween and so that in operation the cutter will have a uniform pressure with respect to the shearing foil, whereby the latter will automatically adapt itself to the cutter.

Difficulty is experienced in so attaching the foil to the shaver head that the above conditions are fulfilled and the present invention seeks to provide a shaver head in which this difficulty is substantially eliminated or reduced.

According to the present invention there is provided a shaver head including a frame member, a flexible shearing foil which is adapted to extend around a cutter means and which has end portions loosely connected to said frame member by respective fastening means at given locations, and biasing means which engage the foil at locations spaced from the given locations to resiliently urge parts of the said foil spaced from the given locations against the said frame member so as to allow said foil to move relative to said frame member in directions substan-

tially parallel to an inner surface of said frame member whereby to provide, when said shaver is mounted on a shaver having said cutter means, substantially uniform sliding engagement between the cutter means and the foil.

Preferably, said biasing means includes a resilient holding plate having a plurality of foil-engaging feet.

The said plate may be formed with a plurality of slots through which said fastening means pass so as to secure the said plate resiliently to said fastening means.

Preferably the frame member is apertured for the passage therethrough of a plurality of screws and nuts constituting the fastening means, the nut having an annular flange located in a recess of said frame member which is of greater diameter than the said flange.

The foil may be provided with a reinforcing plate.

Said holding plate is preferably supported on said fastening means or nuts.

Optionally, said holding plate is secured to said foil by passing some of said feet through appropriate apertures in the foil, the free ends of which feet being thereafter deformed.

The invention also includes a dry shaver provided with a shaving head as set forth above.

The dry shaver may have a power-operated reciprocable cutter means which is biased towards the foil by a spring.

The invention will now be described, merely by way of example, with reference to the accompanying drawings, in which:—

Figure 1 is a partly sectional, fragmentary diagrammatic side elevation of a dry shaver, showing particularly the shaver head part thereof,

Figure 2 is an enlarged fragmentary sectional view showing details of the arrangement of fastening the foil to the shaver head frame member,

Figure 3 is a transverse sectional view from the inside of the shaver head showing

the way in which the foil is urged into engagement with the shaver head frame member.

Figure 4 is a cross-sectional view taken on the line a—a¹ of Figure 3,

Figure 5 is a view similar to Figure 3, but showing a modification, and

Figure 6 is a sectional view taken on the line b—b¹ of Figure 5.

Referring first to Figures 1 to 4, there is shown an electric dry shaver having a housing 27 which houses, inter alia, an electric motor (not shown) which is operatively connected to a shaft 30 carrying a cutter means 2, there being a coil spring 7 for urging the cutter means 2 upwardly (as seen in the drawing), and towards a shearing foil 1 which extends over the cutter means 2. The shearing foil 1 is a substantially thin flexible metallic foil provided with a plurality of openings through which the whiskers can in operation pass to be engaged by the cutter means 2 so as to be sheared off by the sliding shearing action which is provided between the cutter means 2 and the shearing foil 1, the cutter means 2 being in operation reciprocated back and forth to provide cutting strokes in a direction perpendicular to the plane of the Figure.

The shearing foil 1 is attached to a head frame member 3 which is preferably detachable from the housing 27.

For fastening the shearing foil 1 to the head frame member 3 in such a way as to allow said foil to move relative to the frame member in directions substantially parallel to the inner surface of the frame member and to provide substantially uniform sliding engagement between the cutter means 2 and the foil 1, the structure described in detail below is provided.

The head frame 3 is provided with a plurality of apertures 8, e.g. four such apertures, through each of which extends a respective screw 5 having a head which engages the respective outer portions of the head frame 3 and which is of a larger diameter than the aperture 8.

Each screw 5 is engaged by a specially shaped nut 6. The inner surface of the head frame 3 is provided with a recess 9 in the vicinity of each aperture 8, the recess 9 being of a larger diameter than the adjacent aperture 8. Each nut 6 is provided with an annular collar or flange 10 adapted to be received in the respective recess 9, but having a diameter less than that of the recess 9. The thickness of each flange 10 is such that when the flange 10 is located against the wall of the inner frame, it extends below the top surface of the recess 9.

Each nut 6 is in addition provided with an annular shoulder 11 and an annular shoulder 18, the latter being of reduced size

compared with the first-mentioned shoulder 11.

The shearing foil 1 is provided with apertures 12 through which the respective shoulder portions 11 may pass, the apertures 12 being of greater radius than the shoulders 11 whereby the foil 1 is loosely mounted around the nuts 6. The axial extent of each shoulder 11 is several times greater than the thickness of the foil 1 so that the latter can move in the vicinity of a nut 6 freely both in a direction parallel to the inner surface of the shaver head frame member 3 and also in a direction parallel to the axis of the nut 6.

To urge the shearing foil 1 into frictional engagement with the head frame member 3, a holding plate 4 of substantially flexible material is provided. The holding plate 4 is attached to the nuts 6 by engagement in the reduced diameter shoulders 18 thereof. As can be seen from Figure 2, in the region around the screw and nut fastener, the foil 1 is not engaged by the holding plate 4 and thus no frictional resistance is provided in this region to movement of the foil 1 relative to the head frame member 3.

The shape of the holding plate 4 can be seen best from Figures 3 and 4. It will be seen that the holding plate 4 is provided with a plurality of depending projections or feet, those at the edges being denoted by 15 and those in the centre being denoted by 16. In addition, the holding plate 4 is provided with slots 13 and 14 to give the holding plate resilience. The slots 13 are formed with enlarged portions 17 respectively to provide for the passage therethrough of the fastener comprising a screw 5 and a nut 6.

The difference between the width of the slots 13 on the holding plate 4, or more accurately the diameter of the enlarged portions 17 formed in approximately the central area of the slots 13 on the one hand, and the diameter of the nut 6 on the side from which the holding plate 4 is inserted, or more accurately the diameter of the shoulder 18 on the other hand is in the region of 0.3 mm to 0.5 mm, which feature allows the convenient mounting or dismounting of the holding plate 4 for the purpose of cleaning or replacement.

Moreover, by securing the holding plate 4 to the nut 6 and urging the shearing foil 1 against the head frame by the feet 15 and 16, the shearing foil 1 is pressed uniformly and excessive vibration or abnormal metallic noise is prevented.

It will be seen that the above-described apparatus for causing the foil 1 to engage the head frame 3 is preferable to an arrangement wherein the foil is frictionally engaged at or adjacent the fastening means because the arrangement as described above allows

greater frictional resistance and freedom of movement.

The foil 1 may be reinforced by the use of a reinforcing plate 19 at its free end portions, although this feature is not always essential.

Referring now more particularly to Figures 5 and 6, wherein like parts have been given like reference numbers, the shearing foil 1 is secured to the holding plate 4¹ by having its central feet 20 pass through respective aligned apertures 21 in the shearing foil 1 and the reinforcing plate 19. The free ends of the feet 20 are deformed after their passage through the apertures 21 to form a retaining means 22. In order to accommodate the retaining means 22, the shaving head frame 3 is provided with an appropriate recess 23.

In this modification, the foil 1 and the holding plate 4¹ are supported by the nuts 6 in such a manner that slots 25 formed in the holding plate 4¹ are not symmetrical with respect to the openings 12 formed in the foil 1 for the passage of the fasteners there-through. This arrangement facilitates the replacement and the removal of the foil 1 and ensures against the holding plate 4¹ being lost. Moreover, this modification allows the foil 1 to be drawn downwardly by the elasticity of the holding plate 4¹, since the latter is provided with a pair of oblique arms 24 which provide a connection between the parts of the holding plate 4¹ in which the slot 25 is formed and the central portion thereof through which the feet 20 pass. It will be noted that as a result there is a gap 26 between the free end of the slot forming portion of the holding plate 4¹ and its central portion.

Although in this embodiment the foil 1 is always subjected to a downward resilient force as seen in Figure 5, this force is of course smaller than the force of the spring 7 urging the foil 1 in the opposite direction through the agency of the cutter means 2, but nevertheless as soon as a downward force is applied to a foil 1 during shaving, the latter can adapt itself quickly to the cutter 2 so as to provide a uniform sliding contact therebetween.

In summary, in accordance with the illustrated embodiments of the present invention, there is provided a shaver head which allows a certain freedom of movement for the shearing foil relative to the inner surface of the head frame and the holding plate at the fastening portions. In other words, the foil 1 is pressed against the inner surface of the head frame 3 by the projections 15 and 16 formed in the opposite end portions thereof and in the central area, or only at the opposite end portions, and is supported there-

on in such a manner that the foil 1 is shiftable in directions substantially parallel to the inner surface of the head frame and relative to the head frame without providing any friction at the fastening portions. This ensures substantially uniform sliding contact between the foil 1 and the cutter 2.

WHAT I CLAIM IS:—

1. A shaver head including a frame member, a flexible shearing foil which is adapted to extend around a cutter means and which has end portions loosely connected to said frame member by respective fastening means at given locations, and biasing means which engage the foil at locations spaced from the given locations to resiliently urge parts of the said foil spaced from the given locations against the said frame member so as to allow said foil to move relative to said frame member in directions substantially parallel to an inner surface of said frame member whereby to provide, when said shaver head is mounted on a shaver having said cutter means, substantially uniform sliding engagement between the cutter means and the foil.

2. A shaver head as claimed in claim 1 wherein said biasing means includes a resilient holding plate having a plurality of foil-engaging feet.

3. A shaver head as claimed in claim 2 wherein the said plate is formed with a plurality of slots through which said fastening means pass so as to secure the said plate resiliently to said fastening means.

4. A shaver head as claimed in any preceding claim wherein the frame member is apertured for the passage therethrough of a plurality of screws and nuts constituting the fastening means, the nut having an annular flange located in a recess of said frame member which is of greater diameter than the said flange.

5. A shaver head as claimed in any preceding claim wherein the foil is provided with a reinforcing plate.

6. A shaver head as claimed in any of claims 2 to 5 wherein said holding plate is supported on said fastening means or nuts.

7. A shaver head as claimed in any of claims 2 to 5 wherein said holding plate is secured to said foil by passing some of said feet through appropriate apertures in the foil, the free ends of which feet being thereafter deformed.

8. A shaver head substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

9. A dry shaver provided with a shaving head as claimed in any preceding claim.



greater frictional resistance and freedom of movement.

The foil 1 may be reinforced by the use of a reinforcing plate 19 at its free end portions, although this feature is not always essential.

Referring now more particularly to Figures 5 and 6, wherein like parts have been given like reference numbers, the shearing foil 1 is secured to the holding plate 4¹ by having its central feet 20 pass through respective aligned apertures 21 in the shearing foil 1 and the reinforcing plate 19. The free ends of the feet 20 are deformed after their passage through the apertures 21 to form a retaining means 22. In order to accommodate the retaining means 22, the shaving head frame 3 is provided with an appropriate recess 23.

In this modification, the foil 1 and the holding plate 4¹ are supported by the nuts 6 in such a manner that slots 25 formed in the holding plate 4¹ are not symmetrical with respect to the openings 12 formed in the foil for the passage of the fasteners there-through. This arrangement facilitates the replacement and the removal of the foil 1 and ensures against the holding plate 4¹ being lost. Moreover, this modification allows the foil 1 to be drawn downwardly by the elasticity of the holding plate 4¹, since the latter is provided with a pair of oblique arms 24 which provide a connection between the parts of the holding plate 4¹ in which the slot 25 is formed and the central portion thereof through which the feet 20 pass. It will be noted that as a result there is a gap 26 between the free end of the slot forming portion of the holding plate 4¹ and its central portion.

Although in this embodiment the foil 1 is always subjected to a downward resilient force as seen in Figure 5, this force is of course smaller than the force of the spring 7 urging the foil 1 in the opposite direction through the agency of the cutter means 2, but nevertheless as soon as a downward force is applied to a foil 1 during shaving, the latter can adapt itself quickly to the cutter 2 so as to provide a uniform sliding contact therebetween.

In summary, in accordance with the illustrated embodiments of the present invention, there is provided a shaver head which allows a certain freedom of movement for the shearing foil relative to the inner surface of the head frame and the holding plate at the fastening portions. In other words, the foil 1 is pressed against the inner surface of the head frame 3 by the projections 15 and 16 formed in the opposite end portions thereof and in the central area, or only at the opposite end portions, and is supported there-

on in such a manner that the foil 1 is shiftable in directions substantially parallel to the inner surface of the head frame and relative to the head frame without providing any friction at the fastening portions. This ensures substantially uniform sliding contact between the foil 1 and the cutter 2.

WHAT I CLAIM IS:—

1. A shaver head including a frame member, a flexible shearing foil which is adapted to extend around a cutter means and which has end portions loosely connected to said frame member by respective fastening means at given locations, and biasing means which engage the foil at locations spaced from the given locations to resiliently urge parts of the said foil spaced from the given locations against the said frame member so as to allow said foil to move relative to said frame member in directions substantially parallel to an inner surface of said frame member whereby to provide, when said shaver head is mounted on a shaver having said cutter means, substantially uniform sliding engagement between the cutter means and the foil.
2. A shaver head as claimed in claim 1 wherein said biasing means includes a resilient holding plate having a plurality of foil-engaging feet.
3. A shaver head as claimed in claim 2 wherein the said plate is formed with a plurality of slots through which said fastening means pass so as to secure the said plate resiliently to said fastening means.
4. A shaver head as claimed in any preceding claim wherein the frame member is apertured for the passage therethrough of a plurality of screws and nuts constituting the fastening means, the nut having an annular flange located in a recess of said frame member which is of greater diameter than the said flange.
5. A shaver head as claimed in any preceding claims wherein the foil is provided with a reinforcing plate.
6. A shaver head as claimed in any of claims 2 to 5 wherein said holding plate is supported on said fastening means or nuts.
7. A shaver head as claimed in any of claims 2 to 5 wherein said holding plate is secured to said foil by passing some of said feet through appropriate apertures in the foil, the free ends of which feet being thereafter deformed.
8. A shaver head substantially as hereinbefore described with reference to and as shown in the accompanying drawings.
9. A dry shaver provided with a shaving head as claimed in any preceding claim.

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10. A dry shaver as claimed in claim 9 wherein said cutter means is power-operated, reciprocable and biased towards the foil by a spring.

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