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Pivoting safety razor assembly.

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Description

FIELD OF THE INVENTION

The present invention pertains to safety razors. More particularly, the present invention pertains to shaving apparatus which incorporate pivotable-type blade assemblies for rotation between the blade assembly and the handle. The present invention is particularly, but not exclusively, useful for shaving body hair.

BACKGROUND OF THE INVENTION

It has long been recognized in the shaving art that manually operated safety razors produce closer, more uniform shaves and cause less nicking when the blade cutting surface conforms to the complexity of a body surface profile. Many past attempts have been made to design a razor blade assembly which permits razor blade operations that produce more optimum shaves. Some of these attempts have disclosed single blade assemblies; some double blade assemblies. For example, U.S. Patent No. 4,709,477, issued to Ferraro, discloses a double blade assembly featuring pivotally mounted first and second blades which individually pivot around the point at which the blade is mounted on the razor blade assembly. Similarly, U.S. Patent No. 4,324,041, issued to Trotta, discloses a double blade assembly that features first and second blades which individually pivot about their respective rear edges. As another example, U.S. Patent No. 3,593,416, issued to Edson, discloses a double razor blade assembly which has a blade carrier that pivots to follow the contour of the surface being shaved. DE 3635552 discloses a razor in which the blade holder is mounted via a swivel joint to an intermediate portion, which portion is in turn fixed to the razor handle via a springy elastic support. The swivel joint allows a swivel movement of the blade holder in relation to the handle, whilst the springy elastic support permits an all-round pitching movement of the blade holder in relation to the handle under the influence of force.

While these and other similar inventions have produced relatively improved shave characteristics, unevenness of shave and nicking can persist. This is because the particular configurations of Ferraro and Trotta, as well as other previous pivoting razor blades, are designed such that the axis of rotation for the entire assembly is displaced from the blade tips, or cutting edge, resulting in significant non-rotational (i.e. translational) relative motion between the blade cutting edge and blade assembly. As is well known, this translational motion produces low frequency blade "chatter", which can result in nicking, discomfort and a relatively uneven shave.

Stated differently, for configurations such as disclosed by Ferraro, Trotta, and Edson, the razor blade and the blade holding assembly can rotate independently of each other. It is this independent movement that gives rise to the unwanted "chatter".

In light of the foregoing, the present invention recognizes the need to significantly reduce blade chatter. Therefore, the present invention provides a pivoting safety razor assembly which produces a smoother, closer, more comfortable shave by shifting the axis of rotation of the entire assembly to the blade cutting edge. Further, the present invention provides a pivoting safety razor assembly which minimizes any translational relative motion between the blade cutting edge and the blade assembly. Still further, the present invention provides a pivoting safety razor assembly that achieves the foregoing results by limiting relative motion of the assembly to rotation about the blade cutting edge, thereby providing a highly responsive shaving system. Additionally, the present invention provides a pivoting safety razor assembly which is easy to use, relatively inexpensive to manufacture and comparatively cost effective.

SUMMARY OF THE INVENTION

The present invention provides a pivot-type razor assembly comprising an elongate flexible means having a first end and a second end, a blade device having an effective cutting edge, the blade device being mounted on said flexible means with said effective cutting edge substantially at said first end of said flexible means, and a handle fixedly attached to said second end of said flexible means characterised in that said flexible means comprises a first flexible member and a second flexible member, the first and second flexible members being corrugated.

A preferred embodiment of the novel pivotable safety razor assembly includes a blade device, a handle, and two corrugated flexible members connecting the handle to the blade device. As envisioned by the present invention, the blade device comprises a cartridge for fixedly holding at least one razor blade, the cartridge being mounted on the assembly in a fixed relationship with the flexible members. The flexible members of the present invention are angled relative to each other, such that their respective planes intersect in a line at the cutting edge of the blades. This is done in order to provide for substantially pure rotational movement of the handle about the cutting edge. By establishing a single axis of rotation for the entire assembly, the flexible member design of the present invention minimizes translational movement of the handle relative to the cutting edge of the blade on the
surface to be shaved. On the other hand, the rotational motion of the handle about the cutting edge also need to be somewhat limited. To do this, one end of a rigid guide pin is fixedly attached to the blade device, and its other end is slidably engaged with the handle to mechanically limit rotational movement between the handle and the blade device. Rotational movement between the handle and the blade can also be accomplished by eliminating the guide pin and, instead, incorporating a rigid wedge-shaped abutment which extends from the handle between the flexible members. As contemplated by the present invention, for a twin blade assembly, an effective cutting edge is established substantially midway between the twin blades. This effective cutting edge functions in all important respects as does the actual cutting edge of a single blade.

The novel features of this invention, as well as the invention itself, both as to its structure and its operation, will be best understood from the accompanying drawings, taken in conjunction with the accompanying description, in which similar reference characters refer to similar parts, and in which:

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is an exploded perspective view of the pivot razor assembly showing the blade device separated from the handle;

Figure 2 is a cross-sectional view of a portion of the pivot razor assembly as seen along the line 2-2 in Figure 1;

Figure 3 is a cross-sectional view of a portion of an alternate embodiment of the pivot razor assembly as would be seen along the line 2-2 in Figure 1; and

Figure 4 is a representative side cross-sectional view of a flexible member of the pivot razor assembly.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Figure 1 shows a perspective view of the pivot razor assembly according to the present invention which is generally designated 10. As shown, the assembly 10 comprises a handle 12, a flexible means 14 and a mounting flange 16 to which a blade device 18 can be engaged. The handle 12 is an essentially rigid component of the assembly 10 and can be made of any appropriate material such as metal or plastic.

As shown in both Figure 1 and Figure 2, flexible means 14 comprises a pair of flexible members 20 and 22 which define planes that are angled with respect to each other. Flexible member 20 is preferably corrugated and is bendable about an axis that is substantially parallel to the directional orientation of the individual corrugations. Flexible member 20, however, is sufficiently stiff to substantially minimize or effectively prevent bending or flexing of the flexible member 20 about axes which are substantially perpendicular to the directional orientation of the corrugations. It is to be appreciated that the corrugations of flexible member 20 can be of any suitable geometry. For the embodiment shown in Figure 1 and Figure 2, these corrugations are generally rectangular. On the other hand, for the alternate embodiment shown in Figure 3, the corrugations are rounded. In all important respects, flexible member 22 is similar to flexible member 20 and, preferably, both flexible members 20 and 22 are made of a plastic material such as an acetal.

Flexible members 20 and 22 interconnect handle 12 with mounting flange 16 and are respectively connected to these components in any suitable manner well known in the pertinent art. For example, as perhaps best seen by cross referencing figures 1 and 2, a clamp 24 is fastened onto handle 12 by a screw 26, with end 28 of flexible member 20 fixedly held between the clamp 24 and the handle 12. In a similar manner, clamp 30 fixedly holds end 32 of flexible member 20 on the wedge-shaped extensions 34 of mounting flange 16. Flexible member 22 of flexible means 14, like flexible member 20, is attached to both handle 12 and extension 34. When so attached, flexible member 22 is oriented to establish an angled relationship with flexible member 20.

Referring to Figure 1, the angle 62 between flexible members 20 and 22 may theoretically be anywhere in the range of 0°-180°. The present invention, however, envisions an angle 62 in the 20°-40° range. As best seen in Figure 2, vertex 64 of angle 62 coincides with an effective cutting edge 66, which is substantially midway between actual cutting edges 44 and 46 of blades 40 and 42, respectively. It is to be understood that blades 40 and 42 may be replaced by a single blade without materially affecting the operation of the flexible razor design. In such a case, the effective cutting edge 66 will coincide with the actual cutting edge of the single blade.

The significance of placing vertex 64 on effective cutting edge 66 is important. When blade assembly 10 is so designed, the resulting pivot point of the entire assembly 10 is at the effective cutting edge 66 of the blade 40, or blades 40 and 42. Thus, substantially all of the relative motion between effective cutting edge 66 and blade assembly 10 includes rotational motion and none of the relative motion is purely translational.

As shown in Figures 1 and 2, a rigid guide pin 36 extends between flexible members 20 and 22,
and is fixedly attached to wedge extension 34 by any means well known in the pertinent art. Guide pin 36 may be constructed of any suitable material which has the characteristics of rigidity coupled with sufficient strength in the shear and axial directions to withstand forces produced when guide pin 36 operates to limit flexion of flexible means 14.

Referring to Figure 2, guide pin 36 extends into guide slot 38 of handle 12. Guide slot 38 must be of sufficient depth to contain guide pin 36 while permitting slidable movement of guide pin 36 in the directions indicated by arrow 68 in Figure 2.

As will be appreciated by the skilled artisan, the dimension of guide slot 38 establishes the limits of flexion of flexible members 20 and 22. As seen in Figure 2, the movement of flexible members 20 and 22 is limited in one direction of flexion when guide pin 36 abuts upper guide slot limit 48, and in the other direction of flexion when pin 36 abuts lower guide slot limit 50. Although a range of flexion angles defined by the vertical dimension of guide slot 38 may be suitable to achieve the desired result, the preferred embodiment envisions an optimum flexion range of about plus or minus ten degrees (10°) in either direction.

In an alternate embodiment for pivot razor assembly 10, the guide pin 36 and guide slot 38 are eliminated. Instead, a fixed wedge-shaped abutment 70 is provided which extends from handle 12 between the flexible members 20, 22 as substantially shown in Figure 3. Specifically, surface 72 of abutment 70 contacts flexible member 20 to limit rotation of handle 12 in one direction about the effective cutting edge 66 while surface 74 of abutment 70 contacts flexible member 22 to limit counter rotation of handle 12 in the other direction about the effective cutting edge 66.

As will be appreciated by the skilled artisan, several variables are involved in determining the actual stiffness of the flexible members 20, 22. In Figure 4, these variables are shown in relation to a rounded corrugated flexible member (e.g. flexible member 20). More specifically, the variables of interest are thickness of the flexible member (t), width of a corrugation (w), and height of a corrugation (h). Of course, the material qualities of flexible member 20 are also important, but once a given material is selected, it is the variables t, w, and h which determine the response of flexible member 20. By definition, the aspect ratio of flexible member 20 is h/w. With this in mind, it happens that for high aspect ratios, i.e. h/w equal to or greater than one (1), the pivot razor assembly 10 is very compliant. This compliance, however, is achieved by compromising good shaving qualities. On the other hand, it has been found that with very low aspect ratios, i.e. h/w near zero (0), t must be reduced to achieve sufficient bending of the flexible member 20. Further, with low aspect ratios, there is little, if any, axial compressive capability for the flexible member 20. Some balance is required. Thus, it has been determined that the aspect ratio h/w for flexible members 20 and 22 is preferably in the range between one fourth and three fourths (i.e. 0.75 ≥ h/w ≥ 0.25).

It is to be appreciated for the present invention that rectangular corrugations and rounded corrugations for flexible members 20 and 22 are effectively interchangeable. Likewise, either guide pin 36 or abutment 70 can be used with either type corrugation to limit rotation of handle 12 about the cutting edge of assembly 10 without departing from the intent of the present invention.

Referring back to Figure 1, blade device 18 may be fixedly mounted to flexible means 14 in any manner well known in the art. For example, in the preferred embodiment, flange 16 interconnects flexible means 14 and blade device 18. For accomplishing this connection, blade device 18 is formed with a groove 52 that is defined by lips 54 and 56. Flange 16 is slidable attached to blade device 18 by fitting flange 16 snugly inside groove 52. Lips 54 and 56 are constructed with a tolerance which facilitates the sliding of flange 16 into groove 52, yet which is tight enough to hold blade device 18 onto flange 16 during the assembly operation by effecting an interference fit between edges 58 and 60 and the inner surfaces of lips 54 and 56, respectively. As stated above, blade device 18 may contain one (1) or more blades and may be constructed of any known material having sufficient strength to contain blades 40 and 42. The preferred embodiment envisions a blade device 18 constructed of polystyrene.

OPERATION

In its operation, razor assembly 10 is manually operated by grasping handle 12 and effecting skin contact with blades 40 and 42. The assembly 10 is then moved in short strokes across the surface to be shaved. As such strokes are performed, friction between the shaved surface and blades 40 and 42 produces a moment on assembly 10. The resulting torque flexes flexible members 20 and 22, permitting blades 40 and 42 to rotate to conform to the shave surface in proportion to the moment exerted by the shaver. As the shaver applies this moment, flexible members 20 and 22 flex to a point where resulting tensile and compressive forces on flexible members 20 and 22 equal and cancel the friction-induced torque produced by the moment. Flexible members 20 and 22 remain flexed in steady state until the shave stroke (and hence friction-induced torque) is altered. Note that if the friction-induced torque produced by the moment is great enough,
guide pin 36 will be forced into upper limit 48 or lower limit 50, as appropriate, of guide slot 38. Alternatively, for the embodiment incorporating an abutment 70, the travel of flexible members 20 and 22 is limited by contact with the abutment 70. In either case, flexion of flexible members 20 and 22 is thereby limited, as excess friction-induced torque not counteracted by the tensile and compressive forces associated with flexible members 20 and 22 is mechanically cancelled. When the moment which produced the friction-induced torque is removed, flexible members 20 and 22 return to their neutral angle position.

While the particular pivoting safety razor assembly as herein shown and disclosed in detail is fully capable of obtaining the objects and providing the advantages herein before stated, it is to be understood that it is merely illustrative of the presently preferred embodiments of the invention and that no limitations are intended to the details of construction or design herein shown other than as defined in the appended claims.

Claims

1. A pivot-type razor assembly (10) comprising an elongate flexible means (14) having a first end and a second end, a blade device (18) having an effective cutting edge (66), the blade device (18) being mounted on said flexible means (14) with said effective cutting edge (66) substantially at said first end of said flexible means (14), and a handle (12) fixedly attached to said second end of said flexible means (14) characterised in that said flexible means (14) comprises a first flexible member (20) and a second flexible member (22), the first and second flexible members (20, 22) being corrugated.

2. A pivot-type razor assembly according to Claim 1, characterised by further comprising a cartridge for fixedly holding at least one blade (40, 42), said cartridge being fixedly mounted on said flexible means (14).

3. A pivot-type razor assembly according to Claim 1 or 2, characterised in that said first flexible member (20) has a first and a second end, said second flexible member (22) has a first and second end, said first flexible member (20) being angled relative to said second flexible member (22), first and second ends of said flexible members (20, 22) being respectively located at said first and second ends of said flexible means (14).

4. A pivot-type razor assembly according to any one of the preceding claims, characterised in that said first flexible member (20) is angled relative to said second flexible member (22) by an angle in the range of twenty to forty degrees (20°-40°).

5. A pivot-type razor assembly according to any preceding claim, characterised in that said blade device (18) comprises a single blade (40).

6. A pivot-type razor assembly according to any of Claims 1 to 4, characterised in that said blade device (18) comprises a plurality of blades (40, 42).

7. A pivot-type razor assembly according to any preceding claim, characterised by further comprising a rigid guide pin (36) having a first end fixedly attached to said blade device (18) and a second end slidingly engageable with said handle (12) to limit relative movement between said blade device (18) and said handle (12).

8. A pivot-type razor assembly according to Claim 7, characterised in that said guide pin (36) is positioned between said first and second flexible members (20, 22).

9. A pivot-type razor assembly according to any of Claims 1 to 6, characterised by further comprising a fixed abutment (70) extending from said handle (12) between said first flexible member (20) and said second flexible member (22) for limiting movement of said flexible members.

10. A pivot-type razor assembly according to any preceding claim, characterised in that the elongate flexible means (14) provides an axis of rotation substantially at the effective blade cutting edge (66) for rotation of the blade device (18) relative to the handle (12).

Patentansprüche

1. Schwitgkopf-Sicherheitsrasierer (10), umfassend ein langgestrecktes flexibles Mittel (14) mit einem ersten Ende und einem zweiten Ende, eine Klingen-Vorrichtung (18) mit einer wirksamen Schneidkante (66), welche Klingenvorrichtung (18) am flexiblen Mittel (14) angebracht ist, so daß sich die wirksame Schneidkante (66) praktisch am ersten Ende des flexiblen Mittels (14) befindet, und einen fest am zweiten Ende des flexiblen Mittels (14) angebrachten Handgriff (12), dadurch gekennzeich-
net, daß das flexible Mittel (14) ein erstes flexibles Element (20) und ein zweites flexibles Element (22) umfaßt, wobei erstes und zweites flexibles Element (20, 22) jeweils gewellt sind.

2. Schwingkopf-Sicherheitsrasierer nach Anspruch 1, ferner gekennzeichnet durch eine Kassette zum festen Halten mindestens einer Klinge (40, 42), welche Kassette fest am flexiblen Mittel (14) montiert ist.

3. Schwingkopf-Sicherheitsrasierer nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß das erste flexible Element (20) ein erstes und ein zweites Ende aufweist, das zweite flexible Element (22) ein erstes und ein zweites Ende aufweist, das erste flexible Element (20) relativ zum zweiten flexiblen Element (22) abgewinkelt ist, (und) erste und zweite Enden der flexiblen Elemente (20, 22) jeweils am ersten bzw. zweiten Ende des flexiblen Mittels (14) angeordnet sind.

4. Schwingkopf-Sicherheitsrasierer nach einem der vorangehenden Ansprüche, dadurch gekennzeichnet, daß das erste flexible Element (20) relativ zum zweiten flexiblen Element (22) unter einem Winkel in Bereich von zwanzig bis vierzig Grad (20 - 40°) abgewinkelt ist.

5. Schwingkopf-Sicherheitsrasierer nach einem der vorangehenden Ansprüche, dadurch gekennzeichnet, daß die Klingenvorrichtung (18) eine einzige Klinge (40) umfaßt.

6. Schwingkopf-Sicherheitsrasierer nach einem der Ansprüche 1 bis 4, dadurch gekennzeichnet, daß die Klingenvorrichtung (18) mehrere Klingen (40, 42) umfaßt.

7. Schwingkopf-Sicherheitsrasierer nach einem der vorangehenden Ansprüche, ferner gekennzeichnet durch einen starren Leitzapfen (36) mit einem fest an der Klingenvorrichtung (18) angebrachten ersten Ende und einem zweiten Ende, das zwecks Begrenzung der Relativbewegung zwischen der Klingenvorrichtung (18) und dem Handgriff (12) (gleitend) verschiebbar mit dem Handgriff (12) in Eingriff bringbar ist.

8. Schwingkopf-Sicherheitsrasierer nach Anspruch 7, dadurch gekennzeichnet, daß der Leitzapfen (36) zwischen dem ersten und dem zweiten flexiblen Element (20, 22) positioniert ist.

9. Schwingkopf-Sicherheitsrasierer nach einem der Ansprüche 1 bis 6, ferner gekennzeichnet durch einen zwischen dem ersten flexiblen Element (20) und dem zweiten flexiblen Element (22) verlaufenden festen Anschlag (70) zur Begrenzung der Bewegung der flexiblen Elemente.

10. Schwingkopf-Sicherheitsrasierer nach einem der vorangehenden Ansprüche, dadurch gekennzeichnet, daß das langgestreckte flexible Mittel (14) praktisch an der wirksamen Klingenscheidkante (66) eine Drehachse für Drehung der Klingenvorrichtung (18) relativ zum Handgriff (18) festlegt.

**Revendications**

1. Ensemble (10) formant rasoir du type pivotant comportant des moyens (14) allongés flexibles ayant une première extrémité et une seconde extrémité, un dispositif à lame (18) ayant un bord de coupe efficace (66), le dispositif à lame (18) étant monté sur lesdits moyens flexibles (14) en ayant ledit bord de coupe efficace (66) situé sensiblement au niveau de ladite première extrémité desdits moyens flexibles (14), et une poignée (12) reliée de manière fixe à ladite seconde extrémité desdits moyens flexibles (14), caractérisé en ce que lesdits moyens flexibles (14) comportent un premier élément flexible (20) et d'un second élément flexible (22), le premier et le second éléments flexibles (20, 22) étant ondules.

2. Ensemble formant rasoir du type pivotant selon la revendication 1, caractérisé en ce qu'il comporte en outre une cartouche destinée à maintenir de manière fixe au moins une lame (40, 42), ladite cartouche étant montée de manière fixe sur lesdits moyens flexibles (14).

3. Ensemble formant rasoir du type pivotant selon la revendication 1 ou 2, caractérisé en ce que ledit premier élément flexible (20) a une première et une seconde extrémités, ledit second élément flexible (22) a une première et une seconde extrémités, ledit premier élément flexible (20) formant un angle avec ledit second élément flexible (22), les premières et secondes extrémités desdits éléments flexibles (20, 22) étant situées respectivement au niveau desdites première et seconde extrémités desdits moyens flexibles (14).

4. Ensemble formant rasoir du type pivotant selon l'une quelconque des revendications précédentes, caractérisé en ce que ledit premier élément flexible (20) forme un angle avec ledit second élément flexible (22), cet angle étant
5. Ensemble formant rasoir du type pivotant selon l’une quelconque des revendications précédentes, caractérisé en ce que ledit dispositif à lame (18) comporte une seule lame (40).

6. Ensemble formant rasoir du type pivotant selon l’une quelconque des revendications 1 à 4, caractérisé en ce que ledit dispositif à lame (18) comporte plusieurs lames (40, 42).

7. Ensemble formant rasoir du type pivotant selon l’une quelconque des revendications précédentes, caractérisé en ce qu’il comporte en outre un doigt de guidage rigide (36) ayant une première extrémité reliée de manière fixe audit dispositif à lame (18) et une seconde extrémité pouvant venir en prise de manière coulissante avec ladite poignée (12) pour limiter le mouvement relatif entre ledit dispositif à lame (18) et ladite poignée (12).

8. Ensemble formant rasoir du type pivotant selon la revendication 7, caractérisé en ce que ledit doigt de guidage (36) est positionné entre lesdits premier et second éléments flexibles (20, 22).

9. Ensemble formant rasoir du type pivotant selon l’une quelconque des revendications 1 à 6, caractérisé en ce qu’il comporte en outre une butée fixe (70) s’étendant à partir de ladite poignée (12) entre ledit premier élément flexible (20) et ledit second élément flexible (22) pour limiter le mouvement desdits éléments flexibles.

10. Ensemble formant rasoir du type pivotant selon l’une quelconque des revendications précédentes, caractérisé en ce que les moyens flexibles allongés (14) fournissent un axe de rotation situé sensiblement au niveau du bord de coupe efficace de lame (68) pour la rotation du dispositif à lame (18) par rapport à la poignée (12).

11. Ensemble formant rasoir du type pivotant selon l’une quelconque des revendications précédentes, caractérisé en ce que ledit dispositif à lame (18) comporte une seule lame (40).