United States Patent

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[33] **Germany**
[31] **P 16 78 178.5**

[54] **ELECTRIC SHAVER**
25 Claims, 6 Drawing Figs.

[52] **U.S. Cl.** **30/34.1**
[51] **Int. Cl.** **B26b 19/06,** B26b 19/10, B26b 19/38
[50] **Field of Search** 30/34.1, 43.91, 43.92

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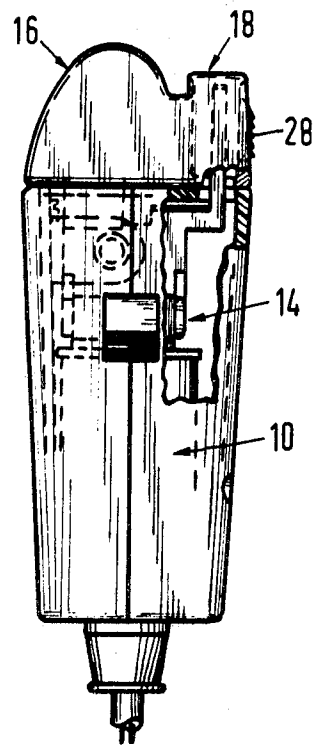
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Primary Examiner—Othell M. Simpson
Attorney—McGlew & Toren

ABSTRACT: A cutter head housing is detachably secured to a body housing. A shorthair cutter head is covered by said cutter head housing and comprises a part-cylindrical screen, which is carried by said cutter head housing, and a set of knife blades, which conform to and contact said screen and are movable along the axis of the screen. A longhair cutter head is covered by said cutter head housing and disposed laterally beside said shorthair cutter head and comprises an outer comb and a shear comb, which contacts the outer comb and is guided by the latter for movement along the same. The longhair cutter head is detachably connected to said body housing. The arrangement is such that the longhair cutter head is removable as a unit from the cutter head housing when the same is connected to the body housing. Drive means are operable to drive said set of blades and the shear comb and comprise a motor, accommodated in said body housing and having an oscillating armature, and power-transmitting means operatively connecting said armature to the shear comb and arranged to disengage said longhair cutter head as the same is removed from said body housing.



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SHEET 1 OF 2

Fig.1

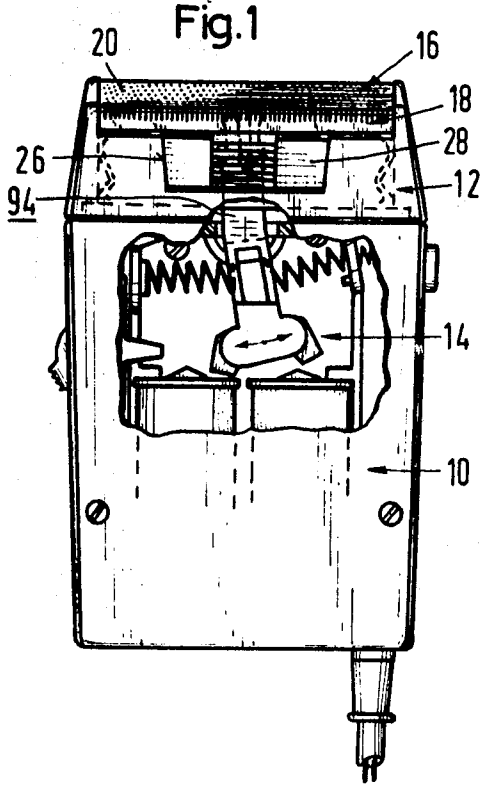
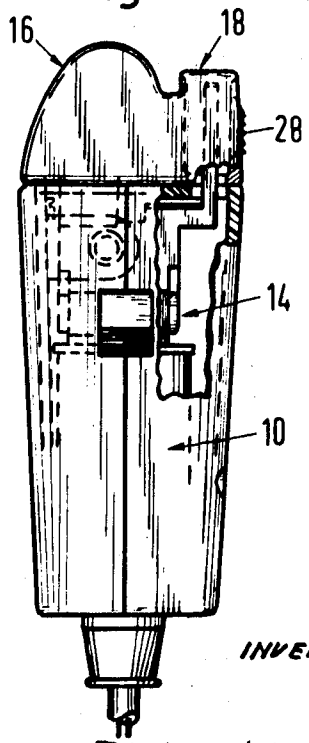


Fig.2



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Fig. 3

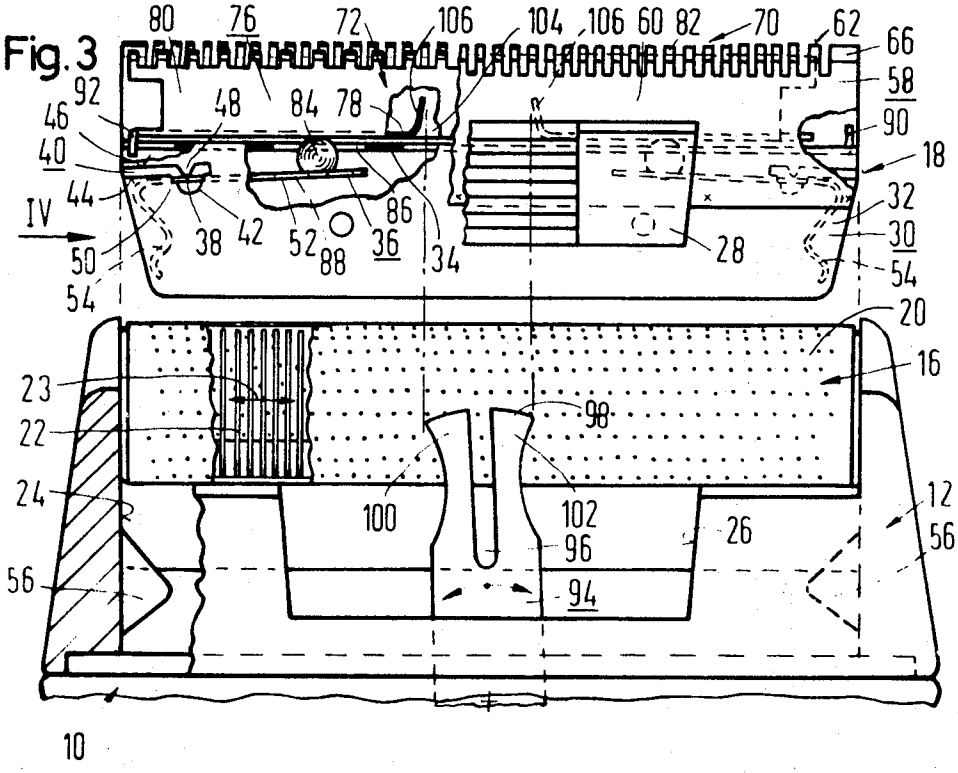


Fig. 4

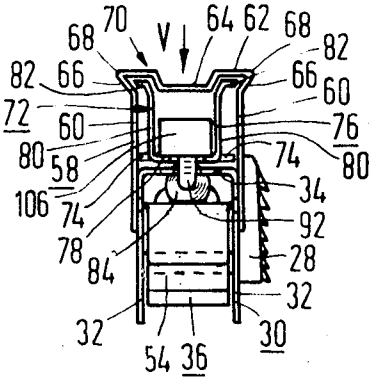


Fig. 5

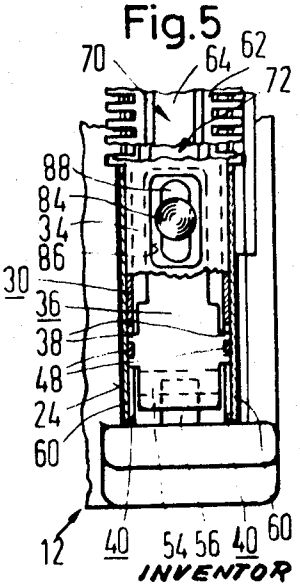
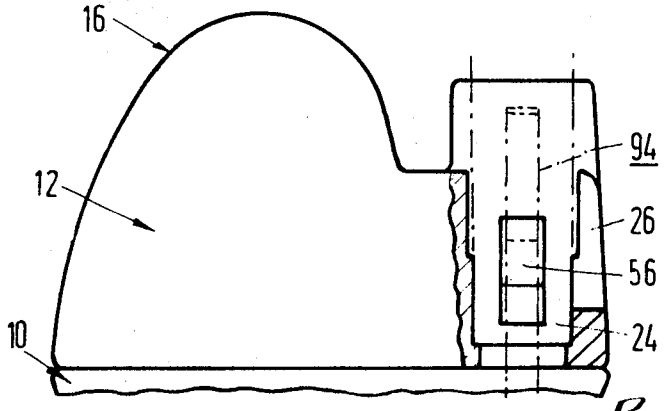


Fig. 6



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ELECTRIC SHAVER

BACKGROUND AND SUMMARY OF THE INVENTION

This invention relates to an electric shaver, which comprises a body housing, a cutter head housing, which is detachably mounted on the body housing, a shorthair cutter head which is covered by the cutter head housing and comprises a part-cylindrical screen, which is carried by the cutter head housing, and a set of knife blades, which conform to and contact the screen and are movable along the axis of the screen, the shaver further comprising a longhair cutter head, which is also covered by the cutter head housing and is laterally disposed beside the shorthair cutter head and detachably connected to the body housing and comprises an outer comb and a shear comb, which contacts the outer comb and is movable along the same, the shaver further comprising a motor which is accommodated in the body housing and comprises an oscillating armature for driving the set of blades and the knife comb, the shaver also comprising power-transmitting means, which are adapted to transmit power from the oscillating armature to the shear comb and to disengage the longhair cutter head as the same is removed from the body housing.

In a known embodiment of such shaver, the longhair cutter head is mounted directly on the body housing and is so covered by the cutter head housing that the longhair cutter head cannot be detached unless the cutter head housing has been removed from the body housing. This arrangement requires two fits because the longhair cutter head must be fitted in the body housing and the cutter head housing must be fitted to the longhair cutter head.

Another disadvantage of the known shaver resides in that the longhair cutter head cannot be removed unless the cutter head housing has been removed as a whole.

The invention proposes an improved design, which is characterized in that the longhair cutter head is removable as a unit from the cutter head housing when the same is connected to the body housing. The longhair cutter head may be held in the cutter head housing by detent springs. The cutter head housing may be provided with a guide well member, which is rectangular in cross section and serves to receive the longhair cutter head.

To enable removal and mounting of the longhair cutter head as a unit, the latter requires a frame. This frame may consist of a U-shaped sheet metal frame, which extends substantially throughout the length of the cutter head and is open toward the oscillating armature motor and which carries the outer comb over its web and carries the knife comb between its web and the outer comb and is formed in its web with a slot through which the means for transmitting power to the shear comb extend. The U-shaped sheet metal frame may be provided at its ends with detent springs, which engage notches in the end walls of the guide well member. Pressure-applying springs may be provided within the U-shaped sheet metal frame and, by means of pressure-transmitting members extending through the web of the U-shaped sheet metal frame, apply pressure to the shear comb on that side which is remote from the outer comb so that the shear comb is forced against the outer comb. The detent springs and the pressure-applying springs may consist of one-piece leaf springs, which fulfill both the pressure-applying and the detent functions. This concept may be embodied in a structure in which the leaf springs are guided between the legs of the U-shaped sheet metal frame and are provided at an intermediate point with lateral fixing straps, which enter fixing slots formed in the end portions of the legs of the U-shaped sheet metal frame and each of which has an end portion which is directed toward the center of the length of the U-shaped sheet metal frame and consists of a pressure-applying spring whereas the other end portion of each strap is laterally bent toward the motor and consists of a detent spring. To facilitate the insertion of the fixing straps into the associated slots, and yet to ensure a firm holding of these fixing straps in the slots, each of the fixing slots in the legs of the U-shaped sheet metal frame may be provided near its inner end with a notch, which is cut into one edge of the slot and is bridged by the associated fixing strap in operative position, whereas the opposite edge of the slot is provided with a nose, which is in register with the notch and bears on the fixing strap. To prevent the fixing straps from slipping back out of the slots, which are open at one end, the fixing straps may be locked at the outer end of the notch by a recess.

The pressure-transmitting means may be formed by balls, which are guided in slots of the U-shaped sheet metal frame and contact the pressure-applying springs and the shear comb. The detent springs may also be formed with guide slots in the area in which they are contacted by the balls.

In known embodiments, the longhair cutter head always consists of a solid comb plate formed with sharp comb teeth, which irritate the skin when long hairs are being cut. The invention proposes to provide an outer comb which consists of a U-shaped sheet metal element, which at each of the transitions from the web to the legs is provided with an acute-angled vertex portion which protrudes outwardly beyond the respective web and is formed by the extended web and an oblique transition portion of the leg, and to arrange the shear comb to engage the edge portions of the web of the U-shaped sheet metal element, and to provide the edge portions of the web and the oblique portions of the legs with comb slots, which extend continuously through the acute-angled vertex portions. It has been found that the acute-angled vertex portions can be so designed that the feared irritation of the skin is avoided. A bead may be formed in the web of the U-shaped sheet metal element at the center of the length of said web, and the slots may be continued in the sidewalls of the bead to improve the action on long hairs.

The shear comb may also consist of a U-shaped element, which carries the shear comb teeth that are intended to contact the web of the U-shaped sheet metal element forming the outer comb and laterally protrude from the free end portions of the legs of the U-shaped element forming the shear comb. These shear comb teeth protrude into the acute-angled vertex portions of the outer comb. A lateral guidance of the shear comb teeth is not afforded by the contact with the acute-angled vertex portions but preferably by guide elements which are lanced out of the material of the U-shaped element forming the shear comb and laterally contact the legs of the U-shaped sheet metal element forming the outer comb.

To ensure a sharp cut, the mutually contacting surfaces of the shear comb and outer comb have been lapped together. This sharp cut will be ensured only when the shear comb has in its operating condition the same position relative to the outer comb as during the lapping operation. The shear comb must be removed from time to time so that it can be cleaned. To ensure that the shear comb is always replaced in the correct position, which it assumed during the lapping operation, the invention proposes to provide the shear comb and the outer comb with constraining means, which permit of an insertion of the shear comb only in the relative position which it assumed during the lapping operation. A first constraining element may be provided at one end of the outer comb and a second constraining element may be provided at one end of the shear comb.

The U-shaped sheet metal element forming the outer comb may laterally contact the legs of the U-shaped sheet metal frame and may be joined to said legs, e.g., by spot welding.

The power-transmitting means may consist of the free end of a drive lever, which is oscillated by a motor having an oscillating armature and which extends through and engages an engaging slot of the shear comb. If the shear comb consists of a U-shaped element having laterally protruding shear teeth, the engaging slot may be formed in the web of said U-shaped element. To increase the contact surfaces between the drive lever and the ends of the engaging slot, lugs for contacting the drive lever may be struck out of the web at the ends of the engaging slot. To ensure a power-transmitting engagement between the

drive lever and the shear comb even when the drive lever has become worn, the drive lever may be forked at its free end and the ends of the fork prongs may be arranged to resiliently engage the longitudinally spaced ends of the engaging slot. The drive lever may consist, e.g., of plastics material.

The guide well member for guiding and holding the longhair cutter head may be formed with a window, which receives a pusher of the longhair cutter head so that the latter can be pushed out of the guide well member.

BRIEF DESCRIPTION OF THE DRAWING

An embodiment of the invention is shown by way of example in the accompanying drawings, in which

FIG. 1 is a side elevation showing a shaver according to the invention, partly broken away.

FIG. 2 is an end elevation showing a shaver according to the invention, partly broken away.

FIG. 3 is an enlarged side elevation showing a cutter head housing, partly broken away, of the shaver according to the invention, which housing is provided with a longhair cutter head, which is also shown in side elevation and partly broken away.

FIG. 4 is an end view showing parts of FIG. 3.

FIG. 5 is an enlarged view showing a detail viewed in the direction V in FIG. 4.

FIG. 6 is an end elevation showing a cutter head housing.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The drawings show a body housing 10 and a cutter head housing 12. The body housing 10 accommodates an oscillating motor 14 having an oscillating armature. The cutter head housing contains a shorthair cutter head 16 and a longhair cutter head 18. As is particularly shown in FIG. 3, the shorthair cutter head 16 is formed by a cylindrically curved screen 20, which is secured to the cutter head housing 12. The cylindrical screen 20 contains a set of knife blades 22, which reciprocate in the direction of the arrow 23. The set of knife blades are connected to the motor 14 by means which are not significant for the invention. The cutter head housing 12 is detachably secured to the body housing 10 by means which are not significant for the invention.

The longhair cutter head 18 is detachably inserted in the guide well member 24 and can be detached therefrom even when the cutter head housing 12 is mounted on the body housing 10. The guide well member 24 is formed with a window 26, which receives a projection or handle 28 of the longhair cutter head 18 as the same is inserted into the guide well member 24. This handle 28 is thereafter accessible from the outside and enables the longhair cutter head to be pushed easily out of the guide well member.

The longhair cutter head 18 has a U-shaped sheet metal frame 30 having legs 32 and a web 34. Leaf springs 36 are provided within the U-shaped sheet metal frame 30 and are guided in that the legs 32 are laterally contacted by the edges of said springs at least in part of the length thereof. The leaf springs 36 have lateral fixing straps 38 at an intermediate portion of their length, and these straps are received by slots 40 formed in the legs 32 of the mounting frame 30. In operating position, the fixing straps 38 bridge a notch 42 in one slot-defining edge 44. A nose 48 protruding from the other slot-defining edge 46 and in register with the notch 42 bears on the fixing strap 38. A recess 50 formed at the outlet end of the notch 42 prevents a slipping of the fixing strap 38 out of the slot 40.

One end portion of the leaf spring 36 consists of a pressure-applying spring 52, the function of which will be explained. The other end of the leaf spring 36 consists of a detent spring 54 and is bent to engage keepers 56 provided in the guide well member 24 when the latter receives the longhair cutter head 18.

A U-shaped sheet metal element 58 comprising legs 60 and a web 62 is secured to the frame 30 in that the legs 60 are spot-welded to the legs 32 of the U-shaped frame. A central bead 64 is pressed into the web 62. At the transitions from the web 62 to the legs 60, acute-angled vertex portions 68 are formed by the web 62 and oblique transition portions 66, which continue the legs 60. The web 62 is slotted as far as to the bottom of the central bead 64. These slots are continued beyond the acute-angled vertex portions 68 into the transition portions 66 so that an outer comb 70 is formed. A shear comb 72 is slidable in the outer comb 70 along guide elements 74 provided on the legs 60 of the U-shaped sheet metal element 58. The shear comb 72 is also formed by a U-shaped element 76 having a web 78 and legs 80. The guide means 74 are formed by the material of the U-shaped element 76. The legs 80 of the U-shaped element 76 are formed at their free ends with shear teeth 82, which contact the web 62 of the U-shaped sheet metal element 58 forming the outer comb 70. The The teeth 82 are forced against the web 62 by balls 84, which are guided in slots 86 of the web 34 of the U-shaped sheet metal frame 30 and contact the inside of the web 78 of the knife comb and the pressure-applying springs 52 adjacent to slots 88 which are cut into the pressure-applying spring 52.

The teeth 82 have been lapped together with the web 62 of the U-shaped sheet metal element 58. To ensure that the teeth are in operative condition always in the same position as during the lapping operation, an upwardly directed lug 90 is provided at the web 34 of the U-shaped sheet metal frame 30 and a depending lug 92 is provided on the U-shaped element 76 forming the shear comb 72. These lugs constrain the shear comb 72 to assume only a single position in the U-shaped sheet metal element 58 in operating condition.

A drive lever 94 extends upwardly from the oscillating armature motor 14 and establishes a driving connection to the shear comb 72. This drive lever is formed at its free end 98 with a slot 96 so that the free end is forked. The two fork prongs 100 and 102 extend through an engaging slot 104, which is formed in the web 78 of the U-shaped element 76. The prongs 100 and 102 resiliently engage upstanding lugs 106, which are lanced out of the web 78.

I claim:

1. An electric shaver, which comprises

a body housing,

a cutter head housing which is detachably secured to said body housing.

a shorthair cutter head which is covered by said cutter head housing and comprises a part-cylindrical screen, which is carried by said cutter head housing, and a set of knife blades, which conform to and contact said screen and are movable along the axis of the screen,

a longhair cutter head which is covered by said cutter head housing and disposed laterally beside said shorthair cutter head and comprises an outer comb and a shear comb, which contacts said outer comb and is guided by the latter for movement along the same, said longhair cutter head, with both said combs, forming a self-contained unit detachably connected to said body housing and said longhair cutter head, with both said combs, is removable as a self-contained unit from the cutter head housing while the latter is connected to the body housing, and

drive means operable to drive said set of blades and said shear comb, said drive means comprising

a motor accommodated in said body housing and having an oscillating armature, and

power-transmitting means operatively connecting said armature to said shear comb and arranged to disengage said longhair cutter head as the same is removed, as a unit, from said body housing.

2. An electric shaver as set forth in claim 1, which comprises detent spring means which hold said longhair cutter head in position in said cutter head housing.

3. An electric shaver as set forth in claim 1, which comprises a guide well member which is provided in said cutter

head housing and rectangular in cross section and accommodates said longhair cutter head.

4. An electric shaver as set forth in claim 3, in which

said guide well member is formed with a window and

said longhair cutter head is provided with a projection, which is received by said window and facilitates the removal of the longhair cutter head from the guide well member.

5. An electric shaver as set forth in claim 1, in which

said longhair cutter head comprises a U-shaped sheet metal frame which extends substantially throughout the length of said longhair cutter head and is open toward said motor,

said frame comprises a web carrying said outer comb and formed with a slot,

said shear comb is carried by said frame and disposed between said web and said outer comb, and

said power-transmitting means extend through said slot from said armature to said shear comb.

6. An electric shaver as set forth in claim 5, which comprises

a guide well member which is provided in said cutter head housing and rectangular in cross section and accommodates said longhair cutter head,

said guide well member having end walls provided with spring-engaging means, and

said U-shaped sheet metal frame having end portions provided with detent spring means engaging said spring-engaging means.

7. An electric shaver as set forth in claim 5, which comprises

pressure-applying spring means disposed inside said U-shaped sheet metal frame and

pressure-transmitting means extending through said web and disposed between said pressure-applying spring means and said shear comb on the side thereof which is remote from said outer comb, whereby said shear comb is urged against said outer comb.

8. An electric shaver as set forth in claim 7, in which

said web is formed with ball-guiding slots, and

said pressure-transmitting means comprise balls, which are guided in said ball-guiding slots and contact said pressure-applying spring means and said shear comb.

9. An electric shaver as set forth in claim 8, in which said pressure-applying spring means are formed with ball-guiding slots engaged by said balls.

10. An electric shaver as set forth in claim 4, which comprises

a guide well member which is provided in said cutter head housing and rectangular in cross section and accommodates said longhair cutter head,

said guide wall member being provided with spring-engaging means,

said U-shaped sheet metal frame being internally provided with one-piece leaf springs which comprise detent spring portions and pressure-applying spring portions,

said detent spring portions engaging said spring-engaging means, and

pressure-transmitting means being provided, which extend through said web and are disposed between said pressure-applying spring means and said shear comb on the side thereof which is remote from said outer comb, whereby said shear comb is urged against said outer comb.

11. An electric shaver as set forth in claim 10, in which

said U-shaped sheet metal frame comprises legs having end portions formed with fixing slots,

said leaf springs extend between said legs and have intermediate portions formed with lateral fixing straps engaging said slots,

said pressure-applying spring portions are end portions directed toward the center of the length of said U-shaped sheet metal frame, and

said detent spring portions are end portions which are opposite to said pressure-applying spring portions and laterally bent toward said motor.

12. An electric shaver as set forth in claim 11, in which

each of said slots has an inner end and two opposite longitudinal slot-defining edges and is formed near said inner end in one of said edges with a notch and provided on the other of said edges with a pressure-applying nose in register with said notch, and

each of said notches is bridged by one of said straps and in pressure contact with the nose in register therewith.

13. An electric shaver as set forth in claim 12, in which

each of said notches has an open end and is formed near said open end with a recess receiving said strap to prevent its escape out of the slot.

14. An electric shaver as set forth in claim 1, in which

said outer comb consists of a U-shaped sheet metal element having two legs, a web laterally protruding beyond said legs and oblique transition portions connecting said legs to said web and forming acute-angled vertex portions with said web,

said web has edge portions engaged by said shear comb, and

said edge portions and said oblique transition portions are formed with comb slots, which extend continuously through said vertex portions.

15. An electric shaver as set forth in claim 14, in which said web has a bead at the center of its length.

16. An electric shaver as set forth in claim 14, in which

said shear comb consists of a U-shaped element having legs which comprise free end portions and

shear comb teeth are carried by and laterally protrude from said free edge portions and contact said web of said U-shaped sheet metal element constituting said outer comb.

17. An electric shaver as set forth in claim 14, in which

said longhair cutter head comprises a U-shaped sheet metal frame having legs, and

said legs of said outer comb laterally contact said legs of said frame and are joined thereto.

18. An electric shaver as set forth in claim 17, in which said legs of said outer comb are spot-welded to said legs of said frame.

19. An electric shaver as set forth in claim 1, in which

said shear comb and said outer comb have mutually contacting surfaces which have been lapped together,

said shear comb is detachably connected to said outer comb, and

said shear comb and said outer comb are formed with constraining means which enable an insertion of the shear comb into the outer comb only in the position assumed by said shear comb relative to said outer comb when said two parts were lapped together.

20. An electric shaver as set forth in claim 19, in which said constraining means comprise

a first constraining element carried by said outer comb at one end thereof and

a second constraining element carried by said shear comb at one end thereof.

21. An electric shaver as set forth in claim 1, in which

said shear comb is formed with a slot and

said power-transmitting means comprise a drive lever, which is adapted to oscillate with said armature and extends through and engages said slot to transmit power to said shear comb.

22. An electric shaver as set forth in claim 21, in which

said shear comb is U-shaped and comprises a web, which is formed in said slot.

23. An electric shaver as set forth in claim 22, in which

said slot has ends which are spaced apart in the longitudinal direction of said shear comb, and

lugs are lanced from said web at said ends of said slots to limit the same.

24. An electric shaver as set forth in claim 22, in which

said slot has edges which are longitudinally spaced apart and

said drive lever has slotted free end portions having prongs which engage said edges.

25. An electric shaver as set forth in claim 22, in which said drive lever consists of plastics material.