Jan. 12, 1960 L. MARESCALCHI 2,920,387

DRY SHAVER WITH OSCILLATING COMB HEAD

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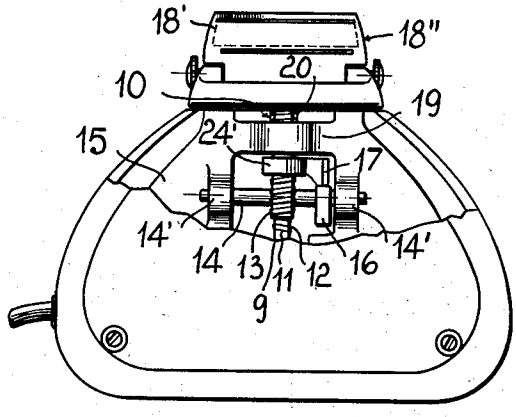


Fig. 1

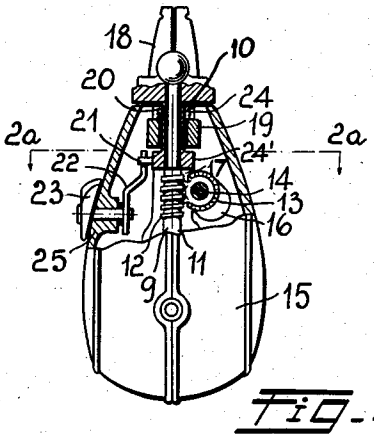


Fig. 2

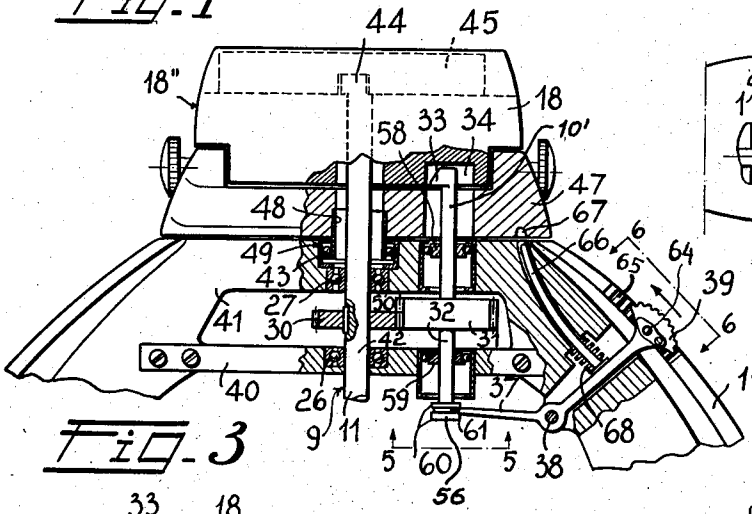


Fig. 3

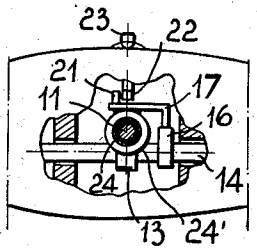


Fig. 2a

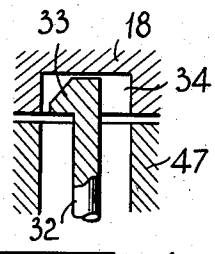


Fig. 4

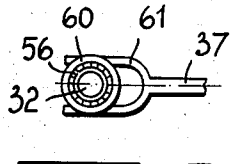


Fig. 5

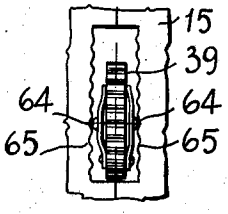


Fig. 6

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DRY SHAVER WITH OSCILLATING COMB HEAD

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The invention relates to dry shavers, and relates more particularly to dry shavers powered by an electric motor and provided with a shearing head in which a cutter moves back and forth within a comb for shearing action.

Facial hair grows in all directions and, even in a small area of the facial skin, the hair is found to grow in random directions. For best shaving results all the hair should be shaved against the growth, but conventional dry shaver heads provide for cutting in only one direction at any one time throughout any one area of the facial skin.

It is therefore among the principal objects of the invention to provide a dry shaver that has a shearing head which can sweep over any given area in more than one direction. Broadly speaking, this is accomplished by imparting to the shearing head an oscillating pendulous motion in a plane parallel to the skin surface.

The accompanying drawings show by way of exemplification two embodiments of the invention, wherein:

Fig. 1 is a front elevational view of a dry shaver in accordance with a first embodiment of the invention;

Fig. 2 is a side elevational view, partly in section, of a dry shaver illustrated in Fig. 1;

Fig. 2*a* is a fragmentary sectional view taken on the line 2*a*—2*a* of Fig. 2;

Fig. 3 is a large scale fragmentary front elevational view, partly in section, similar to Fig. 1 but embodying a modification;

Fig. 4 is a large scale fragmentary sectional view of a detail shown in Fig. 3;

Fig. 5 is a plan view as seen in the direction 5—5 of Fig. 3; and

Fig. 6 is an end elevational fragmentary view as seen in the direction 6—6 of Fig. 3.

In the exemplified embodiment of Figs. 1–2*a*, there is provided a casing 15 which is surmounted by a shearing head 18″. The head 18″ includes a comb 18 and an inner cutting means such as a cutter 18′. On the interior of the casing 15 there is provided a first driving means 9 which includes a driving shaft 11 that is driven from a conventional electric motor (not shown). The driving shaft 11 carries a worm 12 that engages a gear 13 which is secured on a secondary shaft 14. The ends of the secondary shaft 14 are journalled in bearings 14′ of the casing 15. The shaft 11 operates the cutter 18′ to reciprocate in the comb 18 for shearing action.

A second driving means is provided, generally indicated at 10 which includes a hollow driven shaft 24 that surrounds the driving shaft 11 and is connected to the comb 18. A cylindrical body 24′ is connected to the hollow shaft 24, and carries a sector 17. A cam 16 is mounted on the secondary shaft 14, and is operative to engage the sector 17 for rotation thereby of the body 24′ and therewith of the hollow shaft 24 about the axis of the driving shaft 11, to impart pendulous oscillations to the shearing head 18″. A return spring 20 rests on a bearing member 19 of the casing 15, and tends to return the shearing head 18″ to its original position (Fig. 2).

The body 24′ has a tooth 21 which engages a lever 22 which in turn is connected to a portion 25 of the casing 15, and the lever 22 is operated by a knob 23.

The afore-described embodiment operates as follows.

The shaft 11 is rotated by the electric motor (not shown) about the axis of the shaft 11 which coincides with the axis of the casing 15. The shaft 11 will rotate the worm 12 which, in turn, will revolve the gear 13 and thereby will revolve the secondary shaft 14 thus rotating the cam 16. The cam 16 will engage the sector 17 intermittently, and will intermittently impact actuate the sector 17 to swing about the axis of the shaft 11. As the sector 17 is connected to the body 24′, which is secured on the hollow shaft 24, and the hollow shaft 24 is connected to the comb 18, the shearing head 18″ together with the cutter 18′ will perform pendulous oscillations about the axis of the shaft 11 when the cam 16 actuates the sector 17.

The amplitudes of these oscillations may be varied between 0° and 180° by means of adjustment of the knob 23. The spring 20 effects return movement, and the lever 22 limits the approach of the sector 17 to the cam 16. Thus, the sector 17 can be held at such a distance from the cam 16, that the cam 16 will not engage the sector 17 during the rotation of the cam, and hence the shearing head 18″ will not oscillate. By adjustment of the lever 22 by the knob 23, however, the sector 17 may be permitted to approach the cam 16, whereupon impact engagement will periodically take place between the cam 16 and the sector 17, and the amplitude of the oscillations will be proportional to the aforesaid approach.

Either or both shafts 11 and 14 may be supported by suitable anti-friction bearings. Instead of a return spring, a second cam may be positioned on the shaft 14 oppositely to the cam 16 for oppositely directed impacts with the sector 17.

In the modification shown in Figs. 3–6, there is provided a first driving means 9 which includes a driving shaft 11 for the cutter 45. The driving shaft 11 is supported by ball bearings 26 and 27. The bearing 27 is mounted in a cross portion 41 of the casing 15, and the bearing 26 is mounted on a cross member 40 that is secured in the casing 15. The free end of the driving shaft 11 carries a cam 44 which imparts a reciprocating movement to the cutter 45 for shearing action with the comb 18.

Near the cam 44, the shaft 11 passes through a special ball bearing 43 which connects the shearing head 18″ revolubly to the casing 15 near the cross portion 41 thereof. The bearing 43 has its inner wall 48 rigidly connected to the base 47 which supports the comb 18, and the inner diameter of the bearing 43 is larger than the operating diameter of the cam 44; similarly, a hole 50 that is formed in the lower surface of the outer wall 49 of the casing 15 has a diameter which is larger than the operating diameter of the cam 44, to allow passage clearance of the cam 44 during assembly. The outer wall 49 is rigidly connected to the cross portion 41, by means of the ball bearing 27.

In addition to the aforesaid first driving means 9 for operating the cutter 45, there is provided a second driving means 10′ to impart oscillations to the shearing head 18″.

The second driving means 10′ comprises a driven shaft 32 that is parallel to the driving shaft 11, a tapered cam 33 mounted on the driven shaft 32, and a hollow chamber or recess 34 which is formed in the comb 18 and which is engageable by the tapered cam 33.

A gear 30 is rigidly connected to a part 42 of the

driving shaft 11, and is disposed in the space between the cross portion 41 and the cross member 40. The gear 30 engages a gear 31 that is keyed on the driven shaft 32. The driven shaft 32 carries at its upper end the tapered cam 33 which in an active position is disposed in the hollow chamber 34 of the comb 18.

Ball bearings 58 and 59 are provided for the driven shaft 32 and mounted on the cross portion 41 and the cross member 40, respectively. The bearings 58 and 59 permit the driven shaft 32 not only to rotate but also to be shifted axially. The gear 31 has a height of at least twice the height of the gear 30, in order to ensure that the gears 30 and 31 will remain in meshing engagement throughout the shifting movements of the driven shaft 32, as the driving shaft 11 is axially immovable. The extent of shifting of the driven shaft 32 is such that the tapered cam 33 may be shifted between the active position (Figs. 3 and 4) of maximum amplitude oscillations of the shearing head 18'' and, respectively, an inactive position in which the cam 33 will be removed downwardly entirely out of the chamber 34 so that no oscillation movement will be imparted to the shearing head 18''. The height of the gear 31 is greater than the height of the cam 33.

The lower end of the driven shaft 32 is rotatably mounted in a ball bearing 56 (Figs. 3 and 5) which has two collars 60. A fork 61, that is connected to one end of a lever 37, engages the bearing 56 between the two collars 60. The lever 37 is pivoted at 38 to the casing 15, and carries at the opposite free end a knurled driving knob 39 that has indexes 64 and that is movable against and engageable with knurled side plates 65 of the casing 15.

The operation of the modification of Figs. 3–6 is as follows.

The driving shaft 11 is rotated by the electric motor (not shown), and revolves the gear 30 which in turn rotates the gear 31 and thereby the driven shaft 32. The cam 44 of the driving shaft 11 will reciprocate the cutter 45 within the comb 18.

When the tapered cam 33 is in the active position (Fig. 3), it will transmit to the shearing head 18'' pendulous oscillations about the axis of the shaft 11. To adjust the amplitude of the oscillations, the operator will move the driving knob 39; thereby the lever 37, by means of the fork 61 and the collars 60 of the ball bearing 56, will move the driven shaft 32 axially, thereby varying the engaging line diameter of the cam 33 with the longitudinal side surfaces of the chamber 34. If, for instance, the knob 39 is moved downwardly, the driven shaft 32 will be moved up, and if the knob 39 is moved up the shaft 32 will be moved down. When, during upward movement, the knob 39 has reached the upper dead end of the knurled plate 65, the cam 33 will be entirely removed out of the chamber 34.

A locking pin 66 is provided which engages a recess 67 in the base 47 to lock the base 47, and therewith the comb 18 which is supported within the base 47, against oscillating when the knob 39 is in the upper dead end position; in all other positions of the knob 39, the locking pin 66 will be out of engagement with the recess 67, thereby releasing the shearing head for oscillating. A retraction spring 68 is provided that urges the locking pin 66 to be withdrawn from the recess 67 as soon as the knob 39 has been moved downwardly from the upper dead end position.

I wish it to be understood that I do not desire to be limited to the exact details of the exemplifications of construction shown and described, for obvious modifications will occur to a person skilled in the art.

Having thus described the invention, what I claim as

new and desire to be secured by Letters Patent, is as follows:

1. A dry shaver comprising a casing, a head disposed on said casing and including a comb having a skin contacting shaving surface and inner cutting means disposed in said comb, said head being oscillatable about an axis extending in the longitudinal direction of said casing at right angle to the skin contacting shaving surface of said comb, first driving means operating said cutting means including a driving shaft extending in said longitudinal direction of said casing and having an axis coinciding with said longitudinal axis, second driving means driven from said first driving means and operable to impart to said head a pendulous oscillating motion about said axis comprising a driven shaft parallel to and driven by said driving shaft, means supporting said driven shaft axially shiftable slidably, a tapered cam disposed near one end of said driven shaft, said head having a recess engageable by said tapered cam to oscillate said head about said axis when said driven shaft is shifted in one direction, transmission means between said driving and driven shafts operable in all positions of said driven shaft, supporting means for said head supporting and guiding it in all positions, and means operable to control the amplitude of the pendulous oscillations comprising means actuatable for adjusting the axial shifting position of said driven shaft.

2. A dry shaver comprising a casing, a head disposed on said casing and including a comb having a skin contacting shaving surface and inner cutting means disposed in said comb, said head being oscillatable about an axis extending in the longitudinal direction of said casing at right angle to the skin contacting shaving surface of said comb, first driving means operating said cutting means including a driving shaft extending in said longitudinal direction of said casing and having an axis coinciding with said longitudinal axis, second driving means driven from said first driving means and operable to impart to said head a pendulous oscillating motion about said axis comprising a driven shaft parallel to and driven by said driving shaft, means supporting said driven shaft axially shiftable slidably, a tapered cam disposed near one end of said driven shaft, said head having a recess engageable by said tapered cam to oscillate said head about said axis when said driven shaft is shifted in one direction, transmission means between said driving and driven shafts operable in all positions of said driven shaft, supporting means for said head supporting and guiding it in all positions, and means operable to control the amplitude of the pendulous oscillations comprising means actuatable for adjusting the axial shifting position of said driven shaft including a lever pivoted on said casing and extending to the exterior of said casing for manual movement, journalling means between said lever and said driven shaft operable for translating tilting movements of said lever into axial shifting movements of said driven shaft, and means actuatable for releasably locking said lever in any among a plurality of selectable positions.

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