April 23, 1940. C. GARDNER 2,198,266

CUTTING DEVICE

Filed May 7, 1937

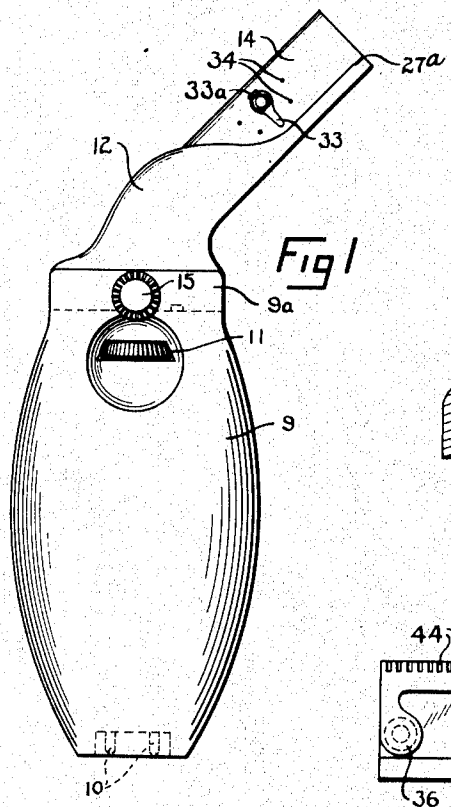


Fig 1

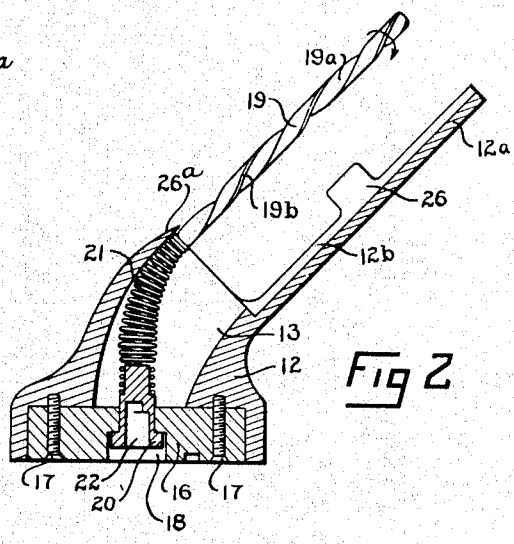


Fig 2

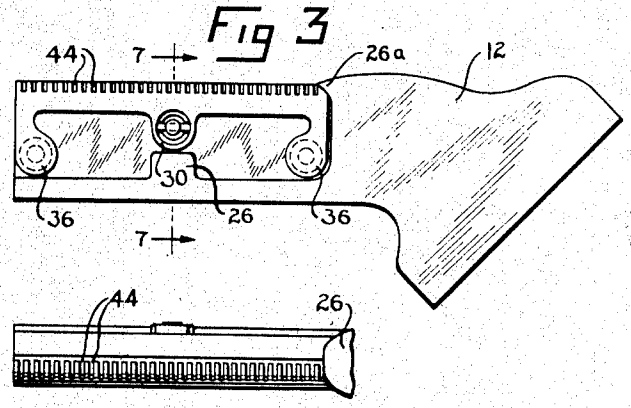


Fig 3

Fig 4

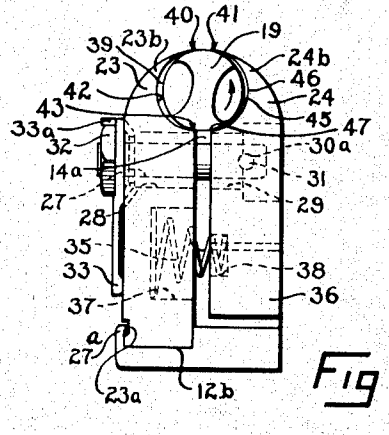


Fig 5

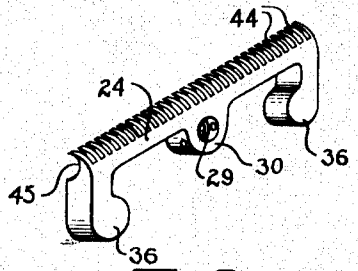


Fig 6

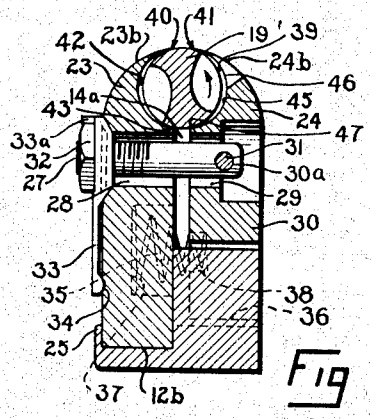


Fig 7

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2,198,266

CUTTING DEVICE

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Application May 7, 1937, Serial No. 141,201

5 Claims. (Cl. 30—43)

This invention relates to cutting apparatus, and more particularly to means for cutting hair or the like.

One of the objects of the present invention is to provide apparatus embodying novel cutting means comprising a power driven rotary element.

Another object of this invention is to provide a power driven shaver of the rotary type which is so constructed as to insure close shaves over a long period of use without necessity for sharpening.

A further object of this invention is to provide novel cutting apparatus of the rotary type which may be adjusted to the texture or quality of the substance to be cut.

Another object is to provide a novel cutting device which, when employed for shaving, for example, may be adjusted to suit the desire of the user for a coarse or close shave or cut.

Still another object is to provide a novel cutting device which comprises only a small number of parts, which may be inexpensively manufactured and which may be readily and quickly assembled and disassembled for cleaning or repair.

A further object is to provide novel cutting means which are so constructed that the cooperating elements thereof need not be machined to extremely low tolerances.

A further object is to provide a shaving device of the rotary cutter type embodying cutting means which do not pull the hair.

The above and further objects and novel features of the invention will more fully appear from the following detailed description when the same is read in connection with the accompanying drawing. It is to be expressly understood, however, that the drawing is for the purpose of illustration only and is not intended to define the limits of the invention, reference being primarily had for this latter purpose to the appended claims.

In the drawing, wherein like reference characters refer to like parts throughout the several views,

Fig. 1 is a side elevation approximately to full scale, illustrating one embodiment of the present invention;

Fig. 2 is a side elevation, on an enlarged scale and partly in section, showing one form of adapter and rotary cutter which may be employed in carrying out this invention;

Fig. 3 is an enlarged side elevation of the cutting head and adapter viewed from the side opposite to that shown in Fig. 2;

Fig. 4 is a top plan view with parts broken away of the mechanism shown in Fig. 3;

Fig. 5 is an enlarged end elevation of the cutting head showing the rotary cutting member associated therewith;

Fig. 6 is an isometric view of one form of comb member which may be employed in the cutting head; and,

Fig. 7 is an enlarged sectional view, the section being taken substantially on line 7—7 of Fig. 3.

One embodiment of the invention is illustrated in the accompanying drawing, by way of example, in the form of a shaving device comprising power means, such as an electric motor, for driving a rotatable cutting element which is associated with a two-part cutting head. One part of said head constitutes a blade member and is provided with a hollow ground cutting edge adapted to cooperate with said cutting element. The other or slotted part of said head constitutes a comb member and is movably mounted with respect to said blade member. Resilient means associated with said comb member are effective to maintain the rotary cutting element and the blade member in yielding contact with one another and means are provided for adjusting the position of said comb member relative to said blade member to thereby compensate for wear of the cutting surfaces and to determine the closeness of the shave to be obtained.

In the form illustrated in Fig. 1, the power means are constituted by an electric motor of the usual type now used with reciprocating power shavers, said motor being enclosed in a housing 9 which is shaped to constitute a handle. A socket having a pair of contacts 10 which are electrically connected to said motor is provided in handle 9 for the reception of a contact plug (not shown) that may be connected through suitable leads to a source of electric energy for energizing the motor. Conventional control means whereby the user is enabled to start or arrest rotation of the motor at will are provided and, in the form shown, include a small knurled wheel 11 which is attached to the main driving shaft of the motor and is effective to control suitable switch means in the motor field. Since motors of the above type and control means therefor are old and well known in the art, and, since the same do not, per se, constitute any part of the present invention, further detailed description thereof is believed to be unnecessary.

Any suitable means may be provided for supporting and housing the novel cutting means

comprehended by the invention in a desirable position relative to handle 9 whereby the user is enabled to conveniently hold the cutting parts in operative contact with the surface to be shaved. In the form shown, said supporting means are constituted by an adapter or support 12 which preferably includes a one-piece casting comprising a base portion having a curved passage 13 therethrough and an angularly extending tongue portion 12a which is constructed to support a cutting head 14, in a manner to be more fully described hereinafter. The base of adapter 12 is shaped to fit into a groove between the extending portions 9a of handle 9 and is removably secured to the latter by means of a set screw 15. A recess is preferably provided in the base of adapter 12 for the reception of a plate 16 which is secured in position therein by means of screws 17, said plate being provided with a bore 18 that registers with passage 13.

Means are provided for operatively connecting the shaft of the motor to a rotatable cutting element 19 which is preferably disposed at an angle of about 45° to said shaft and adapted to coact with a cutting head 14 in a manner to appear hereafter. As illustrated, said connecting means are constituted by a yieldable coupling comprising a coupling member 20 and a coil spring 21. Said coupling member extends through opening 18 in plate 16 and it is provided with a countersunk bore 22, the inner portion of which is eccentric with respect to the axis of rotation thereof for telescopically receiving an eccentric portion on the end of the motor shaft (not shown). Spring 21 forms a yielding and frictional driving connection between member 20 and cutter 19, the same having coils adjacent each end thereof which are sufficiently small to torsionally grip the inner end of said cutter and the inner end of member 20, the latter of which extends through plate opening 18 into passage 13.

Rotating cutter 19 is preferably of the spiral type and may have either one or a plurality of helical flutes or furrows. In the form illustrated, said cutter is of the single pitch type having a single helical groove 19a. The forward edge 19b of the land of cutter 19 is sharpened to form a cutting edge which cooperates in a manner to appear hereafter with cutting head 14. Cutter 19 constitutes in effect a left-hand screw of reamer so that when the same is rotated in the direction of the arrow (Fig. 2) the cut hair will be carried to the outer end thereof by the screw action of the cutter and discharged from head 14. The greater portion of cut hair will be discharged, however, through lower aperture 14a between the two cooperating members of the cutting head which will be hereinafter described.

Novel means constituting a cutting head are provided in combination with rotary cutter 19, whereby either a close or a coarse shave may be obtained according to the desire of the user and whereby both coarse and fine texture hair may be cut with equal facility and without any pulling thereof. Said cutting head, as shown, comprises a blade member 23 and a comb member 24, each of which cooperates with a cutter 19 in a manner to appear hereafter. Blade member 23 is removably secured in a longitudinal groove or slot 12b provided in tongue 12a at one side thereof, the walls of said groove including portion 25 and the face of a centrally disposed lug 26. Member 14 is held in groove 12b by means of a lip 26a which engages the upper inner end thereof and a yielding retaining lip or latch 27a (Fig. 5) which extends into a short recess 23a formed in the side of member 23 at the lower, outer end thereof.

For a purpose to more fully appear hereafter, comb member 24 is adjustably mounted with respect to blade member 23 and is yieldingly held in operative position relative to said blade member and cutter 19, wherey a satisfactory cutting action is assured at all times irrespective of wear of the parts or the texture of the hair. In the illustrated embodiment, novel means are provided for mounting member 24, said means including a bolt 27 which extends through enlarged, transverse openings 28 and 29 formed in member 23, adjacent the center thereof, and in a depending lug 30 on member 24, respectively. The latter member is pivotally secured to one end of bolt 27 by means of a pivot pin 31 which loosely extends through said bolt and into a bore 30a in lug 30.

The other end of bolt 27 is preferably threaded for the reception of a nut 32, the inner surface of which is rounded and adapted to bear against the walls of the enlarged cup-like portion of a small lever 33 which, in turn, engages the outer face of blade member 23. Said bolt is thus anchored by nut 32 for universal movement relative to member 23.

In order that the effective length of bolt 27 may be readily varied by the user for effecting an adjustment of the cutting parts, lever 33 is provided with an ear 33a which engages a flat side of hexagonal nut 32. Thus, when lever 33 is moved angularly, nut 32 is threaded onto or off bolt 27, which is held against rotation by pivot pin 31, thereby decreasing or increasing the distance between said nut and pivot 31. The outer end of lever 33 has a head portion adapted to engage depressions 34 in the side of member 23, whereby the same is held in adjusted position.

Yielding means constituted, in the illustrated embodiment, by coil springs 35, 35 are interposed between blade member 23 and a pair of arms 36 which are formed integrally with and extend downwardly from the ends of comb member 24. Said springs are thus effective to pivot member 24 in a counter-clockwise direction about pivot 31 and to hold said pivot toward the right, as viewed in Fig. 5. Member 23 and arms 36, 36 have alined recesses 37 and 38, respectively, for positioning springs 35, 35.

In order to provide a cutting edge or blade which is adapted to cooperate with cutter 19 and to provide means for guiding the whiskers or hair to the blade and holding the same in position for cutting, an arcuate groove is milled in each of the members 23 and 24 adjacent the tops thereof to thereby form a somewhat elliptical bore 39 in which cutter 19 may operate. The outer surfaces of members 23 and 24 are rounded as at 23b and 24b to thereby minimize the surface which must contact the face and to form thin edges 40 and 41, the former of which constitutes the blade or cutting edge of member 23.

To insure line contact between blade 40 and cutter 19 during a long period of use, groove 42 is so formed that the distance between points 40 and 43, i. e., the smallest diameter of bore 39, is somewhat less than the diameter of cutter 19, thereby obviating surface contact between the walls of said groove and the cutter. By reason of the curvature of the walls of groove 42, blade 40 is in effect hollow ground so that the sharpness thereof and the line contact between the

same and cutter 19 are not materially affected by wear.

The yielding means comprising springs 35 interposed between the blade and comb members 23 and 24, respectively, as above described, produces a resilient engagement between the said members and cutter 19 such that upon the adjustment of the position of the comb member which will vary the aperture between the said members the position of the cutter with respect to the said blade member is not altered. Under these conditions the cutting angle remains constant, the cutting angle being that angle formed by the intersection of a tangent to the circle described by a point of the rotating cutting edge 19b with a tangent to the cross section of groove 42, both lines being tangent at the point of contact of the rotating cutting edge 19b and the fixed cutting edge 40 and both in the plane perpendicular to the axis of the said cutter.

Although the edge 41 on member 24 may be provided with slots milled at an acute angle to the axis of bore 39 and have sharp edges to coact with the cutting edge 19b of cutter 19, the same, in the form shown, has a plurality of slots 44 milled at right angles to the axis of said bore. Member 24 thus constitutes a comb which is effective to guide the whiskers and hold the same in cutting position between cutting edges 19b and 40. The groove 45 in member 24 is preferably of substantially the same size and shape as arcuate groove 42, but, if desired, the radius of curvature of wall 46 may be the same as the radius of cutter 19. As shown, comb member 24 has line engagement with the rotary cutter at 41 and 47 and is effective through springs 35 to yieldingly urge the cutter into engagement with blade 40.

In operation, the motor may be energized by connecting the same to a source of energy through a suitable extension (not shown) plugged in at 10 and then actuating switch member 13. Said motor is effective to rotatably drive cutter 19 through the yielding coupling 20, 21 in the direction of the arrow, whereby cutting edges 19b and 40 coact to cut the hair brought between the same, the coaction of said edges being similar to that between the blades of a hollow ground scissors or shears. Wear of the cutting edges is automatically and continuously compensated for by the yielding action of springs 35 which urge said edges toward one another at all times. When a whisker or hair comes between blade 40 and cutter 19b, the reaction between said blade and cutter causes the lower edge of the latter to swing to the right, as viewed in Fig. 5, and this reaction in prior razors has, after slight wear of the cutting edges, resulted in a pulling of the hair. This difficulty is obviated in the present device by exerting a yielding lateral pressure against cutter 19 at points 41 and 47. By making the lever arm between point 47 and pivot 31 smaller than the lever arm between said pivot and the point of application of force by springs 35, a substantial mechanical advantage is obtained for overcoming the above-mentioned reaction, thereby permitting the use of comparatively light springs and, hence, reducing the pressure by which the cutting edges are held together. The wear of said edges is accordingly reduced and because of decreased friction between said edges, the motor is effective to rotate cutter 19 at a higher rate of speed. It will be noted that by reason of the universal movement of bolt 27 comb member 24 pivots about the axis of cutter 19, as a center, and that edges 41 and 47 accordingly remain in contact with the cutter at all times. The yielding means 35 are thus effective through comb 24 to hold cutter 19 in engagement with cutting edge 40, and the line contact between said edge and cutter is maintained at all times.

If it is desired to vary the compression of springs 35 and, hence, the pressure with which cutter 19 is held against blade 40 in order to provide for cutting hair of different degrees of coarseness or to adjust the razor for a close or coarse shave, this may be accomplished by moving handle 33. Nut 32 is thus rotated relative to bolt 27 and is caused by the cam action of the coacting threads to move axially of said bolt and increase or decrease the distance between pivot 31 and said nut, depending on the direction in which lever 33 is moved.

There is thus provided a novel cutting device which may be used as a shaver and which will not pull the hair and is so constructed that it may be adjusted to give a close or coarse shave or cut according to the desire of the user and which will cut hair of varying texture with equal facility. The apparatus is of light weight and easily manipulated, and provides a quick shave without irritation to the skin. The cutting parts are so constructed and resiliently urged together that a line contact is maintained between the stationary and rotating blades so that the sharpness thereof is not materially affected by wear. Novel means are also provided for varying the yielding engagement of said coacting blades and for adjusting the same to give a close or coarse shave.

Although only one embodiment of the invention has been illustrated and described in detail, it is to be expressly understood that the same is not limited thereto. For example, in the form shown, the comb member is adjustable about the cutter as an axis and the blade member is stationary; however, this construction may be reversed, with the comb member fixed and the blade member adjustable. Also, the method of holding the comb to the blade member by means of a transverse bolt with a pivot therethrough may be varied to include any means whereby the angular position of the comb may be adjusted about the axis of the rotatable cutter while it resiliently urges the said rotatable cutter against the stationary blade. Various changes may also be made in the design and arrangement of parts illustrated, without departing from the spirit and scope of the invention as the same will now be understood by those skilled in the art. For a definition of the limits of the invention, reference will be had primarily to the appended claims.

What is claimed is:

1. In apparatus of the class described, a two-part cutting head comprising a blade member and a comb member, a rotatable cutter interposed between said members and adapted to cooperate therewith, said comb member being mounted for adjustable pivotal movement about the cutter axis, and yielding means interposed between said members for yieldingly maintaining the latter in operative engagement with said cutter.

2. In apparatus of the class described, cutting means comprising a cutting blade and a rotary cutter adapted to cooperate with said blade, comb means pivotally mounted upon said cutting blade for holding said cutter and blade in operative engagement, yielding means interposed between the cutting blade and said last-named

means, and means for adjusting the force of said yielding means.

3. In apparatus of the class described, a two-part cutting head comprising a blade member and a comb member, the parts of said head having grooves of arcuate cross section adjacent the top surfaces thereof forming a bore therethrough and a cutting edge with one of said parts, a rotatable cutter in said bore, the arcuate cross section of the groove of the blade member being substantially semi-elliptical with a minor axis smaller than the diameter of the said cutter, means for mounting one of said cutting head parts for movement relative to the other part, and means to yieldingly urge said cutter against the said blade member whereby contact between the cutter and the blade member is maintained at all times.

4. In apparatus of the class described, a two-part cutting head, one of said parts having a cutting edge, cooperating semi-bores in both of said parts forming a longitudinal bore through said cutting head, and a rotatable cutter in said bore in double line contact with each part of said head, said head having an opening therein below said cutter to provide a discharge outlet for the cut substance.

5. In an apparatus of the class described, a two-part cutting head having an elliptical bore therethrough, one of said parts having a cutting edge, and a rotatable cutter in said bore adapted to coact with said cutting edge for the cutting of hair, said elliptical bore having a minor axis shorter than the diameter of said cutter, one of said parts being cut away beneath the cutter to provide a discharge opening for the cut hairs.

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