

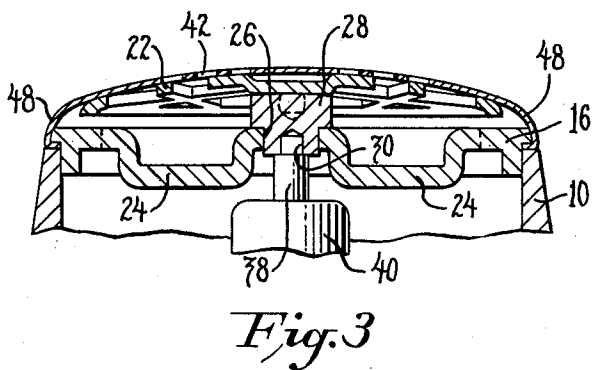
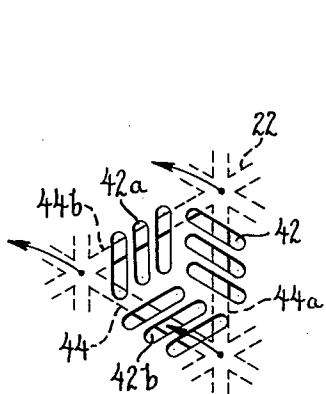
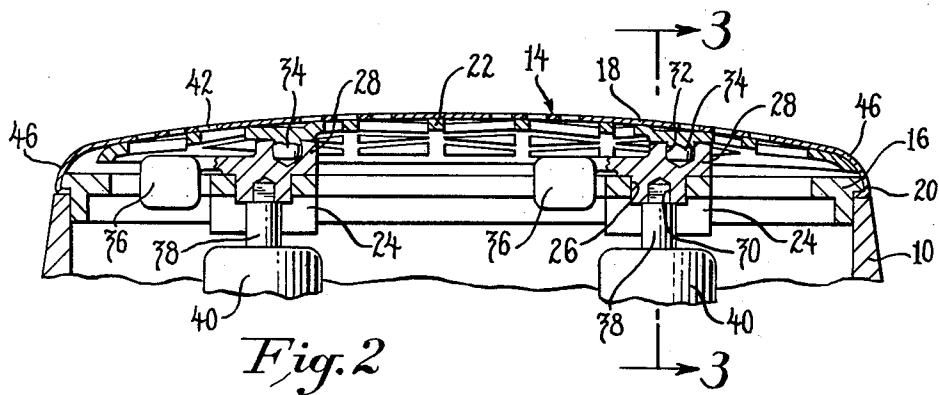
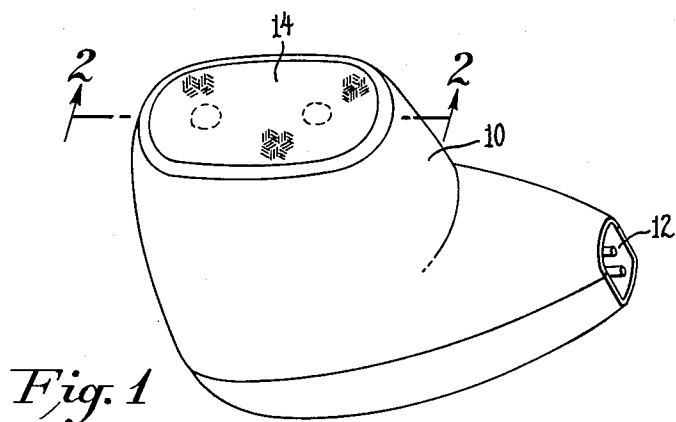
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3,129,507

ORBITAL DRY SHAVER AND CUTTING HEAD THEREFOR

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ORBITAL DRY SHAVER AND CUTTING HEAD THEREFOR

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4 Claims. (Cl. 30-43)

This invention relates to dry shavers or powered razors, it being the general purpose of the invention to improve the effective rate of shaving with negligible skin abrasion in an implement which may be used with full effectiveness in all shaving problems normally encountered.

The dry shavers in common use employ one of three types of action between the stationary perforated guard and the moving shear or cutter. In the reciprocating channel type, the guard and shear are both provided with closely spaced transverse slots with the cutter reciprocating to produce a shearing action simultaneously on the side walls of all slots. The slots usually extend around the shoulders of the guard and cutter so that long hairs can enter more easily when the shaver is translated in a direction perpendicular to the cutter reciprocation. Such shavers have the advantage of a high effective rate of shaving, since a shearing action occurs at each slot at least once in each reciprocation of the cutter. They have the drawback of causing skin abrasion where other types will not do so and their full effectiveness is not realized except in a single direction of travel.

Another common type of shaver provides one or more circular cutting areas on the guard and utilizes a rotary shear blade. These machines can be constructed with elongated slots extending around the shoulder of the guard and the slots can be arranged in non-parallel directions. They have the advantage of negligible skin abrasion and they admit long hairs to the slots with facility. They do not, however, have the advantage of a large rectangular area substantially filled with closely spaced slots, which is found in the reciprocating channel type and consequently the effective rate of shaving is much lower. In addition their inherently circular periphery makes it difficult to shave to a straight boundary at sideburns, mustache, beard, etc.

A third type of shaver uses a semi-cylindrical guard with an oscillating cutter which takes the form of a single blade sweeping the entire effective surface of the guard. With this construction the guard must be inherently self-supporting across the full cylindrical arch which in practical effect limits the form of the perforations to circles or regular polygons, rather than elongated slots running perpendicular to the travel of the cutter. Also a part of the guard area is ineffective where support ribs are located. These machines minimize skin abrasion and, due to the sharp curvature of their cylindrical surface, are more effective in concave areas than other forms. Their effective rate of shaving is not high, however, and unless special areas are given over to enlarged circumferential slots with serrated edges there is little possibility of ever cutting long hairs.

A fourth type of shaver has been proposed in the patent to Mehl 2,323,881, July 6, 1943 in which a flat or channel shaped guard is traversed by one or two cutting knives arranged lengthwise in the channel and in which an orbital motion is imparted to the knives in a circular orbit. With such a construction it is impossible to provide either ribs or an arched shape for supporting the guard and as a consequence the guard must be either prohibitively thick or of such a small area that the effective shaving speed is too slow.

The present invention aims to provide a dry shaver hav-

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ing a very high effective shaving rate with negligible skin abrasion and which at the same time effectively cuts long hairs, cuts all hairs with a combined rolling and shearing action, will easily shave to a straight boundary, and is fully effective in all directions of translatory motion and upon concave as well as convex or flat skin areas.

These objects are accomplished by the provision of a shaver head having a guard of generally oblong shape and preferably of slightly convex contour, which is provided over its entire area with elongated slots arranged in non-parallel configuration. Cooperating with the guard is a cutter of nearly co-extensive area and having a gridwork of cutter bars arranged in non-parallel directions for effective shearing with the side walls of the guard slots and distributed substantially over the full area of the guard so as to provide strong mechanical support therefor. Shearing action is imparted by causing the cutter to partake of an orbital motion through a circular orbit which causes the cutter bars to simultaneously shear hair against the side of one or more elongated slots. Such motion may be conveniently provided by a pair of rotary crank members driven in synchronism from a rotary motor.

These and other objects and advantages are obtained by the present invention of which a preferred embodiment is illustrated in the drawing.

FIGURE 1 is a perspective view of a dry shaver incorporating the present invention.

FIGURE 2 is a fragmentary sectional view on a larger scale taken on line 2-2 of FIGURE 1.

FIGURE 3 is a fragmentary sectional view taken on line 3-3 of FIGURE 2.

FIGURE 4 is a fragmentary diagram on a still larger scale illustrating a preferred pattern of guard slots and cutter bars.

The shaver comprises a body 10 containing an electric motor not shown and having a cord receptacle 12. These parts may be of any suitable type, as for example the well known Norelco shaver body and motor, or that illustrated in the Mehl patent previously mentioned. A head 14 is attached to the body and driven by the motor therein and may be constructed as shown in greater detail in FIGURES 2, 3 and 4.

The head 14 comprises a peripheral frame member 16 of T-shaped cross section which is removably secured to the body 10 by fastening means not illustrated. A perforated steel guard 18 is secured to the member 16 in a suitable fashion, as for example by crimping at 20. This may be either a permanent crimp around the entire edge, performed after final assembly of the head or it may be only crimped in a few locations and to a smaller degree so that the guard may be manually removed from the member 16 and resnapped in place. The guard 18 is preferably formed with a true spherical contour over most of its area with more sharply convex shoulders around its perimeter. A cutter 22 of substantially thicker metal and slightly smaller in projected area than the guard 18 is positioned on the under surface thereof and provided with a closely mating spherical surface with its edges preferably curved to correspond to the curved shoulders of the guard 18.

The member 16 is provided with a pair of transverse bridges 24 which may be downwardly off-set as illustrated in FIGURE 3 and have central portions which form journal bearings 26 for a pair of counterbalanced cranks 28. The cranks 28 are provided with non-circular driving sockets 30 and with eccentric bearings 32 for the reception of drive pins 34 integral with the lower surface of the cutter 22. The pins 34 are preferably slightly barrel-shaped to compensate for the slight conical motion of which they partake. The cranks 28 are provided with counter weights 36 arranged to counter balance the

moments produced by the cranks and the cutter 22. The cranks may be driven by a pair of rotary shafts 38 journaled in bearings 40 and driven synchronously in a common direction by the drive motor, not illustrated.

The pattern of slots in the guard 18 and of the cutter bars in the cutter 22 may take a variety of forms, a preferred form being illustrated in the FIGURE 4. Here the elongated slots 42 are arranged in three groups of three, distributed over a hexagonal area and these areas are repeated over the entire work area of the spherical surface of guard 18. The cutter 22 is formed as a grid work of bars arranged in three directions 60 degrees apart with triangular spaces in between. The spacing of the bars 44 and the throw of the cranks 28 are so chosen with respect to the size of the hexagonal pattern of the slots 42 that each group of three slots will be swept by a cutter bar 44 which is parallel to the orientation of the slot group one or more times during each cycle of orbital movement of the cutter 22. Thus as the cutter 22 moves in the direction of the arrows shown in FIGURE 4 the bar 44a will have shearing engagement with the long edges of the slot 42a with which it remains parallel at all times. The bar 44b will likewise shear with the edges of slots 42b and bar 44 with the slots 42. Other patterns of non-parallel slots 42 and corresponding cutter bar grids may be utilized based upon squares, pentagons, and other regular or irregular figures. The throw of cranks 28 should equal the pitch of the parallel cutter bars, or a multiple thereof, plus a small allowance.

The spherical contour of the cutter and guard is much more rigid than a flat contour, due to the arch effect, and the cutter member, which may be made of substantial thickness, supports almost the entire undersurface of the guard upon a grid pattern of relatively small span between adjacent bars. Although it is not necessary to provide slots in the shoulders 46 or 48 of head 18, such may be provided if desired and corresponding cutter bars arranged along the edges of the cutter 22. However, the fact that the slots 42 in the guard are elongated and are oriented in a plurality of directions assure that long hairs are offered adequate ingress through the guard to be cut. Since the cutter bars have a component of motion lengthwise of the guard slot at the time of shearing there is produced a combined rolling and shearing action on each hair which renders the cutting action more effective.

The contact between the cutter 22 and the guard 18 is maintained resiliently to allow for wear and other minor variations. This is preferably accomplished by crimping the edge of guard 18 in such fashion that the bridge bars 24 are flexed a small amount. On the other hand the drive shafts 38 may be resiliently loaded for endwise motion, as in the commercial shavers of the Norelco type, and thus bias the cranks 28 upwardly.

While a preferred form of the present invention has been illustrated and described it will be understood that other forms may be adopted all coming within the scope of the claims which follow.

I claim:

1. A self supporting removable cutting head for an electric shaver having a rotary driving means for the head comprising an oblong frame and a pair of bearings spaced apart along the longitudinal mid-line of the frame, a sub-

stantially flat guard plate secured to the frame, a mating cutter plate slidable along the guard plate, and a pair of cranks rotatable in said bearings and connected to impart orbital motion to the cutter plate and at the same time hold the cutter plate in association with the guard, and means forming a driving connection for each crank.

2. A shaver comprising a guard plate and a mating cutting plate mounted in face to face engagement for movement parallel thereto, the major area of the guard plate having a large number of perforations of elongated shape oriented in a plurality of directions and a substantially similar area of the cutting plate having a plurality of individual cutting edges distributed over substantially its full area and oriented in a plurality of directions, and drive means for moving the cutting plate in a non-rotating circular orbit of small diameter relative to the guard plate width and approximating the spacing between parallel cutting edges.

3. A dry shaver comprising a guard plate of oblong configuration and perforated with hair receiving openings arranged in multiple array laterally and longitudinally to occupy substantially the entire oblong area of the plate, a cutter comprising a mating plate of corresponding shape and size and having a plurality of larger openings distributed over substantially its entire area, and means for driving the cutter in a non-rotating orbital path in laminar abutment with the guard, whereby hairs can be simultaneously cut at a large number of locations distributed over the full oblong area and with shearing action occurring successively in various directions at each location.

4. A dry shaver comprising a guard plate of oblong configuration and perforated with hair receiving openings arranged in multiple array laterally and longitudinally to occupy substantially the entire oblong area of the plate, a cutter comprising a mating plate-like member of corresponding shape and size and having openings the walls of which form spaced cutting edges, the guard being formed of thin, readily flexed material and the cutter being formed of thick rigid material forming a support for the guard, and means for driving the cutter in a non-rotating orbital path in laminar abutment with the guard.

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