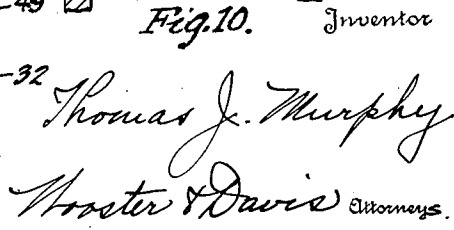


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DRY SHAVER CUTTER HEAD

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DRY SHAVER CUTTER HEAD

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9 Claims. (Cl. 30—41)

This invention relates to dry shaver cutter heads and has for an object to provide an improved head of this character, which is a construction which is simple and may be more accurately finished and which will cut close to the surface of the skin with a minimum of irritation.

Another object is to provide a construction which will facilitate accurate grinding and finishing operations and thus will produce a better cutter head and one which will operate more effectively and uniformly.

With the foregoing and other objects in view, I have devised the construction illustrated in the accompanying drawings forming a part of this specification. It is, however, to be understood the invention is not limited to the specific details of construction and arrangement shown, but may embody various changes and modifications within the scope of the invention.

In these drawings:

Fig. 1 is a top plan view of the cutter head on an enlarged scale;

Fig. 2 is a side elevation with parts broken away;

Fig. 3 is a transverse section substantially on line 3—3 of Fig. 1;

Fig. 4 is an end view;

Fig. 5 is a section substantially on line 5—5 of Fig. 2;

Fig. 6 is a top plan view of the inner cutter;

Fig. 7 is a side view thereof;

Fig. 8 is an end view;

Fig. 9 is a section of one member of the inner cutter illustrating the most effective way of forming the teeth;

Fig. 10 is a detail section on an enlarged scale of the face engaging portion of the outer cutter, and

Fig. 11 is a bottom view of a modified form of inner cutter.

The device shown comprises a stationary outer cutter 1 and a longitudinally reciprocable inner cutter 2 mounted within the outer cutter to cooperate therewith, and they are enclosed within an outer guard or frame 3. The outer cutter 1 comprises two side plates 4 and 5 secured together in laterally spaced relation by spacing blocks 6 at their opposite ends between the lower edge portions of the plates. These blocks are spaced at their inner ends 7 leaving a space for operating connections from the inner cutter to the operating motor (not shown). The blocks 6 are adapted in size and width to properly space the plates 4 and 5 and are provided with tapered recesses 8 for solder or brazing material to secure the plates and the blocks together to a rigid structure.

At their opposite outer or upper free edges these plates are turned inwardly toward each other and are provided with a series of transverse cutter teeth 9 and 10. These teeth are very thin so as to give a cut close to the surface of the skin, and as shown they extend transversely of the free edge of the plates, and their outer surfaces and the surface of the plate immediately back of them, indicated at 11, form skin-engaging surfaces during the shaving operation. The two rows of teeth are separated by a longitudinal slot 12 so that the free ends of the teeth form the opposite sides of this slot, and they terminate at the edges of this slot. These skin-engaging surfaces may be substantially flat with the teeth extending in a plane at substantially right angles to the plane of the bodies of the plates, or they may be inclined either inwardly or outwardly somewhat as is found most desirable, but the outer edges of these members between the skin-engaging surfaces and the outer surfaces of the plate are rounded or convexly curved as indicated at 13, so as to provide smooth rounded surfaces which will not ir-

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ritate the surface of the skin. An important feature of the present construction is that each plate 4 and 5 is of the same thickness throughout its length and the skin-engaging surface of each plate is in the same plane for the full length of the plate, and there is therefore no thickened walls at the opposite ends, as is common construction, to secure greater strength and stiffness at the ends of these cutters. This greatly facilitates accurate grinding and finishing of these outer cutter teeth and the skin-engaging surface as the entire grinding surface of the wheel may be used and the grinding wheel run off the ends of the plates during the grinding operation, and it also permits grinding with smaller cuts and therefore less heating of the thin teeth and less danger of drawing their temper, and still permits grinding the teeth thinner for closer shaving. It is also preferred to make the bottoms of the teeth on one side plate, as, for example, plate 4, straight or substantially at right angles to the plane or outer surface of the teeth, as shown at 14, Fig. 10, and on the opposite side or plate 5 to incline this bottom wall in the notch between the teeth to an angle of about 45° to the plane of the teeth, as shown at 15 in Fig. 10. It is also preferred to make the teeth with the vertical bottoms somewhat shorter than the teeth 10 with the inclined bottom wall. The vertical wall between the teeth 9 tends to raise or lift the hairs as it is passed over the surface of the skin and therefore raise hairs which may be inclined or lying close to the skin to the cutting position, but it increases the resistance to movement of the cutter and therefore the force required to move it over the surface, and although the inclined wall 15 offers less resistance and therefore permits it to move more easily over the surface it may not have quite as much lifting effect on the inclined hairs.

Within the outer cutter is the longitudinally reciprocable inner cutter 2. This is preferably made in two sections 16 and comprises a thickened lower body portion 17 and a thinner side wall 18 extending upwardly from the outer top edge portion of the base or thickened portion 17. The two inner faces of the thickened portion 17 abut, as indicated at 19, and are provided with tapered aligned recesses 20 for solder to secure the two sections together. The abutting surfaces 19 may be through the center or straight, as indicated in Fig. 6, or they may be diagonal or inclined as indicated at 21 in Fig. 11. This provides a taper to the thickened body portions 17, which permits relative adjustment of the two members in assembling to thus vary the thickness of the inner cutter to more accurately fit within the outer cutter 1, by relative sliding movement. At the free edge of the side walls 18 they are provided with a portion inclined inwardly at an angle of about 45 degrees, as indicated at 22, and then at the free edge of this inclined portion extending inwardly at substantially right angles to the plane of the sides 18 as shown at 23, and the inner or movable cutter teeth 24 are formed on the edge portions by grinding a notch 25 between them of desired width, leaving teeth of the desired thickness. The teeth are ground by an abrasive wheel 26 in each element before the elements 16 are assembled, as indicated in Fig. 9, and therefore the teeth are formed in one element at a time. This permits them to be ground inwardly from the free edge of the portion 23, as indicated in Fig. 9, the wheel 26 being preferably so arranged that a line 27 from the axis of the wheel to the center of the bottom of the finished tooth and therefore the free edge of the tooth is about 45 degrees, or that is, at substantially right angles to the plane of the inclined portion 22. This permits grinding the notches between the teeth and thus forming the teeth with a minimum of contact between the surface of the wheel and the metal, thus reducing heating and liability of drawing the temper during the grinding operation, and also permits the grinding with a smaller cut which would have the same effect. The outer bevel surface 28 of the inclined portion 22 also provides the clearance between this inner cutter and the outer cutter at the connection between the outer teeth and the body of the plates 4 and 5, as is shown in Figs. 3 and 5, and reduces friction. Also to further reduce friction between the inner and outer cutters the outer side walls of the inner cutter may be relieved or provided with a longitudinal

channel 29, thus leaving narrow bearing surfaces 30 and 31 between the inner and outer cutters. This reduces friction between them and makes for easier operation of the inner cutter and less power is required.

As indicated, there are a number of advantages to this novel construction of inner cutter. The two halves can be slotted separately to form the teeth, and so the teeth need not be opposed to each other but staggered or offset, as indicated in Fig. 6, for smoother action. The two halves can be machined or extruded in lengths and then cut off to required length. There is less tendency to burn or draw temper of teeth while grinding because of a minimum surface contact face of slot grinding wheel. This new design and arrangement permits the teeth to face the wheel at a right angle while grinding.

It will be seen the outer surfaces of the inner teeth 24 are located at the inner sides of the teeth 9 and 10 of the outer cutter for cooperation therewith for the shearing action required in the shaving operation, and it is preferred that the tips or inner free ends of the outer teeth overhang slightly the inner free ends of the inner teeth, as shown, to permit the outer teeth to move more freely under the hairs in the shaving operation. It is also preferred that the teeth on one side of the inner cutter be staggered with respect to those on the opposite side, as shown in Fig. 6, so that the shearing operation is alternately on one side and the other and the shearing or cutting effect does not take place on all the teeth at the same time, thus reducing the power required for operation.

The outer cutter 1 is enclosed in a frame or guard 3 comprising laterally spaced side walls 32 located at the outer surfaces of the side plates 4 and 5 on thus enclosing the lower part of these plates and the lower part of the outer cutter, and this guard has transverse connecting end walls 33 between the opposite ends of the side walls and extending across the opposite ends of the outer cutter 1. However, the separating blocks 6 of the outer cutter are projected outwardly beyond the ends of the side members 4 and 5 as indicated at 34, and thus the end walls 33 are spaced or located outwardly from the opposite ends 35 of the side plates 4 and 5. The length of extension 34 and therefore the width of the space between the end of the outer end wall 33 may be made anything desired. They may be materially increased to provide greater space for lodgement of shavings. The guard 3 also comprises transversely extending top walls 36 at the opposite ends of the guard and the distance between their inner edges 36a is less than the length of outer cutter 1, so that these top walls 36 overlap at their inner edges the top surfaces of the outer ends of the skin-engaging surfaces of the outer cutter, as shown at 37. This slight overlap or overhang of the ends of the outer cutter by the guard gives mechanical protection to the outer cutter. Also the outer surfaces of these guide walls are located outwardly of the outer surfaces of the cutter teeth or skin-engaging surfaces 11, as indicated in Fig. 2, thus providing a contacting guide surface on the surface of the skin, which reduces the liability of the teeth digging in or irritating the skin, and these guide members also provide reinforcing and stiffening means for the opposite ends of the outer cutter. In this arrangement also, it will be seen from Fig. 2 that the inner surface 38 of these transverse guide walls is spaced outwardly from the inner surface 39 of the outer teeth 9 and 10, so that when during reciprocating of the inner cutter its end teeth pass beyond the ends of the outer cutter they are not passing in contact with any surface and there is no extra wear on them, and they retain proper contact with the teeth of the outer cutter. Also as the end walls 33 are spaced outwardly from the ends of the outer cutter this movement of the inner cutter beyond the ends of the outer cutter is permitted. The end walls 33 of the guard may be provided with openings 40 for circulation of air and escape of shavings, or, if preferred, they may be provided with closures or shutters to retain the shavings in the guard, or, if preferred, the openings 40 may be omitted so the end walls 33 will be closed to retain the shavings until cleaning is necessary. The outer transverse edge of the guide wall 36 is rounded or convexly curved transversely, as shown at 41, to form a smooth rounded contact surface for engagement with the surface of the skin and prevent irritation. This is made possible because the end walls 33 are spaced outwardly from the ends of the outer cutter. The upper edges of the side walls 32

are recessed or relieved as shown at 42 at the opposite sides of the outer cutter to expose the upper portions of the side plates 4 and 5 and not interfere with proper contact of the teeth of the outer cutter with the surface of the skin. Both side walls 32 of the guard are provided with suitable punched openings or slots 46 to receive lugs or bosses molded on the inner side of the side walls of the cutter mounting channel (not shown) in upper end of motor casing (not shown). The thickness of these bosses is slightly greater than the thickness of the side walls 32 of the guard to provide clearance for easy insertion and removal of guard 3 independently of the cutter head. These slots or openings also permit the clamping screw to engage the sides of the cutter 1 to retain the cutter head in the casing. As these openings 46 extend through the lower edge of the guard as shown, the guard can be easily removed for cleaning without disturbing the cutter head.

Another advantage of the guard or frame 3 is that the inner and outer cutters may be provided with indicating lines or marks 47 and 48 (Fig. 4) on their ends, and after the cutters are lapped and cleaned they may be assembled so these marks are in line and then the guard is placed over the complete assembled element and stored until ready to be assembled to the activator. With this guard the inner element cannot fall out of the outer member or otherwise be displaced in storage, handling or assembling.

The outer and inner elements 1 and 2 of the cutter can be of substantially even length for even wear at cutting surfaces, even though the length of the stroke may vary with load or voltage in the motor, but it is preferred the inner cutter be somewhat shorter than the outer cutter so as not to move so far beyond the ends of the outer cutter.

With this outer guard thicker metal at the ends of the outer cutter 1 is not necessary, which permits smoother and more accurate grinding, as the whole surface of the grinding wheel can pass over the outer or skin-contacting surface of the outer cutter. This is important because of extreme thinness of the teeth of the outer cutter. Elimination of this extra metal thickness on ends of outer element assures an easier grinding operation, smoother surfaces and uniform thickness of teeth, which is important where thin teeth are essential for close shaving. It will also eliminate drawing of temper of cutters because less metal is removed and use of coarser grinding wheel is permitted. The inner or lower edge of the inner cutter 2 may be provided with a transverse channel 47 to receive the end of the operating connection (not shown) from the motor, located in the space between the inner ends 7 of the spacer blocks. As is common practice, this driving connection includes spring means tending to force the connection outwardly to keep it seated in the transverse channel 47 and also to hold the outer surfaces of the teeth of the inner movable cutter against the inner surfaces of the teeth of the stationary outer cutter to secure the shearing action between them. Also the height of the inner cutter is preferably made less than the distance between the tops of the spacing blocks 6 and the inner surfaces of the teeth of the outer cutter to provide a clearance 49 between the top walls of these blocks and the bottom wall of the inner cutter and reduce friction and also permit yielding of the inner cutter if required. In the event that a supplementary central guard or comb disclosed in my prior Patent No. 2,325,267, issued July 27, 1943, is found desirable, it can be sweated to the under surfaces 38 of the top cross end walls 36 of the outer guard 3.

The above described structure provides a simple and effective one permitting accurate grinding and finishing of the various parts, particularly the cutter teeth, over the old constructions, thus making them more accurate and uniform as well as finishing in such a way as to permit closer shaving with less irritation of the skin. The guard or frame 3 enclosing the outer cutter is a particularly desirable improvement, forming a more rigid and stronger construction and providing skin-engaging guiding surfaces at the ends of the rows of teeth of the outer cutter without requiring a greater wall thickness at the ends of the outer cutter and therefore permitting uniform and the same grinding for the full length of the outer cutter. The transverse end guide walls on the guard also provide a thicker reinforcing and strengthening wall at the opposite ends of the outer cutter without requiring the forming of thickened walls on the outer cutter itself.

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Having thus set forth the nature of my invention, I claim:

1. A cutter head for dry shavers comprising an inner movable and an outer stationary cutter element each including a longitudinal slot in its outer edge and at least one row of spaced cooperating transverse cutter teeth extending inwardly with their free ends at one side of the slot, a hollow guard comprising spaced longitudinal side walls and transverse connecting end walls enclosing the lower side portions and ends of the outer element leaving the teeth uncovered, said transverse end walls being spaced outwardly from the ends of the side walls of the outer cutter element providing spaces for accumulation of shavings, said guard comprising a unitary structure including a transverse guide wall at each end overlapping the ends of the outer edge of the outer element and covering said space with its outer surface spaced outwardly of the outer surfaces of the stationary teeth and its inner surface spaced outwardly of the inner surfaces of said teeth, and said guard structure being open at its inner edge permitting it to be applied over the outer cutter element from the outer edge thereof.

2. A cutter head for dry shavers comprising an outer stationary cutter and an inner movable cutter cooperating therewith, each cutter comprising a pair of laterally spaced rows of cutter teeth in its outer edge on opposite sides of a longitudinal slot and extending transversely with their free ends forming the edges of the slot, a hollow guard comprising spaced longitudinal side walls at the outer sides of the outer cutter and transverse end walls at and spaced outwardly from the ends of said cutters providing spaces for accumulation of shavings, said guard comprising a unitary structure including a transverse guide wall at each end of the outer cutter covering said space and arranged with its outer surface spaced outwardly of the outer surfaces of the teeth of the outer cutter and its inner surface spaced outwardly of the inner surfaces of said teeth, and said guard being open at its inner edge permitting passage of the cutter through said edge into the guard.

3. A cutter head for dry shavers comprising an outer stationary cutter and an inner movable cutter cooperating therewith, each cutter comprising a pair of laterally spaced rows of cutter teeth in its outer edge on opposite sides of a longitudinal slot and extending transversely with their free ends forming the edges of the slot, the outer cutter comprising a pair of side plates separated by spacer blocks at the opposite ends thereof, each block extending outwardly beyond the ends of the plates, the teeth of the outer cutter being along the outer longitudinal edges of these plates and extending laterally inwardly therefrom, a hollow guard comprising spaced longitudinal side walls at the outer sides of the plates and transverse end walls at the outer ends of the spacer blocks so they are spaced from the ends of said plates providing spaces for accumulation of shavings, and a transverse guide wall at each end of the stationary cutter extending between the side walls of the guard between the end of the cutter and the end wall of the guard over the space at the inner side of the end wall and including an outer surface spaced outwardly of the outer surfaces of the teeth of the outer cutter.

4. A cutter head for dry shavers comprising an elongated outer stationary cutter member having a longitudinally extending skin-engaging surface at its outer edge, said edge being provided with an intermediate longitudinal slot and at least one row of spaced transverse cutter teeth extending inwardly with their free ends at one side of the slot, said surface extending the full length of said member in substantially the same plane, a hollow guard comprising spaced longitudinal side walls and transverse connecting end walls enclosing the lower side portions and ends of the outer element, said transverse end walls being spaced outwardly beyond the ends of the outer cutter member providing spaces for accumulation of shavings, said guard comprising a unitary structure including transverse guide walls at its opposite ends overlapping the opposite ends of said surface of the outer cutter member and covering said spaces with the outer surfaces of these guide walls spaced outwardly of the said surface of the cutter and their inner surfaces spaced outwardly of the inner surfaces of the teeth, said guard being open at its inner edge between its side wall permitting it to be applied to the outer element from the outer edge of said element, and an inner longitudinally reciprocable

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cutter within the outer cutter provided with transverse cutting edges at the inner side of the teeth of the outer cutter and cooperating therewith.

5. A cutter head for dry shavers comprising an outer stationary cutter having at its outer edge skin-engaging surfaces provided by laterally spaced longitudinal rows of cutter teeth on opposite sides of a longitudinal slot with the teeth extending transversely and their free ends forming the edges of the slot, said surfaces at each side of the slot extending the full length of said cutter member in substantially the same plane, a hollow guard comprising spaced longitudinal side walls and transverse connecting end walls enclosing the lower sides and end walls of the cutter, said transverse end walls being spaced outwardly beyond the end of the outer cutter providing spaces for accumulation of shavings, said guard comprising a unitary structure including transverse guide walls at its opposite ends overlapping the opposite ends of said surfaces of the cutter and covering said spaces with the outer surfaces of these guide walls spaced outwardly of said surfaces of the cutter and their inner surfaces spaced outwardly of the inner surfaces of the teeth, said side walls of the guard being laterally spaced at their inner edges permitting insertion of the outer cutter into the guard between them, and an inner longitudinally reciprocable cutter within the outer cutter provided with transverse cutter teeth at the inner sides of the teeth of the outer cutter and cooperating therewith.

6. A cutter head for dry shavers comprising a stationary hollow cutter including laterally spaced connected side plates each having a skin-engaging surface at a free edge, this surface on at least one plate comprising transversely extending cutter teeth, spacer blocks between the opposite edges of the plates at their opposite ends and each extending somewhat beyond the outer ends of the plates, a hollow guard comprising spaced longitudinal side walls enclosing the lower side portions of said cutter and transverse connecting end walls spaced outwardly from the ends of the side plates by the projecting ends of the blocks providing spaces for accumulation of shavings, said guard also including guide walls at its opposite ends over the spaces between the ends of the side plates and the end walls of the guard overlapping the ends of the skin-engaging surfaces with the inner surfaces of the guide walls spaced outwardly of the inner surfaces of the teeth, and an inner reciprocable cutter within the outer cutter provided with transverse cutting edges at the inner side of the teeth of the outer cutter and cooperating therewith.

7. A cutter head for dry shavers comprising an outer stationary cutter including laterally spaced connected side plates each provided with a row of transverse cutter teeth at one edge, spacer blocks between the plates at each end and each block projecting beyond the ends of the plates, a hollow guard comprising spaced side walls enclosing the opposite side portions of the plates from the teeth and transverse end walls spaced from the ends of the plates by the projecting ends of the blocks providing spaces for accumulation of shavings, said guard including transverse guide walls at its opposite ends between its end walls and the cutter overlapping the ends of said toothed edges and covering said spaces with their outer surfaces spaced outwardly of the outer surfaces of the cutter teeth and the outer transverse edges of said guide surfaces being rounded convexly, and an inner longitudinally reciprocable cutter within the outer cutter provided with transverse cutter teeth at the inner sides of the teeth of the outer cutter and cooperating therewith.

8. A cutter head for dry shavers comprising a hollow outer stationary cutter having at its outer edge skin-engaging surfaces provided by laterally spaced longitudinal rows of transverse cutter teeth on opposite sides of a longitudinal slot and arranged with the teeth in each row in alignment with the teeth in the other row, an inner longitudinally reciprocable cutter comprising two members including thickened lower portions and thinner side walls extending laterally from the outer edges of said thickened portions provided at their free edges with longitudinally spaced cutter teeth, said teeth of the inner cutter being arranged in two rows on opposite sides of a longitudinal slot with their free ends forming the sides of the slot and located at the inner sides of and cooperating with the teeth of the outer cutter, and the teeth of

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the inner cutter on one side of the slot being out of alignment with the teeth on the other side of the slot.

9. A cutter head for dry shavers comprising a hollow outer stationary cutter having at its outer edge skin-engaging surfaces provided by laterally spaced longitudinal rows of transverse cutter teeth on opposite sides of a longitudinal slot, an inner longitudinally reciprocable cutter comprising two members including thickened lower portions and thinner side walls extending laterally from the outer edges of said thickened portions provided at their free edges with longitudinally spaced cutter teeth, and the free edges of said thickened portions being in abutment and inclined to the longitudinal side edges of the members with the said teeth of these members ar-

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ranged in two rows on opposite sides of a longitudinal slot with their free ends forming the sides of the slot and located at the inner sides of and cooperating with the teeth of the outer cutter.

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