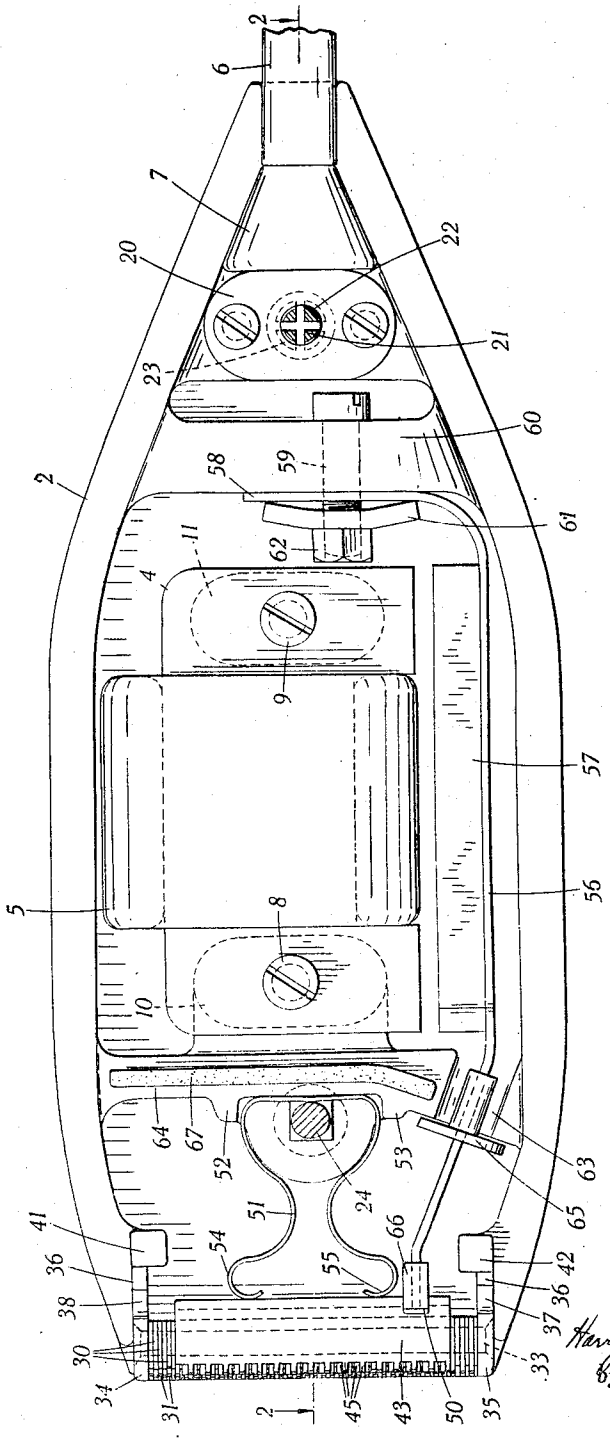
Aug. 6, 1940. H. B. RANDOLPH ET AL 2,210,466

SHAVER

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Fig. 1.



Inventor

Harry B. Randolph

and

By Anders Mathisen

Bon J. Calvomy

Their Attorney

Aug. 6, 1940. H. B. RANDOLPH ET AL 2,210,466

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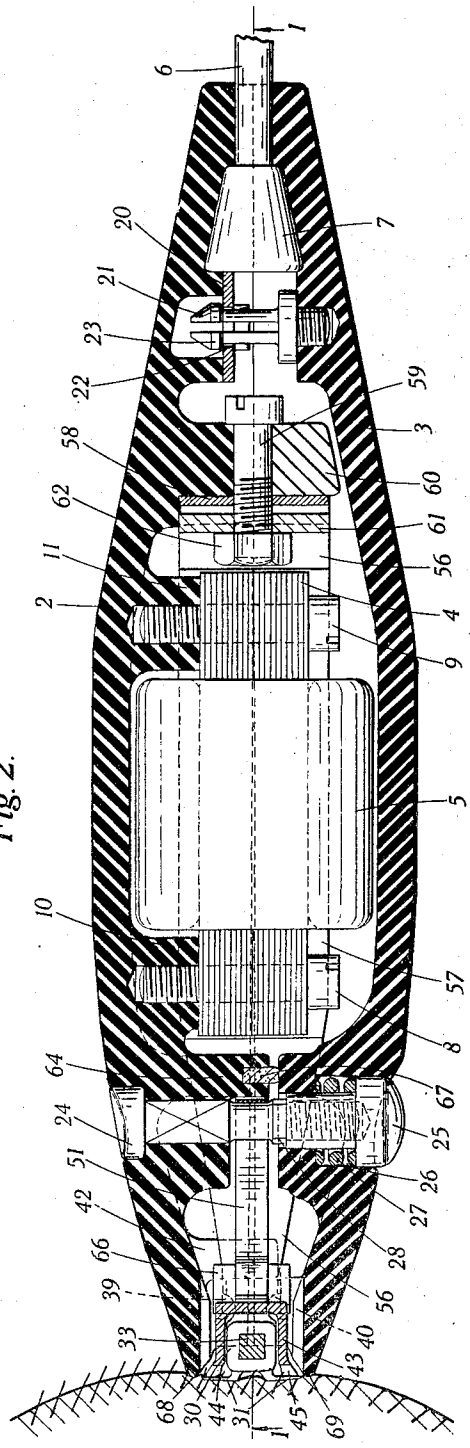


Fig. 2.

Inventor
Harry B. Randolph
and Anders Mathisen
by
Wm. J. Schroeny
Attorney.

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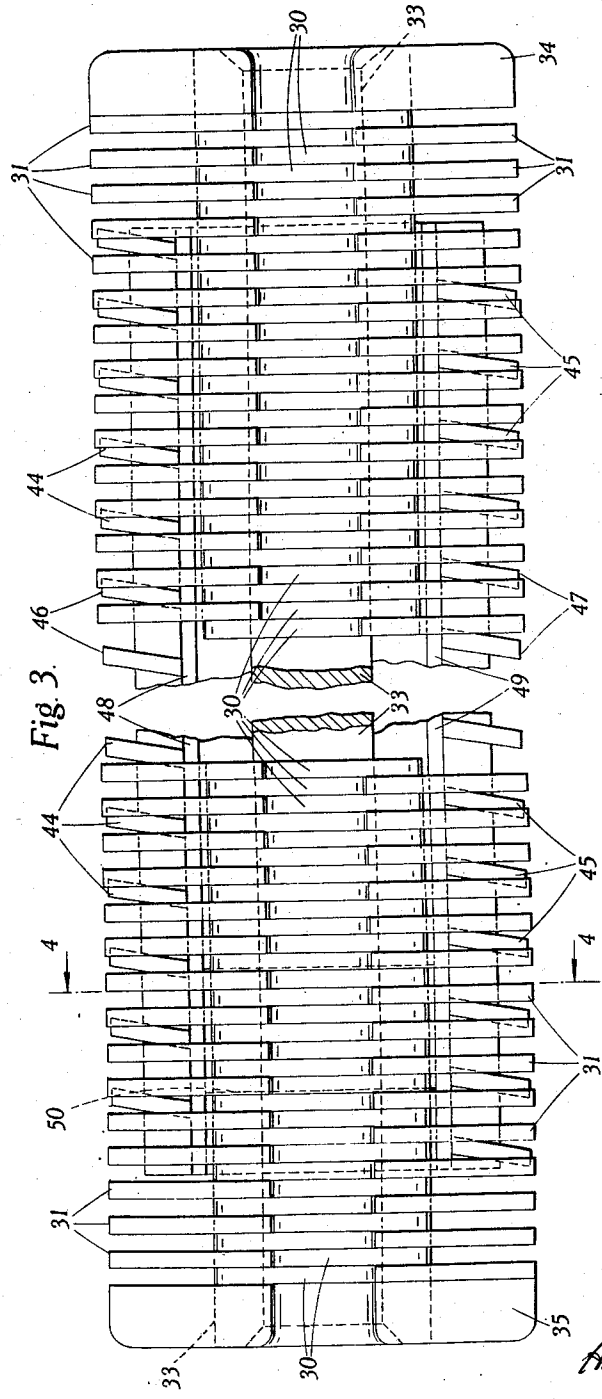


Fig. 3.

Inventor
Harry B. Randolph
by Anders Mathiesen
Ben J. Chromy
Attorney

Aug. 6, 1940. H. B. RANDOLPH ET AL 2,210,466

SHAVER

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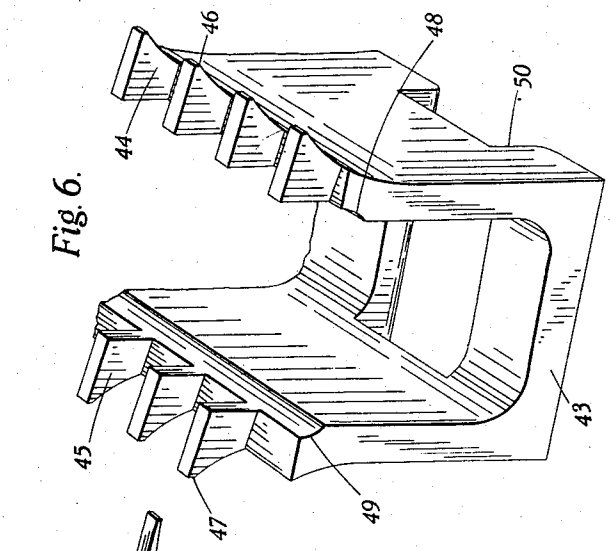


Fig. 6.

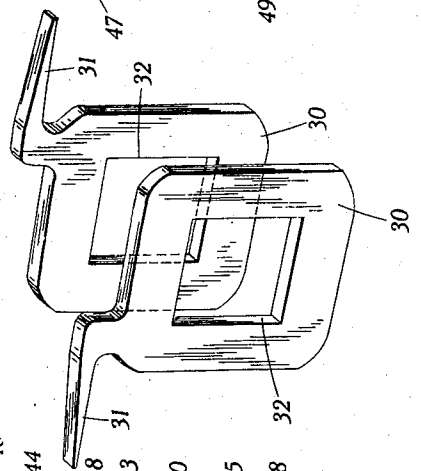


Fig. 5.

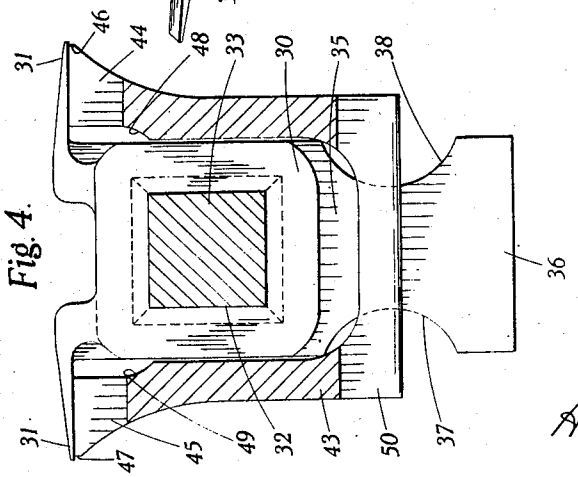


Fig. 4.

Inventor

Harry B. Randolph

by Anders Mathiesen

Ben J. Chromy

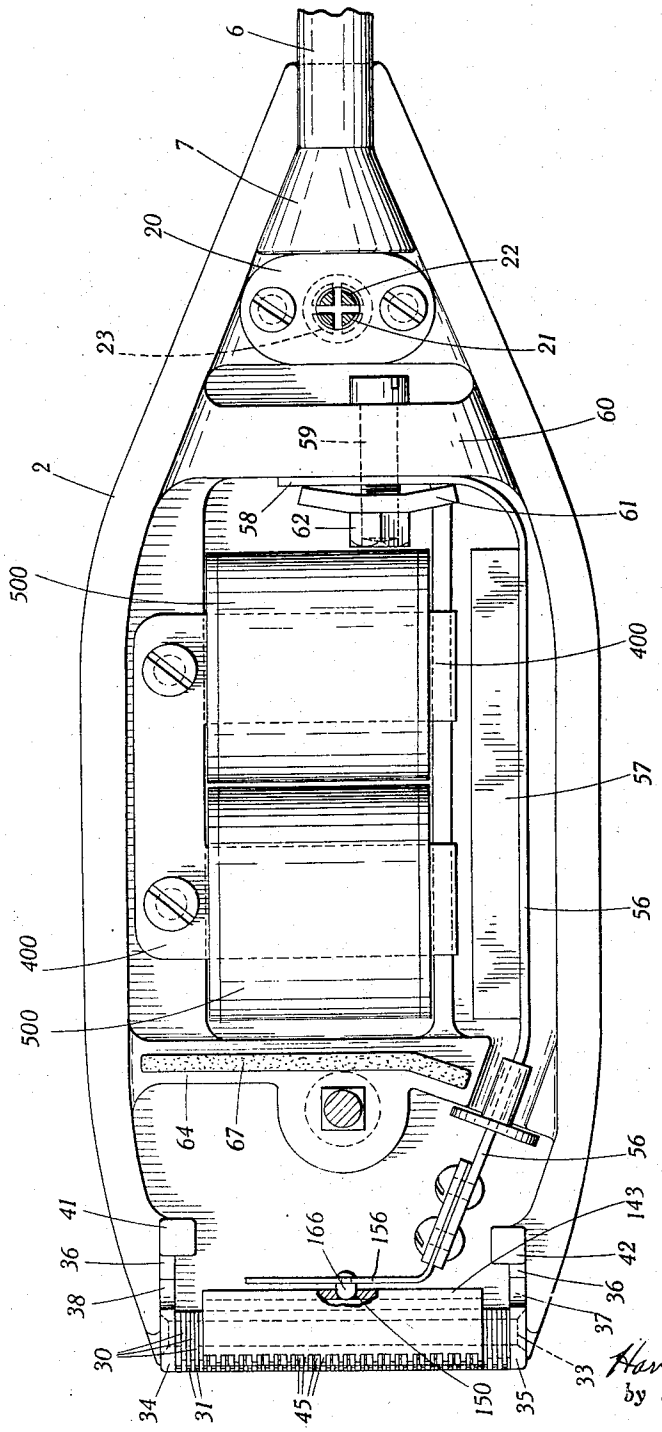
Attorney

Aug. 6, 1940. H. B. RANDOLPH ET AL 2,210,466

SHAVER

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Fig. 7.



Inventor
Harry B. Randolph
by Andrew Mattson
Ben J. Chromy
Attorney

Patented Aug. 6, 1940 2,210,466

UNITED STATES PATENT OFFICE

2,210,466

SHAVER

Harry Beckham Randolph, Acton Green, London, and Anders Mathisen, High Holborn, London, England, assignors to The Wilkinson Sword Company Limited, London, England

Application October 29, 1938, Serial No. 237,764
In Great Britain November 19, 1937

5 Claims. (Cl. 30—43)

This invention relates to improvements in electromagnetically operated mechanical shavers or hair cutters and like implements.

Broadly it is the object of the present invention to construct the shearing members of dry shavers and like cutting appliances so that as clean a shave can be obtained by a dry shaver as by a blade shaver with a comparatively few movements of the shaver over the skin.

Another object of the invention is to provide thin stampings of material of the kind used in wafer razor blades, said stampings having human foot shaped projections or teeth and mounting means whereby a plurality can be made up into a block form adapted to constitute a toothed shearing member.

Another object of the invention is to provide thin material stampings of rectangular shape having human foot shaped projections or teeth the ankle and heel portion of which projects from one side of the rectangular stamping whereas the foot and toe shaped portion projects at right angles thereto to constitute a shearing tooth or element.

A further object of the invention is to provide mounting means for said stampings and to mount a plurality of stampings upon said mounting means so that the ankle and heel shaped portions of the teeth project in the same direction whereas the foot and toe shaped portions of adjacent teeth point in opposite directions so that two oppositely pointing rows of shearing teeth are provided by a plurality of such stampings secured in block form.

A further object of the invention is to provide means for securing a plurality of stampings between end cheeks so that the teeth portions of adjacent stampings project in opposite directions said end cheeks being adapted to be secured by handle means so that the teeth can be applied simultaneously to a surface to be shaved or cut.

Another object of the invention is to mount a laminated block of thin material stampings having oppositely pointing rows of teeth in a handle shaped casing and to provide a U shaped shearing member adapted to fit over the rectangular portions of the stampings to engage the oppositely pointing rows of teeth, actuating means in the form of an electro-magnet provided with a vibratory armature being adapted to reciprocate said U shaped shearing member.

A still further object of the invention is to provide a mechanical shaver of the kind having electro-magnetic actuating means enclosed in a casing suitable for holding in the hand and shearing means at one end of said casing for engaging the beard or hair said shearing means being in the form of a laminated stationary shearing member having oppositely pointing rows of spaced teeth the toes or noses of said teeth being guarded by projecting lips from said casing, a central groove being provided between said oppositely pointing rows of teeth to facilitate entry of hairs missed by the leading row of teeth between the teeth of the trailing row of teeth so that all parts of the surface to be shaved are engaged by the oppositely pointing rows of teeth.

Further objects are to provide a dry shaver with a movable shaving member having a scissor like shearing action and to actuate the shearing member by an electro-magnet system energised by alternating electric current said system comprising a leaf spring rigidly mounted at one end, engaging the movable shearing member at the other end carrying a magnetic armature and loaded so that the spring is tuned to the frequency of the alternating current.

With these and other objects in view the invention will be better understood from the following detailed description taken in connection with the accompanying drawings, wherein:

Figure 1 is a plan view of a casing containing the mechanical shaver mechanism taken on line 1—1 of Figure 2.

Figure 2 is a sectional view taken on line 2—2 of Figure 1 but also showing the lid secured upon the casing for enclosing the shaver mechanism.

Figure 3 shows a partial plan view of the shearing member of the shaver to an enlarged scale.

Figure 4 is a sectional view of the shearing member taken on line 4—4 of Figure 3.

Figure 5 is a perspective view of a pair of shearing or cutter elements for the stationary shearing member of the shaver also to an enlarged scale and

Figure 6 is a perspective view of a portion of a movable shearing member to an enlarged scale.

Figure 7 is a view similar to Figure 1 showing certain modified parts.

Referring to the drawings and to Figures 1, 2 and 7 in particular numeral 2 denotes a composition moulding or other type of casing for the mechanism of a shaver and 3 denotes a lid or cover capable of being secured to casing 2 for the purpose of enclosing the shaving mechanism. The shape of parts 2 and 3 is such that the casing fitted with its lid forms a convenient handle for holding in the hand as is usual in the case of casings for dry shaver mechanism.

The means for securing lid 3 to casing 2 comprises a metal or other material plate 20 secured by screws or rivets or the like to casing 2. Coacting with plate 20 is a slotted stud 21 screwed into lid 3, said stud being capable of being pushed through a hole 22 in plate 20 to engage the plate by means of a collar 23 formed upon the stud.

An additional securing means between casing 2 and lid 3 takes the form of a screw or stud 24 moulded into or otherwise secured in casing 2 so as to be firmly retained therein. Stud 24 is engaged by a screw cap 25 engaging a recess 26 in lid 3 by means of a spring 27, a collar 28 being provided upon stud 24 to enable cap 25 to abut thereon, spring 27 then forcing lid 3 towards casing 2 with a predetermined pressure for the purpose of securing the stationary shearing member between casing 2 and lid 3 as will be further described hereinafter.

The shaver actuating mechanism comprises an alternating current electro-magnet consisting of a laminated core 4 provided with an energising winding 5 which is connected to an alternating electric current supply source by means of an electric cable 6 provided with a moulded rubber block 7 adapted to be clamped between the casing 2 and lid 3. Cable 6 is a twin cable and a pair of electric conductors, not shown, extend from block 7 to winding 5. The core 4 of the electro-magnet is secured by means of screws 8 and 9 to suitable blocks 10 and 11 extending from casing 2 and into which they are screwed as shown in Figure 2.

The stationary shearing member of the shaver is shown in Figures 3 and 4, Figure 5 showing two individual shearing elements and as shown in this figure these shearing elements are in the form of metal or steel stampings 30 said stampings being provided with a projection in the form of a foot shaped tooth 31 and a square or rectangular shank or plate portion apertured at 32.

As will be seen more particularly with reference to Figures 3 and 4 the elements 30 are threaded upon a square or rectangular mounting element or bar 33 upon which they are clamped between end cheeks 34 and 35 said end cheeks having a projection 36 provided with recesses 37 and 38. As will be seen more especially with reference to Figure 3 elements 30 are threaded upon bar 33 so that adjacent shearing elements 30 have the ankle and heel portions projecting in the same direction whereas the foot and toe portions project in opposite directions as the result of which the assembled block of elements 30 constitute a laminated shearing member having spaced teeth projecting in opposite directions as shown especially in Figure 4 a deep groove or recess being formed centrally and longitudinally in the stationary shearing member between the heels of the foot shaped projections 31 upon elements 30. The assembled elements together with end cheeks 34 and 35 constitute the stationary shearing member of the shaver and the end cheeks are secured between casing 2 and lid 3 by means of projections 39 upon casing 2 and 40 upon lid 3 said projections engaging recesses 37 and 38 in projection 36 on end cheeks 34 and 35.

The projection 36 is furthermore supported by moulded projections 41 and 42 in casing 2 and by means of stud 24, cap 25 and spring 27. By the above described engaging means the stationary shearing member is firmly clamped between casing 2 and lid 3, and, as will be seen in Figure 1 projection 36 upon end cheeks 34 and 35 abuts against projecting lips from the rim of casing 2 said lips preventing endway movement of the stationary shearing member due to the reciprocations of the movable shearing member.

The movable shearing member constructed as shown in Figure 6 is in the form of a channel shaped member 43 provided with teeth 44 and 45 at the ends of the legs of the member said teeth as shown in Figure 3 being cut transversely to the centre line of the shearing member but inclined at an angle of approximately 10 degrees to a line transverse to a longitudinal centre line parallel to the legs and the back of the member.

As will be seen by reference more particularly to Figures 4 and 6 teeth 44 and 45 are provided with noses 46 and 47 which project to within a short distance of the ends of stationary shearing member teeth 31 which permits the ends to guide hairs into the spaces between them whereas the rear of teeth 44 and 45 are recessed as shown at 48 and 49 to provide clearance at the rear of the teeth.

The movable shearing member 43 is slotted at 50 to permit engagement of actuating means as shown in Figure 1 and said movable shearing member 43 is adapted to be fitted over the assembled blade shaped shank portions of the stationary member, the movable shearing member teeth 44 and 45 engaging the stationary shearing member teeth 31 as shown in Figures 2 and 4. The movable shearing member 43 is urged into engagement with the stationary shearing member teeth by a spring device 51 held in casing 2 by stud 24 by means of projecting moulded lugs 52 and 53 as shown in Figure 1. Spring 51 is substantially U shaped, the legs of the U being curved and the ends thereof formed into semi-circular portions as shown in Figure 1 said semi-circular portions 54 and 55 engaging the back portion of movable shearing member 43 the arrangement and shape of spring 51 being such that the ends of the spring exert a practically uniform and predetermined pressure upon movable shearing member 43 during the reciprocating movement thereof.

The means for actuating shearing member 43 comprises a leaf spring 56 provided with an electro-magnetic material armature 57 facing the poles of core 4 as shown in Figure 1. Spring 56 is bent at right angles and the end 58 thereof is secured by means of a bolt 59 passing through a moulded bridge portion 60 in casing 2 a curved clamping element 61 engaging spring end 58 when nut 62 is screwed onto bolt 59. The other end of spring 56 passes through recess 63 in a transverse moulded ridge 64 in casing 2 a flanged rubber or composition fitting 65 being secured upon or moulded to spring 56 in recess 63 said fitting serving to limit the reciprocatory movement of spring 56 and to exclude cut hairs and the like from the space in casing 2 below ridge 64. A rubber or like moulded buffer 66 is secured or moulded to the free end of spring 56 and by means of this buffer said end engages slot 50 in movable shearing member 43. A resilient strip of material 67 is fitted into ridge 64 which, in conjunction with fitting 65, serves to prevent the passage of hairs and the like into the space below ridge 64 in the casing.

In operation spring 56 and armature 57 will be attracted and repelled from the poles of magnet core 4 when the winding 5 is energised by means of alternating electric current and as a result shearing member 43 will be set into reciprocatory movement. In order, however, to obtain the required amplitude of reciprocations of the mova-

ble shearing member it is necessary that spring 56, when provided with armature 57 and fittings 66 and 67 as shown in Figure 1 and when actuating shearing member 43 urged into contact with the stationary shearing member teeth by spring 51, should be tuned to its natural period of vibration coinciding with that of the alternating current energising winding 5.

In the view of the shaver shown in Figure 2 it is assumed that the stationary shearing member is pressed moderately firmly onto the part of the skin or surface to be shaved and, as will be seen, a guard edge or lip 68 is provided upon casing 2 and another guard edge or lip 69 upon lid 3, said guard edges being so disposed with respect to the ends of teeth 31 that these teeth cannot dig into the skin of the face. If the shaver as shown in Figure 2 is moved in an upward direction on the skin the hairs shown projecting through the skin will be caused to bristle out of the skin during movement of the shaver and as a result the hairs tend to stand upright on the skin when the head of the shaver passes thereover and to pass between teeth 31 of the stationary shearing member. Owing to the reciprocations of the movable shearing member 43 the hairs are shorn off at the point of contact between teeth 31 and teeth 44.

As is known mechanical shavers employing slotted guards and movable co-acting shearing members have the defect that the material of the guard teeth prevents strips of skin from being shaved during a single passage of the shaver over the skin.

Referring now to Figures 2 and 3 it will be seen that the foot shaped teeth 31 of the stationary shearing member 30 permit hairs upon the strips of the skin in contact with teeth 31 on the leading side of the laminated shearing member to pass between teeth 31 on the trailing side of the shearing member. The two rows of foot shaped teeth 31 form a longitudinal groove along the stationary laminated shearing member, said groove permitting the hairs on the skin to pass between the heels of the trailing teeth 31 so that teeth 45 on the movable shearing member are able to shear such hairs off as may have been missed by teeth 44 on the leading side of the movable shearing member.

In order to improve the shearing action between teeth 31 of the stationary shearing member and teeth 44 and 45 of the movable shearing member, teeth 44 and 45 are cut at an inclination as previously described and as will be seen in Figure 3. The result is that the shearing surface between teeth 44, 45 and 31 does not meet at right angles so that a bunch of hairs are not sheared through simultaneously but a scissor like shearing action is obtained which greatly improves the shearing operation between the teeth of the stationary and movable shearing members. An additional improvement in the operation of mechanical shavers and hair cutters is obtained by the inclined disposition of teeth 44 and 45 in that these teeth overlap the spaces between teeth 31 and such overlapping results in that the teeth in the stationary and movable shearing members do not meet in a line and the inclination of the overlap produces an extremely smooth action between the movable and stationary shearing members in comparison with shearing members having teeth substantially parallel.

In the construction shown in Figure 7 spring 56 is provided with a light leaf spring extension 156 rigidly secured thereto and provided with a rivet or like projection 166 adapted to engage a groove or recess 150 in shearing member 43, the point of engagement being centrally between the ends of member 43 and an advantage is that spring 51 is dispensed with and a smoother action of the movable shearing member is obtained due to the central point of actuating engagement. Spring 156 is tensioned so as to press the movable shearing teeth onto the stationary teeth with just sufficient pressure to ensure an effective shearing action without excessive friction and owing to the taper of recess 150 and to the rounded surface of rivet 166 wear is automatically taken up and lost motion between the engaging elements is obviated, this being difficult to eliminate in the arrangement shown in Figure 1 due to wear between the engaging parts. The magnetic system shown in Figure 1 has been found to have a high magnetic flux leakage factor and to overcome this magnet 400 shown in Figure 4 has two energising windings 500 mounted thereon one upon each leg of the magnet as is usually the case in telephone earpiece receivers and by this means magnetic flux leakage is reduced and a higher efficiency is obtained and consequently less heat is generated which is an important factor in electro-magnetic devices of the kind employed in dry shavers.

The dry shaver mechanism shown in Figure 7 can be connected to the electric current supply mains for an indefinite period without objectionable heating taking place and owing to the centrally disposed drive even wear results between teeth 45 and 31 so that the cutting edges of the teeth are not blunted by continuous use of the shaver.

As will be understood various modifications of the above described arrangement are within the scope of the invention. For example, only one row of teeth may be utilised the adjacent shearing elements being spaced by thin washers. Moreover the teeth may be of any desired shape and ordinary hair and wool clippers may have teeth constructed from laminations according to the invention.

It is of course to be understood that the various parts of the device may be designed and constructed in various other ways, and the various mechanisms arranged in other combinations than illustrated, and therefore we do not wish to be limited in any manner except as set forth in the following claims.

Having thus fully described our invention, what we claim as new and desire to protect by Letters Patent is:

1. A cutter element for use in mechanical shavers and hair clippers, comprising: a plurality of thin metal stampings each having a substantially rectangular body with an angular aperture cut therein, a supporting bar having a cross-sectional configuration corresponding to the shape of said angular aperture, said supporting bar passing through the angular aperture of each of said metal stampings, means for holding said metal stampings assembled on said bar, each of said stampings having a cutting tooth extending from a side thereof, adjacent ones of said assembled stampings having the cutting teeth thereof extending in opposite directions.

2. A cutter element for use in mechanical shavers and hair clippers, comprising: a plurality of thin metal stampings each having a substantially rectangular body with an angular aperture cut therein, a supporting bar passing through the angular aperture of each of said metal stampings, means for holding said metal stampings as-

sembled on said bar, each of said stampings having a cutting tooth extending from a side and in the plane of the body thereof, adjacent ones of said assembled stampings having the cutting teeth thereof extending in opposite directions.

3. A cutter element for use in mechanical shavers and hair clippers, comprising: a plurality of thin metal stampings each having a substantially rectangular body with an angular aperture cut therein, a supporting bar passing through the angular aperture of each of said metal stampings, means for holding said metal stampings assembled on said bar, each of said stampings having a cutting tooth extending from a side thereof, adjacent ones of said assembled stampings having the cutting teeth thereof extending in opposite directions.

4. A cutter element for use in mechanical shavers and hair clippers, comprising: a plurality of thin metal stampings each having a substantially rectangular body with an angular aperture cut therein, a supporting bar having a cross-sectional configuration corresponding to the shape of said angular aperture, said supporting bar passing through the angular aperture of each of said metal stampings, means for holding said metal stampings assembled on said bar, each of said stampings having a tapered cutting tooth extending substantially from a corner thereof, adjacent ones of said assembled stampings having the cutting teeth thereof extending in opposite directions.

5. Mechanical shavers and hair cutters, comprising: a plurality of thin metallic shearing elements each having an apertured shank and an elongated tapered cutter tooth lying in the plane of said element and projecting away from the body thereof, a bar adapted to fit into the apertured shanks of said shearing elements to hold said shearing elements assembled together with said cutter teeth in predetermined spaced positions, and a shearing member co-acting with said cutter teeth.

HARRY BECKHAM RANDOLPH.
ANDERS MATHISEN.