May 31, 1938. F. E. MOSKOVICS ET AL 2,119,021

SHAVING APPARATUS

Filed Jan. 15, 1938

Fig. 1

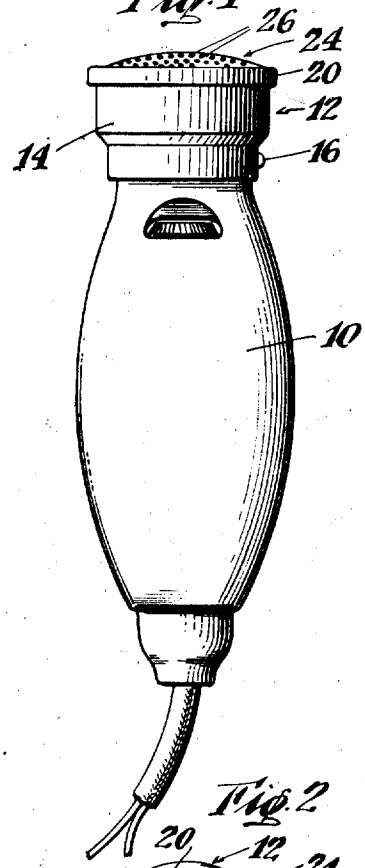
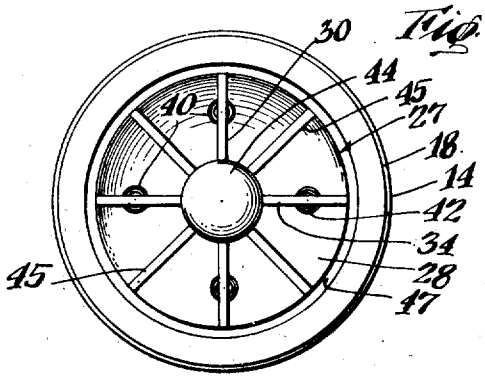


Fig. 3



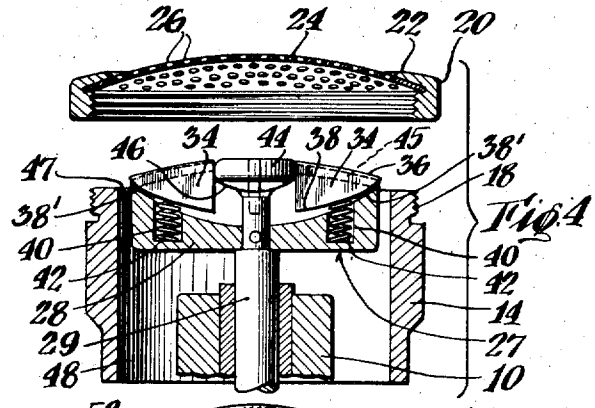


Fig. 4

Fig. 2

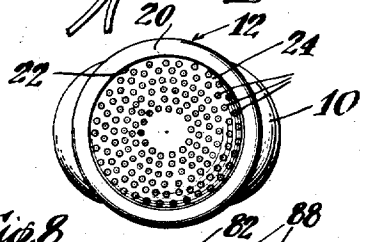


Fig. 5

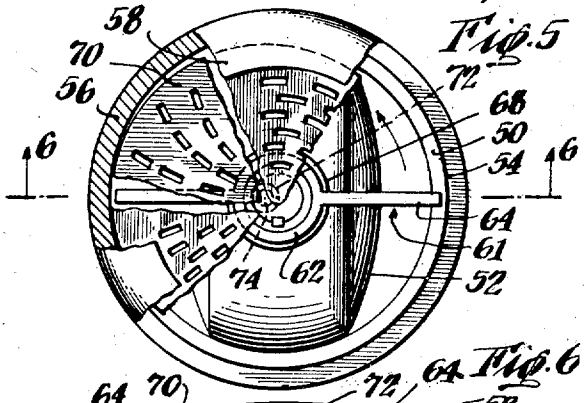


Fig. 8

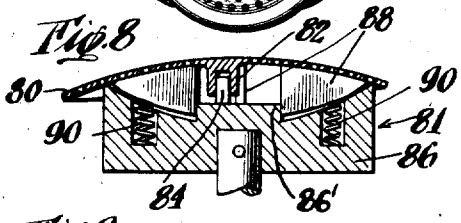


Fig. 9

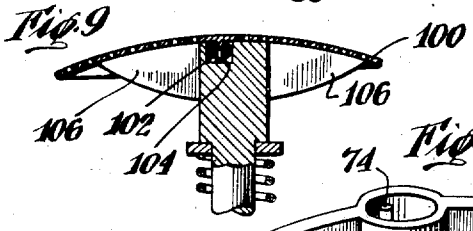


Fig. 7

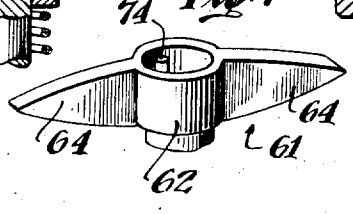
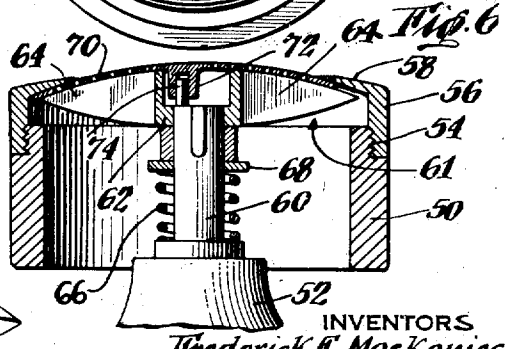


Fig. 6



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2,119,021

SHAVING APPARATUS

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Application January 15, 1938, Serial No. 185,108

7 Claims. (Cl. 30—43)

This invention relates to shaving devices and has particular reference to the class of shaving devices known as latherless or dry shaving devices.

Dry shaving devices generally are provided with an apertured outer skin-engaging shear plate of comparatively small size and have a very small effective shearing zone. This small shearing zone enables the severance of only a small amount of hair during a movement over the skin and consequently an extended length of time is required to obtain a complete and smooth shave. Also, the teeth of the cooperating inner cutter are of such relatively large size compared to the outer shear plate hair receiving apertures that the latter are blocked by the inner cutter during a large proportion of the shaving time so that the shaving time is further increased. Also, those hairs that are engaged by the outer shear plate when the corresponding apertures are so blocked are not sheared, which necessitates repeated application of the device to the same area of the skin to shear all of the hairs. Furthermore, since the movement of the inner cutter is relatively slow, particularly with the reciprocating cutter type, the blades or teeth must be maintained sharp in order to provide a smooth shave without pulling.

An object of this invention is to provide a dry shaving device which has a greatly increased effective shaving area, whereby the total shaving time is materially decreased.

Another object of the invention is to provide a dry shaving device in which the inner cutter blades are of a small area as compared to the total effective area of the outer shear plate whereby the tendency of the inner cutter blades to block entry of the hair into the shaving zone is materially reduced.

Another object of the invention is to provide a dry shaving device in which the severance of the hairs is effected by impact between the shearing edges of the shear plate and the inner cutter, whereby effective shaving is obtained without the necessity of especially sharp shearing edges and without causing pulling for that reason.

Another object of the invention is to provide a rotary type of dry shaving device in which the inner cutter is applied into intimate shearing engagement with the shear plate at least partially by centrifugal force, whereby a clean severance of the hairs is insured.

Another object of the invention is to provide a dry shaving device which is instantaneously self-clearing of severed hairs by reason of the construction and mode of operation of the inner cutter, whereby shaking, tapping, or blowing of the device to dislodge the severed hairs becomes unnecessary.

Another object of the invention is to provide a dry shaving device in which the skin contacting shear plate and inner cutter are bodily relatively movable, whereby the hairs between the shear plate apertures are sought and severed and an improved shearing action due to their relative movement is effected.

An additional object of the invention is to provide a dry shaving device having an improved type of skin contacting shear plate which is characterized by extreme thinness and which is so shaped and so supported as to provide great rigidity.

These objects of the invention have been attained by the provision of a dry shaving device having a generally dome-shaped or convex skin-contacting shear plate pierced by a plurality of apertures of selected shape disposed in relatively closely-spaced relation over substantially its entire area, the under surface of this shear plate being intimately engaged by an inner cutter having one or more shearing edges thereon which are rotated about an axis perpendicular to or axially disposed with respect to the dome-shaped shear plate. A dome-shaped and substantially circular shear plate has the material advantage that it can be of substantially any desired thinness and area within practical limits and, because of its curvature is far more rigid, even when extremely thin, than a shear plate of flat or cylindrical form and of the same thickness, as well as having the property of stretching the skin and conforming to the contours of the face because of its curvature.

In the preferred form of the device the dome-shaped shear plate is provided with a great number of hair-receiving apertures which may be distributed uniformly or non-uniformly throughout its area and have any desired shape, said apertures being of sufficient size to allow passage of hairs and the edges of the apertures act as individual shearing edges cooperating with the rotary inner cutter shearing edges to sever the hairs close to the skin.

The rotary inner cutter may have, as indicated above, one or more shearing edges, preferably provided by two or four blades which are disposed normally to the inner surface of the dome-shaped shear plate. The blades may be spring-pressed as a group against the underside

of the dome-shaped shear plate, and/or they may be individually supported in inclined grooves so arranged in a rotary supporting structure that the centrifugal force of rotation will force them intimately against the under surface of the shear plate. The blades are preferably individually narrow, whereby they will only block a comparatively small proportion of the total area of the shear plate apertures.

The inner cutter is preferably rotated at a relatively high speed and provided with substantial mass so that it acts as a flywheel in operation and has considerable momentum and consequently its edges cooperate with the outer cutter to sever the hairs by an impact shear action which insures clean severance of the hairs without requiring especially sharp shearing edges. This flywheel effect also smoothes the operation of the driving motor. Preferably, the body of the inner cutter at points between its blades is spaced closely to the underside of the shear plate, so that in the event of flexing of an extremely thin shear plate, the inner cutter body supports it against deformation.

The rotation of the inner cutter also immediately ejects the severed hairs outwardly and away from between the shear plate and the inner cutter body by centrifugal action, thereby rendering the device self-clearing. The rotation of the inner cutter also may be utilized, through suitable eccentric connections, to cause the skin-contacting shear plate to gyrate, thereby working the plate over the face mechanically in addition to the manual manipulation of the device and facilitating entry of the hairs into the apertures. The gyratory motion of the shear plate and the rotary movement of the inner cutter also produce an improved shearing action in the nature of a draw cut which materially aids and reduces the effort required to cut the hair. Other structural and operating characteristics will become apparent upon examination of the accompanying drawing, in which:

Figure 1 is an elevation of a preferred embodiment of a dry shaving device of the present invention;

Fig. 2 is an end view thereof;

Fig. 3 is an enlarged end view of the razor with the skin contacting shear plate removed showing the arrangement of the inner cutter;

Fig. 4 is an enlarged view in vertical section of the head of the device of Fig. 1;

Fig. 5 is an end view, shown partly in section and partly broken away, of a modified form of a dry shaving device embodying the present invention;

Fig. 6 is an axial section, as seen along the line 6—6 of Fig. 5;

Fig. 7 is a perspective view of one form of rotary inner cutter;

Fig. 8 is an axial section through a modified form of shear plate and rotary inner cutter assembly; and

Fig. 9 is an axial section through another form of shear plate and rotary inner cutter assembly.

A dry shaving razor illustrated in Figure 1 consists of a handle 10 containing an electric motor of known type and having mounted at one end thereof a shearing or shaving head 12, which consists of a tubular shell 14 attached by means of a screw 16 or other suitable means, to the end of the handle 10. As best shown in Fig. 4, the shell 14 is provided with a threaded portion 18 at its upper end upon which may be screwed an annular cap member or ring 20 having a thin inwardly-projecting flange 22 at its upper end.

Secured to the ring 20 beneath its flange 22 is a dome-shaped shear plate 24, preferably of spherical curvature having a radius on the order of about two inches. This shear plate 24 is provided with a plurality of apertures 26 which may vary in size and shape, depending upon requirements, but principally such that a hair may enter and assume an erect position without allowing the skin to enter sufficiently to be abraded by the inner cutter. For example, in an extremely thin plate, on the order of a few thousandths of an inch, the diameter or greatest width of the apertures 26 may be about .025 of an inch, and are preferably round, as shown, although they may be square holes, straight or curved slots radially or otherwise arranged, and the like, as illustrated in Fig. 5. Apertures as much as .035 of an inch in greatest width or diameter have been found effective. Despite the extreme thinness of the plate 24, which allows a close shave to be had, the plate is very rigid, the curvature of the plate 24 causing it to resist distortion and maintain its normal dome-shape.

Positioned beneath the shear plate 24 is an inner cutter 27 which preferably consists of a relatively massive body 28 secured on the upper end of the motor shaft 29, so as to act as a flywheel when the motor is rotating. As best shown in Fig. 3, the outer face of the inner cutter body 28 is provided with spaced radial slots 30. Although four such slots are shown, a greater or fewer number may be provided, if so desired. The slots 30 are preferably saw-cut or milled diametrically with outwardly-tapering bottoms.

Mounted in the slots 30 of the inner cutter body are generally wedge-shaped shearing blades 34 which are best shown in Fig. 4. The blades 34 are made of relatively thin hardened steel and are each provided with a curved upper edge 36, preferably ground flat so as to have sharp edges, and conforming to the interior curvature of the shear plate 24. The shape of the lower edge 38 of the blade is such as to provide a fulcrum point at 38', so that the blade may tilt about that point as well as slide up the incline at the outer end of the corresponding slot 30.

As shown in Fig. 3, the inner cutter body 28 is preferably provided with bores or recesses 40 beneath and intersecting the slots 30 and in these bores 40 are light coil springs 42 which bear against the lower edges 38 of the blades 34 and normally urge their upper edges 36 into intimate engagement with the under surface of the shear plate 24. During operation of the device, the centrifugal force of rotation of the inner cutter 27 tends to urge the blades 34 radially outwardly, and because of the curvature of the bottom of the slots 30 this centrifugal urge tends to force the blades 34 more intimately into shearing engagement with the under surface of the shear plate 24. Thus, if desired the springs 40 may be omitted or retained merely to perform a holding function to prevent looseness or rattling when the device is not in use.

The blades 34 are maintained in spaced relationship to each other by engagement at their inner ends with a disc 44 which is removably disposed in a depression or recess 46 in the upper center of the inner cutter body 28. The upper surface of disc 44 is spaced only a few thousandths of an inch from the under surface of the shear plate 24, so that, if an extremely thin shear plate is employed, whose weakest

point is at the center, it is supported during material flexing, in case of abnormal shaving pressure, by the disc and thus deformation or distortion of the shear plate is prevented. Likewise, in order to provide support for the remainder of the shear plate 24 during abnormal shaving pressure, radial ribs 45 may be provided on the inner cutter body 28 between the blades 34, the upper surfaces of these ribs being spaced only a few thousandths of an inch from the under surface of the shear plate 24, so as to be normally disengaged therefrom.

The inner cutter body 28 is of somewhat smaller diameter than the internal diameter of the shell 14, thereby leaving an annular space 47 through which the cut hairs may be ejected. The centrifuging effect of the rotation of the inner cutter 27 together with the fan action of the blades 34 and ribs 45, aids in the radial ejection of the cut hairs. The cut hair may fall completely out of the device because of the space 48 between shell 14 and the flat opposite walls of the handle 10, as shown in Fig. 4.

In operation of the shaving device shown in Figs. 1 to 4 inclusive, the motor is set into operation and rotates the inner cutter 27 with its blades 34 wiping the under surface of the shear plate 24, this wiping action being insured not only by the springs 40, but also and principally by the centrifugal effect of the blades 34, which are cammed upwardly against the shear plate by the curved bottom slots 30 in which they rest. The flywheel effect of the relatively massive body 28 causes the hairs projected through the shear plate aperture 26 to be cleanly and quickly severed by the impact shear action of the blades 34 coacting with the edges of the shear plate apertures 26.

Because the shear plate 24 is large in area and its apertures are substantially always uncovered by the small area inner cutter blades, the hair shearing action is continuous so that a rapid shave may be effected. Also, by reason of its shape, a very thin shear plate may be provided to effect a close shave and if there is any tendency to flex, the shear plate is immediately supported by the inner cutter disc 44 and ribs 45. Also, by reason of the flywheel action, the motor operates more smoothly and high speed is obtainable without pulling of the hairs or injury to the skin.

Figs. 5 and 6 disclose another form of the invention, which includes a tubular shell 50 similar to shell 14 and attached to the upper end of the motor-containing handle 52 of the device. The shell 50 is provided with an upper threaded portion 54 which receives a ring 56 having an inwardly directed flange 58 thereon. Splined for axial movement on the upper end of the motor shaft 60 is a cutter 61 consisting of a collar 62 from which project radially two thin shearing blades 64 as shown in Fig. 7. The number of blades carried by the collar may be varied as desired. A spring 66 encircles the motor shaft 60 and bears against a washer 68 which engages the lower end of the collar 62 and urges it axially of the shaft. The upper edges of the shearing blades 64 of the cutter 61 bear against the under side of a dome-shaped shear plate 70, which is slidably mounted beneath the flange 58 on the collar 56. The center of the shear plate 70 is provided with a downwardly projecting socket 72 which receives a pin 74 mounted eccentrically on the end of the motor shaft 60.

During operation of the device shown in Figs. 5, 6 and 7, the motor directly drives the shearing blades 64 about the axis of the shaft 60 and the eccentric pin 74 causes the outer shear plate to gyrate within the flange 58. The spring 66 maintains the blades 64 in proper shearing relation to and at proper shaving pressure against the under surface of the outer shear plate 70, whereby effective shearing action may be obtained.

Fig. 8 discloses another form of gyrating shear plate and rotary inner cutter assembly, in which an outer shear plate 80, similar to the plate 70 disclosed in Figs. 5 and 6, cooperates with a flywheel type inner cutter 81 similar to that disclosed in Figs. 3 and 4. The shear plate 80 is provided with a bearing or socket 82 which receives a pin 84 mounted eccentrically in a depression in the center of the flywheel 86 for effecting the gyratory movement of the shear plate. The flywheel 86 is provided with a plurality of substantially wedge-shaped blades 88 which are urged by centrifugal force and by springs 90 into intimate engagement with the under surface of the shear plate. The blades 88 may be maintained in proper spaced relation by a projecting lug 86' formed on the flywheel 86 and which engages the inner edges of each blade.

Fig. 9 discloses another arrangement for gyrating the shear plate. In this form of the invention, the shear plate 100 is provided with a downwardly-projecting, rotatably mounted ball 102 which is received in an eccentrically-located recess 104 in the rotary shearing blade 106.

In the forms of dry shaving devices illustrated in Figs. 5 to 9, inclusive, the gyratory action of the shear plate not only effects a draw cut between the rotating inner cutter blades and the shear plate apertures, but it enables the apertures in the shear plate to "hunt" the short hairs and thus provides a smooth shave without requiring excessive manual scrubbing movement of the shaving head. Also, the constant movement of the shear plate prevents abrasion of the same skin area by repeated contact with the inner cutter blades in cases where the device is held too long in one place with undue pressure causing the skin to be pressed into the shear plate apertures. No cutting takes place between the edge of the flange 58 and the apertures in the shear plate. In other respects the operation of the gyratory shear plate form of the invention is like the fixed shear plate form illustrated in Figs. 1 to 4 inclusive.

It will be seen that the present invention provides a very effective, simple and inexpensive dry shaving device, which has many advantages over those in current use. While certain preferred embodiments of the invention have been illustrated and described herein, it is to be understood that the invention is not limited thereby, but is susceptible of changes in form and detail within the scope of the appended claims.

We claim:

1. In a shaving device, the combination of a thin, apertured, convex, skin-contacting shear plate, an inner cutter having at least one shearing edge engaging the concave under surface of the shear plate, means for rotating the cutter about an axis substantially normal to the surface of the shear plate, and means responsive to rotation of said cutter for urging the shearing edge thereof transversely and longitudinally of the axis into intimate wiping contact with the concave under surface of said shear plate to sever hairs projected through the apertures thereof said shear plate being adapted to be pressed against

the skin to be shaved with the axis of the cutter directed endwise toward the skin.

2. In a shaving device, the combination of a supporting member a thin, apertured, skin-contacting shear plate engaging said supporting member at its periphery, an inner cutter member having at least one shearing edge engaging the under surface of said shear plate, means for rotating said cutter member about an axis substantially normal to the surface of the shear plate to wipe the shearing edge over said under surface of the shear plate to sever the hairs projected therethrough, and a depressed portion on the cutter member adjacent the shearing edge thereof providing a hair-receiving cavity under the shear plate the periphery of the cutter member being spaced from the periphery of the supporting member to provide a space for receiving severed hair.

3. In a shaving device, the combination of a supporting member a thin, apertured, skin-contacting shear plate engaging said supporting member at its periphery, an inner cutter member having at least one shearing edge engaging the under surface of said shear plate, means for rotating said cutter member about an axis substantially normal to the surface of the shear plate to wipe the shearing edge over said under surface of the shear plate to sever the hairs projected therethrough, and a radially extending depression in the cutter member adjacent the shearing edge thereof for receiving the cut hairs for ejection radially by the centrifugal force of rotation of the cutter the periphery of the cutter member being spaced from the periphery of the supporting member to provide a space for receiving severed hair.

4. In a shaving device, the combination of a thin, flexible, apertured, convex skin-contacting shear plate, an inner cutter having at least one shearing edge engaging the under surface of said shear plate, means for rotating said cutter about an axis substantially normal to the shear plate to wipe the shearing edge over said under surface of the shear plate to sever the hairs projected therethrough, and means associated with said cutter in axially fixed relation with respect to and engageable with said shear plate to afford support for the latter during flexing, said cutter having substantial mass in the form of a fly wheel distributed symmetrically about its axis of rotation to impart substantial impact to the hair severing action of said shearing edge.

5. In a shaving device, the combination of a handle, a thin, apertured, convex, skin-contacting shear plate movably mounted on said handle, a movable inner cutter having at least one shearing edge curved complementarily to and bearing against the concave under surface of said plate, and means for moving said plate and said cutter relatively to each other and to said handle to sever hairs projected through the apertures in said shear plate said means comprising a shaft and means eccentric to the shaft for gyrating the shear plate.

6. In a shaving device, the combination of a handle, a thin, apertured, convex skin-contacting shear plate mounted on said handle, a rotatable member adjacent the concave under surface of said plate, said member having at least one substantially radial slot having a bottom inclined axially outwardly, an axially-tapered blade movably mounted in said slot, and means for rotating said member, whereby the blade is moved radially in said slot by centrifugal force and is urged against said plate by the cam action of the inclined bottom of the blade slot.

7. In a shaving device, the combination of a handle, a thin, apertured, skin-contacting shear plate mounted on said handle, a member adjacent the under surface of said plate and rotatable about an axis substantially normal thereto, a substantially radial guide on said member, a blade movably mounted in said guide, means for rotating said member, and cooperating means on the blade and member responsive to the rotation of the member for moving the blade in the guide transversely and longitudinally of the axis against the said under surface of the plate.

FREDERICK E. MOSKOVICS.
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DISCLAIMER

2,119,021.—*Frederick E. Moskovics*, Greenwich, Conn., and *Victor R. Abrams*, Maplewood, N. J. SHAVING APPARATUS. Patent dated May 31, 1938. Disclaimer filed May 18, 1940, by the assignee of one-half interest, *Eleanor U. Andrews*, and *Victor R. Abrams*, co-inventor.

Hereby enter this disclaimer to claim 5 in said Letters Patent.

[*Official Gazette June 11, 1940.*]

the skin to be shaved with the axis of the cutter directed endwise toward the skin.

2. In a shaving device, the combination of a supporting member a thin, apertured, skin-contacting shear plate engaging said supporting member at its periphery, an inner cutter member having at least one shearing edge engaging the under surface of said shear plate, means for rotating said cutter member about an axis substantially normal to the surface of the shear plate to wipe the shearing edge over said under surface of the shear plate to sever the hairs projected therethrough, and a depressed portion on the cutter member adjacent the shearing edge thereof providing a hair-receiving cavity under the shear plate the periphery of the cutter member being spaced from the periphery of the supporting member to provide a space for receiving severed hair.

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7. In a shaving device, the combination of a handle, a thin, apertured, skin-contacting shear plate mounted on said handle, a member adjacent the under surface of said plate and rotatable about an axis substantially normal thereto, a substantially radial guide on said member, a blade movably mounted in said guide, means for rotating said member, and cooperating means on the blade and member responsive to the rotation of the member for moving the blade in the guide transversely and longitudinally of the axis against the said under surface of the plate.

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