Nov. 4, 1958 E. KANE 2,858,607

ELECTRIC RAZOR WITH ROTARY OPERATED DOUBLE EDGED BLADES

Filed April 18, 1955 2 Sheets-Sheet 1

FIG. 1.

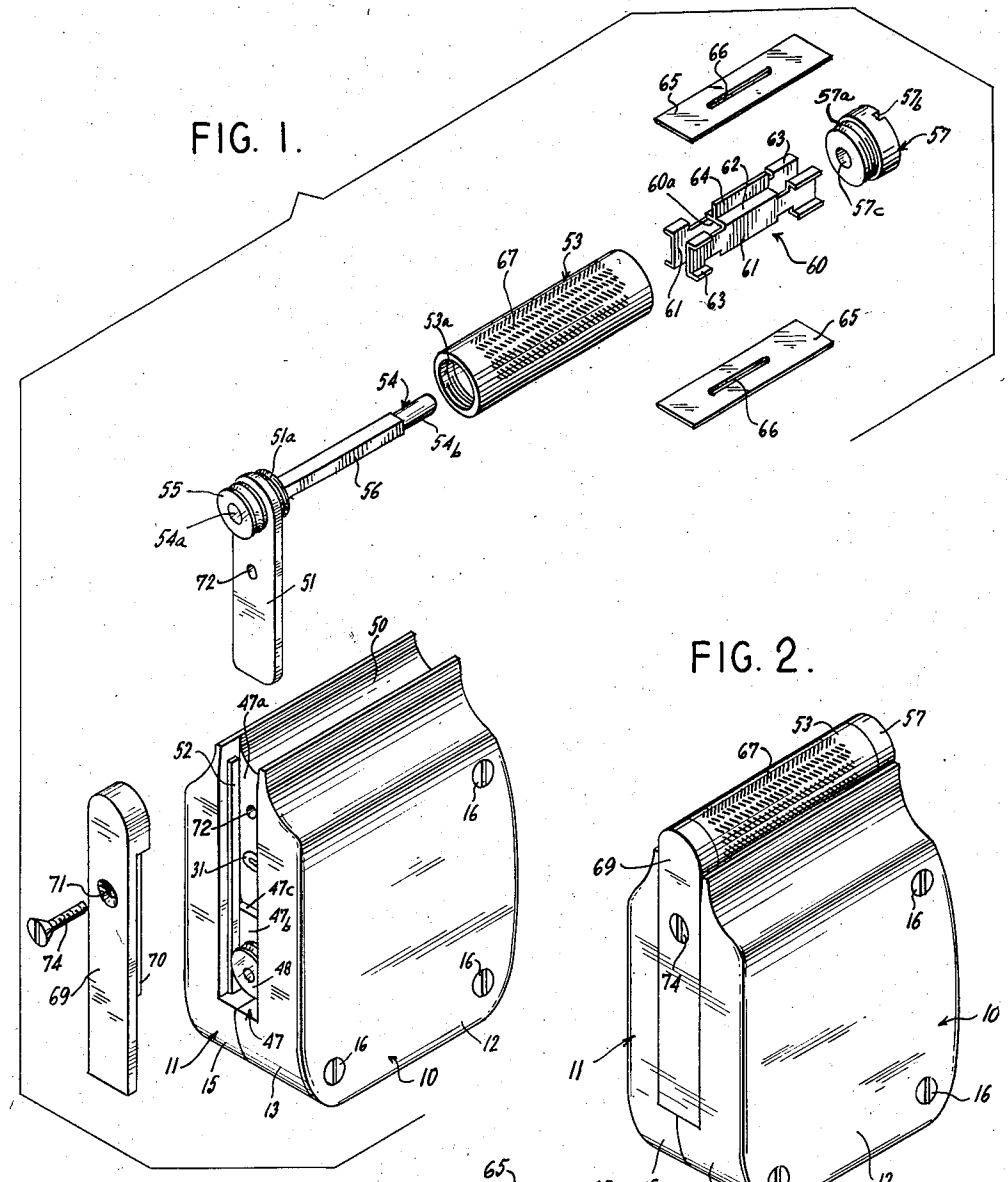
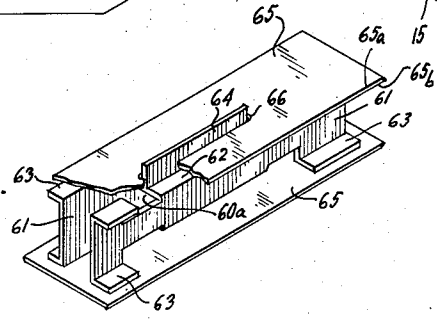


FIG. 2.

FIG. 3.



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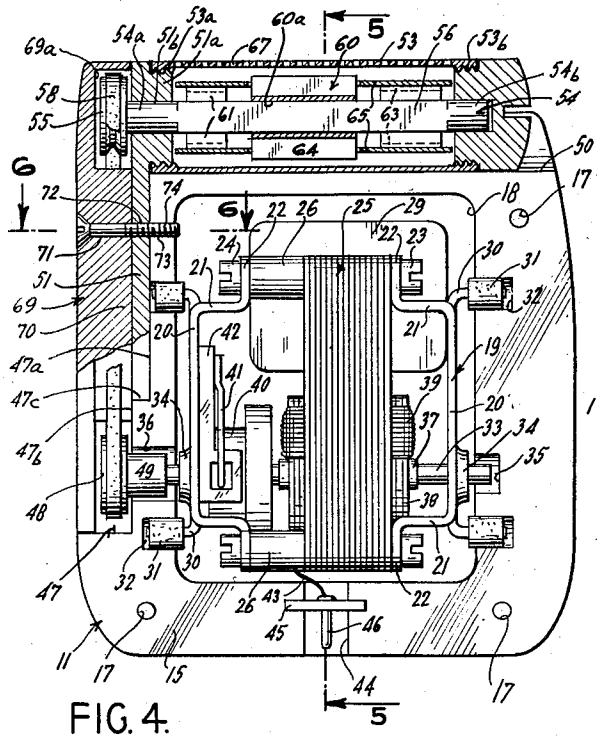

FIG. 4.

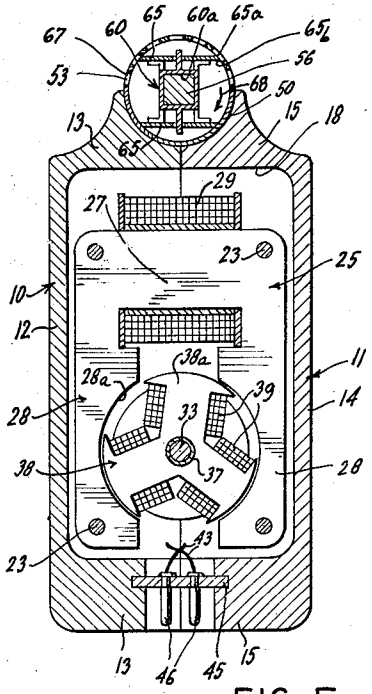

FIG. 5.

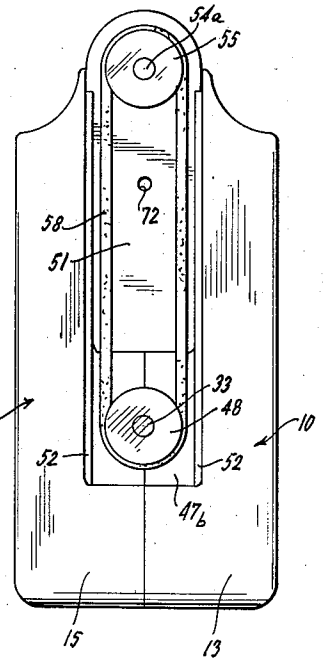

FIG. 7.

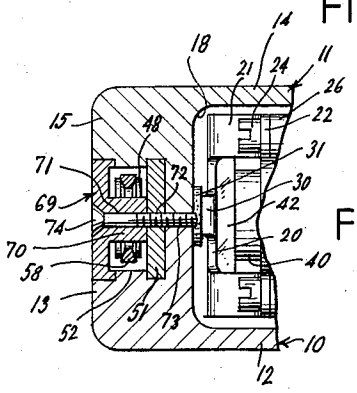

FIG. 6.

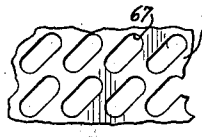

FIG. 8.

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ELECTRIC RAZOR WITH ROTARY OPERATED DOUBLE EDGED BLADES

Edward Kane, New York, N. Y.

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3 Claims. (Cl. 30—43)

This invention relates to improvements in electric razors, and in particular relates to an improved electric razor in which the cutting blades are similar to double-edged safety razor blades, and in which said blades may be readily replaced.

An important object of this invention is to provide an electrically operated razor having inexpensive parts, and the blades of which may be readily replaced. Another important object of this invention is to provide an electric razor having an improved cutting action. Still another important object of this invention is to provide an electric razor having a simplified casing and having simple means for mounting the motor and other parts in said casing.

Another object of the invention is to provide an electric razor which may be readily disassembled for repair and for servicing.

In accordance with a preferred embodiment of the invention, the head of the razor includes a cylindrical sleeve. A turnable shaft extends axially through said sleeve and is coupled to the output shaft of the electric motor of the razor by a pair of pulleys and a coupling pulley belt. A blade mount is mounted upon said shaft for rotation therewith. Said blade mount has opposed faces which have means for receiving respective double edged razor blades thereon. When seated upon the blade mount, each said razor blade has a substantially chordal relationship to the inner wall of the sleeve.

The cutting edges of the blades are shaped and positioned to bear frictionally against the inner wall of the sleeve during rotation of the blade mount, and this results in a sharpening action on the blades. Also, the upper portion of the sleeve is slotted to permit entrance of hairs being shaved, and the edges of the blades are positioned and shaped to exert a shearing cutting action on such entrant hairs.

Means are provided for simple disassembly of the parts within the head so as to permit replacement of the blades. However, the blades need only be replaced after a long period of service, after their cutting edges have been worn away sufficiently so that they no longer make good frictional contact with the inner wall of the sleeve.

Other objects and advantages of the invention will become apparent from the following description, in conjunction with the annexed drawings, in which a preferred embodiment of the invention is disclosed.

The drawings are substantially to scale of a working model of the invention.

In the drawings,

Fig. 1 is an exploded perspective view of the improved electric razor in accordance with this invention.

Fig. 2 is a perspective view of the assembled razor.

Fig. 3 is a detail perspective view, partly broken away, of the blade mount, showing two double-edged razor blades mounted thereon.

Fig. 4 is a front elevation, partly in section, of the razor, with the front portion of the casing removed.

Fig. 5 is a section on line 5—5 of Fig. 4.

Fig. 6 is a fragmentary section on line 6—6 of Fig. 5.

Fig. 7 is an end elevation of the razor, with the guard plate for the pulley assembly removed.

Fig. 8 is a fragmentary elevational detail of the periphery of the blade guard cylinder.

Upon reference to the drawings in detail, it will be noted that the casing comprises similar front and rear casing members **10** and **11**.

Front casing member **10** comprises a front wall **12** having a continuous peripheral, rearwardly extending flange **13**. Rear casing member **11** comprises a rear wall **14** having a continuous peripheral, forwardly extending flange **15**. The respective front face of flange **15** and rear face of flange **13** are substantially planar, except for certain recesses therein to be described below, so as to permit these faces to be butted together. A plurality of fastening screws **16** may be extended through suitable front-to-rear openings in flange **13** and hence into threaded registering screw holes **17** in flange **15**. Flanges **13** and **15** then cooperate to define smooth top and bottom walls and side walls of the assembled casing. The casing has a generally rectangular cavity **18**, which contains the electric motor of the razor.

Said electric motor is supported by a motor frame assembly **19**. Said frame assembly includes a pair of side legs **20** which are located adjacent the side walls of cavity **18**. Bracket arms **21** are integral with each side leg **20** at the front and rear ends of both the top and bottom edges thereof. Said arms **21** extend inwardly, the top bracket arms **21** terminating in upwardly extending flanges **22**, and the bottom bracket arms **21** terminating in downwardly extending flanges **22**. It will be apparent from the drawings that there are front and rear upper sets and front and rear lower sets of opposed and parallel flanges **22**.

Each set of flanges **22** are secured together by a pair of respective interfitting male and female bolts **23** and **24**. The shanks of bolts **23** respectively extend through appropriate holes in the registering stator laminations **25**, which are located adjacent the right hand flanges **22**, as viewed in Fig. 4. The shanks of bolts **24** respectively extend through spacer sleeves **26**, which extend between the left hand flanges **22** and the stator laminations **25**. Bolts **23** and **24** are tightened to hold stator laminations **25** in frictional abutment with each other. Said laminations **25** thus serve as part of the frame assembly **19**.

Stator laminations **25** are of inverted generally horseshoe shape to define a stator cross-arm **27** and stator legs **28**. Field coil **29** is wound upon stator arm **27**.

In order to support frame assembly **19**, legs **20** are respectively provided with upper and lower outwardly extending arms **30**. A resilient shock-absorbing sleeve **31** is mounted on the outer end of each arm **30**. The abutting faces of flanges **13** and **15** are respectively provided with appropriate cut-outs which cooperate in the assembled casing to define upper and lower recesses **32** in the respective sides of cavity **18**. Each shock absorber **31** is frictionally located within a respective recess **32**.

A laterally extending shaft **33** extends between the stator legs **28** and through opposed side legs **20** of frame assembly **19**. Bearings **34** are provided on the outer faces of said legs **20**, and said shaft **33** extends turnably through said bearings **34**. The abutting faces of flanges **13** and **15** are provided at the right side of the device, as taken in Fig. 4, with appropriate cut-outs which cooperate in the assembled casing to define a recess **35** in the side of casing **18**, into which one end of shaft **33** protrudes turnably. Opposite recess **35**, said abutting faces of flanges **13** and **15** are respectively provided with additional cut-outs which cooperate in the assembled casing to define an aperture **36** in the side wall of the casing through which shaft **33** protrudes turnably.

A collar 37 is fixed to shaft 33 between the respective legs 20, and a plurality of rotor laminations 38 are mounted upon said collar 37. Said rotor laminations 38 respectively include three wings or legs 38*a* spaced 120° apart, and an armature coil 39 is wound upon each stack of wings or legs 38*a*. Stator legs 28 are appropriately cut away at 28*a* to permit rotation of the rotor laminations 38.

A commutator assembly 40 is mounted upon shaft 33 adjacent the leg 20 which is proximate to aperture 36. Commutator brushes 41 are mounted upon said leg 20 by means of a suitable insulating bracket 42. The brush leads 43 are attached to the brushes by any suitable means (not shown). The abutting faces of flanges 13 and 15 are respectively provided with additional cut-outs which cooperate in the assembled casing to define an aperture 44 in the bottom of the casing. Bracket 45 is mounted within said aperture 44 and supports plug elements 46, to which the brush leads 43 are respectively connected. Said plug elements 46 are recessed within the wall of the casing.

The operation of the motor is conventional and for this reason the elements of the motor are not described in detail.

The outer faces of flanges 13 and 15 are provided with appropriate cut-outs which cooperate in the assembled casing to define a side recess 47 which communicates with aperture 36. Said recess 47 extends from a point somewhat below the bottom of aperture 36 to the top of the casing.

Said recess 47 is generally rectangular in shape. Said recess 47 has a bottom wall, opposed front and rear walls, and an inner side wall 47*a* and is open at its top and at the outer side of the casing. Shaft 33 extends through aperture 36 into said recess 47, and pulley 48 is mounted upon the outer end of shaft 33, by means of hub 49. It will be apparent that pulley 48 is driven by the electric motor and as will be described below in detail, the cutting elements of the razor are drivingly coupled to said pulley 48.

The upper portions of flanges 13 and 15 are provided with appropriate cut-outs which cooperate in the assembled casing to provide a top recess 50 in the casing. This recess 50 communicates with the upper end of recess 47 and extends laterally to the other side of the casing. Said recess 50 is substantially semi-circular in cross-section, as is clearly shown in Figs. 1 and 5.

A side plate 51 of generally rectangular shape is vertically elongated and is provided at its upper inner face with a transverse boss 51*a* which is externally screw-threaded. Recess 47 has a pair of upstanding ribs 52 on the respective front and rear faces thereof, each said rib 52 being spaced inwardly of the side edges of the face of recess 47 upon which it is mounted. Said ribs 52 extend from the bottom of recess 47 to a point slightly below the top of recess 47. Wall 47*a* is provided with a thickened boss portion 47*b* near the bottom thereof which extends to meet the ribs 52 and serves to provide a shoulder 47*c*. Plate 51 is adapted to be positioned with the bottom of plate 51 resting upon shoulder 47*c* and with said plate 51 abutting the wall 47*a* of recess 47. The front and rear edge zones of plate 51 are respectively received between the respective ribs 52 and wall 47*a*.

The operating head of the razor includes a cylindrical sleeve 53, which is internally screw-threaded at 53*a* and 53*b* at the respective ends thereof. Said operating head also includes a screw cap 57 which has a cylindrical head and an externally threaded shank 57*a*. The head of cap 57 optionally has a slot 57*b* to permit the use of a screw driver in assembly and disassembly of the razor head.

The threaded sleeve portions 53*a* and 53*b* are adapted to be respectively screwed onto boss 51*a* and shank 57*a*, with sleeve 53 and the head of screw 57 then resting within recess 50.

Pulley shaft 54 has a central portion 56 which is square in cross-section, as well as cylindrical end portions 54*a* and 54*b*. Said pulley shaft 54 is adapted to be located in sleeve 53 and extending axially therein. Shaft end portion 54*b* then extends turnably into an axial bore 57*c* in shank 57*a*; and shaft end portion 54*a* then extends turnably through a common bore 51*b* in plate 51 and boss 51*a*, and hence into recess 47.

Said shank 57*a* and said boss 51*a* serve as sleeve bearings for the cylindrical end portions of shaft 54.

Pulley 55 is fixed to said shaft portion 54*a* within recess 47 and is coupled to pulley 48 by means of pulley belt 58, so that the electric motor drives shaft 54. Optionally, shafts 33 and 54 may be coupled by any other suitable means, including but not limited to gears.

Recess 47 is closed by means of cover plate 69. This plate 69 is generally rectangular in shape and is vertically elongated. Said plate 69 is adapted to be interfitted between the front and rear walls of recess 47, in abutment with the outer edges of ribs 52. Said plate 69 has a central flange or boss 70 which is adapted to extend between the front and rear portions of the pulley belt 58 into abutment with plate 51, above shoulder 47*a*. A countersunk hole 71 extends through plate 69 and registers with a hole 72 in plate 51. This hole 72 in turn registers with a threaded hole 73 in the casing side wall. A flat-head screw 74 is adapted to be inserted through holes 71 and 72 and screwed into hole 73 to secure cover plate 69 in place. The thickened upper portion of plate 69 is rounded to conform in shape with sleeve 53 and is recessed at 69*a* to accommodate pulley 55.

Blade holder 60 is shown in Figs. 1, 3, 4 and 5. Said blade holder 60 is unitary and comprises parallel front and rear vertical walls 61. Intermediate their ends, said walls 61 are joined by top and bottom walls 62. The interior space or bore 60*a* defined between walls 61 and walls 62 is substantially square in cross-section and is open ended, and fits frictionally over shaft portion 56, so that blade holder 60 turns in unison with shaft 54.

The upper and lower edges of each wall 61 are provided at their extremities with perpendicular ears 63. There are four upper ears 63 located in a common plane and four lower ears 63 located in a common plane. The ears 63 attached to the front wall 61 extend forwardly therefrom. The ears 63 attached to the rear wall 61 extend rearwardly therefrom. Lateral and vertical flanges 64 respectively extend upwardly from the upper wall 62 and downwardly from the lower wall 62.

Each blade 65 extends laterally and has front and rear surfaces 65*a*. Each blade 65 has a central laterally elongated slot 66. Each blade 65 is adapted to be mounted upon holder 60 with flange 64 extending through slot 66 and with blade 65 resting against respective ears 63 and wall 62. The height of flange 64 is substantially greater than the thickness of blade 65. It will be apparent from Fig. 3 that flange 64 is slidable within slot 66, so that blade 65 is movable toward and away from ears 63 and arm 62. However, flange 64 substantially prevents lateral and forward and rearward movement of blade 65 relative to flange 64. After assembly of blades 65 upon blade holder 60, the assembly is adapted to be inserted into sleeve 53 until shaft portion 56 extends through bore 60*a*, and cap 57 may then be screwed onto sleeve 53.

As shown in Fig. 5, considering the top blade, the surfaces 65*a* are downwardly outwardly inclined, and the junction edge 65*b* between surface 65*a* and the lower face of blade 65 serves as its cutting edge.

A detail of the peripheral surface of sleeve 53 is shown in Fig. 8. Inwardly of the ends of said sleeve 53, it is provided with a plurality of slots 67. Each said slot 67 extends at an angle of approximately 45° to the axis of sleeve 53. Said slots 67 are optionally and prefer-

ably arranged in rows which extend linearly and in the direction of the axis of sleeve **53**, between the unslotted end portions thereof. In addition, the slots **67** are arranged in rows which extend circumferentially around the upper part of sleeve **53**. Only the upper half of sleeve **53** is slotted.

In operation, the blades **65** turn rapidly within sleeve **53**, in the direction of arrow **68**. When sleeve **53** is held against the face or the like, hairs extend through slots **67** into the interior space of sleeve **53**. It will be apparent from Fig. 5 that the right hand cutting edge **65***b* of the upper blade **65** will shear any hairs extending through the particular slots **67** opposite which it turns.

Upon rapid rotation of shaft **54**, and hence of blade holder **60**, it will be apparent that a centrifugal force is exerted upon the two blades **65** so as to urge them radially outwardly relative to the axis of shaft **54**. As a result of this force, blades **65** are urged away from their respective support ears **63** and support arms **62**, thereby maintaining the blade surfaces **65***a* in frictional contact with the inner peripheral wall of sleeve **53**. This is important, of course, to assure shearing of the hairs during the shaving operation. This feature becomes increasingly important as the blade surfaces **65***a* become worn down.

The angle of blade surface **65***a* makes it tend to slide fairly evenly and frictionally over the concave surface of the inner wall of sleeve **53**. As a result, when the blade surface **65***a* travels over the lower half of the inner wall of sleeve **53**, the cutting edge **65***b* is sharpened.

Therefore, the blades **65** are self-sharpened and operate extremely effectively to cut the hair. In addition, when the blades become worn, so that they no longer make good frictional contact with the inner wall of sleeve **53**, it is a simple matter to unscrew screw **57**, remove blade holder **60** and replace blades **65**.

It will be apparent that in accordance with my invention, it is unnecessary to provide springs to urge the blades **65** into cutting contact with the inner peripheral wall of sleeve **53**. The use of springs is unnecessary because of the centrifugal force acting upon the blades **65** while the razor is in operation, and maintaining the blade surfaces **65***a* in frictional contact with said inner peripheral wall of sleeve **53**. Furthermore, when the razor is no longer in operation, and since there are no springs there is no force acting upon blades **65** to urge them against the inner peripheral wall of sleeve **53**. As a result, the danger of the blade edges **65***b* digging into the inner peripheral wall of sleeve **53** is minimized. Furthermore, there is no problem of adjustment of spring tension in my improved razor, and the tension of the blades against sleeve **53**, during operation of the razor, is dependent upon the design of the operating head of the razor and upon the speed of rotation of shaft **54**.

While I have disclosed a preferred embodiment of my invention and have indicated various changes, omissions and additions which may be made therein, it will be apparent that various other changes, omissions and additions may be made in the invention without departing from the spirit and scope thereof.

I claim:

1. A mechanical razor comprising a casing having a recess at the upper face thereof and extending across the entire width thereof, a cylindrical sleeve having a through bore removably positioned within said recess with said recess and said sleeve extending in the same direction, said sleeve having a plurality of slots in the peripheral wall thereof above said recess, the respective end portions of the bore of said sleeve being screw-threaded, a pair of sleeve bearings, said bearings being externally screw-threaded and being removably screwed into the respective end portions of said sleeve, a shaft removably positioned within said sleeve with the ends of said shaft extending turnably into said bearings, one

end of said shaft protruding beyond the outer face of one of said sleeve bearings, said shaft extending coaxially relative to said sleeve, drive means for the externally protruding portion of said shaft for rotating same, and a blade holder removably and non-rotatably mounted upon said shaft within said sleeve, said blade holder having at least one blade seat for receiving a double edged razor blade which has side cutting edges, said seat extending in the direction of length of said sleeve and also extending chordally thereto, said blade holder being adapted to receive said blade with one face of the blade opposing the seat and with said blade extending in the direction of length of said sleeve and with the cutting edges of said blade frictionally and slidably abutting the inner wall of said sleeve.

2. A mechanical razor for use with a double edged razor blade which has side cutting edges and a slot, said razor comprising a casing having an elongated recess at the upper face thereof, a cylindrical sleeve removably positioned within said recess with the axes of said recess and said sleeve extending in the same direction, said sleeve having a plurality of slots in the peripheral wall thereof above said recess, a pair of sleeve bearings, means removably mounting said sleeve bearings within the respective end portions of said sleeve, a shaft removably positioned within said sleeve with the ends of said shaft extending turnably into said sleeve bearings, one end of said shaft protruding beyond the outer face of one of said sleeve bearings, said shaft extending coaxially relative to said sleeve, drive means for the externally protruding portion of said shaft for rotating same, and a blade holder non-rotatably mounted upon said shaft within said sleeve, said blade holder having at least one blade seat, said seat extending chordally thereto, said blade holder also having a member extending transversely from said blade seat, said blade holder being adapted to receive said blade with one face of the blade opposing the seat and with said blade extending in the direction of length of said sleeve and with said member extending slidably through said blade slot, the distance between the opposite side portions of said peripheral wall in the plane of said seat being greater than the width of said blade, the distance in the radial direction between said flange and said peripheral wall being greater than the distance in the radial direction between said blade and said peripheral wall when the blade cutting edges abut the peripheral sleeve wall by reason of radial outward movement of the blade when the shaft is rotated.

3. In a motor driven razor for use in conjunction with a double edged razor blade which has side cutting edges and a central elongated slot parallel to the cutting edges, a cylindrical sleeve having a peripheral wall and having a plurality of slots in the peripheral wall thereof, an elongated blade holder, and means rotatably mounting said blade holder within said sleeve with the axes of said blade holder and said sleeve coinciding, said blade holder having at least one blade seat, said blade seat extending axially and also chordally with respect to the sleeve, said blade holder having at least one flange extending radially and centrally outwardly from said seat and also extending axially, said blade holder being adapted to receive said blade with one face of the blade opposing said seat and with said blade extending axially and with said flange extending radially slidably through the blade slot, the distance between the opposite side portions of said peripheral wall in the plane of said seat being greater than the width of said blade so that the blade cutting edges are spaced from the peripheral sleeve wall when the blade face abuts the seat, the distance in the radial direction between the end of said flange which is remote from said seat and said peripheral wall being less than the distance in the radial direction between said blade and said peripheral wall when the blade cutting

edges abut the peripheral sleeve wall by reason of radial outward movement of the blade when the shaft is rotated.

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