

Jan. 23, 1945.

W. J. NEIDIG

2,367,686

SHAVING MECHANISM

Filed May 7, 1941

Fig. 1

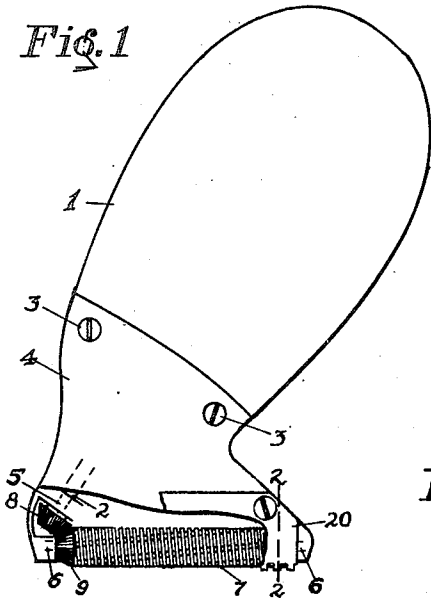


Fig. 2

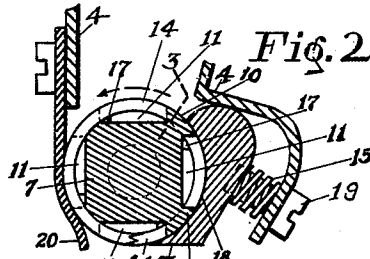


Fig. 3

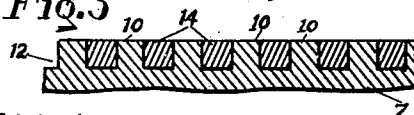


Fig. 4

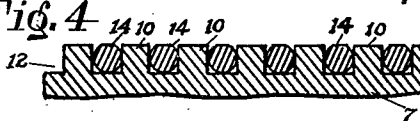


Fig. 5

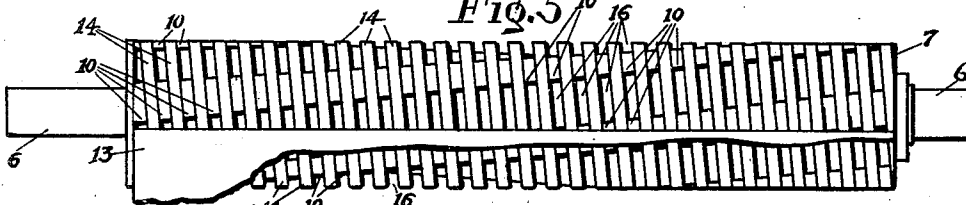


Fig. 6

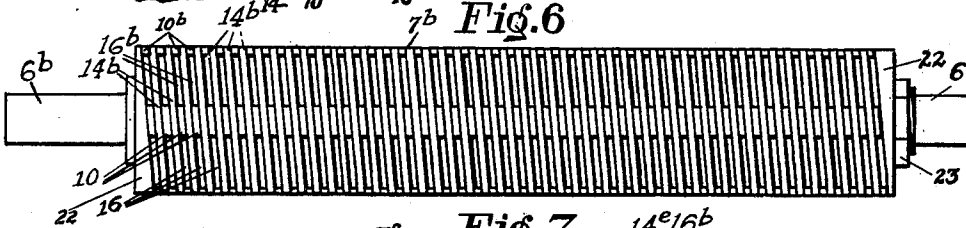


Fig. 7

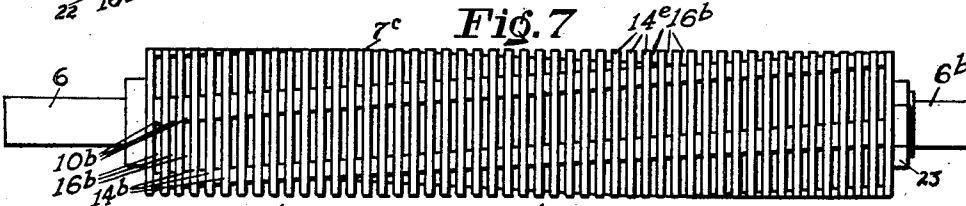


Fig. 8

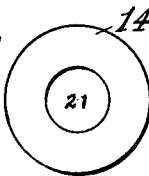
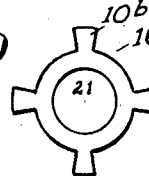


Fig. 9



Inventor:

William Jonathan Neidig

UNITED STATES PATENT OFFICE

2,367,686

SHAVING MECHANISM

William Jonathan Neidig, Napoleon, Ohio

Application May 7, 1941, Serial No. 392,242

10 Claims. (Cl. 30-43)

The invention described herein relates to the class of mechanisms designed to replace the razor in removing the beard as in shaving.

Mechanisms of this kind in present use commonly employ a sheet-metal comb of some kind as one of the cutting elements, the comb being supplied with openings through which the beard projects to be sheared off by cutters moving behind it. These openings commonly have the form of the openings lying between a range of teeth, or of the openings in a colander sieve; commonly they are only half as wide as the teeth or other defining structure. As a consequence only a portion of the beard reaches the cutting elements at their first passage and avenues of beard untouched by the cutters remain to be shaved off later. Moreover, even the shaved portions of the skin commonly have the beard removed at a height above skin level determined by the thickness of the comb.

In my mechanism the comb lying between the movable cutting element and the skin is dispensed with, one of my objects being to provide for a closer shaving action. In my mechanism the first passage of the cutting elements across the skin results in the removal of the beard from all portions of it as completely as if a razor had passed over it, one of my objects being to attain that result. Moreover, a further object is to supply a mechanism in which all cutting parts are sturdy enough to be hardened, and in which keener cutting edges can be maintained, and in which the cutting parts can be maintained in closer cutting relationship, and in which the cost of manufacture is lessened. A further object is to supply a mechanism in which the actuation can be either by a reciprocating or a rotating agency, and in which the cutting may be done in one direction only or in both. Still a further object is to supply a construction in which the danger of wounding the skin is lessened to an extent that guards may be dispensed with if desired. Other objects are as described hereinafter.

I attain my several objects through the mechanism illustrated in the accompanying drawing, in which

Fig. 1 is a front view of one of my embodiments, with the casing partly broken away.

Fig. 2 is a view chiefly in section on the line 2-2, Fig. 1, of the principal parts thereof, enlarged.

Fig. 3 is a detail view in section on the line 3, Fig. 2, of some of the peripheral cutters and bearers carried by member 7, further enlarged.

Fig. 4 is the same as Fig. 3, except that the

bearers are shown in circular section, instead of square.

Fig. 5 is a bottom view of member 7 with its cutters and bearers, together with portions of the cooperating stationary cutter, on the same scale as Fig. 2.

Fig. 6 is a similar view on the same scale of another embodiment of cutting and bearer elements, but with the stationary cutter omitted.

Fig. 7 is a similar view of a still further embodiment, showing only differences in the construction.

Figs. 8 and 9 are detail views of the bearer and cutter parts respectively used in the embodiments shown in Figs. 6 and 7.

Similar symbols of reference refer to similar parts in the several drawings.

The embodiment illustrated in Figs. 1 to 5 makes use of revoluble moving parts and revoluble actuation. I show it for operation by a suitable motor of approved construction such as is commonly employed in mechanical shavers. Such motors are well known and need not be described. The motor in its frame or casing is indicated at 1 and the shaft rotated thereby at 2. Attached to this casing by screws 3 is the supporting frame or casing 4 of my novel cutting devices. The end of shaft 2 is journaled for convenience at 5 in supporting frame 4, and the axles 6 of a revoluble cutter-carrier 7 are also journaled in casing 4, an attached bevel gear 8 on shaft 2 meshing with an attached bevel gear 9 on axle 6 to rotate it. The precise character and form of the driving means is immaterial, as is also the length and diameter of member 7 and the manner and position of its mounting.

Carrier 7 of this embodiment is of substantially cylindrical figure. As shown in the drawing it is constructed by forming a helical thread in the periphery of an axled cylinder of small diameter, the helical thread preferably having a narrow pitch and preferably cut using a threading tool of steep-sided figure. The ridges of the square-threaded screw resulting are then milled through in axis direction forming longitudinal channels or depressions, as shown in Fig. 2, leaving helically disposed cutters, indicated at 10, either end-face of which is adapted to cooperate in a shearing action with suitable stationary cutting agencies. These teeth or cutters 10 are separated angularly by the milled-out channels referred to, indicated at 11, and they are separated in axis direction, that is to say longitudinally of member 7, by the thread-troughs 12, Figs. 3 and 4. Channels 11 may be of any desired width or depth.

I prefer to deepen them below the floor of thread-troughs 12, and so show them, but they need not be so deep. I prefer to give them a longitudinal direction departing from an axial line, so that cutters 10 whose faces they form may engage with a straight-line stationary cutter in succession instead of simultaneously, but they need not be given such a spiral disposition. I prefer to give them as great an angular width as possible, reducing the angular thickness of the teeth defining them as much as possible, so that recesses later described between cutters 10 may have as much length in circumferential direction as possible. In the drawing I show member 7 as having four of these channels 11, separating four rows of cutters 10, but the number of them is immaterial. A greater number would give member 7 a greater number of cutters 10, but would decrease the angular distance between the rows of cutters.

It will be noted that an easily machined milling cut 11 in longitudinal direction upon a cylinder of small diameter threaded as described will result in forming peripheral cutter teeth having faces of an angle that is very favorable for cutting. As shown this is sharply greater than 90°.

It will be noted also that the helical disposition of cutters 10 about the periphery of member 7 staggers them with respect to the zones in which they rotate, so that their cutting action overlaps, leaving no hiatuses in such action along a cooperating stationary longitudinal cutting edge.

My invention is in part directed toward the construction of the peripheral cutters illustrated in this embodiment or those following. It is more largely directed at combining their use, or the use of any such, with that of a stationary cutter through a novel combination that includes what may be called bearer agencies or bearer structure. This can best be described in connection with its principal functions.

I prefer to employ as a stationary cutter a longitudinally extending blade supplied with an unbroken knife-edge or razor-edge, such an edge being thinner than a shear-edge, and therefore affording closer shaving, and also possessing superior cutting advantage, but the edge need not be a knife-edge, nor the cutter be of any precise form. In the drawing such an edged cutter blade is indicated at 13. In this case the cutter is supplied with a longitudinal hollow 18 (Fig. 2) of circular section, of a radius corresponding to that of peripheral cutters 10 on carrier 7, into which carrier 7 is nested, the hollow assisting in holding the blade in operative position irrespective of inexact adjustments and irrespective of wear or heat warpings, but this construction is not essential. Cutter 13 is shown as readily removable through the loosening of screws 19, as for exchange replacement, and as supported on frame 4.

It will be noted that the construction illustrated, embodying a blade supplied with a hollow in which a cutter carrier of circular periphery can be nested, can be used to advantage in some cases independently of the carrier structure described.

In practice the following safety considerations accompany the use of shaving mechanisms: 1. The cutters should be the sharpest that can be adapted to the use. 2. They must be applied as closely as possible against soft skin surfaces easily abraded. 3. Surfaces such as lip folds and warts must be protected against all possibility of injury.

In practice also the following operative con-

siderations become important: 1. The speed of the movable cutters past the stationary is very great and the cutting action is repeated many times a second. This must be made possible. 2. The closest shearing action possible to attain is required between them. 3. Interference between the delicate cutting edges must be avoided. 4. The wear from use tends to destroy delicate permanent adjustments. 5. The cutting action itself tends to warp thin cutting edges out of plane. 6. The heat of use also tends to warp them. 7. Adjustments must not be sensitive beyond the ability of the average user to make. 8. Friction between the cutters must be kept low, not only because of wear but because of the heat generated at high speeds, which quickly becomes objectionable.

My bearer invention is directed at both the first and the second of these groups.

In the drawing it is illustrated in the case of the present embodiment by circumferentially-extending smooth-surfaced peripheral bearer structure of even radius with the cutting edges of cutters 10. This structure is elongated and narrow, like wire, and is preferably of square section, like the ridges between thread-troughs 12. It is indicated at 14. Since it is of small diameter it is preferably of the quality of music wire. It is shown as threaded into thread-troughs 12, and as filling them evenly (Fig. 3), and as crossing channels 11 at substantially peripheral surface level, segmental areas of which are defined by this structure and become depressions of elongated rectangular figure defined at the ends by cutters 10. Depressions of the same figure similarly defined would be obtained by threading elongated narrow material like that described into channels 11 crossways of thread-troughs 12, in which case the ridges between the thread-troughs would act as bearer structure and the material closing the thread-troughs would become the peripheral cutting agencies. Since this material would entirely close channels 11, it would act at the ridges as part of the ridge structure, and therefore as part of the bearer structure.

The purpose of the elongated cutter-and-bearer-defined depressions is to provide recesses for the beard-stubble to project into, past the cutting level. These depressions are indicated at 16. They are shown as of elongated figure, in order to give the beard-stubble more time to spring into cutting position, but they are not necessarily elongated, nor are they necessarily rectangular. They are shown as of narrow width, in order that the skin may be permitted only the shallowest protrusion into them, or none at all, but their width may be as desired, whether narrower or wider. The bearer structure defining their side edges is shown as of even radius with cutters 10, but in some uses may be slightly lower, the height shown being preferable.

Such construction provides for an unobstructed support of the skin by bearer structure at cutting level while preventing all injury thereto by the cutters, and provides for the free springing into cutting position of all the beard stubble at the first passage of the cutting-head.

It will be noted that my bearer structure may be used for the sake of skin-supporting function only.

In the present embodiment the wire-like bearer structure 14 is shown as attached upon carrier 7 by soldering, as at 17, Fig. 2, but when such structure is assembled into thread-troughs 12 by di-

rect winding, the use of solder is not always necessary. Such structure is sometimes formed into helical coils and then threaded into the thread-troughs in screw fashion. Fig. 3 shows the construction as employing wire-like material of square section for bearer structure, and Fig. 4 shows the same construction, using material of circular section.

The drawing shows stationary cutter 13 as supplied with a knife-edge, as has been explained. Cutter 13 is pressed yieldingly against bearers 14 by light springs 15, Fig. 2, attached upon frame 4.

It is clear that the introduction of an intermediate bearer support of the nature of that described enables any such cutter to cooperate with such movable cutters in as close a cutting action as may be desired, with the elimination of all possibility of interference.

It will be noted that the construction described supplies a movable cutter member that will cut equally well when rotated in either direction, so that right-handed and left-handed operation can be provided using the same cutters.

A usual guard is shown at 20, although not always needed. Its position and form are immaterial. It is shown as removably attached upon casing 4 by screws.

The mechanism described operates as follows: as the operator passes it over the skin to be shaved, in a movement advancing the edge of cutter 13 against the beard stubble, the rotation of member 7 brings recesses 16 down over the ends of the beard, or the beard finds its way into the recesses, and a cutter 10 shears it off against the edge of cutter 13 close to the skin. Since the cutting action of cutters 10 overlaps along cutter 13, no portion of the beard is missed. The narrowness of the pitch of bearers 14 prevents the rotation of cutters 10 from affecting the skin, and the position of cutter 13 against member 7 prevents its edge from injuring the skin. The beard is afforded free access into cutting position by the unobstructed recesses 16. The construction, and the quality of the cutting edges made possible by it, produce as a result a shaving action of maximum closeness over the entire surface of the skin covered at a single stroke of the shaver.

The embodiment of the invention shown in Figs. 6, 8 and 9 differs from that just described in the construction of the movable cutters. In this embodiment a revoluble cutter-carrier 7^b, corresponding to carrier 7 described, is shown as interchangeable with it. When so exchanged it is connected to the driving means 1 in the same manner, through shaft 2 and bevel gears 3 and 9, and cooperates with the same stationary cutter 13 in the same manner, being supplied with peripheral cutters and peripheral bearers of even radius. Instead of being disposed about member 7 in helical pattern, however, like cutters 10, its cutters 10^b are disposed upon member 7^b in the pattern of an inclined annulus, and they are flanked in axis direction by inclined annular bearers 14^b, and separated angularly by annularly disposed recesses 16^b of depressed figure.

The construction of member 7^b shown in the drawing makes use of bearer and cutter disks, as of sheet metal, pierced with holes 21 (Figs. 8 and 9), these being assembled alternately upon shaft 6^b. The bearer disks are shown in Fig. 8 and the cutter disks in Fig. 9. The number of

peripheral cutters 10^b on the cutter disks is immaterial. The assembled disks are slightly tilted, as shown in Fig. 6, so as to rotate eccentrically, thereby giving peripheral cutters 10^b on the cutter disks paths of rotation that bring them into an overlapping cutting action along stationary cutter 13. Short oblique cylinders 22 at either end of the assembly assist in maintaining the disks in inclined position, and a clamping nut 23 on the threaded end portion of shaft 6^b holds them against a shoulder at the other end of the shaft. After assembling, the disks are brazed together or sweated together with solder into a cylindrical unit, and then fine-ground to a circular section, so as to bring cutters 10^b and bearers 14^b to the same radius and supply a smooth supporting bearer surface for cutter 13. Fig. 5 shows the assembled disks in one position of extreme throw, with the cutters 10^b angularly positioned to give them an overlapping action. When member 7^b is rotated, the four cutters 10^b on each cutter disk weave back and forth overlappingly along stationary cutter 13, in an action that completely occupies cutter 13 from end to end without hiatuses, insuring a cutting action over the full surface of the skin passing under them, while bearers 14^b insure against the interference of the cutting edges, and against an accidental injury of the skin.

As will be seen, the construction described permits the use of bearers very closely spaced longitudinally, down to a distance barely sufficient to permit entry of the beard into recesses 16^b. I prefer to employ a spacing for them as narrow as can be conveniently kept clean. However narrow the cutters 10^b may be, their cutting action can be made to overlap. The tilting required to attain the overlapping result is very small. The oblique disposition of cutters afforded by such tilting can of course be altered favorably and unfavorably for such overlapping.

Whether the bearer surfaces are disposed obliquely helix-wise at a constant angle, as in Fig. 5, or at varying angles cam-wise, as in Fig. 6, the oblique construction serves to give the intermediate cutters individual cutting paths that may be merged or overlapped at will. It also serves to distribute the friction of contact upon the skin, and upon the cooperating stationary cutting member, whatever form it may have, and by its sidling action assists as well in positioning beard-ends and hairs for cutting. Since the embodiment of Fig. 6 is of cylindrical figure, the thin, shaped sheet-material forming its laminations are of disk-like form, but the rotatable member need not be cylindrical, nor the shaped sheets of any particular form. The desirable oblique surface pattern is obtained in this embodiment through the use of edge portions of inclined flat sheets, but the sheet material employed need not necessarily be flat nor inclined, the edge portions alone forming the pattern.

Whether the rotatable member be of cylindrical figure or not, or whether it be constructed for full rotation or for partial reciprocating rotation, or whether the bearer surfaces on it be elongated to one extent or another, is immaterial. The illustrated bearer feature of the invention as before centers upon the cooperative shielding and supporting action of smooth-surfaced skin-supporting and edge-supporting close-spaced bearer structure, the spacings between the adjacent edges of which form recesses of a width admitting beard-ends and hair for cutting, but not skin

surfaces, the cutting action being performed by bearer-shielded rotating cutters and bearer-shielded bearer-positioned bearer-supported stationary cutting edges of any approved type, the narrowness of the recesses enabling the bearer structure to support such edges throughout the cutting action in close adjacency to such action.

The embodiment of the invention shown in Fig. 7 makes use of the same bearer disks of Fig. 8 and cutter disks of Fig. 9, and of the same shaft 6^b with its clamping nut 23. Oblique cylinders 22 are however omitted, the assembled disks in this embodiment not being tilted. The resulting revoluble member 7^c is illustrated in the figure. This member can be used in place of either member 7 or member 7^b, and cooperates with stationary cutter 13 in the same way. Its component disks are brazed together or otherwise combined into an operative unit, and then fine-ground to give cutters 10^b and bearers 14^b the same radius, and bearers 14^b a smooth surface, against which cutter 13 may rest.

The shaving action of this embodiment differs from that of the embodiments previously described in the fact that the cutting paths of the cutters 10^b do not now overlap and a second passage of the shaver over the skin is required to complete the shaving. Even so, the paths cut are relatively much wider than that of many shaving mechanisms in commercial use at present. I show bearers 14^b as separated by cutters 10^b of the same width. By giving the cutters a greater relative width the area cut over by one passage of the mechanism can be materially increased. Both this embodiment and the one shown in Fig. 6 have the advantage in some uses that the bearers flanking the revoluble cutters to protect the skin therefrom need not themselves in all cases be revoluble, the annular arrangement of cutters permitting independent support for them.

It will be noted that while in both of the two embodiments last described I show the peripheral cutting structure and the peripheral bearer structure as borne upon separate disks, it is not in all cases advantageous, except to simplify assembling, that such structure be borne upon separate disks. It will be noted also that all of the forms of the invention shown provide a movable cutter-member that will operate when given part rotation only, and when the direction of rotation is reversed. It will be noted as well that I have shown and described not only an improved shaving mechanism, but novel detail constructions as well, useful in other shaving mechanisms.

I claim and desire to secure by Letters Patent,

1. In a shaving mechanism, in combination: a rotatable cutting and supporting member having shielded cutters and spaced bearer structure thereon, the cutters having positions across the spacings, the bearer structure having smooth, elongated, skin-contacting surfaces defined at the spacings by edges oblique to their paths of rotation and cooperating to guide beard-ends into cutting position and to form shielding, distributed support for the skin, the spacings forming beard-receiving recesses, and a stationary cutting member cooperating with said cutters and said bearer structure in a protected, distributed cutting action at skin level.

2. In a shaving mechanism, in combination: a rotatable cutting and supporting member having a construction comprising elongated spaced bearer structure defined by edges oblique to their paths of rotation, and comprising spaced cutters flush with and intermediate the spaced edges, the

spacings forming beard-receiving recesses, the bearer structure having a smooth surface and forming close-spaced shielding supports and guides on either side of the recesses, the cutters having angular positions giving them paths of rotation that do not coincide.

3. In a shaving mechanism, in combination: a rotatable cutting and supporting member having a construction including spaced, shaped, thin-bodied sheet material supported edgewise in multiplied parallel pattern, the edges forming spaced bearer surfaces, and including also bearer-shielded cutters having positions across the spacings, said spaced edges extending obliquely in rotational direction, the spacings forming beard-receiving recesses, and a cooperating stationary cutting member having a cutting level established through contact with the bearer surfaces.

4. In a shaving mechanism, in combination: a rotatable cutting and supporting member of cylindrical figure having a construction including spaced thin metal disks assembled for unit operation upon a common axis, said disks having edge portions oblique to their paths of rotation and forming close-spaced bearers having paths of rotation broader than their width, and including also thin-bodied peripheral cutters flush with and intermediate the bearers, and a cooperating stationary cutting member having sliding contact relations with the bearer surfaces.

5. In a shaving mechanism, in combination: a rotatable cutting and supporting member having a construction comprising multiple thin sheet-metal disks bonded together for unit operation upon a common axis, edge portions of said disks being fashioned into elongated bearer supports and edged portions being fashioned into cutting structures, the bearer surfaces being alternated axially with the cutting structures, the edges of the disks lying in planes oblique to the plane of rotation, and a stationary cutting member cooperating with said cutting structures and receiving distributed support from the bearer surfaces.

6. In a shaving mechanism, in combination: a rotatable cutting and supporting member of cylindrical figure comprising multiple supporting disks and cutting disks bound together in alternating sequence upon a common axis, the supporting disks having peripheral portions fashioned into bearer structure of smooth surface, the cutting disks having peripheral portions fashioned into peripheral cutters spaced by cut-away recesses, said several disks being mounted obliquely to their axis.

7. In a shaving mechanism, in combination: a rotatable cutting and supporting member of cylindrical figure having a construction including spaced thin metal disks assembled for unit operation upon a common axis, said disks having rim portions oblique to their paths of rotation, said rim portions forming close-spaced bearers of smooth surface and elongated figure having paths of rotation broader than their width, and including also thin-bodied cutters flush with and intermediate the bearers.

8. In a shaving mechanism, in combination: a rotatable member having a skin-contacting surface comprising the surface portions of spaced elongated bearer structure extending in rotational direction in helical figure, and comprising cutters having positions across the spacings, the spacings forming hair-receiving recesses, the bearer structure forming close-spaced cooperating supports of smooth surface, and a cooperating stationary cutter in shielded sliding contact

with the bearer surfaces, being supported thereby at the level of the rotatable cutters.

9. In a shaving mechanism, in combination: a rotatable cutting and supporting member of cylindrical figure having a construction comprising spaced helically disposed peripheral bearer structure elongated in rotational direction, and comprising angularly separated cutters flush with and intermediate the bearer structure at the spacings, the spacings forming hair-receiving recesses, the bearer structure forming close-spaced shielding supports of smooth surface, and a cooperating stationary cutter in shielded sliding contact with the bearer surfaces and supported thereby at varying points.

10. In a shaving mechanism, in combination: a rotatable member having a construction comprising spaced elongated bearer structure extending in rotational direction in helical pattern, and comprising angularly separated cutters flush with and intermediate the bearer structure, the spacings forming narrow-ported beard-receiving recesses, the bearer structure forming close-spaced cooperating supports of smooth surface on either side of the recesses, the cutters having angular positions giving them merged cutting paths.

WILLIAM JONATHAN NEIDIG.