A housing is provided with a shearhead having an opening, a perforated shearfoil spans the opening and underneath the shearfoil are mounted shear blades the cutting edges of which contact the shearfoil. A drive is coupled with the blades for making the same move relative to the shearfoil; it has at least one flexural unit composed of a plurality of bilaminar flexural oscillators of ferro-electric ceramic material which are mechanically coupled so that they perform their movements in unison.

18 Claims, 12 Drawing Figures
ELECTRICALLY OPERATED ORYSHAVER

BACKGROUND OF THE INVENTION

The present invention relates generally to a dryshaver with electric drives, and more particularly to such dryshavers which have a shear head provided with a perforate shearfoil underneath and in contact with which the shear blades move relative to the foil.

Dryshavers of this type, usually using a circular-outline shearhead, are known. Their cutter blades are mounted on a carrier which is moved by the electric drive, and which is spring biased so that the cutting edges of the blades are lightly urged against the underside of the shearfoil. The upper or outer side of the shearfoil is, of course, to be brought into contact with the skin of a user. The drive uses a low-voltage electromotor which receives electrical energy from a battery accommodated in the housing, and in some instances can also be operated from the electric supply net by interposing a transformer. In any case, the output shaft of the motor is coupled with the blade carrier and, when the motor is energized, it causes the blade carrier to rotate.

Electromotors have been developed, and are in use in such shavers, which provide a highly efficient output to weight ratio. Even so, however, the motor makes up a very substantial portion of the overall weight and size of the shaver. Moreover, such shavers are usually conceived as units which are to be small enough to be conveniently taken along during travel or the like; frequently, the housing is configured as a small cylinder. This necessarily imposes a substantial dimensional limitation on the various components, including the motor.

This, in turn, necessitates high precision in the manufacture of the motor, with the result that the final price of the shaver is largely determined by the manufacturing price of the motor. In addition, if the motor is to be operable both on battery and on net current, there is the further expense of the required transformer.

Evidently, further improvements in this field are desirable but have not heretofore been forthcoming.

SUMMARY OF THE INVENTION

It is, accordingly, a general object of the present invention to provide such further improvements.

More especially, it is an object of the invention to provide an improved dryshaver of the type under discussion.

Still more particularly, it is an object of the invention to provide such a dryshaver which has a novel drive for the shear blades thereof.

A further object of the invention is to provide such a novel dryshaver in which electrical energy is converted into mechanical motion in a manner not heretofore known in this art.

Still an additional object is to provide such a dryshaver in which the novel drive is simpler, lighter, smaller and substantially less expensive than the drives known heretofore.

The invention is based on the utilization of the reversed piezo-electric effect, known as electrostriction. It is already known to produce flexural oscillations of ferro-electric ceramic material, by fixedly connecting two thin electrode-covered ceramic strips, and to mount them at one or both ends for flexural movement. If it also known to improve the mechanical strength of such structures, known as "bilaminar flexural oscillators," by sandwiching between the ceramic strips a strip of metal of approximately the same thickness as the ceramic ones; such a metal strip can perform the additional function of acting as a motion-output member.

However, investigations with such structures have shown that they are not suitable per se for the purpose of driving the shear blades of a dryshaver. They must necessarily have a very low mechanical resonance frequency, and as a result their usable mechanical output is too small, being limited either by the amount of alternating mechanical flexing action permissible at the surfaces of the ceramic strips, or by the permissible electrical alternating-field strength. In addition, the mechanical output is also to some extent determined by other considerations which tend to limit it.

According to the present invention, however, these difficulties can be overcome and the objects outlined above, as well as others which will become apparent hereafter, can be achieved in an electrically operated dryshaver which, briefly stated, comprises a housing, and a shearhead on this housing. The shearhead has an opening which is spanned by an apertured shearfoil and underneath the same are mounted a plurality of shear blades whose cutting edges are in contact with the inwardly directed side of the shearfoil.

This dryshaver comprises drive means for the blades, which drive means is operatively associated with the blades for effecting movement of the same relative to the shearfoil. According to the invention, the drive means comprises at least one flexural unit composed of a plurality of bi-laminar flexural oscillators of ferro-electric ceramic material which are mechanically coupled for performing flexural oscillations in unison.

According to the invention the number of such oscillators in the unit should be as small as possible, so that the unit is light in weight, of small dimensions and inexpensive to produce. The ceramic material of which the oscillators are composed may be barium titanate, or it may be lead-circonate titanate. The oscillators are mechanically coupled in parallel and the unit may be connected directly, or via a motion-transmitting element, with the carrier of the shear blades.

According to one embodiment of the invention, the oscillators may be arranged so that their elongation extends substantially parallel to the axis about which the shear blade carrier rotates. Advantageously, they will be evenly distributed about the axis and be fixed at one end in a plate member which is mounted in the shaver housing, whereas the other end engages the underside of the shear blade carrier. Thus, the oscillators are united, via the plate member and the shear blade carrier, to form a flexural unit which is essentially configured as a body of rotation, preferably being of cylindrical configuration in this embodiment. Such a construction is very well suited for a dryshaver whose housing is elongated, for instance of cylindrical shape.

The shear head may be circular and the blade carrier may be journaled in it for rotation. According to a further concept in connection with this embodiment, the blade carrier may also be carried by a torsion bar which is fixedly mounted on the aforementioned plate member and on which the carrier turns. In such a case it is especially advantageous if the torsion bar is selected with a view towards its particular resonance. This, moreover, permits the bar to be accommodated to the
particular frequency of the electrical net (e.g. 50 or 60 cycles) to which the shaver is to be connected in use. It is merely necessary to shorten the length of the bar to tune or accommodate the same to a higher net frequency. Thus, the shaver may be made adjustable for use with different net frequencies, simply by making the length of the bar variable. This can for instance be done by providing the bar with a projection at an appropriate location spaced from the point where the bar is mounted in the plate member, and to provide an engaging member which is accessible exteriorly of the dryshaver and may be mounted on a fixed component of the same, for instance the plate member. When the engaging member is out of contact with the projection, the effective length of the bar extends from its free end to the point where it is mounted in the plate member. However, when the engaging member is moved into firm engagement with the projection, the effective length of the bar is shortened and now only extends from its free end to the projection; hence, the bar has now been accommodated to a higher net frequency.

It has been observed that a drive using flexural oscillators which oscillate in phase, will cause mechanical vibrations. These are transmitted via the shaver housing to the hand of a user holding the shaver, and are frequently found objectionable. The invention therefore also aims to avoid this problem, by providing a drive in which reaction forces and reaction moments are largely balanced.

A second embodiment of the invention achieves this purpose. It provides for the drive to have two of the flexural units, whose direction of elongation extends substantially parallel to the axis of rotation of the blade carrier. These units are located at opposite sides of this axis and their surfaces are diametrically opposite relative to the axis. The oscillation of the units is out of phase by 180°, but the manner in which they are mounted and coupled with the drive is the same as in the first embodiment. This arrangement is especially valuable if the dryshaver has a substantially cylindrical housing, because it makes possible an optimum utilization of the entire inner cross-sectional area of the housing. Thus, a smaller total number of oscillators (in both units together) will provide the same mechanical power output as a larger number of radially oriented oscillators in the first embodiment. Moreover, in this second embodiment the linear mass forces are compensated due to the counter-phase flexural oscillations.

To make possible an optimum utilization of the cross-sectional area in a substantially cylindrical housing, the units are advantageously so configured that their width in direction parallel to the axis of rotation is greatest adjacent to the axis (which normally coincides with the longitudinal axis of the housing), and decreases in direction normal to and outwardly away from the axis of rotation.

It is further desirable to compensate for the reaction moments which result from the movements of the blade carrier. According to the invention this is achieved by rigidly coupling at least one of the units with a compensating mass, at a point of the units which is located diametrically opposite the point where the unit is coupled with the blade carrier, or with a motion-transmitting member which in turn is coupled with the blade carrier.

The compensating mass is mounted for free turning movement about the axis of rotation of the blade car-ri er and thus performs oscillatory rotary movements which are phase-shifted through 180° relative to those of the similarly moving blade carrier. It goes without saying, of course, that the blade carrier always rotates first in one and then in the opposite direction, not continuously in one direction only. This construction has been found to result in a dryshaver in which the housing of the shaver is totally free from vibrations transmitted to it by internal operating components.

Finally, the invention proposes a third embodiment in which a single unit is provided, its direction of elongation extending transversely of the axis of rotation of the blade carrier. Here, the shaver housing is flat and one of the ends of the unit is fixedly secured to the housing, preferably to an edge portion of the same; the other end of the unit engages the underside of the blade carrier. In this embodiment it is preferable to couple the unit with the blade carrier via a swinging movement about the axis of rotation of the carrier. By appropriate selection of the length of the lever arms of the swinging arm and of the unit, the rotary amplitude of the blade carrier can be adjusted at a given amplitude of the unit.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in conjunction with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1a is a side elevation of a flexural oscillator, one end of which is fixedly mounted;

FIG. 1b shows the oscillator of FIG. 1a in an edge elevation;

FIG. 2 is a longitudinal section through a dryshaver according to one embodiment of the invention;

FIG. 3 is a section taken on line III—III of FIG. 2;

FIG. 4 shows another embodiment of the invention in a section taken on line IV—IV of FIG. 5;

FIG. 5 shows the embodiment of FIG. 4 in a section taken on line V—V of FIG. 4;

FIG. 6 is a section taken on line VI—VI of FIG. 5;

FIG. 7 is a section similar to FIG. 5, but showing a further embodiment of the invention;

FIG. 8 is a view of the top portion of the drive of FIG. 7, with the right-hand unit removed;

FIG. 9 is a top-plan view of a detail of a further embodiment of the invention;

FIG. 10 is a longitudinal section through a dryshaver according to another embodiment of the invention;

FIG. 11 is a section taken on line XI—XI of FIG. 10; and

FIG. 12 is a diagrammatic view, illustrating the transmission ratio in the embodiment of FIGS. 10 and 11.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIGS. 1a and 1b explain the operational principle of flexural oscillators used in accordance with the present invention. FIG. 1a shows such an oscillator in a side elevational view, and FIG. 1b shows it in an edge view. From the latter FIGURE, in particular, it is clear that a metallic strip 1 is covered on both of its major surfaces by thin strips or layers 2 of a ferro-electric ce-
Each of the strips 2 carries in turn on its respective exposed major surfaces a metallic electrode 3; the thickness of the latter is so selected as to be just sufficient for providing the required electrical conductivity. This is well within the skill of the art.

The oscillator is fixed at one end in a holding element, e.g., the illustrated railed member 4, wherein it is secured by potting with a synthetic resin 5 or the like. The resin assures a tight, but still slightly elastic mounting of the oscillator; a slightly elastic mounting is advantageous because it prevents or reduces the danger of cracking under the oscillations of the oscillator.

In the region of the material 5, lead wires are soldered onto the electrodes 3; they have not been illustrated to avoid confusion, but are conventional and therefore require no detailed explanations.

The thickness of strip 1 and of the strips 2 is approximately equal and amounts to between substantially 0.1 and 0.3 mm. It is advantageous to so select the thickness that a single oscillator (such as the one shown in FIGS. 1a and 1b) can be given optimum excitation (made to perform optimum flexural oscillations) when supplied with AC current of 110-125V. If two such oscillators are then electrically connected in series, they required 220V AC current. It follows from this that it is a simple matter to switch over a unit composed of such oscillators from 110/125V operation to 220/250V operation, if and when desired.

If the oscillator is potted in synthetic resin as shown in FIG. 1b, the resin 5 tends to "creep" up along the oscillator at the location 51, which then form a reinforcement against excessive bending-over of the oscillator at the juncture of the latter with the resin 5.

The metal strip 1 extends slightly upwardly beyond the ceramic strips 2 with its portion 1a, which latter can be used to couple the oscillator with adjacent similar oscillators or with the components to be driven, i.e., the blade carrier. The ceramic strips 2 are polarized in direction of their thickness (normal to the plate of FIG. 1a and the polarization is so chosen that they can be operated in series electrically.

When an electrical current is applied to the electrode 3, the oscillator performs flexural oscillations in accordance with its mechanical basic resonant frequency, analogously to a rod which is held rigidly at one end and subjected to vibrations. The resonance depends essentially upon the length and thickness of the ceramic strips 2, and upon the characteristics of the particular ceramic material; it is advantageously so selected that the basic resonant frequency of the oscillating system is between 2 and 10, preferably between 3 and 5 cycles above the operating frequency (which normally is either 50 or 60 cycles). The resonant frequency can be precisely selected by appropriately varying the free length of the oscillator, i.e. the length thereof from the point of engagement with the potting resin 5 to the free end of the oscillator.

The basic operational principle having thus been explained, reference will now be made to the first embodiment of a dryshaver using this principle in a novel manner.

FIGS. 2 and 3 show in rather diagrammatic form a substantially cylindrical dryshaver having a circular shear head. The housing 21 has a shear head frame 22 which can be threaded or otherwise removably connected with it. A perforate shearfoil 23 (having holes and/or slots for the passage of beard hair) is mounted in the frame 22, and located beneath it is a blade carrier 24. A plurality of shear blades 241 is mounted on the carrier 24 which latter performs underneath the foil 23 a to-and-fro movement in the direction of the double-headed arrow F (FIG. 3).

A plate 25 is mounted on the upper end of a torsion bar 26, the lower end of which is rigidly fixed in a base plate 4. Carrier 24 is elastically supported by the plate 25 via a plurality of equi-angularly spaced helical springs 242; in addition, it is coupled with the plate 25 via pins 243 which engage in recesses 251 of the plate 25. In addition to preventing relative rotation of plate 25 and carrier 24, the pins 243 also serve as guides for the springs 242 which latter bear the carrier upwardly and thus maintain the cutting edges of its blades 241 in engagement with the underside of the foil 23.

The housing 21 further contains the drive according to the invention, located downwardly of the plate 25. It uses several (e.g. three) flexural oscillating units 10, each of which is composed of a plurality of oscillators such as the one shown in FIGS. 1a and 1b. The plate 4 performs the same function as the element 4 shown in FIGS. 1a and 1b, and as shown in FIG. 3, the units are equi-distantly distributed about the torsion bar 26. Each unit 10 is coupled (see FIG. 3) with a slot-shaped recess 252 in plate 25 via a coupling projection 11.

Base plate 4 is fixedly mounted in housing 21, in this embodiment by means of a closure cap 27 which closes the housing at the lower end thereof. The plate 25 and the carrier 24, both of which are of circular outline, are guided with slight play at their peripheries by the circumferential wall of the housing 21.

In operation, electrical energy is supplied to the oscillators of the units 10. This causes the units 10 to oscillate in parallagoram-like movement, each in its own plane and with all units moving in the same sense. These movements are transmitted by the projections 11 to the plate 25, causing the same to perform a rotary oscillatory movement; because plate 25 is coupled via pins 243 with the carrier 24, the latter is made to perform similar movements at the same amplitude and frequency as the plate 25. As mentioned before, it is advantageous to tune the torsion bar resonance to that of the oscillatory system composed of the carrier 24 and the units 10 with their associated components, since the torsion bar acts as the elastic component of this system.

Another possibility of mounting the carrier 24 is to movably journal it in the frame 22 and to couple it directly with the units 10.

FIGS. 4-6 show a further embodiment of the invention. This dryshaver is reminiscent of the one in FIGS. 2 and 3, but utilizes two flexural oscillatory units 13 and 14, each composed of a package of the oscillators of which one is shown in FIGS. 1a and 1b. FIG. 5 shows that the width of the oscillators in this embodiment decreases along the radius from the axis of rotation of the carrier towards the inner surface of the peripheral wall of housing 21. The lower ends of the oscillators of the units 13 and 14 are rigidly mounted in rails 131 and 141, respectively, and the rails are in turn connected with the base plate 4. The latter is fixedly connected with the housing 21 via the intermediaries of cap 8 which also serves to close the lower end of the housing. The line cord 9 serving to establish connection with the electrical supply net, extends through this cap into the interior of the housing, and its conductors are con-
3,813,774

connected with the electrodes of the oscillators of the respective units 13 and 14. This embodiment also has substantially semi-circular rails 132 and 142, which connect the upper ends of the oscillators of the units 13 and 14, respectively. The rails 132 and 142 are provided with coupling projections 11 which are arranged in the plane VI—VI of FIG. 5 and which extend into slots 71 of a plate 7. The latter is rigidly connected with a torsion bar 26 which is tuned to the frequency of the current supply net to which the shaver is to be connected.

When the oscillators are energized by alternating current supplied from the net, the units 13 and 14 will oscillate in parallelogram-shaped manner, each in its own plane; however, the movements of the two units will be counter-phasic. These movements are transmitted via projections 11 and plate 7 to the torsion bar 5, imparting a rotary oscillation to the latter and, via the same, to the carrier 24 which is mounted on it. The amplitude of such movement is the greater, the smaller the distance of the projections 11 from the axis of rotation (i.e. the torsion bar 26), given a particular distance of displacement of the units 13 and 14 per oscillation. The torsion bar 26 is tuned to the resonance of the oscillatory system, as explained with reference to FIGS. 2 and 3.

FIG. 6 shows that if the units 13 and 14 are to perform substantial movements during each oscillation, the slots 71 in plate 7 may be omitted and replaced with sleeves 72 of elastomeric material, having bores or passages into which the projections 11 extend. This results in the projections 11—which perform translatory movements—being connected with the plate 7 without play.

If the drive is to be switched from use with a 50 cycle current to use with a 60 cycle current, or vice versa, this can be achieved in simple manner via the torsion bar 26. An engaging member 16 is mounted on the plate 4, either pivotable or slidable thereon. Pivoting or shifting of the member 16 can be effected from the exterior of the housing 21. When element 16 extends into the depression 41 and engages the nose 15, it prevents movement of the same, thus shortening the free (effective) length of the torsion bar 26 and increasing the resonance frequency of the system; the converse is of course also true.

FIGS. 7 and 8 show a modification of the embodiment in FIGS. 4–6. The basic arrangement is the same, and like reference numerals identify like elements. In addition, however, there is provided a plate 17 which is mounted on the torsion bar 26 underneath the carrier 24, being journaled for performing rotary oscillations. The plate 17 serves as a compensating mass for the reaction moments resulting from rotary oscillations of the plate 7 and the carrier 24. The plate 17 must perform rotary oscillations in counter-phase to the movement of the carrier 24; for this purpose the plate 17 is coupled with one of the units 13 and 14 (here the unit 14), namely via a portion 143 to the upper rail 142 of the unit 14, and also via a projection 12. The mass and amplitude of the plate 17 can be coordinated with the reaction moments of the system.

In addition, it is possible (see FIG. 5) to provide the upper rails 132 and 142, diametrically opposite the projections 11, with counter-balancing weights 19 for mass compensating purposes. At the level of the upper rails the inner wall of the housing 21 may carry elastic abutments 20, which serve to dampen vibrations that may occur during strong deflections of the units 13 and 14, e.g. when the shear head is removed and the units 13 and 14 operate under no-load condition.

A dryshaver according to these embodiments provides for optimum utilization of the space available in the housing, and whose vibrations are fully compensated.

Naturally, modifications are possible over the illustrative embodiments thus far described. Thus, the units 13 and 14 can, for instance, be connected with short levers (preferably of tough synthetic plastic, such as nylon or the like) with the plate 7 if the deflection of the units 13 and 14 per oscillation is so great that the expedient shown in FIG. 6 is no longer sufficient. This would be the case if the transmission of the movement of the units 13 and 14 via rigid projections 11 cannot be compensated by the elastomeric inserts 72, because the deviation from the circular oscillatory movement of the plate 7 is too great. It is also possible to make the individual oscillators narrower, and for instance to arrange two oscillators side by side in the same plane, each having half the width of the original oscillator (see FIG. 1a).

When the plate 17 is provided, it may also be used to perform work in addition to its primary compensating purpose. FIG. 9 shows that the plate, here designated as plate '7', may be lower blade of a long-hair cutter. Plate '7' is located within the housing 21, whose contour is shown in broken lines; it carries a comb-shaped blade 173 which may be riveted to it. Blade 173 constitutes, together with a comb which is fixedly mounted on housing 21, a shear system for long hair, a so-called long-hair cutter. Reference numeral 172 designates a central opening through which torsion bar 26 extends (see FIG. 8); reference numeral 171 designates a slot into which projection 12 of the unit 14 extends. In other respects this embodiment is the same as that of FIGS. 7 and 8.

Until now, the invention has been described with reference to a dryshaver of the type having a rod-shaped cylindrical housing. FIGS. 10 and 11, however, show that the invention is also applicable to flat, capsule-shaped shavers having circular shear heads, i.e. the type of shaver which is, for example, known from U.S. Pat. No. 2,720,696. The housing here is identified with reference numeral 31. It has a convex sheaf foil 33 beneath which there is mounted a dischased blade carrier 34 having a plurality of blades 341. The carrier is journaled with its shaft 342 on a traverse member or intermediate plate 32. Thus far, the construction is known.

According to the invention, there is provided in the housing space beneath the member 32 a fluidic oscillatory unit 30 which is composed of a plurality of the oscillators shown in FIGS. 1a and 1b. The unit 30 is elongated transversely of the shaft 342 and extends diametrically of the housing; it has a base plate 301 which is fastened to a side wall of the housing.

The oscillators of the unit 30 are connected at the other end of the same (the other end from the one where the plate 301 is provided) by a rail 302 which is formed at its upper side (see right-hand side of FIG. 10) with a forked portion 303. The latter has a slot into which there extends a coupling projection 61 (pointing downwardly in FIG. 10) of a swing arm 6 which is on
the shaft 342 and is rigidly connected with the latter or with the carrier 34.

It will be seen that in this embodiment the lateral deflection of the unit 30 (which is shown in broken lines in FIG. 11) is converted into a rotary oscillation of the carrier 34 and its blades 341. FIG. 12 shows that, by selecting the length $l_{20}$ of the engagement between the components 303 and 61, as related to the base plate 301 of the unit 30, relative to the (thereby determined) length $l_2$ of the arm 6, the amplitude of the rotary oscillation of the shear system can be adjusted relative to the given oscillatory deflection of the unit 30.

Evidently, the arm 6 need not necessarily be mounted on shaft 342. It can also be mounted on the element 32 via a separate mounting instrumentality, laterally offset from the center axis and axis of rotation of the shear system. In that case, however, a special coupling arrangement (e.g. in form of a coupling unit) must be provided to afford coupling with the carrier 34. Such a modification permits a better accommodation of the oscillatory amplitude of the unit 30 to the rotary oscillations of the shear system.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of applications differing from the types described above.

While the invention has been illustrated and described as embodied in a dryshaver, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

I claim:

1. An electrically operated dryshaver, comprising a housing; a circular shear head on said housing and having an opening, an apertured shearsfoil spanning said opening, and a plurality of shear blades mounted on said shear head for rotation about a center axis of said shear head and having cutting edges engaging an inwardly directed side of said shearsfoil; drive means operatively associated with said shear blades for effecting movement of the same relative to said shearsfoil, said drive means comprising two flexural units each composed of a plurality of bi-laminar flexural oscillators which are elongated in substantial parallelism with said axis, said oscillators of each unit being of ferro-electric ceramic material and being mechanically coupled for performing flexural oscillations in unison; both of said units extending substantially parallel to said axis at opposite sides thereof and each of said units having a major surface diametrically opposite a major surface of the other unit, said units being arranged to perform flexural oscillations of which those of one unit are out of phase by 180 relative to those of the other unit; and a mounting plate in said housing and rigidly connected with each of said oscillators at one end thereof.

2. An electrically operated dryshaver, comprising a housing; a circular shear head on said housing and having an opening, an apertured shearsfoil spanning said opening, and a plurality of shear blades mounted on said shear head for rotation about a center axis of said shear head and having cutting edges engaging an inwardly directed side of said shearsfoil; drive means operatively associated with said shear blades for effecting movement of the same relative to said shearsfoil, said drive means comprising two flexural units each composed of a plurality of bi-laminar flexural oscillators which are elongated in substantial parallelism with said axis, said oscillators of each unit being of ferro-electric ceramic material and being mechanically coupled for performing flexural oscillations in unison; both of said units extending substantially parallel to said axis at opposite sides thereof and each of said units having a major surface diametrically opposite a major surface of the other unit, said units being arranged to perform flexural oscillations of which those of one unit are out of phase by 180 relative to those of the other unit; and a mounting plate in said housing and rigidly connected with each of said oscillators at one end thereof.

3. An electrically operated dryshaver, comprising a housing; a circular shear head on said housing and having an opening, an apertured shearsfoil spanning said opening, and a plurality of shear blades mounted on said shear head for rotation about a center axis of said shear head and having cutting edges engaging an inwardly directed side of said shearsfoil; drive means operatively associated with said shear blades for effecting movement of the same relative to said shearsfoil, said drive means comprising at least one flexural unit composed of a plurality of bi-laminar flexural oscillators which are elongated in substantial parallelism with and equi-angularly spaced about said axis, said oscillators being of ferro-electric ceramic material and being mechanically coupled for performing flexural oscillations in unison.

4. A dryshaver as defined in claim 1, wherein said material is barium titanate.

5. A dryshaver as defined in claim 1, wherein said material is lead-circonate-titanate.

6. A dryshaver as defined in claim 1, further comprising a blade carrier turnable about said axis and on which said blades are mounted; and wherein said oscillators have other ends connected with said blade carrier.

7. A dryshaver as defined in claim 1, further comprising a blade carrier carrying said blades and being turnable about an axis, and wherein said unit has one end portion fixedly connected with a wall of said housing, and another end portion transmitting motion to said blade carrier.

8. A dryshaver as defined in claim 7, further comprising shaft means defining said axis and carrying said blade carrier; and an arm mounted fixedly on and extending transversely to said shaft means, said arm being in engagement with said other end portion.

9. A dryshaver as defined in claim 1, further comprising a torsion bar having one end rigidly connected with said mounting plate and extending along said center axis; and a blade carrier carrying said blades and mounted on said torsion bar for turning movement about said center axis.

10. A dryshaver as defined in claim 9, further comprising a disc mounted on said torsion bar coaxial and fixed therewith; and wherein said unit is connected with said disc at the other ends of said oscillators.

11. A dryshaver as defined in claim 10, said other ends having coupling projections; and further comprising elastomeric bushings affixed on said disc and having passages in which said coupling projections are received.
12. A dryshaver as defined in claim 1, said torsion bar having a projection spaced from said mounting plate; and further comprising an arresting member accessible at the exterior of said housing and movable into and out of rigid arresting engagement with said projection.

13. A dryshaver as defined in claim 6, further comprising a compensating mass body mounted in said housing for free oscillatory rotation about said axis; and wherein said unit is fixedly connected with said mass body at a location diametrically opposite the connection of said other ends with said blade carrier.

14. A dryshaver as defined in claim 6, said other ends including coupling projections which are connected with said blade carrier; and further comprising mass compensating bodies on said other ends diametrically opposite said coupling projections.

15. A dryshaver as defined in claim 2, wherein said housing is substantially cylindrical.

16. A dryshaver as defined in claim 15, wherein said units are configurated as trapezoids having respective bases facing towards said axis.

17. A dryshaver as defined in claim 1, wherein the resonance frequency of the mechanical inherent vibration of said oscillators is higher by between 2 and 10 cycles than the cycle frequency of an alternating current to which said drive is to be connected.

18. A dryshaver as defined in claim 17, wherein said vibration frequency is higher by between 3 and 5 cycles.

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