

[54] **HAIR CUTTING APPARATUS**  
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[57] **ABSTRACT**

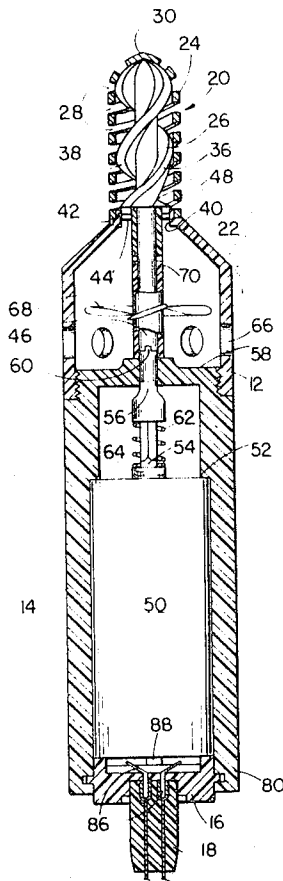
This invention relates to improvements in apparatus for cutting hair. The invention employs a novel hair cutting means which in the embodiment illustrated comprises a pair of cutting blades, one formed as a sheath within which the other blade is contained. Perforations in the wall of the sheath blade are arranged to admit the ends of the hairs to be cut into the interior of the sheath where the second blade, which has helical cutting edges, cooperates with the sheath to effect a shearing action.

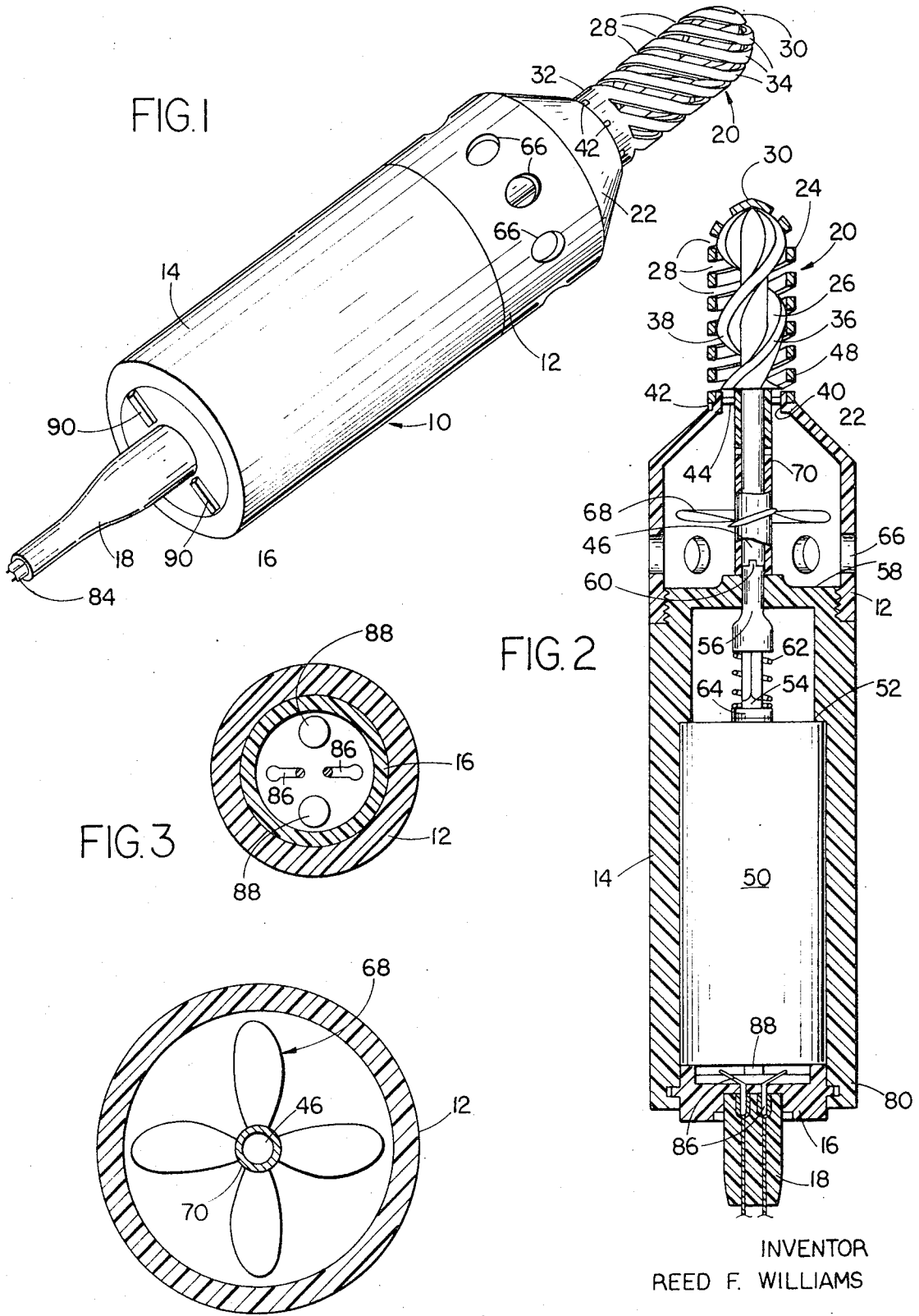
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**5 Claims, 4 Drawing Figures**





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## HAIR CUTTING APPARATUS

This invention relates to improvements in apparatus for cutting hair and it relates particularly to a hair cutting implement capable of cutting hair brought into contact with it from any radial direction towards the axis of its cutting parts.

In addition to other applications which will hereinafter be apparent, the invention is particularly useful in providing a hair clipper or shaver for cutting hairs growing from the walls of nostrils and ear canals. Accordingly, an object of the invention is to provide a novel hair clipping and shaving device useful for trimming hairs in nostrils and in ear canals and to do it safely and efficiently and to do it in a manner which insures that cut hairs will be expelled from the nostril or the ear canal. The need for the device in this application extends to humans and to animals and another object of the invention is to provide a hair clipper which can be embodied in a single structural design useful in its application to either humans or animals.

Another object of the invention is to provide a hair clipping device having a cutting head which is generally tubular in form and which is capable of cutting hairs directed to the cutting head from any radial direction. Another object is to provide such a hair cutting or shaving implement which is readily produced, easily serviced and which is easy and convenient to use.

These and other objects and advantages of the invention which will hereinafter appear are realized in part by the provisions of means for cutting hairs in response to the application of motive power and means for applying motive power to the cutting means, the cutting means including a pair of blades each having a cutting edge capable of cooperating to shear off hair extending between the cutting edges as one is moved over the other, one of said blades comprising a tubular sheath having openings formed through its wall of size to accommodate hairs and opening at the interior surface of the sheath at sharply defined interior cutting edges and the other blade of which is disposed within the sheath, the means for applying motive power comprising means for moving the second blade relatively to the sheath to carry the cutting edge of the second blade over the interior surface cutting edges of the sheath.

One embodiment of the invention has been selected for illustration in the drawings. The embodiment shown is currently preferred. However, various modifications may be made in the embodiment shown and other embodiments of the invention are possible without departing from the spirit of the invention or the scope of the appended claims.

In the drawings:

FIG. 1 is an isometric view of a hair cutting implement embodying the invention;

FIG. 2 is a cross-sectional view of the apparatus of FIG. 1, taken on a plane extending through the longitudinal axis of the unit except that certain of the elements having symmetrical shape have not been sectioned;

FIG. 3 is a transverse cross-sectional view showing the arrangement of the switch employed in the apparatus of FIGS. 1 and 2; and

FIG. 4 is a transverse cross-sectional view, shown enlarged, showing fan employed in the preferred embodiment of the invention.

Referring to FIG. 1 of the drawing, the shaving implement there shown is designated 10 and it comprises a casing which is generally cylindrical except that its forward section is frusto-conical. A cutting head is mounted upon and extends axially from the frusto-conical end of the shaver and an electrical power cord extends along the axis of the casing from its other end. As best shown in FIG. 2 of the drawing, the forward section 12 of the casing has threaded connection to the rearward section 14 of the casing at the forward end of the latter. The rearward end of the rear section 14 is closed by a rotatable end structure 16 which, as will be explained below, comprises part of an electrical switch. Electricity is introduced into the housing by a connector plug 18 which cooperates with a male plug carried by the closure member 16. The hair cutting head 20 is symmetrical about its center axis which is coincident with the axis of the casing and is mounted upon the frusto-conical section 22 of the forward casing section 12.

The invention comprises cutting means for cutting hairs in response to the application of motive power. This cutting means comprises a pair of blades each one of perforations which has a cutting edge and the two blades are capable of cutting hairs as an incident to shearing action in which the cutting edge of one blade moves relatively over the cutting edge of the other blade. In the invention, one of these blades comprises a tubular sheath having perforations formed through its side walls by which the hairs to be cut are admitted into the interior of the sheath. A sharp edge is formed at the juncture of the interior wall of the sheath with the walls that define the perforations through the sheath. A plurality of perforations are provided and a cutting edge is formed at the opening of each of these into the interior of the sheath. The second blade is mounted at the interior of the sheath and is rotatable about the axis of the interior wall of the sheath so that its cutting edge moves over the cutting edges of the sheath. The second blade rotates but its rotation may occur as complete revolutions or as an oscillatory motion. When the second blade oscillates it is advantageously provided with a double shearing edge to provide a shearing action during both phases of its oscillatory motion. In such a case the shearing edges of the sheath are advantageously formed about the entire periphery of the sheath wall margin that marks the opening of the perforations into the interior of the sheath. When the second blade revolves, or when the second blade oscillates but is expected to provide a shearing action during only one phase of its oscillatory motion, the perforations through the sheath need form a cutting edge at only one side of the perforation openings and the second shear need have only one shear edge associated with each blade or blades.

The shearing edge of the second blade may lie in a single radial plane extending through the axis of blade rotation and it may comprise a number of such blades arranged in parallel. Advantageously, however, the cutting edge of the second blade is formed as a helix extending around the axis of the blade rotation. The preferred embodiment incorporates this feature because it serves a useful function in helping to dispose of hair trimmings.

In the preferred form of the invention, selected for illustration in the drawing, the cutting head 20 comprises a first blade 24 having the form of a sheath containing the second blade 26. The sheath is tubular in form. It is cylindrical except at its forward end which is dome-shaped and closed. The rearward end is open. A series of parallel helical grooves 28 extend in parallel around the sheath from a point near to, but removed from, the rearward edge of the sheath to a point at the forward end of the sheath where they terminate to circular connecting structure 30. At its rearward portion the sheath is unperforated and this section serves as a collar 32 by which the sheath is mounted upon the frusto-conical section 22 of the casing. The spiral grooves or slots 28 extend entirely through the side wall of the sheath 24. They could be formed as circular openings or they could be helical in form but of shorter length being interrupted by cross supports to lend rigidity to the unit. Openings of this form, and in fact of any form which will admit the ends of hairs to be cut to the interior of the sheath, are contemplated within the invention. However, the preferred form, and the one selected for illustration in the drawings, contemplates helical perforations which extend from a point near the rearward end of the sheath entirely around the sheath to a terminus at the forward support 30. Thus formed, the structure can be likened to a number of connecting strips helical in form about the axis of the unit and extending from the collar at one end to the disk at the other. It will be apparent from examination of FIGS. 1 and 2 that the end disk 30 can be rotated relatively to the collar section 32 in a direction to tighten the helices comprising the connecting strips 34 thereby to reduce the inside diameter of the sheath. The sheath is made of resilient material whereby the interior wall of the sheath 24 has a given diameter in relaxed condition. The diameter can be increased by unwinding the helical strips 34 against their bias. The inner blade 26 has an outer diameter very slightly larger than the inside diameter that the sheath has in its relaxed condition. When the sheath is assembled over the second blade 26 the connecting strips 34 are made to unwind slightly. The renitence of the strips 34, thus stressed, tends to make them squeeze against the inner blade 26.

The inner blade is provided with two opposed helical cutting edges 36 and 38 which extend over its length within the sheath 24 and the sheath squeezes against these cutting edges with very light pressure sufficient, nonetheless, to provide a very effective shearing action with the edges formed at the interior of the sheath by the juncture of the inner wall of the spiral strips 34 and the side walls of these strips which define the spiral recesses 28. While the pressure with which the sheath 24 squeezes upon the inner blade 26 is very light, means are advantageously provided for preventing frictional force between the two blades from effecting rotation of the sheath 24 as the second blade 26 is rotated as hereinafter described. The means by which the sheath is prevented from rotation is best seen in FIG. 1. At its forward end the truncated conical end 22 of the implement casing is castillated and the rearward end of the sheath 24 is castillated in complementary form to the end that projections 42 from the casing fit within notches formed in the collar portion 32 of the sheath 24 and prevent relative rotation between the two.

The forward end 22 of the casing terminates in a tubular section 40 extending axially forward from the section 22 and having outside diameter to form a press fit within the collar portion 32 of the sheath 24. The sheath is assembled with the casing section 22 by sliding the tubular portion 40 within the open end of the sheath such that the projections 42 are disposed within the corresponding notches formed in the rearward edge of the sheath 24. Casing section 12, and the frusto-conical section 22 formed integrally therewith, is hollow. However, at its forward end it is provided with a sleeve whose axis is coincident with the axis of the casing. The sleeve 48 is connected by a spider 44 to the tubular section 40. Its inner diameter accommodates the rearwardly extending drive shaft 46 of the second blade 26. The sleeve 48 forms a bearing for rotation of the shaft 46.

Means are provided in the invention for applying motive power to the cutting means in the form of means for moving the second blade relatively to the sheath to carry the cutting edge of the second blade over the interior surface edges of the sheath. In the embodiment shown, the motive power means is effective to rotate the helical cutting blade 26 within the sheath 24. To this end means are provided for applying forces to rotate the shaft 46. In this embodiment the motive means is effective to make the shaft revolve. Advantageously, as shown, the motive means comprises an electrically powered motor coupled to the shaft 46. In FIG. 2 the motor 50 is disposed within the interior of the rear section 14 of the casing of the implement 10. The interior of the casing has size to accommodate the motor and it is provided with conformations in its walls, such as the shoulder 52, by which the motor is held in proper position. Motor output is taken at output shaft 54 which revolves upon an axis coincident with the axis of the casing and of the second blade 26 and its shaft 46. Means are provided for coupling the shaft 54 of the motor 50 to the drive shaft 46. In the embodiment selected for illustration in the drawing, this means comprises a shaft extension 56. The extension 56 extends through an axial bore at the forward end 58 of the casing section 14. The margins of this bore form a bearing for rotation of the shaft extension. The forward end of the extension is provided with a key 60 which interlocks with a corresponding notch in the lower end of the blade shaft 46.

The motor shaft is formed to fit within an opening in the lower end of the shaft extension 56 to form a driving connection. Thus, the motor shaft may, as shown, be made square in cross-section to fit within a square opening in the lower end of the shaft extension. At its lower end the shaft extension is enlarged to form a spring gland by which to retain a compression spring 62 which is trapped between this spring gland and a spring gland 64 carried upon the shaft 54. The function of the compression spring 62 is to force the shaft extension 56 upwardly so that its key 60 is retained within the cooperating slot at the lower end of shaft 46 to maintain the driving connection. In addition, spring 62 forces the inner blade 26 upwardly against the disk end 30 of the sheath 24 to maintain the cutting surfaces of the blade in engagement with the forward, closed end 30 of the sheath. The thrust forces are taken by the end disk 30 and no thrust bearing is required at sleeve 48 or at the end wall 53 of the casing section 14.

In a preferred form of the invention means are provided for expelling hair clippings from the interior of the cutting head 20. This means comprises a means for causing a movement of air through the cutting head to an exit point at one end. In the embodiments selected for illustration two structures are provided both of which perform this function. Because of the helical shape of its cutting edge, the inner blade 26 serves to force air movement towards the open end of the sheath 24 when the inner blade is rotated. This air is free to move downwardly, in FIG. 2, past the spider 44 by which the sleeve 48 is mounted upon the casing. Passing through the spider 44 the air enters the interior of the forward section 12 of the casing from whence it may exit via a series of perforations 66 which extend around the periphery of the forward section 12. To augment the action of the helical cutting edges of the blade 26 a multiple bladed fan 68 is provided. In the embodiment shown the fan comprises four blades extending laterally outward from a central hub 70. The hub is bored so that it may be press fitted upon the shaft 46. When forced over the blade shaft 46 the hub 70 will rotate with the shaft and serves to retain the inner blade 26 in assembled condition despite removal of the sheath 24 for any reason. Advantageously, as shown, the hub 70 has length sufficient to extend over the connection between shaft 46 and shaft extension 56. This arrangement assures that the shaft and shaft extension will remain in alignment with the key of one fitting within the notch of the other and without the need for a more complex locking conformation. This construction is shown in cross-section in FIG. 4.

Advantageously, as shown, the helix shaped strips 34, which form the sheath 24, advance in the same direction as the cutting surfaces of the inner blade 26. The pitch or the rate of advance of the inner blade helix is advantageously different from the pitch or rate of advance of the helixes associated with the sheath 24 less binding occur. It is advantageous that they advance in the same direction as shown so that the frictional forces between the two are not permitted to tend to "unwind" the strips 34 that comprise the outer sheath 24.

Means are provided for applying electrical energy to the motive means 50 and a preferred form of this means is illustrated in FIGS. 2 and 3 of the drawing. At its rearward end the rearward section 14 of the casing is provided with an annular recess formed on its interior surface. This recess is designated by the numeral 80 in FIG. 2. The end closure 16 of the casing is provided with an annular rib on its exterior surface which fits within that groove 80. Portions of the casing and end closure are cut away to permit assembly of the end closure with the casing and the end closure is retained in position by a detent means not shown. The central rear face of the end closure 16 is provided with a recess which extends partly through the end closure member and is oblong in cross-section. This recess accommodates the oblong shaped, female connector 18 at the end of an electrical cord 84. A male connector, comprising two L-shaped members 86, is assembled with the end closure 16 so that one arm of each member 86 extends through the end closure rearwardly in parallel into the recess where they are spaced for engagement with the connector 18. The other arm of each of the L-shaped members 86 is disposed on the forward face of

the end closure 16. The two arms extend in opposite directions with their outer ends projecting forwardly from the forward face of the end closure 16. The motor 50 is provided with two input terminals at its rearward end. These terminals 88 are arranged opposite one another on the rear face of the motor in position for engagement by the outer end of the inner arms of the two connector members 86 in one rotational position of the end member 16 relative to the casing 14. The arms of the connector members 86 have sufficient resilience to maintain electrical contact with the terminals 88, when rotated to engage them. To facilitate rotation of the enclosure 16 and effect switch action, its rearward face is provided with a pair of projections 90 which permit the application of finger pressure to accomplish switching.

Although we have shown and described certain specific embodiments of our invention, we are fully aware that many modifications thereof are possible. Our invention therefore is not to be restricted except insofar as is necessitated by the prior art and by the spirit of the appended claims.

I claim:

1. Haircutting apparatus comprising in combination, a generally cylindrical casing, electrically energizable motive power means in said casing, means connected to said casing for conducting electrical energy to said motive power means, a housing including a frusto-conical section connected to one end of said casing and formed with a plurality of angularly spaced radial openings, a generally cylindrical sheath mounted on the reduced end of said frusto-conical housing and formed with a plurality of helically-shaped slots through which human hair can extend, an inner blade rotatably mounted within said sheath to cooperate therewith to shear said hairs, power transmission means interposed between said motive power means and said inner blade comprising a shaft rotatably mounted in said housing and having one end operatively connected to said inner blade and a rotatable output shaft in said casing having one end drivingly connected to said motive power means, an impeller mounted on said first named shaft to rotate therewith, and spring-loaded coupling means interconnecting the other ends of said first named shaft and output shaft comprising a coupling element on said output shaft engageable with said first named shaft and a compression spring interposed between said motive power means and said coupling element to urge the latter into engagement with said first named shaft.

2. Haircutting apparatus according to claim 1 wherein said coupling element is formed with a key on the end thereof and said housing shaft is formed with a slot for receiving said key to effectively interconnect said first named and output shafts.

3. Haircutting apparatus according to claim 2 wherein said inner blade is formed with a helical cutting edge for cooperation with the cylindrical sheath.

4. Haircutting apparatus according to claim 3 wherein said frusto-conical housing and said casing are formed with mating fastening threads for engagement and disengagement thereof.

5. Haircutting apparatus according to claim 4 wherein said coupling element is slideably mounted on said output shaft, and means is provided for limiting

travel of said element in response to the force of said  
compression spring.

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