Nov. 14, 1944.

E. F. SARVER

2,362,666

AIR POWERED HAIR CUTTER

Filed April 15, 1943

2 Sheets-Sheet 1

Fig. 1.

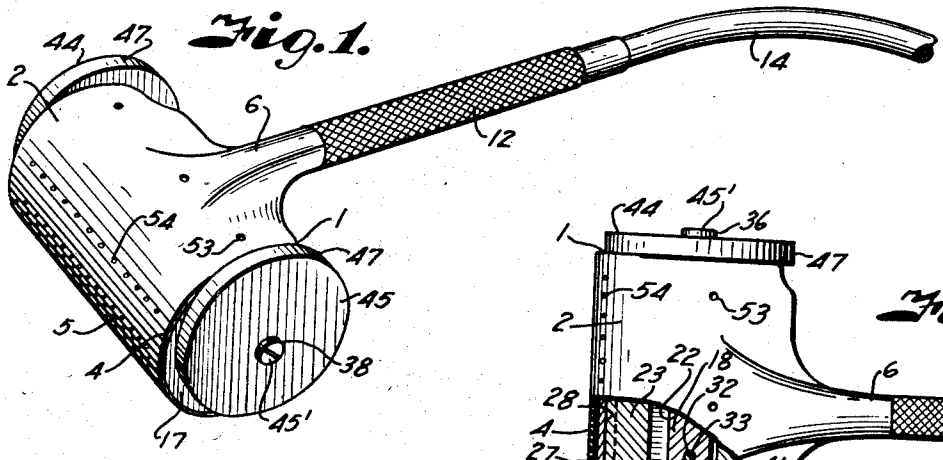


Fig. 2.

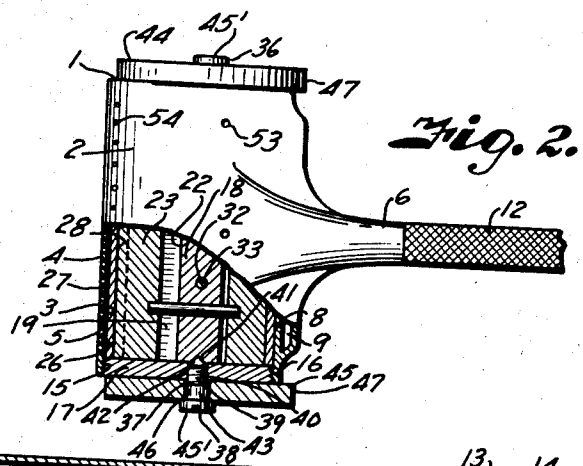


Fig. 3.

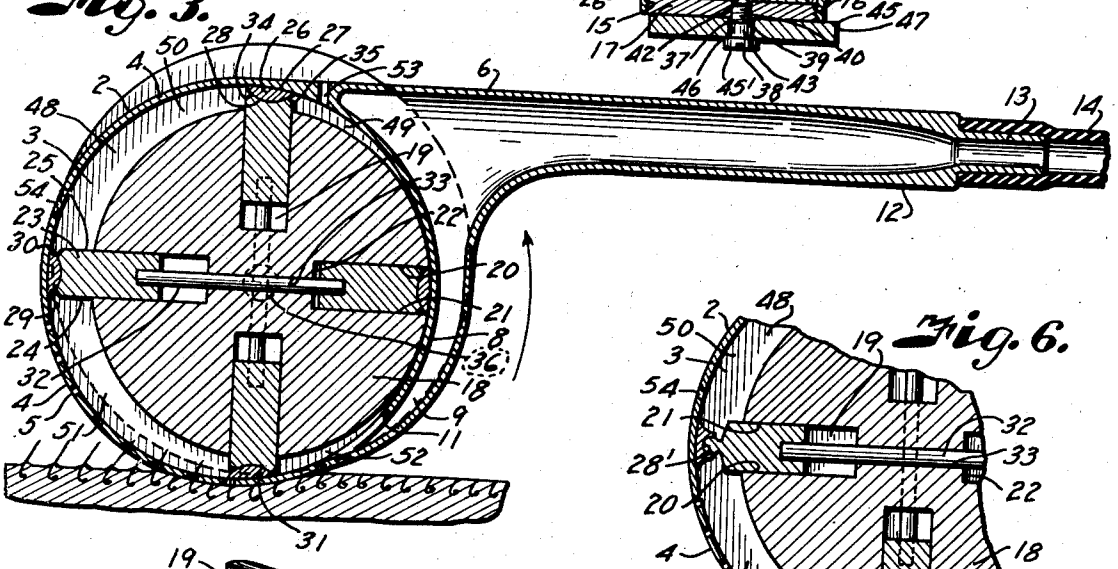
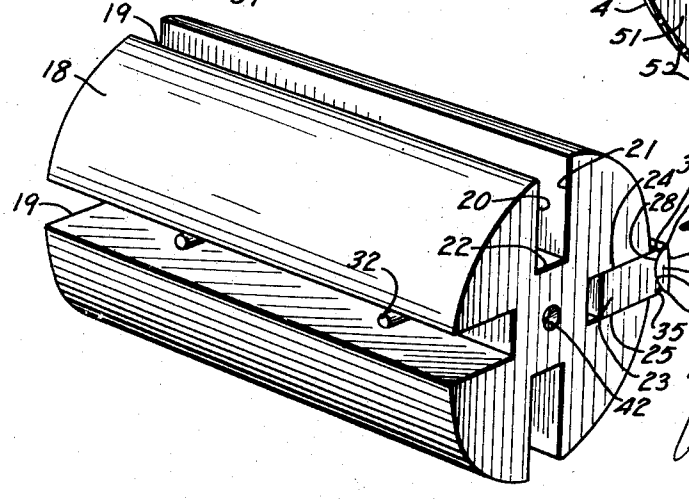


Fig. 6.

Fig. 4.



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Fig. 5.

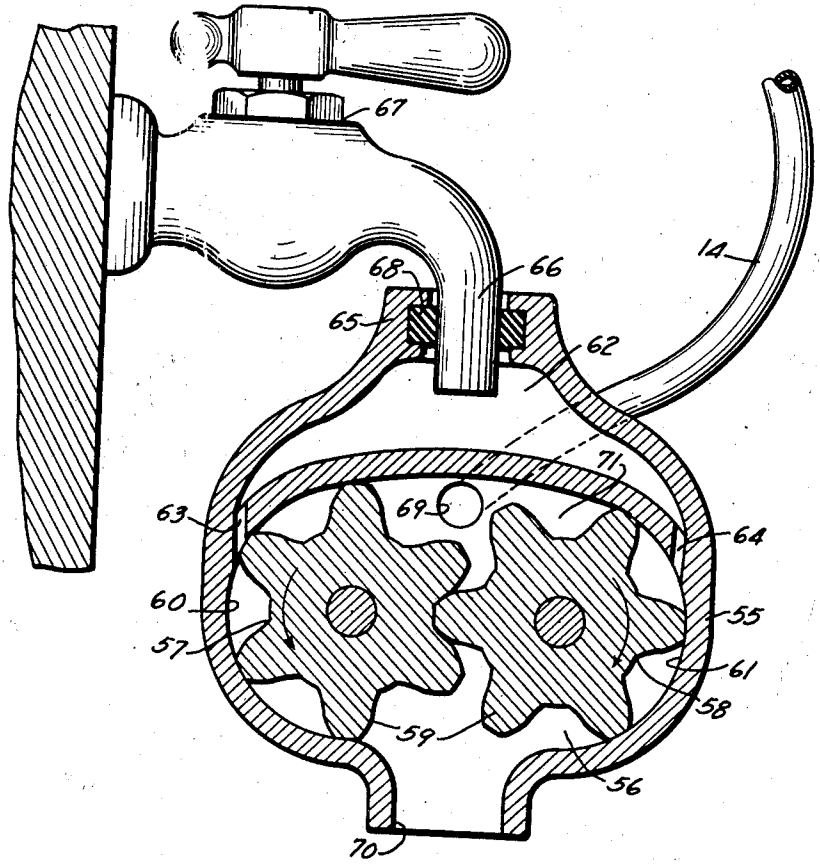


Fig. 7.

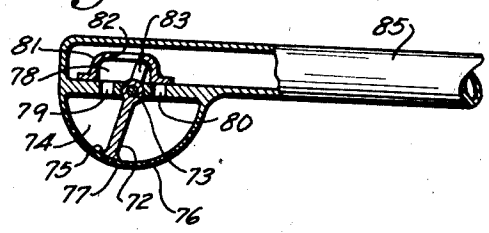


Fig. 9.

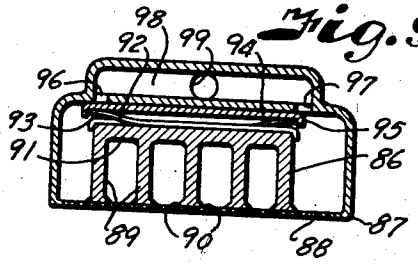


Fig. 8.

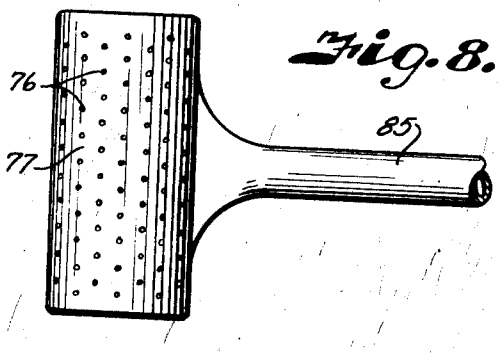
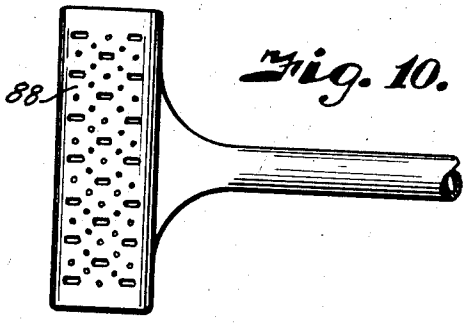


Fig. 10.



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AIR POWERED HAIR CUTTER

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Application April 15, 1943, Serial No. 483,132

9 Claims. (Cl. 30—41)

This invention relates to pneumatically operated hair cutters and has for its principal objects to provide a simple, compact, cool-operating, and self-cleaning structure that is readily operable and not harmful to the skin.

Other objects of the invention are to provide for application of actuating air directly upon the movable cutting elements; and to utilize the actuating air for facilitating entrance of hair into the cutter, for effecting removal of the cut hair and for facilitating the dispersion of heat generated incidental to operation of the device.

In accomplishing these and other objects of the invention, hereinafter pointed out, I have provided improved details of structure, the preferred forms of which are illustrated in the accompanying drawings, wherein:

Fig. 1 is a perspective view of a hair cutter constructed in accordance with the present invention.

Fig. 2 is a plan view of the hair cutter, a portion of which is broken away and shown in section to better illustrate the cutter bar elements and one of the journals for mounting the rotor.

Fig. 3 is an enlarged cross-sectional view through the hair cutter.

Fig. 4 is a perspective view of the rotor body showing one of the cutter bars in position therein.

Fig. 5 is a sectional view through one form of suction pump by which the cutter may be actuated.

Fig. 6 is a fragmentary cross-sectional view through a hair cutter having a modified form of cutter bar elements.

Fig. 7 is a cross-sectional view showing a modified form of the invention employing an oscillatory type of cutter.

Fig. 8 is a face view of the form of invention shown in Fig. 7.

Fig. 9 is a sectional view through the cutting head of a further modified form of invention, the cutter element being adapted for reciprocation.

Fig. 10 is a face view of the form of the invention illustrated in Fig. 9.

Referring more in detail to the drawings:

1 designates a hair cutter constructed in accordance with the present invention, and which includes a shell 2 shaped to provide a substantially cylindrical rotor chamber 3 having a relatively thin wall 4. The wall 4 has a plurality of rows of apertures 5 covering, for example, a quarter thereof and of a size adapted to pass hair into the cylindrical chamber when the perforated face is moved over the skin as illustrated in Fig. 3. Formed on the cylindrical shell, diametrically opposite the perforations, is a tubular neck 6, the top of which extends substantially opposite the lowermost of the apertures 5, as best illustrated in Fig. 3. The lower portion of the neck joins the wall 8 adjacent the lowermost row of apertures to form a passageway 9 having connection with the rotor chamber through a slot-like port 11. The neck 6 terminates in a handle 12 and carries a nipple 13 for attaching one end of a flexible hose or duct 14, having its opposite end connected with a suction pump later described. The exterior surface of the handle may be suitably knurled as shown in Fig. 1.

The ends of the rotor chamber are provided with internal threads 15 for receiving the external threads 16 of disks 17 which are turned into the ends of the cylinder to complete closure of the rotor chamber and retain the rotor 18 now to be described.

The rotor 18 is best illustrated in Fig. 4 and includes a cylindrical body of a length adapted to be received between the ends 17, and of smaller diameter than the internal diameter of the rotor chamber. Formed in the rotor body are longitudinal grooves 19 arranged radially with respect to the axis of the rotor and having side faces 20 and 21 and bottom faces 22 for supporting bars 23. The bars 23 are substantially coextensive with the rotor body and have side faces 24 and 25 closely engaging the side faces 20 and 21 of the grooves in such a manner that the bars 23 are slidable therein to support cutter bars 26 in contact with the inner surface of the rotor chamber.

The cutter bars 26 comprise elongated strips having arcuate outer faces 27 corresponding in radius to the rotor chamber and having reversely arranged inner arcuate faces 28 of a radius adapted to intersect with the outer faces 27 in cutting edges 29 and 30. The cutter bars are of a width substantially corresponding to the slide bars 23 so that they are receivable within the grooves of the rotor when the slide bars are retracted. The rounded faces 28 of the cutter bars are journaled within correspondingly shaped grooves 31 formed in the outer edges of the bars 23, whereby the cutter bars are adapted to pivot and maintain the outer faces 27 in constant contact with the inner surface of the rotor chamber to form a substantially leakproof seal therebetween.

The slide bars 23 ordinarily retain the cutter bars 26 in contact with the wall of the cylindrical chamber responsive to centrifugal force. In order

to avoid possible sticking of the slide bars, the bars are preferably arranged in pairs and the bars of each pair are interconnected by push rods 32 which are freely slidable within bores 33 extending between the bottoms of the diagonally opposed grooves as best illustrated in Fig. 3. The free ends of the push rods 32 are loosely fitted within sockets 34 formed within the inner edges of the slide bars 23 so that there is slight relative movement between the bars and ends of the rods. In order that the cutting edges 29 and 30 are exposed when the cutter bars are moved across the perforated section of the shell, the outer corner edges of the slide bars 23 are beveled as indicated at 34 and 35.

The rotor, equipped with the cutters as above described, is mounted eccentrically of the axis of the rotor chamber on journals 36 and 37 as best illustrated in Fig. 2. The journals preferably comprise screws 38 having threaded shanks 39 engaging threads in openings 40 in the respective disks 17. The ends of the screws are pointed at 41 to engage in conical sockets 42 provided in the ends of the rotor as shown in Fig. 4. The outer ends of the journals have collar portions 43 mounting elevators 44 and 45 which are retained in frictional contact with the disks 17 by heads 45 of the journals. The elevators are in the form of disks substantially corresponding in diameter to the diameter of the shell 2 and have eccentrically arranged openings 46 through which the collar portions of the journals extend. It is thus apparent that the elevator disks are mounted eccentrically of the axis of the cylinder in such a manner that the disks may be moved with respect to the cylinder to bring the peripheral faces 47 thereof into projecting relation with respect to the apertured section of the shell. When the rotor assembly is mounted in the rotor chamber, a side thereof closely contacts the wall of the rotor chamber adjacent the passageway 9 so that a substantially crescent-shaped passageway 48 is provided on the opposite side of the rotor and which is divided by the slide and cutter bars into a plurality of chambers 49, 50, 51 and 52 which vary in volume according to their position in the passageway 48. To break the vacuum ahead of the slide bars after the bars pass the port 11, the shell is provided with apertures 53 and 54 as best shown in Fig. 3. The cutter thus described may be connected with a source of suction, for example, a water driven air pump as illustrated in Fig. 5, or the flexible duct may be connected with the intake manifold of an internal combustion engine whereby the razor may be adapted for use of travelers.

The pump shown in Fig. 5 is illustrated to better describe the operation of the hair cutter. The pump may be of ordinary gear type and includes a housing 55 having a gear chamber 56 in which is rotatably mounted a pair of meshing gears 57 and 58, the teeth 59 of which move in close contact with opposite end walls 60 and 61 of the gear chamber. The upper portion of the housing has a manifold 62 connected with ends of the gear chamber through ports 63 and 64. The manifold 62 has a neck 65 adapted to be slipped over the spout 66 of a faucet 67, the neck 65 being sealed with the spout 66 by a suitable gasket 68. The flexible connection 14 connects with a port 69 located in the upper central portion of the gear chamber. The gear chamber also has an outlet through a spout 70.

It is apparent that when water is discharged under pressure into the manifold, water discharges through the ports 63 and 64 to act upon the teeth of the gears and effect rotation of the gears in the direction of the arrows. Since the gears are in meshing relation, they cooperate with the upper portion of the gear chamber to provide a variable capacity chamber which effects movement of air from the cutter through the flexible duct 14 and port 11.

The form of cutter bar shown in Fig. 6 is similar to the structure just described, with the exception that the slide bars have bead-like ribs 27' and the cutters have socket-like grooves 28' to receive the ribs 27'.

In using a cutter constructed and assembled as described, the apertured section thereof is moved over the skin in such a manner that the hairs are projected through the apertures and into the path of the cutter bars which sever the projecting ends. The severed ends are drawn by the rush of air through the port 11, passageway 9, and flexible duct 14 and discharged with the water from the discharge spout 70 of the vacuum pump.

Attention is directed to the fact that the atmospheric air rushing through the apertures facilitates entrance of the hairs and assures a substantially clean shave with a minimum of passages of the cutter over the skin. The expansion of air drawn through the perforations in passing from atmospheric pressure to a lower pressure causes a small drop in temperature and the volume of air flowing through the shell of the housing carries off heat of friction generated incidental to operation, so that the device is cool in operation and avoids discomforts where heat of friction is accumulative. Since the air stream carries away the severed hairs, there is no clogging of the cutter or the usual annoyance of loose hair. When shaving, the apertured face of the shell would ordinarily be supported in close contact with the skin, however, the cutter may be adjusted by swinging the elevators 44 and 45 into position so as to space the apertured face a selected distance from the skin.

The form of invention shown in Fig. 7 employs an oscillatory type of cutter blade 72 arranged to swing on a pivot 73 within a substantially semi-cylindrical compartment 74 so that the cutting edges 75 of the blade move in shearing contact with hair projected through the apertures 76 in the arcuate face 77 of the housing. A valve chamber 78 is provided on the top of the housing and is connected with the chamber 74 on opposite sides of the pivot 73 by ports 79 and 80. The ports are alternately opened and closed by a D shaped valve 81 having a port 82 in the top thereof connected with the valve chamber 78. The valve is operated by a finger 83 projecting upwardly from the oscillatory cutter to shift the valve for alternately opening and closing the ports 79 and 80. The valve chamber is connected by a duct 85 with a suitable source of suction as in the preferred form of the invention. It is obvious that suction acts on a side of the oscillatory cutter through the uncovered ports 79 and 80 whereby the vacuum causes the cutter to swing in the direction of the uncovered port to shear off any hair protruding through the apertures. When the cutter reaches the limit of its movement, the finger 83 has engaged an end of the valve to effect shifting thereof which brings the valve into covering relation with the uncovered port and opens the other port and opens the

other port so that the vacuum is effective on the opposite side of the cutter.

In the form of the invention shown in Fig. 9, the cutter 86 is slidably mounted within a shell 87 having a substantially flat apertured bottom face 88. The cutter 86 is shown as comprising a plurality of spaced blades 89 having cutting edges 90 movable over the inner surfaces of the section 88. The blades are connected by a bar 91 that carries a spring 92 having flexible fingers 93 and 94 on the ends thereof which engage a valve plate 95 to retain the cutting edges of the blades in cooperative shearing contact with the apertured section 88 and the valve plate 95 in position to alternately open and close ports 96 and 97 that connect the respective ends of the cutter chamber with a manifold chamber 98. The manifold chamber 98 has a connection with a source of suction through a port 99.

With this arrangement the cutter is reciprocated within the housing by suction through the uncovered port, the cutter being shifted laterally in the direction of the uncovered port until that port has been closed by the plate 95, whereupon the opposite port is uncovered to render the corresponding end of the cutter effective to action of the vacuum whereupon movement of the cutter is reversed.

It will be noted that in each instance the actuating air acts directly upon the cutter elements to effect movement thereof so that the cutter is operated with a minimum of parts and therefore results in a substantially compact and simple structure that is easy to manipulate. Direct contact of the propelling air with the cutter elements absorbs heat of friction which is removed by the air through the source of suction. The relatively large volume of air drawn through the apertures tends to lift the hairs and facilitate their entrance through the apertures into contact with the cutting edges. The projecting ends of hairs severed by the cutter elements are then drawn by the air and disposed of through the source of vacuum so that the operating parts are at all times free of severed hair which might clog the parts and which are ordinarily disagreeable.

What I claim and desire to secure by Letters Patent is:

1. A hair cutter including fixed and movable members each having cooperating cutting edges, said members having at least one air chamber therebetween adapted to change in capacity upon movement of the movable member relatively to the fixed members, and pneumatic means having connection with said chamber for effecting movement of air through the chamber in propelling contact with the movable member and for discharging hair severed by the cutting edges.

2. A hair cutter including a shell having a substantially cylindrical cutter compartment provided with apertures forming cutting edges in a wall thereof, a cutter supported in the compartment providing changeable capacity chambers therebetween responsive to flow of air through said chambers, said cutter having cutting edges cooperating with the cutting edges of the apertures for cutting hair projecting through said apertures, and means connected with the chambers for drawing said air through the apertures to facilitate entrance of the hair to be cut and for effecting movement of the cutter to sever the projected hair.

3. A hair cutter including a shell having a rotor compartment provided with apertures in a wall thereof, the edges of said apertures forming cutting edges, a rotor body in the rotor compartment, cutter bars slidably carried by the rotor body and having cutting edges cooperating with the first named edges, means journaling the rotor body eccentrically of the rotor compartment, and pneumatic means connected with the shell for drawing air through the apertures to act upon said cutter bars and effect rotation of the rotor body.

4. A hair cutter including a shell having a rotor compartment provided with apertures in a wall thereof, the edges of said apertures forming cutting edges, a rotor body in the rotor compartment, slide bars carried by the rotor body, means journaling the rotor body eccentrically of the rotor compartment, cutter bars having self aligning connection with the first named bars and provided with cutting edges movable in contact with the wall of said rotor compartment, and pneumatic means connected with the shell for drawing air through the apertures to act on said slide bars and effect rotation of the rotor.

5. A hair cutter including a shell having a rotor compartment provided with apertures in a wall thereof, the edges of said apertures forming cutting edges, a rotor body in the rotor compartment having longitudinal radially arranged grooves, bars slidable in said grooves, means journaling the rotor body eccentrically of the rotor compartment, cutter bars having self aligning connection with the slide bars and provided with cutting edges movable in contact with the wall of said rotor compartment, and pneumatic means connected with the shell for drawing air through the apertures to effect rotation of the rotor.

6. A hair cutter including a shell having a cutter compartment provided with apertures in a wall of the compartment forming cutting edges, a cutter reciprocably supported in the shell and having cutting edges movable over the cutting edges formed by said apertures, means on the shell forming a valve compartment having ports connected with said cutter compartment, a valve in the valve compartment for alternately opening and closing said ports, and suction means connected with the valve compartment for effecting reciprocation of the cutter.

7. A hair cutter including a shell having a cutter compartment provided with apertures in a wall of the compartment forming cutting edges, a cutter reciprocably supported in the shell and having cutting edges movable over the cutting edges formed by said apertures, means on the shell forming a valve compartment having ports connected with said cutter compartment, a valve in the compartment for alternately opening and closing said ports, valve suction means connected with the valve compartment for effecting reciprocation of the cutter, and a connection between the cutter and the valve to effect reciprocation of the valve responsive to movement of the cutter.

8. A device of the character described including a shell having an apertured wall portion for admitting hair into the shell and providing cutting edges, a cutter element having a cutting edge cooperating with the said edges to cut off hair entering the shell, said cutting element having impelling surfaces on opposite sides of said cutting edge, means mounting the cutter element in said shell for movement of the cutting edge on said cutting element relative to cutting edges of said apertured wall portion, and means for producing movement of air from the shell on the

side of one of said surfaces to induce movement of air into the shell through said apertured wall portion to act on the other impelling surface for producing movement of the cutter element in the shell.

9. A device of the character described including a shell having an apertured wall portion for admitting hair into the shell and providing cutting edges, a cutter element carrying a cutting edge cooperating with said edges to cut off hair entering the shell, said cutting element having impelling surfaces on opposite sides of the cutting edge that are carried thereby, means mounting the cutter element in said shell for movement of the cutting edge on said cutting element relative to cutting edges of said apertured wall portion, a flexible duct connected with the shell on one side of one of said surfaces, and suction means connected with said duct to effect movement of the cutter element responsive to movement of air into the shell through said apertured wall portion for acting on the other impelling surface.

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