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J. H. FOX
MOTOR AND LONGITUDINALLY SPLIT HOUSING STRUCTURE
FOR HAIR CLIPPER

3,479,540

Filed Sept. 11, 1967

2 Sheets-Sheet 1

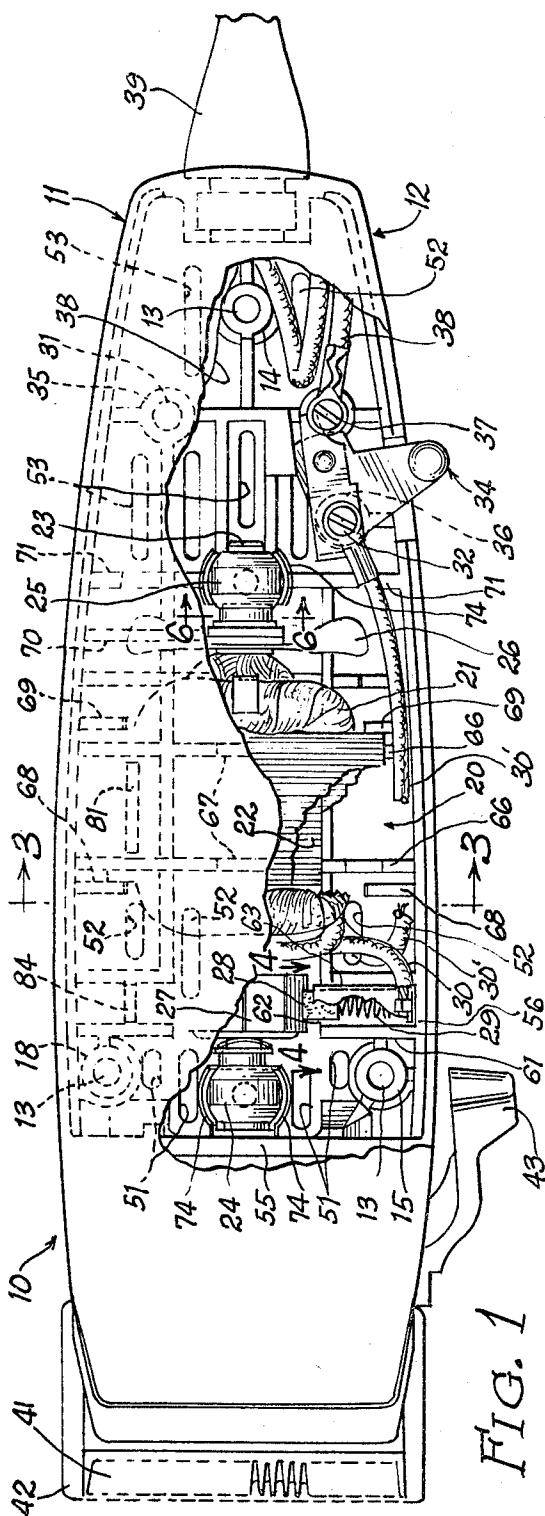


FIG. 1

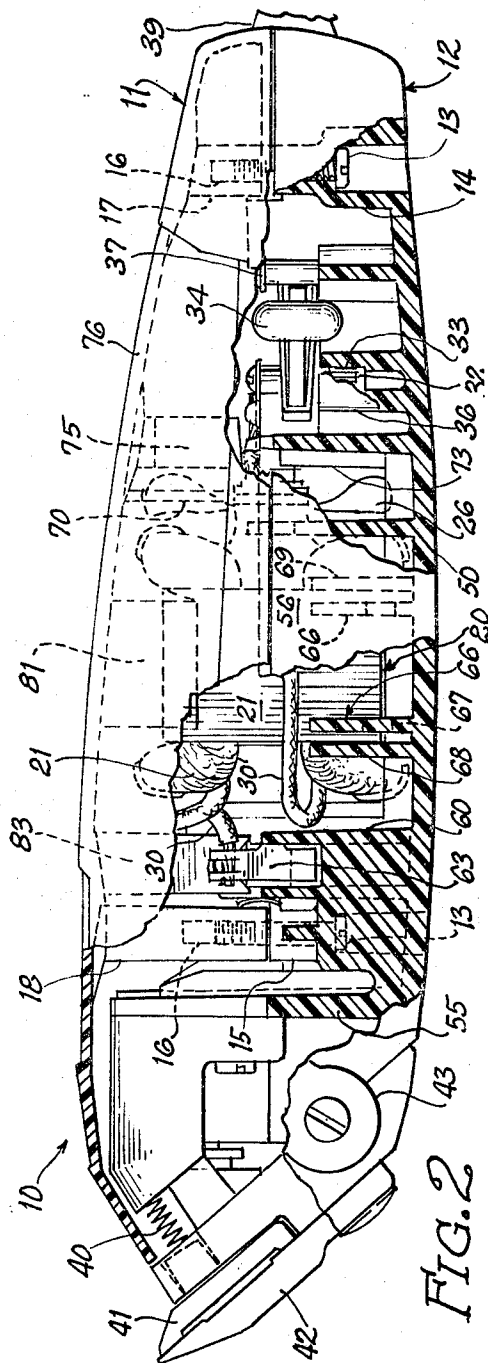


FIG. 2

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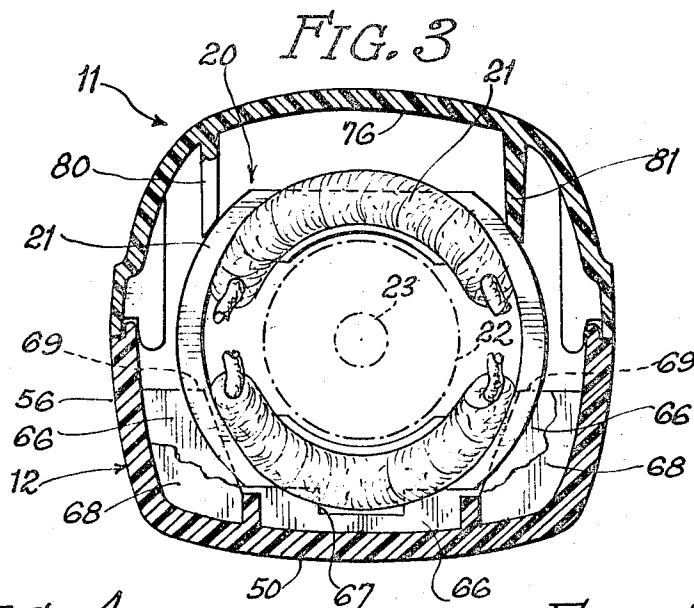


FIG. 4

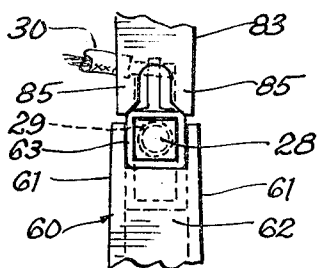


FIG. 5

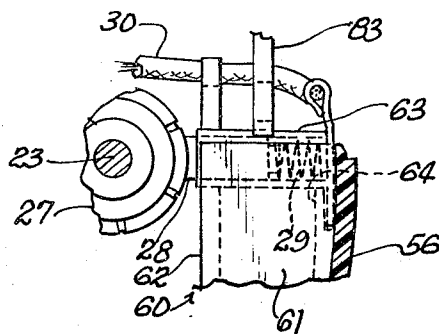


FIG. 6

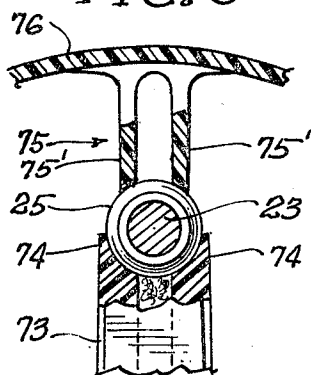
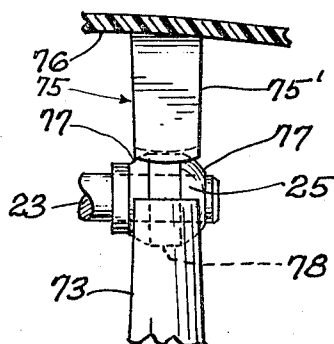


FIG. 7



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3,479,540

MOTOR AND LONGITUDINALLY SPLIT HOUSING STRUCTURE FOR HAIR CLIPPER

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U.S. Cl. 310—50

8 Claims

ABSTRACT OF THE DISCLOSURE

A hair clipper having a rotary motor and a housing made of two components abutted and secured to each other has a structure that utilizes a modified housing for performing plural functions, namely, enclose the motor, establish and maintain the necessary operative relationship between parts of the motor, and provide paths for motor-cooling air.

BACKGROUND OF THE INVENTION

The invention relates to a hair clipper which has a housing enclosing a motor and a transmission mechanism. The latter operates to reciprocate in a linear manner a movable cutter blade mounted at the front end of the clipper between the housing and a stationary comb blade. In conventional constructions, the motor parts are mounted and fixed in operative relationship by a frame structure of several interconnected members, and the over-all motor-frame assembly is placed within a housing that properly positions the frame members.

SUMMARY OF THE INVENTION

The invention is an improvement in the construction of a hair clipper that avoids the previous requirement of a number of frame elements united to each other and to various parts of the motor. This improvement is accomplished by the use, in accordance with the present invention, of a specific construction for the housing and motor that provides as an over-all effect the positioning and stability required for components of the motor in a simple construction that can reduce the size of the housing and more especially can provide a lighter and less expensive hair clipper than conventionally manufactured heretofore. Other advantages appear below.

The housing of the hair clipper of this invention has a two-piece construction. Each of the housing components has specific bosses that cooperate with complementary bosses of the other housing component to provide, in the over-all assembly, the geometrical relationship between various components of the motor that insure the continued operativeness of the motor, in particular the operativeness of the rotor with respect to the stator.

The housing components of the hair clipper of the invention have various bosses as mentioned above. One of the housing components has bosses that support and position the bearings that rotatably carry the rotor shaft on a fixed longitudinal axis while other bosses of that housing component position the stator of the motor. The other housing component has hold-down bosses. Some of these latter bosses engage the bearings mentioned above while others engage the stator when the housing components are secured together. Thus the positioning bosses and the hold-down bosses locate and support the bearings and the stator at the positions required to maintain the stator and rotor in operative relationship.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top plan view, partially broken away, of the preferred hair clipper of the present invention, showing in broken lines in the part not broken away only those

elements and structures relating to the present invention.

FIG. 2 is a side elevational view, partially broken away, of the hair clipper and likewise showing in broken lines only those components and structures relating to the invention.

FIG. 3 is a cross sectional view taken on line 3—3 of FIG. 1.

FIG. 4 is a fragmentary view of one of the motor brushes, the brush support means, the cooperating support and positioning boss, and hold-down boss, as seen on line 4—4 of FIG. 1.

FIG. 5 is a fragmentary view of the commutator, motor brush, brush support means, and bosses as viewed from the right in FIG. 4.

FIG. 6 is a fragmentary view, partly in section, of the rear bearing, the positioning boss, the rotor shaft and a hold-down boss that is integral with the upper housing component, as viewed on line 6—6 of FIG. 1.

FIG. 7 is a fragmentary view, partly in section, of the components of FIG. 6 as seen from the right of FIG. 6.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings, the clipper generally designated 10 has a top housing component 11 and a bottom housing component 12 (FIG. 2) that are secured to each other by screws 13 extending through a rear tubular boss 14 and a pair of forward, transversely spaced bosses 15 in bottom housing component 12. The screws 13 engage threaded cylindrical recesses 16 in a rear downwardly extending boss 17 and a pair of forward transversely spaced downwardly extending bosses 18 integral with upper housing component 11.

Housing components 11 and 12 are made of a molded plastic, and include aforesaid bosses 14, 15, 17 and 18, and other bosses to be mentioned later. The molded housing components 11 and 12 preferably are formed of a plastic material that is electrically non-conductive, substantially rigid, and resistant to breakage in normal use. A preferred plastic is a polycarbonate resin such as Lexan manufactured by General Electric Company, Schenectady, N.Y. These resins have been described as thermoplastic carbonate-linked polymers produced by reacting bisphenol A and phosgene.

A motor generally designated 20 includes a stator 21, a rotor 22 (FIGS. 1 and 3) and a rotor shaft 23 on which the rotor is mounted in fixed manner. Shaft 23 is rotatably mounted in a front bearing 24 and a rear bearing 25. A fan 26 is fixedly mounted on shaft 23 between rotor 22 and bearing 25. A commutator 27 (FIGS. 1 and 5) is fixedly mounted on shaft 23 and engaged by a pair of opposed carbon brushes 28 (only one of which is shown in FIG. 1) biased against commutator 27 in conventional manner by conducting springs 29 which provide contact with wires 30. The latter are connected to stator 21 which is connected by wires 30' to knurled posts 31 and 32. As seen in FIG. 2 for post 32, posts 31 and 32 are received in recesses 33 in bosses 35 and 36 of bottom housing component 12. Post 32 is part of a switch generally indicated 34 having a post 37 similarly mounted. Wires 38 are connected to posts 31 and 37 and they extend through a strain relief 39 to a plug (not shown).

The hair clipper 10 of the preferred embodiment has a gear speed reducer, a cam, a cam follower having a blade-engaging finger and a guide member for the cam follower (all not shown). The cam follower is biased by springs 40 which establish a cutting relationship between movable cutter blade 41 and fixed comb blade 42. The invention of this arrangement is disclosed and claimed in U.S. patent application Ser. No. 666,656 entitled "Transmission for Electric Hair Clipper" being

filed with the subject patent application. The preferred embodiment also includes the invention disclosed and claimed in U.S. patent application Ser. No. 626,826, filed on Mar. 29, 1967, now U.S. Patent 3,430,342, and entitled "Adjustable Clipper Head." The external adjusting actuating lever disclosed therein is lever 43 in FIG. 1 of the instant application. The blade-engaging finger and the relationship thereof with cutter blade 41 are generally those described and claimed in U.S. Patent No. 2,876,538.

The bottom or base wall 50 of bottom housing component 12 has a number of transversely spaced longitudinally extending slots 51 (FIG. 1) in effective relation with bearing 24, and has similar slots 52 and 53 adjacent the forward portion of stator 21 and rearwardly of bearing 25, respectively. Fan 26 draws air in through slots 51 and 52 and discharges it from slots 53, thereby cooling the motor. A transverse wall 55 forwardly of front bearing 24 extends from bottom wall 50 and side walls 56 of bottom housing component 12.

Stator 21 is spaced from the walls of housing components 11 and 12 in the manner described later so that air from slots 51 and 52 can flow around stator 21. The air flowing around and above bearing 24 is directed rearwardly at higher elevation primarily by barriers of lower elevation, namely, brush positioning bosses generally designated 60, each extending upwardly from bottom wall 50 and inwardly from side walls 56 of bottom housing component 12.

Brush positioning bosses 60 have a pair of longitudinally spaced walls 61 (FIG. 4) and a wall 62 between them of lesser height to provide a support for one end of a brush support means 63, the latter being a generally square tube. The other end of brush support means 63 rests on a shoulder 64 (FIG. 5) provided by a thickened portion of wall 56 between spaced walls 61. Thus this thickened portion of wall 56 constitutes with its shoulder 64 a part of positioning boss 60.

Motor stator 21 is supported on a pair of positioning bosses 66 which are longitudinally spaced ribs that extend transversely across bottom wall 50 and partially up walls 56. The central portion of each rib 66 has a recess 67 to provide clearance for a strap (not shown) associated with stator 21. A finger 68 extends inwardly from each wall 56 in front of front boss 66 and a finger 69 extends inwardly from each wall 56 behind rear boss 66. The inward extension of fingers 68 and 69 is greater than that of bosses 66 whereby the fingers prevent longitudinal movement of stator 21.

The top housing component has an integral fan shroud 70 comprising a transverse wall radially outwardly of fan 26. Shroud 70 extends inwardly so that its free edge is close to the extremities of the blades of fan 26. Baffles 71 on side walls 56 at the transverse plane of rear bearing 25 are provided to direct air flow in effective relation with bearing 25.

The construction described above insures air flow around bearings 24 and 25 and around and through stator 21 to provide a cool and more efficient hair clipper during use.

Each of bearings 24 and 25 is supported on a positioning boss 73, best shown in FIGS. 6 and 7, that extends upwardly from wall 50 of bottom housing component 12. Each boss 73 has a top recess provided by a pair of transversely spaced fingers 74 having opposed surfaces that are generally spherical segments with a common center. Each of the hold-down bosses generally indicated 75 for bearings 24 and 25 comprises a pair of fingers 75' that are transversely spaced and extend downwardly from top wall 76 of top housing component 11. The fingers 75' engage the tops of bearings 24 and 25. The fingers 75' of hold-down bosses 75 are more flexible than fingers 74 of positioning bosses 73.

The distal ends of fingers 75' of each pair have opposed beveled surfaces that are upwardly converging, and these ends are arcuate with their centers of curvature above

these ends. Each of the bearings 24 and 25 has an outer surface with margins 77 of generally hemispherical configuration and a central position 78 of cylindrical configuration. As will be understood, the configurations of each bearing and its counterpart positioning and hold-down bosses cooperate to provide a universal or self-aligning mounting for bearings 24 and 25 on and within housing 10.

The stator 21 is held in its position on positioning bosses 66 by hold-down means such for example as a pair of hold-down bosses 80 and 81 (FIG. 3) that are transversely spaced and that extend downwardly from top wall 76 of housing component 11 to engage generally cylindrical surface portions at transversely spaced areas on the top part of the sides of stator 21.

The support means 63 for each brush 28 is engaged by contact of its top corner edges with hold-down bosses 83 (FIG. 4) and 84. Each of bosses 83 and 84 extends downwardly from wall 76 of top housing component 11 and has at its distal end a pair of longitudinally spaced fingers 85 that are beveled at their facing edges. The beveled edges engage the corner edges of brush support means 63 as best shown in FIG. 4.

The hair clipper of the preferred embodiment has many obvious advantages. The clipper of the invention in its broadest aspect has the advantage of utilizing a pair of complementary housing components that include positioning and hold-down bosses that are unitary with the housing components. Although molding of such housing components can be made only within reasonable dimensional tolerances, such limitations suffice because of the cooperation of the bosses and the motor parts supported and positioned thereby.

From the above description it is thought that the construction and other advantages of this invention will be readily apparent to those skilled in the art. Various changes in detail may be made without departing from the spirit or losing the advantages of the invention.

Having thus described the invention, what is claimed as new and desired to secure by Letters Patent is:

1. In a hair clipper having a movable cutter blade, a stationary comb blade, a motor means to operate said cutter blade including a stator, front and rear bearings, a shaft rotatably mounted in said bearings, and a rotor fixedly mounted on said shaft, and a housing enclosing said motor means and having two opposed components abutting each other and secured together, the improvement comprising a construction for the housing components wherein one of said housing components has positioning bosses supporting said bearings and said stator, each of said positioning bosses for said bearings comprising an upwardly extending boss having a top recess providing a pair of upwardly extending transversely spaced fingers with upwardly diverging arcuate opposed wall surfaces, and the other of said housing components has hold-down bosses engaging said bearings and hold-down means engaging said stator to locate and support said bearings and said stator to maintain said stator and said rotor in operative relationship, each of said hold-down bosses that engages one of said bearings comprising a pair of downwardly extending, transversely spaced fingers engaging the top of said bearing, said bearing hold-down bosses of different flexibility than said bearing positioning bosses.

2. The combination of claim 1 wherein each of said pairs of fingers of said positioning bosses for said bearings has opposed surfaces that are arcuate about a common center of curvature, wherein each pair of downwardly extending fingers in said other housing component is beveled at the distal ends to provide a spaced pair of upwardly converging opposed top surfaces and is arcuate at said distal ends with their centers of curvature in a transverse plane above said distal ends, and wherein the outer surface of each bearing has margins of hemispherical configuration and a central portion of cylindrical configuration, whereby said bearings, said positioning bosses

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and said downwardly extending pairs of fingers cooperate to provide a universal mounting of the bearings on and within the housing.

3. The combination of claim 1 wherein said positioning bosses for said stator on said one housing component comprise a pair of longitudinally spaced ribs extending inwardly from the bottom and side walls to support said stator in spaced relation with the bottom and side walls at two transverse planes and wherein said hold-down means for said stator in said other housing component comprise a pair of transversely spaced bosses that extend downwardly from the inside surface of the top wall of said other housing component to engage the top portion of said stator at transversely spaced areas of contact.

4. The combination of claim 3 wherein said transversely spaced downwardly extending pair of bosses engaging the top portion of the stator extend longitudinally between the transverse planes of support provided by said longitudinally spaced ribs in said one housing component and wherein the distal ends of said pair of transversely spaced bosses engaging the stator are beveled to provide longitudinal, opposed surfaces converging upwardly and the surface of the stator engaged by the beveled surfaces is a surface of a longitudinally extending cylindrical section.

5. The combination of claim 4 wherein said one housing component has a pair of inwardly extending fingers on opposite sides of said pair of ribs on each side wall supporting said stator to limit longitudinal movement of said stator.

6. The combination of claim 3 wherein each of said transversely spaced bosses extending downwardly from said other housing component to engage said stator has flexibility in a transverse direction.

7. The combination of claim 3 wherein said motor means includes a commutator fixedly mounted on said shaft, a pair of carbon brushes and a pair of transversely

disposed support means for said carbon brushes to place said brushes in contact with diametrically opposite sides of said commutator and wherein one of said housing components has a pair of positioning bosses for said brush means and the other of said housing components has hold-down bosses engaging said support means to maintain said support means and said brushes in transverse alignment with respect to each other and to said commutator.

8. The combination of claim 7 wherein each of said positioning bosses for said brush support means comprises a pair of longitudinally spaced fingers extending from the bottom wall and a side wall of said one housing component and a finger extending upwardly from said bottom wall to a lesser height to provide a transversely extending support slot, wherein each of said brush support means comprises a square hollow tube in each slot, and wherein said hold-down bosses in said other housing component for said support means comprise a pair of transversely spaced fingers engaging one of said square tubes, said tube-engaging fingers each having in the distal end a slot to provide a pair of prongs engaging said square tubes.

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U.S. Cl. X.R.

310—52, 89, 90