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2,650,993

ELECTRIC HAIR CLIPPER

Filed Jan. 31, 1949

3 Sheets-Sheet 1

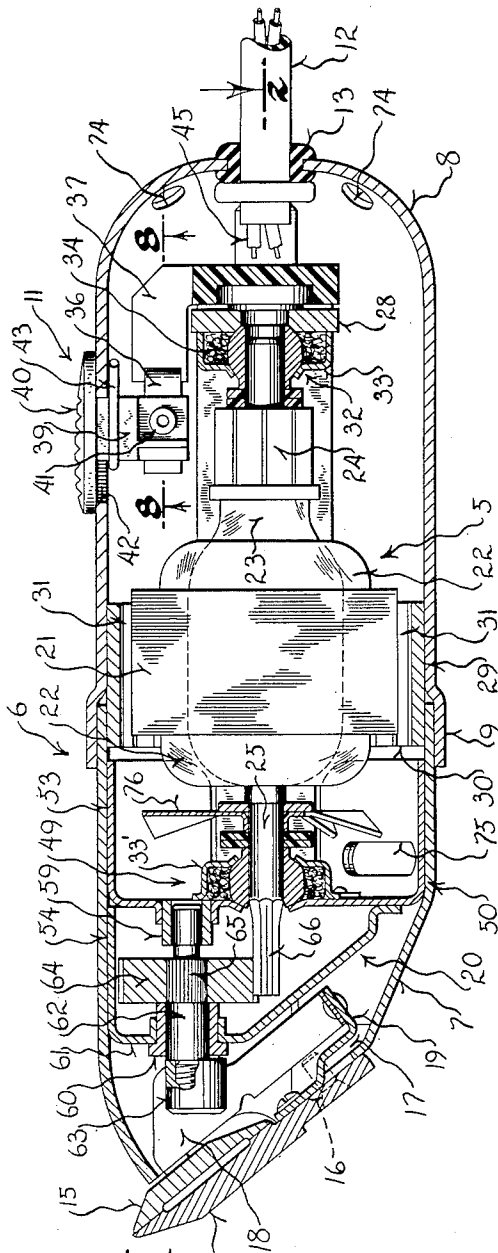


Fig. 1.

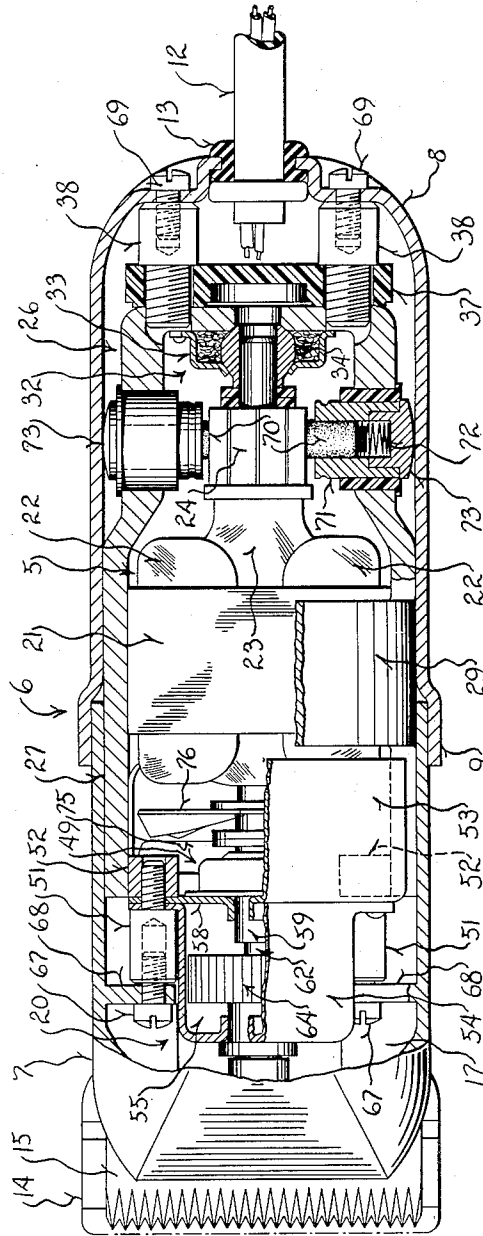


Fig. 2.

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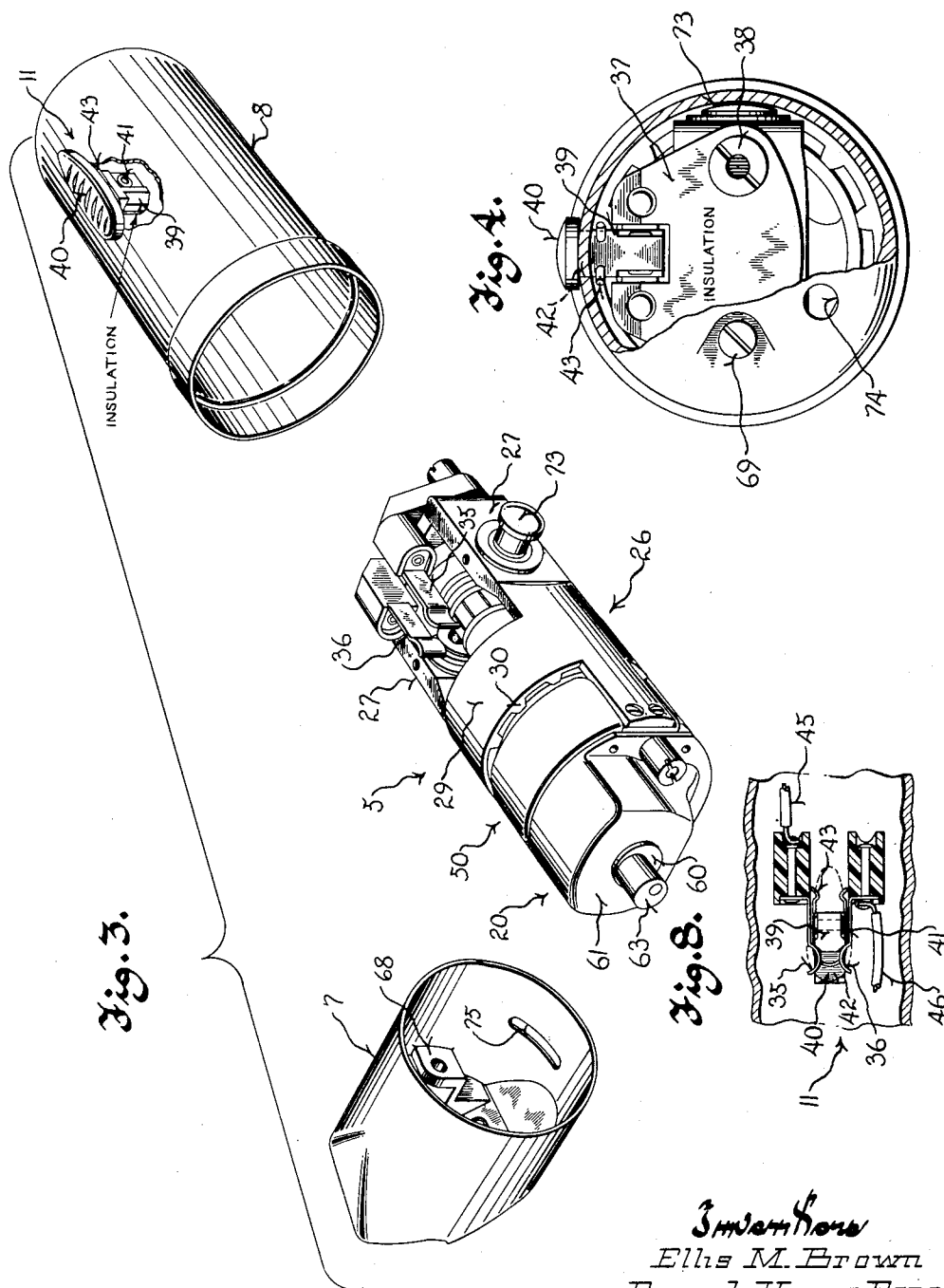
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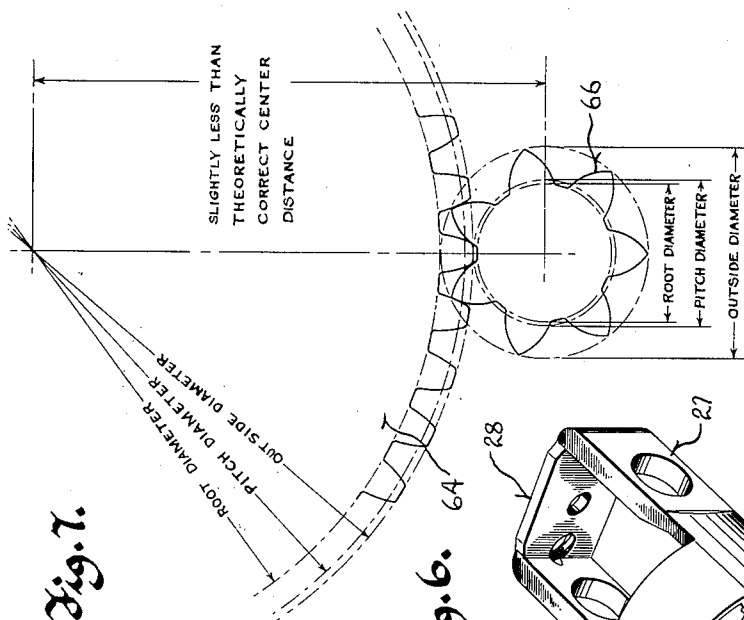
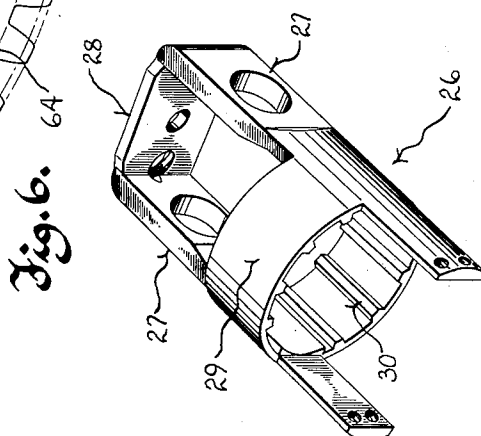
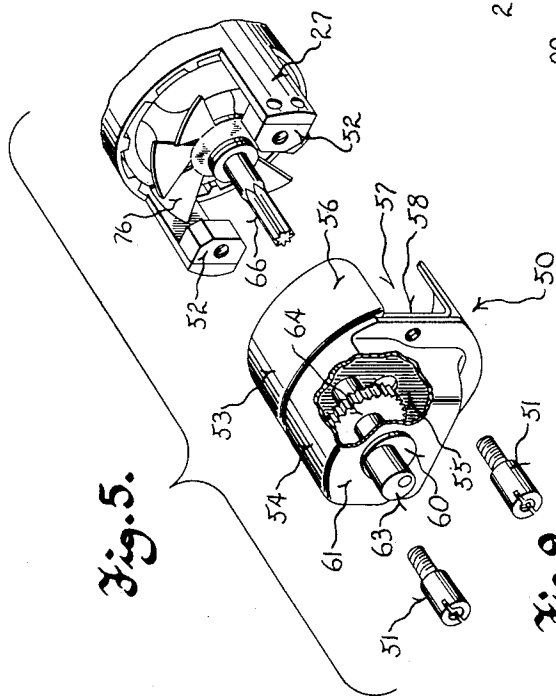
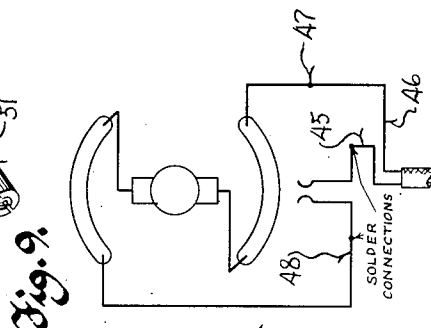
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UNITED STATES PATENT OFFICE

2,650,993

ELECTRIC HAIR CLIPPER

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Application January 31, 1949, Serial No. 73,832

1 Claim. (Cl. 310—50)

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This invention relates to certain new and useful improvements in electric hair clippers and has as its general object to provide a hair clipper which is less costly to manufacture but nevertheless entirely satisfactory in service and performance.

With this general objective in view it is a further object of this invention to provide an electric hair clipper so designed and constructed that its motor may be fully assembled and tested before the housing, which also serves as a handle for the clipper, is applied.

In this connection it is another object of this invention to provide an electric hair clipper wherein the motor housing consists of two complementary substantially cup-like sections telescoped endwise over the opposite ends of the motor.

Another object of this invention is to provide an improved electric motor especially adapted for use in a hair clipper or similar tool.

Another object of this invention is to so arrange and construct the motor switch that the application of the rear housing section to the motor automatically brings the switch contactor into proper cooperative relation with the stationary contacts of the switch.

Another object of this invention is to provide an inexpensive sturdy drive transmission for translating rotation of the motor shaft into reciprocation of the movable cutter blade.

To this end the drive transmission comprises essentially a pinion on the armature shaft of the motor meshing with a gear fixed to a cam shaft inside a gear case formed of inexpensive stampings, and to assure smooth, quiet operation notwithstanding the relatively wide tolerances such construction entails, an unusual tooth design is combined with a deliberately short center-to-center distance.

Still another object of this invention is to obviate the usual threaded securement of the plug-like retainers for the motor brushes by having these retainers held in place by the walls of one of the housing sections.

With the above and other objects in view which will appear as the description proceeds, this invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described, and more particularly defined by the appended claim, it being understood that such changes in the precise embodiment of the hereindisclosed invention may be made as come within the scope of the claim.

The accompanying drawings illustrate one com-

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plete example of the physical embodiment of the invention constructed in accordance with the best mode so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a longitudinal sectional view through an electric hair clipper embodying this invention;

Figure 2 is a longitudinal sectional view through Figure 1 substantially on the plane of the line 2—2;

Figure 3 is a perspective view of the motor and the two complementary housing sections shown disassembled;

Figure 4 is a back end view of the clipper with a part of the housing broken away and in section;

Figure 5 is a perspective view of the front end portion of the motor and the drive transmission shown detached therefrom but with the parts in their proper order of assembly;

Figure 6 is a perspective view of the cradle-like frame of the electric motor;

Figure 7 is a detail view, on an enlarged scale, of the pinion and a portion of the gear of the drive transmission;

Figure 8 is a detail sectional view taken through Figure 1 on the plane of the line 8—8 and showing the switch construction; and

Figure 9 is a diagram illustrating the electrical connections of the motor.

Referring now particularly to the accompanying drawings in which like numerals indicate like parts throughout the several views, the numeral 5 designates generally the electric motor of the hair clipper of this invention which, as will be hereinafter more fully brought out, is a unit entirely independent of its housing indicated generally by the numeral 6.

The housing 6 comprises two complementary substantially cup-like sections, namely a front section 7 preferably formed as a die casting and a back section 8 drawn and stamped from sheet metal. The open ends of the housing sections meet substantially at the middle of the housing and preferably have a telescoping interengagement as at 9. The front housing section has the cutter head 10 of the clipper removably mounted thereon and the back housing section carries the contactor 11 of the motor controlling switch and has an electric cord 12 entering the same through a gromet 13 anchored in its rear end.

The cutter head 10, which is of the conventional type having superimposed stationary and movable blades 14 and 15 respectively, is attached to the front housing section 7 by screws

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16. These screws are threaded into tapped holes in bosses 17 formed on the inside of the housing section 7.

A U-shaped spring 18 having the ends of its arms secured to the movable cutter blade and its closed end anchored to a bracket 19 which is fixed to the back of the stationary cutter blade 14 provides spring tension to hold the blades in co-operative engagement and also serves as part of the driving connection between the movable blade and the motor. This feature of the cutter head, however, forms no part of the instant invention, being covered in a copending application, Serial No. 73,831, filed January 31, 1949, now Patent No. 2,611,955, dated September 30, 1952.

To accommodate the U-shaped spring 18 and its mounting upon the back of the cutter head, the front of the housing 7 is open, and through this opening access may be had (when the cutter head is removed) to the front end of the motor and more specifically to a drive transmission 20 mounted on the front end of the motor frame.

The electric motor 5 is of the universal A. C.-D. C. type and comprises a field core 21 upon which field coils 22 are mounted and the customary armature 23 with its commutator 24 mounted upon a shaft 25. These stator and rotor elements are mounted in a cradle-like frame 26 preferably formed as a die casting and having diametrically opposite longitudinal side arms 27 connected by a crosspiece 28 and by a ring 29 integral with the side arms and situated substantially medially of the length thereof. Longitudinal circumferentially spaced ribs 30 are formed on the inside of the ring 29 to receive the field core 21 with a drive fit. This construction not only provides an exceptionally facile manner of assembling the field core with the frame but also provides air passages 31 across the outside of the field core.

Mounted on the inside face of the crosspiece or end wall 28 is a bearing 32 to receive the adjacent end of the armature shaft. A cup 33 secured to the inner face of the crosspiece or end wall 28 by rivets passing through ears on the edge of the cup coacts with the edge of a bearing socket 34 in the wall 28 to hold the bearing in a manner allowing limited rocking movement. The cup 33 also contains packing to hold a supply of lubricant.

The stationary contacts 35—36 of the motor switch are riveted to an insulated switch base 37 which is secured to the outer face of the crosspiece or end wall 28 by screws 38. The contacts 35—36 are spring blades the outer end portions of which are spaced apart a distance to receive a lug 39 of the bridging contactor therebetween.

The contactor, designated generally by the numeral 41, comprises the lug 39 and an integral actuating button 40 of insulating material with a metal cross pin or rivet 41 extending through the lug 39 with its ends exposed to engage and electrically bridge the contacts 35—36. The lug 39 projects through and is guided in an elongated hole 42 in the housing section 8, so located that upon proper application of the housing section 8 over the rear end of the motor the contactor is operatively associated with the switch blades 35—36. A spring clip 43 snapped into grooves in the opposite sides of the lug 39 holds the contactor assembled with the housing section in a manner allowing the same to be slid back and forth to open and close the motor circuit.

It is, of course, understood that before the

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housing section 8 is applied the supply cord 42 is threaded through the gromet 43 and one wire 45 thereof is soldered to the rivet by which one of the switch contacts, i. e. the contact 35, is anchored to the base 37, and the other wire 46 of the cord is connected to one side of the field as at 47 (see Figure 9).

Inasmuch as the other switch contact 36 is connected to the other side of the field through a lead 48, bridging of the contacts 35—36 closes the circuit for the motor.

The front end of the armature shaft is journaled in a bearing 49 carried by a transmission head indicated generally by the numeral 50. This transmission head is secured to the front ends of the two side arms 27 of the motor frame by screws 51 threaded into lugs 52 which in turn are secured to the inner faces of the arms 27 at their extreme front ends.

It is, of course, understood that the lugs 52 are secured in place after the field core 21 is shoved down into the motor frame and driven into the ring 29. The lugs 52, however, do not interfere with the insertion of the armature.

The transmission head 50 consists of two stampings 53 and 54 riveted together to form a hollow gear case 55. The stamping 53 is substantially cup-shaped with its side wall 56 interrupted at opposite sides as at 57 to accommodate the side arms 27. Its bottom wall 58 has the bearing 49 mounted thereon, which like the bearing 32 is held in place by a cup-shaped stamping 53' riveted to the wall 58. Though theoretically the bearings 32 and 49 are coaxial, some misalignment may be encountered in production but this is compensated by the self-alignment inherent in the bearings.

The wall 56 of the stamping 53 also mounts a bearing 59 which coacts with a bearing 60 mounted on the front wall 61 of the stamping 54 to support a cam shaft 62. The front end of this cam shaft projects beyond the bearing 61 and has an eccentric 63 fixed thereon by being threaded against a shoulder on the shaft. The shaft is held against axial displacement by having the bearing 60 interposed between the eccentric 63 and a gear 64 driven onto a serrated portion 65 of the shaft inside the gear case.

The eccentric 63 is of a diameter to fit snugly between the arms of the U-shaped spring 18 so that upon rotation of the cam shaft these arms will be oscillated to reciprocate the movable cutter blade 15. Entry of the eccentric between the arms of the U-shaped spring during the application of the cutter head is facilitated by having the extreme front end of the eccentric chamfered.

The gear 64 meshes with a sprocket 66 formed on the front end of the armature shaft 25 and as shown in Figure 7, the teeth of the gear have very little addendum while the teeth of the pinion are all addendum. This tooth design plus the fact that the actual center-to-center distance between the shafts is slightly less than the theoretically correct distance produces a smooth running and very quiet transmission. The slight tension under which the parts are placed by the excess center-to-center distance does not affect the mechanism deleteriously.

To more clearly illustrate the nature of the transmission gearing, in one embodiment of the invention the pitch diameter of the gear is .668", its outside diameter is .693", and its root diameter is .628"; and for the pinion the pitch diameter is .1093", its outside diameter .159" and its

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root diameter .1033". The theoretically correct center-to-center distance is .3954" but the actual center-to-center distance is .3924".

The open front end of the housing section 7, upon removal of the cutter head 19, permits access to screws 67 by which the housing section 7 is secured in place. These screws pass through ears 68 on the housing section and thread into tapped holes in the outer ends of the screws 51. The screws 28 by which the insulated switch base 37 is mounted on the motor frame are similarly provided with tapped holes in their outer ends to receive screws 69 by which the back housing section is held in place.

This manner of securing the housing sections to the motor frame enables them to be drawn snugly onto each other.

The motor has the customary brushes 79 mounted in bushings 71 which in turn are carried by the side arms 27 of the motor frame but insulated therefrom. At their inner ends the bushings 71 are grooved to receive the conventional spring clips by which the brush leads are electrically connected, and as is customary the brushes are yieldingly urged inwardly toward the commutator by springs 72, but the spring retainers 73 are not threaded into the bushings 71. Instead these retainers have a sliding fit in the bushings and are held in place by the adjacent wall of the housing section 8. Thus in assembling the housing section 8 over the back end of the motor the retainers 73 must be held in until the housing is applied over them.

To afford ventilation the back housing section 8 has air inlet openings 74 in its rearmost end and the front housing section and the underlying side wall 56 of the stamping 53 have slots at 75 to provide discharge ports for the ventilating air. A fan 76 secured to the armature shaft draws the air into the housing through the openings 74 across the field through the longitudinal air passages 31 and discharges the same from the housing through the discharge port 75.

From the foregoing description taken in connection with the accompanying drawings, it will be readily apparent to those skilled in the art that this invention provides an electric hair clipper which is inexpensive to manufacture; and that the reduction in production costs is brought about largely by the fact that the entire motor may be completed and tested before applying the housing. In other words, the housing which consists of the two complementary front and back sections and which also provides a handle for the clipper is not essential to operation of the motor. The construction of the drive transmission with its economical use of stampings is also an important factor in reducing the cost of the entire unit.

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What we claim as our invention is:

In an electric motor driven tool: a power unit comprising, a one piece motor frame having spaced opposite side arms projecting from and integral with an end wall, a stator mounted on said frame between the side arms thereof and intermediate the ends of said arms, a bearing on said end wall, a stamped sheet metal gear case fixed to the outer ends of the side arms with one wall of the gear case forming a second end wall for the motor frame, a bearing on said wall of the gear case coaxial with the stator and the bearing on the first designated end wall of the motor frame, an armature positioned in the stator and having its shaft journaled in the bearings with one end of the shaft projecting into the gear case, a cam shaft journaled in the gear case and having one end thereof projecting outside the gear case, gears mounted within the gear case drivingly connecting the armature shaft with the cam shaft, and an eccentric fixed to the projecting end portion of the cam shaft to have a driving connection with the tool to be driven; and a combined housing and mounting for the tool to be driven comprising, complementary deep cupped sections telescoped over the opposite end portions of the power unit with their adjacent ends contiguous, means for readily removably and individually securing each of said sections to the power unit so that either section may be removed from the power unit without disturbing the other section, and means on the housing section which covers the end of the power unit at which the gear case is located for mounting the tool to be driven with a part of the tool disposed inside the section for engagement by the eccentric of the power unit.

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