

July 20, 1965

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3,196,298

HAND PORTABLE POWER UNIT

Filed Aug. 6, 1962

2 Sheets-Sheet 1

FIG. 1

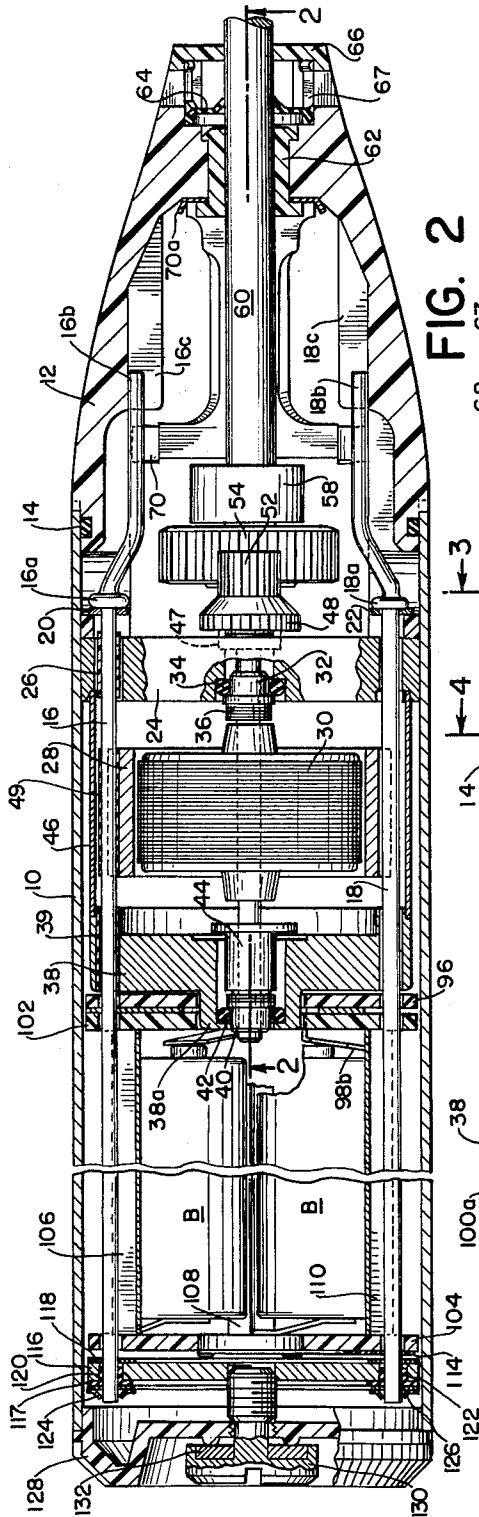
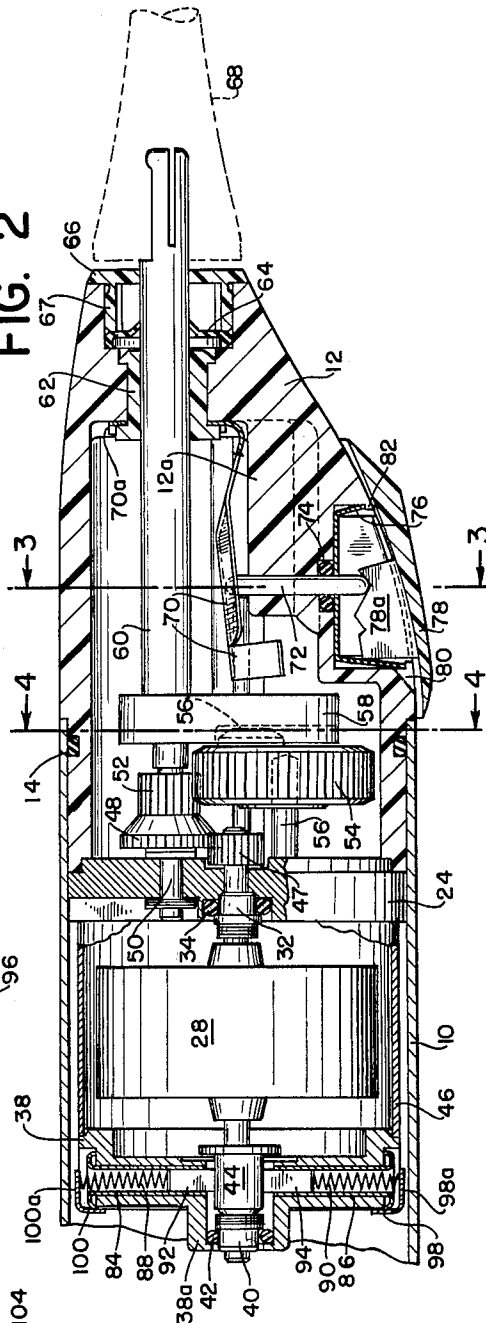


FIG. 2



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FIG. 3

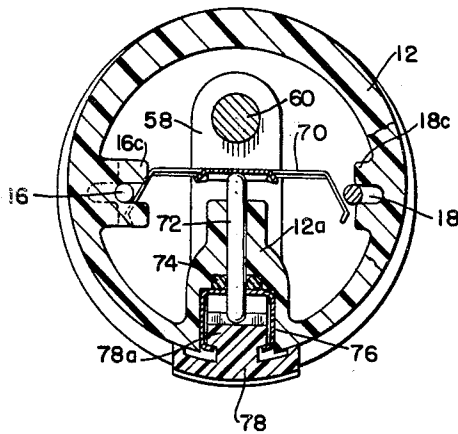


FIG. 4

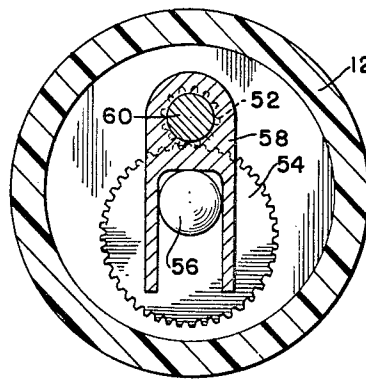


FIG. 5

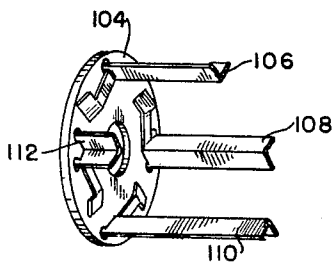
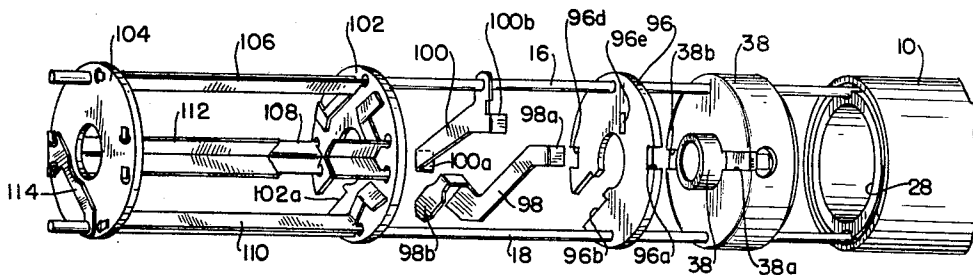


FIG. 6

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HAND PORTABLE POWER UNIT

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2 Claims. (Cl. 310—50)

This invention involves improvements in hand portable power tools particularly those energized with dry batteries.

One object of the invention is to provide a tool of this type which is adapted to operate various types of tools or implements specifically for oscillatory operation, such as for example, a toothbrush.

A further object of the invention is to provide a tool of this type which is sealed against the entrance of moisture so that for use of such a toothbrush it can safely be used around water and even immersed in it without damage.

Another object of the invention is to provide a structural assembly of this type in which substantially all of the parts are mounted on a pair of rods by means of which they can be clamped into a unit and by means of which the housing can be held in place.

A more detailed object is to provide a control circuit arrangement in which said rods form part of the circuit.

Other and more detailed objects of the invention will be apparent from the following description of the embodiment of the invention illustrated in the attached drawings.

In the drawings there is shown in

FIGURE 1 a longitudinal, central, cross-sectional view of the structure of the invention with some parts broken away to facilitate illustration;

FIGURE 2 is a view of the righthand end of the device as illustrated in FIG. 1, turned, however, through an angle of 90 degrees on its longitudinal axis;

FIGURE 3 is a cross-sectional view taken on the line 3—3 of FIG. 2;

FIGURE 4 is a cross-sectional view taken on the line 4—4 of FIG. 2;

FIGURE 5 is an exploded perspective detailed view of the battery unit; and

FIGURE 6 is a similar view of the lefthand end of the battery unit viewed from the opposite side.

As illustrated the device includes a casing of which the tubular sleeve 10 is a part. This sleeve is of circular cross-section, open at both ends, and may be made of any suitable material including metals and plastics. One end of this tube is closed by means of a nose piece 12, which is preferably molded of a rugged waterbound plastic. The nose piece has an annular seat at one end proportioned so that it may slip snugly into the end of the sleeve 10 and a watertight joint is assured by the use of an O-seal ring 14.

The backbone of the structure is a pair of elongated rods 16 and 18 which have shoulders formed by annular enlargements 12a and 18a adjacent the base of the inwardly offset ends 16b and 18b of the rods. These rods pass through washers 20 and 22 which rest upon bifurcated internal radial projections 16c and 16d molded in the nose piece, see particularly FIG. 3.

At 24 is a disc of suitable material which is offset at the inner end of the nose piece 12, which can also be made of any suitable material, including metal, through which the rods pass, see FIG. 1. When made of metal an insulating sleeve 26 is threaded on the rod 16 so as to lie in the hole of the disc 24 to insulate the rod therefrom.

The motor includes a permanent magnet field structure 28 within which is axially positioned the wound rotor 30. This rotor is mounted for rotation in a bearing 32 which is mounted in the disc 24 in an O-seal ring 34. End thrust

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washers 36 are interposed between the rotor and the bearing assembly 32. The motor unit includes a second disc 38, which when made of metal, will have an insulating bushing 39 in the aperture through which the rotor 16 passes. Rod 18 also passes through this disc and between it and the disc 24 is seated an enclosing sleeve 49 surrounding the field and rotor of the motor. The other end of the rotor shaft is supported on disc 38 by means of a bearing assembly 40, which in turn is mounted in an O-seal ring 42. At 44 is the commutator for the motor rotor or armature. As can be seen in FIGS. 1 and 5, the magnetic field structure 28 has a pair of diametrically opposed surface longitudinal grooves in which the rods 16 and 18 rest, but in the case of the rotor 16, an insulating sleeve 49 is provided to insulate the rod from the magnet 28.

The power transmission unit includes a pinion 47 secured to the end of the armature shaft and meshing with the part 48 of a double pinion. This compound pinion is freely rotatable on the end 50 of the shaft 60, see FIG. 2. The teeth 52 of this pinion mesh with a gear 54 which is rotatably mounted on a shaft 56 which is also supported at the disc 24, see FIG. 2. On the outer face of the pinion 54 is a cam button 56 which operates in the bifurcated end of a lever 58, see FIG. 4. This lever is secured to the shaft 60 which is journaled at one end in a suitable bushing 62 mounted in the nose piece 12. The other end of the shaft 60 of course is journaled for movement by its reduced end 50 in the disc 24. The shaft 60 passes through a sealing washer 64 mounted in a recess in the nose piece 12, which is closed by a cup shaped member 66, which can be snapped into place. The bearing bushing 62 can be molded of a suitable plastic such as for example nylon and can be longitudinally split so that it can be compressed sufficiently to seat it in the related passage of the nose piece 12, as shown in FIG. 1. The closure 66 is likewise molded of a suitable plastic so that its mounting prongs 67 can be snapped into the recess in the end of the nose piece. At 68 is diagrammatically illustrated the outlet which can be detachably mounted on the exposed end of the shaft 60 and which for example can be the stem of a toothbrush.

At 70, see FIGS. 1, 2 and 3, is a T-shaped switch-blade, the head of which has its ends shaped, as shown in FIG. 3, so that it can be moved into and out of contact with the rods 16 and 18. The end 70 of the stem of the T is offset so that it can be clamped behind and supported by the flanged end of the bushing 62, see FIG. 2. Slidably mounted in the internal rib 12a of the nose piece is a pin 72 which bears at one end on the contact finger 70 and is engaged at the other end by the cam 78a formed integral with the switch button 78. As shown in FIG. 2 the side of the nose piece is provided with a recess in which the cam 78a is mounted. The cam 78a, see FIG. 3, is an integral part of the switch button 78 and formed with a T-shaped head, so that a mounting spring 76 can embrace it as shown from the sides. Referring to FIG. 2, it will be seen that the ends of the spring 76 normally flare outwardly and are therefore compressed when they are forced into the opening of the recess. When the parts are in place the spring ends snap outwardly against a pair of shoulders 80 and 82 to hold the button in place. The point 72 is sealed by the O-seal ring 74. At this point it may be noted that when taking the structure apart the spring 76 can be released by means of the pin passed through a hole, not shown, in the nose piece 12 to disengage the associated flared ends of the spring from the shoulder 80. The switch button and the spring can then be removed.

As shown in FIG. 2 the disc 38 is provided with a pair of aligned radial holes of square cross-section in which the metal bushing 84 and 86 are mounted. These bushings provide housings for the springs 88 and 90 which force

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the square brushes 92 and 94 into contact with the commutator 44.

Also threaded on the rods 16 and 18 is an insulating disc 96 which is provided on the periphery with the diametrically opposed rectangular notches 96a and 96d with a rectangular aperture 96e and a cutout 96b having circular and radial portions. The circular portion fits around the post 38a formed on the disc 38. At 98 and 100, see FIGS. 2 and 5, are a pair of specially shaped connectors. The connector 98 has an offset end 98a which in the assembly overlies the end of the spring 90 and makes contact therewith. The other end 98b is upstanding and terminates in a contact. This end of the contact 98 will partially lie in the opening 96b when the parts are assembled, see FIG. 1. Contact 100 is shaped so that the rod 16 passes through it and also so that its offset end 100b can extend into the rectangular opening 96e. The other end 100a of the contact falls in the notch 96d.

The battery support and connector comprises an assembly consisting of the discs 102 and 104 connected by four equal circumferentially spaced metal channels 106, 108, 110, 112. These channels, as shown, have tubes which lie in apertures in the discs and are bent over to form a spool-like assembly. The parts are proportioned so that dry cells of proper size can be positioned between adjacent pairs of channels. These channels have lateral projections lying on the inner faces of the discs 102 and 104 so that four batteries can be placed therein to connect them in series. One terminal of this series connections will contact the end 98b of the connector 98 which is exposed through the opening 102a in the disc 102. As shown in FIG. 1 the disc 102 of the battery support also fits over the boss 38a. The other connector 100 electrically connects the rod 16 with the spring 88, see FIG. 2. The other terminal of the series connected batteries is connected by means of the jumper 114 mounted on the disc 104 with the rod 18.

Referring to FIG. 1, there is shown a disc 116 having a ring of insulating material 118 on one face. The rods 16 and 18 pass through apertures in the disc 116 which are lined with the bearings 120 and 122 to insulate the rods from short circuit by the disc 116. Another insulating ring 117 lies on the other face of the disc 116. The ends of the rods 16 and 18 project through this assembly and have threaded thereon nuts 124 and 126 by means of which all parts of the entire assembly with the exception of the housing sleeve 10 and the closure cap 128 are clamped together as a unit. Reference will be further made to this point subsequently.

The closure 128 can be molded of suitable plastic and has centrally mounted thereon a thumbscrew 130, the threaded end of which engages in a threaded aperture in the disc 116. The inner face and the finger piece of the thumbscrew 130 all recess in which a sealing washer 132 is mounted for engagement with an annular rib on the closure disc 128 surrounding the opening through which the end of the thumb screw passes. It will be seen that since the enlargements 16a and 18a on the rods are caught behind the internal shoulders 16c and 18c, see FIG. 3, and all of the internal parts are locked thereon by means of the nuts 124 and 126, when the thumb screw is drawn up tight the sleeve 10 will be clamped between it and the nose piece into a rigid, firm assembly. Sufficient pressure can be brought to bear between the adjacent end of the sleeve 10 and the closure disc 128 so as to make the hous-

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ing watertight as this point. The shoulder projection on the closure nut can be dimensioned to provide a tight press fit with the end of the sleeve 100.

From the above description it will be seen that a very compact, easily assembled, device is provided. With reference to assembly, one of the important features of this invention is ease of assembly. The nose piece 12 can be mounted upright in a fixture with the shaft 60 already mounted in place. The washers 20 and 22 are slipped onto the rods and the rods are seated in the lugs 16c and 18c. The disc 24 is then slipped onto the rods which serves to lock them in the nose piece. The bearing 26 is applied, or it may be cemented in the aperture of the disc 24. The field magnet ring 28 is positioned on the rods with the bushing 49 in place and the armature 30 is positioned with its bearing in the O-seal ring 34. The disc 38 is then positioned over the bearing assembly 40 on the other end of the armature shaft with the bearing 39 in place, the sleeve 46 having been seated on the disc 24 so as to be clamped behind the discs 24 and 38. The disc 96 is then slipped onto the rods followed by the battery holder assembly. Disc 116 is then positioned and locked on the rods. It will be apparent, of course, that the pinion 47 will be attached to the end of the armature shaft after it has been positioned in the disc 24.

As an alternative it may be noted that the parts of the motor could form a sub-assembly, that is the parts could be assembled and then slipped as a unit onto the rods. The assembly is then completed by positioning the sleeve 10, applying the cap 128 and tightening up the thumb screw 130. The switch button is easily assembled by just pushing it into the nose piece so that the flared ends of the spring 76 seat on the shoulders 80 and 82.

It will be apparent to those skilled in the art that various details of this structure can be changed without departing from the novel subject matter herein disclosed. It is intended, therefore, that the scope of protection afforded hereby be determined by the appended claims.

What is claimed is:

1. A hand portable power tool comprising a motor unit, a nose piece housing and a power gear transmission unit, a battery supporting unit having current output terminals, a pair of rods connecting all of said units into a unitary aligned structure, means including a contact finger in said nose piece housing for connecting said output terminals in series with the motor of said motor unit through said rods, a casing enclosing said unitary aligned structure closed at one end by said nose piece housing, and a detachable closure for the other end of said casing seated thereon.

2. In the combination of claim 1 a finger button mounted on said nose piece housing and means operable thereby to actuate said contact finger to electrically connect said rods.

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