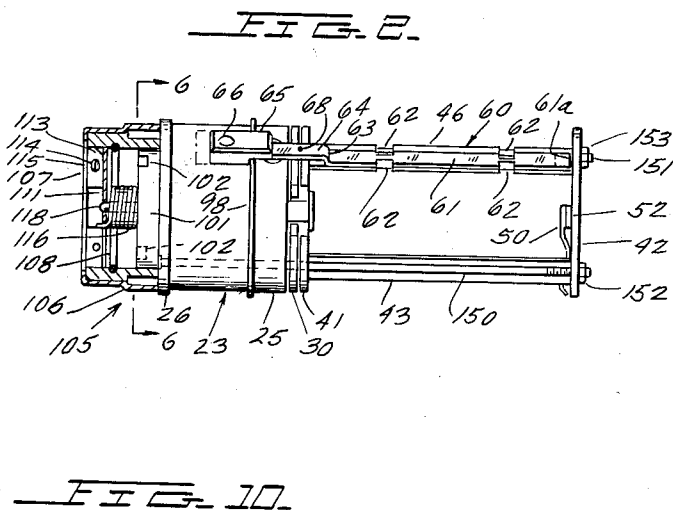
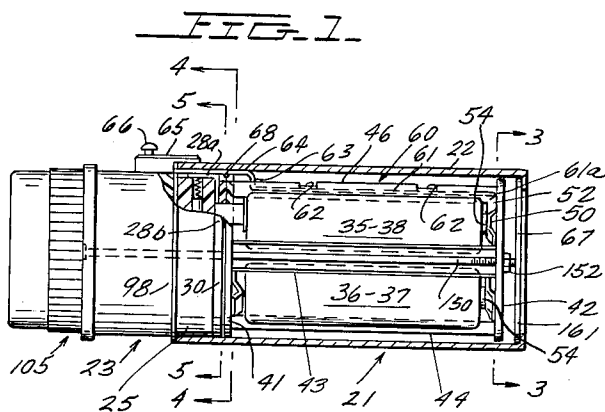
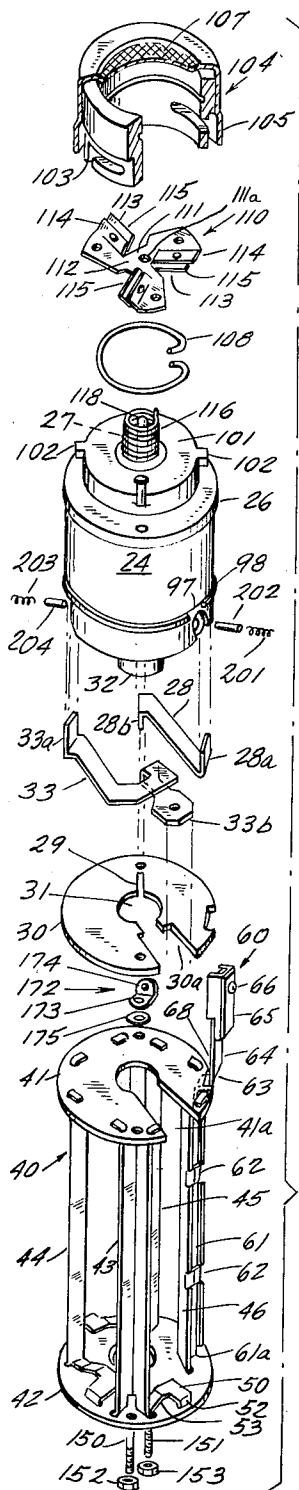


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2 Sheets-Sheet 1



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CORDLESS ELECTRIC SHAVER

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FIG. 3

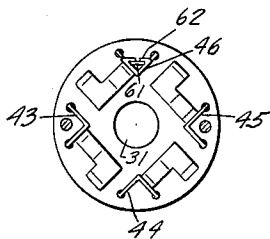


FIG. 4

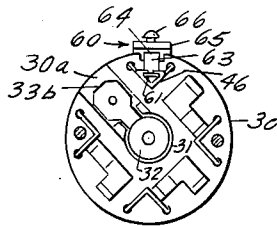


FIG. 5

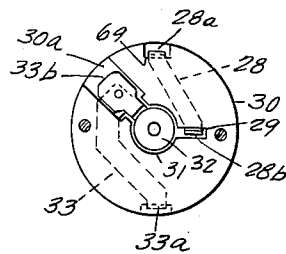


FIG. 6

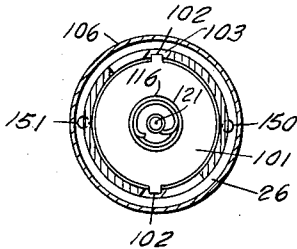
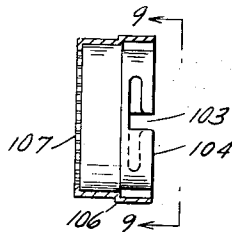


FIG. 8



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CORDLESS ELECTRIC SHAVER

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9 Claims. (Cl. 310—50)

This application is a continuation in part of my copending application Serial No. 700,789, filed December 5, 1957, which has matured into Patent No. 2,963,598, granted Dec. 6, 1960.

The instant invention relates generally to electric shavers and more particularly to a driving means for the razor head comprising a miniature D.C. motor and power pack combination which may be conveniently grasped with one hand during operation.

Today considerable consumer demand is directed toward small power driven devices. Therefore, it is highly desirable to utilize a driving means which includes its own source of power. Heretofore, efforts along these lines have produced driving means of considerable bulk and/or weight which, if directly coupled to the device in question, would make the hand manipulation of the device with any degree of precision an impossible task.

The instant invention provides a hand holdable driving means including its own power source adapted especially for a razor head. In essence, my driving means comprises a power pack and a miniature D.C. motor of the type described in my copending application 683,641, filed September 12, 1957. The power pack includes a holder wherein a plurality of circularly arranged miniature cells, such as 1.5 volt dry cell manufactured by the Burgess Battery Co. and designated 9R, are operatively disposed.

The power pack holder is of a frame-like construction comprising two insulating end disks maintained in spaced relationship by a plurality of elongated conducting struts of V-shaped cross-section to provide rigidity. A first contact member extends laterally in a first direction from one end of each of the struts while a second contact member extends laterally in a second direction, opposite to the first direction, from the other end of the strut. With this construction the cells are automatically connected in series by merely inserting all of the cells into the holder with the positive terminals facing in the same direction. Thus the conducting struts serve the dual functions of being support members and being circuit connectors.

This holder construction makes it highly unlikely that even an unskilled person will insert the cells in bucking relationship. The series connection of cells is preferred over a parallel connection since the higher voltage obtained thereby permits a motor of the same physical size to develop a greater starting torque and the lower running current reduces commutating problems. Further, connection resistances become less critical as the voltage is raised.

The D.C. motor and power pack are in axial alignment with one of the motor terminals arranged in direct contact with one end of the series connections of the cells while a control means selectively engages the motor casing which is connected to the other motor terminal, and when engaged completes the circuit to the other end of the series connection of cells. The control means comprises a simple resilient conducting strip slidably mounted in electrical contact to the strut bearing the end terminal in the series connection and being selectively positionable to engage the other motor terminal.

The motor and power pack are secured to one another by means of two long studs which extend through one end bell of the motor, through the other end bell and then longitudinally through the power pack. These studs also secure the components of the motor in place.

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One of the motor end brackets is formed with two integral bayonets. The bayonets are radially projected and are disposed to be received by slots in the housing of the razor head to cooperate therewith in securing the head to the motor.

The motor shaft extends past the end bracket having the bayonets and is received by a central opening of the rotor whereon the blades are mounted. A compression spring, rigidly secured to the motor shaft, includes an axially extending end section engageable with the rotor for rotating the blade assembly. This same spring also urges the blades against the screened whisker guide.

Accordingly, a primary object of the instant invention is to provide a novel hand held driving means and razor head driven thereby.

Another object is to provide a novel, light-weight compact combination of a D.C. motor and a power pack.

Still another object is to provide a novel stud fastening means whereby the motor and power pack are mechanically secured to one another in correct angular relationship with the fastening means also securing the motor components in place.

A further object is to provide a novel power pack including a holder wherein a plurality of circularly arranged dry cells are automatically connected in electrical series merely by inserting the cells with the terminals facing in the same direction.

A still further object is to provide a frame-like holder comprising two end disks maintained in spaced relationship by means of a plurality of conducting struts with the struts serving the dual functions of being structural members and conducting members.

Yet another object is to provide a novel control means for the motor comprising a resilient member slideably mounted to one of the conducting struts of the holder.

Still another object is to provide a single spring means which serves as a driving connection between a motor and razor head and also biases the blades against the whisker guide.

These as well as other objects of the instant invention shall become readily apparent after reading the following description of the accompanying drawings in which:

FIGURE 1 is a partially sectioned side elevation of the electric razor of the instant invention.

FIGURE 2 is a partially sectioned side elevation of the razor of FIGURE 1 with certain components removed.

FIGURES 3-5 are cross-sections of FIGURE 1 taken through lines 3-3, 4-4, and 5-5, respectively, looking in the directions of the arrows.

FIGURE 6 is a cross-section taken through line 6-6 of FIGURE 2 looking in the direction of arrows 6-6.

FIGURE 7 is a perspective view illustrating the mounting of a strut between the two end disks of the power pack.

FIGURE 8 is a partially sectioned side elevation of the housing of the razor head.

FIGURE 9 is an end view of the razor head looking in the direction of arrows 9-9 of FIGURE 8.

FIGURE 10 is an exploded view of the electric razor of FIGURE 1.

Referring to the figures, the device of the instant invention includes a driving means which comprises power pack 21 completely disposed within cylindrical power pack housing 22 and miniature D.C. motor 23 partially entered into housing 22. Motor 23 is of the type completely described in my aforesaid copending application 683,641 and includes a metallic housing section 24 disposed between insulating end bracket 25 and metallic end bracket 26 with output shaft 27 extending outward through end bracket 26.

End bracket 26 includes an integrally formed section 101, of a diameter smaller than the outer diameter of motor 23, having radially extending bayonets 102 which are received by L-shaped openings 103 of razor head insert 104 to secure razor head 105 to motor 23.

Razor head 105 includes a ring housing 106 having a screen whisker guide 107 over one end thereof. Insert 104 is coaxially arranged within housing 106 and includes an internal annular groove wherein spring retainer 108 is disposed. Spring 108 loosely retains blade assembly 110 within housing 106 between screen 107 and spring 108.

Blade assembly 110 comprises a rotor 111 having three radially extending arms 112 whereon blades 113 are secured as by rivets 114. The cutting edges 115 of blades 113 are urged into contact with screen 107 by compression spring 116 which is rigidly secured at one end to motor shaft 27 and bearing against rotor 111. Longitudinally extending projection 118 at the free end of spring 116 engages one of the rotor arms 112 along an edge thereof to provide a driving connection between motor 23 and rotor 111. At this time the free end of motor shaft 27 is disposed within the central opening 111a of rotor 111.

Terminal members 28 and 33 are disposed between end bracket 25 and insulating retaining member 30. End 28a of terminal member 28 engages a spring 201 which biases one of the motor brushes 202 while the other end 23b is disposed within slot 29 radially extending from central opening 31 of member 30 within which bearing cup 32 is disposed. One end 33a of terminal member 33 engages another spring 203 which biases the other motor brush 204 while the other end 33b is disposed within slot 30a extending from the central opening 31 radially to the edge of member 30. End 33b is bent back on itself to form a terminal engageable by the cell casing which forms the negative terminal of dry cell 35.

Power pack 21 comprises four dry cells 35-38 arranged circularly within holder 40 which includes top 41 and bottom 42 insulating disks. Four struts 43-46 which maintain insulating disks 41, 42 in spaced parallel relationship, are circularly arranged so that a cell 35-38 may fit between any two adjacent struts 43-46.

Each strut 43-46 is an elongated member of V-shaped cross-section having a pair of tabs 47, 48 at each end which, after being entered through appropriate slits in disks 41, 42, are bent over the outer faces thereof to secure struts 43-46 to disks 41, 42 as a rigid structure. Each strut 43-45 also includes terminals 49, 50 formed integrally therewith and positioned adjacent to the inner faces of disks 41, 42, respectively. Terminal 49 extends at right angles, in a first direction, from one leg of the V while terminal 50 extends at right angles, in a second, from the other leg of the V with the second direction being substantially opposite to said first direction. Terminals 49, 50 are each appropriately bowed at 52 and 53. The bowing at 52 and 53 together with the resiliency of the strut material assures good electrical contact between terminals 49, 50 and cells 35-38. Strut 46 merely includes one terminal 50 for a reason to be hereinafter explained.

When the four cells 35-38 inserted into holder 40 with the cell terminals facing in the same direction, the cells are connected in series aiding relationship. That is, when the positive terminals 54 of each cell contacts a terminal 50 and each terminal 49 contacts a cell casing a series electrical path is established as follows: from terminal 50 of strut 46, through cell 38 from plus to minus to terminal 49 of strut 45, through strut 45 to terminal 50 thereof, through cell 37 from plus to minus to terminal 49 of strut 44, through strut 44 to terminal 50 thereof, through cell 36 from plus to minus to terminal 49 of strut 43, and finally through cell 35 from plus to minus. Thus, the voltage between strut 46 and the terminal of cell 35 not connected to terminal 50 of strut 43 is equal

to the arithmetic sum of the voltages appearing across all of the cells 35-38.

Motor 23 is positioned in axial alignment with power pack 21 at one end thereof and is angularly arranged so that motor terminal member end 336 is positioned within radial slot 41a of disk 41 and will contact the negative terminal of cell 35. Studs 150, 151 and nuts 152, 153 cooperate to secure motor 23 to power pack 21.

Each of the studs 150, 151 extend through an aperture in metallic end bracket 26, inside of motor housing 24, and successively through apertures in end bracket 25, insulating member 30, disk 41 and disk 42. The threaded ends of studs 150, 151 are engaged by nuts 152, 153, respectively, while the head of studs 150, 151 are disposed within countersunk holes surrounding the apertures through end bracket 26. Thus, studs 150, 151 not only secure motor 23 to power pack 21 but also secure end brackets 25, 26 to motor housing 24. It is to be noted that studs 150, 151 are disposed between the arms of V-struts 45, 43, respectively, so as not to interfere with the insertion and withdrawal of cells 35-38.

A control means for selectively energizing motor 23 comprises a resilient conducting strip 60, the major portion 61 of which is in sliding contact with strut 46 being retained thereto by tabs 62 bent inwardly from the long edges of strut 46. Strip 60 is stepped at shoulder 63 to provide a portion 64 offset from portion 61. Plastic tab 65 is secured by rivet 66 to the free end of offset portion 64.

When tab 65 is moved toward razor head 105 protrusion 68 of offset portion 64 engages motor terminal member end 28a thereby connecting this terminal member 28 to the position end of the serially connected cells 35-38 while the other motor terminal is connected to the negative end of cells 35-38 so that motor 23 is energized to rotate the blades 113 clockwise with respect to FIGURE 10.

When tab 65 is moved toward the end of housing 22 closed by disk 67, protrusion 68 is moved clear of terminal member end 28a to interrupt the connection between the cells 35-38 and motor 23.

The sliding limits of resilient strip 60 are established at one end by the engagement of shoulder 63 with disk 41 and at the other end by the engagement of strip end 61a with disk 42.

When the motor 23 power pack 21 combination is inserted into housing 22 disk 42 of the power pack holder 40 is positioned opposite insulating closure disk 161 of housing 22. A resilient ring 98 of slightly larger diameter than end bracket 25 is interposed between this bracket and motor housing 24. Ring 98 is provided with a slot 97 for the passage of offset portion 64. The power pack housing 22, near the open end thereof, is engaged by the outer edge of ring 98 for closure of housing 22.

An L-shaped spring member 172 includes foot 173 having an opening through which stud 151 passes. Foot 173 is positioned between disks 41 and 30 with leg 174 of member 172 extending toward head 104. Fiber washer 175 is interposed between disks 41 and foot 173. Leg 174 bears against the inside surface of housing 22 to retain housing 22 to the remaining elements.

Typically, driving means 10 is $3\frac{1}{2}$ inches long by $1\frac{1}{2}$ inches in diameter weighing less than one half pound, with the motor 23 being capable of delivering 0.4 oz./in. of torque to operate razor head 105. With razor head 105 included the unit is approximately $4\frac{1}{8}$ inches long.

Thus, I have provided a self powered electric razor including many novel construction features which lend themselves to inexpensive mass production techniques.

Although I have here described preferred embodiments of my novel invention, many variations and modifications will now be apparent to those skilled in the art, and I therefore prefer to be limited, not by the specific disclosure herein, but only by the appending claims.

I claim:

1. A driving means comprising a D.C. motor and a power pack in axial alignment with said motor and operatively connected thereto; said power pack comprising a plurality of cells each having a positive and a negative terminal; said plurality of cells connected in series aiding relationship to form a voltage source with all of said positive terminals positioned in a first plane and all of said negative terminals being positioned in a second plane; a holder wherein said plurality of cells are disposed; said holder comprising a pair of insulating members and a plurality of struts, having V-shaped cross-sections, equal in number to the cells of said plurality of cells; said plurality of struts providing a structural support to maintain said pair of insulating members in spaced relationship parallel to said first plane and also serving as electrical connectors between the cells of said plurality of cells; said D.C. motor including a first and a second terminal member; said voltage source having a pair of terminals; said first terminal member electrically connected to one of said pair of terminals; a control means including a resilient member when in a first position electrically connecting said second terminal member to the other of said pair of terminals thereby causing rotation of said D.C. motor; said resilient member slideably mounted to the other of said pair of terminals; said D.C. motor also including a pair of end brackets at least one of which comprises an insulating material; a stud means extending through said pair of end brackets and said holder insulating members to thereby maintain the elements of said motor in operating position and also secure said power pack to said motor.

2. Driving means for a device, such as a razor head, having a rotatable assembly; said driving means comprising a D.C. motor and a power pack operatively connected thereto for energization thereof; said motor having an output shaft positioned for entry into a central opening of an assembly whereby said shaft is coaxial with an axis of rotation of that assembly; a coil spring rigidly secured at one end thereof to said shaft and operatively positioned to urge an assembly axially with respect to said shaft away from said motor; said coil spring, at the other end thereof, having a projection extending axially with respect to said shaft misaligned with said shaft, and removably engageable with the assembly for transmitting rotation of said shaft thereto; said motor including a first and a second end bracket at opposite ends thereof; said first bracket including a portion of reduced area having bayonet means projecting therefrom for engaging cooperating means of the assembly and removably securing same to said driving means; said portion of reduced area and said bayonet means constructed integrally with the remainder of said first bracket.

3. The driving means set forth in claim 2 in which the power pack is positioned in axial alignment with said motor and being comprised of a plurality of cells each having a positive and a negative terminal; said plurality of cells connected in series aiding relationship to form a voltage source with all of said positive terminals positioned in a first plane and all of said negative terminals being positioned in a second plane; a holder wherein said plurality of cells are disposed; said holder comprising a pair of insulating members and a plurality of struts equal in number to the cells of said plurality of cells; said plurality of struts providing a structural support to maintain said pair of insulating members in spaced relationship parallel to said first plane and also serving as electrical connectors between the cells of said plurality of cells.

4. Driving means for a device, such as a razor head, having a rotatable assembly; said driving means comprising a D.C. motor and a power pack operatively connected thereto for energization thereof; said motor having an output shaft positioned for entry into a central opening of an assembly whereby said shaft is coaxial with an axis of rotation of that assembly; a coil spring rigidly secured

to one end thereof to said shaft and operatively positioned to urge an assembly axially with respect to said shaft away from said motor; said coil spring, at the other end thereof, having a projection extending axially with respect to said shaft misaligned with said shaft, and removably engageable with the assembly for transmitting rotation of said shaft thereto; said motor including a first and a second end bracket at opposite ends thereof; said first bracket including a portion of reduced area having bayonet means projecting therefrom for engaging cooperating means of the assembly and removably securing same to said driving means; said portion of reduced area and said bayonet means constructed integrally with the remainder of said first bracket; said power pack positioned in axial alignment with said motor and comprising a plurality of cells each having a positive and a negative terminal; said plurality of cells connected in series aiding relationship to form a voltage source with all of said positive terminals positioned in a first plane and all of said negative terminals being positioned in a second plane; a holder wherein said plurality of cells are disposed; said holder comprising a pair of insulating members and a plurality of struts equal in number to the cells of said plurality of cells; said plurality of struts providing a structural support to maintain said pair of insulating members in spaced relationship parallel to said first plane and also serving as electrical connectors between the cells of said plurality of cells; a control means for selectively energizing said motor, comprising a resilient member slidably mounted to a first strut of said plurality of struts; said resilient member selectively operable into engagement with a first terminal of said motor.

5. The driving means set forth in claim 4 in which the resilient member includes a shoulder cooperating with a first of said pair of insulating members and a second of said insulating members cooperating with a first end of said resilient member to define limits of travel of said resilient member with respect to said power pack.

6. The driving means set forth in claim 5 in which each strut of said plurality of struts comprises an elongated member having a V-shaped cross section; each of said struts having a first terminal formed integrally therewith and extending from one end thereof at right angles to one leg of the V in a first direction; all but said first strut having a second terminal formed integrally therewith and extending from the other end thereof at right angles to the other leg of said V in a second direction diverging from said first direction.

7. The driving means set forth in claim 4 also comprising a cylindrical housing having an open first end; said power pack entered through said first end completely disposed within said housing; one of said end brackets of said D.C. motor extending through said first end; one end of said resilient member positioned externally of said cylindrical so as to be accessible for manual operation.

8. Driving means for a device, such as a razor head, having a rotatable assembly; said driving means comprising a D.C. motor and a power pack operatively connected thereto for energization thereof; said motor having an output shaft positioned for entry into a central opening of an assembly whereby said shaft is coaxial with an axis of rotation of that assembly; a coil spring rigidly secured at one end thereof to said shaft and operatively positioned to urge an assembly axially with respect to said shaft away from said motor; said coil spring, at the other end thereof, having a projection extending axially with respect to said shaft misaligned with said shaft, and removably engageable with the assembly for transmitting rotation of said shaft thereto; said motor including a first and a second end bracket at opposite ends thereof; said power pack positioned in axial alignment with said motor and comprising a plurality of cells each having a positive and a negative terminal; said plurality of cells connected in series aiding relationship to form a voltage source with all of said positive terminals positioned in a first plane and all of said negative terminals positioned in a second

plane; a holder wherein said plurality of cells are disposed; said holder comprising a pair of insulating members and a plurality of struts equal in number to the cells of said plurality of cells; said plurality of struts providing a structural support to maintain said pair of insulating members in spaced relationship to said first plane and also serving as electrical connectors between the cells of said plurality of cells; stud means extending through said brackets and said pair of insulating members to secure said power pack to said motor and to maintain the elements of said motor in their operative positions.

9. The driving means set forth in claim 8 also comprising a control means for selectively energizing said motor, comprising means mounted to a first strut of plurality of struts and being selectively operable into engagement with a first terminal of said motor.

References Cited in the file of this patent:

796,517 Jackson Aug. 8, 1905 20

UNITED STATES PATENTS

1,957,307
1,981,787
2,040,683
2,078,845
2,149,995
2,279,682
2,301,147
2,307,303
2,333,437
2,449,568
2,449,811
2,773,306
2,775,730
2,809,424

1,129,017

Von Ohlsen May 1, 1934
Florman Nov. 20, 1934
Biniek May 12, 1936
Goldschmidt Apr. 27, 1937
Gruessner Mar. 7, 1939
Jackson Apr. 14, 1942
Schaaf et al. Nov. 3, 1942
Richardson et al. Jan. 5, 1943
Olschewski Nov. 2, 1943
Shriro Sept. 21, 1948
Hartford Sept. 21, 1948
Ranson Dec. 11, 1956
Eilenberger et al. Dec. 25, 1956
Villeneuve Oct. 15, 1957

FOREIGN PATENTS

France Sept. 3, 1956