

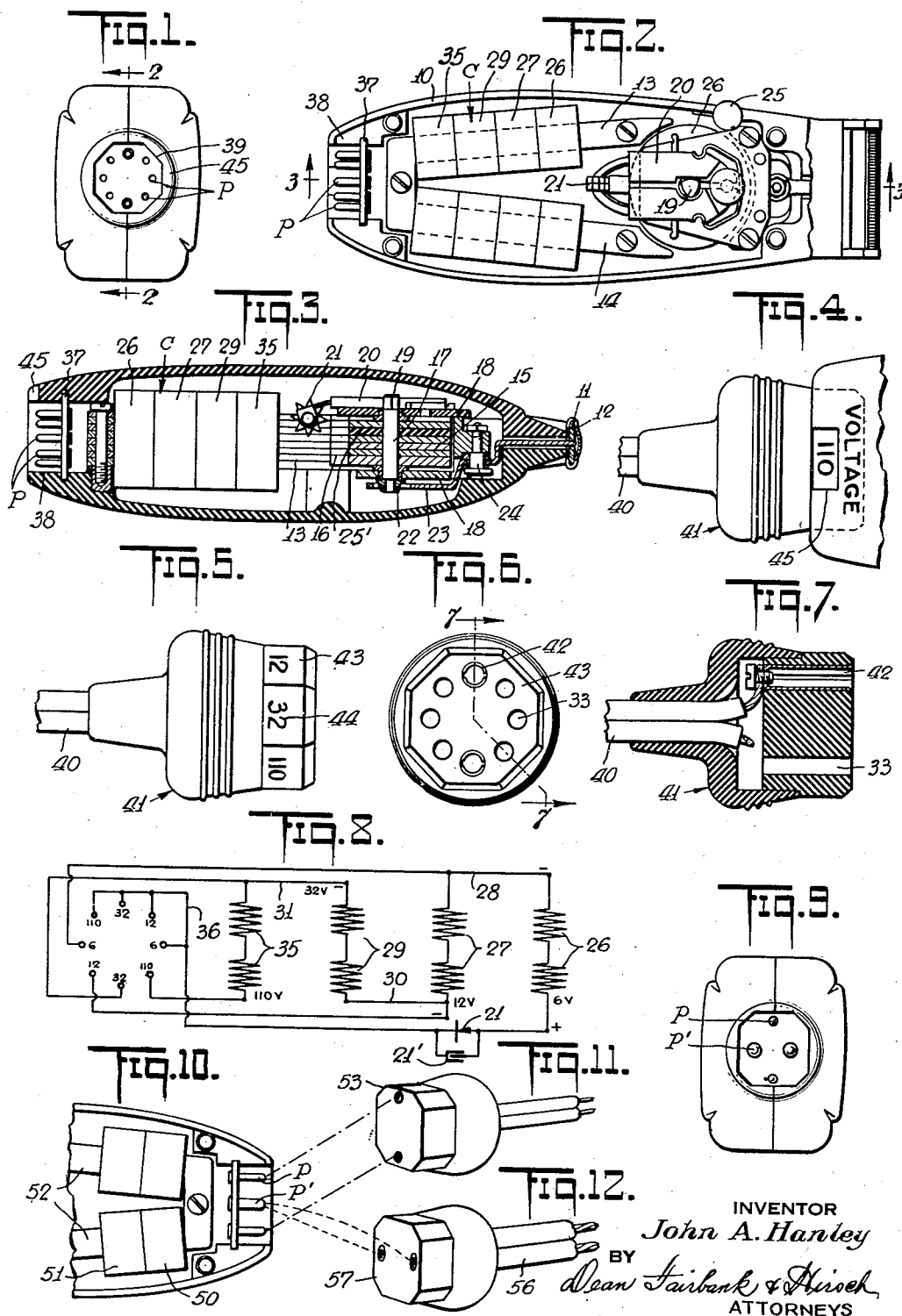
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MULTIVOLTAGE MOTOR DRIVEN TOOL

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MULTIVOLTAGE MOTOR DRIVEN TOOL

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The present invention relates to electrically driven tools or implements, primarily to electric shavers.

Among the objects of the invention are to provide an apparatus of the above type, which may be used alternatively on any of a multiplicity of common circuits illustratively on the usual 110 volt circuit in the home; on the 32 volt circuit in Pullman cars on the 12 volt circuit on boats and the six volt circuit on automobiles.

Another object is to provide a unit of the above type, which shall operate with substantially equal efficiency at any of a variety of voltages in common use, and which shall be relatively inexpensive in construction and the setting of which shall require no adjustment of the motor itself but is reliably effected as an incident to plugging the connector cord set into the tool handle.

In the accompanying drawing in which are shown one or more of various possible embodiments of the several features of the invention,

Fig. 1 is an end view of the shaving unit,

Fig. 2 is a sectional view taken on the line 2-2 of Fig. 1,

Fig. 3 is a sectional view taken on the line 3-3 of Fig. 2,

Fig. 4 is an enlarged side elevation showing the plug in its coaction with the rear of the shaver,

Fig. 5 is a side elevation of the plug,

Fig. 6 is an end view of the plug,

Fig. 7 is a sectional view taken on the line 7-7 of Fig. 6,

Fig. 8 is a circuit diagram indicating the electrical connection within the handle casing,

Fig. 9 is an end view of another embodiment of shaver,

Fig. 10 is a fragmentary sectional view of the embodiment of Fig. 9,

Fig. 11 is a fragmentary view of the cord set showing the female connector plug for high voltage connection in the embodiment of Figs. 9 and 10, and

Fig. 12 is a view similar to Fig. 11 showing the low voltage connection.

Referring now to the drawing, there is shown an electric shaving unit, the general construction of which is not claimed herein and need, therefore, be but briefly described. It comprises essentially an insulating casing 10 which serves as a handle, at the forward end of which is removably mounted a shearing head including an inner movable blade 11 and an outer fixed blade 12. Within the casing is mounted an electric motor by which the movable blade is reciprocated.

The field of the motor illustratively comprises a U-shaped laminated structure desirably with diverging legs 13 and 14 upon which are mounted the field coils C.

The armature comprises a stack of laminations 15 with serrations 16 to determine the armature poles. The armature is mounted on a shaft 17 journaled in bearing plates 18 and has a cam 19 at one end for operating the levers 20 which carry the circuit breaker points 21 at the ends thereof, said points being connected in series with the respective field coils C. At the other end, the shaft has the eccentric 22 for the operating lever 23, pivoted at 24 near the forward end of the casing, from which the forward end of the lever extends for coaction with the movable blade 11 of the shearing head. The starting wheel 25 protrudes from the side of the casing and coacts with a continuous fiber disk 25' included in the stack of laminations 15 that make up the armature structure.

The general features of the motor as thus far described, are more fully set forth and claimed in my prior Patent No. 2,078,896, granted April 27, 1937.

The motor according to the present invention is of the multiple voltage type so that it can be operated with substantially the same effectiveness on any of a plurality, illustratively any of the four voltages set forth that are in more or less common commercial use.

A preferred circuit arrangement for the field coils is shown diagrammatically in Fig. 8. Coils 26 suitable for the six volt circuit are connected across the terminals so marked. Coils 27 are connected in series therewith at 28 and between terminals marked 12. Similarly coils 29 are connected at 30 in series with coils 27 and 26, the said three sets of coils operating conjointly and in series for the 32 volt circuit being connected across terminals marked 32 and finally coils 35 are connected in series at 31 with the other three sets of coils, so that all four sets of coils operating in series will be utilized for operation at 110 volts by connection across terminals marked 110. By connection 36 the terminals 6, 12, 32 and 110 are directly joined at one side, the companion members of the terminal pairs 6, 12, 32 and 110 being distinct. Thus one of the terminal elements of each pair thereof is connected to the end of the corresponding set of field coils and the companion elements of the several pairs of terminals are directly connected together and in turn connected to the otherwise unconnected end of the series connected field

coils. The respective field coils 26, 27, 29 and 35 are of such resistance that the wattage consumption of the motor is substantially the same regardless on which voltage it is operating and the current consumption will vary inversely with the voltage as will be readily understood. The circuit breaker 21 is diagrammatically shown in the common leg 36 of the circuit, condenser 21' being shown bridging the same.

According to the invention, the terminal pairs of the respective field coils are pairs of prongs P which extend longitudinally of the casing and are mounted on an insulating disk 37 at the rear end of said casing. These prongs do not extend beyond the rear end of the casing but are lodged in a socket 38 molded as part of the casing and preferably with a regular polygonal wall 39, of as many sides as there are prongs. In the embodiment shown where four pairs of prongs are used, these are arranged in diametrically opposed pairs at the middles of the sides of a regular octagonal socket.

The electric shaver set forth is connected to the outlet box by means of a cord set 40 having a conventional wall plug (not shown) at one end and a female plug terminal 41 at the other end to be introduced into the socket 38. For that purpose, the plug terminal 41 is provided with a pair of hollow contact sleeves 42 in diametrically opposed relation, which contacts are encompassed by the polygonal periphery 43 of the plug, which is of dimensions to fit snugly in the polygonal socket 38 of the shaving unit for quick-detachable connection with any selected pair of prongs P. The remaining prongs P that are not in circuit are accommodated in corresponding wells 33 in the plug 41. The respective sides of the plug have markings 44 thereon indicating the respective voltages of use and selectively exposed through a notch 45 near one end of the casing 10 when the plug 41 is pushed home. Thus, the notch will expose visibly the particular voltage for which the plug has been set, each marking corresponding to the mating of the plug contacts 42 with the corresponding pair of prongs P in the handle casing. The user, therefore, by introducing the contact plug with the appropriate voltage indication exposed, can use one and the same shaving device on any of the several voltages for which the field of the motor is wound, illustratively, six volts for operation from the battery of an automobile, 12 volts for that of a motor boat, 32 volts in a Pullman car and 110 volts in the ordinary domestic lighting circuit.

Obviously the motor could be designed for use on various other voltages as for instance those used in different foreign countries, such as 50, 150, 200, 230 and 250 volts.

Though illustratively shown applied to a universal motor operable interchangeably on direct or on alternating current of any frequency, the invention manifestly is applicable also to devices equipped with motors specialized respectively for direct or for alternating current use.

Manifestly the invention is useful for tools other than shavers, such for instance as for massaging apparatus of various types.

In the embodiment of Figs. 9 to 12, there is shown a specific embodiment of an electrically operated tool, illustratively a shaver, in which multivoltage motor terminals are so constructed and arranged that the application of correct voltage for each circuit is inherently assured even in the absence of a voltage marking.

The unit illustratively shown, is useful either

on the usual house circuit ordinarily of 110 volts or alternatively on the battery circuit of an automobile, ordinarily of 6 volts. To that end the motor structure, generally like that in the embodiment shown in Fig. 2, has only two sets of field coils 50 and 51 on its field pole legs 52. Coils 51 serve for a 6 volt circuit and coils 50, or desirably the two coils 50, 51 in series are for 110 volt use. The terminals of the high volt field connection appear in the form of prongs P in the rear end of the casing. These prongs are desirably of dimensions and spacing conventional in electric shavers so that there may be plugged thereinto the conventional female plug 53 commonly used on electric shavers.

The terminals for the low voltage or 6 volt coil are a pair of prongs P' which desirably are of larger diameter than the other pair of prongs P and preferably are spaced at a distance from each other less than that of the prongs P. The respective pairs of prongs are preferably in planes at right angles to each other, so that each pair will straddle the plug connected to the other pair. The cord set used for operating the motor at low voltage is desirably of relatively heavy wire 56 to avoid excessive voltage drop therein which would be involved in the use of a conventional cord, and has a female plug 57 with sockets of size and spacing corresponding to those of prongs P'. As a consequence it will be impossible to apply the high voltage to the low voltage coil or conversely the low voltage to the high voltage coil or coils.

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope of the claims, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. An electrically operated tool comprising a handle casing, a multivolt motor therein, a plurality of pairs of terminals accessible at one end of the casing for selective connection for desired voltage, a coacting plug having a quick-detachable connection with said casing and including a pair of contacts adapted to mate with any of the pairs of contacts on the casing for operation on selected voltage.

2. An electrically operated tool suitable for use alternatively at any of a plurality of different voltages, said tool having an associated electric motor with a plurality of pairs of terminals, each pair for a distinct voltage, a socket in the tool for said terminals, and an inlet plug having a pair of contacts for selective quick-detachable connection of said plug for operation of the motor at selected voltage.

3. An electrically operated tool suitable for use alternatively at any of a plurality of voltages, said tool having an associated electric motor with a plurality of pairs of terminals, each pair for a distinct voltage, a socket for said terminals, a corresponding quick-detachable inlet plug, a pair of contacts in the plug for selective connection of said plug to any of said pairs of contacts in the socket, and indicating means visually showing the voltage for which the plug is connected in each setting thereof.

4. An electric shaver including a handle casing having an electric motor therein, said motor having a plurality of field coils for selective con-

nection in accordance with the voltage of the circuit from which the instrument is to be operated, said casing having a socket at one end thereof with a plurality of pairs of contact prongs therein corresponding to the several voltages, and a coacting quick-detachable female contact plug having a pair of contact sleeves adapted selectively to be mated with any pair of said contact prongs, depending on the voltage of the circuit.

5. An electric shaving implement, comprising a casing, a multivoltage electric motor therein, a plurality of pairs of contact prongs at the rear end of the casing, each pair of contact prongs serving as terminals for a distinct voltage of operation, a socket wall protecting said prongs and having a polygonal contour, a plug having a corresponding polygonal contour and adapted to be set in any of a plurality of selected positions with respect to said wall, said plug having a pair of contact sleeves for establishing circuit to any selected pair of prongs, depending upon the setting of the plug in the socket.

6. A multivolt electric shaver comprising a handle casing having a multivolt motor therein, said motor having a plurality of pairs of terminal prongs protruding from one end of the casing, each pair of said prongs serving as terminals for a distinct voltage of operation, a regular polygonal wall encompassing said prongs, a polygonal female plug to mate with said socket, and having a pair of contact sleeves to be selectively telescoped over any of the pairs of prongs for selective voltage setting, one of the sides of said polygonal wall having a window opening, said polygonal plug having voltage markings on the sides thereof selectively exposed through the said window opening.

7. An electric shaver comprising a handle casing having a motor therein, including a field with a plurality of field winding coils, a plurality of pairs of contact prongs connected to the respective coils and extending longitudinally of the handle casing and exposed at the rear end thereof, each pair of prongs serving as terminals for a distinct voltage of operation, said casing presenting a socket shell encompassing said prongs and formed as a regular polygon with one side for each prong, the casing being cut away at the lower end of one side of the polygonal wall and a female plug having a pair of contact shells adapted to be telescoped over any pair of diametrically opposed prongs on the casing, said plug having a regular polygonal form to fit said polygonal wall, each side of said plug having a voltage marking to be exposed through the notch in the casing when the plug is brought home and designating the voltage for which the motor has been connected.

8. An electrically driven tool having a handle and an electric motor enclosed therein and suitable for operation on any of a plurality of circuits of different voltage, said motor including a corresponding plurality of field coils, said coils having one electrically common terminal means, each of said coils having a distinct companion terminal, all of said terminals being accessible at the exterior of the casing, and means for selectively plugging in from a source of current supply between the electrically common terminal means and the selected distinct terminal for operation at the particular voltage available.

9. An electric shaver for use selectively on any of a plurality of voltages, said shaver comprising a handle casing having an electric motor therein

including a plurality of field coils, terminals for the respective voltages at one end of the casing, said terminals being in pairs for the respective voltages, the terminals of one polarity being electrically connected together within the casing and those of opposite polarity being electrically distinct.

10. An electric shaver for use selectively on any of a plurality of voltages, said shaver comprising a handle casing having an electric motor therein including a plurality of field coils, and terminals for the respective field coils at the rear end of the casing, said terminals being in pairs for the respective voltages, the terminals of one polarity being electrically connected together within the shaving unit and those of opposite polarity being electrically distinct, in combination with an electric plug having a pair of terminals adapted selectively to be engaged with any of the pairs of terminals in the casing.

11. An electric shaver for use selectively on any of a plurality of voltages, said shaver comprising a handle casing having an electric motor therein including a plurality of field coils, and terminals for the respective field coils at the rear end of the casing, said terminals being in pairs for the respective voltages, the terminals of one polarity being electrically connected together within the shaving unit and those of opposite polarity being electrically distinct, in combination with an electric plug having a pair of terminals adapted selectively to be engaged with any of the pairs of terminals in the casing, said casing having a socket for accommodating said plug, and presenting a window for exposing a corresponding part of the plug in each of the selective settings thereof, said plug having voltage markings thereon exposed through said window.

12. An electrically driven tool having a handle and an electric motor enclosed therein, and suitable for operation on any of a plurality of circuits of different voltage, said motor including a plurality of field coils connected in series, terminal elements accessible from one end of the casing, including individual terminal elements respectively connected to the ends of one and the same polarity of the various field coils, and further terminal elements respectively paired with said first terminal elements, and connected electrically to the end of opposite polarity of the set of series connected coils.

13. The combination recited in claim 12, in which the respective terminals are prongs and the respective terminal pairs are diametrically opposed within an enclosing socket in the casing of regular polygonal form having one side for each prong.

14. A two-voltage electric shaver having a low voltage coil and a high voltage coil, separate terminals for the respective coils accessible from the wall of the casing, said two pairs of terminals being differently spaced, each pair for cooperation only with a contact plug of corresponding dimensions, thereby to avoid the application of high voltage to the low voltage coil and conversely.

15. An electric shaver comprising a casing, an operating motor therein including one coil for high voltage operation and another coil for low voltage operation, the respective coils having terminals accessible at the rear end of the casing, the pair of low voltage terminals being spaced at a different interval from the pair of high voltage terminals to avoid application of

high voltage to the low voltage coil and conversely.

16. An electric shaver useful interchangeably on the conventional 110 volt house circuit and on the 6 volt battery circuit of an automobile, said shaver including a casing, a pair of electric operating coils including one for low voltage operation and the other for high voltage operation, the high voltage coil having terminals at the rear end of the casing spaced at the conventional distance and adapted for coaction with the end of a conventional electric cord set, the terminals for the low voltage coil being spaced from each other by a distance other than that for the high voltage pair to preclude application of high voltage thereto, and adapted for use with a special cord set suitable for low voltages.

17. An electric shaver useful interchangeably on the conventional 110 volt house circuit and on the 6 volt battery circuit of an automobile, said shaver including a casing, a pair of operating coils including one for the low voltage circuit and the other for the high voltage circuit, the high voltage circuit having terminals at the

rear end of the casing spaced at the conventional distance and adapted for coaction with the end of a conventional electric cord set, the terminals for the low voltage coil being of dimensions different from that for the high voltage coil to preclude the application of high voltage thereto, and adapted for use with a special cord set suitable for low voltages.

18. An electric shaver for use alternatively on the conventional 110 volt house circuit and the 6 volt battery circuit of an automobile, comprising a casing, two pairs of terminals at one end thereof, one pair of said terminals being of conventional size and spacing and having a 110 volt operating coil in the casing connected thereacross, the other pair of terminals being at lesser spacing and of larger dimensions than those of the 110 volt coil, and having a 6 volt operating coil in the casing connected thereacross, whereby error in connection of the conventional 110 volt cord and the special 6 volt cord is precluded.

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