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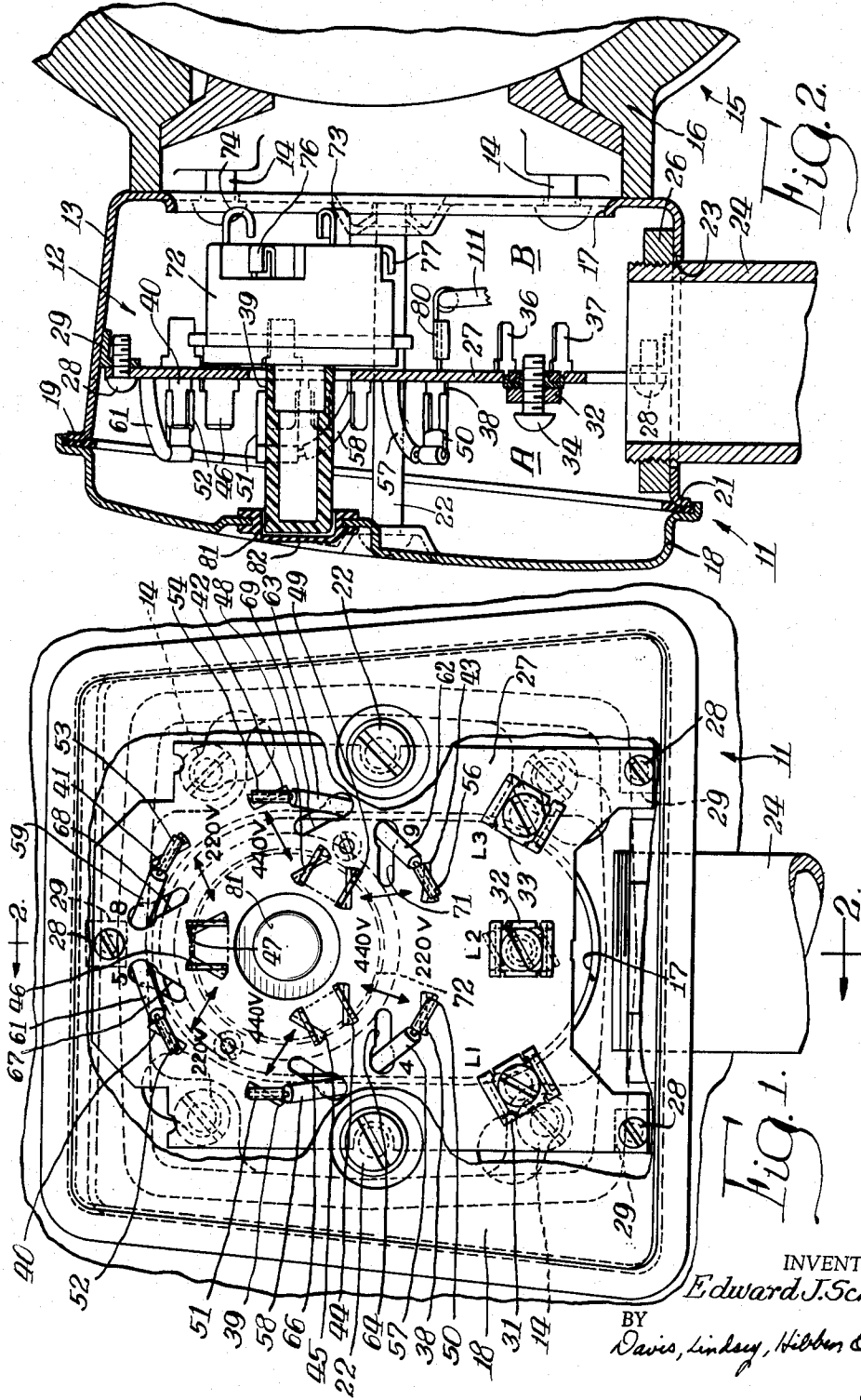
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3,233,129

TERMINAL ASSEMBLY FOR ELECTRIC MACHINES

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3 Sheets-Sheet 1



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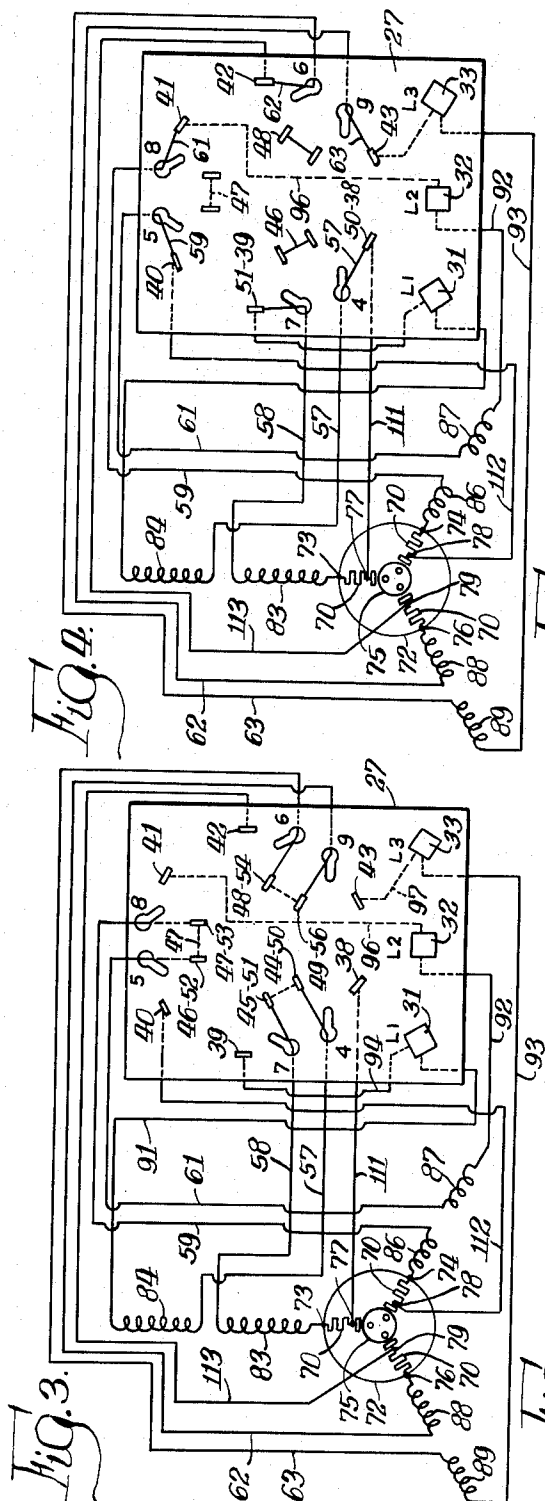
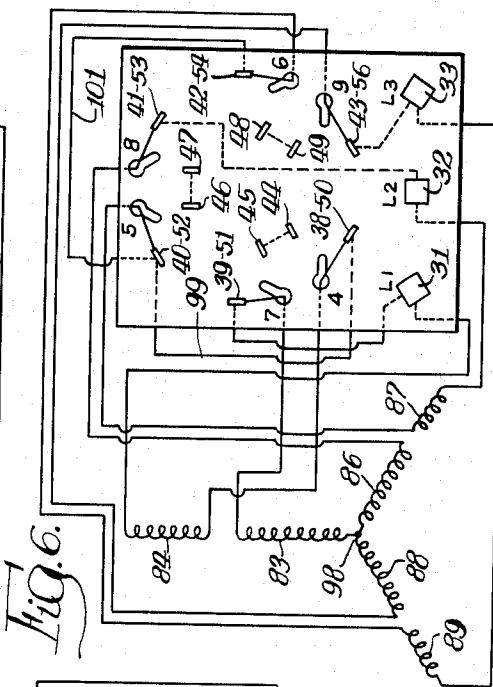
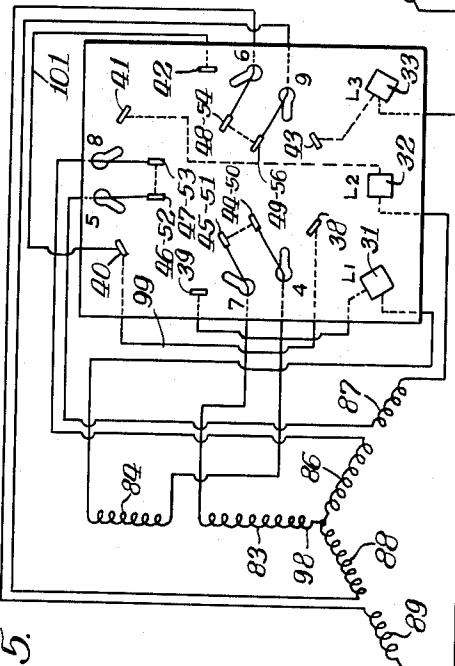
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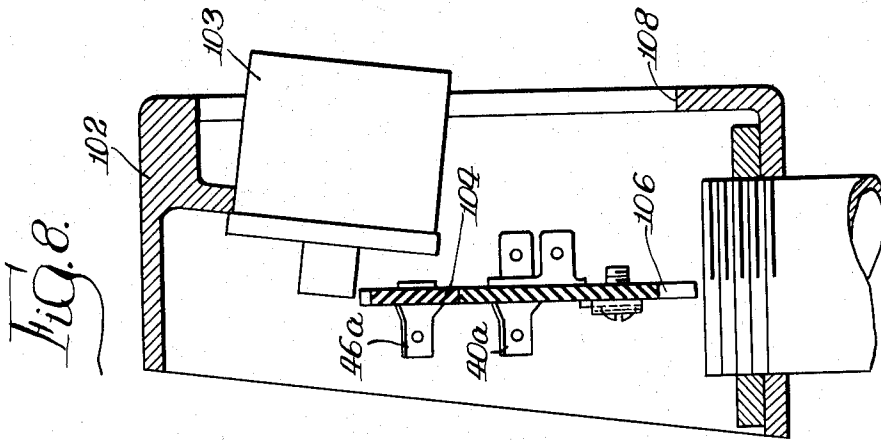
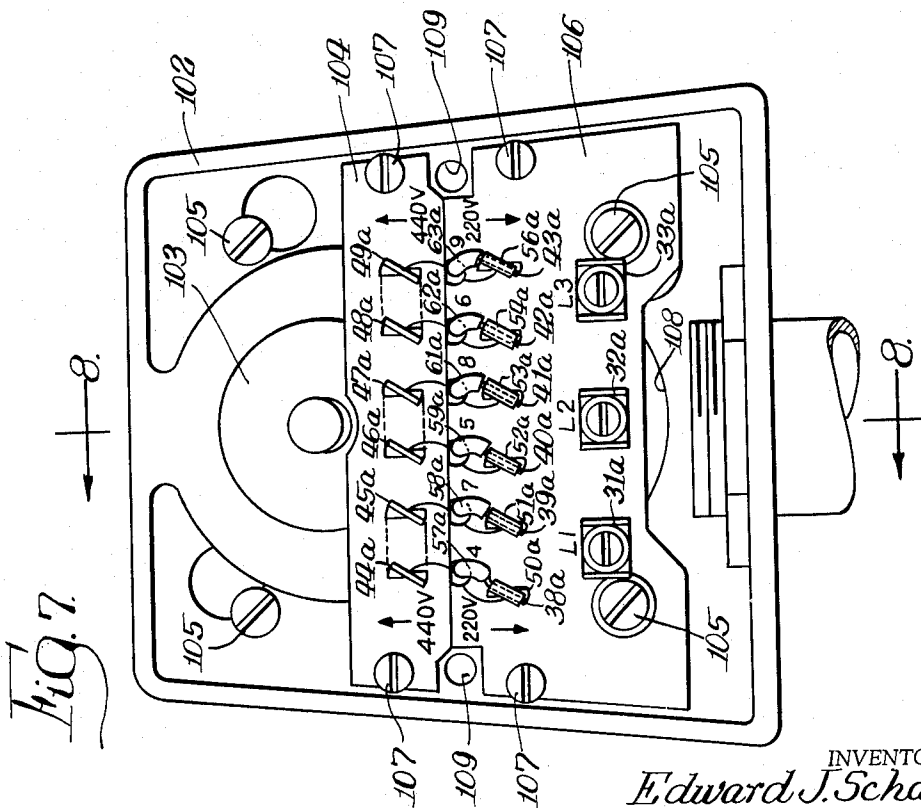
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TERMINAL ASSEMBLY FOR ELECTRIC MACHINES

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3 Sheets-Sheet 3



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3,233,129

TERMINAL ASSEMBLY FOR ELECTRIC MACHINES

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This invention relates to electric machines and, more particularly, to terminal assemblies for such machines.

It is quite common for electric machines to be wired to permit them to be operated in different ways. For example, manufacturers frequently provide dual windings in electric motors to permit low voltage or high voltage operation, depending on how the circuit of the motor is connected. It is also common for motors to be designed to permit clockwise or counterclockwise operation, depending on how the motor circuit is connected. Machines having such dual characteristics are desirable but their circuits are relatively complex and, consequently, much time and effort may be spent in installing them or in changing their mode of operation.

It is a primary object of the present invention to provide a novel terminal assembly for electric machines, which makes the changing of circuit connections for different modes of operation of such machines a simple and quick matter.

It is a further object to provide a novel quick change terminal assembly in which most connections are permanent and can be made during manufacture to reduce customer time in changing circuit connections.

Another object is to provide a novel quick change terminal assembly that is arranged to inhibit the making of improper connections.

Yet another object is to provide a novel terminal assembly for dual voltage motors.

Other objects and advantages of the invention will be apparent from the following description taken in connection with the accompanying drawings wherein:

FIG. 1 is a front view of a terminal assembly embodying the invention;

FIG. 2 is a sectional view taken along line 2-2 in FIG. 1;

FIG. 3 is a schematic view of a motor circuit provided with the assembly of FIG. 1 and connected for high voltage operation;

FIG. 4 is similar to FIG. 3 but showing the circuit connected for low voltage operation;

FIG. 5 shows a modified form of the motor circuit of FIG. 3;

FIG. 6 is similar to FIG. 5, but showing the circuit connected for low voltage operation;

FIG. 7 is a front view of a second form of terminal assembly embodying the invention; and

FIG. 8 is a sectional view taken along line 8-8 in FIG. 7.

A terminal assembly embodying the present invention comprises a housing containing a terminal support on which are mounted a plurality of fixed terminal elements. The terminal support extends transversely of the housing to act as a partition separating the housing into front and rear zones. The fixed terminal elements are mounted in an orderly arrangement on the support and have terminals with engageable portions thereof projecting forwardly into the front zone and other portions projecting rearwardly into the rear zone. The rearwardly projecting portions are for such relatively permanent circuit connections as can be made during manufacture. Their positions in the rear zone behind the support will discourage the making of any changes therein after the machines leaves the factory. The forwardly projecting

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portions are for such circuit connections as are expected to be made during or after installation of the machine to change the mode of operation.

The fixed terminals, in most instances, cooperate with shiftable mating terminals that are formed to grip the fixed terminals. The mating terminals are mounted on flexible leads. To indicate to an installer which circuit connections are proper and to inhibit improper circuit connections, each shiftable terminal located in the front zone is preferably permitted to engage with but two fixed terminals. However, the location of such shiftable terminal relative to its two associated fixed terminals is sufficient to visually indicate which connections are proper. The engageable portions of the fixed terminals may be further arranged symmetrically, as in rows, so that symmetry or the lack thereof clearly indicates whether connections are proper. Finally, indicia may be provided on the face of the support to visually indicate what connections can be properly made.

FIGS. 1 and 2 illustrate one preferred embodiment of the invention that is adapted for use in the circuit of a polyphase dual voltage electric motor as an aid to changing the motor circuit from one voltage to the other. It will be recognized that a similar assembly can be used for changing a motor circuit from one direction of operation to the opposite direction or for changing other kinds of dual voltage machines from one voltage to another. FIGS. 3 and 4 illustrate how the present form is used in conjunction with such dual voltage polyphase motor.

The form of the assembly shown in FIGS. 1 and 2 comprises a generally rectangular housing, indicated generally at 11, and terminal support structure, indicated generally at 12 in FIG. 2. The assembly is adapted to be mounted on an electrical machine and, for this purpose, the housing 11 comprises a member 13 of box-like form adapted to be secured as by screws 14 to the frame 16 of a dual voltage three phase motor, indicated generally at 15. The member 13 has an opening 17 at the rear thereof through which conductors from the motor 15 may enter the assembly. The housing 11 also includes a front cover 18 which is removable to expose the front of the support structure 12. The cover 18 seats against a peripheral flange 19 on the member 13, a gasket 21 preferably being interposed therebetween. A pair of screws 22, threaded into the member 13, may be provided to hold the cover 18 in place.

The support structure 12 is, in effect, a partition that divides the housing 11 into front and rear zones, indicated at A and B, respectively, in FIG. 2. The rear zone B, behind the support structure 12, contains circuit connections of a permanent nature which can be made during manufacture and are not normally changed thereafter. The front zone A contains circuit connections that may be changed during installation of the machine or thereafter. For both dividing the housing 11 into the zones A and B and supporting terminals, the support structure 12 comprises a member 27 of sheet insulating material formed as shown. The member 27 extends transversely of the housing 11 and may be rigidly secured to the member 13 as by a plurality of screws 28 threaded into lugs 29.

The present assembly provides means for connecting the motor 15 to a power line. Hence, an opening 23 is provided in the bottom of the member 13 for receiving a power line conduit 24. The end of the conduit 24 projects into the opening 23 and may be secured to the member 13 as by a nut 26. Near the opening 23, the support member 27 is provided with three power line terminals 31, 32 and 33, for connecting the power line conductors (not shown) that will enter the housing 11 through the conduit 24. Since these connections are non-permanent and are normally made when the machine

is installed, the terminals 31, 32 and 33 have screw connectors, such as 34 in FIG. 2, located on the front of the member 27 for connection to such conductors. Other leads will be permanently connected to the power terminals 31, 32 and 33 during manufacture. Hence, terminals 31, 32 and 33 are each also provided with a pair of terminal prongs, such as 36 and 37 on the terminal 33, which project rearwardly from member 27 into the zone B.

The member 27 also supports terminal means for selectively interconnecting circuit elements of the machine in different ways to provide different modes of operation. Such terminal means comprises, in the present instance, a first set of fixed terminals, a second set of fixed terminals and a set of mating terminals that are selectively shiftable from one set of fixed terminals to the other to change the mode of operation. In the present assembly, the first set of terminals are low voltage terminals connecting the motor 15 for operation on 220 volt current when engaged by the set of shiftable terminals. The second set of terminals are high voltage terminals connecting the motor 15 for operation on 440 volt current. To assist an installer in distinguishing between sets of terminals, the terminals of the two sets are arranged in distinct rows.

In the present instance, there are six fixed terminals 38, 39, 40, 41, 42 and 43 that make up the first or low voltage set. As shown in FIG. 1, the terminals 38, 39, 40, 41, 42 and 43 are arranged in a circular row on the member 27. The elements on which these terminals are formed project through spaced slots in the member 27 and provide similar terminals located on the back of the member 27 for permanent connection in the motor circuit. The fixed terminals are bladelike prongs shaped for engagement with mating terminals and are twisted slightly to fasten the elements on which they are formed in place on the member 27. The terminals in this set are preferably oriented generally tangentially with respect to their row.

There are also six fixed terminals 44, 45, 46, 47, 48 and 49 in the second or high voltage set of fixed terminals. It is the function of the high voltage terminals to connect windings in the motor 15 in series and for this purpose these terminals are interconnected in pairs. Thus terminals 44 and 45 are interconnected, terminals 46 and 47 are interconnected and terminals 48 and 49 are interconnected. This is conveniently accomplished in the present instance by forming the terminals on the opposite ends of U-shaped elements, as shown in FIGS. 1 and 2. These terminals, such as 44 and 45, are prong portions formed on the opposite arms of the U-shaped element, that project to the front of the member 27 through spaced slots in the member 27. The portion of the U-shaped element interconnecting the prong portions extends across the back of the member 27 between the slots. These terminals or prong portions are also twisted to fasten the U-shaped elements in place on the member 27. The terminals 44, 45, 46, 47, 48 and 49 are also in a circular row that is concentric with, but of smaller diameter than, the row formed by the terminals 38, 39, 40, 41, 42 and 43. The terminals of the second set are oriented generally radially of the circle.

For mating with the various fixed terminals on the front of the member 27, the assembly is provided with a set of shiftable terminals. In this instance, there are six shiftable terminals, 50, 51, 52, 53, 54 and 56 secured to the ends of flexible leads 57, 58, 61, 59, 63 and 62, respectively. The leads are connected to the motor circuit during manufacture and thus their ends opposite the shiftable terminal are located behind the member 27. The leads 57, 58, 59, 61, 62 and 63 are supported by the member 27 and project forwardly through slot openings 64, 66, 67, 68, 69, and 71 in the member 27. The slot openings are keyhole shaped to permit the leads and their associated terminal elements to be preassembled

and thereafter passed through the openings. The openings are arranged in a circular row concentric with the previously mentioned rows of fixed terminals and are equidistant from the associated fixed terminals so that the shiftable terminals will be located in position to engage either row of fixed terminals. Each shiftable terminal is arranged so that it may be engaged with only certain adjacent fixed terminals and cannot be engaged with other adjacent fixed terminals. In the present instance, the leads 57, 58, 59, 61, 62 and 63 are preferably anchored behind the member 27 to project a predetermined length from the member 27 so their associated shiftable terminals may be engaged with only two adjacent fixed terminals. Thus, the two fixed terminals to which a lead may be connected are indicated by being substantially in radial alignment (due partly to the positions of the slots through which the fixed terminals project and partly to the previously mentioned twist) with the center of the associated lead. Similar mating terminal elements, such as 80 in FIG. 2, are used to form the permanent connections with the rearwardly extending terminals or prongs.

The present assembly also provides overload protection for the motor 15. Thus, the support structure 12 has mounted thereon an overload protector device 72 (see FIG. 2) of a type frequently used with polyphase motors, such as a manually reset type or an automatic type. The device 72 is provided with six terminals, 73, 74, 76, 77, 78 and 79, which are connected to the ends of three heater elements 70, as shown in FIGS. 3 and 4. The terminals 77, 78 and 79 are normally engaged by a heat sensitive disk 75 (see FIGS. 3 and 4). Upon overheating, the disk 75 disengages the terminals 77, 78 and 79 and disconnects the motor 15. Thereafter, the device 72 must be reset before operation can be resumed. In the present instance, the device 72 is illustrated as a manually reset type and a plunger 81, projecting to the front of the apparatus, is used for resetting the device 72. A flexible diaphragm 82 in cover member 18 permits manipulation of the plunger 81.

FIGS. 3 and 4 illustrate the manner in which the present terminal assembly is connected in the circuit of the motor 15. FIG. 3, shows the circuit connected for high voltage operation, and FIG. 4 shows the circuit connected for low voltage operations. The motor 15, being a three phase dual voltage motor, has three pairs of field windings, one pair being windings 83 and 84, another pair being windings 86 and 87, and the third pair being 88 and 89. The windings of each pair are connected in series by the assembly for high voltage operation (FIG. 3) and in parallel for low voltage operation (FIG. 4). In both arrangements, the motor windings are wye connected and the protective device 72 forms the neutral for the motor.

In the present arrangement, most of the circuit connections for the motors are relatively permanent and, hence, can be made during manufacture. Thus, one end of the winding 83 is permanently connected by the lead 58 to its shiftable terminal 51 and an adjacent end of the winding 84 is permanently connected by the lead 57 to its shiftable terminal 50. Similarly, adjacent ends of windings 86, 87, 88 and 89 are respectively connected by leads 59, 61, 62 and 63 to their shiftable terminals 53, 52, 56 and 54. The opposite ends of windings 83, 86 and 88 are respectively connected permanently to terminals 73, 74 and 76 of the protector device 72 and the opposite ends of windings 84, 87 and 89 are respectively connected permanently to power terminals 31, 32 and 33 by conductors 91, 92 and 93. Power terminals 31, 32 and 33 are also permanently connected by conductors 94, 96 and 97 to fixed terminals 39, 41 and 43, respectively. The fixed terminals 38, 40 and 42 are permanently connected to the terminals 77, 78 and 79, respectively, of the protector device 72 by conductors 111, 112, and 113. Since all of these connections are relatively perma-

nent, they are located behind the member 27 in zone B to discourage the making of changes therein during installation.

The foregoing connections having been made during manufacture, it is a simple matter on installation to connect the windings in series for high voltage operation. As shown by FIG. 3, this is accomplished by simply connecting all the shiftable terminals to their associated fixed terminals in the high voltage row. The shiftable terminals 50, 51, 52, 53, 54 and 56 are respectively connected to the fixed terminals 44, 45, 46, 47, 48 and 49. Thus, the windings of each pair are connected in series since the fixed terminals 44, 45, 46, 47, 48 and 49 are interconnected in pairs. It is apparent from looking at the face of the member 27, as shown in FIG. 3, that the shiftable terminal elements and their associated leads form a symmetrical pattern on the face of member 27. All of the leads extend from their associated slot openings generally radially toward the center of the circles defined by the circular rows of fixed terminal elements. Furthermore, as shown in FIG. 1, printed indicia, comprising arrows and the symbols 440 v. and 220 v. or other indicia, on the face of the member 27 show that the shiftable terminal elements are engaged with the high voltage set of terminals. If a mistake had been made in connecting any of the shiftable terminal elements, such mistake would be apparent from a lack of symmetry.

To shift from high voltage operation to low voltage operation, it is only necessary to shift the connections to the positions shown in FIG. 4. A comparison of the connections in FIG. 4 with those in FIG. 3 reveals that every change necessary is made when the six shiftable terminal elements are changed from engagement with the inner circle of fixed terminal elements to the outer circle of fixed terminal elements. Thus, the shiftable terminals 50, 51, 52, 53, 54 and 56 have been disengaged from the high voltage fixed terminals and engaged with fixed terminals 38, 39, 40, 41, 42 and 43 respectively. By these simple changes, the windings in each pair are connected in parallel rather than in series. Moreover, these changes have also changed the appearance of the face of member 27. The flexible leads and their associated shiftable terminal elements are now arranged generally tangential to the circle defined by the outer row of fixed terminal elements. While there is symmetry, the appearance has changed. By reference to FIG. 1, it can be seen that the shiftable terminal elements are now engaged with terminals indicated by the printed indicia as being 220 v. terminals.

It is not essential to the present invention that the terminal assembly include a protective device, such as the overload protector 72. FIGS. 5 and 6 show circuits for the motor 15 when not equipped with an overload protector. In these two arrangements of the circuit, most of the circuit elements are identical to those in FIGS. 3 and 4. In these circuits, the windings 83, 86 and 83 have their inner ends directly interconnected to form a neutral 98, the neutral 98 replacing the protector 72. In addition, fixed terminals 38, 40 and 42 are interconnected by a jumper comprising conductors 99 and 101 to form a second neutral for windings 84, 87 and 89 when the windings are connected for low voltage operation. Otherwise, the circuits in FIGS. 5 and 6 are substantially the same as those described in FIGS. 3 and 4, respectively.

In FIG. 5, the motor 15 is connected for high voltage operation, with the flexible leads and their associated shiftable terminals connected to the inner row of fixed terminals. In FIG. 6, the motor 15 is connected for low voltage operation, with the flexible leads and their associated shiftable terminals connected to the outer row of fixed terminals.

FIGS. 7 and 8 show a second form of terminal assembly embodying the features of the present invention. The second form of assembly comprises a housing member 102 adapted to be secured to the motor as by screws

105 and in which is mounted an overload protector 103 of the type discussed above. The housing member 102 also contains terminal support structure, in this instance a pair of flat members 104 and 106 of insulating material. The members 104 and 106 are mounted in edge to edge relation in the housing 102 and are held in position as by a plurality of screws 107. The members 104 and 106 thus form a transverse partition which divides the housing 102 into front and rear zones, in the manner described in connection with the first form. The housing 102 has a back opening 108 through which leads from the motor can pass. Threaded openings 109 are provided in the housing 102 for receiving screws (not shown) that secure a cover member (not shown but similar to the cover member 18) to the housing 102.

An important difference between this form of the device and the previous form is the arrangement of the terminals in straight rows. To show basic similarities in the assemblies, however, the leads and terminals in the present form have been given the reference numerals of corresponding leads and terminals in the previous form, but with the subscript "a" added. In the present instance, the terminal elements are arranged in parallel rows. A set of high voltage fixed terminal elements 44a, 45a, 46a, 47a, 48a and 49a, that cooperate with shiftable terminal elements to connect the pairs of windings in series, are located in the top row, labeled 440 v., as shown in FIG. 7. A set of low voltage fixed terminals 38a, 39a, 40a, 41a, 42a and 43a, that cooperate with the shiftable terminals to connect the winding of each pair in parallel, are located in the bottom row, labeled 220 v. in FIG. 7. A row of generally round openings is formed in the upper edge of the member 106, and flexible leads, that carry mating shiftable terminals 50a, 51a, 52a, 53a, 54a and 56a, project through the openings. The terminals can be connected in FIGS. 7 and 8 to form the circuits shown in FIGS. 3 and 4 or 5 and 6 by using the corresponding reference numerals as a guide.

Hence, the arrangement of the second form is specifically different from the first form, yet the basic idea of symmetry is present in this second form of the device. The device is shown in FIG. 7 connected for low voltage operation with the shiftable terminals connected to the lower row of fixed terminals. The device will be connected for high voltage when the shiftable terminals are changed to the upper row of fixed terminals. When a shiftable terminal is not connected in the same row with all the others, it is apparent that such shiftable terminal is improperly connected. In each instance, a shiftable terminal, because of the length of its associated lead, can be connected only to those two fixed terminals that are respectively immediately above and immediately below its lead opening.

From the foregoing, it can be seen that present invention provides a novel terminal assembly for electric machines having dual characteristics, such as dual voltage motors. The assembling makes it obvious to an installer, even one having no prior experience, how to complete the circuit connections during installation. These connections are simple to make, those that are proper being indicated by the symmetry of the assembly, by the length of the leads provided and by indicia printed on the structure.

I claim:

1. A quick change terminal assembly for dual voltage electric machines, comprising terminal supporting structure, a set of high voltage fixed terminals mounted in a row on said structure, a set of low voltage fixed terminals mounted in a row on said structure, each of said high voltage fixed terminals being associated and forming a pair with one of said low voltage fixed terminals, and a set of flexible leads arranged in a row adjacent said sets of fixed terminals, each of said flexible leads having a manually shiftable terminal thereon for selective engagement with one pair said high voltage and said

low voltage fixed terminals, said leads limiting the extent of movement of said shiftable terminals whereby each shiftable terminal is permitted to selectively engage only one of the high and one of the low voltage fixed terminals.

2. An assembly according to claim 1, in which said high voltage fixed terminals are located in a row different from that in which said low voltage fixed terminals are located.

3. An assembly according to claim 2 in which said sets of fixed terminals are in circular concentric rows.

4. A quick change terminal assembly for an electric machine operable in two different modes, comprising terminal supporting structure, a plurality of fixed terminals mounted on said structure, and a plurality of flexible leads adjacent said fixed terminals, said flexible leads having manually shiftable terminals thereon, said shiftable terminals being formed for connection to said fixed terminals to establish electrical connections therebetween, each of said shiftable terminals being located respectively within reach of no more than two of said fixed terminals, the two fixed terminals for each shiftable terminal being in a symmetrical arrangement with respect to said shiftable terminals and with respect to the other fixed terminals to provide two easily distinguished patterns, one of said two fixed terminals being in one of said two patterns and the other of said two fixed terminals being in the other of said two patterns, one pattern indicating proper connections for one mode of operation of the machine and the other pattern indicating proper connections for another mode of operation of the machine.

5. A quick change terminal assembly for an electric machine, comprising terminal supporting structure, a plurality of fixed terminals mounted on said structure in two easily distinguishable groups, the terminals of each of said groups being symmetrically arranged, said structure having a plurality of lead openings therein, a plurality of flexible leads projecting through said openings, each of said flexible leads having a shiftable terminal thereon selectively engageable with one fixed terminal of each of said groups.

6. An assembly according to claim 5, in which the lengths of said leads projecting through said openings are predetermined for limiting the fixed terminals to which each shiftable terminal can be attached.

7. A quick change terminal assembly for an electric machine operable in two different modes, comprising terminal supporting structure, a first set of terminals mounted in a row in fixed relation on said structure, a second set of terminals mounted in a row in fixed relation on said structure and in spaced relation to said first set, each terminal of said first set being located adjacent and forming an associated pair with one terminal of said second set, one hole formed through said structure for each of said pairs, and one flexible lead extending through each of said holes, each of said leads including a manually shiftable terminal which is selectively engageable with the associated pair of said fixed terminals of said first and second sets of fixed terminals for connecting said machine for one mode of operation when said shiftable terminals are engaged with said first set of fixed terminals and for connecting said machine for another mode of operation when said shiftable terminals are engaged with said second set of fixed terminals.

8. An assembly according to claim 7, in which said sets of fixed terminals are arranged in two generally circular concentric rows on said supporting structure.

9. An assembly according to claim 7, in which said fixed terminals are bladelike prongs projecting from said supporting structure, and said shiftable terminals are mating clips that telescopically engage said prongs, and said supporting structure has keyhole shaped slots formed therein from which said clips and their associated leads project, said keyhole shaped slots thereby permitting said clips and their associated leads to be preassembled and inserted through said keyhole shaped slots.

10. An assembly according to claim 7, in which said fixed terminals are bladelike prongs arranged in two generally circular concentric rows on said supporting structure, the terminals in one row being generally tangential to their row and the terminals in the other row being generally radial to their row.

11. A quick change terminal assembly for selectively connecting a pair of windings in a dual voltage electric machine in series for high voltage operation and in parallel for low voltage operation, said assembly comprising a terminal support, a pair of flexible leads carried side by side on said support and respectively adapted to be connected to ends of said windings, said leads having shiftable terminals secured thereto, a first pair of interconnected fixed terminals mounted on said support in position to be respectively engaged by said shiftable terminals for connecting said windings in series for high voltage operation, and a second pair of fixed terminals mounted on said support in position to be respectively engaged by said shiftable terminals and located in spaced relation to said first pair for connecting said windings in parallel for low voltage operation.

12. An assembly according to claim 11, in which said support structure is provided with a line terminal adapted to be connected to a conductor in a power line and also to one winding at the end of said winding opposite to that to which said lead is connected, one fixed terminal in said second pair being connected to said line terminal, said one fixed terminal being positioned on said support to be engaged by the shiftable terminal of the other winding for connecting corresponding ends of said windings together and to such line terminal.

13. An assembly according to claim 12 for a poly-phase machine, in which the other fixed terminal in said second pair is connected to means forming a neutral for such machine, whereby said windings are connected in parallel when said second pair of fixed terminals are engaged by said shiftable terminals.

14. A quick change terminal assembly for selectively connecting each pair of a plurality of pairs of windings in a dual voltage machine respectively in series for high voltage operation and in parallel for low voltage operation, said assembly comprising a terminal support, a pair of flexible leads for each pair of windings carried side by side on said support and adapted to be connected to ends of the associated windings, said leads having shiftable terminals respectively secured thereto, a first pair of interconnected fixed terminals for each pair of windings mounted on said support in position to be respectively engaged by said shiftable terminals for connecting the associated pair of windings in series, and a second pair of fixed terminals for each pair of windings mounted on said support in position to be respectively engaged by said shiftable terminals and located in spaced relation to said first pair, the fixed terminals in said second pair being arranged for connecting their associated windings in parallel across power line conductors when engaged by their associated shiftable terminals.

15. The combination according to claim 14, in which said first set of fixed terminals being arranged all in a first row and said second set of fixed terminals being arranged all in a second row, whereby the connection of said shiftable terminals to said first row provides a visual indication that the machine is connected for high voltage operation and the connection of the shiftable terminals to said second row provides a visual indication that the machine is connected for low voltage operation.

16. The combination according to claim 15, in which said support structure is provided with a row of lead openings arranged in a row of the same shape as said rows of fixed terminals, said flexible leads projecting through said openings.

17. The combination according to claim 16, in which said fixed terminals are in pairs with each pair associated with one lead opening, the fixed terminals of each pair

being substantially equidistant from their associated lead opening.

18. A quick change terminal assembly for selectively connecting a pair of windings in a dual voltage machine in series for high voltage operation and in parallel for low voltage operation, said assembly comprising a terminal support, an overload protector device mounted on said support and adapted to be connected to an end of one of the windings, a pair of flexible leads carried side by side on said support and adapted to be connected respectively to the other end of said one winding and an end of the other winding, said leads having shiftable terminals respectively secured thereto, a first pair of interconnected field terminals mounted on said support in position to be respectively engaged by said shiftable terminals for connecting said windings in series, and a second pair of fixed terminals mounted on said support in position to be respectively engaged by said shiftable terminals and located in spaced relation to said first pair, one terminal of said second pair being connected to said overload protector device and the other terminal of said second pair being connected to the other end of said other winding for connecting said other winding to said protector in parallel with said one winding.

19. A quick change terminal assembly for an electric machine for quickly changing the circuits of said machine from one mode of operation to another, comprising a terminal support, a plurality of fixed terminals supported by said support and projecting from one face thereof, and a plurality of flexible leads supported by said support and projecting from said one face and having shiftable terminals for engagement with certain of said fixed terminals for one of said modes of operation and with other of said fixed terminals for said other mode of operation, said fixed terminals and said leads extending through said support to the other face thereof with certain of said fixed terminals at said other face and said leads being adapted to be permanently connected to said machine for both modes of operation, whereby all shiftable connections for changing the mode of opera-

tion are located at said one face and all permanent connections are at the other face.

20. An assembly according to claim 19, in which a plurality of line terminals are mounted on said support and have portions on said one face for connection to power lines and portions on said other face adapted to be permanently connected to said machine, thereby locating the connections for the power lines on the same face with the shiftable connections for determining the mode of operation.

21. A quick change terminal assembly for an electric machine, comprising a generally flat terminal support, a plurality of line terminals mounted in fixed relation on said support, a first set of fixed terminals mounted on said support, and a second set of fixed terminals mounted on said support, said first and second sets of fixed terminals being arranged respectively in first and second rows, said support having a plurality of openings adapted to receive flexible leads and arranged in a row corresponding to said first and second rows and located such that flexible leads extending through said holes may cooperate with said fixed terminals, each opening being associated only with a pair of fixed terminals comprising one fixed terminal in each of said first and second rows.

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