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ELECTRIC PLUG-IN CONNECTOR

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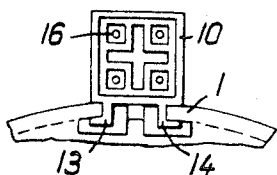
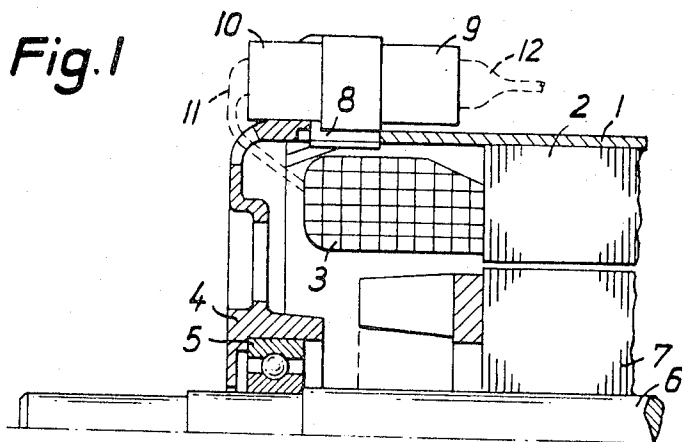
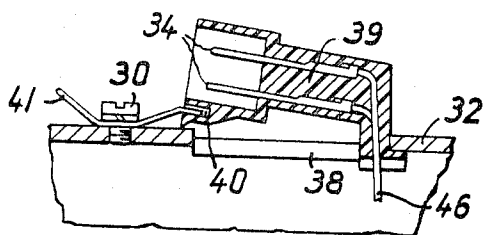
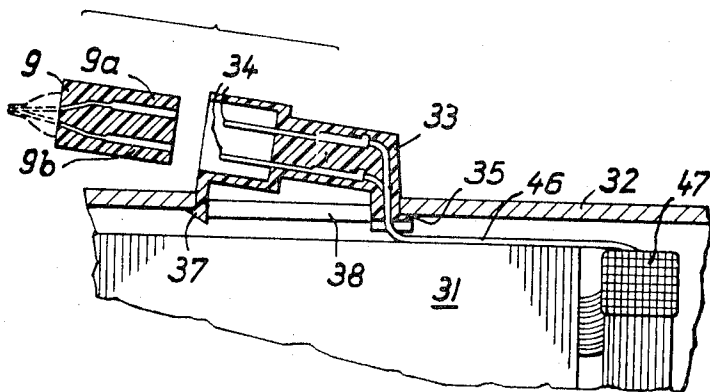


Fig. 2



Fig. 2a



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ELECTRIC PLUG-IN CONNECTOR

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U.S. Cl. 339—14

8 Claims

ABSTRACT OF THE DISCLOSURE

A multiple-pole plug-in connector for connecting the winding of an electric motor to a power supply. A casing mounted on the motor housing holds the stationary contacts. The means for holding the stationary contacts as well as at least part of the means for securing the casing to the motor housing are parts of the casing itself. The portions of the stationary contacts which are attached to winding-connected power leads as well as the respective end portions of the power leads themselves are embedded within said casing.

Background of the invention

The present invention relates to plug-in means for connecting an electric motor to a power supply; and, in particular, to plug-in connectors of the type comprising movable and stationary contacts mounted in male and female connector casings which can be plugged together to electrically connect the contacts.

Electrical plug-in connectors of the prior art have been constructed with the female portion of the connector containing stationary contacts and fitted against and attached to an electric motor enclosure. This portion has principally consisted of a rectangular-shaped casing surrounding either one or more insulating members which hold and insulate the stationary contacts of the plug-in connector. In one known type of connector the contacts have been inserted through the insulating member and gripped in a fixed position with a barb. The rectangular-shaped casing, made large enough to permit the motor power leads to be connected to the contacts, is usually attached to the motor housing by means of screws passed either through specially provided holes in the casing or through brackets which hold the casing down. The casing has been mounted to receive the male member of the plug-in connector in a direction either parallel or radial to the motor axis.

A number of individual parts are required for the connection and attachment of such a plug-in connector to an electric motor. These parts must be manufactured from different materials and consume time in their assembly. The repeated connection of the individual free ends of the motor power leads, the opposite ends of which are connected to motor windings, to various pieces of measuring and test equipment for electrically checking the motor windings and then to their corresponding stationary contacts in the plug-in connector casing has also led to difficulties and to time-consuming working steps. Because of the repeated connections and reconnections of the individual motor power leads connection errors have often been made.

Summary of the invention

An object of the present invention is to design a plug-in connector for use with electric motors which is considerably simpler and more practical and which avoids the disadvantages of the connectors known in the prior art.

A further object of the present invention is to design

a plug-in connector which simplifies the testing of motor windings prior to electric motor assembly.

These and other objects, which will become apparent in the discussion that follows, are achieved according to the present invention by a multiple pole plug-in connector for connecting the winding of an electric motor to a power supply having a casing mounted on the motor housing and stationary contacts arranged within the casing and connected to the motor windings by means of power leads. The casing is adapted to receive a plug holding movable contacts which cooperate with the stationary contacts and is provided with means forming an integral part thereof, for securing itself to the motor housing.

According to one preferred embodiment of the present invention, the securing means are constructed as guide rails arranged parallel to the axes of the stationary contacts on the side of the casing which faces the motor housing.

According to another preferred embodiment of the present invention, the securing means include two projections arranged transverse to the axes of the stationary contacts on the side of the casing which faces the motor housing. One of the projections is flexible and is provided with a clamp arranged to hold itself to the motor housing. The other projection is rigid and provided with a flange so that this other projection will hold itself to the motor housing.

The casing is preferably manufactured in one solid piece with the connected portions of stationary contacts as well as the respective portions of the power leads undetachably embedded therein.

Brief description of the drawings

FIGURE 1 is an elevational and partially sectional view of an electric motor having attached thereto a plug-in connector according to one embodiment of the present invention.

FIGURE 2 is a front view of one embodiment of the connector casing of the plug-in connector shown in FIGURE 1.

FIGURE 2a is a fragmentary front view of another embodiment of the connector casing of the plug-in connector shown in FIGURE 1.

FIGURE 3 is a cross-sectional view of a plug-in connector according to another embodiment of the present invention.

FIGURE 4 is a cross-sectional view of a connector casing of a plug-in connector according to still another embodiment of the present invention.

Description of the preferred embodiments

Turning now to the drawings, FIGURE 1 shows a section through part of an electric motor having a plug-in connector, according to the present invention, attached thereto. Parts of the electric motor which are not necessary for an understanding of the invention are omitted from FIGURE 1 for the sake of clarity.

Included in FIGURE 1 are a motor housing 1, which encases the stator laminations 2, and the corresponding motor winding 3. The rotor 7 is mounted on a shaft 6 which turns inside a bearing 5 that is carried by a bearing bracket 4. The casing 10 of the plug-in connector which holds the stationary contacts is pushed in from the bearing bracket side of the motor in an opening 8 in the motor housing 1. The male coupling member 9 having the movable contacts 9a, 9b (as in FIGURE 3) of the plug-in connector is inserted into the casing 10. The motor power leads 11 are led out through the winding 3 to the back of the casing 10 where they are conductively connected to the stationary contacts of the plug-in connector. The ends of the connecting leads 12 of the power

supply are correspondingly connected to the movable contacts in member 9.

FIGURE 2 illustrates the manner in which the casing 10 is attached to the motor housing 1 according to one embodiment of the invention. The side of the casing 10 facing the motor is provided with two guide rails 13 and 14 having an L-shaped cross section. When the casing 10 is inserted in the opening 8 of the motor housing 1 these rails engage the motor housing walls and keep the casing 10 from shifting both in the radial as well as the circumferential direction. The casing 10 is held in the motor axis direction by the bearing bracket 4 which covers the front side of the opening 8.

FIGURES 1 and 2 illustrate only one of a number of ways in which the casing 10 may be attached to the electric motor. For example, as illustrated in the fragmentary view of FIGURE 2a, a single rail with a T-shaped cross section may be used in place of the two L-shaped guide rails 13 and 14. It is also possible, and within the scope of the invention, to arrange spring tabs provided with barbs on the casing 10 to engage in correspondingly arranged holes in the motor housing 1. Likewise, the number, arrangement and design of the contacts 16 are not limited to the example illustrated in FIGURE 2 but may be modified as desired; for example, all contacts might be arranged side-by-side in the circumferential direction of the motor housing. The receptacles for the contacts 16 shown in the FIGURE 2 form, together with the casing 10, a single unit of construction.

The male and female members 9 and 10, respectively, of the plug-in connector may also be provided with spring-loaded elements, not shown, which prevent both parts from accidentally pulling apart.

During the manufacture of an electric motor it is necessary that the stator winding be tested at least once after it has been mounted on the stator laminations and after it has been impregnated. It has been common practice, in this regard, to provide the winding ends with power leads and to warp the points of connection between the ends of the leads and the ends of the winding when wrapping the entire winding with insulation. The free ends of the power leads have then been individually connected to the test equipment. This procedure consumed considerable time and it often occurred that the power leads were accidentally interchanged when connected to the test equipment causing error in the test results. The manner in which the casing 10 may be connected to the motor housing 1 according to the invention, on the other hand, makes it practical to connect the power leads to the contacts 16 and insert the contacts 16 in the casing 10 immediately after the power leads have been connected to the winding ends. This procedure is advantageous because it removes the possibility of interchanging the power leads during subsequent working steps. The casing 10 can then, moreover, be quickly and easily connected to the test equipment.

The arrangement shown in FIGURES 1 and 2 and described above requires that casing 10 be designed to permit the insertion of the stationary contacts, attached to the power leads, in corresponding receptacles in the casing back side. This arrangement requires that the back side of casing 10 be exposed and that the motor housing also be provided with an opening for the power leads. If it is necessary, as often happens, that the electric motor unit be protected from the effects of dust or moisture, the back sides of both the male and female members of the plug-in connector must be sealed and the housing opening covered. This can be accomplished, for example, by sealing the openings with a viscous hardenable casting resin or a specially designed cover. These methods, however, require additional material, and, perhaps more important, additional labor.

These difficulties are eliminated by an embodiment of the present invention which is illustrated in FIGURES 3 and 4. In this embodiment the stationary contacts of

the plug-in connector and the portions of motor power leads connected to the contacts are undetachably connected to the casing receptacle.

The motor housing 32, only a segment of which is illustrated in FIGURE 3, contains an opening 38 for receiving the plug-in connector casing 33. This casing 33 is manufactured of insulating material by the injection molding process. The ends of the stationary contacts 34 which are connected to the power leads are undetachably embedded in the material of the casing 33. Such a casing 33 is advisably manufactured by inserting the contacts 34 in the injection molding form after they have been connected to the stator winding power leads. When the casing material is injected into the form the power lead connected ends of the contacts are surrounded by the material and permanently and solidly fixed in the casing.

The casing 33 includes on its lower rear side a flange or holding catch 35, which, together with an elastically mounted projection 37 arranged on the opposite lower side, serves to attach the casing to the motor housing 32. The casing is mounted on the motor housing by inserting the holding catch 35 into the opening 38 underneath the housing wall 32, and pressing the casing down toward the motor housing until the projection 37 snaps in place.

The opening in the motor housing 38 is dimensioned so that the casing can be vertically inserted through it from the inside of the motor housing. The width of the opening is slightly less than the width of the casing, however, so that when mounted as shown in FIGURE 3, with the members 35 and 37, which are dimensioned to fit inside the opening, inserted in place, the casing does not fall through but is rigidly attached.

The power leads 46, which are connected to the stationary contacts 34 and thus project from the casing 33, are connected to the winding ends immediately upon completion of the manufacture of the stator winding 47. This procedure permits the plug-in connector to be used for connecting the stator winding to measuring and testing equipment.

The shape of the casing 33 is chosen so that it may be inserted through the aperture 38 from inside the motor housing 32 either before or after the stator laminations 31 are forced into the motor housing. After turning the casing to its proper position on the motor housing 32 it is attached, as described above, by pressing it down against the housing.

FIGURE 4 illustrates another way of attaching a casing of the type shown in FIGURE 3. Casing 39 is provided with a recess 40 that receives a metal hold down bracket 41 which simultaneously serves as a ground terminal. When screw 30 is tightened, the bracket 41 holds the casing against the motor housing 32. It is also within the scope of the invention to attach the casing to the motor housing by means of two such metal brackets, and two such corresponding screws, one on each side of the casing.

The invention has the advantage that the casing, which serves as a receptacle for the stationary contacts, is a single unit of construction. It is relatively small, yet can shield the power leads running to the motor as well as the motor-housing opening. The casing according to the present invention is simple and can be manufactured at little expense. The material costs of the casing are low yet its useful life is long. The casing may be attached to the motor housing with few motions of the hand, and in most cases without the use of tools. The casing provides the best possible mechanical protection against damage to the connecting cables. Finally, by locating the power lead connected contacts in the casing immediately after the winding is introduced into the laminations of the motor, a plug-in connector is formed which eliminates the possibility of poor connection between the winding and the measuring and testing equipment. Not only is there a saving in labor but it becomes impossible to erroneously interchange the individual winding ends.

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It will be understood that the above description of the present invention is susceptible to various modifications, changes, and adaptations, and the same are intended to be comprehended within the meaning and range of equivalents of the appended claims.

I claim:

1. In a multiple-pole electrical plug-in connector for connecting an electric motor to a power supply, which connector includes a casing mounted on the motor housing and stationary contacts, arranged within said casing and connected to the motor windings by means of power leads, said casing being adapted to receive a plug holding movable contacts which cooperate with said stationary contacts and including means, as an integral part thereof, for securing said casing to said motor housing, the improvement that said securing means comprise guide rails arranged parallel to the axes of said stationary contacts on the side of said casing which faces said motor housing.

2. The improvement defined in claim 1, wherein said stationary contacts are arranged with their axes at least approximately parallel to that portion of the surface of said motor housing on which said connector is mounted.

3. The improvement defined in claim 1, wherein said casing includes a recess on one side thereof and said connector further comprises a metal bracket inserted in said recess and fastened to said motor housing by means of a screw, thereby to further secure said casing and to serve as a ground terminal.

4. In a multiple-pole electrical plug-in connector for connecting an electric motor to a power supply, which connector includes a casing mounted on the motor housing and stationary contacts, arranged within said casing and connected to the motor windings by means of power leads, said casing being adapted to receive a plug holding movable contacts which cooperate with said stationary contacts and including means, as an integral part thereof, for securing said casing to said motor housing, the improvement that said securing means comprise two projections arranged transverse to the axes of the stationary contacts and projecting from the side of the casing which

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faces the motor housing, one of said projections being flexible and having a clamp arranged to hold said one projection to said motor housing, and the other of said projections being rigid and provided with a flange arranged to hold said other projection to said motor housing.

5. The improvement defined in claim 4, wherein said stationary contacts are arranged with their axes at least approximately parallel to that portion of the surface of said motor housing on which said connector is mounted.

6. The improvement defined in claim 4, wherein said casing includes a recess on one side thereof and said connector further comprises a metal bracket, inserted in said recess and fastened to said motor housing by means of a screw, thereby to further secure said casing and to serve as a ground terminal.

7. The improvement defined in claim 4, wherein said two projections are inserted through an opening in said motor housing and said casing is constructed to cover said opening when mounted on said motor housing.

8. The improvement defined in claim 7, wherein the side walls of said casing rest on said motor housing when said casing is mounted on said motor housing.

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RICHARD E. MOORE, *Primary Examiner.*

U.S. Cl. X.R.

339—125; 310—71

U.S. DEPARTMENT OF COMMERCE

PATENT OFFICE

Washington, D.C. 20231

**UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION**

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Edgar Zelle

It is certified that error appears in the above identified patent and that said Letters Patent are hereby corrected as shown below:

In the heading to the printed specification, lines 7 and 8 "Claims priority, application Germany, Apr. 15, 1968, L 56,257" should read -- Claims priority, applications Germany, Sept. 21, 1966, L 54,603; Apr. 15, 1967, L 56,257 --. Column 2, line 65, "bucket" should read -- bracket --. Column 3, line 39, "warp" should read -- wrap --; line 58, "causing" should read -- casing --.

Signed and sealed this 3rd day of March 1970.

(SEAL)

Attest:

Edward M. Fletcher, Jr.

Attesting Officer

WILLIAM E. SCHUYLER, JR.

Commissioner of Patents