Title: IMPROVEMENT IN THE OUTER FRAME OF AN ELECTRIC MOTOR

Abstract: An electric motor comprises an outer frame (4), a stator stack accommodated within said outer frame, one or more support means provided on the outer side thereof and firmly joined thereto, and comprising one or more engagement members (5) provided integrally with said outer frame (4) and accessible from the outside thereof, as well as one or more coupling devices (6a, 6b, 6c) adapted to be associated to corresponding engagement members (5) and engage respective motor mounting members. These coupling devices (6a, 6b, 6c) are adapted to be applied to said engagement members (5) and a multiplicity of different mounting members, so as to feature interchangeability characteristics as far as the engagement members (5) are concerned, and non-interchangeability characteristics as far as respective mounting members are concerned.
IMPROVEMENT IN THE OUTER FRAME OF AN ELECTRIC MOTOR

DESCRIPTION

The present invention refers to an improved kind of electric motor, preferably of the type generally used as a drive means within household appliances, such as clothes washing machines, dishwashing machines and the like, and thus provided with corresponding operating capabilities, as generally made up by an association of component parts designed to ensure a high extent of modularity and interchangeability.

Electric motors of the above-cited kind are generally known to be mass-produced in very large quantities on an industrial scale and therefore - considering also the quite extreme competitiveness requirements, which such products are generally required to comply with - they must ensure corresponding properties and capabilities of great flexibility in both their construction and their practical use, i.e. installation and assembly, in the various particular appliance types and models, in which they are due to operate.

Currently, however, such motors are manufactured using throughout traditional techniques and materials, which involve production costs to be sustained that are not liable to be curbed or reduced to any significant extent any further, if the same manufacturing techniques and
construction materials are kept being used in a substantially unaltered manner.

Reference is hereby made in particular to the construction of electric motors, in which the stator winding is retained and supported by an outer structure, which is generally comprised of two frame halves that are provided individually, are usually configured in a cup-like or bowl-like shape, and are arranged relative to each other so as to contain and accommodate said stator winding therewithin; upon said stator winding having been fitted and assembled therebetween, said two frame halves are firmly coupled to each other by means of proper stay-bolts, or similar connecting and fastening means, so as to enable the construction of the motor to be completed.

Such two frame halves are then applied - with the aid of simple means generally known as such in the art - to appropriate support means, so that the motor can be installed in the intended site of use in a firm and stable manner.

However, the situation is very frequently, if not habitually incurred in the related industry, in which a same electric motor, i.e. an electric motor having the same operating characteristics and specifications, but a differing mechanical interface, has to be installed in different appliances having peculiar, i.e. specific mechanical mounting or coupling means; for this reason, each motor must therefore be provided with specific support means for coupling to a respective specific type or kind of appliance.

In practice, this means that a given kind of electric motor featuring general operating characteristics and specifications that would enable it to be used in a number of different appliances, cannot practically be manufactured in a standardized manner for all such appliances, but must rather be designed and manufactured so as to ensure that the mechanical interface characteristics thereof are specific to each single type of
appliance, which they are intended for.

From a practical point of view, this production-related situation, although quite reliable and free of technical problems whatsoever, has however following three major drawbacks:

a) **High Production Costs**

In fact, fragmenting motor production into a plurality of types, which solely differ from each other for the mechanical interface characteristics thereof, gives rise to significant diseconomies of scale in terms of both production and logistics, which anyone skilled in the art is able to readily appreciate, this being also the reason why this cost factor shall not be dealt with any further in this description.

b) **High Costs of Production Tools**

Since the supports of each motor must be designed and made in a manner that is specific to each and any type of appliance, which the motors are intended for, it ensues that also the related production tools and structures, i.e. the tools, dies and moulds used to produce the various outer frames for the motors, must be selected so as to be specific to each and any type of motor being produced, in the sense that they must be specific to any particular kind of mechanical interface needed by each motor for the installation thereof. The high cost entrained by this further hindrance to production standardization is therefore fully apparent.

c) **Non-Interchangeability**

The fact should at this point be once again stressed that in many industrial sectors, and in particular in the so-called white-goods or appliance industry, use is largely made of motors types that would be functionally interchangeable, actually, even in appliances of different type and make, but cannot on the contrary be interchanged due to the specific design and character of the mechanical mounting devices and means thereof. This most obviously entrains a further difficulty for after-sales
service organizations to keep - in their spare-parts warehouses - any adequate variety and quantity of motor types available for each and all of the various uses and applications thereof, notwithstanding the afore-noted fact that such motors might well be considered to be fully interchangeable from a functional point of view, i.e. as far as their operating specifications are concerned.

The practical result of such situation is again an indirect increase in service costs, as well as lesser promptness in coping with service calls and repair duties.

It is therefore desirable, and is a main object of the present invention, actually, to provide an electric motor type provided with at least an outer frame that is particularly low-cost in both the materials and the production process used, and is further capable of being manufactured so as to fully do away with the above-noted drawbacks, wherein such outer frame shall further be capable of being associated to support and interface means that are fully interchangeable as far as said motor is concerned, so as to enable a same type of motor to be mounted and used in appliances of different kind and type, by simply providing and mounting appropriate interface means between said motor and the support means on which said motor is to be mounted.

According to the present invention, this aim is reached in an electric motor provided with at least an outer frame and at least a plurality of support means that are mutually interchangeable on said motor, all of them incorporating the characteristics as set forth and recited in the appended claims.

Features and advantages of the present invention will anyway be more readily understood from the description that is given below by way of non-limiting example with reference to the accompanying drawings, in which:
- Figure 1 is a perspective view of an electric motor according to the prior art;

- Figure 2 is a symbolical view of a face of an electric motor and a plurality of coupling devices provided separately from such motor and capable of being selectively mounted on such motor;

- Figure 3 is a symbolic view of an electric motor according to the present invention in a first embodiment thereof;

- Figure 4 is a symbolic view of an electric motor according to the present invention in a second embodiment thereof;

- Figures 5 and 6 are respective symbolical views of corresponding improved embodiments of an electric motor according to the present invention.

With reference to Figure 1, which illustrates an electric motor embodied according to the prior art, there is provided an outer frame 1 adapted to - at least partly - accommodate and support the related stator 2; this outer frame may include a plurality of support means 3 adapted to enable the motor to stably and firmly engage in a general manner the mounting or resting members 4 thereof or, anyway, the mechanical interfaces that are in turn adapted to engage such motor.

With reference to Figures 2 and 3, in an electric motor according to the present invention, the above-cited support means 3 included in the outer frame 4 of the prior-art motor illustrated in Figure 1, are totally done away with, so that the outer frame 4 does not have any either autonomous and/ or incorporated support means any longer.

For the related motor to be able to be mounted, a plurality of engagement members 5 are on the contrary provided integrally with said...
frame, preferably in a single-piece unitary construction therewith.

These engagement means 5 are not - nor must they be, actually - adapted to enable the outer frame 4 of the motor, and hence the motor itself, to be mounted in an autonomous manner. To such purpose, in fact, a plurality of coupling devices 6A, 6B, 6C, etc. are produced separately, i.e. independently of the frame 4 itself, wherein each such device is provided in such a way as to be able to be applied - either alone or jointly with other similar or different devices - on to said outer frame 4 and, in particular, on to said engagement members 5 which, as already indicated above, are an integral part of said outer frame 4.

Each such coupling device 6A, 6B, 6C, etc. shall therefore be designed and produced so as to be able to be autonomously applied on to the motor frame 4 and, as a result, these devices are fully interchangeable relative to said engagement members 5, even if - as specially explained below - they are not identical, but rather different from each other, actually.

In fact, since they must both be interchangeable on a same motor frame 4 and enable the motor to be mounted on to different mounting or resting members 7, such coupling devices must also provide specific interfacing options enabling them to engage any respective and different one of said mounting members 7.

In other words, and as anyone skilled in the art should by now have been fully able to appreciate, each motor of any particular type shall according to the present invention not be comprised of a single motor block, as this generally occurs in prior-art motors, but rather of a motor block and a respective coupling device (the latter being so defined in a general manner here, so that it shall be understood as even being formed of or comprising a certain plurality of physically distinct pieces), wherein this coupling device is specially made and provided in view of the mechanical interface on which said motor is due to be mounted.
With reference to Figure 4, it has been found of particular advantage if, in some cases, said coupling devices can be brought down to just two supports 9A and 9B to be mounted on to the same motor frame, however adequately spaced from each other on the surface of such frame, so as to ensure a stable and reliable coupling of the motor on to the respective ones of said external support members.

In addition, in view of reaching most obvious economy-of scale and production-standardization benefits, it is still more advantageous if said two devices 9A and 9B are fully identical and, therefore, perfectly interchangeable with each other.

A further, improved embodiment of the present invention is based on unifying into a single piece the various coupling devices that should possibly be required for mounting on to a same motor frame; in fact, with reference to Figures 5 and 6, it can be noticed that the single and sole coupling device 10 is designed and provided so as to be able to engage two distinct and different portions H A and H B of the motor frame, thereby achieving the same effect as it would be achievable in the case that two distinct elements were used, while introducing a significant beneficial effect in terms of production simplification and further cost reduction.

As far as the way is concerned, in which said coupling devices actually engage the respective motor support members, suffice it to say that use can be made to such purpose of usual, standard means that are largely known as such in the art, such as in particular snap-fitting coupling means or screw-and-bolt fastening means, so that no further explanation needs to be given in this connection.
CLAIMS

1. Electric motor comprising:
   - an outer frame (1),
   - a stator stack (2) accommodated within said outer frame,
   - one or more support means provided on the outer side of said outer frame and firmly joined thereto,
   characterized in that said support means comprise:
     - one or more engagement members (5) provided integrally with said outer frame and accessible from the outside thereof,
     - one or more coupling devices (6A, 6B, 6C; 9A, 9B; 10) adapted to be associated to corresponding ones of said engagement members and, at the same time, engage respective mounting members (7) provided externally for said motor.

2. Electric motor according to claim 1, characterized in that said coupling devices (6A...10) are adapted to be selectively associated in a removable manner to said engagement members, so as to feature interchangeability characteristics as far as said engagement members are concerned.

3. Electric motor according to claim 2, characterized in that said coupling devices (6A...10) feature non-interchangeability characteristics as far as said respective external mounting members (7) are concerned.

4. Electric motor according to claim 3, characterized in that said
coupling devices (6A... 10) comprise at least two supports (9A, 9B) adapted to be mounted on to respective portions of said outer frame separately.

5. Electric motor according to claim 4, characterized in that said at least two supports (9A, 9B) are identical.

6. Electric motor according to claim 3, characterized in that said coupling devices comprise a single and sole support (10) adapted to be mounted on to respective and distinct portions (HA, HB) of said outer frame.
INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2007/052144

A. CLASSIFICATION OF SUBJECT MATTER

INV. H02K5/26

According to International Patent Classification (IPC) and/or both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H02K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and where practical search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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☒ Further documents are listed in the continuation of Box C ☒ See patent family annex

Date of the actual completion of the international search
11 July 2007

Date of mailing of the international search report
23/07/2007

Name and mailing address of the ISA/
European Patent Office P B 5818 Patentlaan 2 NL - 2280 HV Rijswijk
Tel (+31-70) 3402040, Tx 31651 epo nl
Fax (+31-70) 3403016

Authorized officer
Zanichel l, Franco

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