The stator core includes: a first lamination (11), having at least one first welding groove (1101) formed in an outer peripheral surface (110) of the first lamination (11); a second lamination (13), having at least one second welding groove (1301) formed in an outer peripheral surface (130) of the second lamination (13); and a third lamination (12), having at least one third welding groove (1201) and at least one fourth welding groove (1202) formed in an outer peripheral surface (120) of the third lamination (12) respectively.
STATOR CORE OF ELECTRICAL MOTOR AND ELECTRICAL MOTOR

CROSS REFERENCE TO RELATED APPLICATION

This application claims priority and benefits of Chinese Patent Application No. 201320868246.1, filed with State Intellectual Property Office on December 25, 2013, the entire content of which is incorporated herein by reference.

FIELD

Embodiments of the present disclosure generally relate to an electrical motor product filed, and more particularly, to a stator core of an electrical motor and an electrical motor.

BACKGROUND

With optimizing a cooling mode of an electrical motor, a traditional water-cooling mode of a chassis is changed into an oil-cooling mode of a stator core, so as to improve the cooling effect of the electrical motor.

Nowadays, the stator core using the oil-cooling mode includes an upper lamination, a middle lamination and a lower lamination, the upper lamination and the lower lamination are formed by using two different sets of molding, and thus manufacture costs of the stator core increases.

SUMMARY

Embodiments of the present disclosure seek to solve at least one of the problems existing in the related art to at least some extent.

A first object of the present disclosure is to provide a stator core of an electrical motor. The stator core of an electrical motor includes: a first lamination, having at least one first welding groove formed in an outer peripheral surface thereof; a second lamination, having at least one second welding groove formed in an outer peripheral surface thereof; and a third lamination, having at least one third welding groove and at least one fourth welding groove formed in an outer peripheral surface thereof respectively and being symmetrical to each other with respect to a predetermined plane defined by a center axis of the stator core; wherein the third lamination is sandwiched between the first lamination and the second lamination, the first welding groove and
the third welding groove are aligned so as to be fixed, and the second welding groove and the
fourth welding groove are aligned so as to be fixed.

With the stator core of the electrical motor according to embodiments of the present
disclosure, because that each of the third welding grooves is symmetrical to one of the fourth
welding grooves with respect to the predetermined plane, the first lamination and the second
lamination can be formed by one same molding, i.e. the lamination manufactured by the molding
can be used as the first lamination or as the second lamination, thus saving the development cost of
the molding and the manufacturing costs of the stator core.

A second object of the present disclosure is to provide an electrical motor. The electrical
motor includes a motor housing; and the above stator core.

With the electrical motor according to embodiments of the present disclosure, because that
each of the third welding grooves is symmetrical to one of the fourth welding grooves with respect
to the predetermined plane, the first lamination and the second lamination can be formed by one
same molding, i.e. the lamination manufactured by the molding can be used as the first lamination
or as the second lamination, thus saving the development cost of the molding and the
manufacturing costs of the stator core.

Additional aspects and advantages of embodiments of present disclosure will be given in part
in the following descriptions, become apparent in part from the following descriptions, or be
learned from the practice of the embodiments of the present disclosure.

**BRIEF DESCRIPTION OF THE DRAWINGS**

These and other aspects and advantages of embodiments of the present disclosure will
become apparent and more readily appreciated from the following descriptions made with
reference to the accompanying drawings, in which:

Fig. 1 is a schematic view of a first lamination of a stator core of an electrical motor
according to an embodiment of the present disclosure;

Fig. 2 is a schematic view of a third lamination of a stator core of an electrical motor
according to an embodiment of the present disclosure; and

Fig. 3 is a schematic view of a second lamination of a stator core of an electrical motor
according to an embodiment of the present disclosure.
DETAILED DESCRIPTION

Reference will be made in detail to embodiments of the present disclosure. Embodiments of the present disclosure will be shown in drawings, in which the same or similar elements and the elements having same or similar functions are denoted by like reference numerals throughout the descriptions. The embodiments described herein according to drawings are explanatory and illustrative, not construed to limit the present disclosure.

The following description provides a plurality of embodiments or examples configured to achieve different structures of the present disclosure. In order to simplify the publication of the present disclosure, components and dispositions of the particular embodiment are described in the following, which are only explanatory and not construed to limit the present disclosure. In addition, the present disclosure may repeat the reference number and/or letter in different embodiments for the purpose of simplicity and clarity, and the repeat does not indicate the relationship of the plurality of embodiments and/or dispositions. Moreover, in description of the embodiments, the structure of the second characteristic "above" the first characteristic may include an embodiment formed by the first and second characteristic contacted directly, and also may include another embodiment formed between the first and the second characteristic, in which the first characteristic and the second characteristic may not contact directly.

In the description of the present disclosure, unless specified or limited otherwise, it should be noted that, terms "mounted," "connected" and "coupled" may be understood broadly, such as electronic connection or mechanical connection, inner communication between two elements, direct connection or indirect connection via intermediary. These having ordinary skills in the art should understand the specific meanings in the present disclosure according to specific situations.

With reference to the following descriptions and drawings, these and other aspects of embodiments of the present disclosure will be distinct. In the descriptions and drawings, some particular embodiments are described in order to show means of the principles of embodiments according to the present disclosure, however, it should be appreciated that the scope of embodiments according to the present disclosure is not limited. On the contrary, embodiments of the present disclosure include all the changes, alternatives, and modifications falling into the scope of the spirit and principles of the attached claims.

In the following, a stator core of an electrical motor and an electrical motor are described in detail with reference to drawings.
Fig. 1 is a schematic view of a first lamination of a stator core of an electrical motor according to an embodiment of the present disclosure. Fig. 2 is a schematic view of a third lamination of a stator core of an electrical motor according to an embodiment of the present disclosure. Fig. 3 is a schematic view of a second lamination of a stator core of an electrical motor according to an embodiment of the present disclosure.

As shown in Fig. 1-Fig. 3, the stator core of the electrical motor includes a first lamination 11, a second lamination 13 and a third lamination 12. The first lamination 11 has at least one first welding groove 1101 formed in an outer peripheral surface 110 of the first lamination. The second lamination 13 has at least one second welding groove 1301 formed in an outer peripheral surface 130 of the second lamination. The third lamination 12 has at least one third welding groove 1201 and at least one fourth welding groove 1202 formed in an outer peripheral surface 120 of the third lamination respectively and being symmetrical to each other with respect to a predetermined plane defined by a center axis of the stator core. The first lamination 11, the third lamination 12 and the second lamination 130 are laminated together, in other words, the third lamination 12 is sandwiched between the first lamination 11 and the second lamination 13. The first lamination 11 is fixed with the third lamination 12 by welding the first welding groove 1101 with the third welding groove 1201, the second lamination 13 is fixed with the third lamination 12 by welding the second welding groove 1301 with the fourth welding groove 1202.

In other words, firstly the third lamination 12 defines a straight line A across a center of a cross-section off the third lamination 12, as shown in Fig. 2, and then the predetermined plane is a plane defined by a center axis of the stator core and passes through the straight line A. The third welding groove 1201 and the fourth welding groove 1202 are symmetrical to each other with respect to the predetermined plane (in Fig. 2, the straight line A may represent the predetermined plane). Subsequently, the first welding groove 1101 is aligned with the third welding groove 1201 in a thickness direction of the third lamination 12, so that the first welding groove 1101 and the third welding groove 1201 can be welded. On the other hand, the second welding groove 1301 is aligned with the fourth welding groove 1202 in a thickness direction of the third lamination 12, so that the second welding groove 1301 and the fourth welding groove 1202 can be welded. Thus, the first lamination 11, the third lamination 12 and the second lamination 13 are laminated together in turn to obtain the stator core of the electrical motor.

As shown in Fig. 1, each of the first welding groove 1101, the second welding groove 1301,
the third welding groove 1201 and the fourth welding groove 1202 has a cross section of a U-shaped 111, which can be prevented a welding electrode to touch the stator core when welding. Each of the first welding groove 1101, the second welding groove 1301, the third welding groove 1201 and the fourth welding groove 1202 has a bulge 112 at a bottom wall of each of the first welding groove 1101, the second welding groove 1301, the third welding groove 1201 and the fourth welding groove 1202. Each of the first welding groove 1101, the second welding groove 1301, the third welding groove 1201 and the fourth welding groove 1202 also has two side walls separated by the bulge 112. The bulge 112 has a cross section of a rectangular, which is advantageous for welding.

In an embodiment, the stator core further includes at least one first fixing lug 113, at least one second fixing lug 133 and at least one third fixing lug 123. The first fixing lug 113 is disposed on the outer peripheral surface 110 of the first lamination 11 and is separated with the first welding groove 1101. The second fixing lug 133 is disposed on the outer peripheral surface 130 of the second lamination 13 and is separated with the second welding groove 1301. The third fixing lug 123 is disposed on the outer peripheral surface 120 of the third lamination 12 and is separated with the third welding groove 1201 and the fourth welding groove 1202.

The first fixing lug 113, the second fixing lug 123 and the third fixing lug 133 are aligned with one another. As shown in Fig. 1-3, three first fixing lugs 113,114,115 are disposed on the outer peripheral surface 110 of the first lamination 1 and separated with the first welding groove 1101. Three second fixing lugs 133, 134, 135 are disposed on the outer peripheral surface 130 of the second lamination 13 and separated with the second welding groove 1301. Three third fixing lugs 123,124,125 are disposed on the outer peripheral surface 120 of the third lamination 12 and separated with the third welding groove 1201 and the fourth welding groove 1202. The three first fixing lugs 113,114,115, the three second fixing lugs 133, 134, 135 and the three third fixing lugs 123,124,125 are aligned with one another respectively and are circumferentially spaced in the stator core. For example, the first fixing lug 113, the second fixing lug 133 and the third fixing lug 123 are aligned with one another,

As shown in Fig. 1-3, the first lamination 11 has six first welding grooves 1101 formed in the outer peripheral surface 110 of the first lamination 11. There are adjacent two of six first welding grooves 1101 between two of three first fixing lugs 113,114,115. The second lamination 13 has six second welding grooves 1301 formed in the outer peripheral surface 130 of the second lamination.
13. There are adjacent two of six second welding grooves 1301 between two of three second fixing
lugs 133, 134, 135. The third lamination 12 has six third welding grooves 1201, 1203, 1205, 1207,
1209, 1211 and six fourth welding grooves 1202, 1204, 1206, 1208, 1210, 1212 formed in the
outer peripheral surface 120 of the third lamination 12 respectively. There are adjacent two of six
third welding grooves 1201, 1203, 1205, 1207, 1209, 1211 and adjacent two of the six fourth
welding grooves 1202, 1204, 1206, 1208, 1210, 1212 between two of the three third fixing lugs
123, 124, 125.

As shown in Fig. 1-3, the stator core further includes a first fixing hole 1131, a second fixing
hole 1331 and a third fixing hole 1231. The first fixing hole 1131 is formed in the first fixing lug
113, the second fixing hole 1331 is formed in the second fixing lug 133, and the third fixing hole
1231 is formed in the third fixing lug 123. The first fixing hole 1131, the second fixing hole 1331
and the third fixing hole 1231 are aligned with one another. In other words, each of the three first
fixing lugs 113 has one first fixing hole 1131, each of the three second fixing lugs 133 has one
second fixing hole 1331, and each of the three third fixing lugs 123 has one second fixing hole
1231.

In an embodiment, the six third welding grooves 1201, 1203, 1205, 1207, 1209, 1211 and the
six fourth welding grooves 1202, 1204, 1206, 1208, 1210, 1212 are divided into a first group, a
second group, and a third group.

The first group includes two of the third welding grooves 1201, 1203 and two of the fourth
welding grooves 1202, 1204. The two of the third welding grooves 1201, 1203 are arranged
between the two of the fourth welding grooves 1202, 1204.

The second group includes two of the third welding grooves 1205, 1207 and two of the fourth
welding grooves 1206, 1208, the two of the third welding grooves 1205, 1207 and the two of the
fourth welding grooves 1206, 1208 are arranged alternately along a circumferential direction of the
third lamination 12.

The third group includes two of the third welding grooves 1209, 1211 and two of the fourth
welding grooves 1210, 1212, the two of the fourth welding grooves 1210, 1212 are arranged
between the two of the third welding grooves 1209, 1211.

As shown in Fig. 2, the first group is arranged between the third fixing lugs 123, 124, the
second group is arranged between the third fixing lugs 124, 125, the third group is arranged
between the third fixing lugs 125, 123.
The third welding grooves 1201, 1203 in the first group and the fourth welding grooves 1212, 1210 in the third group are symmetrical to each other with respect to the predetermined plane, i.e. the third welding groove 1201 and the fourth welding groove 1212 are symmetrical to each other, and the third welding groove 1203 and the fourth welding groove 1210 are symmetrical to each other. The fourth welding grooves 1202, 1204 in the first group and the third welding grooves 1211, 1209 in the third group are symmetrical to each other with respect to the predetermined plane. In the second group, the fourth welding groove 1206 and the third welding groove 1205 are symmetrical to the third welding groove 1207 and the fourth welding groove 1208 respectively with respect to the predetermined plane. In other words, each of the third welding grooves 1201, 1203, 1205, 1207, 1209, 1211 is symmetrical to one of the fourth welding grooves 1202, 1204, 1206, 1208, 1210, 1212 with respect to the predetermined plane.

In some embodiments, a number of the first welding grooves 1101 is equal to that of the second welding grooves 1301, the first welding groove 1101 are in one-to-one correspondence with the third welding grooves 1201, 1203, 1205, 1207, 1209, 1211, and the second welding grooves 1301 are in one-to-one correspondence with the fourth welding grooves 1202, 1204, 1206, 1208, 1210, 1212.

With the stator core of the electrical motor according to embodiments of the present disclosure, because that each of the third welding grooves 1201, 1203, 1205, 1207, 1209, 1211 is symmetrical to one of the fourth welding grooves 1202, 1204, 1206, 1208, 1210, 1212 with respect to the predetermined plane, the first lamination 11 and the second lamination 13 can be formed by one same molding, i.e. the lamination manufactured by the molding can be used as the first lamination 12 or as the second lamination 13, thus saving the development cost of the molding and the manufacturing costs of the stator core.

In an embodiment, the electrical motor includes a motor housing and the above stator core. The stator core disposes in the motor housing. An oil passage is formed in an inner surface of the motor housing. The first welding groove 1101, the second welding groove 1301, the third welding groove 1201, the fourth welding groove 1202 and the oil passage are circumferentially spaced in the stator core apart from one another.

With the electrical motor according to embodiments of the present disclosure, because that each of the third welding grooves 1201, 1203, 1205, 1207, 1209, 1211 is symmetrical to one of the fourth welding grooves 1202, 1204, 1206, 1208, 1210, 1212 with respect to the predetermined
plane, the first lamination 11 and the second lamination 13 can be formed by one same molding, i.e. the lamination manufactured by the molding can be used as the first lamination 11 or as the second lamination 13. For example, one lamination is manufactured by the molding and can be used as the first lamination 11 or the second lamination 13 by easily rotating the lamination 180° with respect to the straight line A, thus saving the development cost of the molding and the manufacturing costs of the stator core.

Reference throughout this specification to "an embodiment," "some embodiments," "one embodiment", "another example," "an example," "a specific example," or "some examples," means that a particular feature, structure, material, or characteristic described in connection with the embodiment or example is included in at least one embodiment or example of the present disclosure. Thus, the appearances of the phrases such as "in some embodiments," "in one embodiment", "in an embodiment", "in another example," "in an example," "in a specific example," or "in some examples," in various places throughout this specification are not necessarily referring to the same embodiment or example of the present disclosure. Furthermore, the particular features, structures, materials, or characteristics may be combined in any suitable manner in one or more embodiments or examples.

Although explanatory embodiments have been shown and described, it would be appreciated by those skilled in the art that the above embodiments cannot be construed to limit the present disclosure, and changes, alternatives, and modifications can be made in the embodiments without departing from spirit, principles and scope of the present disclosure.
What is claimed is:

1. A stator core of an electrical motor, comprising:
   a first lamination, having at least one first welding groove formed in an outer peripheral surface thereof;
   a second lamination, having at least one second welding groove formed in an outer peripheral surface thereof; and
   a third lamination, having at least one third welding groove and at least one fourth welding groove formed in an outer peripheral surface thereof respectively and being symmetrical to each other with respect to a predetermined plane defined by a center axis of the stator core;
   wherein the third lamination is sandwiched between the first lamination and the second lamination, the first welding groove and the third welding groove are aligned so as to be fixed, and the second welding groove and the fourth welding groove are aligned so as to be fixed.

2. The stator core of claim 1, the first welding groove and the third welding groove are aligned so as to be welded, and the second welding groove and the fourth welding groove are aligned so as to be welded.

3. The stator core of claim 1 or 2, wherein each of the first welding groove, the second welding groove, the third welding groove and the fourth welding groove has a cross section of a U-shaped.

4. The stator core of any one of claims1-3, wherein each of the first welding groove, the second welding groove, the third welding groove, and the fourth welding groove has a bulge disposed at a bottom wall thereof and protruded outward.

5. The stator core of claim 4, wherein each of the first welding groove, the second welding groove, the third welding groove, and the fourth welding groove further has two side walls separated by the bulge.

6. The stator core of claim 4 or 5, wherein the bulge has a cross section of a rectangular.
7. The stator core of any one of claims 1-6, further comprising:
   at least one first fixing lug, disposed on the outer peripheral surface of the first lamination and
   separated with the first welding groove;
   at least one second fixing lug, disposed on the outer peripheral surface of the second
   lamination and separated with the second welding groove; and
   at least one third fixing lug, disposed on the outer peripheral surface of the third lamination
   and separated with the third welding groove and the fourth welding groove;
   wherein the first fixing lug, the second fixing lug and the third fixing lug are aligned with one
   another.

8. The stator core of claim 7, wherein
   three first fixing lugs are provided and uniformly arranged along a circumferential direction
   of the first lamination;
   three second fixing lugs are provided and uniformly arranged along a circumferential
   direction of the second lamination; and
   three third fixing lugs are provided and uniformly arranged along a circumferential direction
   of the third lamination.

9. The stator core of claim 7 or 8, further comprising:
   a first fixing hole, formed in the first fixing lug;
   a second fixing hole, formed in the second fixing lug; and
   a third fixing hole, formed in the third fixing lug;
   wherein the first fixing hole, the second fixing hole and the third fixing hole are aligned with
   one another.

10. The stator core of any one of claims 1-9, wherein the first lamination has a plurality of the
    first welding grooves, the second lamination has a plurality of the second welding grooves, and
    the third lamination has a plurality of the third welding grooves and a plurality of the fourth
    welding grooves;
    wherein a number of the plurality of the first welding grooves is equal to that of the plurality
    of the second welding grooves, the plurality of the first welding grooves are in one-to-one
correspondence with the plurality of the third welding grooves, the plurality of the second welding grooves are in one-to-one correspondence with the plurality of the fourth welding grooves,

wherein each of the plurality of the third welding grooves is symmetrical to one of the plurality of the fourth welding grooves with respect to the predetermined plane defined by the center axis of the stator core.

11. The stator core of 10, wherein six first welding grooves are formed in the outer peripheral surface of the first lamination; six second welding grooves are formed in the outer peripheral surface of the second lamination; and six third welding grooves and six fourth welding grooves are formed in the outer peripheral surface of the third lamination;

wherein the six third welding grooves and the six fourth welding grooves are divided into a first group, a second group, and a third group, each of the first group, the second group, and the third group has two of the third welding grooves and two of the fourth welding grooves;

wherein the two of the third welding grooves are arranged between the two of the fourth welding grooves in the first group, the two of the third welding grooves and the two of the fourth welding grooves in the second group are arranged alternately along the circumferential direction of the third lamination; and the two of the fourth welding grooves are arranged between the two of the third welding grooves.

12. an electrical motor, comprising:
a motor housing; and
a stator core of any one of claims 11, disposed in the motor housing.
INTERNATIONAL SEARCH REPORT

International application No. PCT/CN2014/095026

A. CLASSIFICATION OF SUBJECT MATTER
H02K 1/12(2006.01, i)

According to International Patent Classification (IPC) or to 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 practicable, search terms used)
CNPAT, CNKI, WPI, EPODOC: core, lamination, sheet, plate, welding, groove, slot

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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

* Special categories of cited documents:
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Date of the actual completion of the international search 26 February 2015
Date of mailing of the international search report 13 March 2015

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