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Michael O'Keeffe
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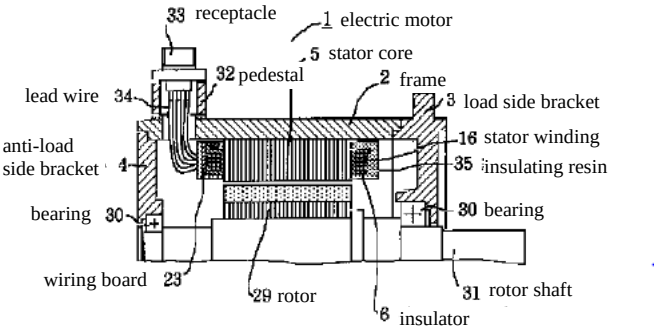
(54) **[Title of Invention]** ELECTRIC MOTOR

(57) **[Abstract]**

[Task] To simplify attachment work of a wiring board without narrowing the cross-sectional area of a magnetic circuit of a stator core.

[Solution] In an electric motor in which split cores 9, each provided with an outer arcuate part 6, an inner arcuate part 7, and a winding part 8 connecting these arcuate parts to each other, and each having a stator winding 16 wound around the winding part 8, are arranged annularly, and which is equipped with a wiring board 23 for connecting winding ends of the stator windings 16, the electric motor is provided with: insulators 12 which are attached to the respective winding parts 8 of a stator core 5 and around which the respective stator windings 16 are wound; engagement recesses 28 provided to respective flanges 14 of the insulators 12; a wiring board 23 made of insulating material and having a conductor embedded therein to connect the winding ends of the stator windings 16; and attachment arms 27 provided on a back side of the wiring board 23 and having respective hooks 26 for engagement with the engagement recesses 28 of the insulators 12.



[Claims]
[Claim 1] An electric motor in which split cores, each provided with an outer arcuate part, an inner arcuate part, and a winding part connecting the arcuate parts to each other, and each having a stator winding wound around the winding part, are arranged annularly, the electric motor being equipped with a wiring board for connecting the winding ends of the stator windings, characterized in that the electric motor is provided with: insulators which are attached to the respective winding parts of the stator core and around which the respective stator windings are wound; engagement recesses provided to respective flanges of the insulators; a wiring board made of insulating material and having a conductor embedded therein to connect the winding ends of the stator winding; and attachment arms provided on a back side of the wiring board and having respective engagement hooks for engagement with the engagement recesses of the insulators.
[Detailed Description of the Invention]
[0001]
[Technical Field] The present invention relates to an electric motor equipped with a wiring board for connecting winding ends of stator windings.
[0002]
[Prior Art] Conventionally, an electric motor equipped with a wiring board for connecting winding ends of stator windings is configured as shown in FIG. 6. In the drawing, 40 denotes a stator core, which is configured by annularly arranging split cores 41, each including an inner arcuate part 41b, an outer arcuate part 41a, and a winding part connecting these arcuate parts, and fitting a protrusion 41c circumferentially protruding from one circumferentially facing end surface of each outer arcuate part 41a into a recess 41d formed in the other circumferentially facing end surface of the outer arcuate part 41a of an adjoining split core 41. An insulator is provided to the winding part of each split core 41, and a stator winding 42 is wound around the insulator. 43 denotes a wiring board attached to supports 44 fixed to an end surface of the stator core 40, and a plurality of through-holes 45 are provided in a board surface of this wiring board. Printed wiring 46 is provided between the through-holes 45, and the winding ends of the stator winding 42 are inserted into the through-holes 45, whereby the winding ends of the stator windings 42 are connected.
[0003]
[Task to be Achieved by the Invention] However, in the conventional technology, holes are formed in the end surface of the stator core 40 to attach the supports 44, and this narrowed the cross-sectional area of the magnetic circuit of the stator core, and in addition, complicated the attachment work. The present invention has an object of simplifying the attachment work of the wiring board without narrowing the cross-sectional area of the magnetic circuit of the stator core.
[0004]
[Means to Achieve the Task] To solve the above problem, according to the present invention, in an electric motor in which split cores, each provided with an outer arcuate part, an inner arcuate part, and a winding part connecting these arcuate parts to each other, and each having a stator winding wound around the winding part, are arranged annularly, and which is equipped with a wiring board for connecting winding ends of the stator windings, the electric motor is provided with: insulators which are attached to the respective winding parts of a stator core and around which the respective stator windings are wound; engagement recesses provided to respective flanges of the insulators; a wiring board made of insulating material and having a conductor embedded therein to connect the winding ends of the stator windings; and attachment arms provided on a back side of the wiring board and having respective engagement hooks for engagement with the engagement recesses of the insulators.
[0005]
[Embodiments of the Invention] In the following, an embodiment of the present invention will be described in detail with reference to the drawings. FIG. 1 is a cross-sectional view of an upper half of an electric motor, FIG. 2 is a perspective view showing the structure of a split core and an insulator, FIG. 3 is an essential part perspective view showing the structure of a stator core to which insulators have been attached, FIG. 4 is a perspective view of a wiring board, and FIG. 5 is an essential part cross-sectional view of a structure in which the wiring board has been attached to the insulators. In the drawings, 1 denotes an electric motor, 2 denotes a frame of the electric motor 1, 3 denotes a load side bracket attached to a load side end of the frame 2, and 4 denotes an anti-load side bracket attached to an anti-load side end of the frame 2. 5 denotes a stator core attached to an inner circumferential surface of the frame 2, the stator core being configured by circumferentially arranging split cores 9 each constituted of an outer arcuate part 6, an inner arcuate part 7, and a winding part 8 as shown in FIG. 2, and fitting a protrusion 10 protruding circumferentially from one circumferentially facing end surface of the outer arcuate part 6 of each split core 9 into a recess 11 provided in the other circumferentially facing end surface of an adjoining split core 9. 12 denotes an insulator, which is constituted of a tubular body part 13 and flanges 14, 15 formed on either end of the tubular body part 13. A stator winding 16 is wound around the tubular body part 13 of the insulator 12, and an axial end surface of one flange 14 is provided with a rectangular parallelepiped projection 17 that projects laterally. On either side of the projection 17 are provided grooves 18, 19 for pinching the winding end of the stator winding 16. A circumferentially facing side surface of the flange 14 is provided with an engagement arm 21 having a hook 20, and another side surface of the flange 14 is provided with a groove 22 to which the hook 20 of the engagement arm 21 is to be engaged. 23 denotes a wiring board provided at an axial end of the stator windings 16 to connect the winding ends. As shown in FIG. 4, this wiring board is formed in a disk shape and provided with semicircular recesses 24 on inner and outer peripherals thereof, and connection metal fittings 25 are fixed near the recesses 24. The wiring board has a conductor (not shown in the drawings) embedded therein for connecting the winding ends of the stator windings 16, whereby wiring of the stator windings 16 is achieved. A back side of the wiring board 23 is provided with attachment arms 27 each having a hook 26 to engage with one of the engagement recesses 28 provided to the flanges 14 of the insulators 6 [*sic*]. 29 denotes a rotor provided on a rotor shaft 31 supported by bearings 30 of the load side bracket 3 and the anti-load side bracket 4, 32 denotes a pedestal fixed to the frame 2, and 33 denotes a receptacle connected with the wiring board 23 by lead wires 34. 35 denotes insulating resin covering the stator windings 16. Assembly of the stator core having the above structure is performed as follows. First, an insulator 12 is attached to the winding

part 8 of each split core 9. Subsequently, a stator winding 16 is wound around the tubular body part 13 of the insulator 12. Further, a winding end of the stator winding 16 is fitted in the groove 18 provided to the flange 14 of the insulator 12, and the winding end is wound a half turn around the projection 17. Thereafter, the winding end is fitted in the groove 19 such that the winding end of the stator winding 16 is fixed to the insulator 12. The split cores 9 each having the stator winding 16 wound therearound as described above are arranged annularly, and the protrusion 10 of each split core 9 is fitted into the recess 11 of the adjoining split core 9 to fixedly connect the split cores 9 to each other, while the engagement arm 21 of each insulator 12 is engaged with the groove 22 of the insulator 12 of the adjoining split core to fixedly connect the insulators 12 to each other. Subsequently, the wiring board 23 is disposed on one side of the stator core 5, and the hooks 26 of the attachment arms 27 provided on the back side of the wiring board 23 are engaged with the engagement recesses 28 of the flanges 14 of the insulators 12 to thereby fix the wiring board 23 to the insulators 12. The winding ends of the stator windings 16 are fitted in and fixed to the connection metal fittings 25 of the wiring board 23 fixed to the insulators 12 as described above, thereby connecting the stator windings 16. Thereafter, the stator windings 16 are covered with insulating resin 35 to insulate the stator windings 16, and the stator core 5 configured as above is fitted in and fixed to the frame 2. Thus, because the hooks 26 provided to the wiring board 23 are engaged with and fixed to the engagement recesses 28 of the insulators 12, the attachment of the wiring board 23 is simplified.

[0006]

[Effects of the Invention] As described above, according to the present invention, because the wiring board 23 for connecting the stator windings 16 is fixed to the insulator 12, it is possible to simplify the attachment work of the wiring board without narrowing the cross-sectional area of the magnetic circuit of the stator core.

[Brief Description of Drawings]

[FIG. 1] A cross-sectional view of an upper half of an electric motor, which shows an embodiment of the present invention.

[FIG. 2] A perspective view of a split core and an insulator, which shows the embodiment of the present invention.

[FIG. 3] An essential part perspective view showing the structure of a stator core to which insulators have been attached, which shows the embodiment of the present invention.

[FIG. 4] A perspective view of a wiring board, which shows the embodiment of the present invention.

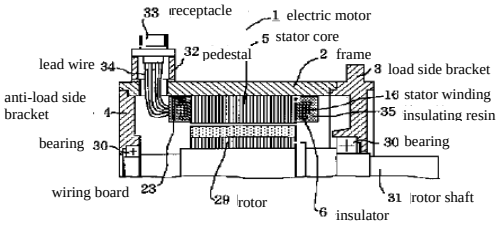
[FIG. 5] An essential part cross-sectional view of a structure in which the wiring board has been attached to the insulators, which shows the embodiment of the present invention.

[FIG. 6] A perspective view of a stator core attached with a wiring board, which shows a conventional embodiment.

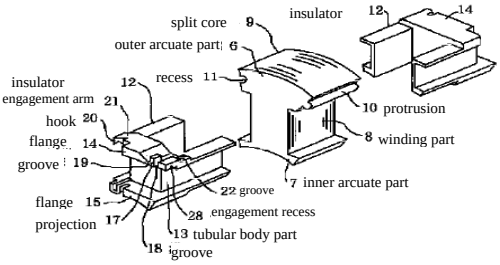
[Glossary]

1 electric motor, 2 frame, 3 load side bracket, 4 anti-load side bracket, 5 stator core, 6 outer arcuate part, 7 inner arcuate part, 8 winding part, 9 split core, 10 protrusion, 11 recess, 12 insulator, 13 tubular body part, 14 flange, 15 flange, 16 stator winding 17 projection, 18 groove, 19 groove, 20 hook, 21 engagement arm, 22 groove, 23 wiring board, 24 recess, 25 connection metal fitting, 26 hook, 27 attachment arm, 28 engagement recess, 29 rotor, 30 bearing, 31 rotor shaft, 32 pedestal, 33 receptacle

[FIG. 1]



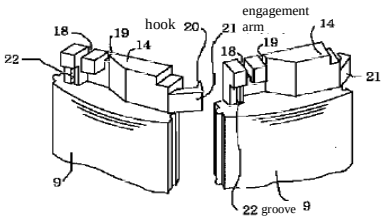
[FIG. 2]

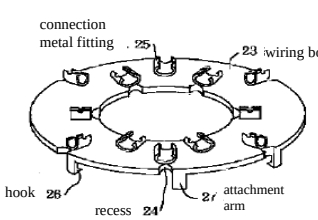


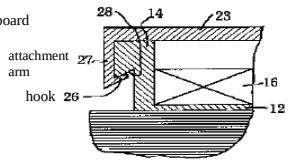
[FIG. 3]

[FIG. 4]

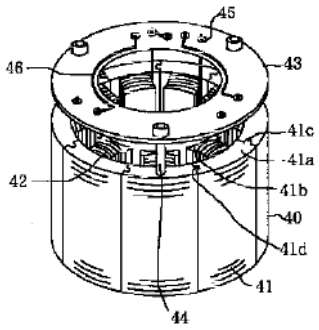
[FIG. 5]







[FIG. 6]



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