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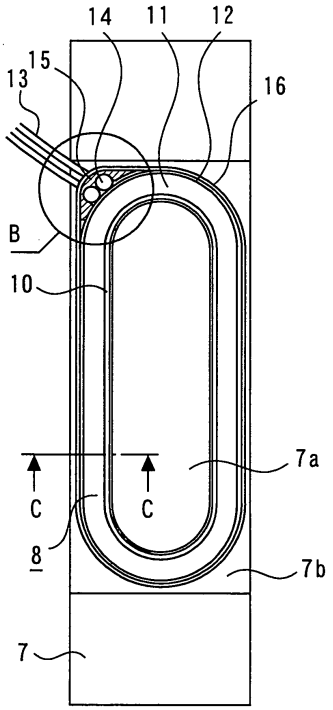
(54) BRAKE UNIT OF ELEVATOR HOIST MACHINE AND PROCESS FOR MANUFACTURING THE SAME

(57) There is provided a braking device for an elevator traction machine, which can be made thin and small easily and has high reliability and productivity. For this purpose, after a self-melting wire and a prepreg tape have been wound on a resin-made bobbin, a glass tape is wound on the outside of the prepreg tape to fix a wire connecting portion in which a lead wire is connected to the self-melting wire to the prepreg tape. Subsequently, the self-melting wire is energized while a pressure is applied to the glass tape toward the inside to melt the resin of the self-melting wire, and at the same time, the resin impregnated into the prepreg tape is also melted to stick the glass tape fast to the prepreg tape.

Fig. 2



EP 1 988 051 A1

Description

Technical Field

[0001] The present invention relates to a braking device for braking the turning of a driving sheave of an elevator traction machine and a manufacturing method therefor.

Background Art

[0002] As a braking device for braking the turning of a driving sheave of an elevator traction machine, there is available a braking device that is arranged in a rotor drum turning in association with the driving sheave so that a brake is operated, namely, a braking force is generated by pressing a brake lining on the inner peripheral surface (braking surface) of the rotor drum. The braking device having the above-described construction is especially used for a thin traction machine provided in an elevator shaft of a machine room-less elevator system. The braking device having such a construction usually includes a pressing spring for operating the brake by pressing the brake lining on the inner peripheral surface of rotor drum, and an electromagnet for releasing the brake by moving the brake lining against the urging force of the pressing spring.

[0003] Also, as a conventional art of the brake device, there has been disclosed a molding method for fixing a magnet coil of the electromagnet to a shell, in which after the magnet coil has been arranged in the shell, a resin composition is poured to between the shell and the magnet coil, and these elements are put into a thermostatic oven to heat harden the resin composition (for example, refer to Patent Document 1).

[0004] Patent Document 1: Japanese Patent Laid-Open No. H11-136911 (Figure 3)

Disclosure of the Invention

Problems to be Solved by the Invention

[0005] In the case where a method in which a mold resin is poured and heat hardened is used as a method for fixing the magnet coil to the shell as described in Patent Document 1, a predetermined peel strength and a thickness not smaller than a predetermined size capable of resisting a shock of some degree are required for the mold resin, so that the requirement has been a cause for a hindrance to making the braking device small and thin. Also, in the above-described molding method, many various manufacturing steps such as mixing and agitating of mold resin before pouring, preheating of the mold resin and shell, pouring, heating in the thermostatic oven, and edge treatment after the hardening of mold resin are needed, which arises a problem of remarkably decreased productivity.

[0006] The present invention has been made to solve the above problems, and accordingly an object thereof is to provide a braking device for an elevator traction machine, which can be made thin and small easily and has high reliability and productivity, and a manufacturing method therefor.

Means for Solving the Problems

[0007] A braking device for an elevator traction machine comprises a self-melting wire wound a predetermined number of turns on a bobbin and melted, a prepreg tape wound on the outside of the self-melting wire, a wire connecting portion in which a lead wire is connected to the self-melting wire, and a glass tape stuck fast to the prepreg tape by the resin impregnated into the prepreg tape to fix the wire connecting portion to the prepreg tape.

[0008] A braking device for an elevator traction machine comprises a self-melting wire wound a predetermined number of turns on a bobbin and melted, a prepreg tape wound on the outside of the self-melting wire, a wire connecting portion in which a lead wire is connected to the self-melting wire, a glass tape stuck fast to the prepreg tape by the resin impregnated into the prepreg tape to fix the wire connecting portion to the prepreg tape, and a fixed iron core provided in a rotor drum turning in association with a driving sheave of elevator, to which the bobbin is fixed.

[0009] A manufacturing method for a braking device for an elevator traction machine comprises the steps of winding a self-melting wire a predetermined number of turns on a bobbin, winding a prepreg tape on the outside of the self-melting wire, winding a glass tape on the outside of the prepreg tape to fix a wire connecting portion in which a lead wire is connected to the self-melting wire to the prepreg tape, and melting the self-melting wire by energizing the self-melting wire, and sticking the glass tape fast to the prepreg tape by the resin impregnated into the prepreg tape.

Effect of the Invention

[0010] The present invention is configured so that the braking device comprises a self-melting wire wound a predetermined number of turns on a bobbin and melted, a prepreg tape wound on the outside of the self-melting wire, a wire connecting portion in which a lead wire is connected to the self-melting wire, and a glass tape stuck fast to the prepreg tape by the resin impregnated into the prepreg tape to fix the wire connecting portion to the prepreg tape. Thereupon, the braking device can be made thin and small easily and has high reliability and productivity.

Brief Description of the Drawings

[0011]

Figure 1 is a front view of a braking device for an

elevator traction machine in embodiment 1 of the present invention.

Figure 2 is a view taken in the direction of the arrows along the line A-A of Figure 1.

Figure 3 is a detail view of portion B in Figure 2.

Figure 4 is a view taken in the direction of the arrows along the line C-C of Figure 2.

Figure 5 is a detail view of the magnet coil shown in Figure 4.

Figure 6 is an explanatory view for explaining the manufacturing method for the braking device for an elevator traction machine in embodiment 1 of the present invention.

Description of symbols

[0012] 1 housing, 2 rotor drum, 3 braking device, 4 brake lining, 5 spherical washer, 6 moving iron core, 7 fixed iron core, 7a one side surface, 7b storage portion, 8 magnet coil, 9 pressing spring, 10 resin-made bobbin, 11 self-melting wire, 12 prepreg tape, 13 lead wire, 14 wire connecting portion, 15 resin-made holder, 16 glass cloth tape, 17 cold-setting two-component acrylic adhesive 18a pressure plate, 18b pressure plate, 18c pressure plate, 18d pressure plate

Best Mode for Carrying Out the Invention

[0013] The present invention will now be described in more detail with reference to the accompanying drawings. In the figures, the same symbols are applied to the identical or equivalent elements, and a duplicated explanation thereof is simplified or omitted.

Embodiment 1

[0014] Figure 1 is a front view of a braking device for an elevator traction machine in embodiment 1 of the present invention. In Figure 1, reference numeral 1 denotes a housing of a thin traction machine provided in an elevator shaft of a machine room-less elevator system, 2 denotes a rotor drum that turns in association with a driving sheave (not shown) around which a main rope (not shown) of elevator is set, and 3 denotes a braking device that is provided in the rotor drum 2 to brake the turning of the rotor drum 2 (driving sheave).

[0015] The braking device 3 includes a brake lining 4 arranged so as to face to the inner peripheral surface (braking surface) of the rotor drum 2, a moving iron core 6 that supports the brake lining 4 via spherical washers 5, a fixed iron core 7 that is arranged so as to face to the moving iron core 6 and fixed to the housing 1 via a fixing member etc., a magnet coil 8 provided on one side surface 7a facing to the moving iron core 6 of the fixed iron core 7, and pressing springs 9 that are provided in the fixed iron core 7 to always urge the moving iron core 6 toward the outside so as to press the brake lining 4 on the inner peripheral surface of the rotor drum 2. In the braking device 3 having the above-described construction, the brake lining 4 is pressed on the inner peripheral surface of the rotor drum 2 by the urging force of the pressing springs 9, by which a braking force is generated and hence a brake is operated. Also, the magnet coil 8 is energized and hence the attraction force of electromagnet is generated, by which the moving iron core 6 is moved to the one side surface 7a side of the fixed iron core 7 against the urging force of the pressing spring 9, and thereby the brake is released. When the brake is released, a predetermined gap is formed between the inner peripheral surface of the rotor drum 2 and the brake lining 4.

[0016] Also, Figure 2 is a view taken in the direction of the arrows along the line A-A of Figure 1, Figure 3 is a detail view of portion B in Figure 2, Figure 4 is a view taken in the direction of the arrows along the line C-C of Figure 2, and Figure 5 is a detail view of the magnet coil shown in Figure 4. Figures 2 to 5 show the construction of an electromagnet of the braking device 3 provided with the fixed iron core 7 and the magnet coil 8. In Figures 2 to 5, the fixed iron core 7 has a substantially rectangular shape such that the one side surface 7a facing to the moving iron core 6 is long in the up and down direction and short in the thickness direction (the right and left direction of the one side surface 7a) of the traction machine (the braking device 3), and on the one side surface 7a, a storage portion 7b in which the magnet coil 8 is stored and fixed is formed by cutting etc.

[0017] The magnet coil 8 includes a substantially rectangular ring-shaped resin-made bobbin 10 having a high slenderness ratio, which is long in the up and down direction and short in the right and left direction (the thickness direction of traction machine), a self-melting wire 11 that is wound a predetermined number of turns in a coil form and meltedly installed in a U-shaped portion of the resin-made bobbin 10, an insulating prepreg tape 12 that is wound several turns on the outside of the self-melting wire 11 so as to cover the whole of the outer peripheral surface of the self-melting wire 11 wound in a coil shape on the resin-made bobbin 10, a wire connecting portion 14 in which a lead wire 13 is connected to the self-melting wire 11, a resin-made holder 15 for protecting and insulating the wire connecting portion 14 by covering the whole of the wire connecting portion 14 from the outside of the prepreg tape 12, and a glass cloth tape 16 forming the outermost layer, which is wound on the outside of the prepreg tape 12 and the resin-made holder 15 to fix the wire connecting portion 14 and the resin-made holder 15 to the prepreg tape 12, and is stuck fast to the prepreg tape 12 by the resin having been impregnated into the prepreg tape 12.

[0018] The resin-made bobbin 10 is manufactured, for example, by using an injection molding machine, and has predetermined insulating properties. Also, since the resin-made bobbin 10 has a substantially rectangular ring shape having a high slenderness ratio, the self-melting wire 11 and the like wound in a coil form on the resin-

made bobbin 10 also have a substantially rectangular ring shape having a high slenderness ratio, which is long in the up and down direction and short in the right and left direction, and each of the corner portions thereof is formed by a curved surface having a predetermined curvature. On the outside of one corner portion having a curved surface shape of the self-melting wire 11 wound in a coil form, the wire connecting portion 14 and the resin-made holder 15 are provided. The wire connecting portion 14 and the resin-made holder 15 are arranged so as not to project in the up and down direction and in the right and left direction by wrapping the resin-made holder 15 to the inside with the glass cloth tape 16 wound on the outside of the resin-made holder 15. That is to say, the wire connecting portion 14 and the resin-made holder 15 are arranged so that the width in the up and down direction and the width in the right and left direction of the magnet coil 8 are uniform regardless of the presence of the resin-made holder 15.

[0019] Also, the prepreg tape 12 and the glass cloth tape 16 are wound so as to have a width slightly wider than the U-shaped portion of the resin-made bobbin 10, and both edge portions thereof are bent so as to face to side surfaces in the U-shaped portion of the resin-made bobbin 10.

[0020] The magnet coil 8 having the above-described construction is arranged in the storage portion 7b and is fixed to the fixed iron core 7 by bonding the resin-made bobbin 10 to the fixed iron core 7. To fix the resin-made bobbin 10 to the fixed iron core 7, for example, a cold-setting two-component acrylic adhesive 17 is used. To secure a predetermined bonding area, for example, the cold-setting two-component acrylic adhesive 17 is filled into a gap between the resin-made bobbin 10 and the fixed iron core 7 so that the whole of the inner peripheral surface and one side surface of the resin-made bobbin 10 is fixed by the cold-setting two-component acrylic adhesive 17.

[0021] Next, a manufacturing method for the braking device 3 having the above-described construction is explained. In manufacturing the electromagnet, first, the self-melting wire 11 is wound a predetermined number of turns in a coil form in the U-shaped portion of the resin-made bobbin 10 by using a winding machine (not shown). Next, the prepreg tape 12 that has been treated into a semi-hardened state by impregnating a resin into a heat-resistant substrate is wound several turns on the outside of the self-melting wire 11 so as to cover the whole of the outer peripheral surface of the self-melting wire 11 wound in a coil form on the resin-made bobbin 10. After the prepreg tape 12 has been wound on the outside of the self-melting wire 11, the resin-made holder 15 is arranged on the self-melting wire 11 so as to cover the whole of the wire connecting portion 14 to which the lead wire 13 is connected, and the glass cloth tape 16 is wound on the outside of the prepreg tape 12 so as to wrap the resin-made holder 15 to the inside, by which the wire connecting portion 14 and the resin-made holder 15 are fixed to the prepreg tape 12.

After the self-melting wire 11, the prepreg tape 12, and the glass cloth tape 16 have been wound in the U-shaped portion of the resin-made bobbin 10, a pressure is applied to the glass cloth tape 16 forming the outermost layer from the outside to the inside, namely, to the prepreg tape 12 side, and the self-melting wire 11 is energized while this pressure applying state is maintained.

[0022] Figure 6 is an explanatory view for explaining the manufacturing method for the braking device for an elevator traction machine in embodiment 1 of the present invention, showing a state in which a pressure is applied to the glass cloth tape 16 from the outside before the self-melting wire 11 is energized. In Figure 6, symbols 18a to 18d denote pressure plates that are arranged in the centers of long sides and in the centers of short sides of the magnet coil 8 having a substantially rectangular ring shape to apply a pressure to the glass cloth tape 16 toward the inside from four directions with a predetermined force. The pressure plates 18a and 18b arranged in the centers of long sides of the magnet coil 8 and the pressure plates 18c and 18d arranged in the centers of short sides of the magnet coil 8 apply pressures to the glass cloth tape 16 so that a distance between pressure surfaces contacting with the glass cloth tape 16 takes a predetermined value.

The pressure surfaces of the pressure plates 18a to 18d are arranged so as to come into contact with the glass cloth tape 16 only when the pressures are applied.

[0023] By energizing the self-melting wire 11, the self-melting wire 11 is heated, and the resin of the self-melting wire 11 is melted. Also, the self-melting wire 11 is heated and hence the prepreg tape 12 is heated, by which the resin impregnated into the prepreg tape 12 is also melted. Therefore, by energizing the self-melting wire 11, the glass cloth tape 16 is stuck fast to the prepreg tape 12 by the resin impregnated into the prepreg tape 12. By the energization of the self-melting wire 11, a gap formed between the self-melting wires 11 are filled with the resin, and by the melting of the resin impregnated into the prepreg tape 12, a gap formed between the self-melting wire 11 and the prepreg tape 12 and a gap formed between the prepreg tape 12 and the glass cloth tape 16 are filled with the resin.

[0024] After the self-melting wire 11 has been energized for a predetermined period of time to melt the resin, the pressure plates 18a to 18d are separated from the surface of the glass cloth tape 16 and are removed, and the magnet coil 8 is arranged at a predetermined position in the storage portion 7b of the fixed iron core 7. Since the pressure plates 18a to 18d are arranged so that the pressure surfaces come into contact with the glass cloth tape 16 only, a trouble such that the prepreg tape 12 and the pressure plates 18a to 18d are stuck fast to each other by the resin impregnated into the prepreg tape 12 when the self-melting wire 11 is energized so that the pressure plates 18a to 18d cannot be removed, or that the surface state of the prepreg tape 12 is deteriorated

when the pressure plates 18a to 18d are removed so that the insulating properties cannot be secured can be prevented.

[0025] After the magnet coil 8 has been arranged in the storage portion 7b of the fixed iron core 7, the cold-setting two-component acrylic adhesive 17 is filled into a gap formed between the resin-made bobbin 10 and the fixed iron core 7, and thereby a predetermined surface of the resin-made bobbin 10 is bondingly fixed to the fixed iron core 7.

[0026] The braking device 3 manufactured by the above-described manufacturing method can be made thin and small easily, and has high reliability and productivity. Regarding the thinning and downsizing of the braking device 3, since no mold resin is used unlike the conventional example to protect and fix the self-melting wire 11 and the wire connecting portion 14, a predetermined thickness of mold resin is not needed, so that the magnet coil 8 can be made thin and small easily.

[0027] Since the resin-made bobbin 10 has a substantially rectangular ring shape having a high slenderness ratio, when the self-melting wire 11, etc. are wound on the resin-made bobbin 10, the center of long side and the center of short side tend to expand to the outside. Therefore, by applying a pressure from the outside using the pressure plates 18a to 18d when the self-melting wire 11 is energized, the widths in the up and down direction and the right and left direction of the magnet coil 8 can be kept within a predetermined size, and thereby the braking device 3 can be made thin and small. Also, since the wire connecting portion 14 and the resin-made holder 15 are arranged on the outside of one corner portion having a curved surface shape of the self-melting wire 11 and do not project in the up and down direction and the right and left direction of the magnet coil 8, a part of the magnet coil 8 does not protrude from the fixed iron core 7, and also the area of one side surface 7a of the fixed iron core 7, which exerts a great influence on the brake characteristics because it stores the magnet coil 8, need not be reduced or changed.

[0028] On the other hand, regarding the reliability of the braking device 3, functions of protection, fixture, and heat release of the coil (the self-melting wire 11) and the wire connecting portion 14, which have conventionally provided by the mold resin, can be fulfilled sufficiently even by the above-described method. Specifically, the protection and insulation of the self-melting wire 11 can be secured sufficiently by the prepreg tape 12 wound on the outside of the self-melting wire 11. Since the prepreg tape 12 is wound so as to have a width slightly wider than the width of the U-shaped portion of the resin-made bobbin 10, even if the positions of the self-melting wire 11 and the prepreg tape 12 somewhat shift at the time of melting, the self-melting wire 11 is not exposed, so that the self-melting wire 11 can be protected and insulated surely.

[0029] Also, the wire connecting portion 14 is surely protected from a shock and vibration applied from the outside by the resin-made holder 15. The outer peripheral surface of the resin-made holder 15 is fixed by the adhesion force of the glass cloth tape 16, and the glass cloth tape 16 for fixing the resin-made holder 15 is stuck fast to the prepreg tape 12 by melting the resin impregnated into the prepreg tape 12. Therefore, the resin-made holder 15 is fixed surely to prevent the positional shift of the wire connecting portion 14, and thereby the deterioration in insulating properties caused by the positional shift of the wire connecting portion 14 can be prevented surely. Since a pressure is applied to the glass cloth tape 16 toward the inside, namely, toward the prepreg tape 12 side by the pressure plates 18a to 18d when the self-melting wire 11 is energized, the glass cloth tape 16 can be fixed surely to the prepreg tape 12.

[0030] Also, by providing the wire connecting portion 14 just outside one corner portion having a curved surface shape of the self-melting wire 11 wound in a coil form, the length of the self-melting wire 11 coming from the portion wound in a coil shape to the outside can be decreased as compared with the case where the wire connecting portion 14 is provided at a place separate from the portion wound in a coil form of the self-melting wire 11, so that the protecting construction can be simplified and the reliability of insulation can be increased. To secure the predetermined insulating properties of the wire connecting portion 14, for example, the lead wire 13 is staked to the self-melting wire 11, and thereafter the staking portion is insulated by an insulating tape, insulating tube, or the like.

[0031] Also, since the resin-made bobbin 10 is manufactured by using an injection molding machine etc., at the time of cooling after molding, deformation such as warp or torsion occurs. Therefore, when the resin-made bobbin 10 is fixed to the fixed iron core 7, the method is used in which the cold-setting two-component acrylic adhesive 17 is filled into the gap formed between the resin-made bobbin 10 and the fixed iron core 7, by which the load is distributed to the whole of the attachment surface of the resin-made bobbin 10 to release stresses, and thereby damage to the resin-made bobbin 10 caused by stress concentration, creep, or the like can be prevented.

[0032] On the other hand, regarding the heat release properties of the electromagnet, since the gap between the self-melting wires 11, the gap between the self-melting wire 11 and the resin-made bobbin 10, the gap between the self-melting wire 11 and the prepreg tape 12, and the gap between the prepreg tape 12 and the glass cloth tape 16 are filled with the resin, sufficient thermal conductivity is secured, and thereby the Joule's heat generated in the self-melting wire 11 when the brake is applied can be released to the outside efficiently. Since the gap formed between the resin-made bobbin 10 and the fixed iron core 7 is filled with the cold-setting two-component acrylic adhesive 17, the thermal conductivity between the resin-made bobbin 10 and the fixed iron core 7 can also be secured sufficiently. Therefore, the Joule's heat generated in the self-melting wire 11 when the brake

is applied can also be transmitted to the fixed iron core 7 efficiently, so that a local rise in temperature of the portion formed into a coil shape of the self-melting wire 11 can also be prevented.

[0033] Also, regarding the productivity of the braking device 3, the electromagnet can be manufactured by a step of winding the self-melting wire 11, the prepreg tape 12, and the glass cloth tape 16, a step of melting the resin of the self-melting wire 11 by the energization of the self-melting wire 11 and melting the resin impregnated into the prepreg tape 12 to stick the glass cloth tape 16 fast to the prepreg tape 12, and a step of bonding the magnet coil 8 to the fixed iron core 7. As compared with the conventional molding method, the manufacturing process can be simplified, and the manufacturing time can be shortened. In particular, only by energizing the self-melting wire 11, the fixing of the glass cloth tape 16 can be performed with the melting of the resin of the self-melting wire 11 and the resin impregnated into the prepreg tape 12, so that the work process can be simplified significantly.

[0034] Also, by using a cold setting adhesive to bond the resin-made bobbin 10 to the fixed iron core 7, a need for a thermostatic oven is eliminated, and the work efficiency can also be enhanced. A method in which the resin-made holder 15 for protecting the wire connecting portion 14 is affixed onto the outer peripheral surface of the prepreg tape 12 by using an adhesive etc. is also conceivable. However, this method is disadvantageous because the resin-made holder 15 must be held until the adhesive cures and thereby the manufacturing process and manufacturing time are increased.

Industrial Applicability

[0035] As described above, according to the braking device for an elevator traction machine in accordance with the present invention, the braking device can be made thin and small easily, so that the elevator traction machine itself can be made thin and small. Therefore, the present invention achieves effects especially in a machine room-less elevator system in which the installation space of the traction machine is limited. Also, since the braking device has high reliability and productivity, various effects such as a reduction in cost and a shortened delivery period can be anticipated.

Claims

1. A braking device for an elevator traction machine comprising:

   a self-melting wire wound a predetermined number of turns on a bobbin and melted;
   a prepreg tape wound on the outside of the self-melting wire;
   a wire connecting portion in which a lead wire is connected to the self-melting wire; and
   a glass tape stuck fast to the prepreg tape by the resin impregnated into the prepreg tape to fix the wire connecting portion to the prepreg tape.

2. A braking device for an elevator traction machine comprising:

   a self-melting wire wound a predetermined number of turns on a bobbin and melted;
   a prepreg tape wound on the outside of the self-melting wire;
   a wire connecting portion in which a lead wire is connected to the self-melting wire;
   a glass tape stuck fast to the prepreg tape by the resin impregnated into the prepreg tape to fix the wire connecting portion to the prepreg tape; and
   a fixed iron core provided in a rotor drum turning in association with a driving sheave of elevator, to which the bobbin is fixed.

3. The braking device for an elevator traction machine according to claim 1 or 2,
   characterized in that
   the wire connecting portion is provided on the outside of one corner portion having a curved surface shape of the self-melting wire, and
   a holder for protecting and insulating the wire connecting portion by covering the wire connecting portion from the outside of the prepreg tape is provided on the outside of the one corner portion of the self-melting wire.

4. The braking device for an elevator traction machine according to claim 3, **characterized in that** the self-melting wire wound on the bobbin has a rectangular ring shape that is long in the up and down direction and short in the right and left direction.

5. The braking device for an elevator traction machine according to claim 3 or 4, **characterized in that** the glass tape is wound on the outside of the prepreg tape and the holder to fix the holder to the prepreg tape, and is stuck fast to the prepreg tape by the resin impregnated into the prepreg tape.

6. A manufacturing method for a braking device for an elevator traction machine comprising the steps of:

   winding a self-melting wire a predetermined number of turns on a bobbin;
   winding a prepreg tape on the outside of the self-melting wire;
   winding a glass tape on the outside of the prepreg tape to fix a wire connecting portion in which a lead wire is connected to the self-melting wire

to the prepreg tape; and
melting the self-melting wire by energizing the self-melting wire, and sticking the glass tape fast to the prepreg tape by the resin impregnated into the prepreg tape.

7. The manufacturing method for a braking device for an elevator traction machine according to claim 6, **characterized by** further comprising a step of applying a pressure to the glass tape wound on the outside of the prepreg tape toward the inside before the self-melting wire is energized.

8. The manufacturing method for a braking device for an elevator traction machine according to claim 6 or 7, **characterized by** further comprising a step of bondingly fixing the bobbin to a fixed iron core after the self-melting wire has been energized.

Fig. 1

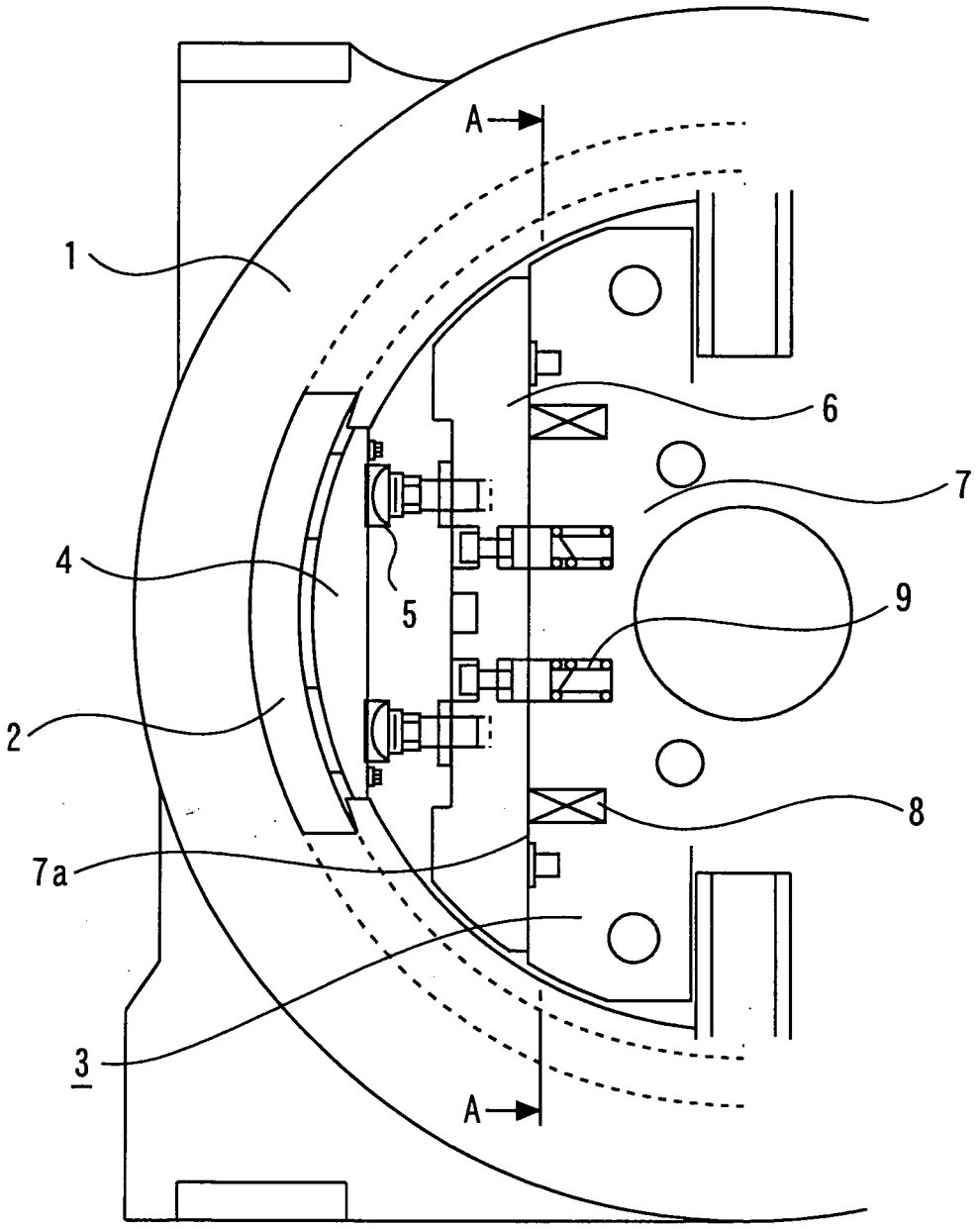


Fig. 2

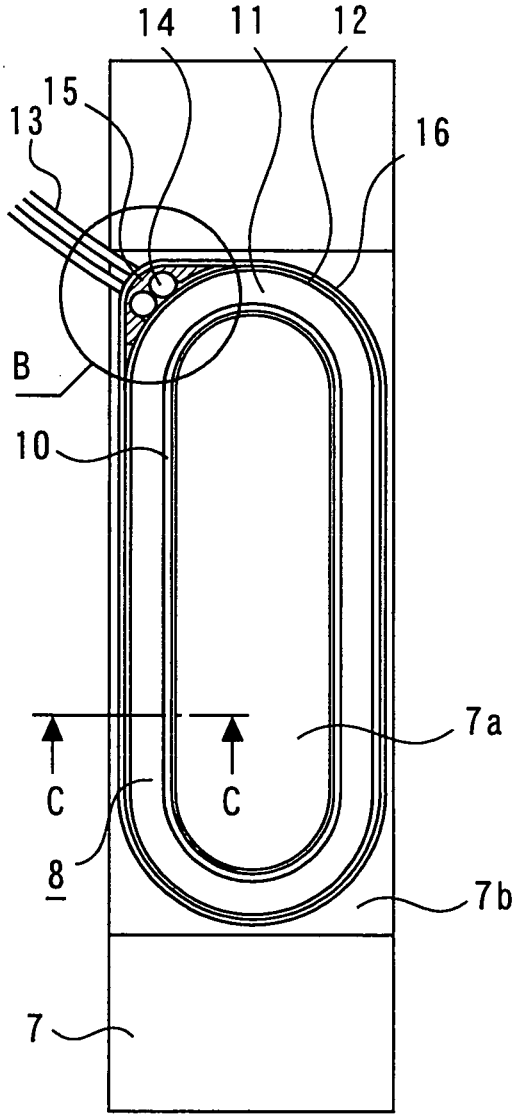


Fig. 3

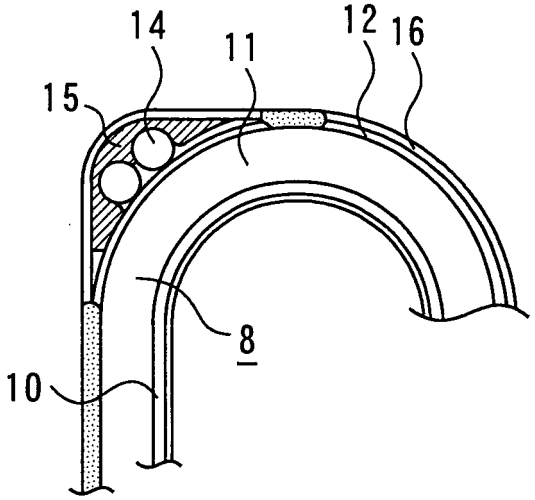


Fig. 4

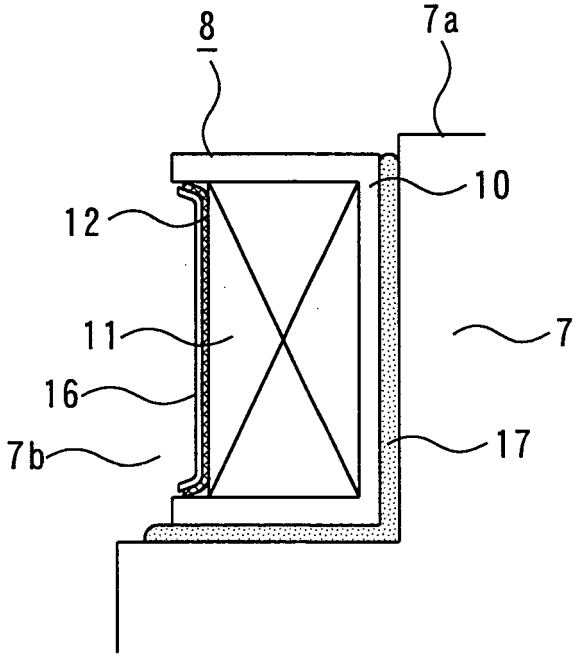


Fig. 5

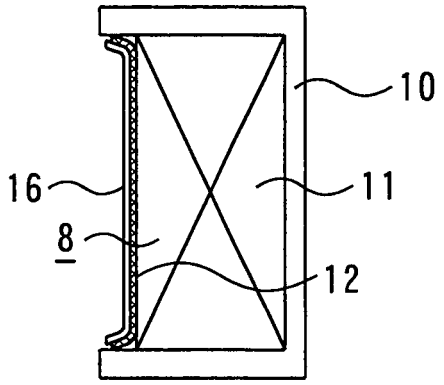
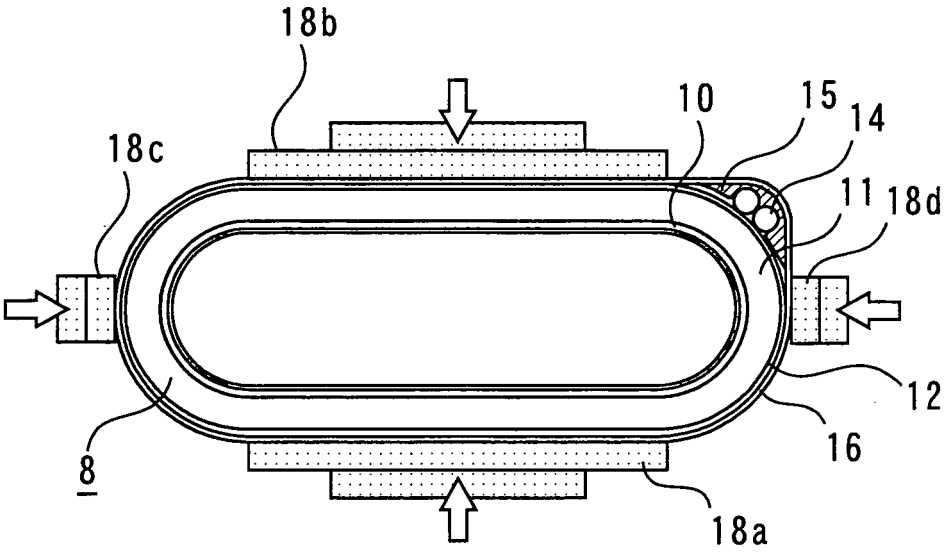


Fig. 6



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2006/303149

A. CLASSIFICATION OF SUBJECT MATTER
B66B11/08(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)
B66B1/00-B66B31/02, H01F1/00-H01F41/34, H02K1/00-H02K57/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2006
Kokai Jitsuyo Shinan Koho 1971-2006 Toroku Jitsuyo Shinan Koho 1994-2006

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 11-299201 A (ATB Antriebstechnik AG.), 29 October, 1999 (29.10.99), & EP 0949743 A2 & DE 19815962 A	1-2,6
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☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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09 November, 2006 (09.11.06)	21 November, 2006 (21.11.06)
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2006/303149

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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REFERENCES CITED IN THE DESCRIPTION

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