(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 873 793 A1

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
02.01.2008 Bulletin 2008/01

(21) Application number: **05734447.5**

(22) Date of filing: **20.04.2005**

(51) Int Cl.:
***H01F 7/06** (2006.01)* ***B66B 11/08** (2006.01)*

(86) International application number:
PCT/JP2005/007531

(87) International publication number:
WO 2006/114869 (02.11.2006 Gazette 2006/44)

(84) Designated Contracting States:
DE

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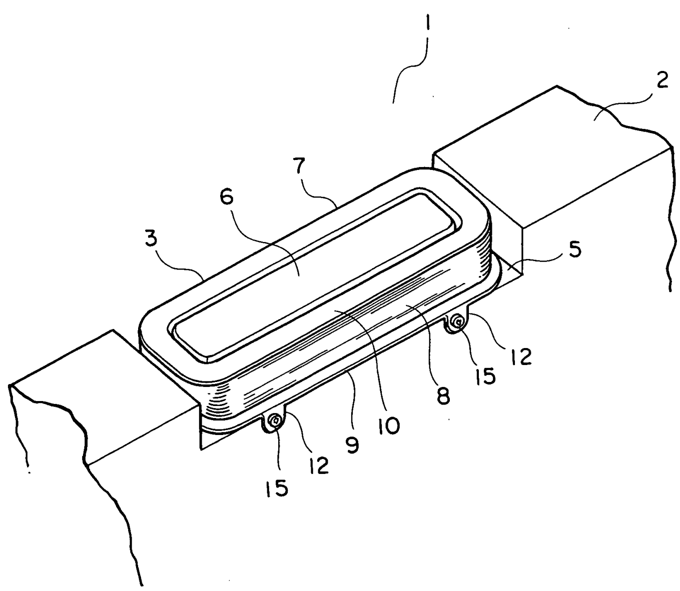
(54) ELECTROMAGNET DEVICE FOR ELEVATOR

(57) An electromagnetic coil body has a winding frame, and an electromagnetic coil provided on the winding frame. The electromagnetic coil body is fitted to a field by means of a coil fitting member. The coil fitting member is engaged with the winding frame and fixed to the field, thereby fixing the electromagnetic coil body to the field. Thus, an operation performed in fitting the electromagnetic coil body to the field can be facilitated. As a result, the electromagnetic coil body can be fitted to the field more reliably.

FIG. 1



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Description

Technical Field

[0001] The present invention relates to an electromagnet device for an elevator which is provided on a component mounted on a hoisting machine of the elevator, for example, an electric motor, a brake device, or the like.

Background Art

[0002] Conventionally, a mold material such as varnish, resin, or the like is injected into a space between an electromagnetic coil and a shell, so the electromagnetic coil is fixed to the shell. After having been injected into the space between the electromagnetic coil and the shell, the mold material is heated to be cured. The electromagnetic coil is fixed to the shell due to the cure of the mold material (see Patent Document 1).

[0003] Patent Document 1: JP 11-136911 A

Disclosure of the Invention

Problems to be solved by the Invention

[0004] However, some troublesome operations need to be performed before setting out to perform the operation of fixing the electromagnetic coil to the shell. Those troublesome operations include the mixing of a main agent and a curing agent to make the mold material, the control of weight, and the like. Further, the coefficients of linear expansion of the electromagnetic coil and the shell are different from the coefficient of linear expansion of the mold material, so the mold material may develop a crack or peel off the shell due to changes in temperature.

[0005] The present invention has been made to solve the above-mentioned problems, and it is therefore an object of the present invention to obtain an electromagnet device for an elevator which can be manufactured with ease while allowing an electromagnetic coil to be fitted to a field more reliably.

Means for solving the Problems

[0006] According to the present invention, an electromagnet device for an elevator includes: an electromagnetic coil body having a winding frame and an electromagnetic coil provided on the winding frame; a field having the electromagnetic coil body fitted to the field; and a coil fitting member engaged with the winding frame and fixed to the field, for fitting the electromagnetic coil body to the field.

Brief Description of the Drawings

[0007]

Fig. 1 is a perspective view showing an electromagnet device for an elevator according to Embodiment 1 of the present invention.
Fig. 2 is a perspective view showing a bobbin of Fig. 1.
Fig. 3 is a front view showing one of protrusion portions of Fig. 1 and one of screws of Fig. 1.
Fig. 4 is a sectional view taken along the line IV-IV of Fig. 3.

Best Mode for carrying out the Invention

[0008] A preferred embodiment of the present invention will be described hereinafter with reference to the drawings.

Embodiment 1

[0009] Fig. 1 is a perspective view showing an electromagnet device for an elevator according to Embodiment 1 of the present invention. Referring to Fig. 1, a brake device mounted on a hoisting machine of the elevator has a rotary body (not shown) for rotating integrally with a rotational shaft of the hoisting machine, a movable member (not shown) forbeingpressedagainst the rotary body to brake rotation thereof, a spring (not shown) for pressing the movable member against the rotary body, and an electromagnet device 1 for opening the movable member away from the rotary body against an urging force of the spring.

[0010] The movable member is disposed between the electromagnet device 1 and the rotary body. The electromagnet device 1 generates an electromagnetic suction force through energization. When the electromagnet device 1 is stopped from being energized, the movable member is pressed against the rotary body due to an urging force of the spring. When the electromagnet device 1 is energized, the movable member is sucked toward the electromagnet device 1 side and opened away from the rotary body against the urging force of the spring.

[0011] The electromagnet device 1 has a plurality of plate-type fields 2 made of a magnetic material such as iron or the like, and annular (endless) electromagnetic coil bodies 3 provided on the fields 2, respectively. Each of the fields 2 is disposed such that a thickness direction thereof extends perpendicularly to a direction in which the movable member is displaced. A depressed portion (coil installation portion) 5 in which the electromagnetic coil body 3 is installed is provided in the portion of each of the fields 2, which is opposed to the movable member, along the thickness direction of each of the fields 2. A field core portion (iron core portion) 6, which is passed inside the electromagnetic coil body 3, is provided in the depressed portion 5. The field core portion 6 protrudes from a bottom of the depressed portion 5.

[0012] The electromagnetic coil body 3 has an annular bobbin (winding frame) 7, and an annular electromagnetic coil 8 provided on an outer periphery portion of the bobbin 7 so as to surround the bobbin 7. The bobbin 7 is disposed in the depressed portion 5 such that a height direction of the field core portion 6 and a thickness direction of the bobbin 7 coincide with each other. The bobbin 7 and the electromagnetic coil 8 are integrated with each other.

[0013] Fig. 2 is a perspective view showing the bobbin 7 of Fig. 1. As shown in Fig. 2 as well, the bobbin 7 has a pair of annular opposed portions 9 and 10 opposed to each other in the thickness direction of the bobbin 7, an annular coupling portion 11 extending along inner periphery portions of the respective opposed portions 9 and 10 to couple the opposed portions 9 and 10 to each other, and a plurality of protrusion portions 12 protruding from an outer periphery portion of one of the opposed portions 9 away from the other opposed port ion 10 side. Through-holes 13 are provided through the protrusion portions 12, respectively. The bobbin 7 is provided with a groove portion 14 extending in a circumferential direction of the bobbin 7. The groove portion 14 is constituted by the respective opposed portions 9 and 10 and the coupling portion 11. The bobbin 7 is a resin-molded member made of resin.

[0014] The bobbin 7 is disposed in the depressed portion 5 such that one of the opposed portions 9 is located closer to the bottom side of the depressed portion 5 than the other opposed portion 10. Part of one of the opposed portions 9 extends along a borderline between a lateral surface of the field 2 and a bottom surface of the depressed portion 5. The respective protrusion portions 12 protrude from the opposed portion 9 along the lateral surface of the field 2.

[0015] The electromagnetic coil 8 is disposed in the groove portion 14. The electromagnetic coil 8 is constructed by winding autohesion enamel wires around the bobbin 7 along the groove portion 14. The autohesion enamel wires are obtained by superposing adhesive layers, which melt when heated, on surfaces of enamel wires (which are obtained by baking varnish onto conductors). The electromagnetic coil 8 is manufactured by energizing the autohesion enamel wires to heat the adhesive layers, fuse the respective enamel wires to one another, and cure them.

[0016] The electromagnetic coil body 3 is fitted to (retained by) the field 2 by means of a plurality of screws (coil fitting members) 15 passed through the through-holes 13, respectively. Fig. 3 is a front view showing one of the protrusion portions 12 of Fig. 1 and one of the screws 15 of Fig. 1. Fig. 4 is a sectional view taken along the line IV-IV in Fig. 3. Referring to Figs. 3 and 4, a plurality of screw holes 16 are provided through the lateral surface of the field 2. Each of the screw holes 16 is disposed at the same position as the through-hole 13 of a corresponding one of the protrusion portions 12 in a direction along the borderline between the bottom surface of the depressed portion 5 and the lateral surface of the field 2.

[0017] Each of the screws 15 has a head portion 17 and a rod-type screwed portion 18. The head portion 17 has an outer diameter larger than an inner diameter of a corresponding one of the through-holes 13. The screwed portion 18, which protrudes from the head portion 17, is passed through a corresponding one of the through-holes 13 and screwed into a corresponding one of the screw holes 16. When the screwed portion 18 is passed through, the through-hole 13, each of the protrusion portions 12 is engaged with a corresponding one of the screws 15. When the screwed portion 18 is screwed into the screw hole 16, each of the screws 15 is fixed to the field 2.

[0018] That is, the plurality of the screws 15, which have been passed through the through-holes 13 to be engaged with the protrusion portions 12 respectively, are screwed into the screw holes 16 respectively to be fixed to the field 2, so the electromagnetic coil body 3 is fitted to the field 2. In this example, the screws 15 are designed as hexagon socket head bolts. An adhesive 19 is interposed between the bobbin 7 and the field core portion 6, between the bobbin 7 and the bottom surface of the depressed portion 5, between the screws 15 and the through-holes 13, and between the screws 15 and the screw holes 16.

[0019] Next, a method of manufacturing the electromagnetic coil body 3 will be described. First of all, the bobbin 7 is set on a winding machine. After that, the winding machine is operated to wind the autohesion enamel wires around the bobbin 7 with a predetermined tensile force and a predetermined number of turns. After that, the bobbin 7 around which the autohesion enamel wires are wound is removed from the winding machine, and the autohesion enamel wires are energized. Thus, the adhesive layers on the surfaces of the autohesion enamel wires melt, so the autohesion enamel wires are fused to one another. After that, the autohesion enamel wires are stopped from being energized to cure the molten adhesive layers. Thus, the electromagnetic coil body 3 is manufactured.

[0020] Next, a procedure of fitting the electromagnetic coil body 3 to the field 2 will be described. First of all, the adhesive 19 is thickly applied on a border between the field core portion 6 and the bottom of the depressed portion 5. After that, the electromagnetic coil body 3 is inserted into the depressed portion 5. At this moment, the field core portion 6 is inserted inside the electromagnetic coil body 3, so the adhesive 19 is pressed to be spread out between the bobbin 7 and the bottom surface of the depressed portion 5 and between the bobbin 7 and the field core portion 6.

[0021] After that, the adhesive 19 is injected into the respective screw holes 16 and the respective through-holes 13. After that, the screws 15 are screwed into the screw holes 16 while being passed through the through-holes 13, respectively. The screws 15 are then fastened. In this manner, the electromagnetic coil body 3 is fitted to the field 2.

[0022] In the electromagnet device 1 constructed as described above, the screws 15 engaged with the bobbin

7 are fixed to the field 2, so the electromagnetic coil body 3 is fitted to the field 2. Therefore, even when misalignment is caused between the electromagnetic coil body 3 and the field 2 due to, for example, changes in temperature or the like, the electromagnetic coil body 3 can be prevented, owing to the engagement of the screws 15 with the bobbin 7, from falling off the field 2. Consequently, the electromagnetic coil body 3 can be fitted to the field 2 more reliably. Further, there is no need to manufacture or control the mold material as in conventional cases, and no further step is required once the screws 15 engaged with the bobbin 7 have been fixed to the field 2. Therefore, the electromagnetic coil body 3 can be fitted to the field 2 with ease, so the electromagnet device 1 can be manufactured with ease.

[0023] The screws 15 are passed through the through-holes 13 respectively to be engaged with the bobbin 7, and are screwed into the screw holes 16 to be fixed to the field 2. Therefore, the screws 15 can be engaged with the bobbin 7 with ease, and can be fixed to the field 2 with ease.

[0024] The bobbin 7 has the protrusion portions 12 through which the through-holes 13 are provided. Therefore, the through-holes 13 can be positioned such that the screws 15 can be inserted thereinto with ease. As a result, the operation performed in fitting the electromagnetic coil body 3 to the field 2 can be further facilitated.

[0025] The adhesive 19 is interposed between the screws 15 and the through-holes 13 and between the bobbin 7 and the field 2, so the screws 15 can be prevented from loosening due to a creep phenomenon of the bobbin 7. In particular, the strain resulting from the creep phenomenon is noticeable when the bobbin 7 is made of resin. Therefore, the effect of preventing the screws 15 from loosening is improved.

[0026] The bobbin 7 is made of resin, so the electromagnetic coil body 3 can be manufactured at low cost and with ease.

[0027] The electromagnetic coil 8 is constructed by winding the autohesion enamel wires around the bobbin 7. Therefore, there is no need to solidify the electromagnetic coil 8 using the mold material, so the electromagnetic coil body 3 can be manufactured easily.

[0028] The autohesion enamel wires wound around the bobbin 7 are fused to one another by the heat generated through energization. Therefore, the electromagnetic coil 8 can be solidified by simply energizing the autohesion enamel wires. Consequently, the electromagnetic coil body 3 can be manufactured more easily.

[0029] In the foregoing example, the screws 15 passed through the through-holes 13 are screwed into the screw holes 16, so the electromagnetic coil body 3 is fitted to the field 2. However, the electromagnetic coil body 3 may also be fitted to the field 2 by providing pin holes through the lateral surface of the field 2 and driving pins (coilfitting members) passed through the through-holes 13 into the pin holes, respectively. In this manner as well, the pins engaged with the bobbin 7 can be fixed to the field 2, so the electromagnetic coil body 3 can be fitted to the field 2 more reliably.

[0030] In the foregoing example, the electromagnetic coil 8 is constructed by winding the autohesion enamel wires around the bobbin 7. However, the electromagnetic coil 8 may also be manufactured by winding normal enamel wires around the bobbin 7. In this case, insulating tapes for electric protection and mechanical protection may be wound around outer peripheries of the enamel wires.

[0031] In the foregoing example, the adhesive 19 is interposed both between the screws 15 and the through-holes 13 and between the bobbin 7 and the field 2. However, the adhesive 19 may be interposed only either between the screws 15 and the through-holes 13 or between the bobbin 7 and the field 2. In this manner as well, the screws 15 can be prevented from loosening due to the creep phenomenon of the bobbin 7.

[0032] In the foregoing example, the present invention is applied to the brake device mounted on the hoisting machine. However, the present invention may also be applied to an electric motor of the hoisting machine. That is, in the electric motor, the present invention may also be applied to a stator for rotating a rotor.

Claims

1. An electromagnet device for an elevator, comprising:

an electromagnetic coil body having a winding frame and an electromagnetic coil provided on the winding frame;
a field having the electromagnetic coil body fitted to the field; and
a coil fitting member engaged with the winding frame and fixed to the field, for fitting the electromagnetic coil body to the field.

2. An electromagnet device for an elevator according to Claim 1, wherein:

the coil fitting member is a screw;
the winding frame is provided with a through-hole through which the screw is passed;
the field is provided with a screw hole into which the screw is screwed; and
the screw is passed through the through-hole to be engaged with the winding frame, and screwed into the screw hole to be fixed to the field.

3. An electromagnet device for an elevator according to Claim 2, wherein the winding frame has a protrusion portion provided with the through-hole.

4. An electromagnet device for an elevator according to Claim 2 or 3, wherein at least either the screw and the through-hole or the winding frame and the field have an adhesive interposed therebetween.

5. An electromagnet device for an elevator according to any one of Claims 1 to 4, wherein the winding frame is made of resin.

6. An electromagnet device for an elevator according to any one of Claims 1 to 5, wherein the electromagnetic coil is constructed by winding autohesion enamel wires around the winding frame.

7. An electromagnet device for an elevator according to Claim 6, **characterized in that** the autohesion enamel wires wound around the winding frame are fused to one another through heat generated by energization.

FIG. 1

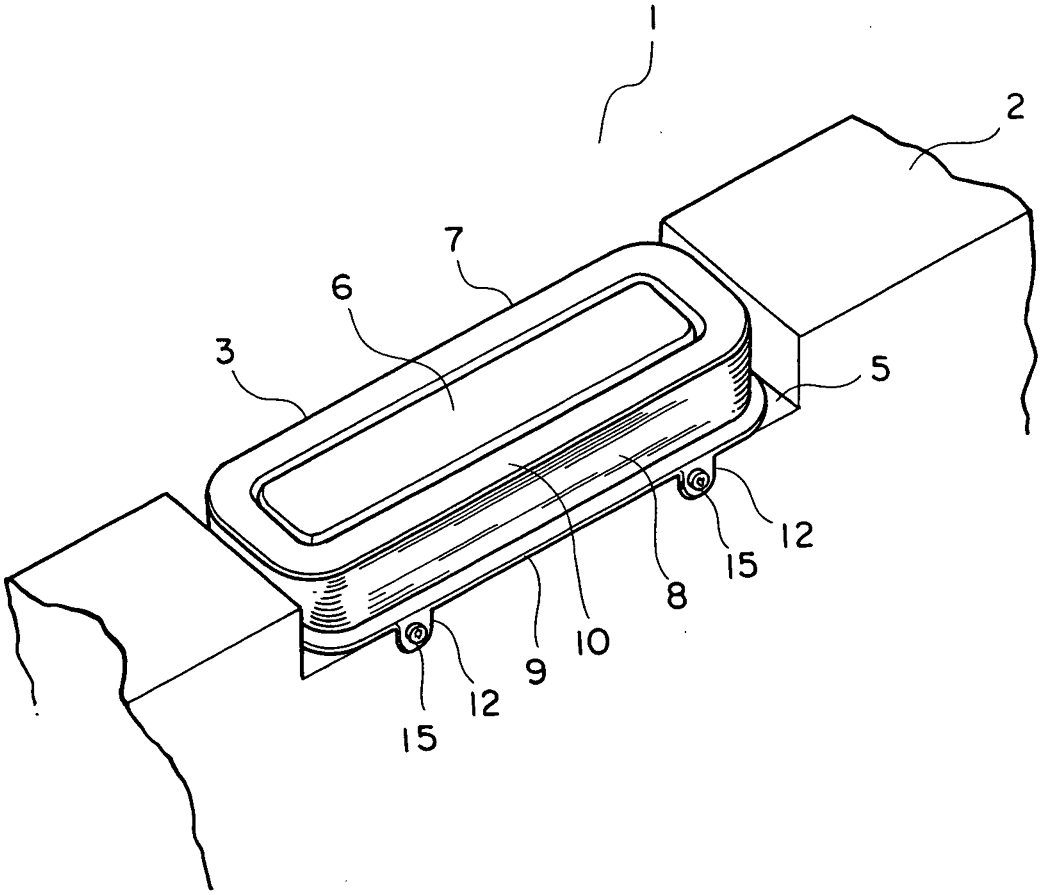


FIG. 2

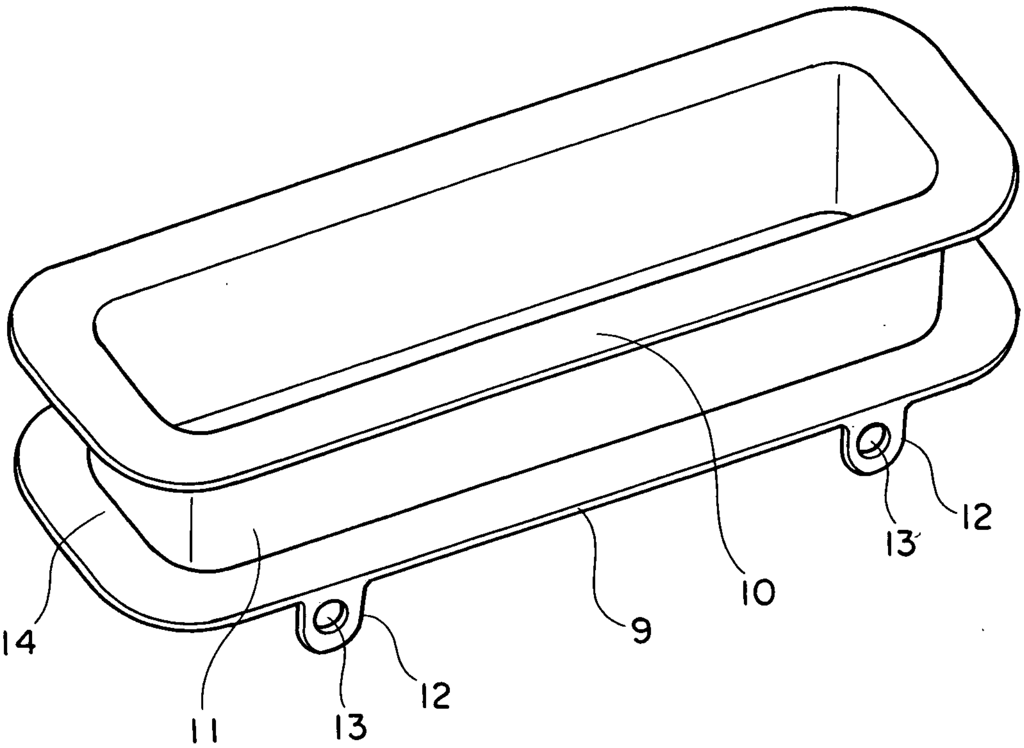


FIG. 3

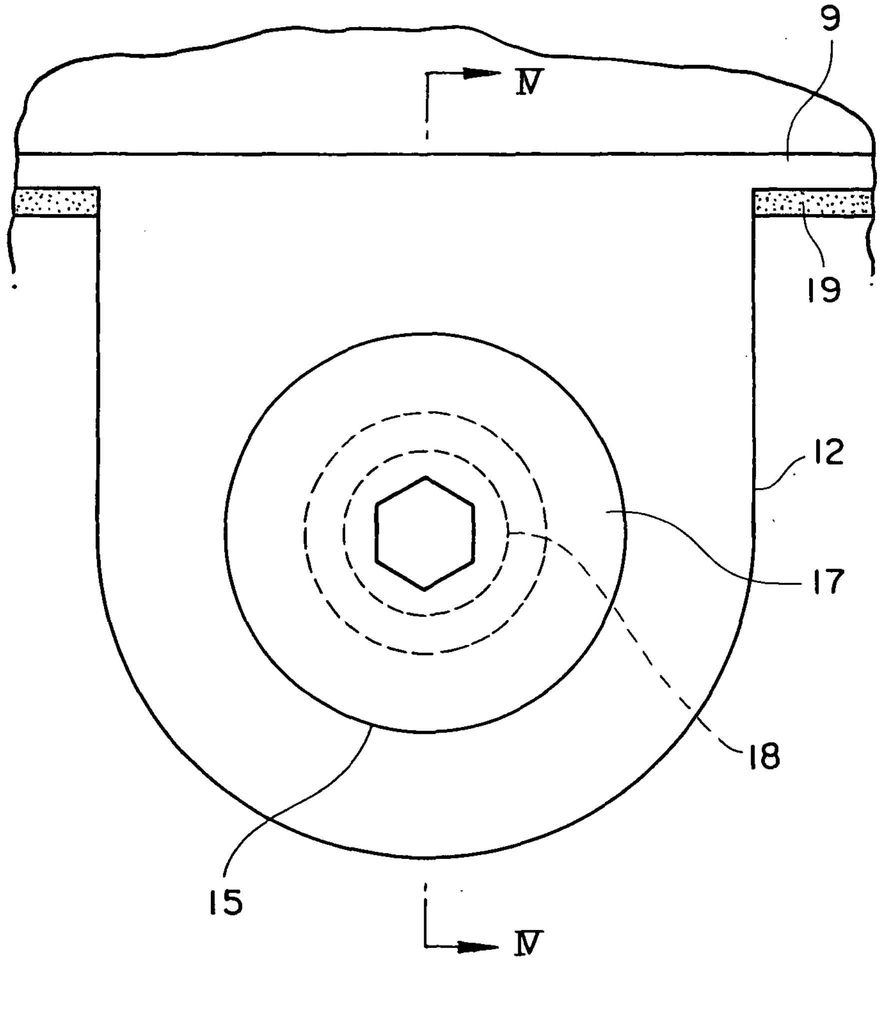
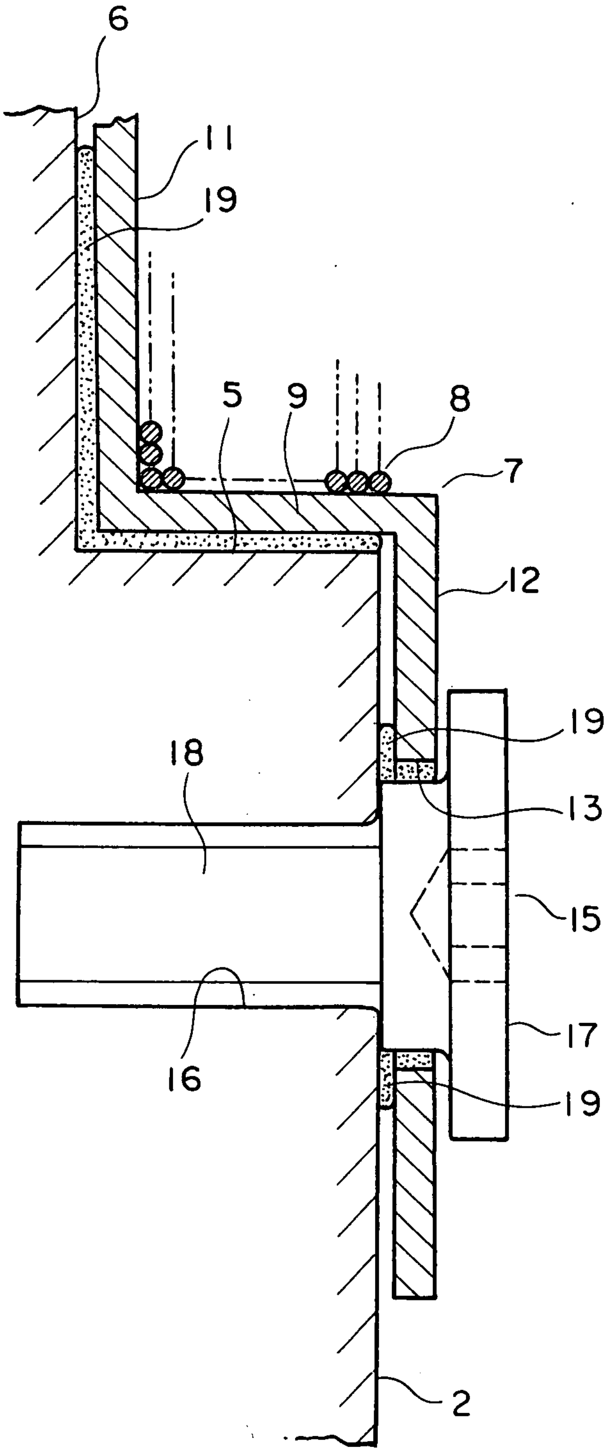


FIG. 4



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2005/007531

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl^{7} H01F7/06, B66B11/08

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)
Int.Cl^{7} H01F7/06, B66B11/08, H01F5/02, 27/32

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	1996-2005
Kokai Jitsuyo Shinan Koho	1971-2005	Toroku Jitsuyo Shinan Koho	1994-2005

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.
Y	JP 10-101271 A (Mitsubishi Electric Corp.), 21 April, 1998 (21.04.98), Column 2, lines 17 to 24; Fig. 10 (Family: none)	1-7
Y	JP 10-189351 A (Toyoda Automatic Loom Works, Ltd.), 21 July, 1998 (21.07.98), Par. No. [0021]; Figs. 1, 3 (Family: none)	1-7
Y	JP 8-232939 A (Kabushiki Kaisha Arutesu), 10 September, 1996 (10.09.96), Claims (Family: none)	4

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

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Date of the actual completion of the international search	Date of mailing of the international search report
16 June, 2005 (16.06.05)	05 July, 2005 (05.07.05)

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2005/007531

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y	JP 2002-358836 A (Hitachi Cable, Ltd.), 13 December, 2002 (13.12.02), Par. No. [0003] (Family: none)	6,7

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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