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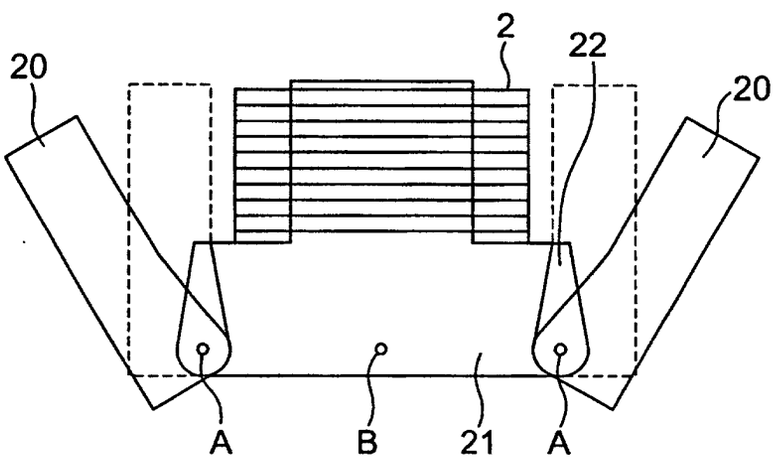
(54) ELECTROMAGNET CORE, METHOD OF MANUFACTURING THE ELECTROMAGNET CORE, AND ELEVATOR HOIST BRAKE UTILIZING THE ELECTROMAGNET CORE

(57) An electromagnet core assembly in which movable core members are fit respectively between second laminated coil-wound core members by means of first engaging portions, respectively, while first coil-wound core members are respectively fit between the second laminated coil-wound core members by means of second engaging portions, respectively, wherein the movable core members are rotatable about the first engaging portions, respectively, and a coil is wound around a coil-wound portion of the first and second laminated coil-wound core members.

Fig. 1



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Description

TECHNICAL FIELD

[0001] The present invention relates to a core assembly of an electromagnet used in a brake for an hoisting machine of an elevator system. The core assembly of the electromagnet will hereinafter be referred to also as the electromagnet core assembly.

BACKGROUND TECHNIQUES

[0002] A typical one of a hoisting machine for an elevator system in which an electromagnet core assembly is employed is shown in Fig. 4, More particularly, Fig. 4 shows a structure in general of a hitherto known hoisting machine for an elevator system which is equipped with a conventional electromagnet core assembly.

[0003] In Fig. 4, reference numeral 1 denotes an electromagnet core assembly, 2 denotes a coil and numeral 3 denotes a brake arm.

[0004] Figure 5 shows the electromagnet core assembly 1 of the elevator hoisting machine shown in Fig. 4. More specifically, Fig. 5 is an enlarged view showing schematically a conventional electromagnet core assembly 1 employed in the hoisting machine of an elevator.

[0005] The electromagnet core assembly 1 known heretofore is formed in an E-like fixed structure. As a consequence, an attempt to wind a coil around a mid or center projecting portion 10 by using a coil winding machine (coil winder) has failed because an arm of the coil winding machine interferes with side projecting portions 11 of the electromagnet core assembly 1, making it impossible to wind directly the coil around the center projecting portion 10.

[0006] Such being the circumstances, when the coil is to be mounted on and around the center projecting portion 10 of the electromagnet core assembly 1 by using the coil winding machine, the coil is previously wound once on a coil former dedicated to this end with the coil winding machine, whereon the coil thus formed is mounted on the center projecting portion 10 by inserting the latter into the coil.

[0007] Thus, with the conventional method of mounting the coil on the center projecting portion of the electromagnet core assembly, there are required two steps, i.e., winding of the coil on the coil former and mounting the coil formed around the center projecting portion of the electromagnet core assembly, giving rise to a problem from the viewpoint of the production efficiency, i . e. , poor efficiency of manufacturing the electromagnet.

DISCLOSURE OF THE INVENTION

[0008] The present invention has been made with a view to solving the problem mentioned above, and it is an object of the present invention to provide an improved electromagnetic core assembly which can ensure manufacturing of an electromagnet with an enhanced production efficiency by rendering unnecessary the step of mounting through insertion a coil on a center projecting portion of the electromagnet core assembly by allowing the coil to be directly wound around the center projecting portion.

[0009] For achieving the object mentioned above, in the electromagnet core assembly according to the present invention, movable core members are fit respectively between second laminated coil-wound core members (i.e., second core members laminated which are destined to be wound with a coil) by means of first engaging portions, respectively, first coil-wound core members (i.e., first core members which are destined to be wound with a coil together with the second core members) are respectively fit between the second laminated coil-wound core members by means of second engaging portions, respectively, the movable core members are rotatable about the first engaging portions, respectively, and a coil is wound around a coil-wound portion of the first and second coil-wound core members.

[0010] Further, in the electromagnet core assembly according to the present invention, the movable core members are fit between the second laminated coil-wound core members by means of the first engaging portions, respectively, and the first coil-wound core members are fit between the second laminated coil-wound core members by means of second engaging portions, respectively.

[0011] Furthermore, in the electromagnet core assembly according to the present invention, each of the second coil-wound core members is comprised of a base portion and a projecting portion integrally implemented substantially in a T-like shape, and the movable core members are mounted on the base portion at both ends thereof by means of the first engaging portions, respectively.

[0012] Moreover, in the electromagnet core assembly according to the present invention, each of the first coil-wound core members is comprised of a base portion and a projecting portion integrally implemented substantially in a T-like shape, and the projecting portion of the first coil-wound core member is formed in a shape which coincides with that of the projecting portion of the second coil-wound core member when the first coil-wound core member and the second coil-wound core member are stacked or superposed on each other.

[0013] In a method of manufacturing an electromagnet core assembly according to the present invention, a core subassembly is formed by fitting convex portions A of a second coil-wound core member in concave portions of movable core members, respectively, while fitting a convex portion B of the second coil-wound core member in a concave portion B of a first coil-wound core member, whereon a plurality of the core subassemblies are laminated one another by fitting convex portions B of the movable core members in the concave portions

A of the second coil-wound core members, respectively, while fitting convex portions B of the first coil-wound core members in the concave portions B of the second coil-wound core members, respectively, among the plurality of different core subassemblies, and a plurality of the first coil-wound core members and a plurality of the movable core members are sandwiched between a plurality of the second coil-wound core members, respectively, by fitting exposed convex portions of the movable core members in the concave portions A of the second coil-wound core members, respectively, while fitting exposed convex portions B of the first coil-wound core members in the concave portions B of the second coil-wound core members, respectively.

[0014] In a brake for a hoisting machine of an elevator system according to the present invention, the electromagnet core assembly described above is made use of.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015]

Figure 1 is a block construction view showing an data collection apparatus according to an embodiment 1 of the present invention.

Figure 1 is a front side view showing an electromagnet core assembly according to an embodiment of the present invention.

Figure 2 shows a front side view and a top plan view of a second coil-wound core member according to the instant embodiment of the invention.

Figure 3 shows a front side view and a top plan view of a first coil winding portion according to the instant embodiment of the invention.

Figure 4 is a view showing generally a structure of an elevator hoisting machine equipped with an electromagnet core assembly known heretofore.

Figure 5 is an enlarged view of a conventional electromagnet core assembly 1 employed in the conventional hoisting machine of an elevator.

BEST MODES FOR CARRYING OUT THE INVENTION

[0016] In the following, the present invention will be elucidated in conjunction with an exemplary embodiment thereof.

[0017] Referring to Fig. 1, description will be made of an electromagnet core assembly according to an exemplary embodiment of the present invention. Figure 1 is a front side view showing an electromagnet core assembly according to the instant embodiment of the present invention.

[0018] In Fig. 1, reference numerals 20 denotes movable core members, respectively, 21 denotes a first coil-wound core member (i.e., a first core member to be wound with a coil) and 22 denotes a second coil-wound core member (i.e., a second core member to be wound with a coil). These core members are integrally assembled together to constitute the electromagnet core assembly according to the instant embodiment.

[0019] Next, referring to Fig. 2, a structure of the second coil-wound core member shown in Fig. 1 will be described. Figure 2 is a front side view showing the second coil-wound core member according to the instant embodiment of the invention.

[0020] In Fig. 2, reference numeral 30 denotes a projecting portion which is intrinsically destined to be wounded with a coil. Reference numeral 31 denotes a base portion which is provided with convex portions A and a convex portion B, respectively. More specifically, the convex portions A are formed at both sides of the base portion 31 while the convex portion B is formed substantially at a center or mid position of the base portion 31. These convex portions A and the convex portion B are formed on one surface of the second coil-wound coremember 22 implemented in the form of a substantially T-like plate. On the other hand, concave portions A and a concave portion B corresponding to the convex portions A and the convex portion B, respectively, are formed on the other or back surface of the second coil-wound core member 22.

[0021] Next, by reference to Fig. 3, a structure of the first coil-wound core member shown in Fig. 1 will be described in detail. Figure 3 is a front side view showing the first coil-wound core member according to the instant embodiment of the invention.

[0022] In Fig. 3, reference numeral 40 denotes a projecting portion which is intrinsically destined to be wounded with the coil. Reference numeral 41 denotes a base portion which is provided with a convex portion B. This convex portion B is formed substantially at the a mid position of the base portion 31. More specifically, the convex portion B is formed on one surface of the first coil-wound core member 21 formed of a substantially T-like plate. On the other hand, a concave portion B corresponding to the convex portion B is formed on the other or back surface of the first coil-wound core member 21.

[0023] The convex portion B of the first coil-wound core member 21 is adapted to snugly engage with or fit in the concave portion B of the second coil-wound core member 22, while the convex portion B of the second coil-wound member 22 is adapted to snugly fit in or engage with the concave portion B of the first coil-wound core member 21. At this junction, it should be mentioned that the convex and concave portions B and B formed in the first and second coil-wound core members, respectively, are not necessarily provided at or in the vicinity of the mid position of the base portions 31 and 41. What is required is that the convex and concave portions B and B be provided so that the first and second coil-wound core members 21 and 22 can snugly engage or fit each other. Further, the number of the convex/concave portion is never limited to one, but two or more convex/ concave portions may equally be provided. It should additionally be mentioned that the length of the

base portion 41 of the first coil-wound core member 21 is longer than that of the second coil-wound core member 22.

[0024] On the other hand, each of the movable core members 20 is provided with a convex portion A at one end portion thereof. This convex portion A is formed on one surface of the movable core members 20 implemented in the form of a substantially I-like sheet or plate. A concave portions A corresponding to the convex portion A is formed in the back surface of the movable core members 20. The convex portion A of the movable core members 20 is adapted to snugly engage with or fit in the concave portions A of the second coil-wound core member 22. Further, the concave portions A of the movable core members 20 is adapted to snugly engage receive therein the convex portion A of the second coil-wound core member 22. When the movable core members 20 are juxtaposed with the first coil-wound core member 21, the magnet core assembly is realized substantially in an E-like structure. Further, it should be noted that in the state where the movable core members 20 are engaged with or fit in the second coil-wound core member 22 on which the first coil-wound core member 21 is mounted, the movable core members 20 can be rotated about the convex portions A, respectively.

[0025] For manufacturing the electromagnet core assembly according to the instant embodiment of the invention, the movable core members 20 are first superposed on the second coil-wound core member 22 so that the concave portions A of the movable core members 20 are engaged with or fit in the convex portions A, respectively, of the second coil-wound core member 22, and then the first coil-wound core member 21 is superposed on the second coil-wound core member 22 such that the convex portion B of the second coil-wound core member 22 is fit in the concave portion B of the first coil-wound core member 21, to thereby form a core subassembly. A plurality of the core subassemblies formed in this way are stacked or laminated with the convex portions A of the movable core members 20 of one core subassembly being fit in the concave portions A, respectively, of the second coil-wound core member 22 of another core subassembly while the convex portion B of the first coil-wound core member 21 of the one core subassembly is fit in the concave portion B of the second coil-wound core member 22 of the other core subassembly. Finally, the convex portions A of the movable core members 20 are fit in the concave portions A, respectively, of the second coil-wound core member 22 while the convex portion B of the first coil-wound core member 21 is fit in the concave portion B of the second coil-wound core member 22, whereby the stack or lamination of the first plural coil-wound members 21 and plural movable core members 20 are clamped together, being sandwiched between the second coil-wound core members 22. Thus, the electromagnet core assembly according to the instant embodiment of the invention is completed.

[0026] As can be understood from the above, the electromagnet core assembly according to the instant embodiment of the invention is manufactured by stacking or laminating alternately the subassemblies of the movable core members 20 and the first coil-wound core member 21 on one hand and the second coil-wound core member 22 on the other hand, whereby the electromagnet core assembly can be implemented in a structure similar to that shown in Fig. 5. In the electromagnet core assembly completed, the individual movable core members 20 each sandwiched between the second coil-wound core members 22 can rotate about the convex portion A and the concave portions A formed in the second coil-wound core member 22. Incidentally, the convex portions A and the concave portions A of the movable core member 20 and the second coil-wound core member 22 constitute first engaging portions, respectively. Similarly, the convex portion B and the concave portion B of the first coil-wound core member 21 and the second coil-wound core member 22 cooperate to constitute a second engaging portion.

[0027] In this conjunction, it should be mentioned that it is not necessarily required to form both the convex portions A and the convex portion B in the one surface of the second coil-wound core member 22. To say in another way, a convex portion A and a concave portion B may be provided on the one surface of the second coil-wound core member 22. Furthermore, it is not always required to provide a paír of convex portions A in the one surface of the second coil-wound core member 22. To say in another way, a convex portion A and a concave portion A may be formed in the one surface of the second coil-wound core member 22 to thereby allow the two movable core members 20 to be undisplaceably but rotatably superposed on the second coil-wound core member 22, being seized by the convex portion A and the concave portions A, respectively. It is however important to ensure that the second coil-wound core members 22 on one hand and the movable core members 20 and the first coil-wound core member 21 on the other hand are stacked or laminated tightly.

[0028] Incidentally, the elevator hoisting machine which the present invention concerns can be implemented similarly to the structure generally shown in Fig. 4, description of which is omitted. Further, the outer appearance of the electromagnet core assembly according to the instant embodiment of the invention is approximately similar to that of the electromagnet core assembly shown in Fig. 5. Of course, the former assumes different outer appearance from the latter upon mounting the coil. Accordingly, the forgoing description has been made only of the features which differ from the conventional electromagnet core assembly.

[0029] As can now be understood from the foregoing, in the electromagnet core assembly according to the illustrated embodiment of the invention, it is possible to wind the coil around the projecting portion 30; 40 while avoiding interference between the movable core mem-

bers 20 and the arm of the coil winding machine because the movable core members 20 can be unfolded or expanded upon winding of the coil around the projecting portion 30; 40 with the coil winding machine. In other words, the coils can directly be wound on the core member by using an automatic coil winding machine.

[0030] Because the coil can directly be wound around the projecting portion 30; 40 with the coil winding machine, two steps of firstly forming the coil by using a coil former and secondly mounting the finished coil around the projecting portion through insertion as required in the conventional method can be reduced to one step of winding directly the coil around the projecting portion 30; 40, which can contribute to enhancing the production efficiency.

[0031] Besides, since the coil former dedicated heretofore for use for the coil winding can be spared the cost otherwise taken for the coil former can be reserved for the other purpose, to an advantage.

INDUSTRIAL APPLICABILITY

[0032] As is apparent from the foregoing, in the electromagnet core assembly according to the present invention, the movable core members are fit respectively between the second laminated coil-wound core members by means of the first engaging portions, respectively, while the first coil-wound core members are respectively fit between the second laminated coil-wound core members by means of the second engaging portions, respectively, allowing thus the movable core members being rotatable about the first engaging portions. By virtue of this structure, the coil can directly be wound around the coil-wound portion of the first and second coil-wound core members with the coil winding machine while avoiding interference between the movable core members and the arm of the coil winding machine because the movable core members can be unfolded or expanded upon winding of the coil around the first and second coil-wound core members because of rotatability of the movable core members. Because the coil can directly be wound around the first and second coil-wound core members with the coil winding machine in this manner, two steps of winding and insertion as required in the conventional method can be reduced to one step of winding directly the coil around the first and second coil-wound core members, which can contribute to enhancing the production efficiency.

Claims

1. An electromagnet core assembly, **characterized in:**

   that movable core members (20) are fit respectively between second laminated coil-wound core members (22) by means of first engaging portions (A, A), respectively,
   first coil-wound core members (21) are respectively fit between said second laminated coil-wound core members (22) by means of second engaging portions (B, B), respectively,
   said movable core members (20) are rotatable about said first engaging portions (A, A), respectively, and
   that a coil is wound around a coil-wound portion (30; 40) of said first and second coil-wound core members (21; 22).

2. An electromagnet core assembly set forth in claim 1, **characterized in:**

   that the movable core members (20) are fit between the second laminated coil-wound core members (22) by means of the first engaging portions (A, A), respectively, and the first coil-wound core members (21) are fit between said second laminated coil-wound core members (22) by means of second engaging portions (B, B), respectively.

3. An electromagnet core assembly set forth in claim 2, **characterized in:**

   that each of said second coil-wound core members (22) is comprised of a base portion (31) and a projecting portion (30) integrally implemented substantially in a T-like shape, and
   that said movable core members (20) are mounted on said base portion (31) at both ends thereof by means of the first engaging portions (A, A), respectively.

4. An electromagnet core assembly set forth in claim 3, **characterized in:**

   that each of said first coil-wound core members (21) is comprised of a base portion (41) and a projecting portion (40) integrally implemented substantially in a T-like shape, and
   that the projecting portion (40) of said first coil-wound core member (21) is formed in a shape which coincides with that of the projecting portion (30) of the second coil-wound core member (22) when said first coil-wound core member (21) and said second coil-wound core member (22) are superposed on each other.

5. A method of manufacturing an electromagnet core assembly, **characterized in:**

   that a core subassembly is formed by fitting convex portions A of a second coil-wound core member (22) in concave portions A of movable core members (20), respectively, while fitting a

convex portion B of said second coil-wound core member (22) into a concave portion B of a first coil-wound core member (21),
a plurality of said core subassemblies are laminated one another by fitting convex portions A of said movable core members (20) in the concave portions A of said second coil-wound core members (22), respectively, while fitting convex portions B of said first coil-wound core members (21) in the concave portions B of said second coil-wound core members (22), respectively, among said plurality of different core subassemblies, and
that a plurality of the first coil-wound core members (21) and a plurality of the movable core members (20) are sandwiched between a plurality of second coil-wound core members (22), respectively, by fitting exposed convex portions A of said movable core members (20) in the concave portions A of the second coil-wound core members (22), respectively, while fitting exposed convex portions B of the first coil-wound core members (21) in the concave portions B of said second coil-wound core members (22), respectively.

6. A brake for a hoisting machine of an elevator system, **characterized in that** the electromagnet core assembly set forth in one of claims 1 to 4 is made use of.

Fig. 1

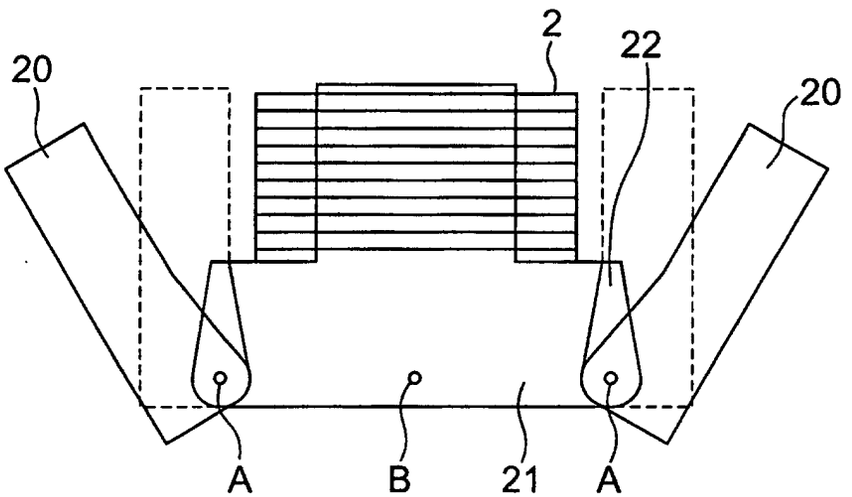
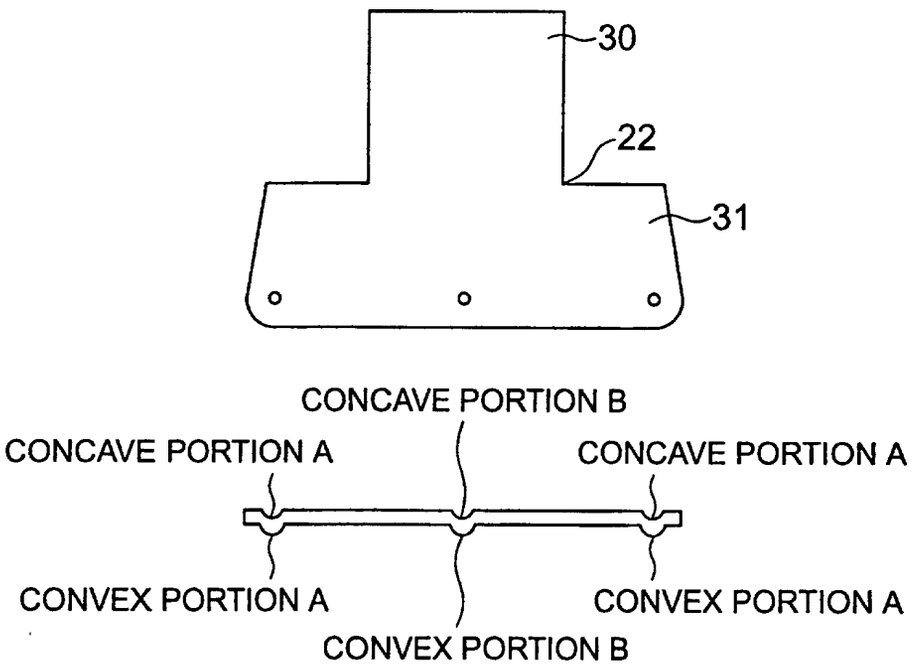


Fig. 2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22
31
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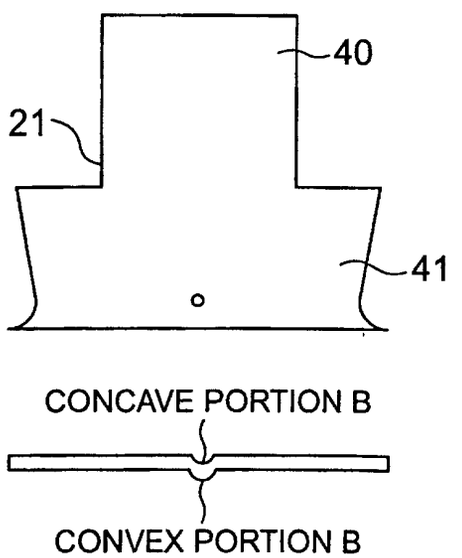
CONCAVE PORTION A
CONVEX PORTION A
CONVEX PORTION A
CONVEX PORTION B

Fig. 3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41
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CONVEX PORTION B

Fig. 4

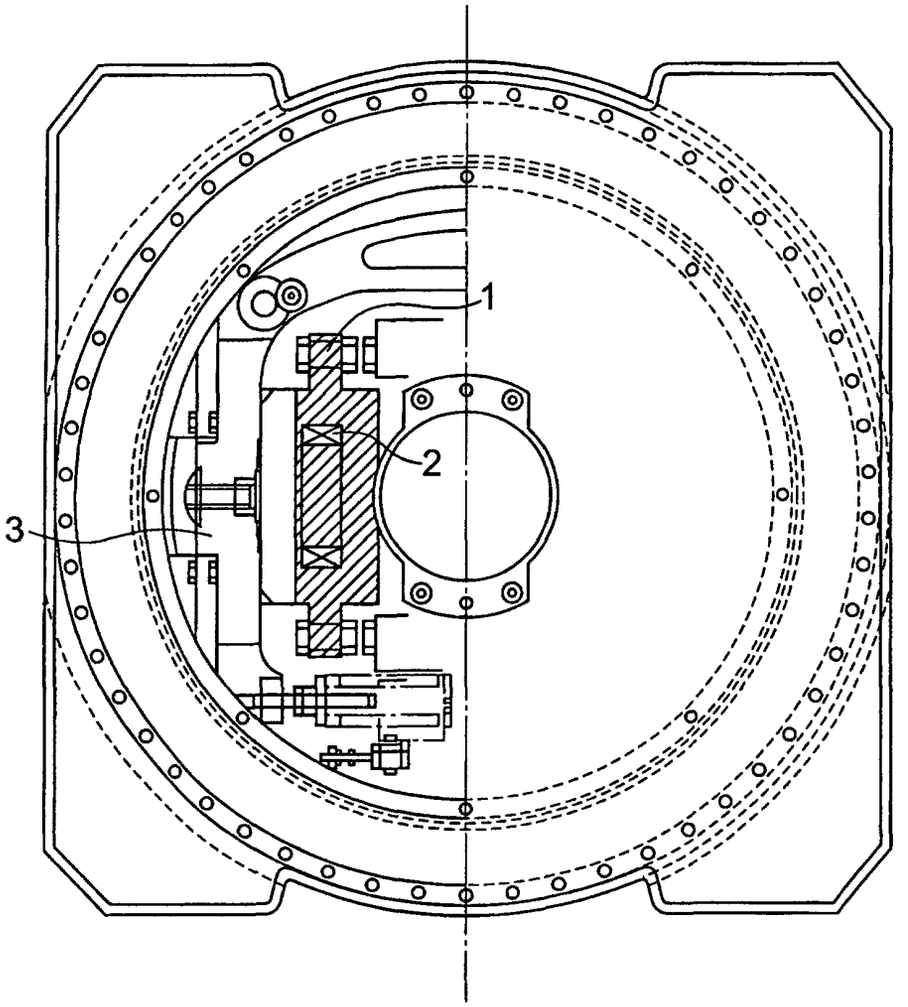
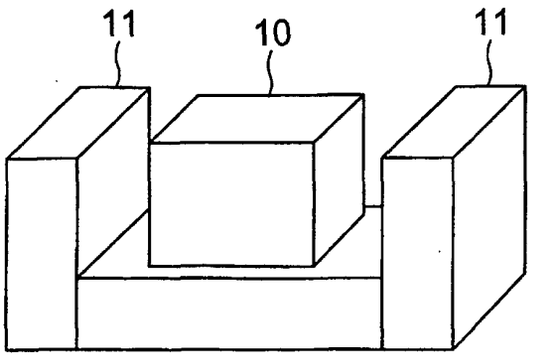


Fig. 5



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP01/02351

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[7] H01F7/20, H01F41/02, 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] H01F7/20, H01F41/02, B66B11/08

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Toroku Jitsuyo Shinan Koho 1994-2001
Kokai Jitsuyo Shinan Koho 1971-2001 Jitsuyo Shinan Toroku Koho 1996-2001

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, 54-152158, A (FIT K.K.), 30 November, 1979 (30.11.79), Full text; Figs. 1 to 4 (Family: none)	1-6
A	JP, 6-251954, A (Matsushita Electric Ind. Co., Ltd.), 09 September, 1994 (09.09.94), Par. No. [0003]; Fig. 5 (Family: none)	1-6
A	JP, 2-106590, A (Mitsubishi Electric Corporation), 18 April, 1990 (18.04.90), Full text; Figs. 1, 2 (Family: none)	6

☐ 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	Date of mailing of the international search report
19 June, 2001 (19.06.01)	03 July, 2001 (03.07.01)
Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer
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