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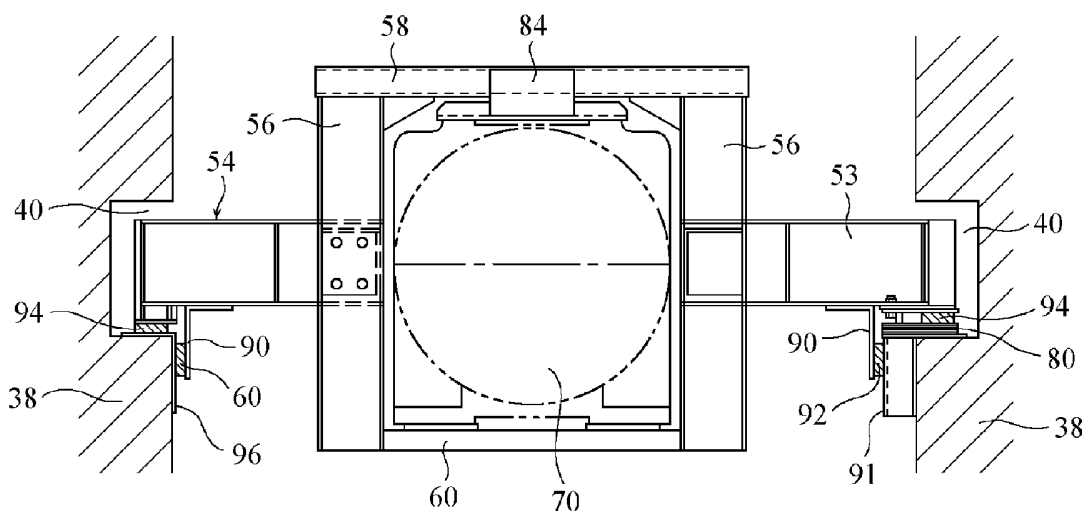
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(54) Title: **MACHINEROOM-LESS ELEVATOR SYSTEM**



(57) Abstract: There is provided a machineroom-less elevator system with a machine support assembly having at least a pair of support members and a holder for holding an elevator machine, which is supported between and by the pair of support members. Each pair of the support members extends across a hoistway and is separated from each other in a longitudinal direction. Outer ends of the pair of support members are fixed to opposite walls defining the hoistway. The holder generally has a rectangular shape. The machine support assembly further has an auxiliary support member extending in parallel with the pair of support members, and a plurality of connecting bodies connecting the pair of support members to the auxiliary support member and connecting the holder to the auxiliary support member.

Description

MACHINEROOM-LESS ELEVATOR SYSTEM

Technical Field

- [1] The present invention generally relates to a machineroom-less elevator system, and more particularly to a machineroom-less elevator system having a machine support assembly by which an elevator machine can be supported in a more stable position with reduced noises and less vibrations, while being minimally influenced by twisting moment.

Background Art

- [2] In Fig. 1, there is shown an elevator machine support assembly of a prior art machineroom-less elevator system. The elevator machine 6 is attached to a U-shape frame formed with members 2a, 4a, 4b, which are fixed to counter-weight guide rails 5a, 5b via members 7a through 7d. Rubber pads 3a, 3b are retained between the members 7c, 7d and a horizontal plate 2b positioned below the members 7c, 7d to absorb vibrations during the operation of the elevator machine. A pair of supports 1a, 1b for supporting the weight of the members 7a through 7d and the elevator machine 6 is fixed to the counter-weight guide rails 5a, 5b.
- [3] In the prior art elevator machine support assembly, however, there may be a possibility for the counter-weight guide rails to be deformed. This is because the counter-weight guide rails have to support the load of the elevator system applied to a sheave of the elevator machine in addition to the weight of the elevator machine.
- [4] In Fig. 2, there is shown an elevator machine support assembly for another prior art machineroom-less elevator system.
- [5] In this prior art, the elevator machine 16 is fixed to a beam 12 through pads 14 arranged under the elevator machine 16. The elevator machine 16 is surrounded by a frame member 20 at its upper, left and right sides. Both ends of the beam 12 are accommodated and fixed on recesses 10 formed at walls defining a hoist way. Another pads 14 are maintained between an upper end of the elevator machine 16 and the frame member 20.
- [6] In the prior art, a center of a sheave of the elevator machine is on a different level than the level of the beam. This may generate at the beam a twisting moment, which is caused by loads of the elevator system including the elevator car, the counter-weight, etc., applied to the sheave, while the level difference acts as the moment arm. For this reason, a vertical fluctuation of the beam or the sheave of the elevator machine often occurs during the movement of the elevator car, which results in a degradation of the ride, an increase in noise and a reduction of stability of the elevator system.

Disclosure of Invention

Technical Problem

- [7] It is an object of the present invention to provide a machineroom-less elevator system having a machine support assembly configured to more efficiently support an elevator machine without the aforesaid shortcomings (i.e., the deformation of the counter-weight guide rails or the generation of the twisting moment).

Technical Solution

- [8] The aforesaid object and other objects can be achieved by providing a machineroom-less elevator system comprising: at least a pair of support members, wherein each pair of the support members extends across a hoistway and is separated from each other in a longitudinal direction; and a holder for holding an elevator machine, wherein the holder is supported by the pair of support members and is positioned between the pair of support members.
- [9] In accordance with one aspect of the present invention, there is provided a machine support assembly for use in a machineroom-less elevator system. The assembly comprises at least a pair of support members, wherein each pair of the support members extends across a hoistway and is separated from each other in a longitudinal direction. The assembly further comprises a holder for holding an elevator machine, wherein the holder is supported by the pair of support members and is positioned between the pair of support members.
- [10] In accordance with another aspect of the present invention, there is provided a machine support assembly for supporting an elevator machine of a machineroom-less elevator system. The assembly is characterized in that a center of a sheave of the elevator machine is on a same level as the machine support assembly.

Brief Description of the Drawings

- [11] The above object and features of the present invention will become more apparent from the following description of the preferred embodiment together with the accompanying drawings, wherein:
- [12] Fig. 1 illustrates a front view of a machine support assembly for use in a prior art machineroom-less elevator system;
- [13] Fig. 2 is a perspective view of a machine support assembly for use in another prior art machineroom-less elevator system;
- [14] Fig. 3 is a partially cut-away perspective view of the machineroom-less elevator system constructed in accordance with the present invention;
- [15] Fig. 4 is an enlarged perspective view of the machine support assembly of the machineroom-less elevator system shown in Fig. 3;
- [16] Fig. 5 is an exploded view of the machine support assembly shown in Fig. 4; and

- [17] Fig. 6 is a front view of the machine support assembly extending across a hoistway of the machineroom-less elevator system of the present invention.

Best Mode for Carrying Out the Invention

- [18] A preferred embodiment of the present invention is now described with reference to the attached drawings.
- [19] In Fig. 3, there is shown a machineroom-less elevator system constructed in accordance with the present invention.
- [20] The machineroom-less elevator system is an elevator system that does not have a conventional machine room for an elevator machine, which is normally provided in an upper space of a hoistway through which an elevator car 22 and a counter-weight 24 travel. In the hoistway, the elevator car 22 is able to vertically travel via a main rope or belt 30 retained around pulleys 11 of the elevator car 22 (which are attached to the elevator car 22 in an underslung manner), a pulley 28 of the counter-weight 24, and a sheave (not shown) of the elevator machine 70. The elevator machine is subjected to high loads of the elevator system via the main rope 30 retained over its sheave.
- [21] In accordance with the present invention, an elevator machine support assembly 50 for supporting such elevator machine 70 is mounted to opposite walls 38 (only one shown), which define the hoistway, near a space above the counter-weight 24.
- [22] In Fig. 4, there is shown an enlarged perspective view of the machine support assembly 50, wherein a sheave of the elevator machine 70 is shown in front of the elevator system.
- [23] The machine support assembly 50 includes a main frame 54 and an auxiliary frame 52 extending in parallel with the main frame 54. Both ends of the two frames 52, 54 are seated on recesses 40 formed at the opposite walls 38, which define the hoistway.
- [24] The inventive machine support assembly 50 includes connecting bodies 64a, through 64d, brackets 62a through 62d, and vibration-absorbing pads 92, 94 (see Fig. 5), in addition to the main frame 54 and the auxiliary frame 52.
- [25] Referring to Fig. 5, there is shown an exploded perspective view of the machine support assembly 50.
- [26] The main frame 54 includes two external beams 53 and a rectangular frame, which is positioned between and supported by the two external beams 53. A pair of vertical members 56 of the rectangular frame is fixed to inner ends of the two external beams 53. The outer ends of the two external beams 53 are seated on the recesses 40 of the hoistway wall 38.
- [27] The rectangular frame includes an upper member 58 and a lower member 60 (in addition to the pair of vertical members 56) and has a size that is sufficient enough to provide a space in which the elevator machine 70 can be accommodated. Two upper

ends of the vertical members 56 are connected together by the upper member 58, whereas two lower ends of the vertical members 56 are connected with each other via the lower member 60. In this manner, the pair of vertical members 56, the upper member 58 and the lower member 60 form the rectangular frame. Such frame has a general rectangular shape, which can surround the elevator machine 70.

[28] The elevator machine 70 is fixed to the rectangular frame at its upper and lower ends and is positioned within an inside space of the rectangular frame. The upper end of the elevator machine 70 is attached to the upper member 58 through a fixing bracket 84 (shown in Fig. 6), while the lower end of the elevator machine 70 is bolted to the lower member 60.

[29] In accordance with the present invention, the vertical position of the rectangular frame with respect to the external beam 53 is determined such that a center of a sheave of the elevator machine 70, which is mounted to the rectangular frame, and a center of the external beam 53 in a vertical direction are on a same level.

[30] Further, additional pairs of external beams may be used to more firmly grasp the rectangular frame in addition to the pair of external beams 53 (shown in Fig. 5), which extend in parallel with the pair of external beams 53 as shown. In such case, additional rectangular frames corresponding to the additional external beam pairs may be employed.

[31] An auxiliary frame 52 is provided, which extends in parallel with the main frame 54. The auxiliary frame 52 is separated from the main frame 54 in a transversal direction. In the preferred embodiment of the present invention, the auxiliary frame 52 is a long one-piece beam. The auxiliary frame 52 has the same specifications as those of the external beam 53, except that it is longer than the external beam 53. Both ends of the auxiliary frame 52 are also seated and fixed on the recesses 40 of the opposite wall 38 defining the hoistway.

[32] A plurality of connecting bodies 64a through 64d are arranged between the auxiliary frame 52 and the main frame 54 in order to connect them together. As shown, the connecting bodies 64a through 64d are spaced from one another so that the sheave of the elevator machine 70 can be positioned in one of such spaces.

[33] In order to provide the external beam 53 with an increased resistance against a twisting moment caused by the loads of the elevator system including the elevator car, the counter-weight, etc., applied on the sheave of the elevator machine 70 (from a configuration in which only the pair of external beams 53 support the rectangular frame positioned between them), a plurality of L-shaped brackets 62a through 62d are employed to connect the rectangular frame with the auxiliary frame 52. In the preferred embodiment, the upper brackets 62a, 62b connect the upper end of the vertical members 56 to the auxiliary frame 52, while the lower brackets 62c, 62d connect the

lower member 60 with the auxiliary frame 52.

[34] Referring to Figs. 5 and 6, pads 94 for absorbing vertical vibrations of the machine support assembly 50 are positioned under both ends of the auxiliary frame 52, the outer ends of the two external beams 53 of the main frame 54 and the connecting bodies 64a, 64d. However, it should be recognized that the pads 94 may be mounted under only the outer ends of the external beams 53.

[35] Further, the pads 92 for absorbing horizontal vibration of the machine support assembly 50 are positioned between mounting structures 90, 91 and between mounting structures 90, 96. The mounting structure 90, 91, 96 have a support surface extending in a downward direction. Although the mounting structures 90 are preferably fixed to the connecting bodies 64a, 64d, they may be joined to the auxiliary frame 52 or the external beams 53. The mounting structures 91, 96 are retained on bottoms of the recesses 40, respectively.

[36] In the preferred embodiment of the present invention, the pads 92, 94 are fabricated from rubber.

[37] Referring to Fig. 6, a plurality of metal plates 80 may be provided under both ends of the auxiliary frame 52, the outer ends of the two external beams 53 and the connecting bodies 64a to 64d in order to adjust the height of the main frame 54 and the auxiliary frame 52.

[38] As shown in Fig. 6, the center of the sheave of the elevator machine 70 is on a same level as that of the external beam 53. This is so that the twisting moment applied on the main frame 54 can be reduced.

Industrial Applicability

[39] In accordance with the present invention, the upper and lower ends of the elevator machine are fixed to the rectangular frame. Further, the elevator machine is positioned inside the rectangular frame. As such, the elevator machine can be better stably supported.

[40] Further, since the two frames, which extend in parallel and are transversely separated from each other, support the elevator machine, a better stable condition for the elevator machine can be guaranteed than the prior art using a single beam.

[41] Moreover, since the center of the sheave of the elevator machine is on the same level as that of the external beam, the beam is subjected to a less twisting moment, which is caused by the loads of the elevator system applied on the sheave of the elevator machine.

[42] Finally, additional connection between the rectangular frame and the auxiliary frame by the L-shaped brackets helps the entire assembly to resist the twisting moment.

- [43] While the present invention has been shown and described with respect to the particular embodiment, it will be apparent to those skilled in the art that many exchanges and modifications may be made without departing from the scope of the invention as defined in the appended claims.

Claims

- [1] A machineroom-less elevator system, comprising:
at least a pair of support members, each of the pair of the support members extending across a hoistway and being separated from each other in a longitudinal direction; and
a holder for holding an elevator machine, the holder being supported by the pair of the support members and being positioned between the pair of the support members.
- [2] The machineroom-less elevator system of Claim 1, wherein outer ends of the pair of the support members are fixed to opposite walls defining the hoistway.
- [3] The machineroom-less elevator system of Claim 1, wherein the holder generally has a rectangular shape.
- [4] The machineroom-less elevator system of Claim 3, wherein the holder comprises:
a pair of vertical members vertically extending and fixed to inner ends of the pair of the support members;
an upper member connecting upper ends of the pair of the vertical members to each other and being fixed with respect to an upper end of the elevator machine; and
a lower member connecting lower ends of the pair of the vertical members to each other and being fixed to a lower end of the elevator machine.
- [5] The machineroom-less elevator system of Claim 1, further comprising:
an auxiliary support member extending in parallel with the pair of the support members, the auxiliary support member being transversely separated from the pair of the support members; and
a plurality of connecting bodies connecting the pair of the support members to the auxiliary support member and connecting the holder to the auxiliary support member.
- [6] The machineroom-less elevator system of Claim 5, wherein ends of the auxiliary support member are fixed to the opposite walls defining the hoistway.
- [7] The machineroom-less elevator system of Claim 5, further comprising:
a pair of upper brackets connecting an upper end of the holder to the auxiliary support member; and
a pair of lower brackets connecting a lower end of the holder to the auxiliary support member.
- [8] The machineroom-less elevator system of Claim 7, wherein the upper brackets and the lower brackets generally have a L-shape.

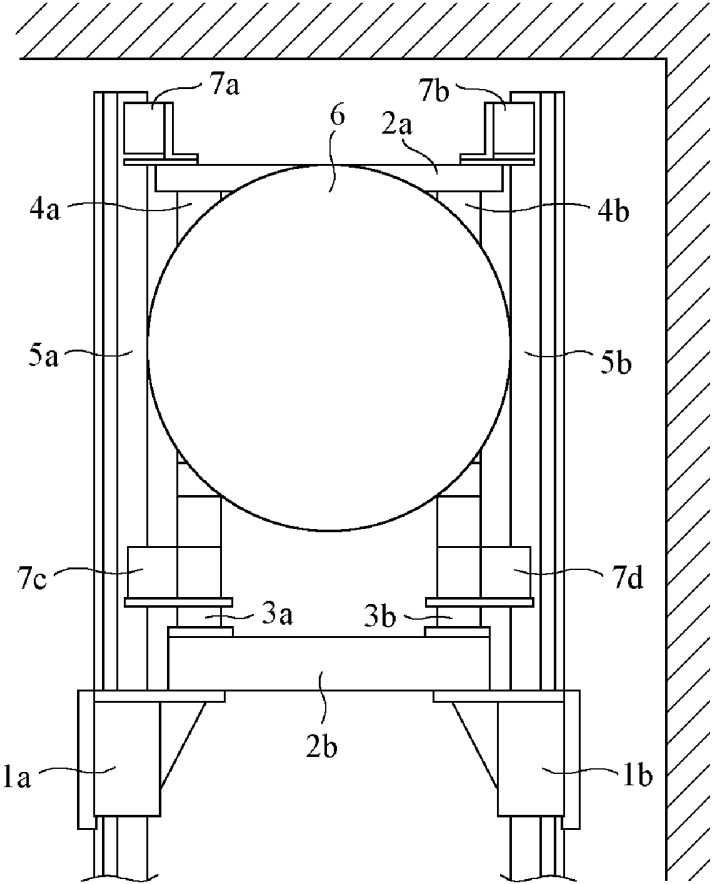
- [9] The machineroom-less elevator system of Claim 2, further comprising:
a plurality of pads for absorbing vertical vibration mounted under the outer ends of the pair of support members.
- [10] The machineroom-less elevator system of Claim 5, further comprising:
a first mounting structures fixed to the connecting bodies, each having a first support surface extending in a downward direction;
a second mounting structures retained on bottoms of the recesses and having a support surface extending in a downward direction; and
pads for absorbing horizontal vibration mounted between the first support surface and the second support surface.
- [11] The machineroom-less elevator system of Claim 9 or 10, wherein the pads are fabricated from rubber.
- [12] The machineroom-less elevator system of Claim 1, wherein a center of a sheave of the elevator machine is on a same level as the support member.
- [13] A machine support assembly for use in a machineroom-less elevator system, the assembly comprising:
at least a pair of support members, each pair of the support members extending across a hoistway and being separated from each other in a longitudinal direction; and
a holder for holding an elevator machine, the holder being supported by the pair of the support members and being positioned between the pair of the support members.
- [14] The assembly of Claim 13, wherein outer ends of the pair of support members are fixed to opposite walls defining the hoistway.
- [15] The assembly of Claim 13, wherein the holder generally has a rectangular shape.
- [16] The assembly of Claim 15, wherein the holder comprises:
a pair of vertical members vertically extending and fixed to inner ends of the pair of the support members;
an upper member connecting upper ends of the pair of the vertical members to each other and being fixed with respect to an upper end of the elevator machine; and
a lower member connecting lower ends of the pair of the vertical members to each other and being fixed to a lower end of the elevator machine.
- [17] The assembly of Claim 13, further comprising:
an auxiliary support member extending in parallel with the pair of the support members and being transversely separated from the pair of the support members; and
a plurality of connecting bodies connecting the pair of the support members to

the auxiliary support member and connecting the holder to the auxiliary support member.

- [18] The assembly of Claim 17, further comprising:
a pair of upper brackets connecting an upper end of the holder to the auxiliary support member; and
a pair of lower brackets connecting a lower end of the holder to the auxiliary support member.
- [19] The assembly of Claim 13, wherein a center of a sheave of the elevator machine is on a same level as the support members.
- [20] A machine support assembly for supporting an elevator machine of a machine room-less elevator system, the assembly characterized in that a center of a sheave of the elevator machine is on a same level as the machine support assembly.

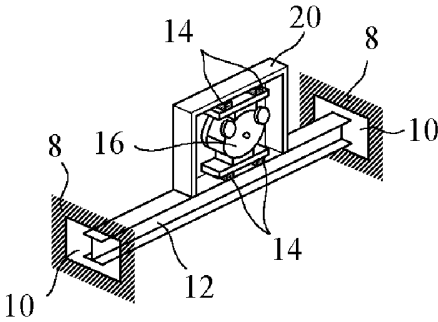
[Fig. 1]

(Prior Art)

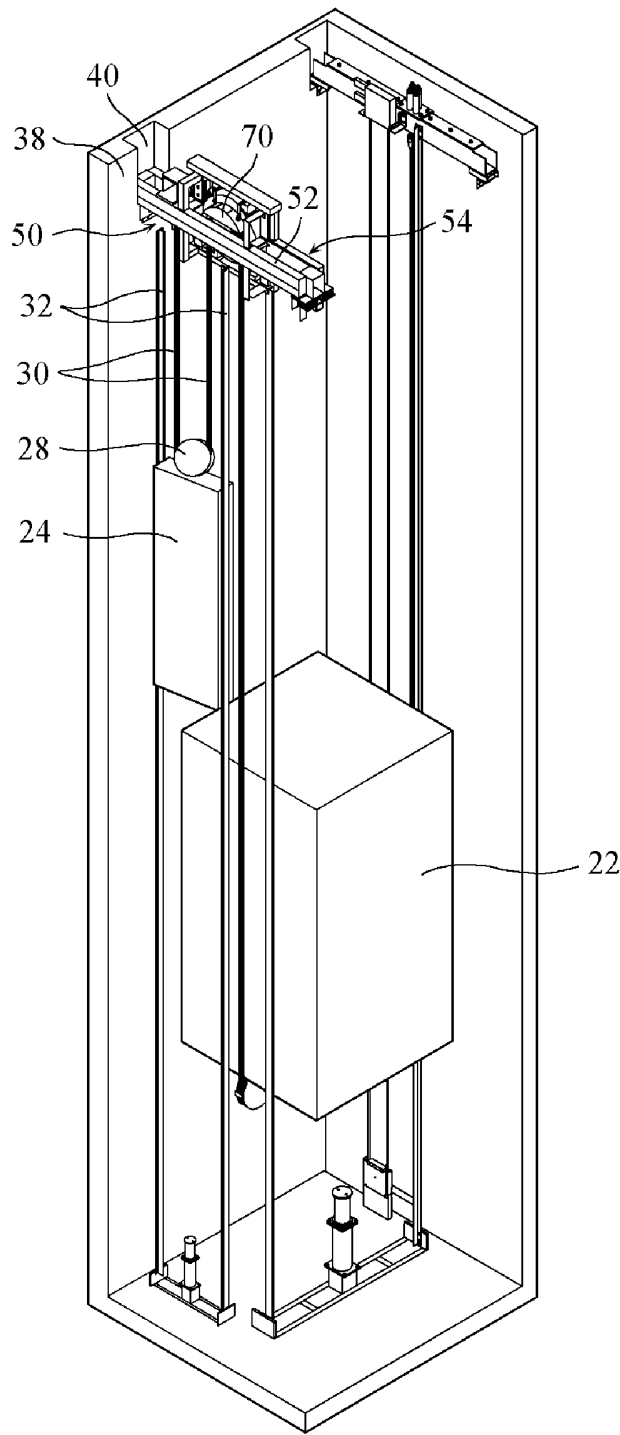


[Fig. 2]

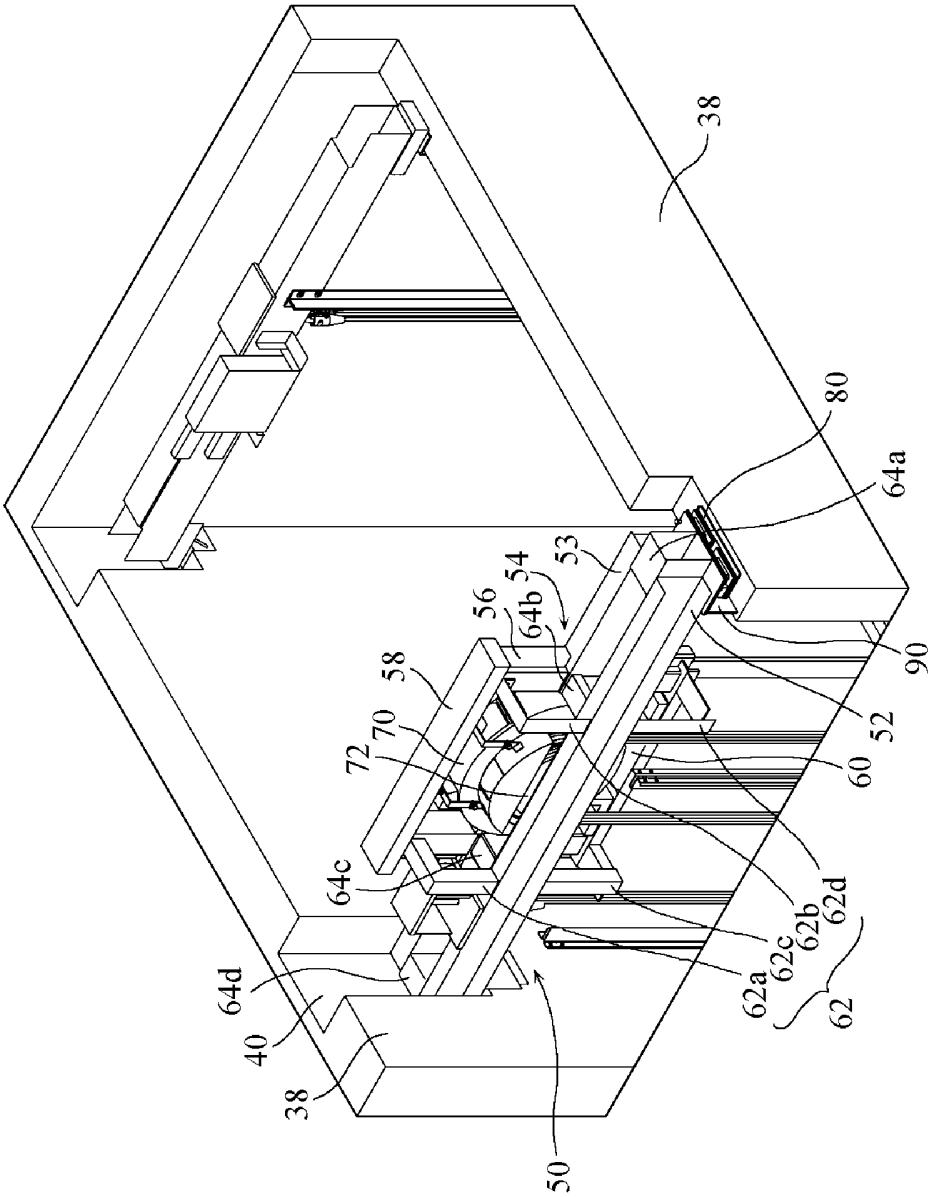
(Prior Art)



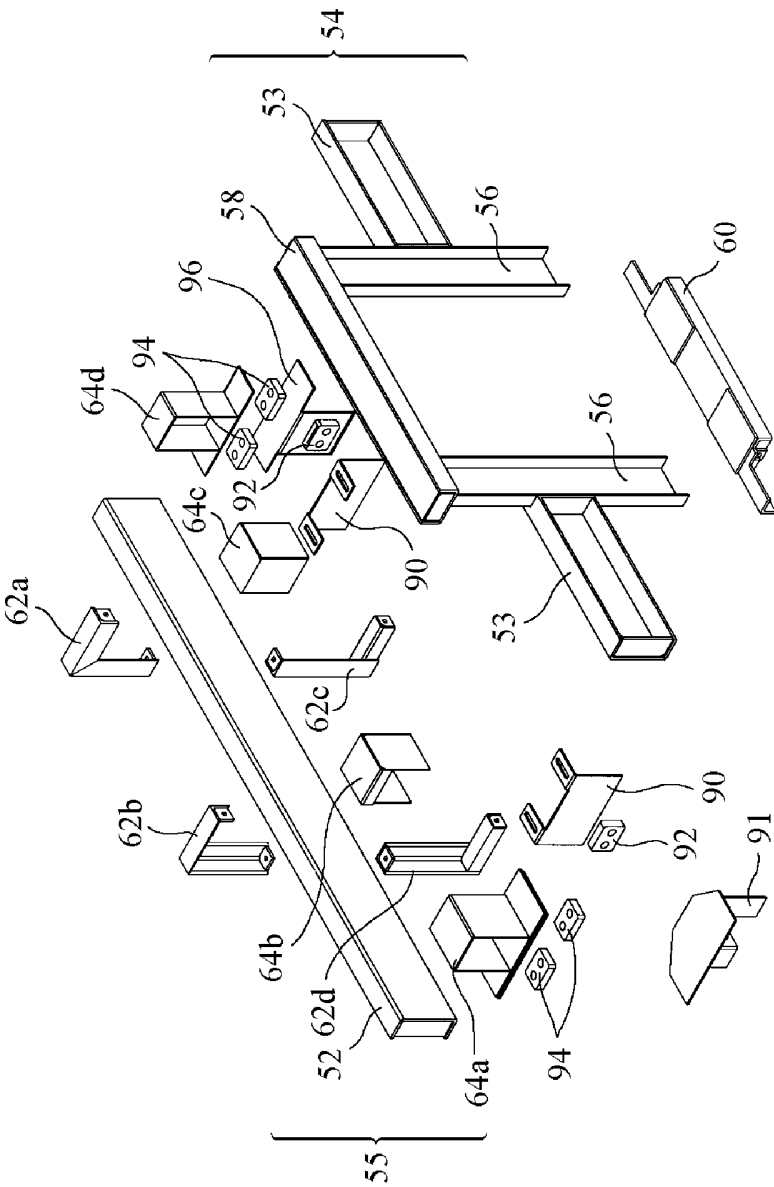
[Fig. 3]



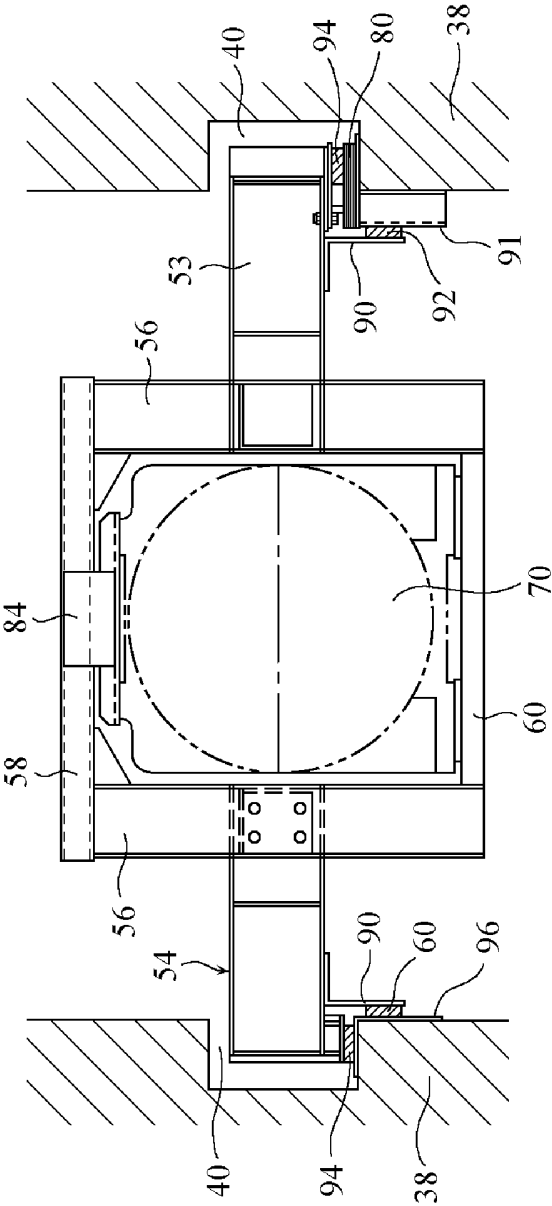
[Fig. 4]



[Fig. 5]



[Fig. 6]



INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2005/001666

A. CLASSIFICATION OF SUBJECT MATTER**IPC7 B66B 11/04**

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)

IPC7 B66B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

KR, JP : IPC as above

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

KIPO NPS system : "frame", "support"

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5,653,311 A (HEIKKINEN et al.) 5 AUGUST 1997 (Abstract, Fig. 6)	1-20
A	US 5,027,925 A (KAHKIPURO) 2 JULY 1991 (abstract, Fig. 1, 5)	1-20
A	US 6,431,325 B1 (BLEDSOE et al.) 13 AUGUST 2002 (abstract, Fig. 5)	1-20

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

* Special categories of cited documents:

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