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(54) **Rotatable building structure**

Drehbares Gebäude

Bâtiment tournant

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Description

[0001] This invention relates to stalic structures and especially to a structure mounted for in situ repositioning.

[0002] In particular, the structure of this invention concerns a building having floor units that are rotatable about a vertical axis.

[0003] The ability of an apartment to command a desirable view is a recognizable factor in determining the saleability and economic value of the apartment. However, most buildings have only a limited number of apartments with highly desirable exposures. A solution to this problem is to provide a changeable environment by in situ repositioning of the building. Typically, repositionable building structures were designed with an outer casing rotatably mounted on a spindle; the structures were used principally for observation towers, amusement devices, and/or restaurants for providing patrons will changeable views and not for apartment, hotel and similar dwellings; examples of such structures are shown in U.S. Patent Nos. 3, 905, 166, 6, 742, 308, and 841, 468.

[0004] A limitation of these structures is that they are not intended primarily for use as multi-story apartment buildings or hotels or for providing selective 360 deg. viewing capability. Another shortcoming is that lack of floor independence decreases load stability. It is also known from documents DE 2318203 and DE 1949254 rotatable building structures containing a vertical central core for supporting suspended floor units surrounding the core. An annular platform extends from the core at corresponding floor units for providing accessibility to and from the central core. The floor units contain a drive mechanism for rotational displacement. Having thus summarized the invention, it will be seen that it is an object thereof to provide a rotatable building structure of the general character described herein which is not subject to any of the aforementioned limitations.

[0005] Another object of this invention is to provide a rotatable building structure suitable for high-rise or low-rise buildings.

[0006] A further object of this invention is to provide a rotatable building structure with independently rotatable suspended floor units that provide improved seismic stability.

[0007] A still further object of this invention is to provide a rotatable building structure wherein the configuration of the floor units can optionally be varied in shape such that the profile of the building will continually change during rotation of the floor units.

[0008] Still another object of this invention is to provide a rotatable building structure including a stationary platform providing an accessway from the floor unit to the central core.

[0009] Yet another object of this invention is to provide a rotatable building structure having single or multiple vertical cores for supporting the floor units.

[0010] Still yet another object of this invention is to provide a rotatable building structure wherein displacement of the floor units are computer-controlled and actuatable on command.

[0011] Yet still a further object of this invention is to provide a rotatable building structure having prefabricated furnished floor units to facilitate erection and onsite installation.

[0012] Yet still another object of this invention is to provide a rotatable building structure with aerodynamically designed floor units that can be repositioned to reduce wind load, as in a hurricane.

[0013] Other objects of this invention will in part be apparent and in part will be pointed out hereinafter.

[0014] Briefly, the nature of this invention involves a building structure having a vertically disposed central core with plural horizontal floor units suspended from and surrounding the core at incremental heights for transferring balanced vertical loading through the core. An annular platform extending horizontally from the core, in correspondence with the floor units, provides a corridor for accessing the central core. The floor units are independently displaceable about the core, for example, by motor-power actuation, wind-power, electromagnetic energy, or other drive force.

[0015] In view of the foregoing, it should be apparent that the present invention overcomes the limitations of the prior art and provides an improved rotatable building structure.

[0016] The invention finds embodiment in certain combinations of elements and arrangements of parts by which the aforementioned objects and certain other objects are hereinafter attained, as more fully described with reference to the accompanying drawings and the scope of which is more particularly pointed out and indicated in the appended claims.

[0017] In the accompanying drawings, in which are shown an exemplary embodiments of the invention:

FIG. 1 is a perspective view illustrating a portion of a multi-story building in accordance with this invention having independently rotatable floor units surrounding a central core;

FIG. 2 is a plan view of the rotatable building structure of this invention showing a central core, a platform projecting from the central core and the floor units;

FIG. 3 is a perspective view of the rotatable building structure of this invention showing a floor unit suspended from the central core;

FIG. 4 is a perspective view of the rotatable building structure of this invention detailing the attachment of the floor unit to a respective upper and a lower rail for supporting the floor unit;

FIG. 5 is a sectional view of the rotatable building structure of this invention taken substantially along lines 5--5 of FIG. 4 showing in detail the central core, the platform, the upper rail, the lower rail, and a motor drive for displacing the floor unit;

FIG. 6 is an elevational view of an alternate embodiment of the rotatable building structure of this inven-

tion showing a floor unit with a wind tool in operational position for providing wind-power assist during rotational displacement of the floor unit around the central core;

FIG. 7 is a schematic illustration of an alternate embodiment of the rotatable building structure of this invention showing a platform with a track for supporting a floor unit; and

FIG. 8 is an elevational view of the rotatable building structure of this invention showing a variable building profile formed by a plurality of floor units mounted along a horizontal plane asymmetrically with respect to the central core.

[0018] With specific reference now to the figures in detail, it is stressed that the particulars shown are by way of example and for the purposes of illustrative discussion of the preferred embodiments of the present invention only and are presented in the cause of providing what is believed to be the most useful and readily understood description of the principles and conceptual aspects of the invention. In this regard, no attempt has been made to show aspects of the invention in more detail than is necessary for a fundamental understanding of the invention, the description taken together with the drawings should make it apparent to those skilled in the art how the several forms of the invention may be embodied in practice.

[0019] Referring now in detail to FIG. 1 of the drawings, there is shown a portion of a multi-level rotatable building structure 10 having an independently rotatable suspended floor unit 12. It should be understood that the structure of this invention encompasses application to high-rise and/or low-rise buildings. The arrows are intended to show that each of several floor units 12 can rotate in opposite circular directions or optionally can rotate in the same circular direction. The floor units can also operate at different speeds.

[0020] Referring next to FIG. 2, there is shown in plan view of a central core 14, preferably cylindrical in shape, and constructed of reinforced concrete, structural steel or equivalent materials. A platform 22 is attached to or formed integrally with the central core 14. The core 14 is designed to support the total live and dead load of the floor units 12. The floor units 12 surround the core 14 and provide for balanced load transfer to the core 14. The floor units 12 can be nonuniform shapes and/or mounted asymmetrically with respect to the central core 14, as for example, is shown in FIG. 8, with a counterweight applied to achieve balanced loading. It should be noted that this later arrangement of floor units 12 will provide a variable building profile during rotation. As will be further noted, the floor units 12 can be connected along a horizontal plane to form floor levels at incremental vertical heights along the central core 14 and are supported in cantilever fashion from the central core 14. In the event of seismic loading, the free ends of the respective floor units 12 may be subjected to movement without resulting in stress fracture, as may be the case if the separate floor levels were interconnected. The mechanical/electrical components such as an elevator shaft 16, an emergency stairway 18; HVAC, water supply systems, trash disposal, electrical power cables, and utilities, such as, telephone, computer, television, jointly designated 20, are housed within the central core 14. It should also be noted that the core 14 has an opening (not shown) to provide a passageway from the platform 22 to the interior of the core 14, for example, for occupants to access the elevator shaft 16.

[0021] As further noted in FIG. 3, in this preferred embodiment, the floor unit 12 is substantially a wedge-shaped, open-frame segment that is preferably fabricated of structural steel, aluminum, a combination of the above, however, other materials may be suitably utilized. A plurality of connected floor units 12 are designed to encircle the core 14 to provide a circular periphery. A roof member 21 and a floor member 23 are secured to the frame segment to form an enclosure. Note that a portion of the floor member 23 as shown in FIG. 3 has been displaced to better illustrate the connection to the core 14. The floor unit 12 also has a peripheral exterior curved boundary wall 24, preferably made of a transparent material, for providing maximum visibility from within the floor unit 12 and an interior boundary wall (not shown) adjacent the platform 22 with an occupant passageway through the interior boundary wall for accessing the platform 22.

[0022] Concerning next the securement of the floor units 20 to the central core 14, there is provided an upper rail 26 and a lower rail 28, as shown in FIGS. 3, 4 and 5, designed for supporting the floor unit 12. With regard to rotational displacement of the floor unit 12, a roller bearing 30 is mounted to a distal end of an arm 27 extending from the roof member 21. The roller bearing 30 is adapted to ride within a raceway 32 defined by the upper rail 26. A safety lock 34, also extending from the arm 27, is positionable below the raceway 32 for securing the roller bearing 30 in the raceway 32. Another raceway 36 is defined in the lower rail 28 and is adapted to accommodating a drive wheel 38. The drive wheel 38 is actuated by an electric motor 40 mechanically linked to the drive wheel 38 by a beveled gear arrangement 42 or by other drive force. The gear ratio can be designed to the operating specifications. The motor drive 40 can also be computer operated by command at selected speeds and directions for displacing the floor unit 12 in either a clockwise or counterclockwise direction. Although the floor unit 12 has been described as defining a circular periphery surrounding the core 14, alternative floor unit configurations e.g. square, ellipsoid, or non-symmetric shapes are within the scope of this invention, and will provide a continually changeable building profile during displacement. It should also be noted that the radial dimension of the floor units 12 can be varied, for example, from floor level to floor level, so as to create a variable building profile. Additionally, the exterior boundary wall 24 can be aero-

dynamically designed and selectively positionable for reducing wind load, especially during hurricanes.

[0023] It is also within the scope of this invention to employ prefabricated floor units 12, with the respective unit containing factory-furnished interiors of an apartment, a hotel room, an office space, such as partition walls, floors, mechanical equipment, HVAC, plumbing connections, electrical connections, and the like.

[0024] In an alternate embodiment, wherein the same reference numerals have been used for designating corresponding parts of the previously described embodiment with the suffix "a", a floor unit 12a is connected to a central core 14a in a manner as described herein (see FIG. 6). In this embodiment, a wind tool 46 is shown deployed for providing a wind-power assist to the previously discussed motor drive. The wind tool 46 is comprised of a planar vane 48 hingedly connected to a spindle 50 mounted to a peripheral wall 24a of the floor unit 12a. The vane 48 can be remotely and/or directly actuated for deployment to an operational mode from a retracted mode housed within the floor unit 12a. A bar 52 provides a rotational limit stop to prevent further rotation of the vane 48 when in the fully deployed position. The wind tool 46 can alternatively be used for electrical power generation, for example, for recharging a backup battery system.

[0025] In a further alternate embodiment as shown in FIG. 7 wherein the same reference numerals have been used for designating corresponding parts of the previously described embodiment with the suffix "b", a floor unit 12b is connected to a central core 14b by a tension cable or steel strut 26b. A slidable anchor bearing 30b is attached at a distal end of the strut 26b. The anchor bearing 30b is contained within a slot 32b. The slot 32b extends on a horizontal plane, around the circumference of the central core 14b. The strut 26b is designed to support the floor unit 12b. A modified platform 22b projects under a portion of the floor unit 26b to provide additional support thereto and further includes a roller bearing 38b mounted in a track (not shown) or equivalent slide means for permitting displacement of the floor unit 26b along the platform 22b.

[0026] It should further be apparent that since the independent floor units 12 at each floor level are each separated, for example, as noted in FIG. 1, any seismic force transmitted through the central core 14 would tend to be absorbed, in contrast to conventionally interconnected floors, and thus less likely to be subject the floor units 12 to stress failure. Also the aerodynamically designed and repositionable boundary wall 24 of the floor units 12 and the opening spacing between respective horizontal levels of floor units 12, substantially reduce the wind load applied as compared to a conventional vertical wall structure. It should thus be seen that there is provided a rotatable building structure which achieves the various objects of this invention and which is well adapted to meet conditions of practical use.

[0027] Since various possible embodiments might be made of the present invention, said invention being defined by the appended claims, or modifications might be made to the exemplary embodiments above set forth, it is to be understood that all materials shown and described in the accompanying drawings are to be interpreted as illustrative and not in a limiting sense.

Claims

1. A rotatable building structure comprising at least one central core **(14),** at least one floor unit **(12)** attachable to said central core **(14),** said floor unit **(12)** being adapted for rotatable displacement about the central core **(14)**, an annular platform **(22)** extending horizontally from the central core **(14),** said platform **(22)** being accessible from the floor unit **(12)** for providing passage to the central core **(14); characterized in that** said central core (14) includes an upper and a lower rail (26, 28), said rails being adapted to suspendedly accommodate the floor unit (12), the floor unit (12) further being displaceable along said rails (26, 28).

2. A rotatable building structure as claimed in claim 1 wherein a plurality of floor units **(12)** define a circular periphery about the central core **(14).**

3. A rotatable building structure as claimed in claim 2 comprising multiple levels of floor units **(12),** each level of floor units being independently displaceable.

4. A rotatable building structure as claimed in claim 1 wherein the annular platform **(22)** provides accessibility to the floor units **(12)** from the central core **(14).**

5. A rotatable building structure as claimed in claim 3 wherein the multiple levels of floor units **(12)** are structurally separated for withstanding seismic loading.

6. A rotatable building structure as claimed in claim 1 wherein the floor units **(12)** define a noncircular periphery about the central core **(14)** for providing a changeable profile during rotational displacement.

7. A rotatable building structure as claimed in claim 1 wherein the floor units **(12)** are rotatably displaceable by a drive-force.

8. A rotatable building structure as claimed in claim 1 wherein the floor units **(12)** include a deployable wind vane **(48)** for providing an auxiliary power source.

9. A rotatable building structure as claimed in claim 1 including multiple vertical cores.

Patentansprüche

1. Drehbare Gebäudestruktur, beinhaltend zumindest einen mittleren Kern (14); zumindest eine Geschosseinheit (12), die mit dem mittleren Kern (14) verbunden werden kann, wobei die Geschosseinheit (12) für die Ausführung einer Drehbewegung um den mittleren Kern (14) ausgelegt ist; eine ringförmige Plattform (22), die sich horizontal vom mittleren Kern (14) aus erstreckt, wobei die Plattform (22) von der Geschosseinheit (12) aus zugänglich ist, um den Durchgang zum mittleren Kern (14) bereitzustellen; **dadurch gekennzeichnet, dass** der mittlere Kern (14) eine obere und eine untere Schiene (26, 28) beinhaltet, wobei diese Schienen für die hängende Aufnahme der Geschosseinheit (12) ausgelegt sind und die Geschosseinheit (12) ferner entlang den Schienen (26, 28) beweglich ist.

2. Drehbare Gebäudestruktur nach Anspruch 1, worin mehrere Geschosseinheiten (12) eine kreisförmige Peripherie um den mittleren Kern (14) herum bilden.

3. Drehbare Gebäudestruktur nach Anspruch 2, mehrere Ebenen von Geschosseinheiten (12) beinhaltend, wobei jede Ebene von Geschosseinheiten unabhängig von den anderen bewegt werden kann.

4. Drehbare Gebäudestruktur nach Anspruch 1, worin die ringförmige Plattform (22) den Zugang zu den Geschosseinheiten (12) vom mittleren Kern (14) aus bereitstellt.

5. Drehbare Gebäudestruktur nach Anspruch 3, worin die mehreren Ebenen von Geschosseinheiten (12) strukturell voneinander getrennt sind, um Erdbebenbeanspruchungen standhalten zu können.

6. Drehbare Gebäudestruktur nach Anspruch 1, worin die Geschosseinheiten (12) eine nichtkreisförmige Peripherie um den mittleren Kern (14) herum bilden, um ein veränderliches Profil während der Drehbewegung bereitzustellen.

7. Drehbare Gebäudestruktur nach Anspruch 1, worin die Geschosseinheiten (12) durch eine Antriebskraft drehbeweglich sind.

8. Drehbare Gebäudestruktur nach Anspruch 1, worin die Geschosseinheiten (12) einen ausschwenkbaren Windflügel (48) beinhalten, um eine zusätzliche Energiequelle bereitzustellen.

9. Drehbare Gebäudestruktur nach Anspruch 1, mehrere vertikale Kerne beinhaltend.

Revendications

1. Une structure de bâtiment tournante comprenant au moins un noyau central (14), au moins une unité d'étage (12) pouvant être associée audit noyau central (14), ladite unité d'étage (12) étant adaptée à un déplacement de rotation autour du noyau central (14), une plateforme annulaire (22) s'étendant horizontalement à partir du noyau central (14), ladite plateforme (22) étant accessible depuis l'unité d'étage (12) pour fournir un passage vers le noyau central (14) ; ladite structure de bâtiment tournante étant **caractérisée en ce que** ledit noyau central (14) comprend un rail supérieur et un rail inférieur (26, 28), lesdits rails étant adaptés pour loger de façon suspendue l'unité d'étage (12), ladite unité d'étage (12) pouvant en outre être déplacée le long desdits rails (26, 28).

2. La structure de bâtiment tournante selon la revendication 1, **caractérisée en ce qu'**une pluralité d'unités d'étage (12) définit une périphérie circulaire autour du noyau central (14).

3. La structure de bâtiment tournante selon la revendication 2, **caractérisée en ce qu'**elle comprend de multiples niveaux d'unités d'étage (12), chaque niveau d'unités d'étage pouvant être déplacé de façon indépendante.

4. La structure de bâtiment tournante selon la revendication 1, **caractérisée en ce que** la plateforme annulaire (22) permet l'accessibilité des unités d'étage (12) au noyau central (14).

5. La structure de bâtiment tournante selon la revendication 3, **caractérisée en ce que** les niveaux multiples d'unités d'étage (12) sont structurellement séparés pour résister à une charge sismique.

6. La structure de bâtiment tournante selon la revendication 1, **caractérisée en ce que** les unités d'étage (12) définissent une périphérie non circulaire autour du noyau central (14) pour permettre un profil variable lors du déplacement de rotation.

7. La structure de bâtiment tournante selon la revendication 1, **caractérisée en ce que** les unités d'étage (12) peuvent être déplacées en rotation par une force d'entraînement.

8. La structure de bâtiment tournante selon la revendication 1, **caractérisée en ce que** les unités d'étage (12) comprennent une pale éolienne (48) pouvant être déployée pour fournir une source d'énergie auxiliaire.

9. La structure de bâtiment tournante selon la revendi-

cation 1, **caractérisée en ce qu'**elle comprend de multiples noyaux verticaux.

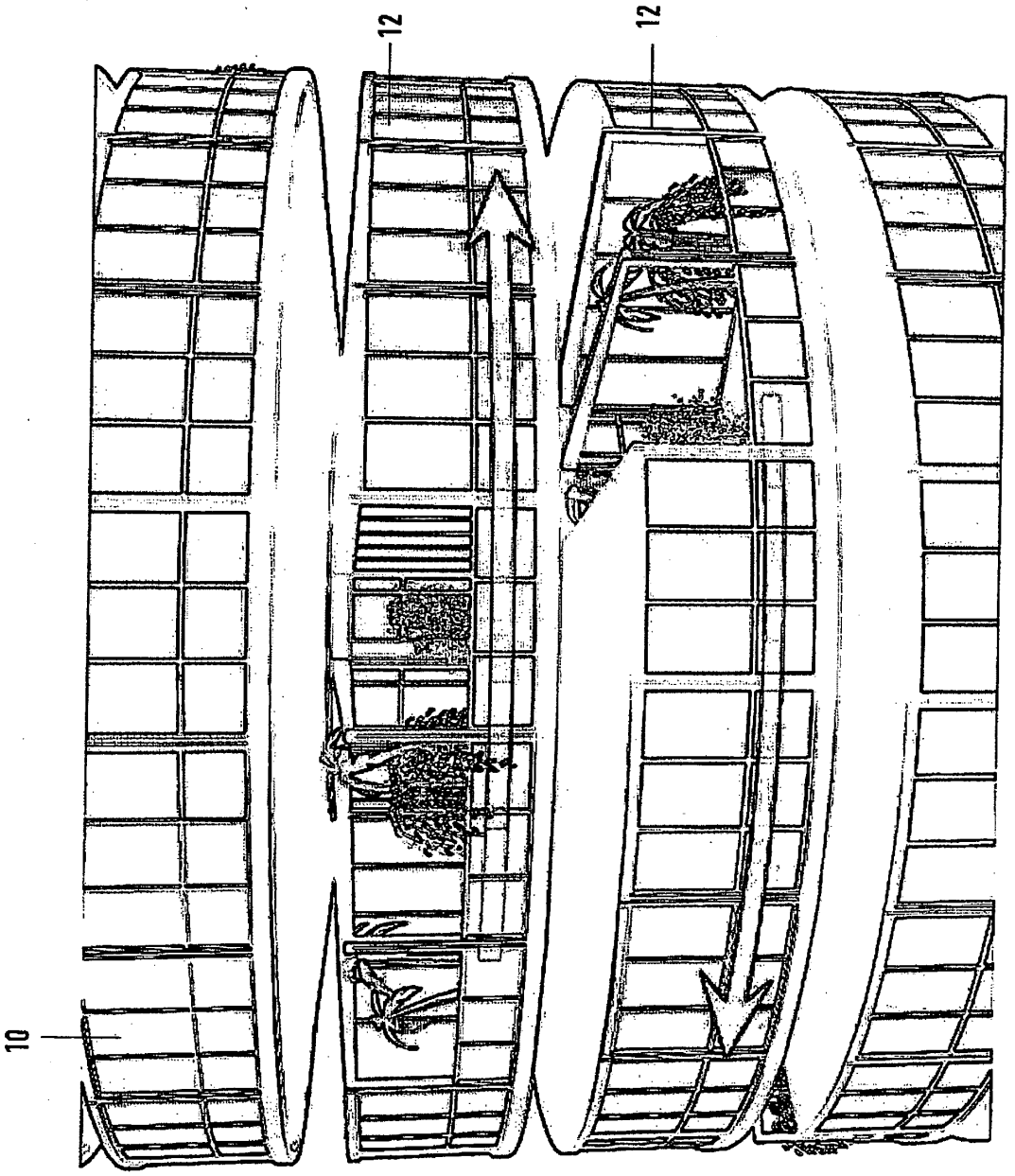


FIG. 1

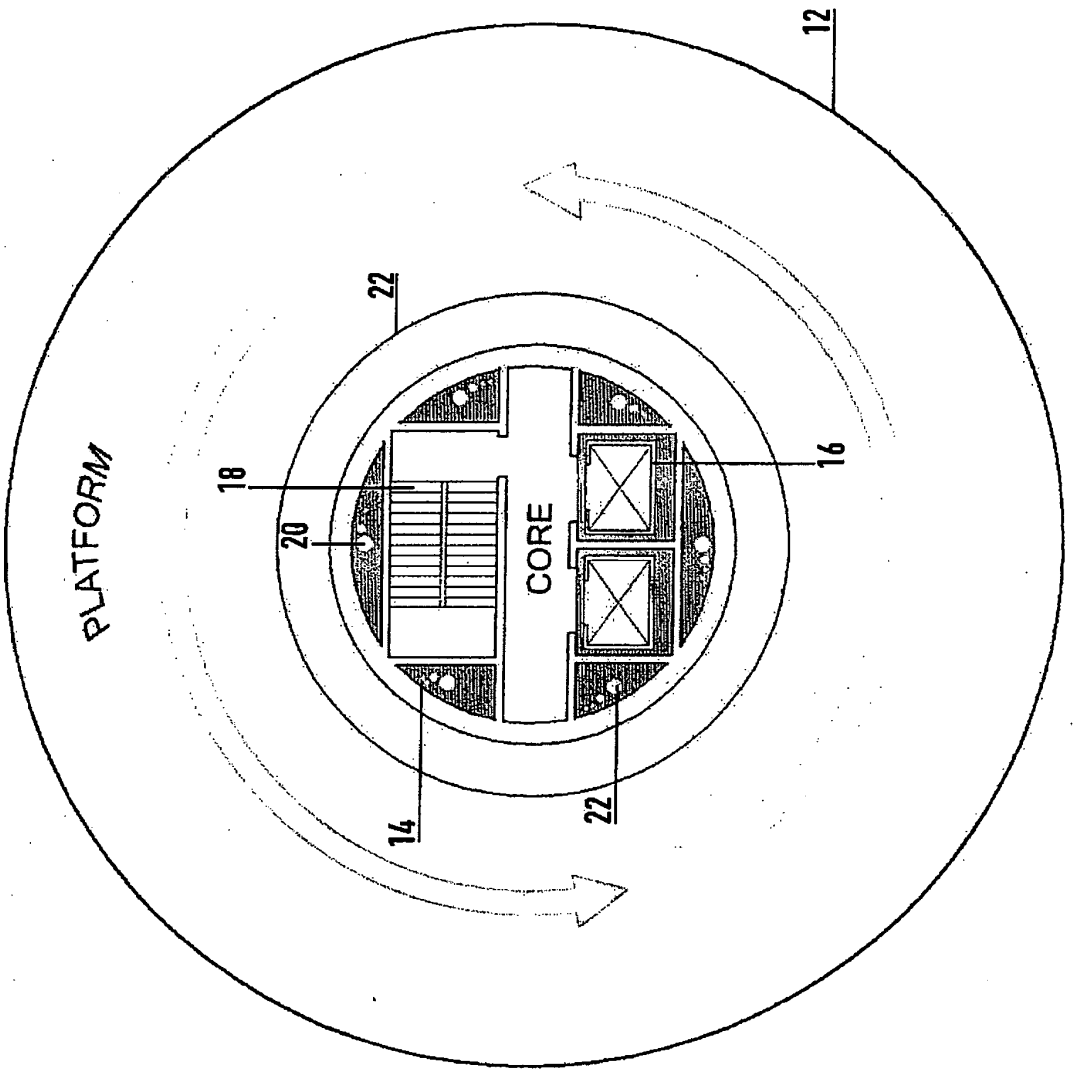


FIG. 2

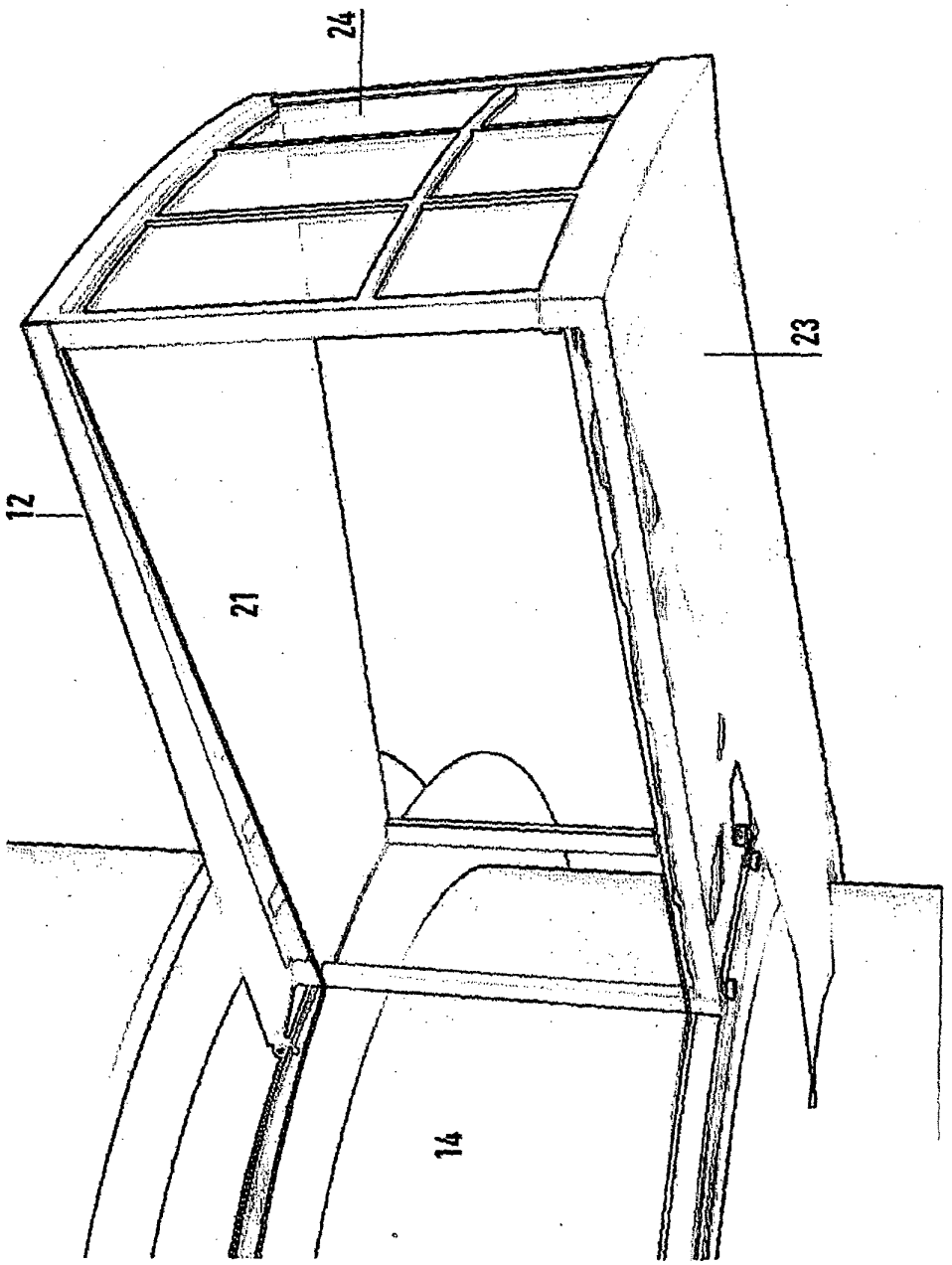


FIG. 3

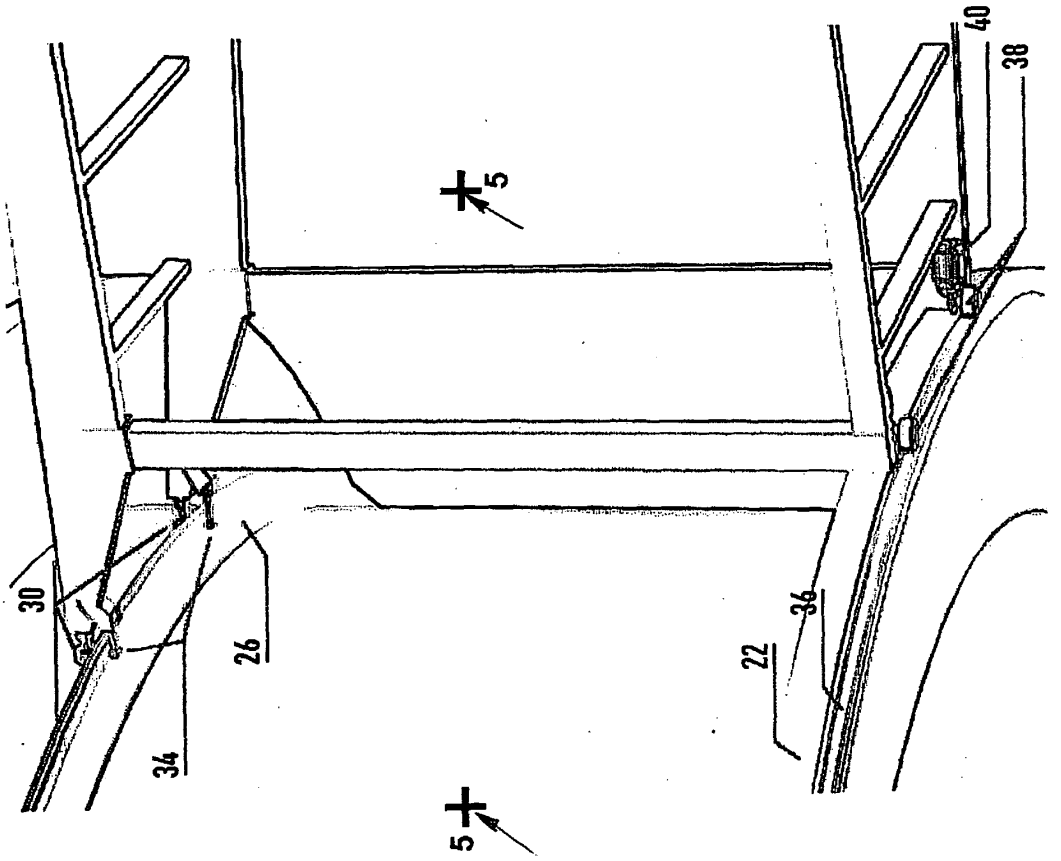


FIG. 4

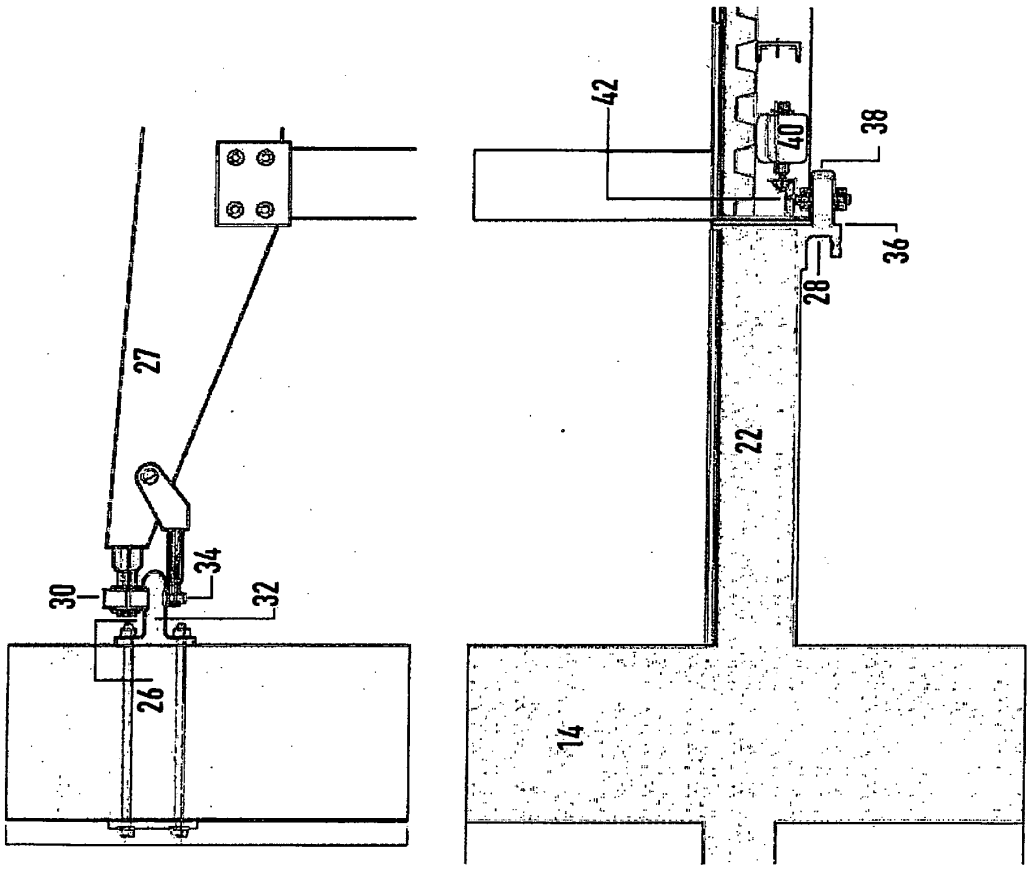


FIG. 5

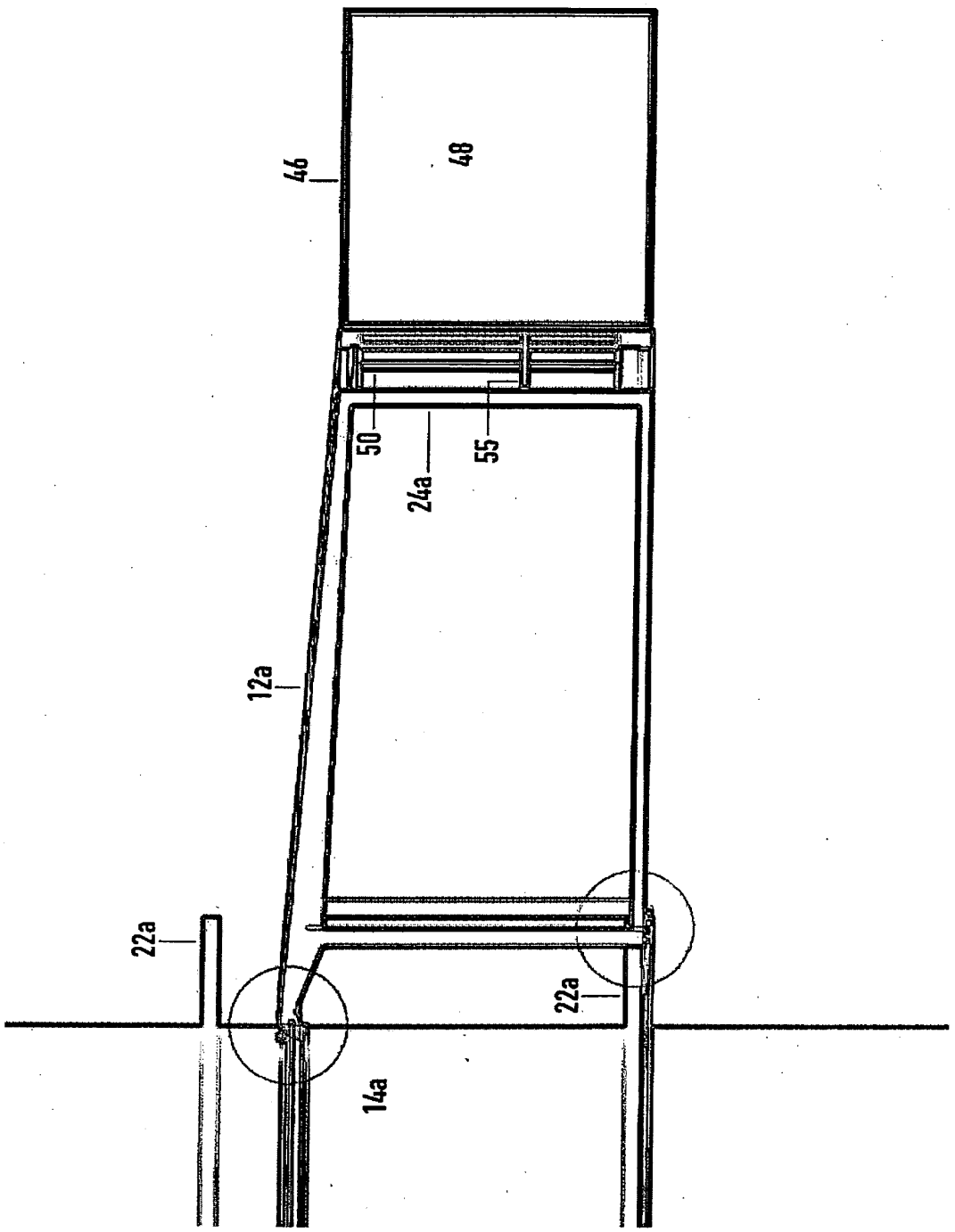


FIG. 6

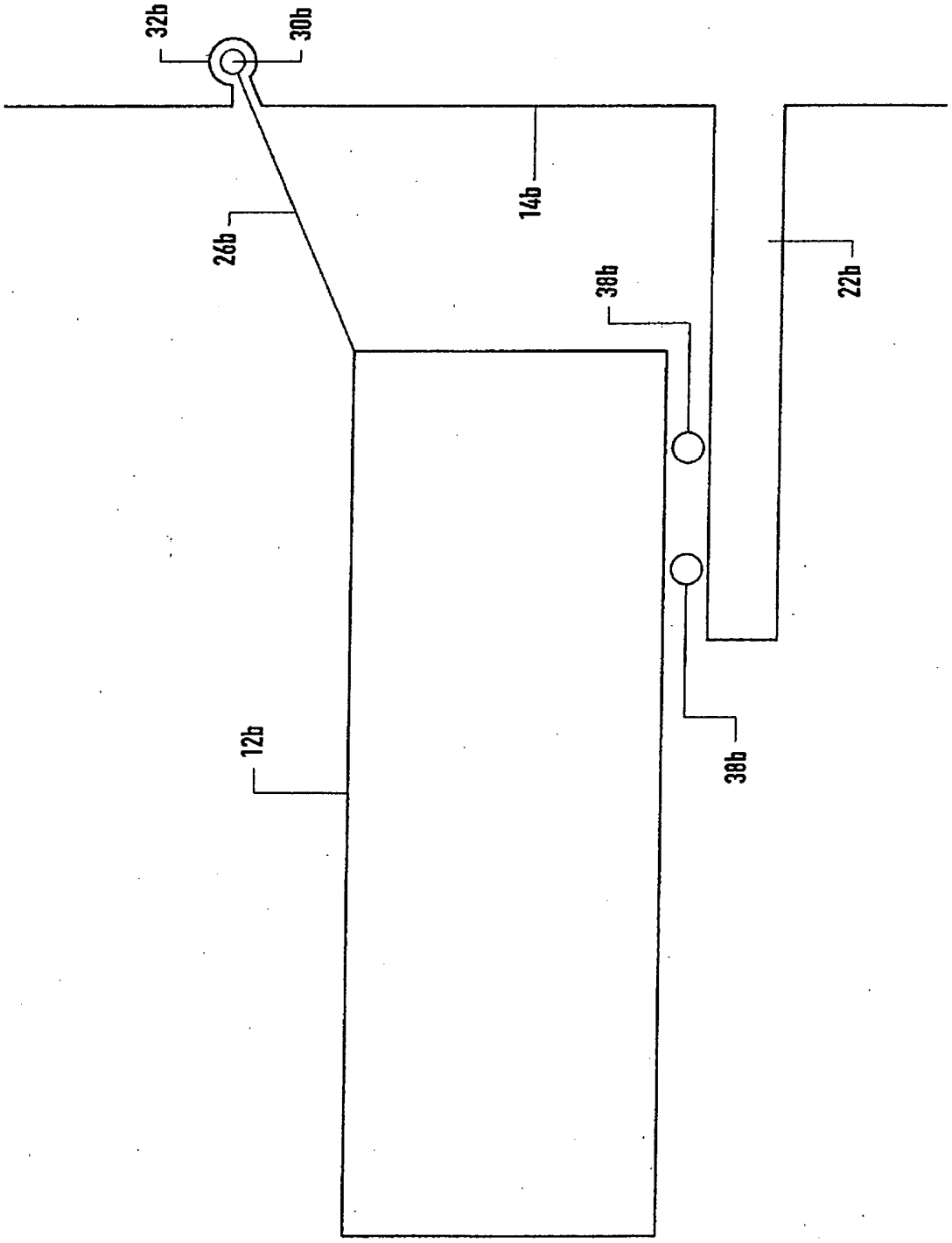


FIG. 7

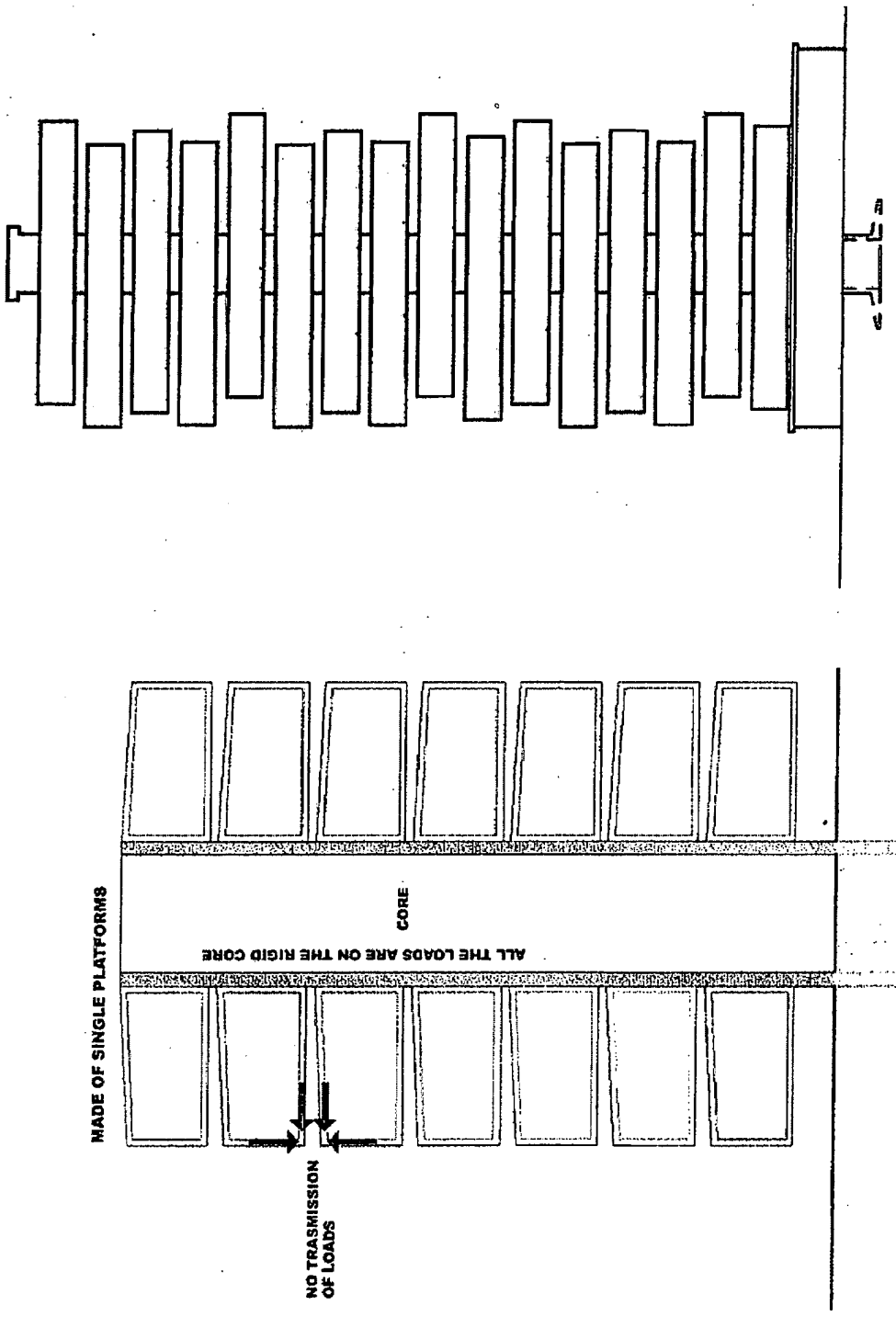

MADE OF SINGLE PLATFORMS
CORE
ALL THE LOADS ARE ON THE RIGID CORE
NO TRASMISSION OF LOADS

FIG. 8

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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- DE 2318203 **[0004]**
- DE 1949254 **[0004]**