

ROTATABLE BUILDING STRUCTURE

Cross-Reference to Disclosure Document

A disclosure document entitled Building with Independently Rotatable Suspended Floor Structure (Turning Tower) filed December 2, 2004 as Disclosure Document No. 565968 is referred to herein and incorporated by reference.

Context of the Invention

Field of the invention

This invention relates to static structures and especially to a structure mounted for *in situ* repositioning.

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

Background information

The ability of an apartment to command a desirable view is a recognizable factor in determining the salability 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 with 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.

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° viewing capability. Another shortcoming is that lack of floor independence decreases load stability.

Brief Summary of the Invention

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, hydraulic power, electro-magnetic energy, or other drive force.

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.

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.

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

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

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.

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.

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

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.

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.

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.

Yet still another object of this invention is to provide a rotatable building structure that generate energy through the wind pressure on each single floor that act as a “wind mill” by transforming the wind load in electrical power,

Yet still another object of this invention is to provide a rotatable building structure that generate energy through the wind pressure on horizontal wind mill structure that is separate from the floors themselves and rotate according to the wind pressure transforming the wind load in electrical power,

Yet still another object of this invention is to provide a rotatable building structure that generate energy through solar panels situated on top of each floor as this type of building has a number of roofs, equal to the number of floors, where solar panels can be installed, generating electrical power,

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

With these ends in view, 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.

Brief Description of the Drawings

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

FIG. 1 is a perspective new 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 invention 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.

FIG 9 is a schematic illustration showing that the single floors, being separate one from the other, are particularly resistant for seismic events as the horizontal and vertical forces do not cross one the other but are circulating in “continuous” direction.

The floors therefore do not transmit the forces from one to the other floor and even the main structure vibrate, the floors will maintain their solidity and resist to high seismic event.

FIG 10 and FIG 10A are schematic illustrations showing the wind load on the building that by forcing resistance to the natural movement create by the wind load (through stopping or slowing the movement) create energy to be transformed to electrical energy.

FIG 11 and FIG 11A are schematic illustrations showing that the single floors, being distanced one from the other, will allow to have an horizontal “wind mill” between each floor, of independent movement and separate from the floors themselves, that will turn round due to the wind load and according to the wind velocity, creating electric power to be used as part of the building consumption.

The system is made of wind catching wings (1) connected to a wheel (2) rotating around the central structure of the building (3). The wind move the wings in the direction of the wind (4) impressing a rotational movement (5) to the wheel that can be converted in electricity. A rotating shield (6) is mechanically aligned to the wind through a computerised sensor in order to avoid the wind force to act on the wings when they are turning back against the wind direction.

FIG 12 is a schematic illustration showing that this type of building has many roofs, as the number of the floors, and each roof is covered with solar panels for the production of energy.

FIG 13 is a schematic illustration showing the plumbing system solution as the vertical piping system inside the core is rigid while the plumbing system of the single

floors are rotating around. To allow such connection between the a fixed pipe and the rotating pipe there is one connection in each floor where the rotating pipe is inserted inside the fixed pipe in a way that one is fixed while the other one in partly inserted in the other one rotating around, allowing the water flow for clear water, for waist water or for air conditioning cold water to flow continuously.

FIG 14 is a schematic illustration showing the electrical connection between a rigid electric wire and a rotating wire, similar to any electric transmission in movement.

FIG 15 is a schematic illustration showing the installation process of the single prefabricated units that are lifted up along the core and then mechanically installed creating a finished floor in very short time and limited number of unskilled workers.

FIG 16 is a self-generating power source includes multiple wind turbines horizontally mounted to a vertical building core (3) and positioned between incrementally spaced floor units (FIG 3) attached to the core.

The turbines are provided with blades that intercept wind forces for producing rotational displacement. The kinetic energy of the rotating blades can, for example, be transmitted to a rotor of an electrical generator and converted to electrical power.

Alternatively, the kinetic energy can be converted to mechanical, hydraulic, thermal, or similar forms of power.

Detailed Description of the Invention

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.

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.

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.

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.

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.

The Movement of the floor can however be hydraulic or of magnetic force.

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

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.

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.

It is also within the scope of this invention to use the wind load on the exterior side of each single floor as power that will create energy to be used for the electric consumption of the building itself.

The rotation of each single floor will be determined by the tenant or the building management and will be achieved through the building electric power system, however when the wind blow and tend to rotate each single floor in the building, the monitored rotation of the floor (stopping or slowing down such wind force) creates resistance to the natural force of the wind load and therefore create energy that will be transformed to electrical energy to be used as part of the building consumption.

In addition, as shown in FIG 10 the single floors, distance one from the other, will allow to have an horizontal “wind mill” between each floor, of independent movement and separate from the floors themselves, This “wind mills” will turn round due to the

wind load and according to the wind velocity, creating electric power to be used as part of the building consumption.

In addition, as shown in FIG 11 this type of building has many roofs, equal to the number of the floors, and each roof will be covered with solar panels for the production of energy.

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.

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.

Since various possible embodiments might be made of the present invention 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.

What is Claimed:-

1. A rotatable building structure comprising at least one central core, at least one floor unit attachable to said central core, said floor unit being adapted for rotatable displacement about the central core, an annular platform extending horizontally from the central core, said platform being accessible from the floor unit for providing passage to the central core.
2. A rotatable building structure as claimed in claim 1 wherein a plurality of floor units define a circular periphery about the central core.
3. A rotatable building structure as claimed in claim 2 comprising multiple levels of floor units, each level of floor units being independently displaceable.
4. A rotatable building structure as claimed in claim 1 wherein the annular platform provides accessibility to the floor units from the central core.
5. A rotatable building structure as claimed in claim 3 wherein the multiple levels of floor units are structurally separated for withstanding seismic loading.
6. A rotatable building structure as claimed in claim 1 wherein the central core includes an upper and a lower rail, said rails being adapted to suspendedly accommodate the floor unit, the floor unit further being displaceable along said rails.
7. A rotatable building structure as claimed in claim 1 wherein the floor units define a noncircular periphery about the central core for providing a changeable profile during rotational displacement.
8. A rotatable building structure as claimed in claim 1 wherein the floor units are rotatably displaceable by a drive-force.

9. A rotatable building structure as claimed in claim 1 wherein the floor units include a deployable wind vane for providing an auxiliary power source.

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

11. A rotatable building structure comprising at least one vertical core, a plurality of floor units suspended from and surrounding the vertical core, said floor units being positionable at vertical increments along the core corresponding to floor levels, an annular platform fixedly connected to the vertical core, said platform corresponding to the respective floor units and being accessible from the floor units, said core further having a passageway from the platform to the interior of the core.

12. A rotatable building structure as claimed in claim 11 wherein the interior of the core contains at least one of an elevator shaft and a stairway.

13. A rotatable building structure as claimed in claim 12 wherein the floor units are suspended from at least one rail member mounted to the core and includes a roller bearing for cooperative interaction with the rail member for rotational displacement of the floor unit.

14. A rotatable building structure as claimed in claim 13 wherein the floor unit includes a drive mechanism for displacing the floor unit with respect to the core.

15. A rotatable building structure as claimed in claim 11 further including a wind tool deployable from the floor unit for providing a wind generated force.

16. A rotatable building structure as claimed in claim 11 wherein the platform extends below and partially supports the floor units.

17. A rotatable building structure as claimed in claim 16 wherein the interface between the platform and the floor unit includes slide means for permitting displacement of the floor unit along the platform.

18. A rotatable building structure as claimed in claim 11 wherein the floor units are connected along a horizontal plane with respect to the central core at selected heights along the central core.

19. A rotatable building structure as claimed in claim 11 wherein the floor units are mounted asymmetrically along a horizontal plane with respect to the central core.

20. A rotatable building structure as claimed in claim 11 wherein the floor units define a peripheral boundary wall, said wall being aerodynamically designed and selectively repositionable for reducing the effect of wind loads.

21. A rotatable building structure as claimed in claim 1 wherein at least one floor unit is provided with solar panels.

22. A rotatable building structure as claimed in claim 1 wherein a wind-power generator is mounted to the central core.

23. A rotatable building structure as claimed in claim 22 wherein the wind-power generator is rotationally mounted between at least two of the floor units.

24. A rotatable building structure as claimed in claim 22 wherein the wind-power generator is mounted between each of the floor units.

25. A rotatable building structure as claimed in claim 22 wherein the wind-power generator includes arcuate shovel blades for intercepting the wind to generate a unidirectional rotational force.

26. A rotatable building structure as claimed in claim 21 wherein each floor unit is provided with solar panels.

27. The wind load on the building that by forcing resistance to the natural movement create by the wind load (through stopping or slowing the movement) create energy to be transformed to electrical energy.

28. The single floors, being distanced one from the other, will allow to have an horizontal “wind mill” between each floor, of independent movement and separate from the floors themselves, that will turn round due to the wind load and according to the wind velocity, creating electric power to be used as part of the building consumption.

29. This type of building has many roofs, as the number of the floors, and each roof is covered with solar panels for the production of energy.

30. The plumbing system solution as the vertical piping system inside the core is rigid while the plumbing system of the single floors are rotating around. To allow such connection between the a fixed pipe and the rotating pipe there is one connection in each floor where the rotating pipe is inserted inside the fixed pipe in a way that one is fixed while the other one is partly inserted in the other one rotating around, allowing the water flow for clear water, for waste water or for air conditioning cold water to flow continuously.

31. The electrical connection between a rigid electric wire and a rotating wire, similar to any electric transmission in movement.

32. The installation process of the single prefabricated units, made of steel, aluminum, carbon or any other light material are lifted up along the core and then

mechanically installed one to the other and fixed to the core, creating a finished floor in very short time using limited number of unskilled workers.