Claims

1. A building structure (1) comprising:

– a stationary core (2) extending upright through and supporting the weight of one or more rotable stories (3) of the building structure (1), each story (3) comprising one or more floor units (4),

– said story (3) forming an outer peripheral portion (5) which defines an outer surface (6) of the story (3), and an inner support portion (7) through which the story (3) is supported by the core (2) via an interface (8) along the an external perimeter of the core (2),

wherein the a horizontal cross-section of the core (2) has a substantially circular said external perimeter at the level of the interface (8), the interface (8) and the inner support portion (7) of the story (3) hence being both of substantially annular shape,

wherein said story (3) is stiffened by a space frame (9) extending from the inner support portion (7) to the outer peripheral portion (5) and making the story (3) a self-supporting rigid body cantilevered off the core (2) and structurally independent of all other stories (3),

wherein the story (3) transmits gravity-induced loads to the core (2) via the interface (8) only by means of vertical forces.

2. A building structure (1) according to claim 1, wherein:

– the space frame (9) comprises a truss-likeshaped, lightweight rigid structure constructed from interlocking struts (15) in a geometric pattern,

– the space frame (9) has an upper and a lower membrane (10, 11), each membrane (10, 11) having a number of substantially radial ribs (12) and substantially circumferential ribs (13) intersecting each other in nodes (14) of said space frame (9),

– all the nodes (14), from which the struts (15) extend, are placed at the intersection of one of said substantially radial ribs (12) and one of said substantially circumferential ribs (13), and

– horizontal gravity-induced loads are self-balanced within the ribs (12, 13) and in the membranes (10, 11).

3. A building structure (1) according to claim 1, wherein said floor unit (4) within said story (3) has an interior ceiling (16) and an interior pavement (17) whose vertical distance varies throughout the floor unit (4).

4. A building structure (1) according to claim 1, wherein a separation device (18) located between two of the stories (3) separates the an external environment (19) of the building structure, which is in contact with all atmospheric elements, from the an internal environment (20) of the building structure, which is in contact with the space frame (9) and the interface (8).

52. A The building structure (1) according to claim 41, wherein the separation device (18) comprises a brush (22) extending substantially circumferentially around a vertical axis (21) of the a respective section of the supporting core (2).

63. A The building structure (1) according to claim 4 or 51, wherein the separation device (18) comprises a liquid seal (23) extending substantially circumferentially around a vertical axis (21) of the respective section of the supporting core (2), and comprising a trough (24) containing a liquid, and a separation lip or wall or sheet (25) projecting into the trough (24) and being immersed in said liquid, wherein the trough (24) is fixed to one story (3) or to the core (2), and the separation lip or wall or sheet (25) is fixed to a vertically neighboring story (3), or vice versa.

4. The building structure (1) according to claim 1, comprising a plurality of lifting jacks (43) for temporary vertical displacement of an entirety of the story (3), or only part of the story (3), with respect to the core (2), from a predetermined operating position to a maintenance position, which allows at least one of (i) access to and maintenance or (ii) replacement of items present in the internal environment (20).

75. A The building structure (1) according to claims 4 to 61, wherein horizontal surfaces of the separation device (18) are covered with damping layers made of shock absorbing material forming a damper during extreme events such as earthquakes.

6. The building structure (1) according to claim 5, wherein the extreme events are earthquakes.

8. A building structure (1) according to claim 1 or 2, wherein at the story (3) the core (2) forms a continuous circumferentially extending, upward facing, primary support surface (27) formed either by a radially outward protruding primary support corbel (28) or by a radially inward extending support channel, wherein the primary support surface (27) supports the interface (8) and transfers substantially the entire loads from the story (3) to the core (2).

9. A building structure (1) according to claim 1 or 2, wherein at the story (3) the core (2) forms a discontinuous, circumferentially extending, upward facing, primary support

surface (27) formed by a plurality of radially outward protruding primary support corbels (28) with free access spaces therebetween, wherein the primary support surface (27) supports the interface (8) and transfers substantially the entire loads from the story (3) to the core (2).

10. A building structure (1) according to claim 8 or 9, wherein a fixed part of the interface (8) is releasably anchored to the primary support surface (27).

11. A building structure (1) according to claim 8 or 9, wherein at the story (3) the core (2) forms an upward facing auxiliary support surface (29) formed either by one or more radially outward protruding auxiliary support corbels (30) or by a radially inward extending circumferential auxiliary channel or sequence of cavities.

12. A The building structure (1) according to any preceding claim 1, wherein the interface (8) between the inner substantially annular support portion (7) of the story (3) and the core (2) comprises a device enabling a rotatable coupling of said inner annular support portion (7) of the story (3) to said stationary core (2), thus enabling the story (3) to rotate about the stationary core (2), independently of any of the other stories (3), in a substantially horizontal story (3) rotation plane (35).

13. A The building structure (1) according to claim 12, wherein the interface (8) between the inner support portion (7) of the story (3) and the core (2) comprises rolling track means (32) having an annular rolling track (33) extending substantially circumferentially around the stationary core (2) and fixed to one of the stationary core (2) and the inner support portion (7) of the story (3), and a plurality of rolling elements or wheels (34) held by the other one of said stationary core (2) and the inner support portion (7) of the story (3), and rollably engaging the annular rolling track (33).

14. A building structure (1) according to claim 13, wherein the rolling track means (32) comprise a single annular slewing bearing having a fixed bearing ring (36) extending substantially circumferentially around the stationary core (2) and fixed to the stationary core (2), and a rotatable bearing ring (37) fixed to the inner support portion (7) of the story (3) and rotatably coupled to the fixed bearing ring (36) by means of the interposition of a plurality of rolling elements (34), thus enabling the rotation of the story (3) about the stationary core (2).

~~15~~9. ~~A~~ The building structure (1) according to claim ~~13~~8, wherein the rolling track means (32) comprise a rail-wheel assembly having a single substantially annular rail (38) forming the rolling track (33), and a plurality of wheels (34) arranged to abut on the single rail (38) and adapted to roll along the single rail (38) to enable the rotation of the rotatable story (3) about the stationary core (2).

~~**16.** A building structure (1) according to claim 15, wherein the single rail (38) is fixed to the stationary core (2) and the wheels (34) are rotatably held by wheel holders (44) fixed to the inner support portion (7) of the story (3), or vice versa.~~

~~**17.** A building structure (1) according to claim 16, comprising a device which pushes or pulls the wheel holder (44) and the single rail (38) towards each other in order to ensure uninterrupted contact between the corresponding wheel (34) and the single rail (38).~~

10. The building structure (1) according to any of claim 8, wherein one or more of the wheels (34) are supported on an eccentric portion (45) of a rotatably adjustable wheel axle (46) which is configured to be turned:
in a working position in which the eccentric portion (45), together with the wheel (34), is turned vertically towards the rail (38),
in a maintenance position in which the eccentric portion (45), together with the wheel (34), is turned vertically away from the rail (38), thereby detaching the individual wheel (34) from the rail (38) for the purpose of at least one of maintenance or replacement.

~~18~~11. ~~A~~ The building structure (1) according to any of claim~~s 12 to 17~~ 7, comprising drive means (39) to impart a rotational motion to the rotatable story (3) about the stationary core (2).

~~19~~12. ~~A~~ The building structure (1) according to claim ~~18~~11, wherein the drive means (39) comprise one or more motors (40) associated to said rotatable story (3), said motors (40) being positioned along a circumference of the stationary core (2) and configured to impart a motion to one or more drive members (41) connected to one of the stationary core (2) and the rotatable story (3), said drive members (41) engaging one or more corresponding driven members (42) connected to the other one of the stationary core (2) and the rotatable story (3), ~~such as~~ to rotate the story (3) about the stationary core (2).

20. A building structure (1) according to claim 19, wherein said motor (40) is positioned at the interior of the stationary core (2) and imparts a motion to said drive member (41), positioned at the exterior of and connected to the stationary core (2), via a shaft (57) placed through a cavity in said stationary core (2).

2113. A The building structure (1) according to claim 19 or 2012, wherein:

- the drive member (41) comprises either a friction wheel or a toothed ring,
- the driven member (42) extends circumferentially around the stationary core (2) and comprises either an annular friction track having a steel or tarmac or concrete surface or an annular toothed surface.

22. A building structure (1) according to any of claims 19 to 21, wherein the drive member (41) is a friction wheel and the driven member (42) is a friction track, and further comprising a device which pushes or pulls the friction wheel and the friction track towards one another in order to ensure uninterrupted contact and friction therebetween.

23. A building structure (1) according to claims 13 and 18, wherein the drive means (39) comprise one or more of the rolling elements or wheels (34) of the substantially annular rolling track means (32), which are directly driven by one or more motors (40) embodied as direct drives or as gear motors connected to the corresponding rolling elements or wheels (34).

2414. A The building structure (1) according to claim 1912, wherein the drive member (41) imparts a motion to the driven member (42) via meshing gears or via pulley-belt transmissions.

25. A building structure (1) according to claim 18, wherein the drive means (39) comprise one or more linear motors, each comprising a stator (55) having the ability to impart to a rotor (56), by means of electromagnetic propulsion, a motion relative to the stator (55), the stator (55) being fixed to the stationary core (2) and the rotor (56) being fixed to the rotatable story (3), or vice versa.

26. A building structure (1) according to any preceding claim, as dependent on claims 4, 11 and 18, wherein the auxiliary support surface (29) supports at least one of:

- auxiliary story support means (31) for temporarily supporting the story (3) to allow the

maintenance and/or replacement of items present in the internal environment (20),
- drive means (39) for imparting a rotation to the rotatable story (3),
- emergency story lock-out means which prevent the story (3) from rotating.

27. A building structure (1) according to any preceding claim, as dependent on claim 4, comprising a plurality of lifting jacks (43) for temporary vertical displacement of the entire story (3), or only part of the story (3), with respect to the core (2), from a predetermined operating position to a maintenance position, which allows access to and maintenance and/or replacement of items present in the internal environment (20).

28. A building structure (1) according to claim 16 or 17, wherein a wheel holder (44) of the rolling track means (32) can be individually height-adjustable in order to allow a selective disengagement of a single wheel (34) from the rolling track (33) for the purpose of maintenance and/or replacement.

29. A building structure (1) according to any of claims 13 to 17, 23, and 28, wherein one or more of the wheels (34) are supported on an eccentric portion (45) of a rotatably adjustable wheel axle (46) which can be turned:
- in a working position in which the eccentric portion (45), together with the wheel (34), is turned vertically towards the rail (38),
- in a maintenance position in which the eccentric portion (45), together with the wheel (34), is turned vertically away from the rail (38), thereby detaching the individual wheel (34) from the rail (38) for the purpose of maintenance and/or replacement.

30. A building structure (1) according to any of claims 12 to 29, wherein the rotatable story (3) comprises a bottom plate structure (47) having a lower cover structure (11) and an upper cover structure (10) and a space frame (9) arranged in between and connecting the lower and upper cover structures (11, 10), wherein the inner support portion (7) is formed by a reinforced stiff radially internal edge region of the upper cover structure (10).