(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 563 771 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
04.06.2025 Bulletin 2025/23

(21) Application number: **23772546.0**

(22) Date of filing: **26.07.2023**

(51) International Patent Classification (IPC):
E04H 3/14 *(2006.01)*

(52) Cooperative Patent Classification (CPC):
E04H 3/14; E04H 2003/142

(86) International application number:
PCT/ES2023/070484

(87) International publication number:
WO 2024/023386 (01.02.2024 Gazette 2024/05)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
KH MA MD TN

(30) Priority: **26.07.2022 ES 202230684**

(71) Applicant: **Sener Mobility S.A.**
48930 Getxo Bizkaia (ES)

(72) Inventors:
- **VIZCAYA PEREZ, Jorge**
  48930 Getxo (Bizkaia) (ES)
- **LATA PEREZ, Jesus Maria**
  48930 Getxo (Bizkaia) (ES)
- **QUEVEDO GALVAN, Cesar**
  48930 Getxo (Bizkaia) (ES)
- **MORALES POLO, Miguel Angel**
  48930 Getxo (Bizkaia) (ES)

(74) Representative: **Igartua, Ismael**
Galbaian S.Coop.
Garia Parke Teknologikoa
Goiru Kalea 1
20500 Arrasate-Mondragón (ES)

(54) **SPORTS STADIUM AND METHOD FOR CONVERTING A SPORTS STADIUM INTO A MULTI-SPACE, MULTIFUNCTIONAL INFRASTRUCTURE**

(57) Stadium comprising a first level (1) with a pitch (120) divided into a plurality of self-supporting units (4), a second level (2) under the first level (1) which houses the plurality of self-supporting units (4), both levels (1,2) being arranged in communication through a pit (3), horizontal movement means (26) of each self-supporting unit (4), and vertical movement means (15) of each self-supporting unit (4) in the pit (3) comprising a first platform (5') which can be moved in the pit (3) between an initial position aligned with the first level (1), closing the pit (3), and an end position, and a second platform (14) which can be moved in the pit (3) between an initial position aligned with the first platform (5') when said first platform (5') is located in the end position and an end position, with the second platform (14) aligned with the second level (2).

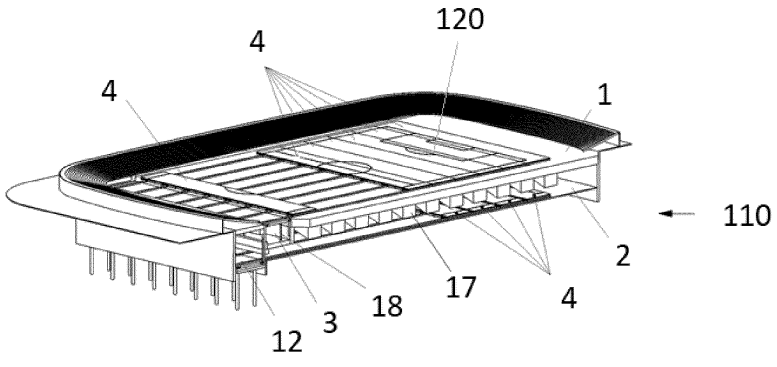

FIG. 1

EP 4 563 771 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to sports stadiums, which are preferably already built in consolidated urban centers and are understood to mean facilities which combine a large central space for sports games and other events with a large seating capacity for spectators, and it also relates to a method for converting a sports stadium into a multi-space, multifunctional infrastructure.

PRIOR ART

[0002] While technical solutions for converting stadiums into multifunctional facilities are known today, it is also true that most of them focus on newly built stadiums, are very complex and expensive, and do not focus on caring for and maintaining the turf in a controlled environment. Furthermore, most of them would not be valid for stadiums that are already built and operating.

[0003] International application WO2021/186096A1 discloses a system for converting stadiums into multifunctional infrastructures by removing the pitch and storing it in a pit. The vertical storage of the self-supporting units into which the pitch is divided involves building a deep pit, in addition to complicating the maintenance of the stored turf.

[0004] International application WO2022/106570A1 discloses an installation which comprises multiple movable turf modules that are movable between an installed state and a storage state, and a storage system is with a module storage chamber configured to accommodate the turf modules when in the storage state and with sets of movable support beams configured to support the turf modules. The module storage chamber comprises two opposite guide walls, each guide wall comprising horizontal beam guides configured to guide support beams in horizontal directions. The module storage chamber vertically moves, and retractable beam lift moves support beams vertically. Retractable storage support supports the support beams. The module storage system comprises a support beam storage configured to store the sets of support beams.

[0005] US applications US2014/0123566A1 and US2015/0354240A1 disclose a sports stadium according to the preamble of claim 1.

DISCLOSURE OF THE INVENTION

[0006] The object of the invention is to provide a sports stadium and a method for converting a sports stadium into a multi-space, multifunctional infrastructure, as defined in the claims.

[0007] One aspect relates to the sports stadium comprising a first level on which, in a playing position, a pitch is arranged, divided into a plurality of self-supporting units, horizontal movement means for horizontally moving each self-supporting unit on the first level, a pit in communication with the first level, and vertical movement means for vertically moving each self-supporting unit in the pit.

[0008] The sports stadium comprises a second level arranged under the first level which houses, in a storage position, the plurality of self-supporting units which form the pitch, the second level being arranged in communication with the first level through the pit, each self-supporting unit being moved horizontally along the first level and/or the second level through the horizontal movement means and between both levels through the vertical movement means. The vertical movement means comprise a first platform which can be moved in the pit between a position in which it is aligned with the first level, closing the pit, and an end position, and a second platform which can be moved in the pit between an initial position in which it is aligned with the first platform when said first platform is located in the end position and an end position, in which the second platform is aligned with the second level.

[0009] Another aspect of the invention relates to the method for converting the sports stadium into a multi-space, multifunctional infrastructure comprising the following steps carried out sequentially:

- horizontally moving each self-supporting unit through horizontal transport means along the first level until being arranged on the vertical movement means;
- vertically moving the self-supporting unit upon actuation of the vertical movement means to an end position; and
- horizontally moving the self-supporting unit through the horizontal movement means along the second level to its storage position,
- wherein after being moved horizontally along the first level, the self-supporting unit is supported on a first platform vertically moving along a first path to an end position, then moving horizontally to a second platform which in turn will vertically move the self-supporting unit along a second path, and finally the self-supporting unit is moved horizontally on the second level to a storage position.

[0010] Any sports stadium can thereby be converted into a multi-space, multifunctional infrastructure by removing the pitch and storing it in an automated manner on a lower level built for that purpose below the area of the pitch and taking up about the same surface area as said pitch. When the upper level where the pitch is initially located for other activities is required to be used, the self-supporting units are taken to the second level where, in addition to storing the turf of the pitch, they can be properly cared for. This facility can be implemented not only in newly built sports stadiums but also in sports stadiums that are already built, such that they can be

reversibly converted into multifunctional infrastructures.

[0011] A facility is obtained more rapidly, given that while the second platform vertically moves the self-supporting unit towards the second level, the first platform can vertically move a self-supporting unit. Since the paths and loads to be withstood by each platform are independent of one another, the facility is simplified given that since the first platform acts like a closure of the pit, it has to withstand higher loads than the second platform depending on the type of events to be held on the first level. Moreover, arranging part of the pit under the stands without affecting the structure of said stands, or under the playing space without affecting the second level, is enabled.

[0012] These and other advantages and features of the invention will become apparent in view of the figures and detailed description of the invention.

DESCRIPTION OF THE DRAWINGS

[0013]

Figure 1 shows a schematic perspective view of an embodiment of a sports stadium according to the invention, comprising a pitch divided into self-supporting units.

Figure 2 shows a detail of the sports stadium shown in Figure 1, where horizontal movement means of the self-supporting units are shown.

Figure 3 shows a detail of retaining means of the vertical movement means shown in Figure 1.

Figure 4 shows a partial sectioned view of the sports stadium shown in Figure 1, where the retaining means shown in detail in Figure 3 are in the locking mode.

Figure 5 shows in detail a platform of the vertical movement means of the sports stadium shown in Figure 1.

Figure 6 shows in detail trolleys of the horizontal movement means of the sports stadium shown in Figure 1.

Figure 7 shows a detail of the pit of the sports stadium shown in Figure 1.

Figures 8 to 18 sequentially show the transfer of a self-supporting unit from the playing position on the first level to the storage position on the second level of the sports stadium shown in Figure 1.

Figure 19 shows another embodiment of the sports stadium according to the invention.

Figure 20 shows a detail of the sports stadium shown in Figure 19.

Figure 21 shows a side view of the sports stadium shown in Figure 19.

DETAILED DISCLOSURE OF THE INVENTION

[0014] The sports stadium 110 according to the invention comprises a first level 1 on which, in a playing position, a pitch 120 is arranged, divided into a plurality of self-supporting units 4, horizontal movement means 26 for horizontally moving each self-supporting unit 4 on the first level 1, a pit 3 in communication with the first level 1, and vertical movement means 15 for vertically moving each self-supporting unit 4 in the pit 3. In the embodiments shown in the figures, the pit 3 is located on one side of the pitch 120. In another embodiment, the pit 3 is located on one side of the pitch 120 but extends below the pitch 120, invading the space occupied by the pitch up to a width close or equal to the width of a self-supporting unit 4. In another embodiment, the pit 3 is located in the pitch in an intermediate position, the pit 3 being aligned with the end position of the self-supporting unit 4, above same, such that this self-supporting unit 4 requires only a vertical movement to start its storage maneuver.

[0015] The fact that the pit 3 is built on one side of the pitch and does not invade same has the advantage that all the self-supporting units 4 can be the same since in use, they will all be supported on firm ground and without any difference in support between any of them. The fact that the pit 3 is built on one side of the pitch, but invading it only up to the width of one of self-supporting units 4 has the advantage that the stands are not affected. In both cases, the movements of all the self-supporting units in the same horizontal direction in their storing or extraction sequences are facilitated, and it will allow the support structure 17 of the first level 1 to be spatially continuous and not have to be cut, and therefore reinforced, by a pit in an intermediate area thereof.

[0016] In the event that the pit is built on one of the sides of the pitch, without invading it or partially invading it, one of the preferred embodiments of the invention will seek for the position of the pit to be slightly moved to the outside of the pitch with respect to the self-supporting unit located above same, for the purpose of allowing slight horizontal translational movement of this self-supporting unit to more securely close the turf joint with respect to the next self-supporting unit, and with it leading the self-supporting unit above the pit to be, in match mode, moved slightly towards the pitch, resting on the slab at the inner edge thereof, and on the scale at the other three.

[0017] Furthermore, the sports stadium 110 comprises a second level 2 arranged under the first level 1 which houses, in a storage position, the plurality of self-supporting units 4 which form the pitch 120. The second level 2 is arranged substantially parallel to the first level 1 and

facing said first level 1. The second level 2 is in communication with the first level 1 through the pit 3, each self-supporting unit 4 being moved horizontally along the first level 1 and/or the second level 2 through the horizontal movement means 26 and between both levels 1 and 2 through the vertical movement means 15.

[0018] Each self-supporting unit 4 comprises layers of field, a natural or artificial turf and irrigation means not shown in detail in the figures. The pitch 120 is divided longitudinally or transversely into self-supporting units 4.

[0019] In one embodiment, each self-supporting unit 4 has a length at least equal to the total length of the pitch 120, said length being preferably equal to the smaller side of the pitch 120.

[0020] Preferably, the number of self-supporting units 4 configuring the pitch 120 is comprised between five and eight when said self-supporting units 4 are arranged longitudinally along the length of the pitch 120. Preferably, each self-supporting unit 4 has dimensions of 144 m in length and between about 9 and 12 m in width.

[0021] In another embodiment not shown in the figures, in which the self-supporting units 4 are arranged transversely along the length of the pitch 120, the number of self-supporting units configuring the pitch 120 is preferably comprised between 8 and 14, the dimension of each self-supporting unit 4 being preferably up to 70 m in length and between 8 and 13 m in width, respectively.

[0022] The second level 2 is sized such that it enables the storage of all the self-supporting units 4 arranged forming the pitch 120 on the second level 2. In one embodiment, the dimensions of second level 2 are such that it allows housing all the self-supporting units 4 separated from one another by a certain distance to enable treating joints of each self-supporting unit 4. In another embodiment, the self-supporting units 4 are stored on the second level 2 forming the pitch 120 without separations between them. When it becomes necessary to treat the joints, each self-supporting unit 4 could be displaced sequentially a horizontal distance to separate it from its adjacent one and the joint could be treated if needed, or the entire turf could be cared for in monoblock mode.

[0023] The horizontal movement means 26, shown in detail in Figure 6, comprise trolleys 6 in each self-supporting unit 4 and guides 7 embedded on the first level 1 and on the second level 2, with the trolley 6 collaborating with the respective guide 7 for the horizontal movement of the corresponding self-supporting unit 4 along the first level 1 and/or the second level 2. The first level 1 and the second level 2 have substantially flat surfaces, the guides 7 being arranged embedded therein.

[0024] In one embodiment, the guides 7 can be rails (as shown in the figures) or inductive guiding systems. Preferably, each self-supporting unit 4 is supported by between 10 and 22 trolleys if the self-supporting unit 4 is oriented longitudinally towards the pitch 120, the number of trolleys preferably being between 4 and 12 if the self-supporting unit 4 is configured in the transverse direction of the pitch 120.

[0025] The horizontal movement means 26 comprise motors, control means, and the elements needed to be able to carry out the synchronized horizontal movement of each self-supporting unit 4, and the description of such means is not considered necessary.

[0026] In one embodiment of the sports stadium 110 according to the invention, shown in Figures 1 to 18, the vertical movement means 15 comprise a first platform 5' which can be moved in the pit 3 between an initial position in which it is aligned with the first level 1, closing the pit 3, and an end position, and a second platform 14 which can be moved in the pit 3 between an initial position in which it is aligned with the first platform 5' when said first platform 5' is located in the end position and an end position, in which the second platform 14 is aligned with the second level 2. Preferably, the path of the first platform 5' is smaller than the path of the second platform 14.

[0027] The pit 3 comprises a first chamber 3a where the first platform 5' is housed and a second chamber 3b where the second platform 14 is housed, with both chambers 3a and 3b being arranged adjacent to and in communication with one another. In this embodiment, the first chamber 3a is arranged adjacent to one side of the pitch 120 and the second chamber 3b extends at least partially under stands 121 of the sports stadium 110, as shown in the figure or under the pitch 120. Arranging part of the pit 3 under the stands without affecting the structure of the stands, or in other embodiments under the playing space without affecting the second level 2, is thereby enabled. Furthermore, the paths and the loads that each platform 5' and 14 must withstand are independent of one another, simplifying the facility given that since the first platform 5' acts like a closure of the pit 3, it has to withstand higher loads than the second platform 14 depending on the type of events to be held on the first level 1.

[0028] The vertical movement means 15 comprise the lifting devices 18 which support each platform 5' and 14 and the corresponding self-supporting unit 4 which is arranged on the same, and move them vertically along the pit 3. In this embodiment, the lifting devices 18 can also be mechanical, such as spiralifts or linear spindles and/or hydraulic, such as hydraulic cylinders, being moved in a synchronized manner in all cases both in loading and in position. The hydraulic lifting devices can further comprise the corresponding tanks, pumps, electric motors, etc., and their description is not considered necessary given that they are known in the state of the art.

[0029] Moreover, both platforms 5' and 14 are substantially flat and comprise guides 7 similar to the guides of the horizontal movement means 26 described above, such that when the first platform 5' is in the initial position, closing access to the pit 3, the guides 7 of the first platform 5' are arranged aligned with the guides 7 embedded on the first level 1 such that the trolleys 6 of each self-supporting unit 4 can displace in a guided manner each self-supporting unit 4 along the first level 1 until being positioned in the first platform 5'. When the second platform 14 is in the initial position and the first platform 5' is in

the end position, the guides 7 of both platforms 5' and 14 are aligned so that the self-supporting unit 4 can be displaced horizontally between both.

[0030] Moreover, the first level 1 is supported by a structure 17 the span of which is greater than the length of the pitch 120. The support structure 17 supports the entire first level 1, being capable of overcoming the large spans existing between the sides and bottoms of the pitch, without the need for intermediate columns. The structure 17 is based on a spatial mesh system, made up of bars and balls, in an arch shape and studs following the arch to the lower side supports; and open at the lower part to house the set of elements and components of the agronomic systems to care for the turf on the second level 2. The support structure 17 which is conceived for the vertical separation between the two levels 1 and 2 to be as small as possible but enough to house the necessary edge that makes it possible to support the first level 1 with the events performed on it and to also allow events on the second level 2 without problems with visual ergonomics.

[0031] In the embodiment shown in the figure, the sports stadium 110 further comprises side guides 10 and 11 in the pit 3 and on each platform 5' and 14 which collaborate with one another in the guided vertical movement of the respective platform 5' and 14 along the pit 3, as shown in Figures 5 and 7. The guides 11 are arranged on the sides of the respective platform 5' and 14.

[0032] In the embodiments shown in the figures, the sports stadium 110 further comprises retaining means 9 for retaining the platform 5' that closes the pit 3, the purpose being to retain the platform 5' in a locking position, the locking position being the position in which the platform 5' is aligned with the self-supporting units 4 on the first level 1, closing access to the pit 3 (also referred to as the initial position). The retaining means 9 shown in detail in Figures 3 and 4 are arranged at least partially embedded in the pit 3, in particular in the walls of the pit 3, and are configured to be moved between a retracted situation (shown in particular in Figures 3(a) and 3(b)) in which the platform 5' can move vertically along the pit 3 and an extended position (shown in Figures 3(c) and 4), in which they block the platform 5' in the locking position which coincides with the initial position of the platform 5'.

[0033] The retaining means 9 have to withstand the weight of the loads deposited on the platform 5' when it is in the locking position.

[0034] In another embodiment, the sports stadium 110 can include retaining means to retain the first platform 5' in its end position, and/or the second platform 14 in its initial and/or end position.

[0035] Moreover, in the embodiment shown in Figures 19 to 21, the first level 1 is supported on the support structure 17 and on intermediate columns 16 each of which comprises a fixed part 16a and a mobile part 16b fixed to the second level 2. The mobile part 16b is arranged retracted in a non-working position; preferably, it can be deployed from the non-working position to a working position in which is connected to the corresponding fixed part 16a forming an intermediate column 16 to reinforce the first level 1 when the activities to be held on the first level 1, for example concerts, require this. The mobile part 16b can be deployed by means of irreversible mechanical linear spindles or other known lifting systems.

[0036] In Figures 19 to 21, the self-supporting units 4 are separated from one another by a certain distance to treat their joints in their end storage position on the second level 2, with the intermediate columns 16 being arranged between those gaps.

[0037] Another aspect of the invention relates to a method for converting a sports stadium 110 as defined above into a multi-space, multifunctional infrastructure.

[0038] The method comprises the following steps carried out sequentially:

- horizontally moving each self-supporting unit 4 through the horizontal transport means 26 along the first level 1 until being arranged on the vertical movement means 15;
- vertically moving the self-supporting unit 4 upon actuation of the vertical movement means 5 to an end position; and
- horizontally moving the self-supporting unit 4 through the horizontal movement means 26 along the second level 2 to its storage position.

[0039] In particular, when the pitch 120 must be stored on the second level 2, the trolleys 6 are operated such that they horizontally displace the self-supporting unit 4 guided along the first level 1 until positioning it on the platform 5' which, at that time, is in the initial position or locking position retained by the retaining means 9.

[0040] When the self-supporting unit 4 is centered on the platform 5', it moves downwards, operated by the respective actuation means 18 to the end position in which it is aligned with the second platform 14. The self-supporting unit 4 is horizontally transferred by means of the trolleys 6 from the first platform 5' to the second platform 14, subsequently being lowered by means of the actuation means of the second platform 15 to the end position in which the second platform 14 is aligned with the second level 2. In that position, the trolleys 6 are operated to displace the self-supporting unit 4 from the second platform 14 to the storage position on the second level 2. Preferably, the movement of the first platform 5' is smaller than the movement of the second platform 14. The self-supporting units 4 are moved sequentially from the first level 1 to the second level 2 where they are stored. When the pitch 120 is to be re-positioned on the first level 1, the process described above is inverted.

[0041] A method of converting a sports stadium into a multifunctional facility in a rapid and optimized manner is thereby obtained. Furthermore, a more rapid facility can be obtained, given that while the second platform 14 vertically moves the self-supporting unit 4 towards the

second level 2, the first platform 5' can vertically move the self-supporting unit 4.

[0042] The described features of the sports stadium in any of its embodiments are valid for the method described in any of its embodiments and vice versa.

Claims

1. Sports stadium comprising a first level (1) on which, in a playing position, a pitch (120) is arranged, divided into a plurality of self-supporting units (4), and a second level (2) arranged under the first level (1) which houses, in a storage position, the plurality of self-supporting units (4) which form the pitch (120), the second level (2) being arranged in communication with the first level (1) through a pit (3), each self-supporting unit (4) being moved horizontally along the first level (1) and/or the second level (2) through horizontal movement means (26) and between both levels (1,2) through vertical movement means (15), **characterized in that** the vertical movement means (15) comprise a first platform (5') which can be moved in the pit (3) between a position in which it is aligned with the first level (1), closing the pit (3), and an end position, and a second platform (14) which can be moved in the pit (3) between an initial position in which it is aligned with the first platform (5') when said first platform (5') is located in the end position, and an end position in which the second platform (14) is aligned with the second level (2).

2. Sports stadium according to the preceding claim, wherein the pit (3) comprises a first chamber (3a) where the first platform (5') is housed and a second chamber (3b) where the second platform (14) is housed, with both chambers (3a, 3b) being arranged adjacent to and in communication with one another, such that the first chamber (3a) is arranged adjacent to one side of the pitch (120) and the second chamber (3b) extends at least partially under stands (121) of the sports stadium (110) or under the pitch (120).

3. Sports stadium according to any of the preceding claims, wherein each platform (5',14) includes the horizontal movement means (26) arranged such that they are aligned with the horizontal movement means (26) arranged on the first level (1) and on the second level (2), respectively, when the platform (5', 14) is arranged aligned, respectively, with the first level (1) and/or with the second level (2).

4. Sports stadium according to any of the preceding claims, wherein the vertical movement means (15) comprise lifting devices (18) which support the corresponding platform (5',14) and move it vertically, said lifting devices (18) being mechanical and/or hydraulic.

5. Sports stadium according to any of the preceding claims, comprising retaining means (9) for retaining the respective platform (5', 14), the retaining means (9) being arranged at least partially embedded in the pit (3) and configured to be moved between a retracted situation in which the platform (5',14) can move vertically along the pit (3), and an extended position in which they block the respective platform (5', 14) in its initial and/or end positions, respectively, said retaining means (9) being mechanically and/or hydraulically operated.

6. Sports stadium according to any of the preceding claims, comprising guides (10,11) in the pit (3) and in the respective platform (5',14) which collaborate with one another for the guided vertical movement of each platform (5',14) along the pit (3).

7. Sports stadium according to any of the preceding claims, wherein the second level (2) has a surface at least equal to the surface corresponding to the pitch (120) such that it enables the storage of the self-supporting units (4) forming the pitch (120) on the second level (2).

8. Sports stadium according to the preceding claim, wherein the second level (2) has a surface above the surface corresponding to the pitch (120) such that it enables the storage of the plurality of the self-supporting units (4) separated from one another for maintenance thereof.

9. Sports stadium according to any of the preceding claims, wherein the horizontal movement means (26) comprise at least one trolley (6) in each self-supporting unit (4) and guides (7) embedded on the first level (1), on the second level (2), and in the corresponding platform (5',14), respectively, the trolley (6) collaborating with the respective guide (7) for the horizontal movement of the corresponding self-supporting unit (4).

10. Sports stadium according to any of the preceding claims, comprising a support structure (17) the span of which is greater than the length of the pitch (120), and a plurality of intermediate columns (16) each of which comprises a fixed part (16a) fixed to the first level (1) and a mobile part (16b) fixed to the second level (2), the mobile part (16b) being arranged retracted in a non-working position, and being deployable from the non-working position to a working position in which it is connected to the corresponding fixed part (16a) forming an intermediate column (16) to reinforce the first level (1).

11. Sports stadium according to any of the preceding claims, wherein each self-supporting unit (4) has a length at least equal to the length of the smaller side

of the pitch (120).

12. Sports stadium according to any of the preceding claims, wherein each self-supporting unit (4) comprises layers of field, a natural or artificial turf and irrigation means.

13. Method for converting a sports stadium according to any of the preceding claims into a multi-space, multi-functional infrastructure, comprising the steps of horizontally moving each self-supporting unit (4) through the horizontal movement means (26) along the first level (2) until being arranged on the vertical movement means (15), vertically moving the self-supporting unit (4), and horizontally moving the self-supporting unit (4) from the platform (5',14) until positioning it in a storage position on the second level (2), **characterized in that** after being moved horizontally along the first level (1), the self-supporting unit (4) is supported on a first platform (5') vertically moving along a first path to an end position, then moving horizontally to a second platform (14) which in turn will vertically move the self-supporting unit (4) along a second path, and finally the self-supporting unit (4) is moved horizontally on the second level (2) to a storage position.

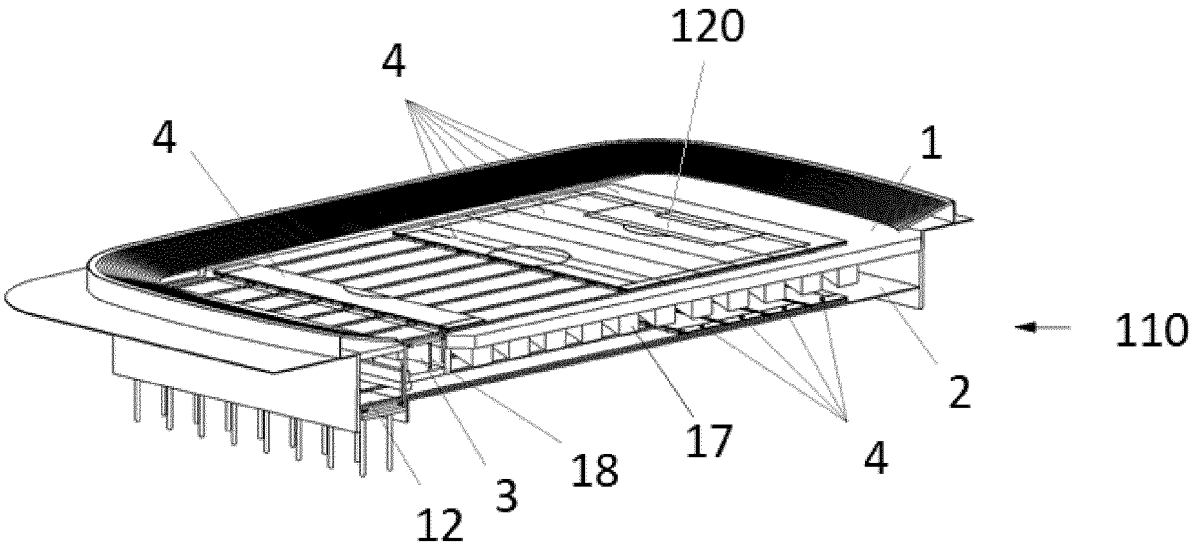

FIG. 1

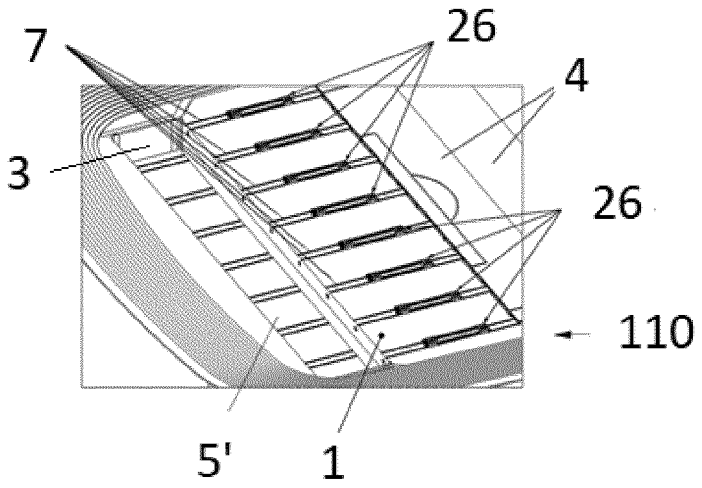

FIG. 2

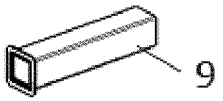

FIG. 3(a)

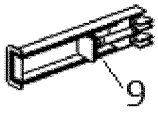

FIG. 3(b)

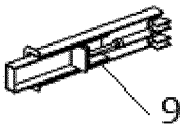

FIG. 3(c)

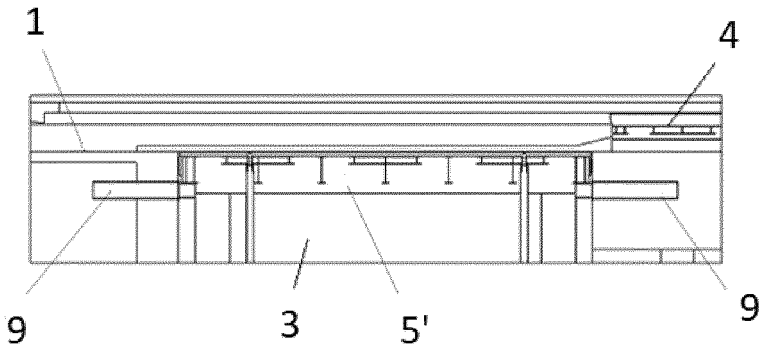

FIG. 4

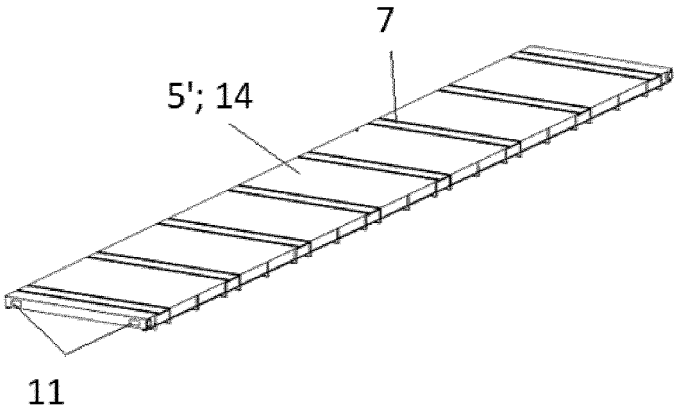

FIG. 5

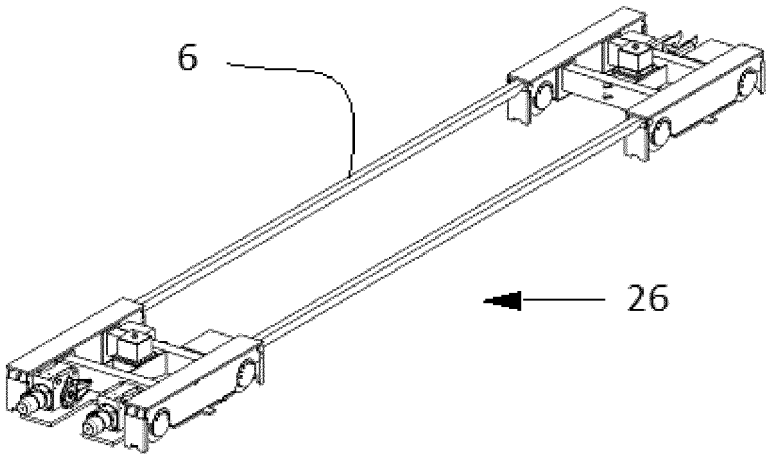

FIG. 6

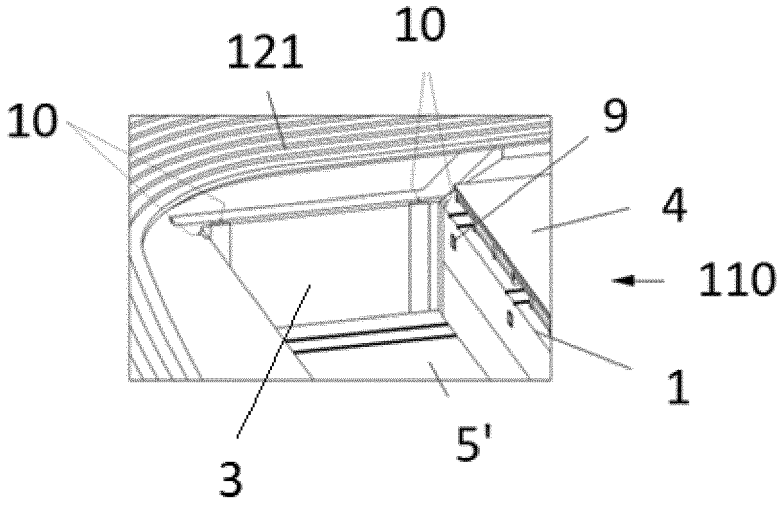

FIG. 7

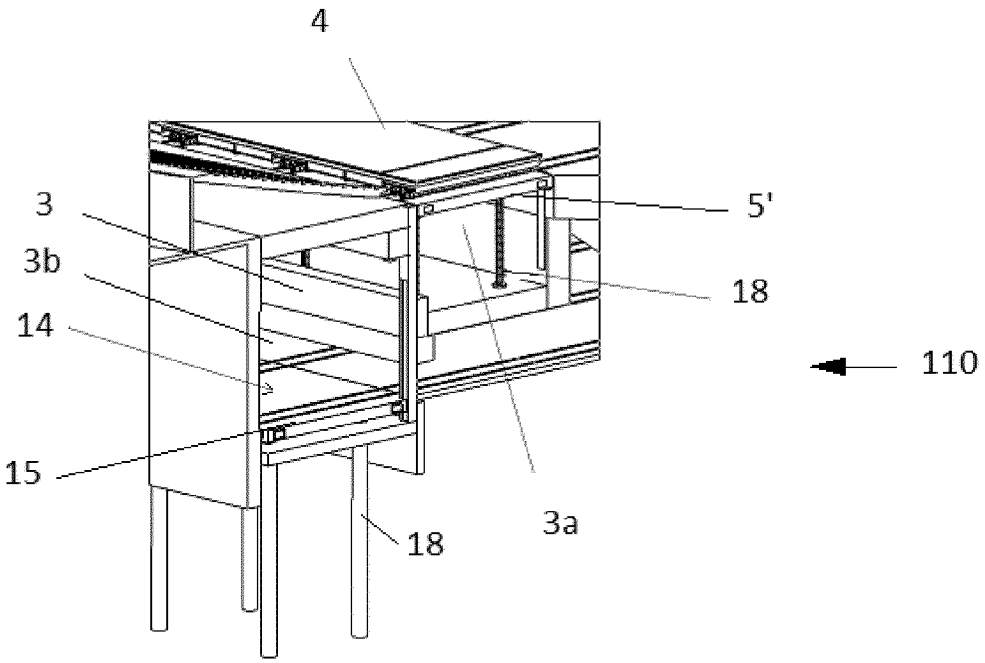

FIG. 8

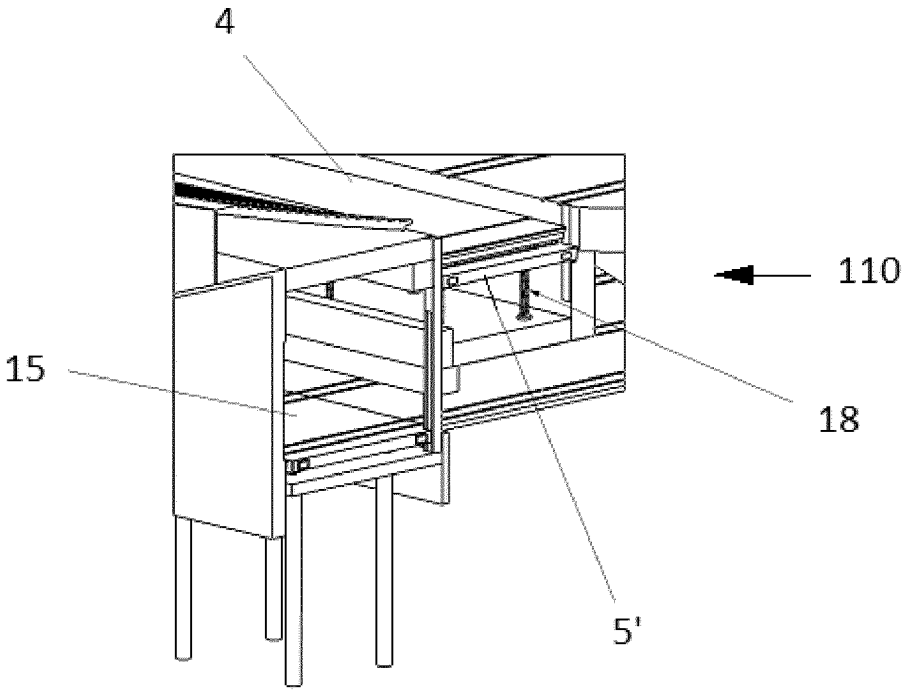

FIG. 9

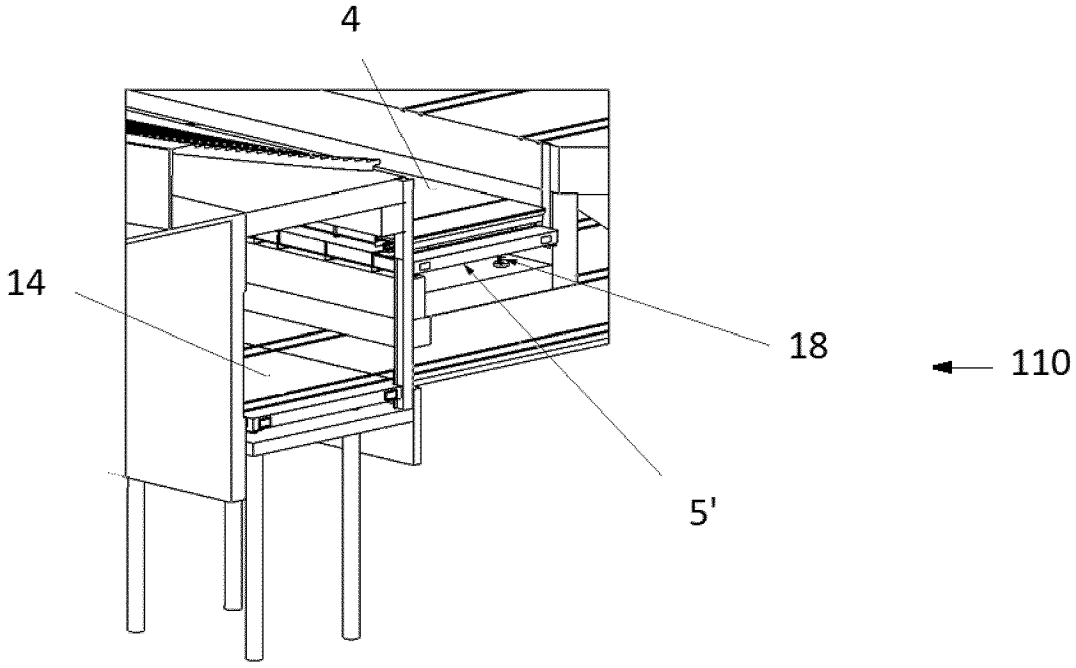

FIG. 10

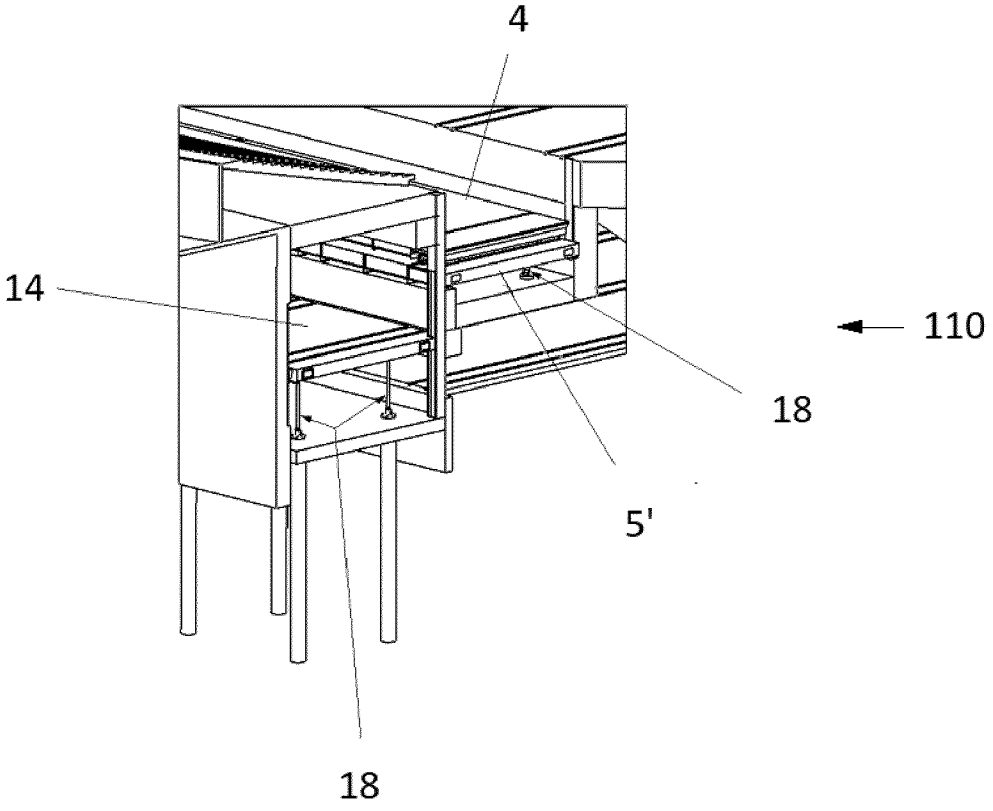

FIG. 11

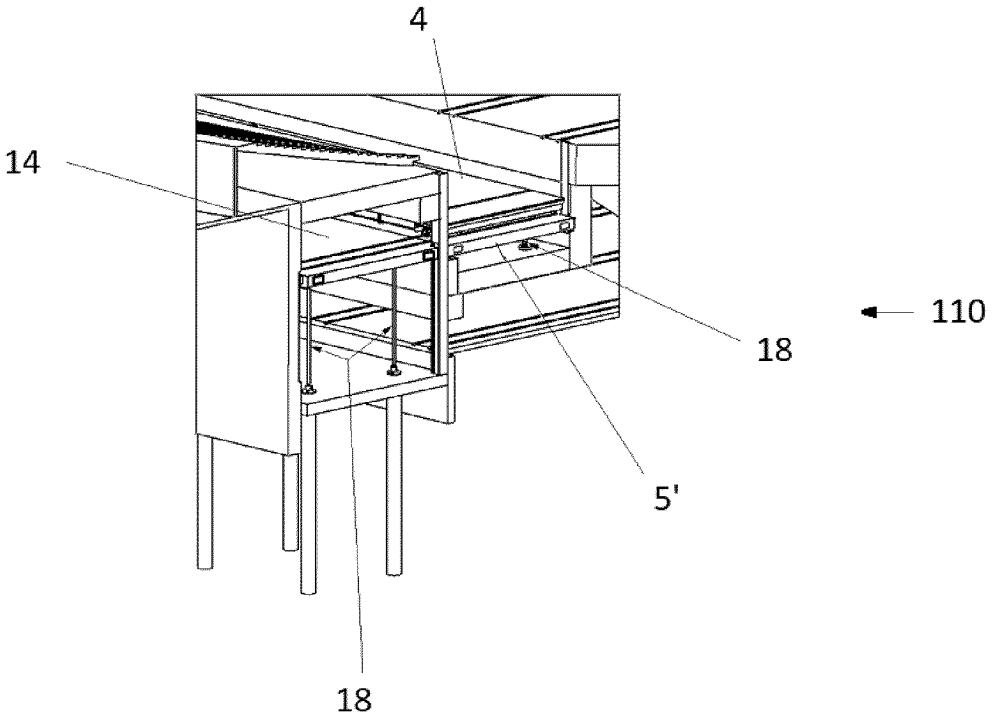

FIG. 12

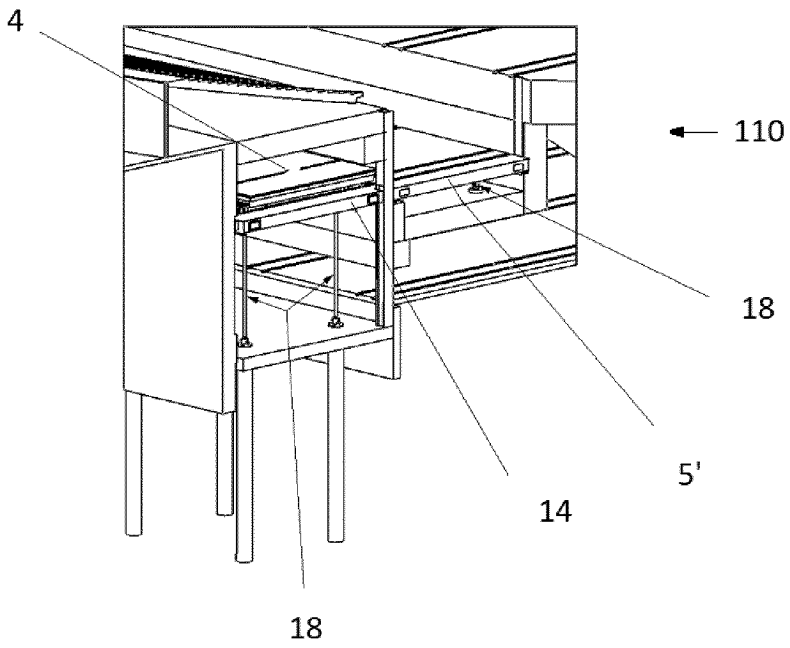

FIG. 13

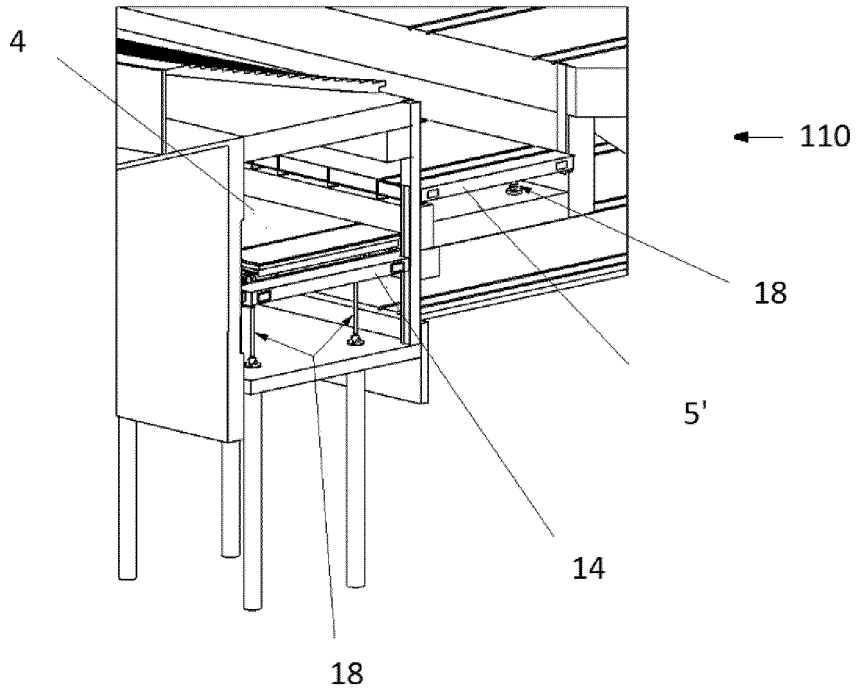

FIG. 14

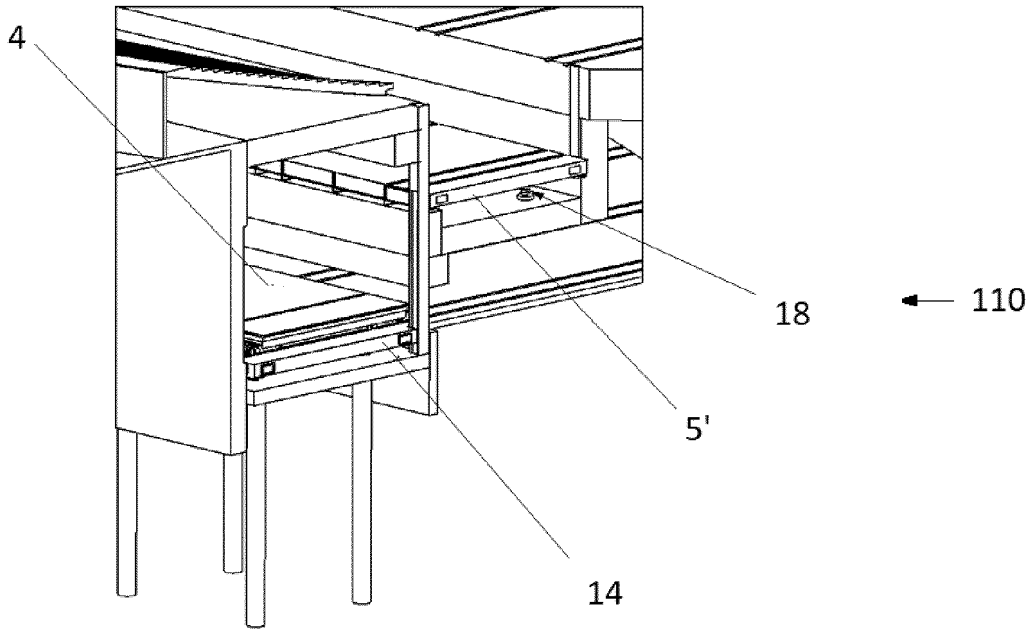

FIG. 15

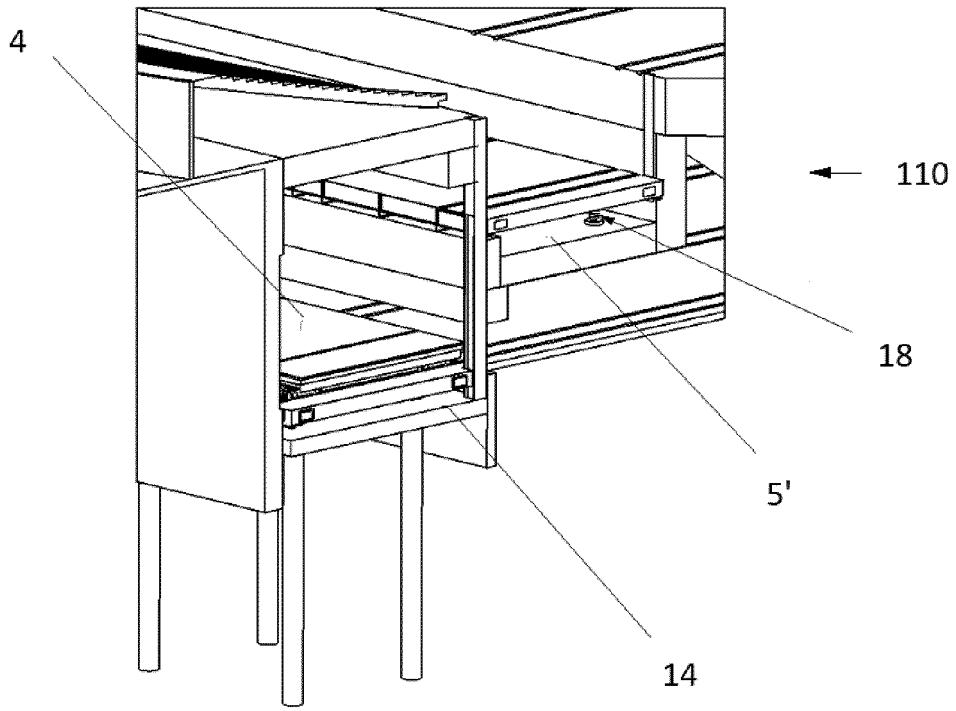

FIG. 16

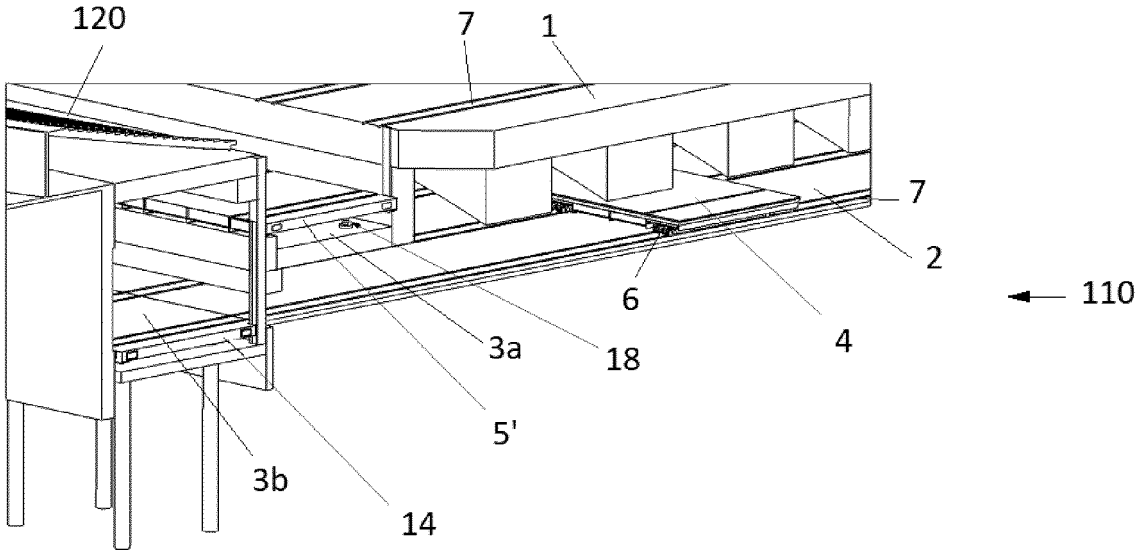

FIG. 17

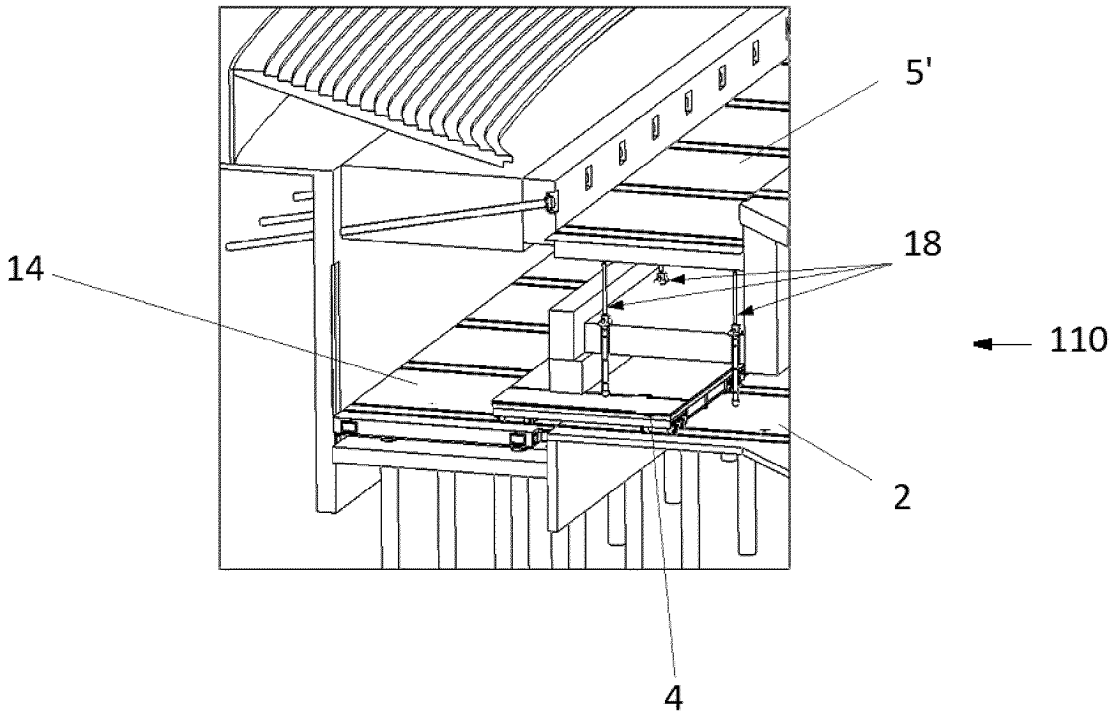

FIG. 18

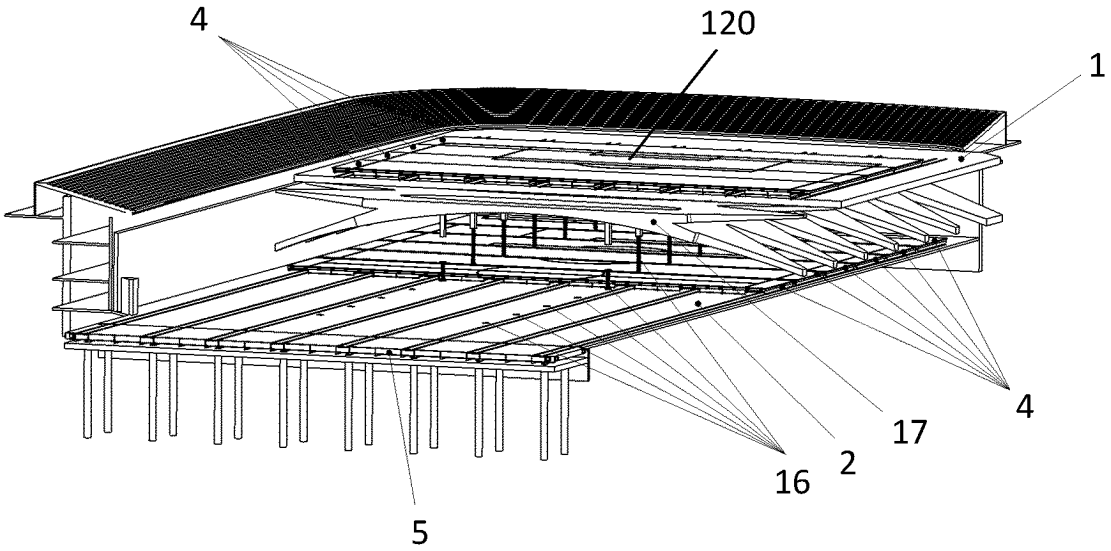

FIG. 19

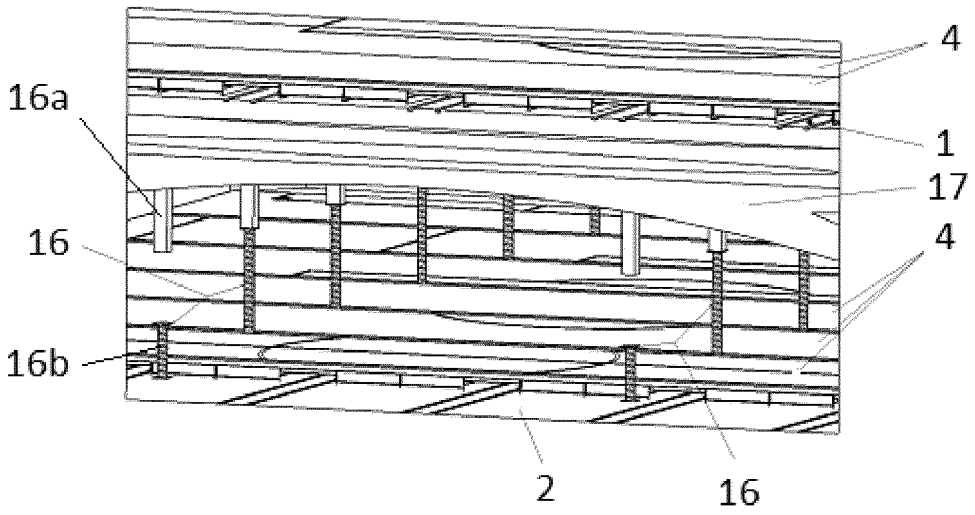

FIG. 20

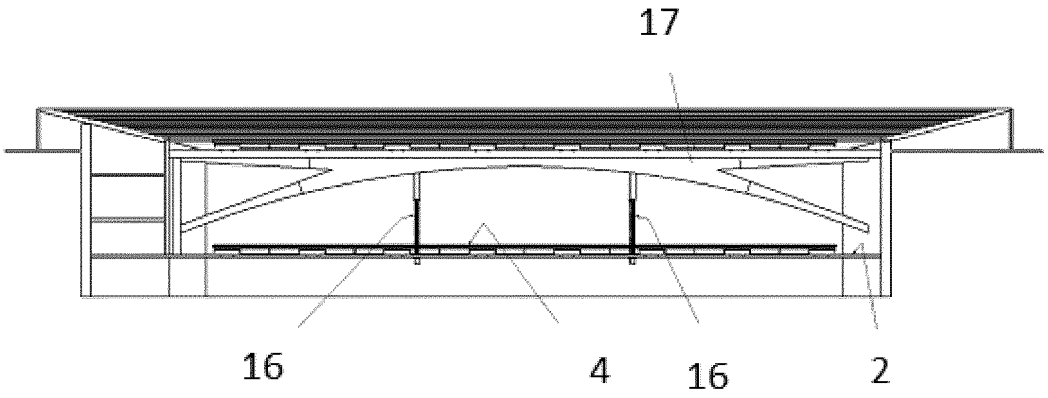

FIG. 21

INTERNATIONAL SEARCH REPORT

International application No
PCT/ES2023/070484

A. CLASSIFICATION OF SUBJECT MATTER
INV. E04H3/14
ADD.

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)
E04H

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2015/354240 A1 (SALTVEIT YNGVE [NO] ET AL) 10 December 2015 (2015-12-10) cited in the application paragraph [0001] - paragraph [0055]; figures 1-8	1-13
A	US 2014/123566 A1 (SALTVEIT YNGVE [NO] ET AL) 8 May 2014 (2014-05-08) cited in the application figures 1-12	1-13
A	WO 2022/106570 A1 (NUTCRACKER SOLUTIONS AS [NO]) 27 May 2022 (2022-05-27) figures 1-14	1-13
A	WO 2021/186096 A1 (SENER ING & SIST [ES]) 23 September 2021 (2021-09-23) cited in the application claim 1; figures 1-20	1-13

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance;; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance;; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
4 December 2023	11/12/2023

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Decker, Robert

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/ES2023/070484

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2015354240 A1	10-12-2015	CN 104918667 A	16-09-2015
		DE 112013006317 T5	10-09-2015
		GB 2524197 A	16-09-2015
		JP 2016509139 A	24-03-2016
		KR 20150003355 U	09-09-2015
		US 2015354240 A1	10-12-2015
		WO 2014102321 A1	03-07-2014
US 2014123566 A1	08-05-2014	AU 2012276391 A1	23-01-2014
		BR 112013033889 A2	14-02-2017
		CN 104039402 A	10-09-2014
		EP 2726165 A1	07-05-2014
		JP 2014520979 A	25-08-2014
		KR 20140050640 A	29-04-2014
		MX 338160 B	05-04-2016
		RU 2014101461 A	10-08-2015
		US 2014123566 A1	08-05-2014
		WO 2013002649 A1	03-01-2013
WO 2022106570 A1	27-05-2022	NONE	
WO 2021186096 A1	23-09-2021	BR 112022018695 A2	07-02-2023
		EP 4123108 A1	25-01-2023
		ES 2854498 A1	21-09-2021
		JP 2023520161 A	16-05-2023
		KR 20220147147 A	02-11-2022
		US 2023175277 A1	08-06-2023
		WO 2021186096 A1	23-09-2021

Form PCT/ISA/210 (patent family annex) (April 2005)

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- WO 2021186096 A1 **[0003]**
- WO 2022106570 A1 **[0004]**
- US 20140123566 A1 **[0005]**
- US 20150354240 A1 **[0005]**