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(54) CONVERTIBLE MODULAR GRANDSTAND

UMBAUBARE MODULARE TRIBÜNE

TRIBUNE MODULAIRE CONVERTIBLE

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Description

Technical field

[0001] The present invention according to claim 1 belongs to the field of provisional grandstands intended to accommodate the public at sporting, musical, cultural events or shows of any kind, both outdoors and indoors.

[0002] More in detail, the present invention belongs to the field of transportable modular grandstands, particularly dedicated to a temporary or provisional use, i.e. structures not permanently fixed to the ground that are usually set up when necessary and are subsequently dismantled when no longer needed, to be removed, stored and finally reassembled elsewhere.

[0003] In particular, the present invention belongs to the field of convertible grandstands, i.e., those structures that pass from a compact transport configuration to an open use configuration.

Present status of the art

[0004] It should be noted that in this patent text, the term grandstand refers to a tiered construction, i.e. a structure made up of several tiers of shelves placed at a progressively increasing height from the ground, on which the public attending an event or show is seated.

[0005] Temporary grandstands, which can be assembled and disassembled, are often used during exhibitions, events or shows that take place in open spaces on public land, for example in city squares or parks or more generally in areas that must be cleared and vacated immediately after the conclusion of the event.

[0006] These structures are generally composed of a plurality of metal beams reversibly connected to each other, completed by parapets, walking surfaces and seats to accommodate spectators.

[0007] Traditional temporary grandstands are made up of numerous components that have to be assembled to set up the grandstand and then disassembled to move or transport it elsewhere. The operations of assembly and disassembly require many workers and very long working times, which are hardly compatible with the need to free the area occupied by the stand as quickly as possible, after there is no longer need to use it.

[0008] In order to reduce installation times, convertible grandstands have been designed, i.e. transformable structures designed to be quickly converted from a closed storage configuration, compact and space-saving, to an open configuration for use, in which the grandstand changes to a typical tiered structure and can be folded just as quickly. In particular, retractable grandstands are known, consisting of a plurality of telescopically sliding frames one inside the other, so that, in the closed configuration, these types of grandstands are conformed as a parallelepiped, with the different orders of steps vertically superimposed on each other, while in the configuration of use the different frames are telescopically extracted, gradually forming a plurality of steps.

[0009] US3352069 discloses a retractable grandstand of the aforementioned type, specifically designed for indoor spaces, particularly auditoriums, gymnasiums and the like. A similar solution is described in British patent GB1420615. U.S. patent US3025106 describes a retractable grandstand, also suitable for interior spaces of a building. In the closed configuration, the entire grandstand retracts into a specially prepared cavity in the wall of the building, so it is possible to free the space occupied by the grandstand when not in use, also facilitating the cleaning of the floor below.

[0010] U.S. patent US4063392 describes a retractable telescopic grandstand comprising actuator means that act on the various steps to automatically return them to the closed configuration; the transition to the open configuration must instead be performed manually.

[0011] The retractable grandstands described so far have the obvious disadvantage of being very bulky and heavy, even when they are in the closed storage configuration, so that it is not possible to transport them easily or load them on small or medium-sized vehicles.

[0012] This type of grandstand is therefore not suitable for use in temporary installations, in open spaces or in public places that must be cleared quickly as soon as there is no longer any need to use the grandstand.

[0013] Patent US4611439 describes a grandstand that rests on a fourwheeled cart and transitions from a closed transport configuration to an open working configuration and vice versa, however even in the closed configuration the grandstand occupies a large amount of space, as its overall length remains the same in both configurations, to the point that a single grandstand always occupies an entire fourwheeled cart.

[0014] Patent US4909000 shows a tribune that opens and closes by translating horizontally, so in this case both the overall length and the total height remain unchanged.

[0015] The known solutions of convertible grandstands provide for the significant reduction of only one dimension, alternating between length, width or height.

Object and summary of the invention

[0016] It is therefore felt the problem of having a temporary tribune that can be set up and disassembled very quickly and at the same time reducing its overall size and dimensions so that in the closed configuration it becomes convenient to transport and relocate in a different place.

[0017] Therefore, a first object of the present invention is to provide a modular grandstand according to claim 1 that is simple and quick to assemble and disassemble, without requiring time-consuming operations to assemble a large number of components.

[0018] A second object of the present invention is to provide a modular grandstand according to claim 1 that, when not in use, can assume a compact configuration for transportation or storage.

[0019] No less important object of the present invention

is to provide a lightweight grandstand that is convenient to transport and inexpensive to manufacture.

[0020] These and other objectives that will be clear to the skilled person competent in the field are solved by a modular grandstand comprising at least two trusses that can be opened like a folding fan between a closed configuration of storage and transport and an open configuration of work in which the truss extends vertically; in this last position on the open trusses are arranged horizontally a plurality of boards, at increasing heights from the ground, thus forming a deck with the typical stepped structure of traditional grandstands.

[0021] Each truss comprises an openable shell shaped as an elongated box-like body, which houses a movable frame, the latter comprising a set of rods interconnected with each other and with the box body by a plurality of connection means that allow them to rotate and/or slide with each other.

[0022] Preferably, but not exclusively, said trusses are metal, and in particular said movable frame comprise metal rods.

[0023] The openable shell comprises an upper half-shell, with one end rotationally coupled to a corresponding end of the lower half-shell.

[0024] Basically, the rods of each frame define a kinematic chain, thanks to which the frame passes from the closed transport configuration, in which it is entirely housed inside the closed shell, to an open configuration of use, in which the rods are unfolded in a fan-like manner outside the open shell and form a stepped structure.

[0025] As shown in the figures, when the truss is open, the upper extrados of each frame defines the profile of a staircase. In particular, the interconnected rods of the frame define a series of risers and treads, where riser means the vertical portion of a step while tread refers to the horizontal portion of the step itself.

[0026] The different horizontal boards each define a seating surface for the audience and at the same time a walking surface to allow people to move around.

[0027] The ends of each horizontal board rest on a respective truss, being attached to two corresponding horizontal rods of the extrados of the frame of each truss.

[0028] It should be noted that the same inventive concept can encompass different embodiments of the invention.

[0029] In particular, grandstands can have a greater or lesser number of horizontal boards, therefore with different orders of steps, depending on the structural configuration of each frame and namely the number of treads and risers defined by it, as will be evident to the skilled person from the drawings and the detailed description that follows.

[0030] In some embodiments, the upper half-shell may comprise a front portion and a rear portion that are reciprocally movable and interconnected by known means of connection, such as releasable hinges.

[0031] It should be noted that, in accordance with the same inventive principle, the elements of the shell could be replaced with different elements, which perform the same mechanical functions but which are not shaped like a container that opens and closes; so that in the closed transport configuration the truss may not be enclosed within a shell. Thus, in this patent text, the expression shell should not be understood in a limiting sense.

[0032] To facilitate the transportation of the truss in the closed configuration, the shell may include a plurality of horizontal-axis wheels, pivoting about their own vertical axis, which protrude inferiorly from the upper half-shell. According to a practical embodiment, the lower half-shell comprises feet for resting on the ground that protrude below and, preferably, are of the type adjustable in height to compensate for any irregularities or slopes of the support surface.

[0033] According to a preferred embodiment, each frame in turn comprises two lateral groups, each of which comprises three main pivoting arms that open in a fan-like manner. In practice, the pivoting arms of a first lateral group lie in a vertical plane, parallel to the plane in which the pivoting arms of the second group lie.

[0034] The distal ends of two successive arms of each lateral group are respectively connected to the distal ends of the preceding arm and the following arm by means of a strut. The distal ends of the first and last pivoting arms are respectively connected by other struts to the lower half-shell and the upper half-shell.

[0035] The connections between the struts and the pivoting arms allow both rotation and sliding of the struts relative to the arms, to allow the frame to be folded back on itself within the shell.

[0036] A first and second bar are rotationally connected to the respective ends of each strut, and these bars are rotationally connected to each other, so that when the frame is unfolded in the open position of use, the two bars and the strut form a triangular structure, usually with the first bar being arranged horizontally and the second bar being arranged vertically.

[0037] Advantageously, beams, or transverse reinforcing rods, are provided to connect the corresponding elements of each of the two lateral assemblies of the frame.

[0038] When the grandstand is in the configuration of use, two trusses are aligned parallel to each other at a mutual distance substantially equal to the length of the horizontal seating and walking boards, the latter resting on the extrados of the first horizontal bars of each frame.

[0039] In the transport configuration, each of the fan-shaped truss is folded back on itself, completely retracting within its respective shell, which is then closed to be easily transported together with the different seating boards.

[0040] To further improve the lateral stability of the grandstand when it is disposed in the open configuration of use, bracings may be provided to counteract transverse actions. Preferably, such bracings connect the two upper half-shells of each truss, for example bracings connect the upper end of each upper half-shell with the lower

end of the other upper half-shell.

[0041] The grandstand described above constitutes a unitary module that can be used alone or can be used by joining it to other modules of the same type, to form modular composite grandstands of greater length, when it is necessary to accommodate a large number of spectators.

[0042] For example, a composite modular grandstand can be set up using three trusses placed side by side parallel to each other at a mutual distance dictated by the length of the horizontal boards; in this configuration a first set of horizontal boards rests on the first and second trusses, while a corresponding second set of horizontal boards rests on the second and third trusses.

[0043] The present invention makes it possible to construct grandstands with a greater number of tiers, simply by placing a second grandstand behind a first grandstand and at an elevation such that the base level of the second grandstand is at an elevation close to the top level of the first grandstand.

Brief description of the drawings

[0044]

Fig. 1 shows a perspective view of a truss (1) of the grandstand subject of the present invention, in the open configuration of use with the movable frame (4) fully unfolded outside the shell (3). Shown therein are the two lateral groups (5), the main pivoting arms (6), the struts (7), the first bars (8), the second bars (9), the transverse shafts (71), and the beams (12) constituting the frame (4). Also visible are the wheels (10) pivoting around a vertical axis and the feet (11) for ground support. Also shown are the lower half-shell (31) and upper half-shell (32) of the shell (3); in the figure, the front portion (321) of the upper half-shell (32) is separated from its rear portion (322).

Fig. 2 shows a side view of the truss (1) shown in Figure 1 in the fully open use configuration.

Fig. 3 shows a side view of the truss (1) in a partially open configuration, intermediate between the closed configuration and the configuration of use; the front portion (321) of the upper half shell (32) is connected to the respective rear portion (322).

Fig. 4 shows a side view of the partially closed truss (1), with the front portion (321) of the upper half shell (32) connected to the respective rear portion (322).

Fig. 5 shows a side view of the truss (1) in the closed transport or storage configuration.

Fig. 6 shows a perspective view of the grandstand object of the present invention in the fully open configuration of use, there are shown two trusses (1) and horizontal boards (2). The bracings (13) are also visible.

Fig. 7 shows a perspective view of a composite modular grandstand obtained by joining two unitary modules, comprising three trusses (1) placed side by side in parallel and two sets of horizontal boards (2).

Fig. 8 shows a perspective view of a composite modular grandstand formed by three unitary modules arranged in an arch shape and connected by horizontal connecting boards.

Fig. 9 shows a sequence of six images illustrating the opening procedure of said truss (1).

Fig. 10 shows a higher solution with more steps, obtained by combining two grandstands. In particular, extendable supports (15) are shown, also enclosed in a shell and therefore easily transportable, which are used to raise the grandstand on the back.

Fig. 11 shows a perspective view of one of said extendable supports (15).

Fig. 12 shows a sequence of six images illustrating the opening procedure of said extendable supports (15).

Detailed description of an embodiment of the invention

[0045] The convertible modular grandstand subject of the present invention includes a plurality of boards (2) and at least two trusses (1), the trusses passing from a closed compact storage or transportation configuration to an open fan-shaped configuration.

[0046] In the open configuration of use, each of the two trusses (1) supports the intrados of a respective end of each of said boards (2), the latter are arranged horizontally on the trusses (1) at a progressively increasing height from the ground, thus creating various seating and walking surfaces for the public.

[0047] In the present patent text, the terms "intrados" and "extrados" mean respectively the lower portion and the upper portion of a structure not necessarily in the form of an arch or vault.

[0048] Each truss (1) comprises an openable shell (3) and a movable frame (4), the latter moving from the closed transport configuration, in which it is entirely housed within the respective closed shell (3), to the open use configuration, in which it is completely unfolded outside said open shell (3), forming a stepped structure that develops vertically and on which the respective ends of said boards (2) rest. The openable shell (3) is conformed as an elongated box body and comprises a lower half-shell (31) and an upper half-shell (32) rotationally interconnected at their respective rear ends.

[0049] In the embodiment described herein and depicted in the figures, the upper half-shell (32) includes a front portion (321) and a rear portion (322) that are reversibly interconnected and mutually movable. The rear portion (322) of the upper half-shell (32) is rotationally connected to the lower half-shell (31); the front portion (321) of the upper half-shell (32) is reversibly connected to the rear portion (322) of the same half-shell (32) by means of connection of known type, such as, for example, releasable hinges.

[0050] Each movable frame (4) of each truss (1) com-

prises two lateral groups (5), a plurality of struts (7), first bars (8) and second bars (9). The two lateral groups (5) respectively lie in two parallel vertical planes, each lateral group (5) comprises one or more main pivot arms (6). In the embodiment shown in the figures, each side group (5) consists of three pivoting arms (6).

[0051] The proximal end of each pivoting arm (6) is rotationally connected to a circular sector-shaped plate located at the rear end of the lower half-shell (31).

[0052] The respective distal ends of the first and third pivoting arms (6) are rotationally connected, by means of struts (7), respectively to the lower half-shell (31) and to the rear portion (322) of the upper half-shell (32). Said distal ends are also connected, by means of further struts (7) to the distal end of the second pivoting arm (6), which is located in an intermediate position between the first and third pivoting arms (6).

[0053] The connections between each strut (7) and the corresponding pivoting arm (6) are such as to permit both mutual rotation and relative sliding. In the embodiment shown in the figures, these connections are made by means of elongated slots (61), defined on each pivoting arm (6), in which the end pins of the transverse shafts (71) are engaged, to which the ends of the struts (7) are also rotationally coupled.

[0054] A first bar (8) and a second bar (9) are also provided for each strut (7), each of which is rotationally coupled at one end to a respective shaft (71); the respective second ends of each first (8) and second (9) bar are rotationally connected to each other.

[0055] As shown in the figures, when the grandstand is placed in the open configuration each pair of bars (8,9) and the corresponding strut (7) form a triangular structure, with the second bar (9) arranged vertically and the first bar (8) arranged horizontally, so as to support one end of a board (2) .

[0056] According to a simple and economical embodiment, in correspondence of both ends, the boards (2) have a transversal recess at the bottom, in which a corresponding first bar (8) is engaged when the grandstand is in the configuration of use, so that any transversal movement of the board (2) with respect to the truss (1) is prevented by the coupling with interference between the recesses of the boards and the bars.

[0057] In order to contrast possible transversal forces and increase the lateral rigidity of the grandstand, each of the elements of the first frame (4) is further connected, through one or more beams (12), to a corresponding element of the second frame (4).

[0058] A particularly convenient embodiment for transporting the grandstand easily when it is in the closed configuration, includes at least two pairs of wheels (10) with a horizontal axis, pivoting around its vertical axis and projecting below from the upper half-shell (32). In the closed transport configuration, the wheels rest on the ground and the closed grandstand can be easily moved by letting it roll on such wheels (10). The grandstand shown in the attached figures comprises two pairs of wheels (10), respectively protruding from each side face of the front portion (321) and the rear portion (322) of said upper half shell (32).

[0059] The embodiment of the grandstand shown in the figures also includes height-adjustable ground support feet (11), which can be used to adjust the inclination of the grandstand when it is placed in the use configuration, compensating for any slope or unevenness of the ground. These feet (11) protrude from the lower half of the shell (31).

[0060] To further reinforce the tribune against possible lateral stresses, bracings (13) are provided that connect two different trusses (1) to each other. An effective solution involves the use of two crossed bracings (13), so that each one connects the upper end of the rear portion (322) of the upper half shell (32) of one truss (1) with the lower end of the rear portion (322) of the upper half shell (32) of the other truss (1).

[0061] Figure 7 shows two grandstands side-by-side to form a composite grandstand of greater length; in this configuration, a first set of horizontal boards (2) rests on the first and second trusses (1), while a corresponding second set of horizontal boards (2) rests on the second and third trusses (1).

[0062] In some embodiments, from the upper extrados of the front portion of each board (2) protrudes a seat comprising, for example, a cushion or a padded support layer to make it more comfortable for people to sit; in this case the rear portion of each board (2) is used as a walking surface.

Claims

1. A modular grandstand convertible between a closed configuration for storage or transport and an open configuration for use, comprising a plurality of boards (2) and at least two trusses (1), said trusses being openable between said closed configuration, in which all said trusses are folded in a compact conformation, and said open configuration in which all said trusses are unfolded in a vertical plane similarly to a folding fan; each truss (1) comprising a movable frame (4) consisting of a set of rods, each of which is interconnected with at least one other rod by means of connection means allowing their rotation about a horizontal axis and/or their reciprocal sliding, so that during the unfolding of each of said trusses, the respective movable frame (4) is also unfolded, the latter, passing from said closed configuration for transport to said open configuration for use, forms a tiered structure, on each step of which rests one end of said boards (2) arranged horizontally at increasing heights from the ground, **characterized in that** each of said trusses (1) comprises an openable shell (3) interconnected with at least a part of said rods of said movable frame (4) by means of connecting means allowing their rotation about a horizontal axis

and/or their reciprocal sliding, so that when said movable frame (4) is in said closed configuration for transport it is entirely housed inside its respective closed shell (3), while when said movable frame (4) is in said open configuration for use it is entirely unfolded outside its respective open shell (3); said openable shell (3) being conformed as an elongated box body comprising a lower half-shell (31) and an upper half-shell (32), the latter being rotationally connected by one of its ends to a corresponding end of said lower half-shell (31).

2. Modular grandstand according to the previous claim **characterized in that** said upper half shell (32) comprises a front portion (321) and a rear portion (322) interconnected and mutually movable, said rear portion (322) being rotationally connected to a corresponding rear end of said lower half shell (31).

3. Modular grandstand according to any one of the previous claims **characterized in that** each of said movable frames (4) comprises

- two lateral groups (5) lying on two parallel vertical planes, each of said lateral groups (5) being constituted by one or more main pivoting arms (6) which fan out and are hinged in correspondence to the rear end of said lower shell (31);
- two struts (7) which rotationally connect the distal ends of the first and last pivoting arms (6) of each side group (5) respectively with the lower half-shell (31) and the upper half-shell (32);
- at least two further struts (7) connecting the distal ends of two successive pivoting arms (3) by means of connecting means which allow rotation and sliding of said struts (7) with respect to said pivoting arms (6);
- for each of said struts (7), a first (8) and a second bar (9) rotationally connected to each other at one respective end and with the other end rotationally connected to the respective ends of said strut (7);

so that when said grandstand is placed in said open configuration, each pair of two bars (8,9) and the corresponding strut (7) form a triangular structure, with the second bar (9) placed vertically and the first bar (8) placed horizontally so as to support the intrados of a board (2).

4. Modular grandstand according to any one of the previous claims **characterized in that** said shell (3) comprises a plurality of wheels (10) having a horizontal axis, pivoting about their own vertical axis, protruding below from said upper half-shell (32) .

5. Modular grandstand according to any one of the previous claims **characterized in that** said shell (3) comprises height-adjustable feet (11) for ground support, protruding below from said lower half shell (31).

6. Modular grandstand according to any one of previous claims 3 to 5 **characterized in that** it comprises one or more beam (12) laterally connecting two corresponding elements of each side group (5) of each frame (4).

7. Modular grandstand according to any one of previous claims **characterized in that** it comprises at least one bracing (13) whose ends are respectively connected to two different trusses (1).

8. Modular grandstand according to any one of previous claims **characterized in that** one or more seats protrude above from the front portion of each of said boards (2).

Patentansprüche

1. Modulare Tribüne, die zwischen einer geschlossenen Konfiguration für die Lagerung oder den Transport und einer offenen Konfiguration für die Verwendung umbaubar ist und eine Vielzahl von Platten (2) und mindestens zwei Traversen (1) umfasst, wobei die Traversen zwischen der geschlossenen Konfiguration, in der alle Traversen in einer kompakten Form gefaltet sind, und der offenen Konfiguration, in der alle Traversen in einer vertikalen Ebene ähnlich wie ein faltbarer Fächer entfaltet sind, geöffnet werden können; jede Traverse (1) einen beweglichen Rahmen (4) umfasst, der aus einem Satz von Stangen besteht, von denen jede mit mindestens einer anderen Stange mittels Verbindungselementen verbunden ist, die ihre Drehung um eine horizontale Achse und / oder ihre gegenseitige Verschiebung ermöglichen, so dass beim Entfalten jeder der Traversen der jeweilige bewegliche Rahmen (4) ebenfalls entfaltet wird, wobei letzterer, wenn er von der geschlossenen Konfiguration für den Transport in die offene Konfiguration für die Verwendung übergeht, eine gestufte Struktur bildet, wobei auf jeder Stufe ein Ende der horizontal in zunehmender Höhe vom Boden angeordneten Platten (2) ruht, **dadurch gekennzeichnet, dass** jede der Traversen (1) eine zu öffnende Schale (3) umfasst, die mit mindestens einem Teil der Stangen des beweglichen Rahmens (4) mittels Verbindungselementen verbunden ist, die ihre Drehung um eine horizontale Achse und / oder ihre gegenseitige Verschiebung ermöglichen, so dass der bewegliche Rahmen (4), wenn er sich in der geschlossenen Konfiguration für den Transport befindet, vollständig im Inneren seiner jeweiligen geschlossenen Schale (3) untergebracht ist, während der bewegliche Rahmen (4), wenn er sich in der of-

fenen Konfiguration für die Verwendung befindet, vollständig außerhalb seiner jeweiligen offenen Schale (3) ausgeklappt ist; wobei die zu öffnende Schale (3) als länglicher Kastenkörper geformt ist, der aus einer unteren Halbschale (31) und einer oberen Halbschale (32) besteht, wobei die letztere mit einem ihrer Enden drehfest mit einem entsprechenden Ende der unteren Halbschale (31) verbunden ist.

2. Modulare Tribüne nach dem vorhergehenden Anspruch, **dadurch gekennzeichnet, dass** die obere Halbschale (32) einen vorderen Abschnitt (321) und einen hinteren Abschnitt (322) umfasst, die miteinander verbunden und gegenseitig beweglich sind, wobei der hintere Abschnitt (322) drehbar mit einem entsprechenden hinteren Ende der unteren Halbschale (31) verbunden ist.

3. Modulare Tribüne nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** jeder der beweglichen Rahmen (4) umfasst:

- zwei seitliche Gruppen (5), die auf zwei parallelen vertikalen Ebenen liegen, wobei jede der seitlichen Gruppen (5) aus einem oder mehreren Hauptschwenkarmen (6) besteht, die sich auffächern und in entsprechend mit dem hinteren Ende der genannten unteren Schale (31) angelenkt sind;
- zwei Streben (7), die die distalen Enden des ersten und des letzten Schwenkarms (6) jeder seitlichen Gruppe (5) drehbar mit der unteren Halbschale (31) bzw. der oberen Halbschale (32) verbinden;
- mindestens zwei weitere Streben (7), die die distalen Enden von zwei aufeinanderfolgenden Schwenkarmen (3) mit Hilfe von Verbindungselementen verbinden, die eine Drehung und ein Gleiten der Streben (7) in Bezug auf die Schwenkarme (6) ermöglichen;
- für jede der Streben (7) eine erste (8) und eine zweite Stange (9), die an einem jeweiligen Ende drehbar miteinander verbunden sind, wobei das andere Ende drehbar mit den jeweiligen Enden der Strebe (7) verbunden ist;

so dass, wenn die Tribüne in der offenen Konfiguration aufgestellt ist, jedes Paar von zwei Stangen (8, 9) und die entsprechende Strebe (7) eine dreieckige Struktur bilden, wobei die zweite Stange (9) vertikal und die erste Stange (8) horizontal platziert ist, um die Innenseite einer Platte (2) zu stützen.

4. Modulare Tribüne nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die genannte Schale (3) eine Vielzahl von Rädern (10) mit einer horizontalen Achse umfasst, die um ihre eigene vertikale Achse drehen und unten aus der oberen Halbschale (32) herausragen.

5. Modulare Tribüne nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die genannte Schale (3) über höhenverstellbare Füße (11) zur Bodenabstützung verfügt, die von der unteren Halbschale (31) nach unten ragen.

6. Modulare Tribüne nach einem der vorhergehenden Ansprüche 3 bis 5, **dadurch gekennzeichnet, dass** sie einen oder mehrere Träger (12) umfasst, die zwei entsprechende Elemente jeder seitlichen Gruppen (5) jedes Rahmens (4) seitlich verbinden.

7. Modulare Tribüne nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** sie mindestens eine Verstrebung (13) umfasst, deren Enden jeweils mit zwei verschiedenen Traversen (1) verbunden sind.

8. Modulare Tribüne nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** ein oder mehrere Sitze oben aus dem vorderen Teil jeder der Platten (2) herausragen.

Revendications

1. Une tribune modulaire convertible entre une configuration fermée pour le stockage ou le transport et une configuration ouverte pour utilisation, comprenant une pluralité de planches (2) et au moins deux fermes (1), lesdites fermes étant ouvrables entre ladite configuration fermée, dans laquelle toutes lesdites fermes sont repliées en une conformation compacte, et ladite configuration ouverte dans laquelle toutes lesdites fermes sont dépliées dans un plan vertical semblable à un éventail; chaque ferme (1) comprenant un cadre mobile (4) constitué d'un ensemble de tiges, chacune étant interconnectée avec au moins une autre tige au moyen de dispositifs de connexion permettant leur rotation autour d'un axe horizontal et/ou leur glissement réciproque, de sorte que lors du déploiement de chacune desdites fermes, le cadre mobile respectif (4) est également déplié, ce dernier, passant de ladite configuration fermée pour le transport à ladite configuration ouverte pour utilisation, forme une structure en gradins, sur chaque marche de laquelle repose une extrémité desdites planches (2) disposées horizontalement à des hauteurs croissantes par rapport au sol, **caractérisée en ce que** chaque ferme (1) comprend une coque ouvrable (3) interconnectée avec au moins une partie desdites tiges dudit cadre mobile (4) au moyen de dispositifs de connexion permettant leur rotation autour d'un axe horizontal et/ou leur glissement réciproque, de sorte que lorsque ledit cadre mobile (4) est dans ladite configuration fermée pour

le transport, il est entièrement logé à l'intérieur de sa coque fermée respective (3), tandis que lorsque ledit cadre mobile (4) est dans ladite configuration ouverte pour utilisation, il est entièrement déployé à l'extérieur de sa coque ouverte respective (3) ; ladite coque ouvrable (3) étant conçue comme un corps de boîte allongé comprenant une demi-coque inférieure (31) et une demi-coque supérieure (32), cette dernière étant reliée en rotation par l'une de ses extrémités à une extrémité correspondante de ladite demi-coque inférieure (31).

2. Tribune modulaire selon la revendication précédente, **caractérisée en ce que** ladite demi-coque supérieure (32) comprend une partie avant (321) et une partie arrière (322) interconnectées et mutuellement mobiles, ladite partie arrière (322) étant reliée en rotation à une extrémité arrière correspondante de ladite demi-coque inférieure (31).

3. Tribune modulaire selon l'une quelconque des revendications précédentes, **caractérisée en ce que** chaque cadre mobile (4) comprend

- deux groupes latéraux (5) reposant sur deux plans verticaux parallèles, chacun desdits groupes latéraux (5) étant constitué par un ou plusieurs bras pivotants principaux (6) qui se déploient en éventail et sont articulés à l'extrémité arrière de ladite demi-coque inférieure (31);
- deux entretoises (7) qui relient en rotation les extrémités distales des premiers et derniers bras pivotants (6) de chaque groupe latéral (5) respectivement à la demi-coque inférieure (31) et à la demi-coque supérieure (32);
- au moins deux autres entretoises (7) reliant les extrémités distales de deux bras pivotants successifs (3) au moyen de dispositifs de connexion permettant la rotation et le glissement desdites entretoises (7) par rapport à ces bras pivotants (6);
- pour chacune de ces entretoises (7), une première (8) et une seconde barre (9) reliées en rotation l'une à l'autre à une extrémité respective et dont l'autre extrémité est reliée en rotation aux extrémités respectives de ladite entretoise (7);

de sorte que lorsque ladite tribune est placée dans ladite configuration ouverte, chaque paire de deux barres (8,9) et l'entretoise correspondante (7) forment une structure triangulaire, avec la seconde barre (9) placée verticalement et la première barre (8) placée horizontalement de manière à soutenir l'intrados d'une planche (2).

4. Tribune modulaire selon l'une quelconque des revendications précédentes, **caractérisée en ce que** ladite coque (3) comprend une pluralité de roues (10) ayant un axe horizontal, pivotant autour de leur propre axe vertical, faisant saillie en dessous de ladite demi-coque supérieure (32) .

5. Tribune modulaire selon l'une quelconque des revendications précédentes, **caractérisée en ce que** ladite coque (3) comprend des pieds réglables en hauteur (11) pour le support au sol, faisant saillie en dessous de ladite demi-coque inférieure (31).

6. Tribune modulaire selon l'une quelconque des revendications 3 à 5, **caractérisée en ce qu'**elle comprend une ou plusieurs poutres (12) reliant latéralement deux éléments correspondants de chaque groupe latéral (5) de chaque cadre (4).

7. Tribune modulaire selon l'une quelconque des revendications précédentes, **caractérisée en ce qu'**elle comprend au moins un hauban (13) dont les extrémités sont respectivement reliées à deux fermes (1) différentes.

8. Tribune modulaire selon l'une quelconque des revendications précédentes, **caractérisée en ce qu'**un ou plusieurs sièges font saillie au-dessus de la partie avant de chacune desdites planches (2).

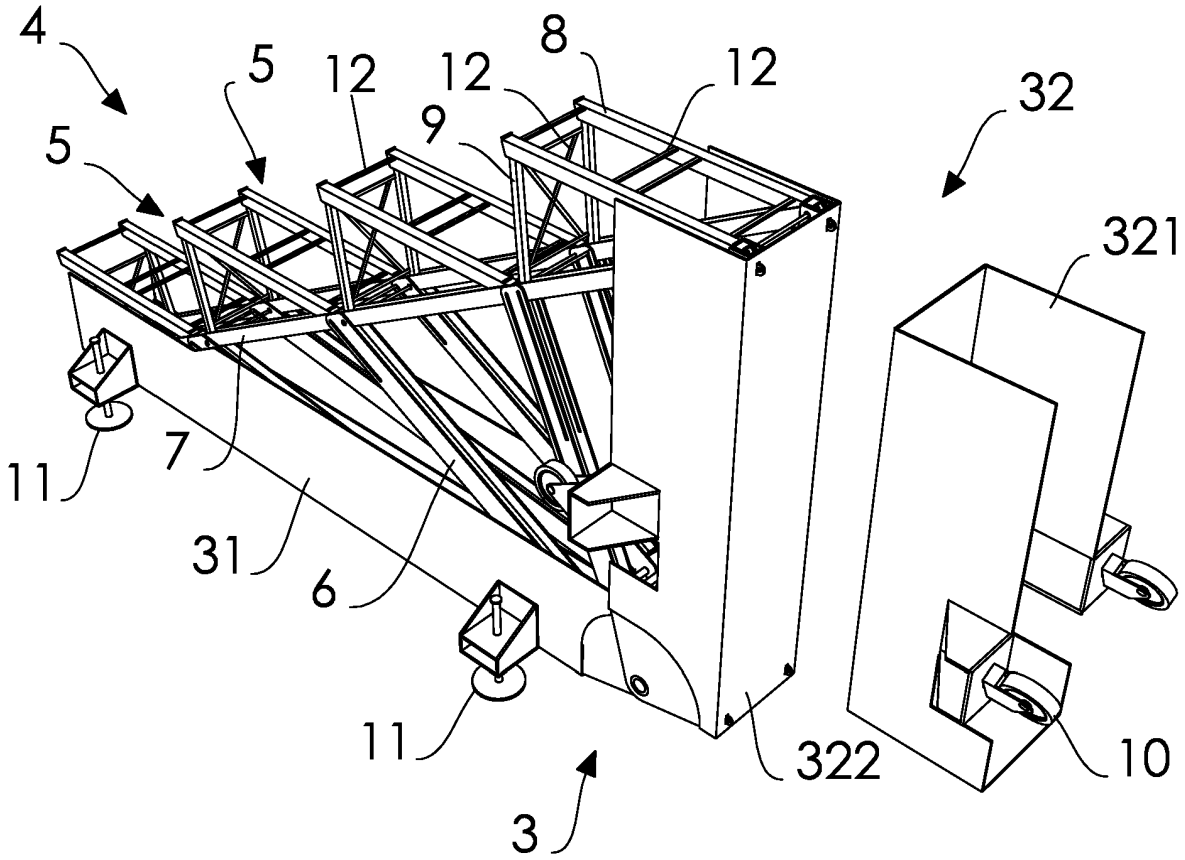
4
5
5
12
12
8
12
9
32
321
11
7
31
6
11
322
10
3

FIG. 1

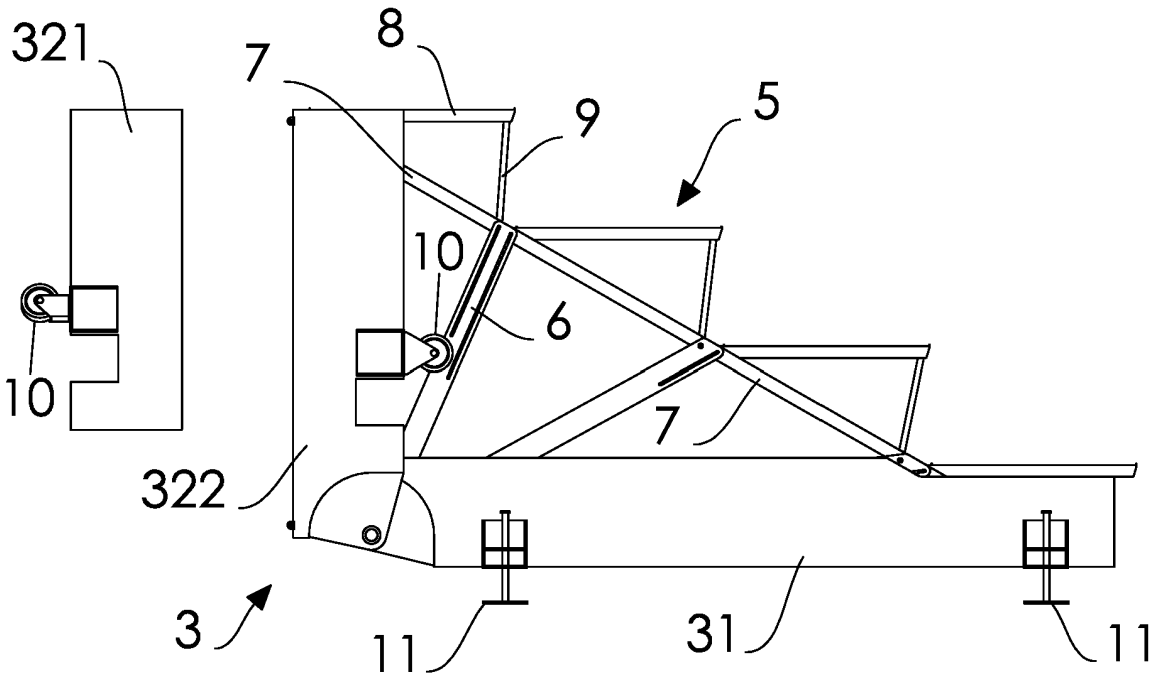
321
7
8
9
5
10
6
10
7
322
3
11
31
11

FIG. 2

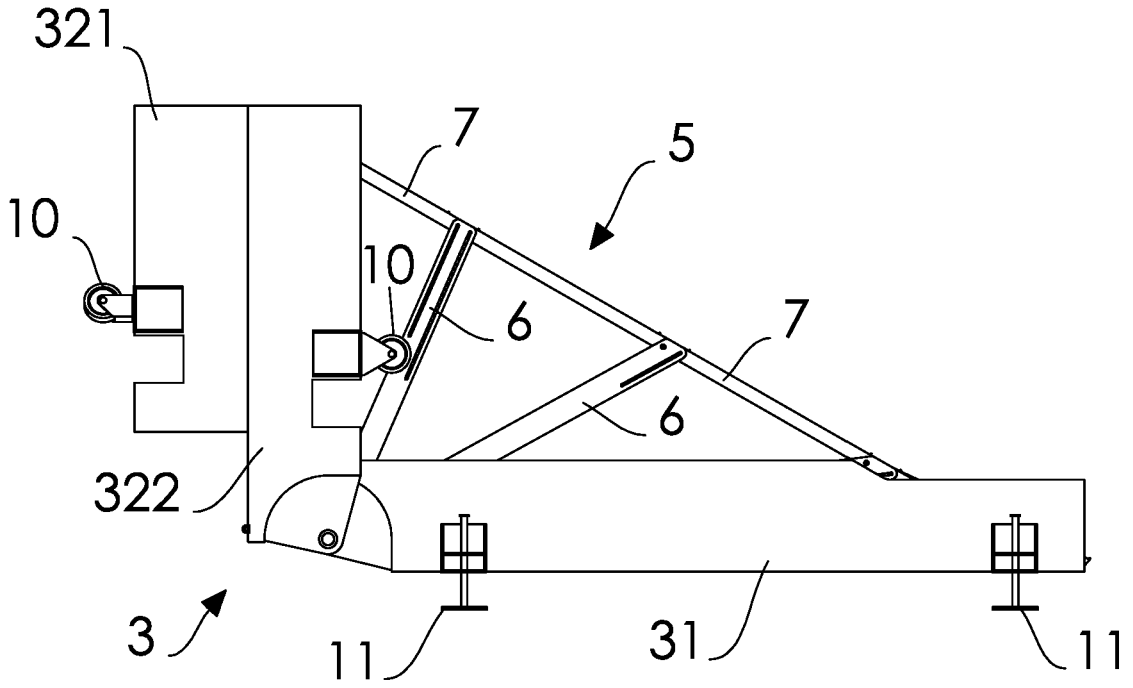

FIG. 3

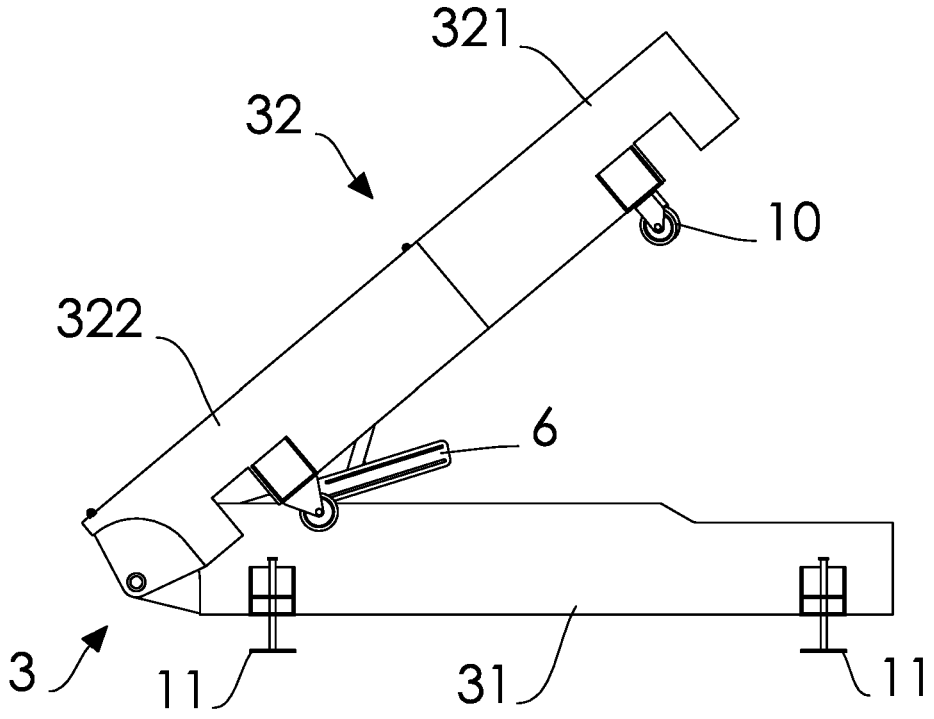

FIG. 4

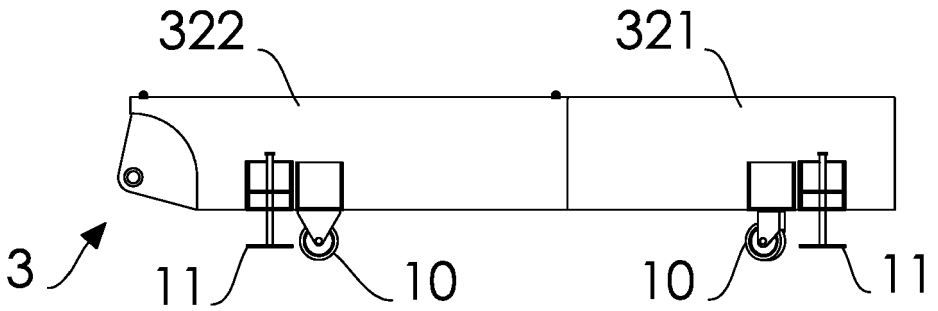

FIG. 5

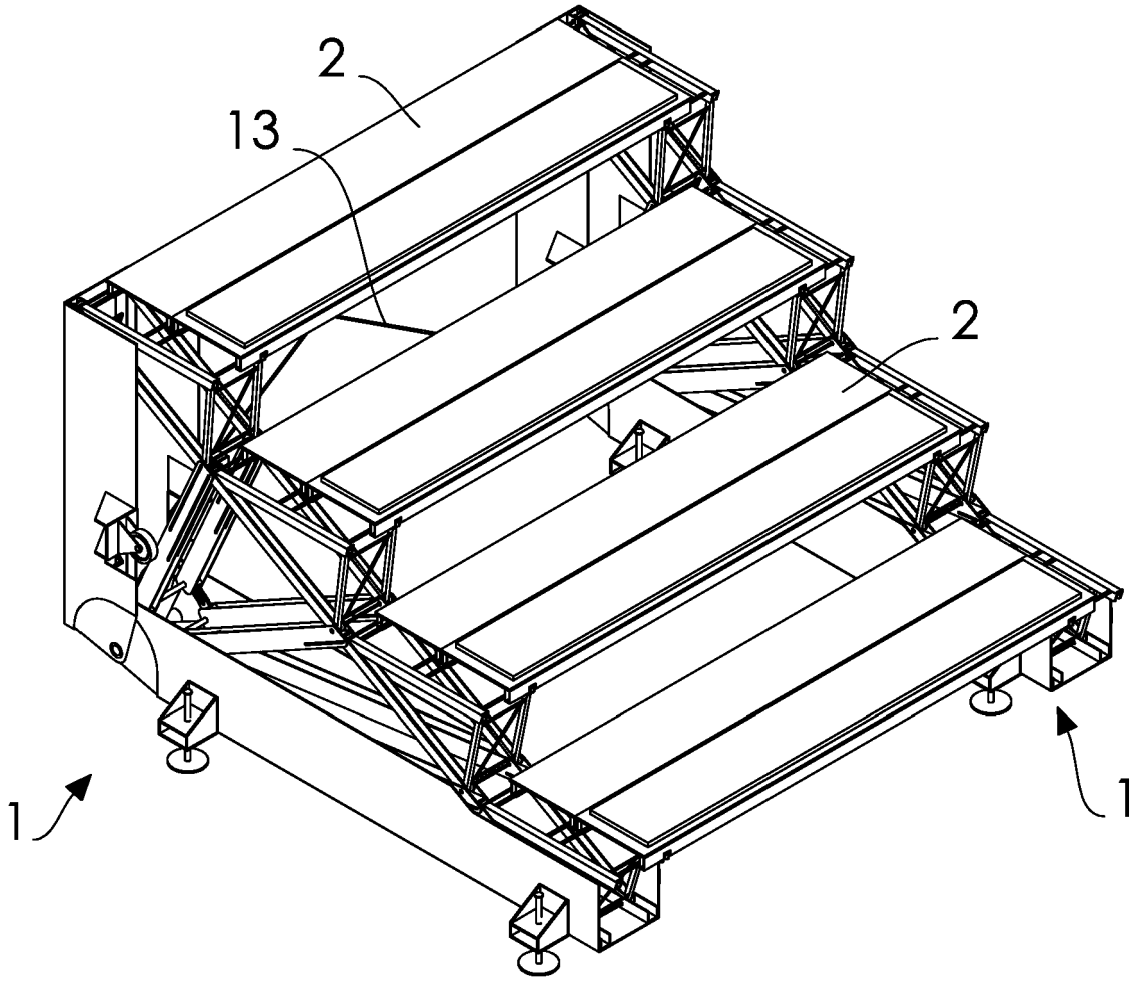

FIG. 6

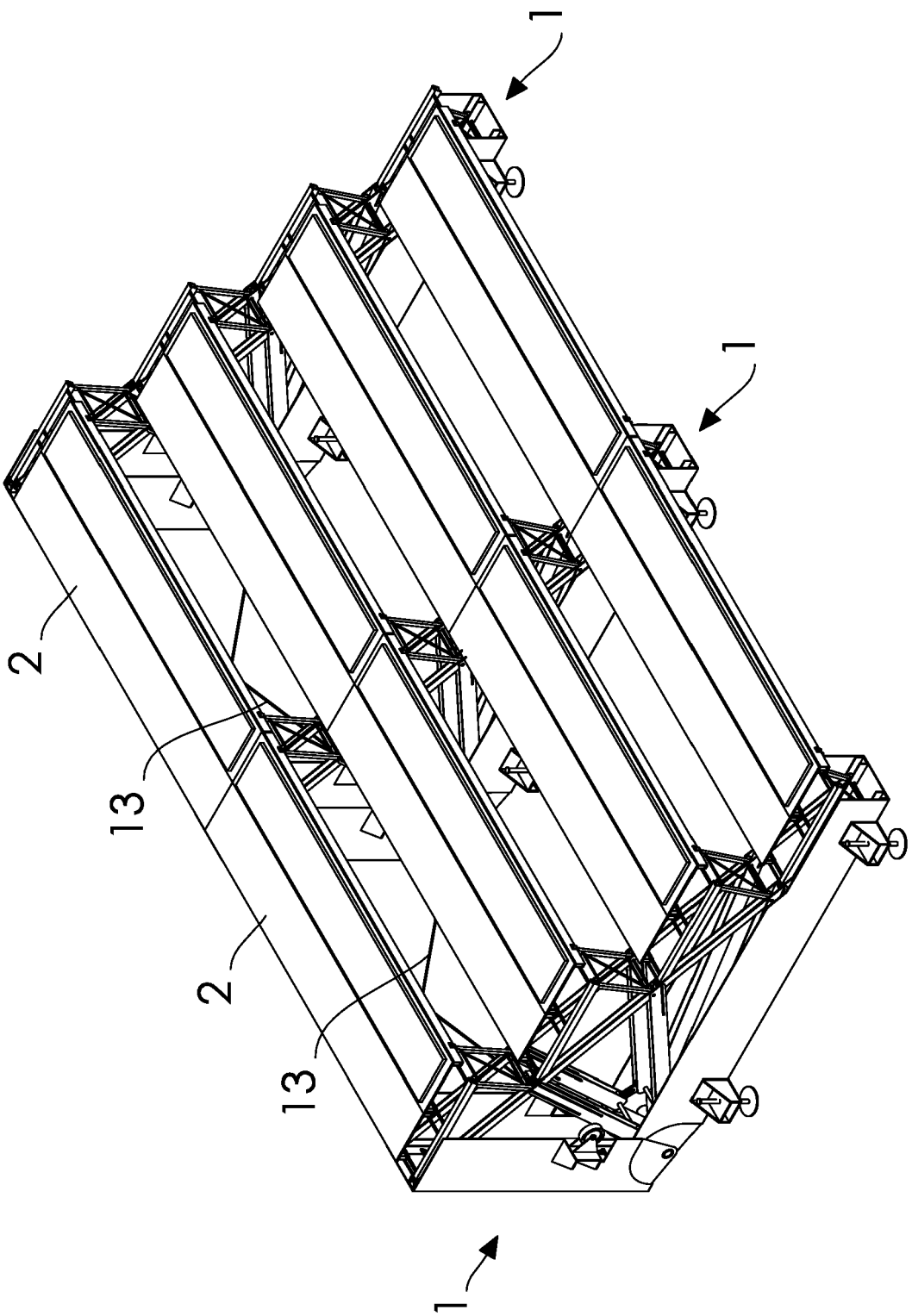

FIG. 7

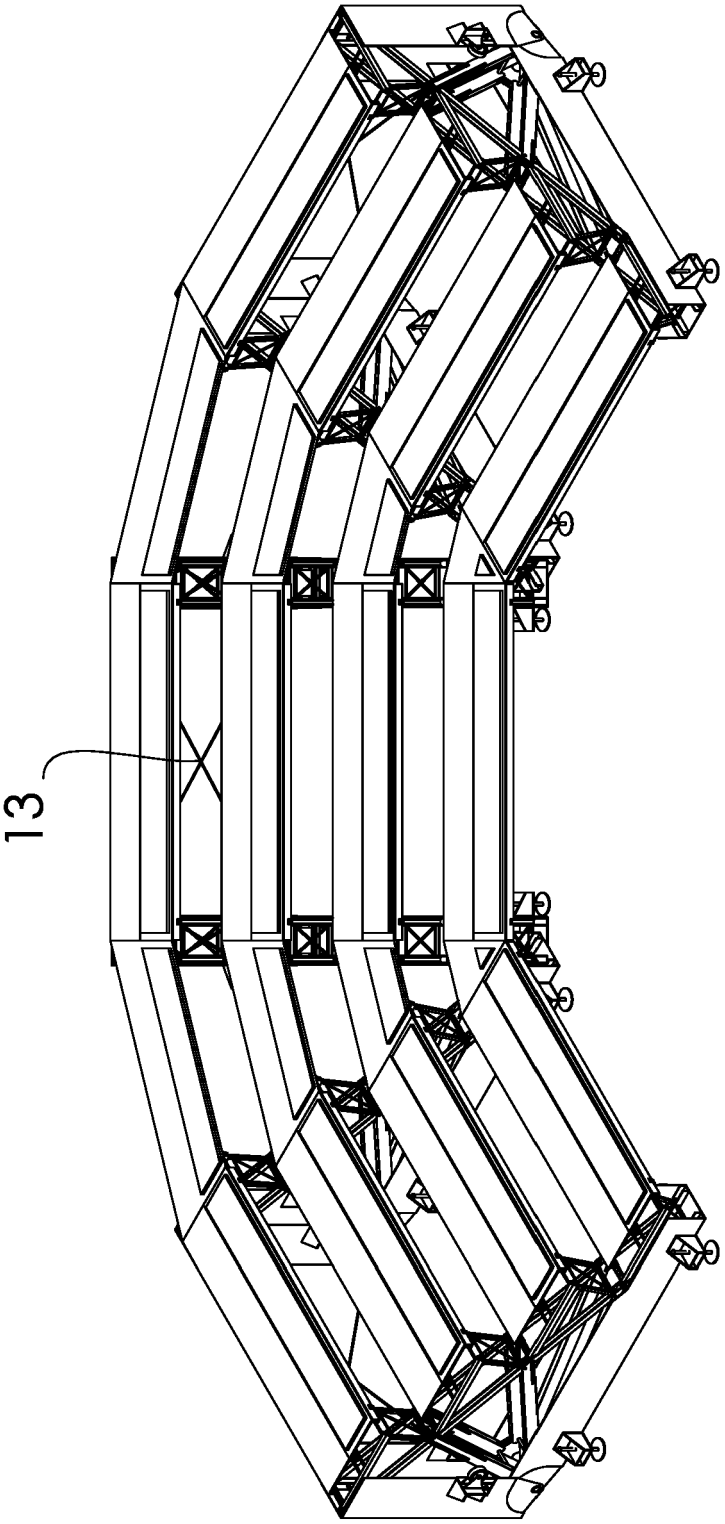

FIG. 8

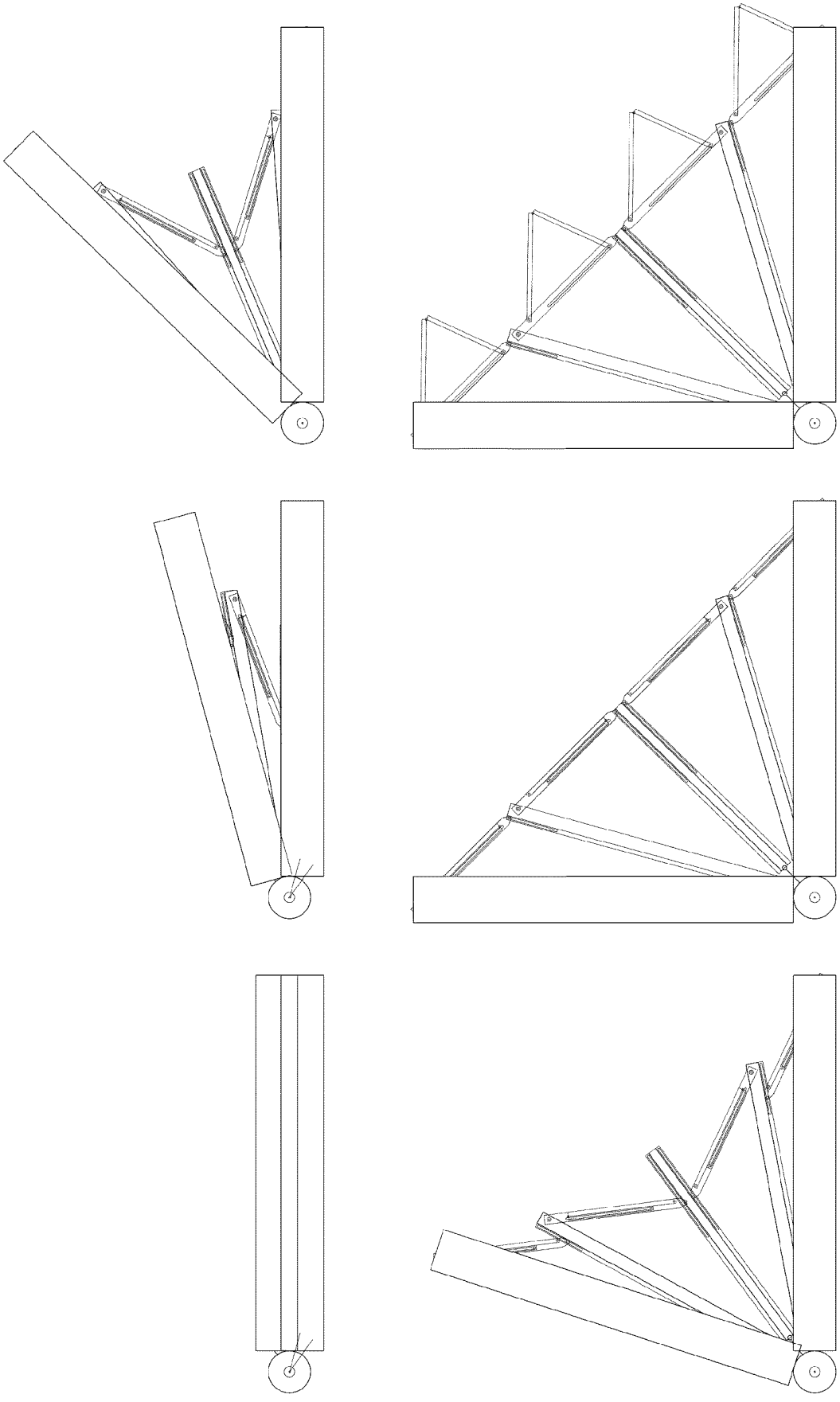

FIG. 9

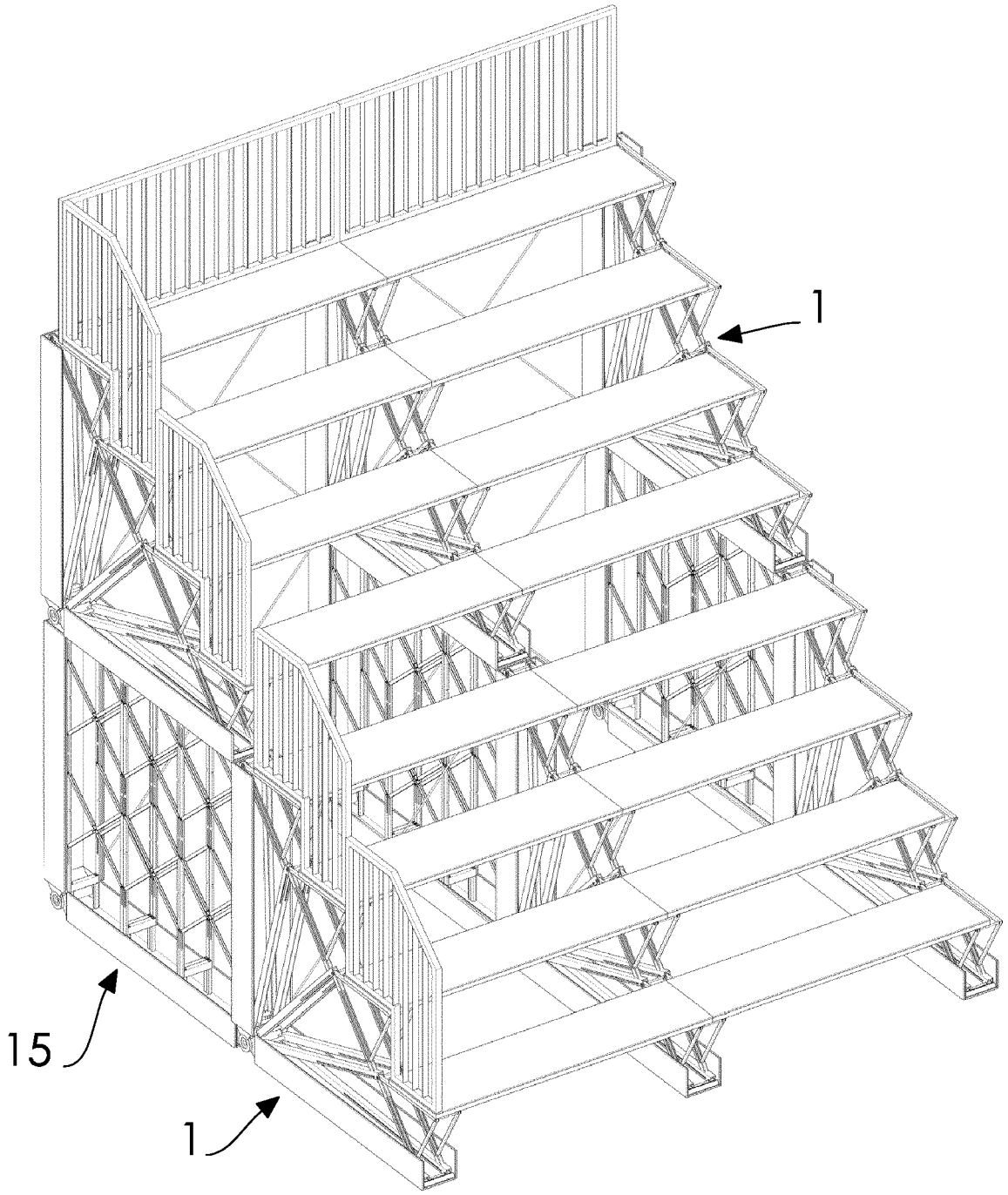

FIG. 10

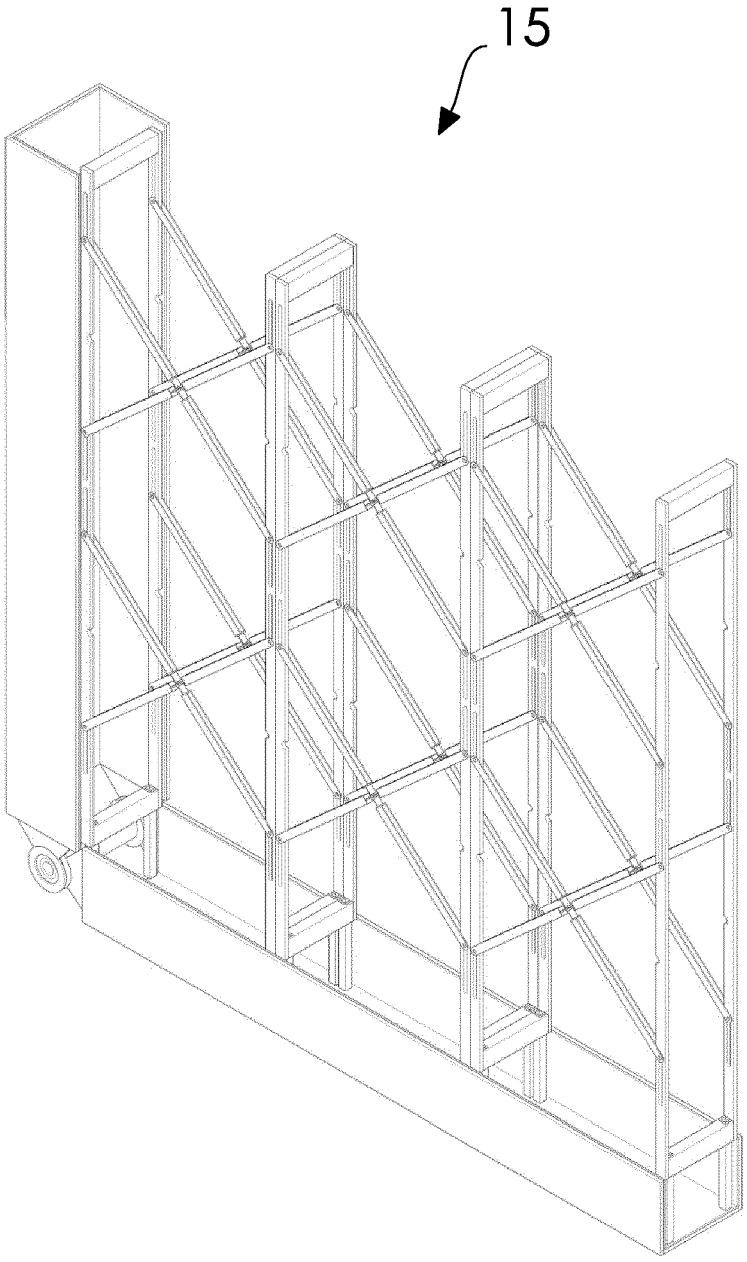

FIG. 11

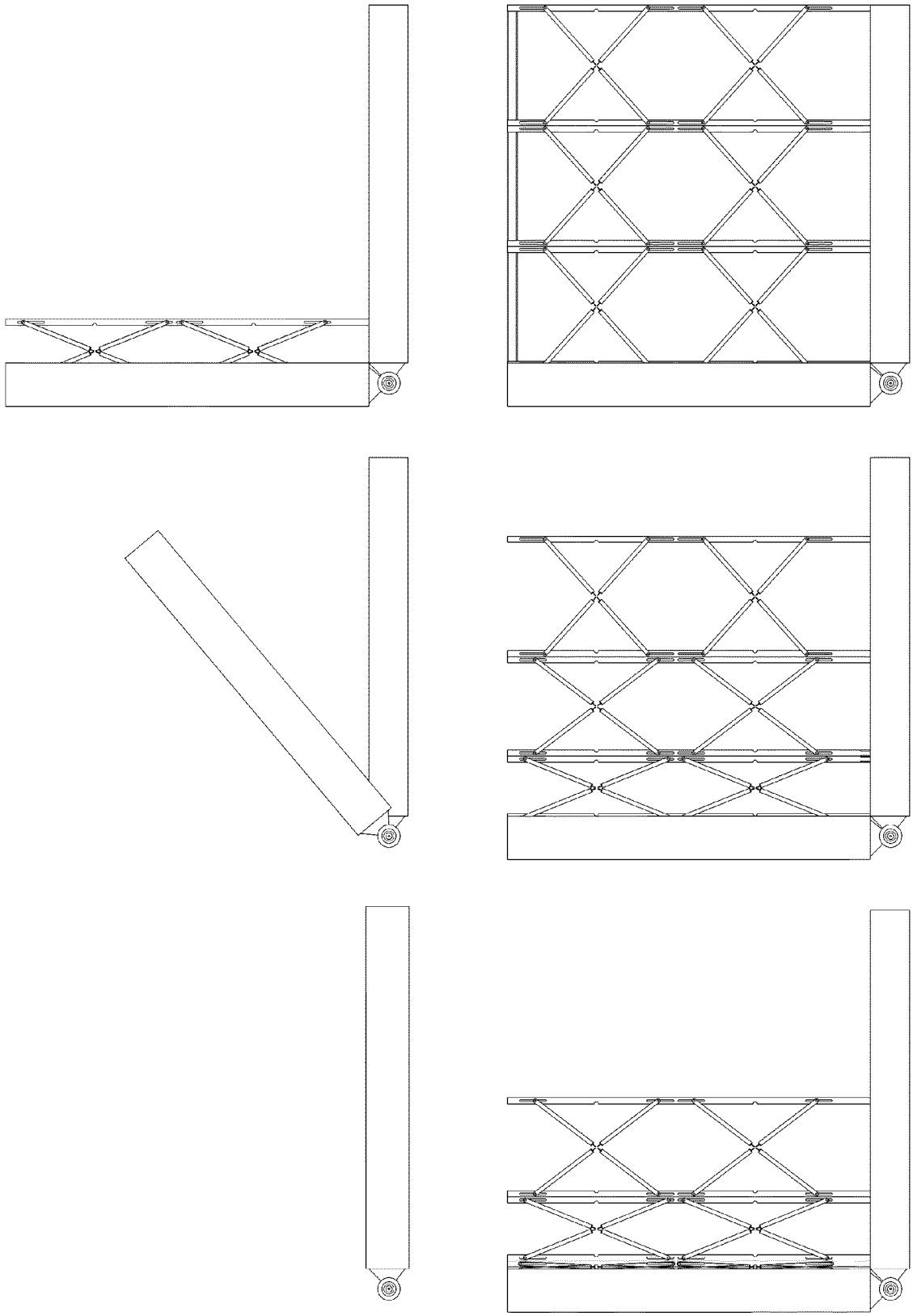

FIG. 12

REFERENCES CITED IN THE DESCRIPTION

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