(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
20 October 2011 (20.10.2011)

PCT

(10) International Publication Number
WO 2011/128769 A2

(51) International Patent Classification:
E04H 12/18 (2006.01) *E04B 1/34* (2006.01)
E04B 1/344 (2006.01)

(21) International Application Number:
PCT/IB2011/000836

(22) International Filing Date:
15 April 2011 (15.04.2011)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/324,836 16 April 2010 (16.04.2010) US

(72) Inventor; and
(71) Applicant : **GRAF FERNANDEZ, Rodrigo** [MX/MX]; Bosque de Ciruelos No. 227, Colonia Bosques de las Lomas, México, D.F. 11700 (MX).

(74) Agent: **PANAMERICANA DE PATENTES Y MARCAS, S.C.**; Avenida Revolución No. 1392, 2° Piso, Colonia Guadalupe Inn, México, D.F. 01020 (MX).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *without international search report and to be republished upon receipt of that report (Rule 48.2(g))*

(54) Title: FOLDABLE STRUCTURES FOR A CONSTRUCTION

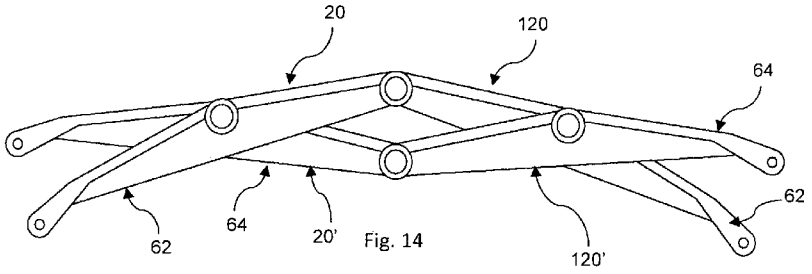


Fig. 14

(57) Abstract: A roof, ceiling, dome, bridge, tunnel or similar structure for a construction, a system and method thereof, the structure configured to move between a folded position and an extended position, the structure comprising a folding structure unit with a first end and a second end, the first end being co-lineal with the second end when the structure is in an extended position, a first coupling and folding device between the first end and the second end, an actuating device connected from the first end to the second end, a first rod between the first end and the first coupling and folding device and a second rod between the second end and the first coupling and folding device, and wherein the actuating device and the coupling and folding device are configured to move the transportable and foldable structure from a folded position to an extended position and from an extended position to a folded position. A plurality of structures may be co-lineally connected between themselves. A plurality of structures may be connected in a parallel manner between themselves. A plurality of structures may be perpendicularly connected between themselves. Connection devices are also disclosed.

WO 2011/128769 A2

FOLDABLE STRUCTURES FOR A CONSTRUCTION

Field of the Invention

The present invention refers to foldable structures method/system for creating parts of a construction such as domes, roofs or similar for any building and/or tunnels and/or bridges for pedestrian and/or vehicle traffic, including the method/system for their transportation, assembly and an unfolding method to place the structure in the construction site.

Description of the Prior Art

Constructions systems and methods using prefabricated structures are known and desired in the art. Using prefabricated structures helps the builder save in costs and time and allows the building or construction to be ready to be used in less time.

Foldable and transportable roofs are known in the prior art. For example document CN201268965 discloses a mobile home with a foldable roofing, which comprises an integral floor structure, four wall bodies, two slanting roofs and two gables.

Publication US No. US2009014044 discloses a folding shed including a roof with a first roof section pivotally connected to a first sidewall and a second roof section pivotally connected to a second sidewall.

Publication No. JP2007170150 disclose a structure having the gable roof comprises: four wall surfaces formed by hinging both side edges of a front face constitutive body and a rear face constitutive body hinged through center columns, and both side edges of a pair of side face constitutive bodies facing each other; and the roof section formed by hinging a ridge part and the upper edges of a pair of inclined roof boards.

Furthermore, roof connections are also known in the art, for example publication No. US2009078297 discloses an automatic control device of foldable tent connecting to several roof strut sets consisting of several segments serially connected in radial; wherein, said control device is typically comprised of a central standing base containing a sliding hub, a spring and a tappet roller at inside.

Furthermore publication No. US2007131265 discloses a top frame of foldable tent including a set of foldable roof braces and a set of coordinated sub-braces constructing the main frame is typically employed with a hydraulic tappet

fixed between the static pivot hub pivoting all the sub-braces and spreader pivoting all the roof braces with both ends, by means of the jack-up and hold-on features of the hydraulic tappet, said spreader is pushed down and kept in the ultimate position to bring the entire roof braces q and sub-braces to expend out. Said structure has fewer parts, simple, convenient for manufacturing and combination features.

Brief Description of the Invention

The present invention refers to a transportable and foldable structure for building a construction, more specifically building roofs, ceilings, domes or similar or tunnels or bridge constructions for pedestrian and/or vehicle traffic, wherein both are placed between at least two elements of the construction. Specifically, the present invention refers to transportable, foldable and coupling structure units for building constructions, specifically roofs, domes, ceilings, tunnels or bridges for pedestrian and/or vehicle traffic, in which coupling and folding structure units are to be placed between two elements of the construction.

An element of the construction to which the coupling and folding structures are fixed is preferably a column or a base of the construction. The construction may be selected among any type of construction, such as cement, plywood, pvc, modified marine containers, mobile homes, or other building structures.

The transportable and foldable structure may be comprised by at least one coupling and folding structure unit.

If the transportable and foldable structure comprises one coupling and folding structure unit, the coupling and folding structure unit comprises at least a first fixing element, such as an anchor, which will fasten the folding structure unit to a first element of the construction, such as a column or base. The first fixing element may be alternately coupled to a further fixing element of a different coupling and folding structure unit by means of a fastening element or coupled to coupling and folding device of a different coupling and folding structure unit. The first fixing element is placed at a first end of the construction. Furthermore, the coupling and folding structure unit comprises at least a second fixing element in the opposite end of the coupling and folding structure unit

than the first fixing element, similar to the first fixing element, which will fasten the transportable and foldable structure to a second element of the construction, such as a second column or base to anchor the structure. Alternately, the second fixing element may be coupled to a further fixing element of a different coupling and folding structure unit by means of a fastening element or coupled to coupling and folding device of a different coupling and folding structure unit. The second fixing element is placed at a second end of the transportable and foldable structure, which is opposite to and may be co-lineal with the first end of the transportable and foldable structure. In between the first fixing element and the second fixing element at least one coupling and folding device is provided. In between the first fixing element and the coupling and folding device a first rod is provided. In between the coupling and folding device and the second fixing element a second rod is provided. Both rods are coupled with the coupling and folding device. Furthermore, both rods when fully extended are substantially co-lineal one to another. When the coupling and folding structure unit is fully extended a certain angle which is at least 90°, more preferably 140° and yet more preferably at least 160° may be present among

the lower face of the first rod and the lower face of the second rod. However, a 180° angle between the lower face of the first rod and the lower face of the second rod may be achieved. An actuating device, such as a rod, bolt, pin, screw, wire or thread, is attached from the first end of the transportable and foldable structure to the second end of the transportable and foldable structure. When actuated, the actuating device rotates the coupling and folding device so as to move the second rod in regards to the first rod, so that the second rod is in a substantially parallel position in regards to the first rod when in a folded position. The first rod may be fastened with regards to the coupling and folding device, while the second rod is movable with regards to the coupling and folding device. The movement of the second rod with regards to the coupling and folding device may be provided by means known in the art, such as a bearing.

The transportable and foldable structure may comprise two folding structure units. A second folding structure unit comprises a first fixing element, such as an anchor, which will fasten the transportable and foldable structure to a first element of the construction, such as a column or base. The second folding structure unit further comprises at least

two coupling and folding devices. A first coupling and folding device will fasten the second folding structure unit to a first folding structure unit of the construction. The first coupling and folding device is placed at a second end of the second folding structure unit, opposite to the first end. In between the first fixing element and the first coupling and folding device, a second coupling and folding device is provided. In between the first fixing element and the second coupling and folding device a first rod is provided. In between the second coupling and folding device and the first coupling and folding device a second rod is provided. Both rods are coupled with the second coupling and folding device. When both rods are fully extended, that is, when the second folding structure unit is fully extended, the first rod and the second rod are substantially co-lineal one to another. When fully extended, a certain angle which is at least 90°, more preferably 140° and yet more preferably 160° is present among the lower face of the first rod and the second rod. However, a 180° angle between the lower face of the first rod and the lower face of the second rod may be achieved. An actuating device, such as a rod, wire, bolt, pin, screw or thread, is attached from the first end of the first folding structure unit to the second end of

the first folding structure unit. When actuated, the actuating device rotates the second coupling and folding device so as to move the second rod in regards to the first rod, so that the second rod is in a substantially parallel position in regards to the first rod when in a folded position. The first rod may be fastened with regards to the second coupling and folding device, while the second rod is movable with regards to the second coupling and folding device. The movement of the second rod with regards to the folding device may be provided by means known in the art, such as a bearing. The first folding structure unit is built essentially in the same manner as when the transportable and foldable structure comprises one folding unit. The coupling between the first folding structure unit and the second folding structure unit is by means of the first coupling and folding device of the second folding structure unit and one of the two fixing elements of the first folding structure unit is carried by conventional means known in the art, such as threaded holes, bolts, pin, screw, wire or threads and nuts.

The transportable and foldable structure may comprise three or more folding structure units. The first and second folding structure units are formed in a similar manner to

the first folding structure unit disclosed for the one folding structure unit for the transportable and foldable structure. A third folding structure unit, which is placed in between the first and second folding structure units, comprises a first coupling and folding device at one end of the third folding structure unit, proximate to the first folding structure unit, which will fasten the third folding structure unit to the first folding structure unit by means of the first coupling and folding device of the third folding structure unit and by means of the second fixing element of the first folding structure unit. Furthermore, the third folding structure unit comprises a second coupling and folding device at a second end of the third folding structure unit, opposite to the first end of the third folding structure unit, which will fasten the third folding structure unit to the second folding structure unit by means of the second coupling and folding device of the third folding structure unit and by means of the second fixing element of the second folding structure unit. In between the first coupling and folding device and the second coupling and folding device of the third folding structure, a third coupling and folding device is provided in the third folding structure unit. In between the first coupling and folding

device and the third coupling and folding device of the third folding structure a first rod is provided. In between the third coupling and folding device and the second coupling and folding device of the third folding structure a second rod is provided. Both rods are coupled with the third coupling and folding device. When both rods are fully extended, that is, when the third folding structure unit is fully extended, the first rod and the second rod are substantially co-lineal one to another. When fully extended, a certain angle which is at least 90°, more preferably 140° and yet more preferably at least 160° is present among the lower face of the first rod and the second rod. However, a 180° angle between the lower face of the first rod and the lower face of the second rod may be achieved. An actuating device, such as a rod, wire or thread, is attached from the first end of the third folding structure unit to the second end of the third folding structure unit. When actuated, the actuating device rotates the third coupling and folding device so as to move the first rod in regards to the second rod, so that the first rod is in a substantially parallel position in regards to the second rod when in a folded position. The second rod may be fastened with regards to the third coupling and folding device, while the first rod is

movable with regards to the third coupling and folding device. The movement of the first rod with regards to the third coupling and folding device may be provided by means known in the art, such as a bearing. The coupling between the first folding structure unit and the third folding structure unit, by means of the first coupling and folding device of the third folding structure unit and the second fixing element of the first folding structure unit is carried by conventional means known in the art, such as threaded holes, bolts, pin, screw, wire or threads or nuts. Likewise, the coupling between the second folding structure unit and the third folding structure unit, by means of the second coupling and folding device of the third folding structure unit and the second fixing element of the second folding structure unit is carried by conventional means known in the art, such as threaded holes, bolts pin, screw, wire or threads and nuts.

In all the embodiments, the coupling and folding devices may be a substantially cylindrical form, however may take any desired shape. The inner part of the folding device should be hollow and more preferably, hollow and threaded. Therefore, a bolt, pin, screw, wire or threads may be threaded in the inner part of the coupling and folding

device, in such a manner that the same bolt may fasten two or more folding structure units in a substantially parallel manner. Furthermore, a bolt, pin, screw, wire or threads may be threaded in the inner part of the coupling and folding device in such a manner that the same bolt may fasten two or more folding structure units in a substantially co-lineal manner. Therefore, the transportable and foldable structure is actually comprised by folding structure units in a substantially parallel manner and by folding structure units in a substantially co-lineal manner. The ends of the bolts, pin, screw, wire or thread are fastened by nuts.

The fixing elements may be alternately coupled to each other by means of fastening elements. That is, instead of coupling the fixing elements to a second, third, fourth, or more folding structure units, the fixing elements are coupled to fastening elements. The fixing elements have a hole, which may be threaded, in which a bar which may be threaded is placed. The fastening elements comprise a lower part and an upper part, which are coupled together by means of conventional coupling means known in the art, such as threaded holes, bolts, pin, screw, wire or threads and nuts.

The fastening elements may be formed by any shape, however, shapes with smooth and constant walls are

preferred. The fastening elements have at least two connections, each wall of the fastening element having at least one connection. The fastening elements preferably have at least three connections and even more preferably at least four connections. When a folding structure unit is coupled with a fastening element, part of the fixing element, which is an extension of one of the two rods of the folding structure unit, is placed within a connection of the fastening element. The connections are generally hollow and are usually placed between the lower part and the upper part of the fastening element. Furthermore, the connections have a width or diameter which is less than the width or diameter of the wall of the node in which the connection is present. The connections are formed in shape so that at least part of the fixing element may rest within the connection. Given that the fixing element ("joint") has a bar in its hole, and given that the bar is generally broader than the width of the connection, when the lower part and the upper part are coupled, the folding structure unit is coupled and fixed with regards to the fastening element. As stated before, the fastening elements or joints may have one or more connections for each wall. Therefore, the fastening elements

are prepared to receive at least one folding structure unit per wall.

The fastening elements are provided as relief devices for a large amount of folding structure units. That is, if a broad or large area is to be covered with the transportable and foldable structure, then fastening elements need to be used since otherwise transportation of the transportable and foldable structure would be difficult. Furthermore, the fastening elements are used as nodes, that is, if a broad or large area is to be covered with the transportable and foldable structure fastening elements need to be used so that each foldable structure unit does not fold or vibrate when the transportable and foldable structure is installed.

When two or more folding structure units which are substantially co-lineal are present, the actuating devices between the first folding structure unit and the second folding structure unit may be connected to each other, so that when one of the at least two actuating devices is actuated, the at least two folding structure units may be simultaneously extended or folded. Reels may be added to the actuating devices so as to coil or uncoil the actuating devices.

When a first pair of two or more folding structure units which are substantially co-lineal are present, and when second pair of two or more folding structure units which are also substantially co-lineal and which are substantially parallel to the first pair of folding structure units, wherein the first pair of folding structure units may be substantially parallel to the second pair of folding structure units, the first pair of folding structure units may be intercalated in position with the second pair of folding structure units with regards to the first and second fixed elements of the construction. That is, since in the first pair of folding structure units both folding structure units are coupled by means of the first coupling and folding devices and the second fixing element, and since the first coupling and folding devices are coupled laterally, then the coupling means have a determined width. Given that the coupling means have a determined width, both folding structure units are substantially co-lineal with each other, however not necessarily co-lineal with the construction. That is, the first pair of folding structure units intercalates with the second pair of folding structure unit in the point where the at least two substantially co-lineal folding structure units are coupled together, that

is, in the respective first coupling and folding device of both the first and second substantially co-lineal folding structure units of the first pair, and in the point when the other at least two substantially co-lineal folding structure units are coupled together, that is, in the respective first coupling and folding device of both the first and second substantially co-lineal folding structure units of the second pair, which is parallel to the first pair.

Therefore, a transportable and foldable structure may be formed by multiple folding devices some of which are substantially co-lineal and some of which are substantially parallel. For installation purposes, depending on the area to be covered by the transportable and foldable structure, the transportable and foldable structure is placed and/or transported in a vehicle which is capable of setting a first fixing element proximate to a first fixed element of the construction. The first fixing element is coupled to the first fixed element of the construction. At least a first part of the transportable and foldable structure is then extended in a substantially horizontal manner. Specifically at least a first pair of substantially co-lineal folding structure units and a second pair of substantially co-lineal folding structure units, which are substantially parallel to

the first pair of folding structure units are extended. These first and second pair of folding transportable and foldable structure may then coupled to another first and second pair of folding transportable and foldable structure by means of a fastening element. These newly coupled first and second pair of transportable and foldable structure are again extended. This is carried out continuously until the transportable and foldable structure is complete. Finally, a second fixing element is placed proximate to a second fixed element of the construction. The second fixing element is coupled to the second fixed element of the construction.

Brief Description of the Figures

The present invention will be further understood when referenced with the following detailed description and with the following figures. Additionally, other aspects will become apparent when referenced with the detailed descriptions along with the following figures.

Figure 1 shows a front view of a first embodiment for the foldable structure unit, in which two fixing elements are present and one coupling and folding device is present.

Figure 2 shows a front view of a second embodiment for the foldable structure unit, in which one fixing element is present and two coupling and folding devices are present.

Figure 3 shows a front view of a third embodiment for the foldable structure unit, in which three coupling and folding devices are present.

Figure 4 shows a front view of a fourth embodiment for the foldable structure unit, in which three coupling and folding devices are present and in which the two rods are substantially at 180° one from another.

Figure 5 shows an upper view of a first foldable structure and a second folding structure unit, both of which are substantially parallel to each other, in which both the first foldable structure and the second foldable structure are being coupled together.

Figure 6 shows an upper view of the first foldable structure unit and the second foldable structure unit, in which both foldable structures units are coupled.

Figure 7 shows an upper view of the first part of a first embodiment for the fastening element.

Figure 8 shows a front view of the first embodiment for the fastening element.

Figure 9 shows a front view of the first embodiment for the fastening element, in which the lower part and upper part are separated.

Figure 10 shows an upper view of the first part of a second embodiment for the fastening element.

Figure 11 shows a front view of the second embodiment for the fastening element.

Figure 12 shows a front view of the second embodiment for the node, in which the lower part and upper part are separated.

Figure 13 shows a front view of a first and second pair of parallel folding structure units being coupled with another first and second pair of parallel folding structure units by means of a fastening element.

Figure 14 shows a front view of a first and second pair of parallel folding structure units being coupled with another first and second pair of parallel folding structure units wherein both pairs are intercalated.

Figure 15 shows an upper view of a first, second, third and fourth folding structure units being coupled by means of a fastening element.

Figure 16 shows a first step of the process for the installation of the transportable and foldable structure.

Figure 17 shows a second step of the process for the installation of the transportable and foldable structure.

Figure 18 shows a third step of the process for the installation of the transportable and foldable structure.

Figure 19 shows a fourth step of the process for the installation of the transportable and foldable structure.

Figure 20 shows a transportable and foldable structure fixed to two constructions, in this case, marine container acting as columns or anchor elements.

Figure 21 shows a transportable and foldable structure fixed to two fixed elements of other conventional a construction.

Figure 22 shows an upper view of multiple folding structure units, substantially parallel, substantially co-lineal and substantially perpendicular, the substantially co-lineal folding structure units being coupled by a node.

Detailed Description of the Invention

The following description is made in reference to figures 1 through 15 and 22. The present invention refers to a transportable and foldable structure 2 for constructions to be placed between two elements 4, 4' of the construction 6. The transportable and foldable structure 2 may be

selected to create any of a roof, ceilings, domes or similar or tunnels or bridge constructions for pedestrian and/or vehicle traffic. Specifically, the present invention refers to transportable, foldable and coupling structure units 20 for building a transportable and foldable structure 2 for building constructions such as roofs, ceilings, domes or similar, or tunnels or bridge constructions for pedestrian and/or vehicle traffic, wherein the transportable and foldable structure 2 is to be placed between two elements 4, 4' of the construction. An element 4, 4' of the construction to which the transportable and foldable structure 2 is fixed, is preferably at least one column of the construction 6. The construction 6 may be selected among traditional construction structures, such as cement structures or similar structures, such as wooden or metal structures, to other construction structures, such as container, more preferably marine containers.

First Embodiment

The transportable and foldable structure 2 may be comprised by at least one coupling and folding structure unit 20.

If the transportable and foldable structure 2 comprises one folding structure unit 20, the folding structure unit 20 comprises at least a first fixing element 26, such as an anchor, which will fasten the transportable and foldable structure 2 to a first element 4 of the construction 6, such as a column or base. The first fixing element 26 may be alternately coupled to a further fixing element 26' of a different folding structure unit 20' by means of a fastening element 50 or coupled to a coupling and folding device of a different folding structure 120, 220. The first fixing element 26 is placed at a first end 22 of the transportable and foldable structure. Furthermore, the folding structure unit 20 comprises at least a second fixing element 28 in the opposite end 24 of the folding structure unit 20 than the first fixing element end 22, wherein the second fixing element 28 is similar to the first fixing element, and will fasten the transportable and foldable structure 2 to a second element 4' of the construction 6. Alternately, the second fixing element 28 may be coupled to a further fixing element 26, 28 of a different folding structure unit 20' by means of a fastening element 50 as will be explained below or coupled to a coupling and folding device of a different folding structure unit 120, 220 as will be explained below.

The second fixing element 28 is placed at the second end of the transportable and foldable structure 2, opposite to and co-lineal with the first end of the transportable and foldable structure. In between the first fixing element 26 and the second fixing element 28 at least one coupling and folding device 30 is provided. In between the first fixing element 26 and the coupling and folding device 30 a first rod 40 is provided. In between the coupling and folding device 30 and the second fixing element 28 a second rod 42 is provided. Both rods 40, 42 are coupled with the coupling and folding device 30. Furthermore, both rods 40, 42 when fully extended are substantially co-lineal one to another. When the coupling and folding structure unit 20 is fully extended a certain angle which is at least 90°, more preferably 140° and yet more preferably at least 160° may be present among the lower face 44 of the first rod 40 and the lower face 44 of the second rod 42. However, a 180° angle between the lower face 44 of the first rod 40 and the lower face 44 of the second rod 42 may be achieved. An actuating device 36, such as a rod, wire or thread, is attached from the first end 22 of the transportable and foldable structure to the second end 24 of the transportable and foldable structure, either directly or indirectly through the

coupling and folding device 30. When actuated, the actuating device 36 rotates the coupling and folding device 30 so as to move the second rod 42 in regards to the first rod 40, so that the second rod 42 is in a substantially parallel position in regards to the first rod 40 when in a folded position. That is, when the actuating device 36 actuates the folding of the coupling and folding structure unit 20, the second end 24 is drawn to be proximate to the first end 22, as well as the second rod 42 is drawn to be proximate and substantially parallel with the first rod 40. The first rod 40 may be fastened with regards to the coupling and folding device 30, while the second rod 42 is movable with regards to the coupling and folding device 30. The movement of the second rod 42 with regards to the coupling and folding device 30 may be provided by means known in the art, such as a bearing.

Second Embodiment

The transportable and foldable structure 2 may comprise two substantially co-lineal folding structure units 20, 120'. If the transportable and foldable structure comprises two folding structure units 20, 120' a second folding structure unit 120 comprises a first fixing element 126,

such as an anchor, which will fasten the transportable and foldable structure 2 to a first element 4 of the construction 6, such as a column. Alternately, the first fixing element 126 may be coupled to another fixing element 26, 336 of a different folding structure unit 120 by means of a fastening element 50 or coupled to a coupling and folding device of a different folding structure unit 120, 220 as will be explained below. The first fixing element 126 is placed at one end 122 of the second folding structure unit 120. The second folding structure unit 120 further comprises at least two coupling and folding devices 130, 130'. A first coupling and folding device 130' of the second folding structure unit 120 will fasten the second folding structure unit 120 to a first folding structure unit 20 of the construction. The first coupling and folding device 130' of the second folding structure unit 120 is placed at a second end 124 of the second folding structure unit 120, opposite to the first end 122. In between the first fixing element 126 and the first coupling and folding device 130' a second coupling and folding device 130 is provided. In between the first fixing element 126 and the first coupling and folding device 130' a first rod 140 is provided. In between the second coupling and folding device 130' and the

first coupling and folding device 130 a second rod 142 is provided. Both rods 140, 142 are coupled with the second coupling and folding device 130. When both rods 140, 142 are fully extended, that is, when the second folding structure unit 120 is fully extended, the first rod 140 and the second rod 142 are substantially co-lineal one to another. When the second folding structure unit 120 is fully extended, a certain angle which is at least 90°, more preferably 140° and yet more preferably at least 160° is present among the lower face 144 of the first rod 140 and the second rod 142. However, a 180° angle between the lower face 144 of the first rod and the lower face 144 of the second rod may be achieved. An actuating device 136, such as a rod, wire or thread, is attached from the first end 122 of the second folding structure unit 120 to the second end 124 of the second folding structure unit 120, either directly or indirectly by means of the second coupling and folding device 130. When actuated, the actuating device 136 rotates the second coupling and folding device 130 so as to move the second rod 142 in regards to the first rod 140, so that the second rod 142 is in a substantially parallel position in regards to the first rod 140 when in a folded position. That is, when the actuating device 136 actuates the folding of

the second coupling and folding structure unit 120, the second end 124 is drawn to be proximate to the first end 122, as well as the second rod 142 is drawn to be proximate and substantially parallel with the first rod 140. The first rod 140 may be fastened with regards to the second coupling and folding device 130, while the second rod 142 is movable with regards to the second coupling and folding device 130. The movement of the second rod 142 with regards to the second coupling and folding device 130 may be provided by means known in the art, such as a bearing.

The first folding structure unit 20 which is similarly built to the first embodiment comprises the first fixing element 26 and a second fixing element 28, wherein the second fixing element 28 is placed at one end 124 of the second folding structure unit 120. The second folding structure unit 120 further comprises the at least two coupling and folding devices 130, 130'. A first coupling and folding device 130' and the second fixing element 28 will fasten the second folding structure unit 120 to the first folding structure unit 20. The first coupling and folding device 130' when coupled to the second fixing element 28 will allow the folding of both the first and second folding structure units 20, 120. The actuating devices 36, 136, may

be attached between themselves, either directly or indirectly by means of the coupling and folding devices 30, 130, 130'. When actuated, the actuating devices 36, 136 rotate the coupling and folding device, the second coupling and folding device 130 and the first coupling and folding device 130', so as to move the second rods 42, 142 in regards to the first rods 40, 140, so that the second rods 42, 142 are in a substantially parallel position in regards to the first rod 40, 140 when in a folded position. That is, when the actuating devices 36, 136 actuate the folding of the coupling and folding structure units 20, 120, so that the second ends 24, 124 are drawn to be proximate to the first ends 22, 122, as well as the second rods 42, 142 are drawn to be proximate and substantially parallel with the first rods 40, 140. Further to the above configuration of the first and second coupling and folding structure units 20, 120, the second rod 142 may be fastened with regards to the first coupling and folding device 130', while the second rod 42 is movable with regards to the first coupling and folding device 130'. The movement of the second rod 42 with regards to the first coupling and folding device 130' may be provided by means known in the art, such as a bearing.

Third Embodiment

The transportable and foldable structure 2 may comprise three or more folding structure units 20, 20', 220. A first and second folding structure unit 20, 20' are formed in a similar manner to the first folding structure unit 20 above disclosed for the first embodiment. A third folding structure unit 220, which is placed in between the first and second folding structure units 20, 20', comprises a first coupling and folding device 230' at one end 222 of the third folding structure unit 220, proximate to where the first folding structure unit 20 will be fastened, wherein the first coupling and folding device 230' and the first fixing element 26 will fasten the third folding structure unit 220 to the first folding structure unit 20. Furthermore, the third folding structure unit 220 comprises a second coupling and folding device 230'' at a second end 224 of the third folding structure unit, opposite to the first end 222 of the third folding structure unit. The second coupling and folding device 230'' will fasten the third folding structure unit 220 to the second folding structure unit 20' by means of the second coupling and folding device 230'' of the third folding structure unit and by means of the second fixing element 28' of the second folding structure unit 20'. In

between the first coupling and folding device 230' and the second coupling and folding device 230'', a third coupling and folding device 230 is provided in the third folding structure unit 220. In between the first coupling and folding device 230' and the third coupling and folding device 230 a first rod 242 is provided. In between the third coupling and folding device 230 and the second coupling and folding device 230'' a second rod 240 is provided. Both rods 240, 242 are coupled with the third coupling and folding device 230. When both rods 240, 242 are fully extended, that is, when the third folding structure unit 220 is fully extended, the first rod 242 and the second rod 240 are substantially co-lineal one to another. When the third folding structure unit 220 is fully extended, a certain angle which is at least 90°, more preferably 140° and yet more preferably at least 160° is present among the lower face 244 of the first rod 242 and the lower face 244 of the second rod 240. However, a 180° angle between the lower face 244 of the first rod 242 and the lower face 244 of the second rod 240 may be achieved. An actuating device 236, such as a rod, wire or thread, is attached from the first end 224 of the third folding structure unit 220 to the second end 222 of the third folding structure unit 220. When

actuated, the actuating device 236 rotates the third coupling and folding device 230 so as to move the first rod 242 in regards to the second rod 240, so that the first rod 242 is in a substantially parallel position in regards to the second rod 240 when in a folded position. The second rod 240 may be fastened with regards to the third coupling and folding device 230, while the first rod 242 is movable with regards to the third coupling and folding device 230. The movement of the first rod 242 with regards to the third coupling and folding device 230 may be provided by means known in the art, such as a bearing.

The first folding structure unit 20 comprises the first fixing element 26, such as an anchor, which will fasten the transportable and foldable structure to a first element 4 of the construction 6, such as a column or base and the second fixing element 28 of the first folding structure unit 20 or to further units 120, 220, wherein the second fixing element 28 is placed at one end 224 of the third folding structure unit 220. The second folding structure unit 20' comprises the first fixing element 26', such as an anchor, which will fasten the transportable and foldable structure to a second element 4' of the construction 6, such as a column or base or to further units 120, 220, wherein the second fixing

element 28' is placed at one end 222 of the third folding structure unit 220. The third folding structure unit 220 further comprises the at least three coupling and folding devices 230, 230', 230''. A first coupling and folding device 230' and a fixing element 26, 28 will fasten the third folding structure unit 220 to the first folding structure unit 20. A second coupling and folding device 230'' and a fixing element 26', 28' will fasten the third folding structure unit 220 to the second folding structure unit 20'. The first coupling and folding device 230' when coupled to the first fixing element 26 will allow the folding of both the first and third folding structure units 20, 220. The actuating devices 36, 236, may attached between themselves, either directly or indirectly by means of the coupling and folding devices 30, 230, 230', 230''. When actuated, the actuating devices 36, 236 rotate the coupling and folding device 30, the third coupling and folding device 230 and the first coupling and folding device 230', so as to move the second rods 42, 242 in regards to the first rods 40, 240, so that the second rods 42, 242 are in a substantially parallel position in regards to the first rods 40, 240 when in a folded position. That is, when the actuating devices 36, 236 actuate the folding of the

coupling and folding structure units 20, 220, the second ends 24, 224 are drawn to be proximate to the first ends 22, 222, as well as the second rods 42, 242 are drawn to be proximate and substantially parallel with the first rods 40, 240. Further to the above configuration of the first and third coupling and folding structure units 20, 220, the rod 242 may be fastened with regards to the coupling and folding device 230', while the rod 40 is movable with regards to the coupling and folding device 230'. The movement of the rod 40 with regards to the coupling and folding device 230' may be provided by means known in the art, such as a bearing.

The second coupling and folding device 230'' when coupled to the fixing element 26', 28' will allow the folding of both the second and third folding structure units 20', 220. The actuating devices 36', 236, may attached between themselves, either directly or indirectly by means of the coupling and folding devices 30', 230, 230', 230''. When actuated, the actuating devices 36', 236 rotate the coupling and folding device 30', the third coupling and folding device 230 and the second coupling and folding device 230'', so as to move the first rods 40', 240 in regards to the second rods 42', 242, so that the second rods 42', 242 are in a substantially parallel position in regards

to the first rods 40', 240 when in a folded position. That is, when the actuating devices 36', 236 actuate the folding of the coupling and folding structure units 20', 220, the second ends 24', 224 are drawn to be proximate to the first ends 22', 222, as well as the first rods 40', 240 are drawn to be proximate and substantially parallel with the second rods 42', 242. Further to the above configuration of the second and third coupling and folding structure units 20', 220, the rod 240 may be fastened with regards to the coupling and folding device 230'', while the rod 42 is movable with regards to the coupling and folding device 230''. The movement of the rod 42 with regards to the coupling and folding device 230'' may be provided by means known in the art, such as a bearing.

In all the embodiments, the coupling and folding devices 30, 130, 130', 230, 230', 230'' (from hereinafter only referred to as 30 unless necessary) may be a substantially cylindrical form, however may take any desired shape. The inner part 32 of the folding device 30 should be hollow and more preferably, hollow and threaded. Therefore, a bolt 8 may be threaded in the inner part 32 of one of the two side ends 34, 34' of the coupling and folding device 30,

in such a manner that the same bolt 8 may fasten two or more folding structure units 120, 120' in a substantially parallel manner. Furthermore, a bolt 8 may be threaded in the inner part 32 of one of the two side ends 34, 34' of the coupling and folding device 30 in such a manner that the same bolt 8 may fasten two or more folding structure units 20, 120, 220 in a substantially co-lineal manner. Therefore, the transportable and foldable structure 2 may be comprised by folding structure units 120, 120' in a substantially parallel manner and by folding structure units 20, 120, 220 in a substantially co-lineal manner. The ends of the bolts 8 are fastened by nuts 10.

The fixing elements 26, 28, 126' (from hereinafter 26, 28, unless necessary) may be alternately coupled to each other by means of fastening elements 50. When four or more coupling and folding structure units 20 are used, it is preferred that the transportable and foldable structure 2 uses at least one fastening element 50. That is, instead of coupling the fixing elements to a coupling and folding device o another unit, the fixing elements 26, 28 are coupled to fastening elements 50. The fixing elements 26, 28 may be threaded, in which a bar which may be threaded is placed. The fastening elements comprise a lower part 52 and

an upper part 54, which are coupled together by means of conventional coupling means known in the art, such as threaded holes, bolts, pin, screw, wire or threads and nuts.

The fastening elements 50 may be formed by any shape, however, shapes with smooth and constant walls are preferred. The fastening elements 50 have at least two connections, wherein at least two walls 56, 56' of the fastening element 50 having at least one connection 58. The fastening elements 50 preferably have at least three connections 58 and even more preferably at least four connections 58. When a folding structure unit 20 is coupled with a fastening element 50, part of the fixing element 26, 28, which is an extension of one of the two rods 40, 42 of the folding structure unit, is placed within a connection 58 of the fastening element 50. The connections 58 are generally hollow and are usually placed between the lower part 52 and the upper part 54 of the fastening element 50. Furthermore, the connections 58 have a width or diameter which is less than the width or diameter of the wall of the node 60 which the fastening element 50 is forming. The connections 58 are formed in such a manner so that at least part of the fixing element 26, 28 may rest within the connection 58. Given that the fixing element 26, 28 has a

bar 18, and given that the bar 18 is generally broader than the width of the connection 58, when the lower part 52 and the upper part 54 are coupled, the folding structure unit 20 is coupled and fixed with regards to the fastening element 50. As stated before, the fastening elements 50 may have one or more connections 58 in each wall 56, 56'. Therefore, the fastening elements 50 are prepared to receive at least one folding structure unit 20 per wall 56, 56'.

The fastening elements 50 are provided as relief devices for a large amount of folding structure units 20. That is, if a broad or large area is to be covered with the transportable and foldable structure 2, then fastening elements 50 need to be used, since otherwise transportation of the transportable and foldable structure would be difficult. Furthermore, the fastening elements 50 are used as nodes 60, that is, if a broad or large area is to be covered with the transportable and foldable structure 2 fastening elements need to be used so that each foldable structure unit 20 does not fold or vibrate when the transportable and foldable structure 2 is installed.

When two or more coupling and folding structure units 20, 120 which are substantially co-lineal are present, the actuating devices 36, 136 between the first folding

structure unit 20 and the second folding structure unit 120 may be connected to each other, so that when one of the at least two actuating devices 36, 136 is actuated, the at least two folding structure units 20, 120 may be simultaneously extended or folded as above described. Reels (not shown) may be added to the actuating devices 36, 136 so as to coil or uncoil the actuating devices 36, 136.

When more than four coupling and folding structure units 20, 120, 220, 20' which are substantially co-lineal are present, the actuating devices 36, 136, 236, 36' between the first coupling and folding structure unit 20, the second coupling and folding structure unit 120, the third coupling and folding structure unit 220 and fourth coupling and folding structure unit 20', may be connected to each other, so that when one of the at least one actuating devices 36 or 36' which is in the end of the transportable and foldable structure 2 is actuated, the at least four folding structure units 20, 120, 220, 20' may be simultaneously extended or folded as above described. Reels (not shown) may be added to the actuating devices 36, 136, 236, 36' so as to coil or uncoil the actuating devices 36, 136, 236, 36'.

When a first pair 62 of two or more folding structure units 20, 120 which are substantially co-lineal are present,

and when second pair 64 of two or more folding structure units 20', 120' which are substantially co-lineal between themselves and which are substantially parallel to the first pair 62 of folding structure units, hence the first pair 62 of folding structure units may be substantially parallel to the second pair 64 of folding structure units, the first pair 62 of folding structure units may be intercalated in position with the second pair 64 of folding structure units with regards to the fixed elements 4, 4' of the construction 6. That is, since in the first pair 62 both folding structure units 20, 120 are coupled by means of the first coupling and folding device 130' of the second coupling and folding structure unit 120 and the fixing element 26, 28, and since the first coupling and folding device 130 is coupled sideways with regards to the fixing element 26, then the coupling means have a determined width. Given that the coupling means have a determined width, both folding structure units 20, 120' are substantially co-lineal with each other, however not necessarily co-lineal with the fixed elements 4, 4'. The same may be applied for the second pair 64. That is, the first pair 62 of folding structure units intercalates with the second pair 64 of folding structure units in the point where the first and second pairs 62, 64

of coupling and folding structure units are coupled together, that is, in the respective first coupling and folding device 130' of both the first and second pairs 62, 64 of substantially co-lineal folding structure units.

Therefore, a transportable and foldable structure 2 may be formed by multiple folding devices 20 some of which are substantially co-lineal and some of which are substantially parallel. For installation purposes, depending on the area to be covered by the transportable and foldable structure 2, the transportable and foldable structure 2 is transported in a vehicle 12 which is capable of setting at least a first fixing element 26 proximate to a first fixed element 4 of the construction. The first fixing element 26 is coupled to the first fixed element 4 of the construction. At least a first part of the transportable and foldable structure 2 is then extended in a substantially horizontal manner by means of the actuating devices 36. Specifically at least a first pair 62 of substantially co-lineal folding structure units and a second pair 64 of substantially co-lineal folding structure units, which are substantially parallel to the first pair 62 of folding structure units are extended. These first and second pair 62, 64 of folding transportable and foldable structures 2 may then coupled to another first and

second pair 62, 64 of folding transportable and foldable structure by means of a fastening element 50. These newly coupled first and second pair 62, 64 of folding transportable and foldable structures are again deployed. This is carried out continuously until the transportable and foldable structure 2 is complete. Finally, a second fixing element 28 is placed proximate to a second fixed element 4' of the construction. The second fixing element 28 is coupled to the second fixed element 4' of the construction.

Alterations to the structure described in the present, shall be able to be foreseen by those with expertise in the field. However, it must be understood, that the present description is related with the preferred embodiments of the invention, which are solely for illustrative purposes, and must not be construed as a limitation of the invention. All modifications which do not depart from the spirit of the invention are included within the body of the attached claims.

Claims

1. A roof, ceiling, dome, bridge, tunnel or similar structure for a construction, the structure configured to move between a folded position and an extended position, the structure comprising:

a first folding structure unit comprising

a first end and a second end, the first end being substantially co-lineal with the second end when the structure is in an extended position;

a first coupling and folding device between the first end and the second end;

an actuating device connected from the first end to the second end;

a first rod between the first end and the first coupling and folding device and a second rod between the second end and the first coupling and folding device;

wherein the actuating device and the coupling and folding device are configured to move the structure from a folded position to an extended position and from an extended position to a folded position.

2. The structure of claim 1, wherein the first end is a first fixing element capable of fixing the structure to a fixed element of the construction or fixing the first folding structure unit to a second folding structure unit by means of a fastening element or fixing the first folding structure unit to a second folding structure unit by means of a coupling and folding device of the second folding structure unit.

3. The structure of claim 2, wherein the second end is a second fixing element capable of fixing the structure to a second fixed element of the construction or fixing the first folding structure unit to a third folding structure unit by means of a fastening element or fixing the first folding structure unit to a third folding structure unit by means of a coupling and folding device of the third folding structure unit.

4. The structure of claim 2, wherein the second end is a coupling and folding device capable of fixing the structure to a third folding structure unit by means of a fixing element of the third folding structure unit.

5. The structure of claim 1, wherein the first end and the second end are a second and third coupling and folding device, the second coupling and folding device being capable

of fixing the structure to a second structure unit by means of a fixing element of the second folding structure unit, and the third coupling and folding device being capable of fixing the structure to a third structure unit by means of a fixing element of the third structure unit.

6. The structure of claim 1, wherein the first end and the second end are a first and second fixing element, the structure further comprising:

a second folding structure unit comprising

a second coupling and folding device and a third coupling and folding device, the second coupling and folding device of the second folding structure unit being substantially co-lineal with the third coupling and folding device of the second folding structure unit when the structure is in an extended position;

a first coupling and folding device between the second coupling and folding device of the second folding structure unit and the third coupling and folding device of the second folding structure unit;

an actuating device connected from the second coupling and folding device of the second folding structure unit to the third coupling and folding device of the second folding structure unit;

a first rod between the second coupling and folding device of the second folding structure unit and the first coupling and folding device of the second folding structure unit and a second rod between the third coupling and folding device of the second folding structure unit and the first coupling and folding device of the second folding structure unit;

wherein the actuating device of the second folding structure unit and the first coupling and folding device of the second folding structure unit are configured to move the second folding structure unit from a folded position to an extended position and from an extended position to a folded position;

a third folding structure unit comprising

a first fixing element and a second fixing element, the first fixing element of the third folding structure unit being substantially co-lineal with the second fixing element of the third folding structure unit when the structure is in an extended position;

a first coupling and folding device between the first fixing element of the third folding structure unit and the second fixing element of the third folding structure unit;

an actuating device connected from the first fixing element of the third folding structure unit to the second fixing element of the third folding structure unit;

a first rod between the first fixing element of the third folding structure unit and the first coupling and folding device of the third folding structure unit and a second rod between the second fixing element of the third folding structure unit and the first coupling and folding device of the third folding structure unit;

wherein the actuating device of the third folding structure unit and the first coupling and folding device of the third folding structure unit are configured to move the third folding structure unit from a folded position to an extended position and from an extended position to a folded position;

wherein the first folding structure unit is fixed to the second folding structure unit by means of the first fixing means of the first folding structure unit and the second coupling and folding device of the second folding structure unit and wherein the first folding structure is configured to move between a folded and extended position with regards to the second folding structure;

wherein the second folding structure unit is fixed to the third folding structure unit by means of the third coupling and folding device of the second folding structure unit and the first fixing means of the third folding structure unit and wherein the third folding structure is configured to move between a folded and extended position with regards to the second folding structure; and

wherein the actuating device of the first folding and structure unit is connected with the actuating device of the second and third folding and structure units.

7. The structure of claim 6, the structure further comprising:

a fourth folding structure unit comprising

a first fixing element and a second fixing element, the first fixing element of the fourth folding structure being substantially co-lineal with the second fixing element of the fourth folding structure when the structure is in an extended position;

a first coupling and folding device between the first fixing element of the fourth folding structure and the second fixing element of the fourth folding structure;

an actuating device connected from the first fixing element of the fourth folding structure to the second fixing element of the fourth folding structure;

a first rod between the first fixing element of the fourth folding structure and the first coupling and folding device of the fourth folding structure and a second rod between the second fixing element of the fourth folding structure and the first coupling and folding device of the fourth folding structure;

wherein the actuating device of the fourth folding structure and the coupling and folding device of the fourth folding structure are configured to move the fourth folding structure from a folded position to an extended position and from an extended position to a folded position;

a fifth folding structure unit comprising

a second coupling and folding device and a third coupling and folding device, the second coupling and folding device of the fifth folding structure unit being substantially co-lineal with the third coupling and folding device of the fifth folding structure unit when the structure is in an extended position;

a first coupling and folding device between the second coupling and folding device of the fifth folding structure unit and the third coupling and folding device of the fifth folding structure unit;

an actuating device connected from the second coupling and folding device of the fifth folding structure unit to the third coupling and folding device of the fifth folding structure unit;

a first rod between the second coupling and folding device of the fifth folding structure unit and the first coupling and folding device of the fifth folding structure unit and a second rod between the third coupling and folding device of the fifth folding structure unit and the first coupling and folding device of the fifth folding structure unit;

wherein the actuating device of the fifth folding structure unit and the first coupling and folding device of the fifth folding structure unit are configured to move the fifth folding structure unit from a folded position to an extended position and from an extended position to a folded position;

a sixth folding structure unit comprising

a first fixing element and a second fixing element, the first fixing element of the sixth folding structure unit being substantially co-lineal with the second fixing element of the sixth folding structure unit when the structure is in an extended position;

a first coupling and folding device between the first fixing element of the sixth folding structure unit and the second fixing element of the sixth folding structure unit;

an actuating device connected from the first fixing element of the sixth folding structure unit to the second fixing element of the sixth folding structure unit;

a first rod between the first fixing element of the sixth folding structure unit and the first coupling and folding device of the sixth folding structure unit and a second rod between the second fixing element of the sixth folding structure unit and the first coupling and folding device of the sixth folding structure unit;

wherein the actuating device of the sixth folding structure unit and the first coupling and folding device of the sixth folding structure unit are configured to move the sixth folding structure unit

from a folded position to an extended position and from an extended position to a folded position;

wherein the fourth folding structure unit is fixed to the fifth folding structure unit by means of the first fixing means of the fourth folding structure unit and the second coupling and folding device of the fifth folding structure unit and wherein the fourth folding structure is configured to move between a folded and extended position with regards to the fifth folding structure;

wherein the fifth folding structure unit is fixed to the sixth folding structure unit by means of the third coupling and folding device of the fourth folding structure unit and the first fixing means of the sixth folding structure unit and wherein the sixth folding structure is configured to move between a folded and extended position with regards to the fifth folding structure;

wherein the actuating device of the fourth folding and structure unit is connected with the actuating device of the fifth and sixth folding and structure units; and

wherein the first folding structure unit is fixed to the fourth folding structure unit in a parallel manner, the second folding structure unit is fixed to the fifth structure unit in a parallel manner and the third folding

structure unit is fixed to the sixth structure unit in a parallel manner.

8. The structure of claim 1, the structure further comprising:

a second folding structure unit comprising

a first end and a second end, the first end of the second folding structure unit being substantially co-lineal with the second end of the second folding structure unit when the structure is in an extended position;

a first coupling and folding device between the first end of the second folding structure unit and the second end of the second folding structure unit;

an actuating device connected from the first end of the second folding structure unit to the second end of the second folding structure unit;

a first rod between the first end of the second folding structure unit and the first coupling and folding device of the second folding structure unit and a second rod between the second end of the second folding structure unit and the first coupling and folding device of the second folding structure unit;

wherein the actuating device of the second folding structure unit and the first coupling and folding device of the second folding structure unit are configured to move the second folding structure unit from a folded position to an extended position and from an extended position to a folded position;

wherein the first end of the first folding structure unit is fixed with the first end of the second folding structure unit;

wherein the actuating device of the first folding and structure unit is connected with the actuating device of the second folding and structure unit;

wherein the first folding structure unit and the second folding structure unit form a first pair of structure units;

a third folding structure unit comprising

a first end and a second end, the first end of the third folding structure unit being substantially co-lineal with the second end of the third folding structure unit when the structure is in an extended position;

a first coupling and folding device between the first end of the third folding structure unit and the second end of the third folding structure unit;

an actuating device connected from the first end of the third folding structure unit to the second end of the third folding structure unit;

a first rod between the first end of the third folding structure unit and the first coupling and folding device of the third folding structure unit and a second rod between the second end of the third folding structure unit and the first coupling and folding device of the third folding structure unit;

wherein the actuating device of the third folding structure unit and the first coupling and folding device of the third folding structure unit are configured to move the third folding structure unit from a folded position to an extended position and from an extended position to a folded position;

a fourth folding structure unit comprising

a first end and a second end, the first end of the fourth folding structure unit being substantially co-lineal with the second end of the fourth folding structure unit when the structure is in an extended position;

a first coupling and folding device between the first end of the fourth folding structure unit and the second end of the fourth folding structure unit;

an actuating device connected from the first end of the fourth folding structure unit to the second end of the fourth folding structure unit;

a first rod between the first end of the fourth folding structure unit and the first coupling and folding device of the fourth folding structure unit and a second rod between the second end of the fourth folding structure unit and the first coupling and folding device of the fourth folding structure unit;

wherein the actuating device of the fourth folding structure unit and the first coupling and folding device of the fourth folding structure unit are configured to move the fourth folding structure unit from a folded position to an extended position and from an extended position to a folded position;

wherein the first end of the third folding structure unit is fixed with the first end of the fourth folding structure unit;

wherein the actuating device of the third folding and structure unit is connected with the actuating device of the fourth folding and structure unit;

wherein the third folding structure unit and the fourth folding structure unit form a second pair of structure units;

wherein the first folding structure unit is substantially parallel to the third folding structure unit and the second folding structure unit is substantially parallel to the fourth folding structure unit; and

wherein the first pair of structure units is intercalated with the second pair of structure units in regards to a first, second, third and fourth fixed element of the construction, wherein the first and second fixed elements of the construction are substantially co-lineal between themselves and are in opposite ends of the construction and wherein the third and fourth fixed elements of the construction are substantially co-lineal between themselves and are in opposite ends of the construction.

9. The structure of claim 1, wherein the first end is a first fixing element, the structure further comprising:

a second folding structure unit comprising

a first fixing element in a first end and a second end, the first fixing element of the second folding structure unit being substantially co-lineal with the second end of the second folding structure unit when the structure is in an extended position;

a first coupling and folding device between the first fixing element of the second folding structure unit and the second end of the second folding structure unit;

an actuating device connected from the first fixing element of the second folding structure unit to the second end of the second folding structure unit;

a first rod between the first fixing element of the second folding structure unit and the first coupling and folding device of the second folding structure unit and a second rod between the second end of the second folding structure unit and the first coupling and folding device of the second folding structure unit;

wherein the actuating device of the second folding structure unit and the first coupling and folding device of the second folding structure unit are configured to move the second folding structure unit

from a folded position to an extended position and from an extended position to a folded position;

a fastening means comprising a lower part and an upper part, the fastening means comprising at least a first and second connections;

wherein the first fixing element of the first folding structure unit is fixed with the first connection of the fastening means and the first fixing element of the second folding structure unit is fixed with the second connection of the fastening means;

wherein the actuating device of the first folding and structure unit is connected with the actuating device of the second folding and structure unit.

10. A structure for a construction configured to move between a folded position and an extended position, the structure comprising:

a first end and a second end;

at least one coupling and folding device between the first and second end;

at least one bar between the first end and the second end interconnected with the at least one coupling and folding device;

wherein the at least one coupling and folding device are configured to move the bar from a folded position to an extended position and from an extended position to a folded position.

11. A roof, ceiling, dome, tunnel, bridge or similar structure system for a construction, the system configured to move between a folded position and an extended position, the system comprising:

a plurality of substantially co-lineal folding structure units interconnected between two ends of said substantially co-lineal folding structure units, wherein one end of a first and second of said plurality of substantially co-lineal folding structure units are fixed to a first fixed element and a second fixed element of the container, respectively;

wherein each of said plurality of substantially co-lineal folding structure units comprise

a first coupling and folding device between their two ends,

an actuating device connected between their two ends;

a first and second rod between their two ends;

wherein each of said interconnected actuating devices and each of the coupling and folding devices are configured to move the structure from a folded position to an extended position and from an extended position to a folded position.

12. The system of claim 11, further comprising:

a second plurality of substantially co-lineal folding structure units interconnected between two ends of said substantially co-lineal folding structure units, wherein one end of a first and second of said second plurality of substantially co-lineal folding structure units are fixed to a first fixed element and a second fixed element of the construction, respectively;

wherein each of said second plurality of substantially co-lineal folding structure units comprise

a first coupling and folding device between their two ends,

an actuating device connected between their two ends;

a first and second rod between their two ends;

wherein each of said interconnected actuating devices and each of the coupling and folding devices are configured to move the structure from a folded position to an extended

position and from an extended position to a folded position; and

wherein said second plurality of substantially co-lineal folding structure units is substantially parallel to the first plurality of substantially co-lineal folding structure units.

13. The system of claim 11, further comprising:

a second plurality of substantially co-lineal folding structure units interconnected between two ends of said substantially co-lineal folding structure units, wherein one end of a first and second of said second plurality of substantially co-lineal folding structure units are fixed to a first fixed element and a second fixed element of the construction, respectively;

wherein each of said second plurality of substantially co-lineal folding structure units comprise

a first coupling and folding device between their two ends,

an actuating device connected between their two ends;

a first and second rod between their two ends;

wherein the actuating devices are interconnected between each of said second plurality of substantially co-

lineal folding structure units and wherein said interconnected actuating devices and each of the coupling and folding devices are configured to move the structure from a folded position to an extended position and from an extended position to a folded position; and

wherein said second plurality of substantially co-lineal folding structure units is substantially perpendicular to the first plurality of substantially co-lineal folding structure units.

14. The system of claim 11, wherein at least two of said plurality of substantially co-lineal folding structure units are connected by means of a fastening means, wherein the fastening means comprises a lower part and an upper part and at least a first and second connections;

wherein a first end of a first folding structure unit is fixed with a first connection of the fastening means and a first end of a second folding structure unit is fixed with the second connection of the fastening means.

15. A method for installing a folded roof, ceiling, dome, tunnel, bridge or similar structure in a construction comprising:

connecting a first end of the structure to a first fixed element of the construction;

actuating an actuating device so as to move a second end of the structure away from the first end by rotating a coupling and folding device and a first rod, until the first rod end is substantially co-lineal with a second rod; and

connecting a second end of the structure to a second fixed element of the construction.

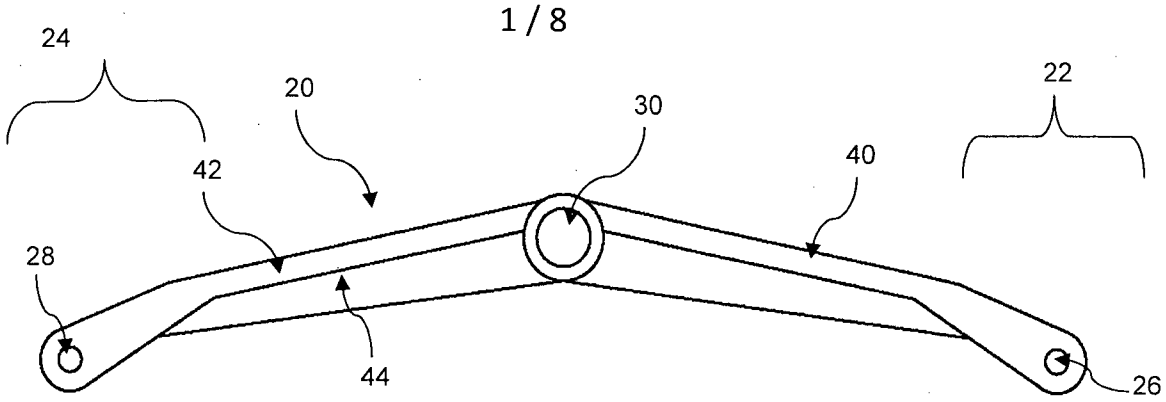


Fig. 1

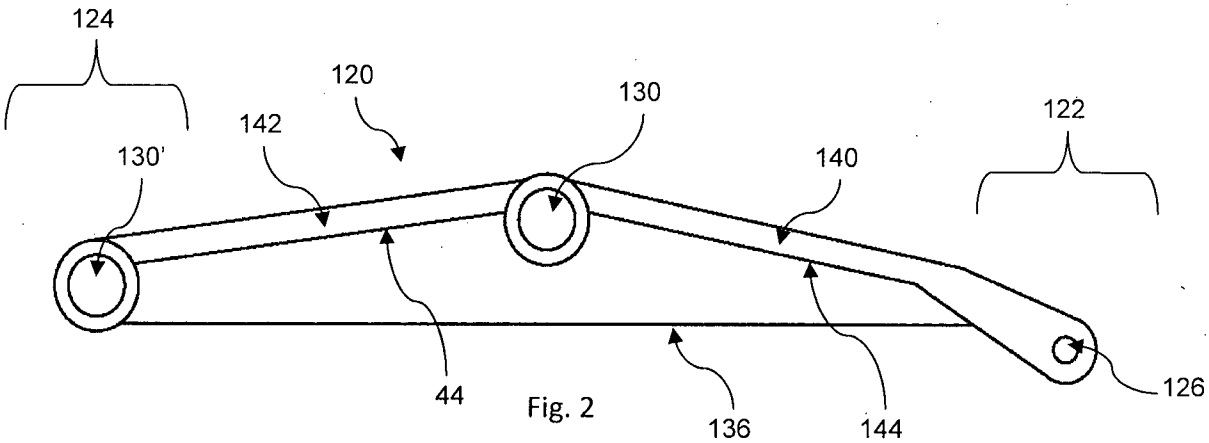


Fig. 2

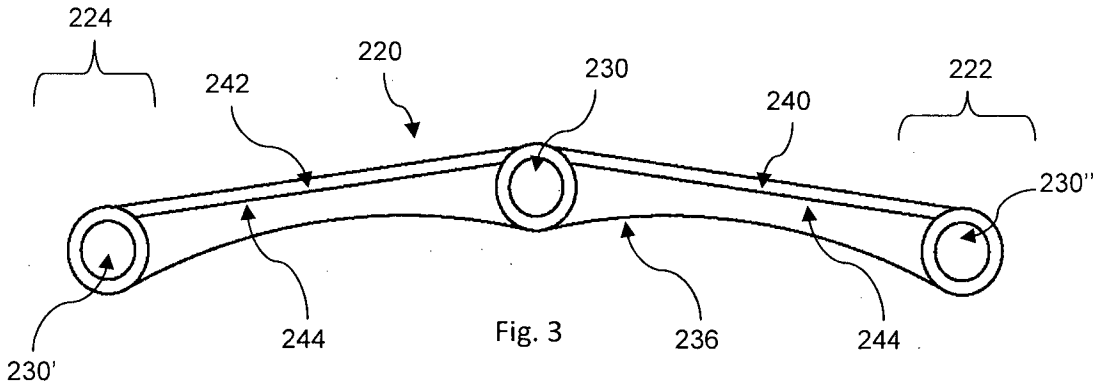


Fig. 3

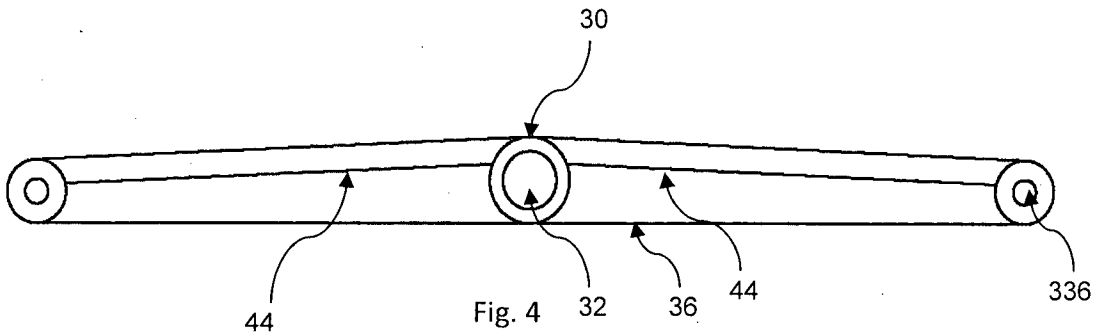


Fig. 4

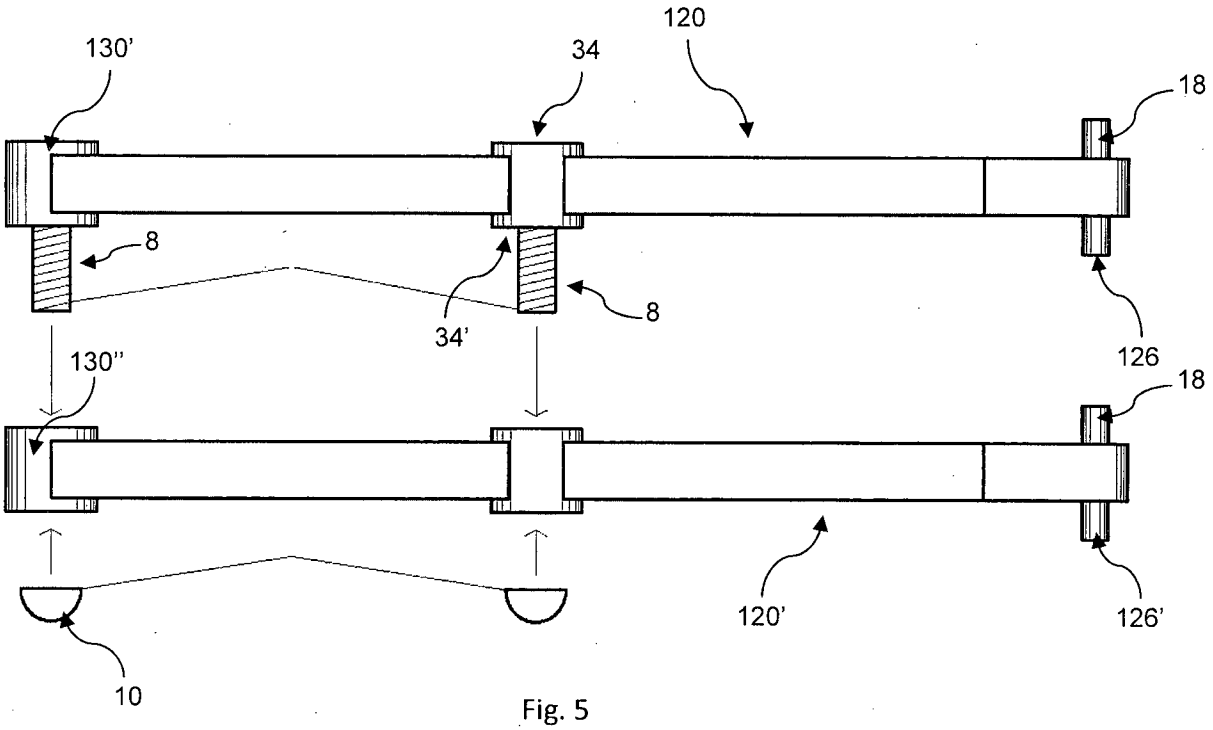

130'
34
120
18
8
8
34'
126
130''
18
120'
126'
10

Fig. 5

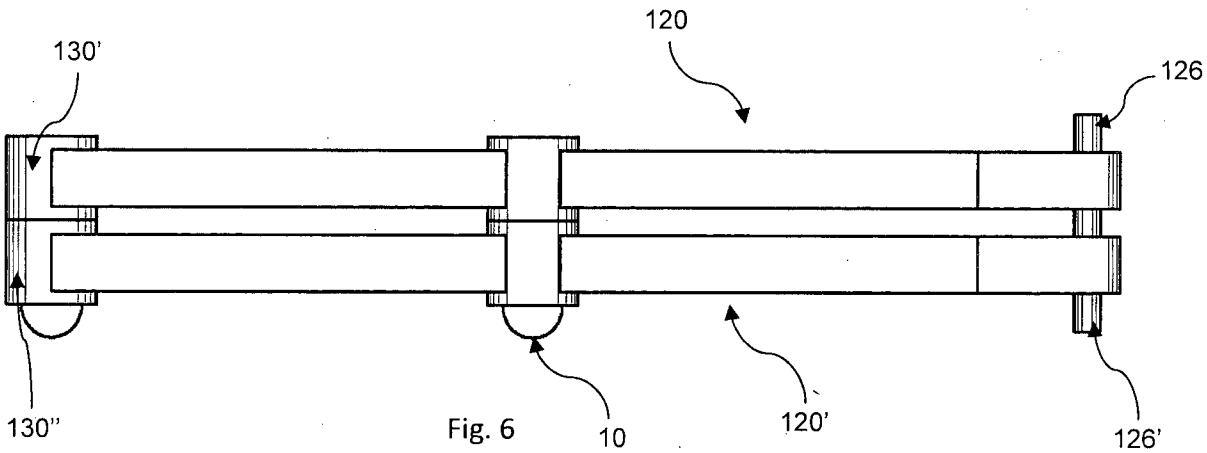

120
130'
126
130''
10
120'
126'

Fig. 6

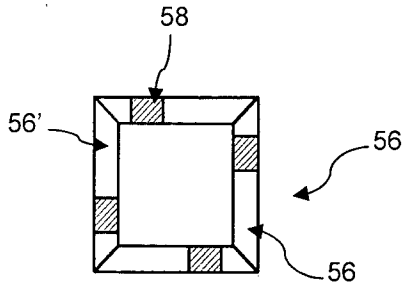


Fig. 7

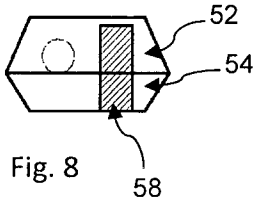


Fig. 8

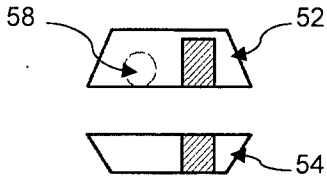


Fig. 9

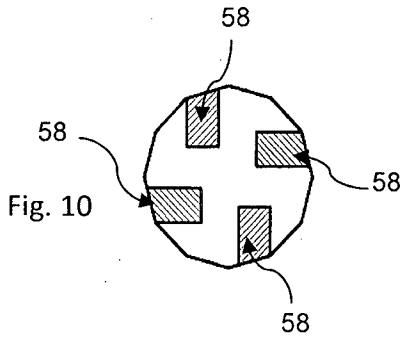


Fig. 10

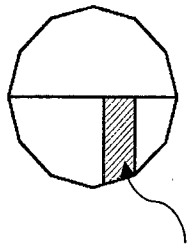


Fig. 11

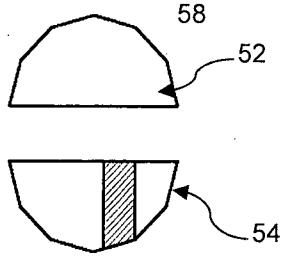


Fig. 12

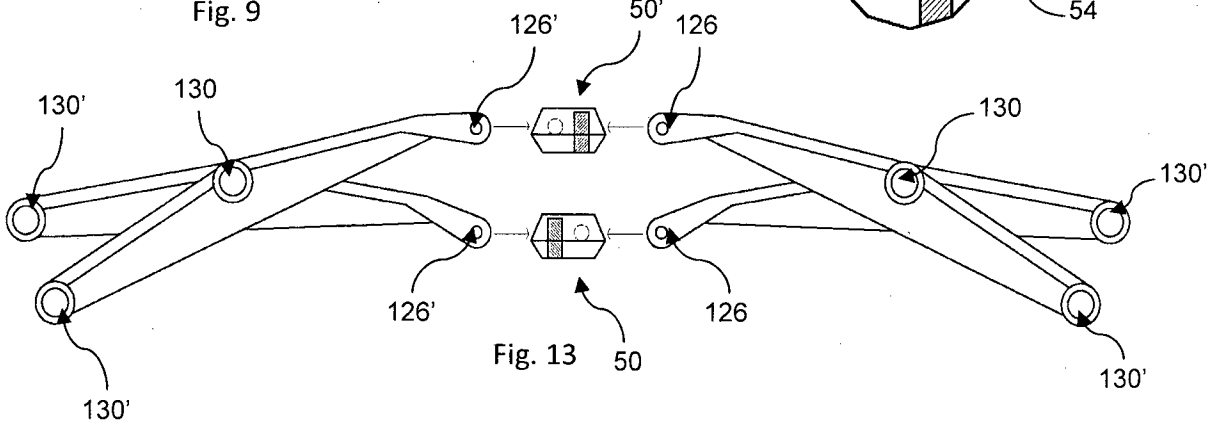


Fig. 13

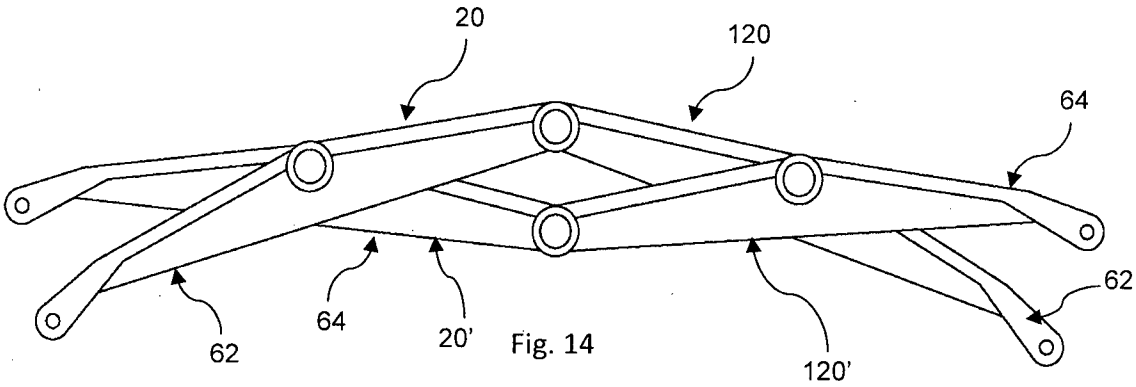
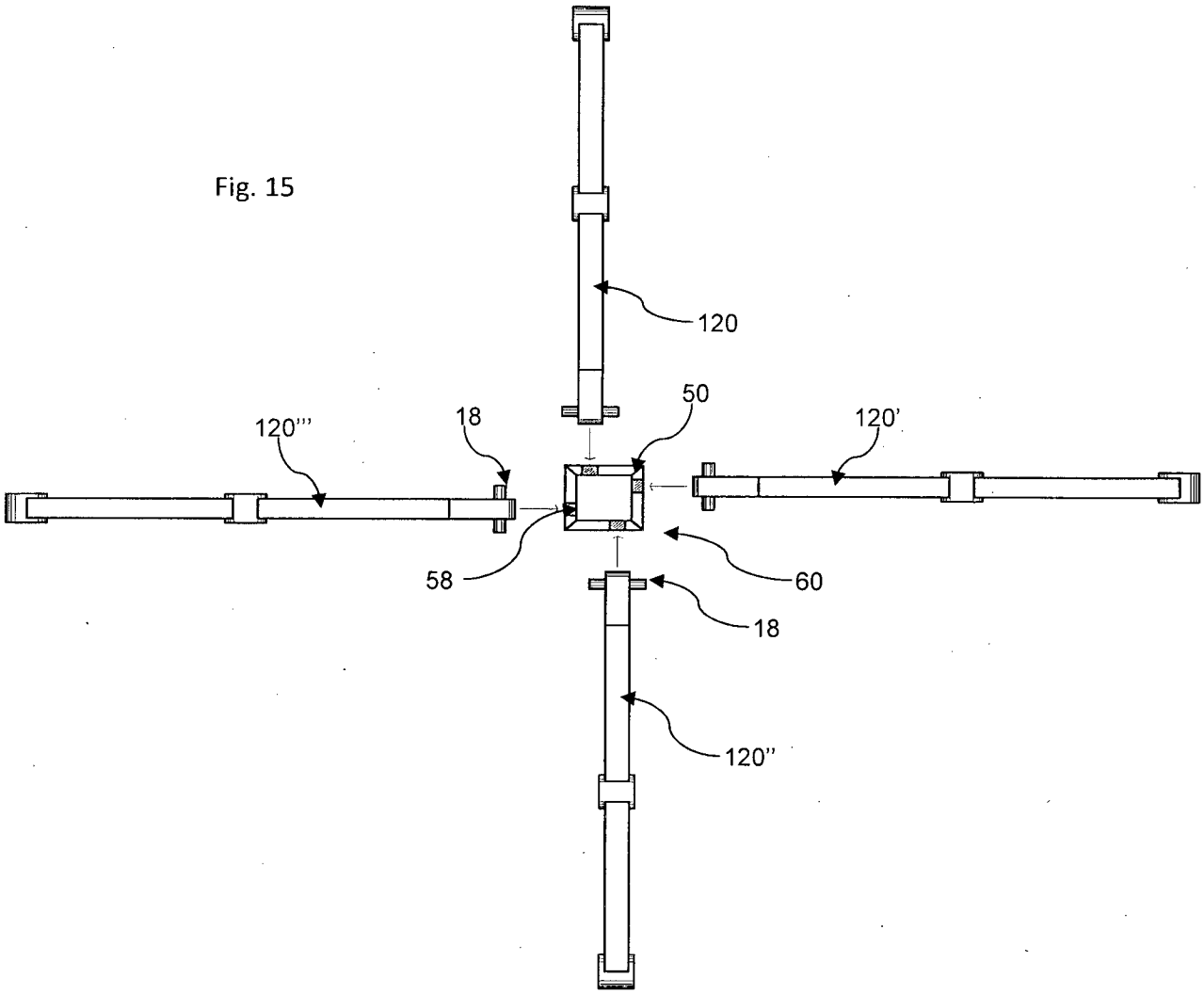


Fig. 14

Fig. 15



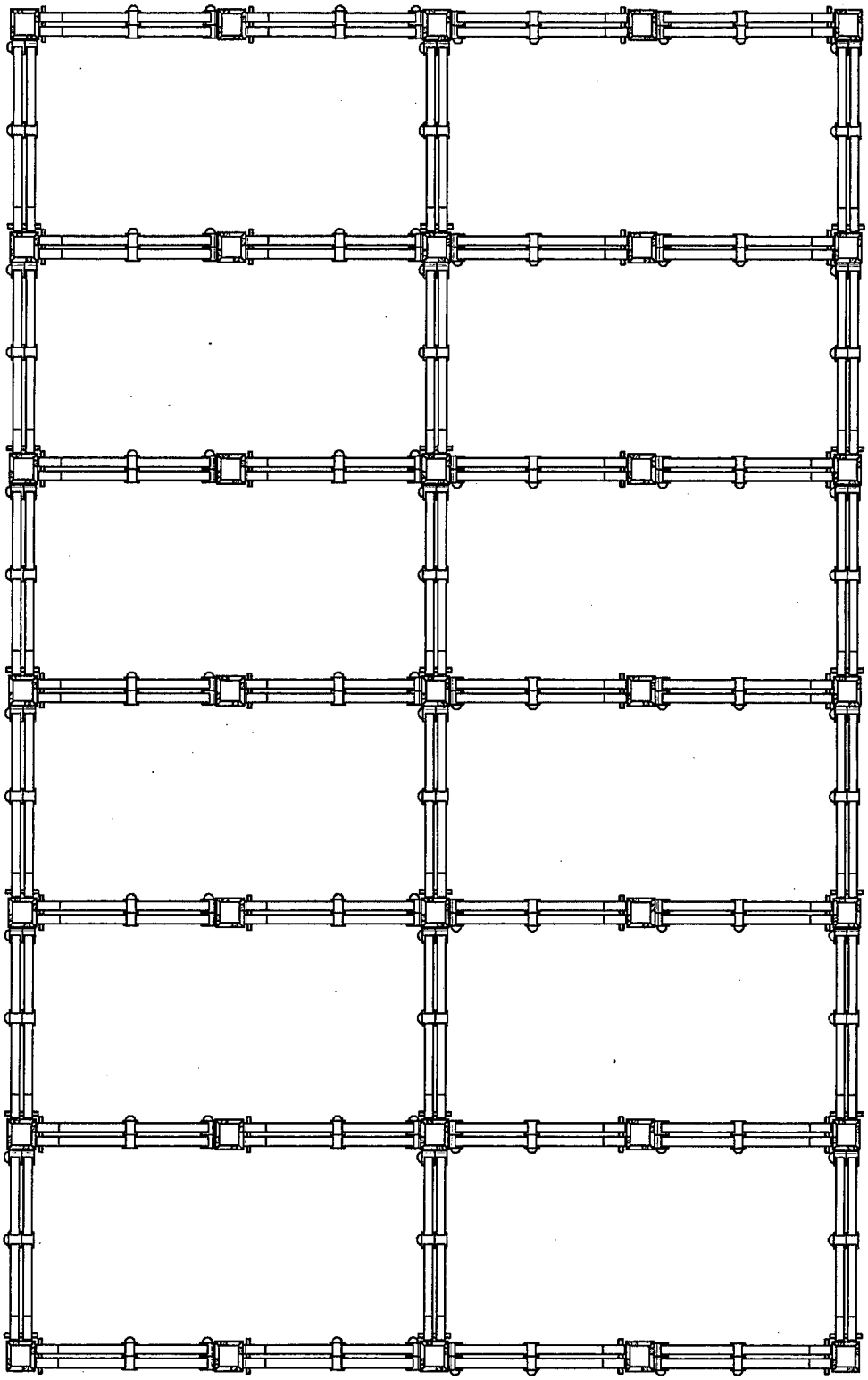


Fig. 22

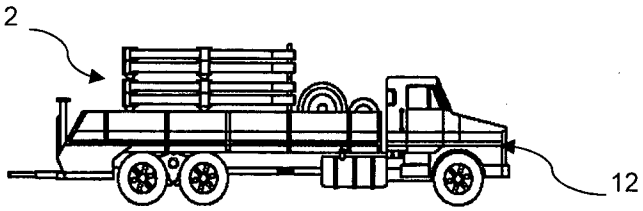


Fig. 16

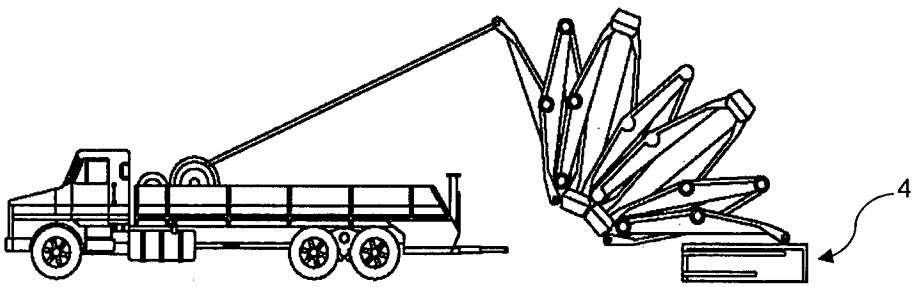


Fig. 17

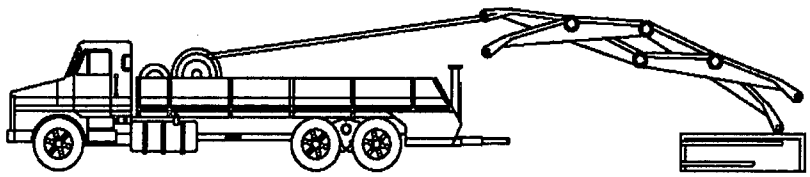


Fig. 18

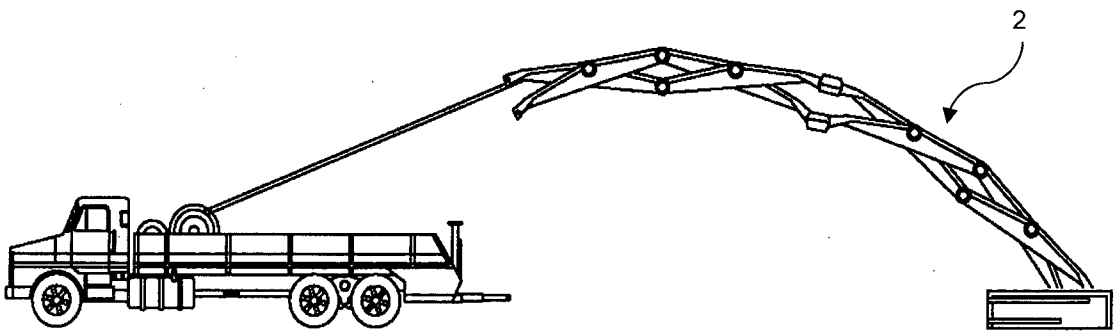


Fig. 19

Fig. 20

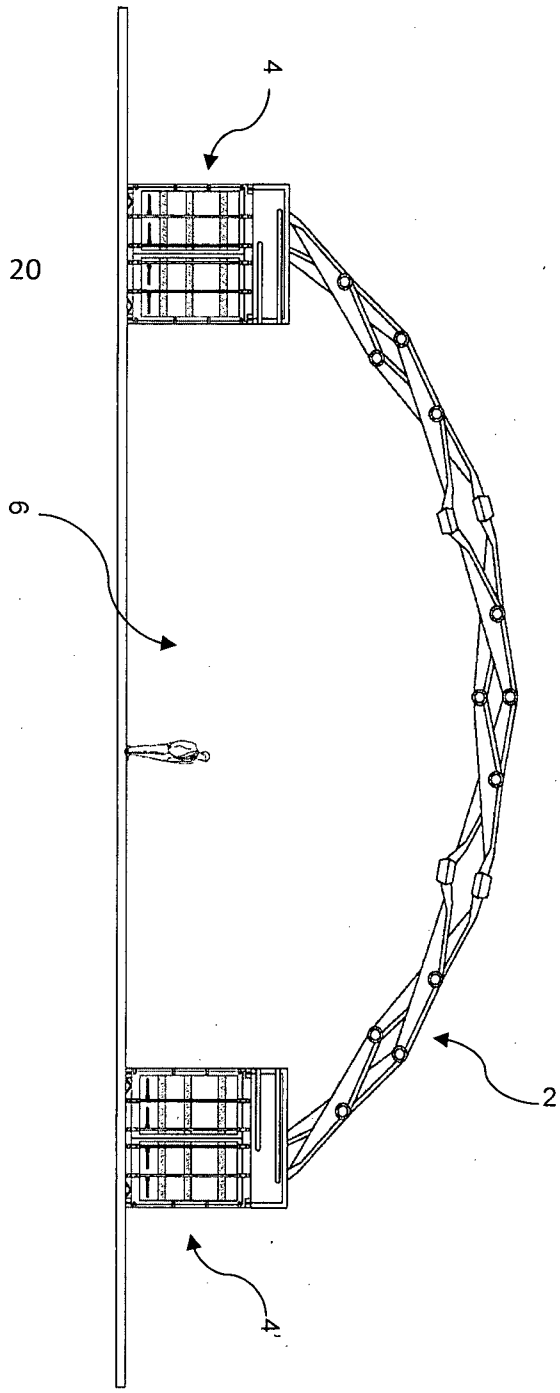


Fig. 21