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(54) **MOVEMENT SYSTEM FOR A MOBILE ROOF**

(57) System for moving a retractable roof consisting of aligned movable trusses that move on two parallel guide rails by means of runners arranged on the side posts of the said trusses, and where the trusses are joined together by a tarpaulin, where the retraction system has the particularity that each runner consists of two side walls facing each other, and between these walls there are rows of grooved wheels fixed at two different

heights; each guide rail comprises an upper curved surface on its upper side, and a lower curved surface on its lower side; where the runner runs along and is kept in contact with the guide rail by the wheels of the upper row being in contact with the upper curved surface of the guide rail, and by the wheels of the lower row being in contact with the lower curved surface of the guide rail.

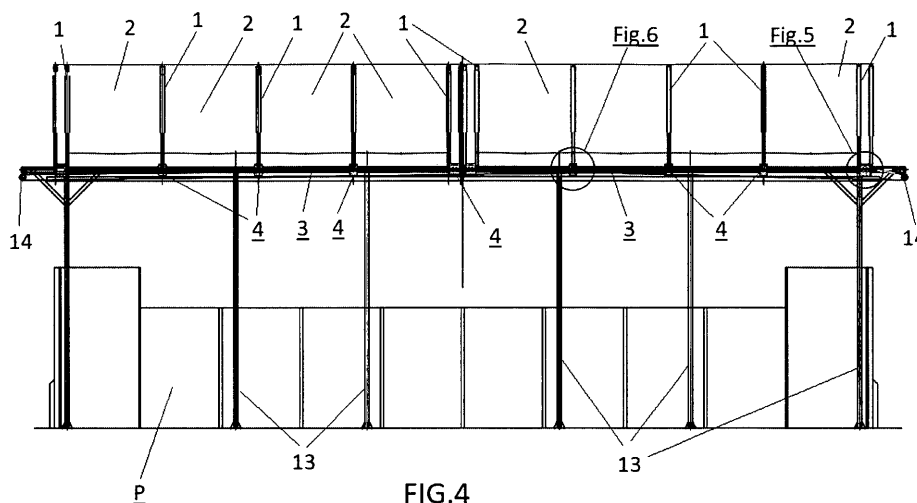


FIG. 4

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Description

FIELD OF THE INVENTION

[0001] This invention describes a new system for moving the equipment of a retractable roof, where the roof is made up of a number of trusses that move along rails, and with which a tarpaulin or similar surface can be folded or unfolded to cover a facility, such as a sports field, a recreational area, or an outdoor commercial or industrial area.

[0002] The system that is the subject of this invention corresponds to different types of retractable structures, more specifically to folding roof structures and, in particular, to the means, systems or equipment that make it possible for such roofs to be folded or unfolded.

STATE OF THE ART

[0003] Within this industrial sector, it is widely known that there are non-retractable roofing systems based on fixed structures, which cover a facility but involve the problem where users are unable to enjoy good weather or where the use of artificial light becomes necessary. To solve this problem, retractable roofs were developed.

[0004] In this sense, there are different types of retractable roofs, mainly based on telescopic or retractable systems. They involve major construction problems at certain heights, limiting their field of application and preventing the trusses that make up such structures from moving correctly. An example of this type of roof is given in document US2603171. This means that this type of roof has to be designed for each particular facility.

[0005] There are also different retractable tarpaulin systems, such as those shown in document ES1054415U or document ES1016096U, which describe mechanisms for folding large tarpaulins, but which are not supported by a structure that provides resistance or durability against rain, wind or other environmental agents.

[0006] Finally, document ES2531203 describes a type of roof composed of a variable number of aligned movable trusses that move on two parallel rails. The trusses are connected to each other by a tarpaulin deployed by the inertia of the first truss, which is set in motion by a motor operated by a remote control or pushbutton. In this way, the roof can remain deployed as all the trusses are dragged by the first motor truss, the last truss being immobilised and fixed in position at all times. The problem with this document is that it presents a displacement system that encounters jamming problems caused by weight, and it can also come off the rails, which can affect the safety and strength of the roof assembly.

[0007] The need thus arises to develop a displacement system to ensure that the trusses move safely and do not get stuck during folding and unfolding, and to increase the durability of the unit as a whole. This invention, which is detailed below, describes a new type of displacement

system. It is different from any existing inventions in this industrial field and improves and solves the problems referred to above.

DESCRIPTION OF THE INVENTION

[0008] The displacement system of this invention is designed to improve the movement of trusses that support tarpaulins or enclosures, and that constitute a retractable roof.

[0009] The document begins with a description of the type of roof for which the system is intended. This roof is composed of a variable number of aligned retractable trusses. The trusses move on two parallel guide rails and are joined together by a tarpaulin deployed by the inertia of the first truss, which is set in motion by a motor operated by a remote control or pushbutton, such that the roof can remain deployed as all the trusses are dragged by the first motor truss, the last truss being immobilised and fixed in position at all times.

[0010] Looking at the details of the invention, the displacement system of this invention is based on the fact that a runner is coupled to each end of a truss with a number of grooved wheels connected in the form of a bearing by means of bolts, and each runner is connected to a guide rail. The top and bottom faces of the guide rail comprise a curved surface with which the grooved wheels are in contact and along which they run.

[0011] In particular, the runner consists of two side walls facing each other, where a truss post is attached to the inner wall, and at least two grooved wheels are attached between the walls at two heights, the wheels being fixed between the side walls by means of a shaft. In other words, there is an upper row of grooved wheels, and a lower row of grooved wheels.

[0012] In more detail, the wheels of the upper row are in contact with the upper curved surface of the rail, while the wheels of the lower row are in contact with the lower curved surface of the rail. In this way, the runner moves and remains in contact with the rail and cannot come off it, as the runner wraps around the rail.

[0013] Once each runner has been inserted into the guide rail, the truss stays vertical; it enables smooth movement, ensuring there is no significant resistance when the tarpaulin is pulled to unfold, as it increases the free surface along which it can run. In turn, this improves the durability of the tarpaulin. The system also enables safe movement without the tarpaulin coming out of the guide rail, as the rail is sandwiched between the two wheel heights and the side walls of the runner. There is also an improvement in the weight distribution of each truss and the tarpaulin in relation to the guide rail, preventing the movement from jamming.

[0014] Taking into account this aspect, and as the object of this invention is not to define a specific type of roof, this system can be used in any type of structure comprising a retractable roof, where the retractable roof can also be of different shapes depending on the facility in which

it is to be installed. In addition, the roof can be extended in length as desired, adding as many trusses as necessary and lengthening the surface of the tarpaulin to the desired size. It can be made of any material known in the construction sector, such as steel, aluminium, wood or others; and the design of the truss can be of any shape as long as it complies with the manufacturing standards for roof construction. It can also be made up of pieces that can be assembled with through-bolts, always ensuring that the final truss is light, resistant and, above all, safe.

[0015] As for the mounting or support of the roof-where this aspect is also not the object of protection-, the roof can be supported in different ways. In one possible embodiment of the invention, the structure supporting the cover can be self-supporting, i.e. it is a self-supporting structure, without the need for it to be attached to the padel court or facility in question by means of the columns welded to the padel court, in which case if you were to remove the court, the cover might come down. In this possible first embodiment, the retractable roof can be supported on a belt that joins all the columns and the columns can be fitted with braces to reinforce the structure so that it is supported without the need for it to be attached to the actual structure of the padel court or the facility that is to be covered. In another possible embodiment of the invention, as has been done in the conventional way, the cover can be fixed to the structure of the facility itself, i.e. a padel court, as in the previous case. In any of the cases, and in a generic way, it can be said that the roof rests on support pillars, either in the self-supporting structure or the conventional structure of the facility itself.

[0016] For the assembly of the roof runner system, once the support pillars and guide rails have been assembled, the truss runners are then inserted through the ends of the rails. This operation can be quick and simple, and only requires two workers: one worker lifts each truss by its middle using a manual load elevator, while the other worker checks that the runner is in line with the guide rail and inserts it in the rail from a ladder. Once all the trusses have been mounted on the guide rails, one of the workers inserts a through-bolt in all the ends of the guide rails as a safety stop to prevent the trusses from sliding out lengthwise. In another possible embodiment of the invention, the guide rails are sections welded to another rectangular section that has a third element attached, i.e. a toothed rack to enable the traction of the trusses on the guide rail by means of the motor pinion and cogs, where these elements thus create a single assembly. This unit is fitted by joining together as many sections as necessary to cover the desired area.

[0017] The support pillars are structural sections that can be attached to the metal structure of the place where the roof is to be installed, for example, a padel court, by means of flanges or bolted plates when there is an existing structure, which will save in building work, discreetly integrating the design of the roof. The space will also

be used and, in this way, no obstacle will be placed in the perimeter corridors of the court. The height of the support pillars is variable depending on the facility or area that is to be covered. For sports facilities, the height will depend on the sport in question, always leaving a free space up to the height authorised by each federation or official body.

[0018] In one possible embodiment of the invention, the outer wall of the runner comprises a central opening to improve the connection between the guide rail and the support pillar. This allows for better movement or displacement of the runners, and improves the connection between the guide rail and the support pillars. This is important when there is a large number of such support pillars and they are fixed on the outside of each rail. This central opening improves the movement of the runner and also avoids jamming or problems with the connection at the fastening points between the guide rail and the support pillars.

[0019] The material for the tarpaulin can be canvas, cloth, plastic or any flexible or pliable material. Air exhaust valves can be fitted to the cover material to prevent the sail effect. The tarpaulin is fitted when all the trusses have been installed and collected at the end. One of the workers, from a personnel lifting device, fits the tarpaulin on the trusses in sections that are easy to handle. The tarpaulin is fastened to each truss using conventional pressure elements, preferably threaded. The tarpaulin fits across the entire cover but sections of tarpaulin can also be fitted to cover the sides.

[0020] When the cover is to be extended, a motor is started up by remote control. The motor is bolted to the first truss, the cog of the motor moves along a rack attached longitudinally to the guide rail and it extends from the start to the end of said guide. This first truss is also fitted with bearings that turn a shaft that runs from one end of the truss to the other. The ends of the shaft are fitted with cogs that transmit the movement of the motor when it moves from one guide to the other. It is also fitted with a rack to enable the runners to move simultaneously on the two rails and ensure that the trusses are parallel. At the end of the sweep, the motor stops when the limit switch comes into contact with a fixed stop. The motor can be stopped at any time by operating the remote control. To retract the cover, the motor is operated with the remote control and the drive truss runs in reverse along the same sweep. This slackens each section of tarpaulin, dragging each mobile truss on the way owing to the contact of the wheeled runners on each truss against each other. At end of the sweep, the motor stops when the limit switch comes into contact with a fixed stop. The retraction and extension actions described above are to collect the cover on one side of the facility only. To retract the tarpaulin on both sides of the facility, simply remove the racks and couple two shafts at the ends. One will be the drive shaft and will be connected to the motor, which will be fixed by a fastening plate, and the other shaft will be driven by a chain joining them together from end to

end of the sweep of the cover. When the cover is extended, the motor trusses will be in the middle of the sweep. Accordingly, the chain will be attached to one of the drive trusses in the section that goes in one direction, and the other drive truss will be attached to the section that moves in the opposite direction. Thus, when the motor rotates in one direction, the chain will separate the two trusses and when it rotates in the opposite direction, it will bring them together. The two rotation directions will therefore extend or retract the cover. At the end of the sweep, the motor will stop when a rev-counter limit switch counts the revs set for the extension and retraction of the cover.

[0021] Taking into account the above aspects, it can be seen that the displacement system of the retractable roof object of this invention can be implemented in a structure comprising a retractable roof, where all such movement is automatic. Furthermore, the displacement system differs from any other system known in the state of the art. It improves stability, avoids jamming, makes it possible to maintain the verticality of the truss posts, does not interfere with the motor mechanisms of the cover, enables smooth movement of the assembly, which improves the durability of the cover, and in short, it improves the displacement of the retractable roof.

[0022] Finally, throughout the description and claims, it should be noted that the term "includes" and its variants are not intended to exclude other technical features or additional elements.

BRIEF DESCRIPTION OF THE FIGURES

[0023] In order to complete the description and help with a better understanding of the characteristics of the invention, several figures are included, illustratively and unlimitedly depicting the following:

Figure 1 shows a perspective view of the displacement system of this invention, namely how a runner is coupled to and runs along a guide rail. In this case, it is a runner comprising two wheels in the upper row and two wheels in the lower row, where the wheels are in contact with the upper and lower curved surfaces of the guide rail. This figure also shows how the truss post is fixed to the inner wall of the runner.

Figure 2 shows a front elevation view of a retractable roof over a padel court, the retractable roof comprising the runner-and-rail system that is the subject of this invention.

Figure 3 shows an enlarged view of the previous figure with the system that is the subject of this invention.

Figure 4 shows a side elevation view of the retractable roof according to Figure 2, where it can be seen that the roof comprises a number of trusses that move by means of the system of this invention, where

each truss has runners that move along the guide rails.

Figure 5 shows an enlarged view of the previous figure with a runner comprising a top and bottom row, each with three wheels

Figure 6 shows an enlarged view of Figure 4 with a runner comprising a top and bottom row, each with two wheels.

Figure 7 shows an aerial view of the retractable roof according to Figure 2, illustrating how the retractable roof can protect the entire surface of a padel court.

Figure 8 shows a perspective view of the retractable roof comprising the runner-and-rail system subject of this invention in deployed position.

Figure 9 shows a perspective view of the retractable roof in the retracted position.

DESCRIPTION OF ONE EMBODIMENT OF THE INVENTION

[0024] As previously mentioned, and as can be seen in the figures for an embodiment in which the installation to be covered with the retractable roof is a padel court (P), the displacement system is designed to improve the movement of the trusses (1) that support the tarpaulins (2) or roof, and which, when joined together, form a retractable roof.

[0025] As can be seen in the figures, the roof is composed of a variable number of aligned mobile trusses (1), which move on two parallel rails (3), and the trusses are joined together by a canvas (2), deployed by the inertia of the first truss and set in motion by a motor (14) operated by a remote control or a pushbutton. This moves the chains attached to at least one of the trusses to allow them to move, so that the roof can be kept unfolded as all the trusses are pulled by the first drive truss and where the last truss, which always remains fixed in position, is generally immobilised. In this sense, each truss (1) is made up of lateral posts (11) and transverse sections (12) that hold up the tarpaulin (2).

[0026] The particularity of the invention is that each side post (11) of a truss has a runner (4) attached with a number of grooved wheels, where each runner (4) is fitted to a guide rail (3) such that the runner can move along the guide rail.

[0027] For this purpose, as can be seen in the view of Figure 1, a runner (4) is made up of two side walls facing each other, where the truss is fixed on the inner wall (5) to the post (11), and between these walls there are at least two grooved wheels fixed at two heights. The wheels are fixed between the side walls by means of a shaft in the form of a bolt bearing (6). Therefore, there is an upper row (7) of grooved wheels and a lower row (8)

of grooved wheels. In addition, the upper side of the guide rail (3) comprises an upper curved surface (9) and the lower side has a lower curved surface (10) with which the grooved wheels of the runner make contact and along which they run. In other words, the wheels of the upper row (7) make contact with the upper curved surface (9) of the rail, while the wheels of the lower row (8) make contact with the lower curved surface (10) of the rail. In this way, the runner runs along, fits tightly to and cannot come out of the rail, as the runner (4) actually wraps completely around the guide rail (3). Figures 5 and 6 show that within the same system, there can be runners where the top and bottom row of the grooved wheels can each have two and three wheels. It is recommended that in the initial and final trusses, which are more exposed to stress forces, the runners have more than two wheels, as this improves the stability of the assembly and the displacement of the set of trusses joined together by the tarpaulin.

[0028] As previously indicated, once each runner (4) has been inserted into the guide rail (3), the truss can remain vertical; the movement is smooth; the durability of the tarpaulin is improved; the movement is safe with no runner coming out of the rail as the rail is enclosed between the two wheel heights and the side walls of the runner; and there is an improvement in the weight distribution of each truss and the tarpaulin in relation to the guide rail, preventing the movement from jamming.

[0029] In addition, as shown in the figure and in the example in which the system is used to cover a padel court, the guide rails (3) are mounted on self-supporting pillars (13), which are distributed at the same height along the entire side of the padel court, such that the guide rails are not only aligned and parallel, but also level, and the runners move correctly so that the tarpaulin (2) can fold and unfold as necessary, therefore covering the padel court as shown in Figure 8 or leaving it in the open air, as shown in Figure 9.

[0030] In one possible embodiment of the invention (see Figure 3), the outer wall of the runner comprises a central opening (15) to improve how the runners (4) slide along the guide rail (3), preventing jamming or problems with the connection between the guide rail (3) and the support pillars (13).

each runner (4) consists of two side walls facing each other, where the post (11) of the truss is fastened to the inner wall (5), and between these walls there is an upper row (7) with grooved wheels, and a lower row (8) with grooved wheels fixed at two heights, where the wheels are fixed between the side walls by means of a shaft; each guide rail (3) comprises an upper curved surface (9) on its upper side and a lower curved surface (10) on its lower side; and where the runner (4) runs along and is attached to a guide rail (3) by the wheels of the upper row (7) being in contact with the upper curved surface (9) of the guide rail, and by the wheels of the lower row (8) being in contact with the lower curved surface (10) of the guide rail.

2. System for moving a retractable roof according to Claim 1, **characterised by** the fact that the shaft that fixes the wheels between the side walls has the form of a bolt bearing (6).
3. System for moving a retractable roof according to Claim 1, **characterised by** the fact that the outer wall of the runner (4) comprises a central opening (15).
4. System for moving a retractable roof according to Claim 1, **characterised by** the fact that the upper row (7) comprises at least two grooved wheels.
5. System for moving a retractable roof according to Claim 1, **characterised by** the fact that the lower row (8) comprises at least two grooved wheels.

Claims

1. System for moving a retractable roof, where the roof is composed of a number of aligned retractable trusses (1), consisting of side posts (11) and cross-sections (12), which move along two parallel guide rails (3) by means of runners (4) attached to the side posts (11) of the said trusses, where the trusses are joined together by a tarpaulin (2) and where the guide rails (3) are mounted on support pillars (13); where the displacement system is **characterised by** the fact that:

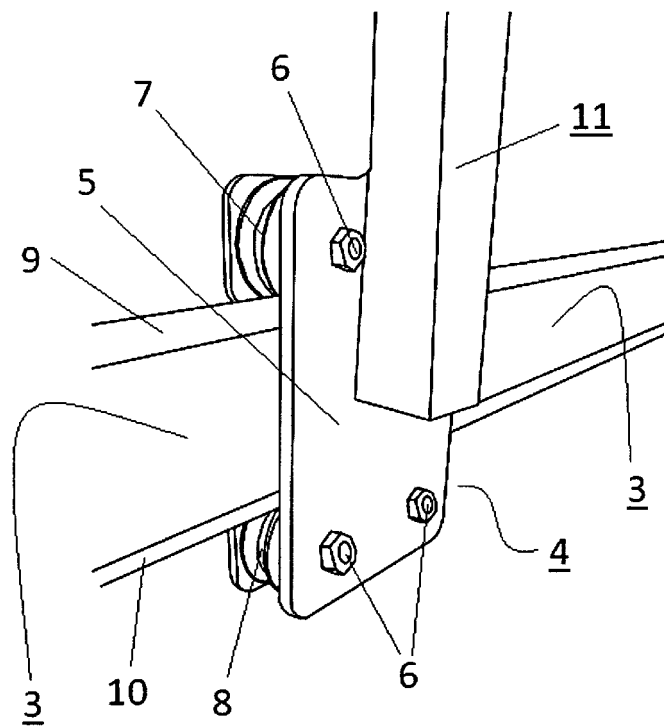
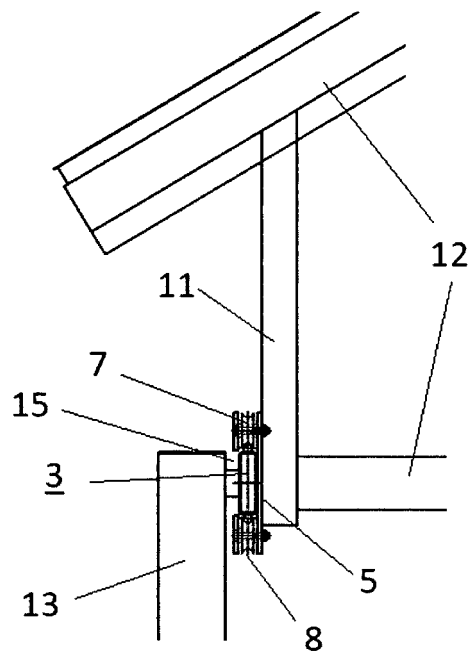
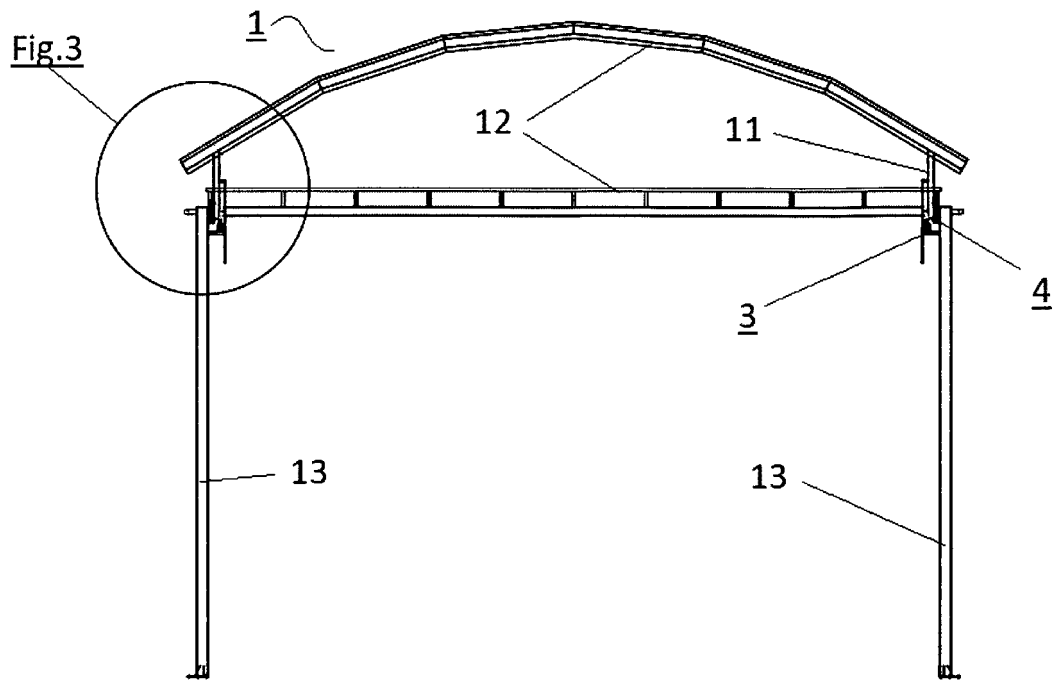
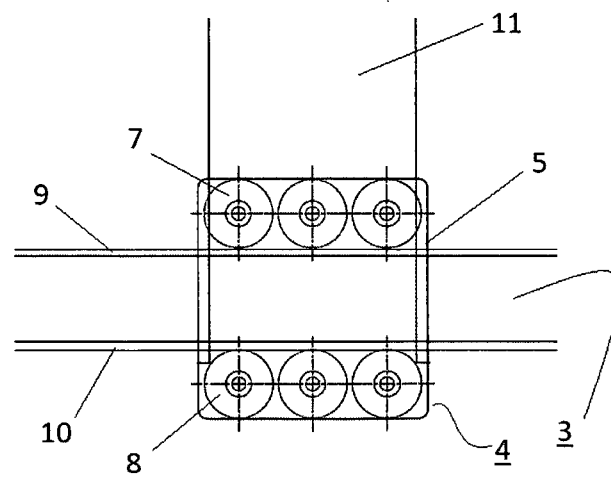
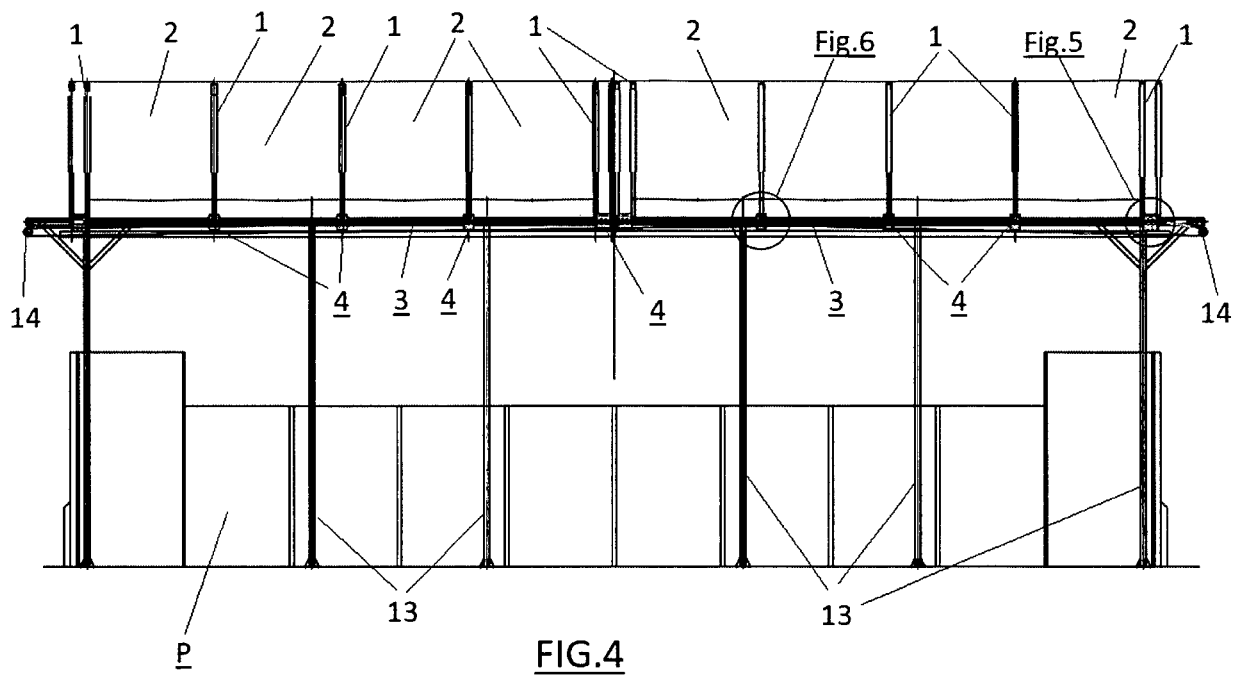


FIG.1





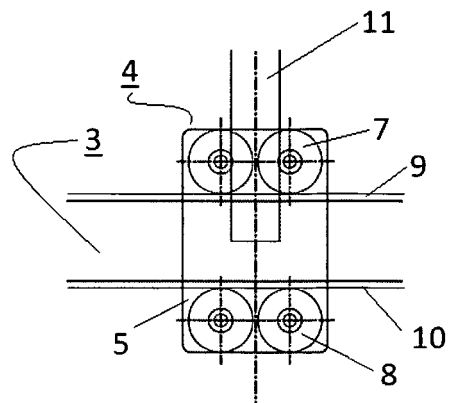


FIG. 6

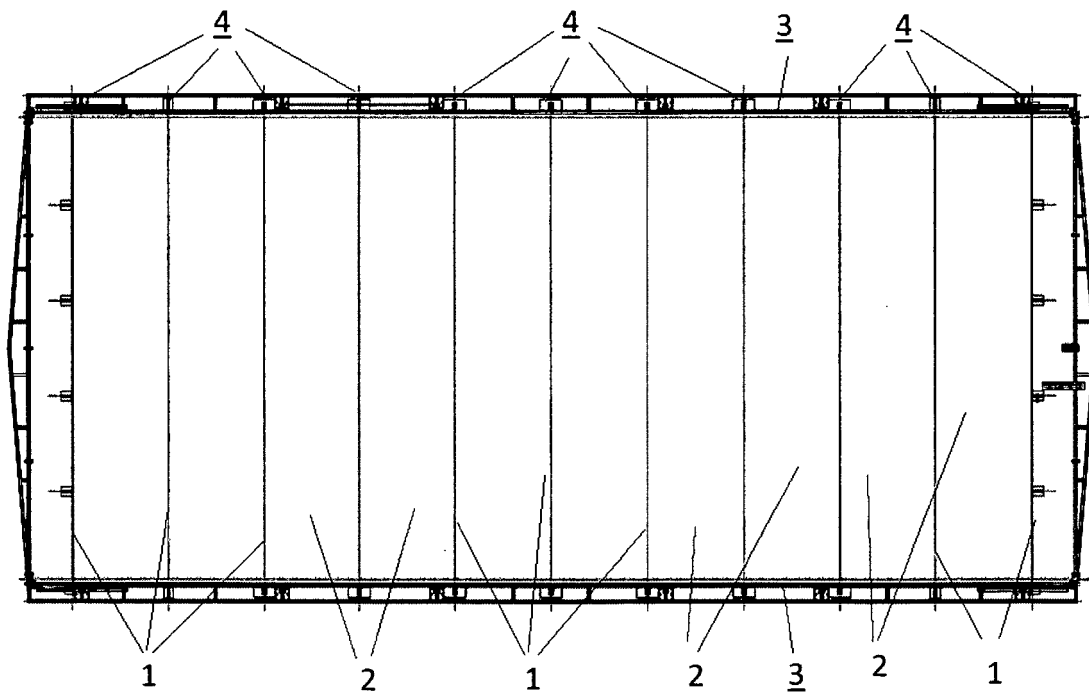


FIG. 7

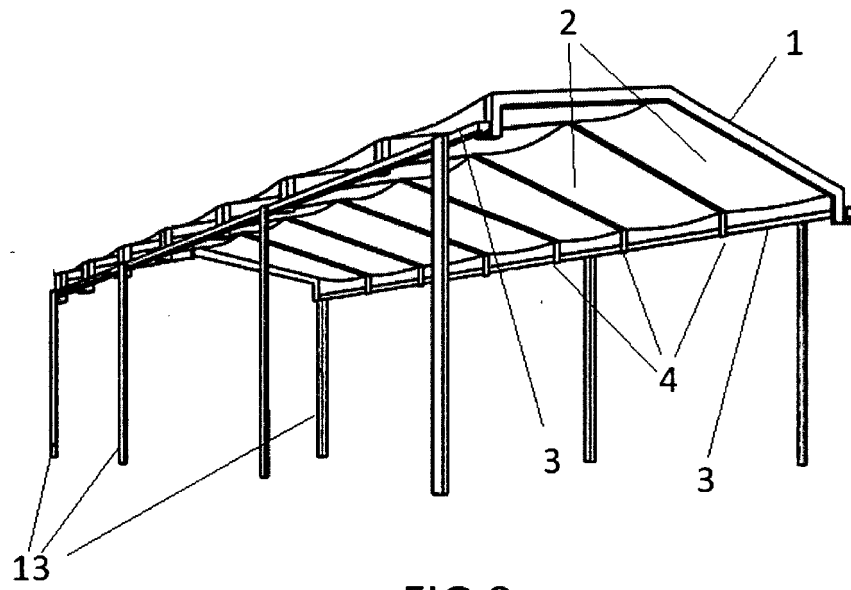


FIG. 8

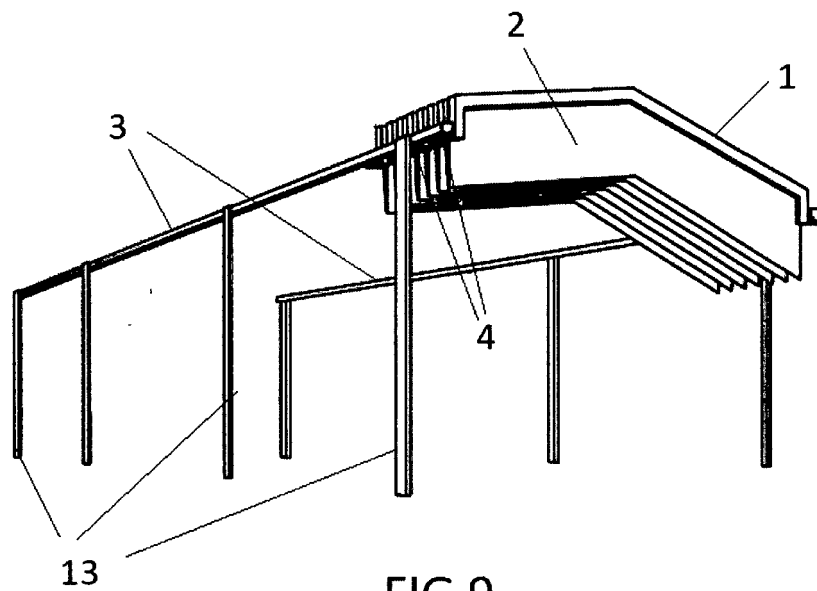


FIG. 9

INTERNATIONAL SEARCH REPORT

International application No.

PCT/ES2022/000022

A. CLASSIFICATION OF SUBJECT MATTER

See extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

E04B, E04F, E04H

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

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

EPODOC, INVENES

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 9404281 B1 (DONNAY JOHN) 02/08/2016, column 1, line 47 - column 5, line 12; figures.	1, 4, 5
A	US 2603171 A (SMITH HORACE G) 15/07/1952, column 1, line 65 - column 5, line 20; figures.	1-5
A	WO 2014170510 A1 (MARTINEZ FRANCO FRANCISCO JAVIER) 23/10/2014, page 6, line 21 - page 12, line 12;	1
A	WO 2008000034 A1 (HARDHOUSE CAFE BAR PTY LTD ET AL.) 03/01/2008, pages 5 - 7; figures 5 and 7.	1, 4, 5

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

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Date of the actual completion of the international search
31/08/2022Date of mailing of the international search report
(09/09/2022)

Name and mailing address of the ISA/

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Telephone No. 91 3495553

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/ES2022/000022

Information on patent family members

Patent document cited in the search report	Publication date	Patent family member(s)	Publication date
US9404281 B1	02.08.2016	NONE	
US2603171 A	15.07.1952	NONE	
WO2014170510 A1	23.10.2014	ES2531203 A1 ES2531203 B1 EP2987923 A1 EP2987923 A4	11.03.2015 22.12.2015 24.02.2016 28.12.2016
WO2008000034 A1	03.01.2008	AU2007264408 A1 AU2007264408 B2	03.01.2008 27.09.2012

Form PCT/ISA/210 (patent family annex) (January 2015)

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International application No.

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E04B7/16 (2006.01)

E04F10/04 (2006.01)

E04B1/342 (2006.01)

E04H15/58 (2006.01)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 2603171 A [0004]
- ES 1054415 U [0005]
- ES 1016096 U [0005]
- ES 2531203 [0006]