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(72) Inventors:  
• **Lahtinen, Jyrki Juha**  
**33400 Tampere (FI)**  
• **Mäkinen, Vesa**  
**33400 Tampere (FI)**

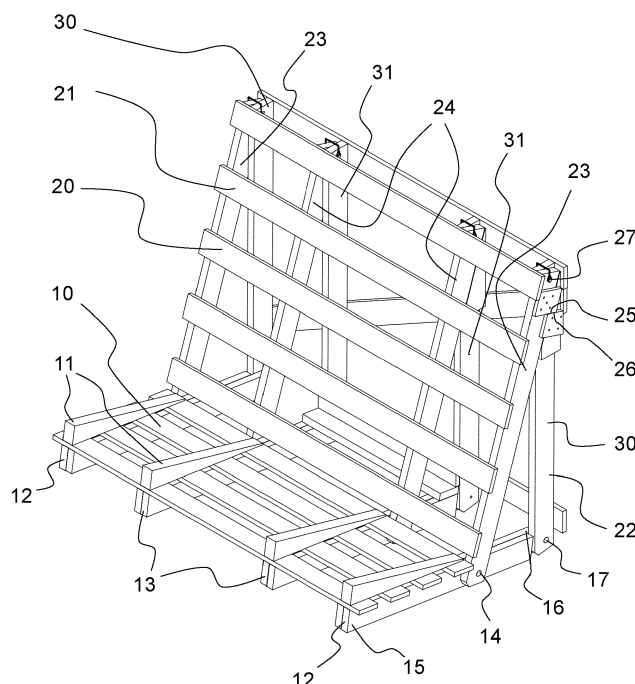
(74) Representative: **Koivisto, Harri Kristian et al**  
**Koivisto Patentit Oy**  
**Pyhäjärvenkatu 5 B 406**  
**33200 Tampere (FI)**

(71) Applicant: **A5 Investment and Real Estate Oy**  
**33400 Tampere (FI)**

### (54) **A PALLET APPARATUS FOR TRANSPORTATION OF AUTOMOTIVE GLASS**

(57) A pallet apparatus for transportation of automotive glass, comprising a horizontal base (10) configured to receive a forklift fork; and a vertical support (20) having at least one inclined plane for the automotive glass standing on the horizontal base (10). The vertical support (20) is connected to the horizontal base (10) by at least one

first hinge (14). The vertical support (20) is configured to fold along the first hinge (14) between a support position and a storage position. In the storage position, the vertical support (20) is longitudinally parallel and in the same plane as the horizontal base (10). Length of the pallet apparatus is less than 2,48 metres.



**Fig.1**

**EP 3 885 282 A1**

## Description

### BACKGROUND

**[0001]** The invention relates to packaging, more specifically to packaging elements or packages, adapted for automotive glass.

**[0002]** A pallet is a flat transport structure, which supports items in a stable fashion while being lifted by a forklift, a pallet jack, a front loader, a jacking device, or a crane. The pallet enables importing, exporting or transporting automotive glass for long distances.

**[0003]** Automotive glass is often curved vertically and/or horizontally. A pallet apparatus for transporting the automotive glass is often a wooden pallet that allows the glass to be packed substantially vertically. The pallet has a horizontal base where the bottom edge of the vertical glass rests. The glass leans against a vertical support having an inclined plane for the glass. Multiple glasses may be transported spaced apart, pressed against each other or having soft support elements between consecutive glasses. Examples of automotive glasses are windshields, rear windows and side windows.

**[0004]** The pallet apparatus is usually a rigid structure that is not assigned for reuse. Usually the automotive glass is transported to one direction only, as it is fitted into a car at the destination. Shape of the pallet apparatus makes transporting empty pallet apparatuses uneconomical. Rigid pallet apparatuses are optimized for glass transport. Glasses are fragile objects that require specially purposed pallets - without the glass payload, transporting empty pallet apparatuses could cost about the same as the pallets having full load of glass. Therefore the pallet apparatuses are usually discarded at the destination. Although the pallet apparatuses are often made of wood and are as such recyclable, the lack of reusability wastes a lot of resources.

### SUMMARY

**[0005]** This summary is provided to introduce a selection of concepts in a simplified form that will be further described below in the detailed description. This summary is intended to neither identify key features or essential features of the claimed subject matter nor to be used to limit the scope of the claimed subject matter. Furthermore, the claimed subject matter is not limited to implementations that solve any or all of the disadvantages noted in any part of this disclosure.

**[0006]** A pallet apparatus for transportation of automotive glass is disclosed herein. The pallet apparatus is foldable into two positions; a support position and a storage position. In the support position a vertical support stands on a horizontal base, providing inclined support for the glass to be transported. In the storage position the vertical support is folded down into the level of the horizontal base. The pallet apparatus is in one embodiment made of wood. The horizontal base and the vertical

support comprise longitudinal beams that are parallel in the storage position. In the storage position, length of the pallet apparatus is less than 2,48 metres. The pallet apparatus is rigid in the flat storage position, enabling easy transportation and stacking multiple apparatuses.

**[0007]** The foldable pallet apparatus is reusable, as the storage position enables economical transport for the empty pallet apparatuses. The cost per transported pallet apparatus reduces significantly as they can be fitted transversely into a truck load. Transporting the reusable pallet apparatuses in storage position may be done by readily available loading equipment. Truck loading and unloading from the side is fast and easy. In one embodiment the pallet apparatuses in storage position are transported transversely inside an intermodal container.

**[0008]** Many of the attendant features will be more readily appreciated as they become better understood by reference to the following detailed description considered in connection with the accompanying drawings. The embodiments described below are not limited to implementations which solve any or all the disadvantages of known pallet apparatuses or automotive glass supports.

### BRIEF DESCRIPTION OF THE DRAWINGS

**[0009]** The present description will be better understood from the following detailed description read in light of the accompanying drawings, wherein

FIG. 1 illustrates schematically one exemplary embodiment of a pallet apparatus in a support position;

FIG. 2 illustrates schematically the same embodiment in a transport position;

FIG. 3 illustrates schematically the same embodiment from alternative angle in a support position;

FIG. 4 illustrates schematically the same embodiment, wherein the connection between a first support and a second support is slightly open;

FIG. 5 illustrates schematically one exemplary embodiment of a vertical support top portion;

FIG. 6 illustrates schematically one exemplary embodiment of the vertical support top portion;

FIG. 7a illustrates schematically one exemplary embodiment of the vertical support top portion;

FIG. 7b illustrates an alternative view of the same embodiment; and

FIG. 8 illustrates schematically one exemplary embodiment of the pallet apparatus.

**[0010]** Like reference numerals are used to designate

like parts in the accompanying drawings.

## DETAILED DESCRIPTION

**[0011]** The detailed description provided below in connection with the appended drawings is intended as a description of the present examples and is not intended to represent the only forms in which the present example may be constructed or utilized. However, the same or any equivalent functions and sequences may be accomplished by different examples.

**[0012]** Although the present examples are described and illustrated herein as being implemented in transporting windshields in a pallet apparatus, they are provided as an example and not a limitation. As those skilled in the art will appreciate, the present examples are suitable for application in a variety of different types of glass products or other fragile and substantially flat products. Examples of automotive glass are windows for passenger cars, trucks, tractors, heavy duty vehicles or other terrain vehicles.

**[0013]** FIG. 1 illustrates schematically one exemplary embodiment of a pallet apparatus in a support position. FIG. 2 illustrates schematically the same embodiment in a storage position. In the support position the pallet apparatus is configured to receive and support during transport automotive glass or other similar flat and fragile items. A horizontal base 10 comprises elements found in traditional pallets, for example means for receiving a forklift fork. The horizontal base 10 has at least two longitudinal base beams 12 configured to lift the horizontal base 10 from the ground level and allowing the forks to be positioned below the pallet apparatus. The longitudinal base beams 12 also provide structural rigidity to the pallet apparatus. The present exemplary embodiment comprises four longitudinal base beams 12, 13; a pair of outer longitudinal base beams 12 and a pair of inner longitudinal base beams 13.

**[0014]** A vertical support 20 resides at one end of the horizontal base 10. The vertical support 20 provides an inclined plane for the automotive glass standing on the horizontal base 10. The automotive glass, such as windshields, may lean against the vertical support 20. The horizontal base 10 comprises multiple inclined support blocks 11 that allow multiple automotive glasses to be stacked parallel to each other. The inclined support blocks 11 also allow robotic arms to load and unload the automotive glass to/from the pallet apparatus as the automotive glass does not fall back when released from the robotic arm.

**[0015]** The vertical support 20 may not be completely transverse to the horizontal base 10. The vertical support 20 is connected to the horizontal base 10 by at least one first hinge 14. The vertical support comprises four longitudinal support beams 23, 24. In the present example the longitudinal base beams 12, 13 are connected by a set of first hinges 14 to the longitudinal support beams 23, 24 of the vertical support 20. The outer longitudinal

support beams 23 are connected by the first hinges 14 to the outer longitudinal base beams 12. The inner longitudinal support beams 24 are connected by the first hinges 14 to the outer longitudinal base beams 13. All first hinges 14 reside at the same axis.

**[0016]** The vertical support 20 is configured to fold along the first hinges 14 between the support position and the storage position. In the storage position, the vertical support 20 has been folded down along the first hinges 14 to the flat position as illustrated in FIG. 2; as a parallel extension to the horizontal base 10. The vertical support 20 is longitudinally parallel and in the same plane as the horizontal base 10. The storage position is substantially flat, enabling multiple pallet apparatuses to be stacked on top of each other. In the storage position the pallet apparatuses do not consume unnecessary space, and as a consequence, reusing the pallet apparatuses becomes economically viable.

**[0017]** The pallet apparatus may be made of wood. Wooden pallet apparatus is simple to recycle with the established recycling devices found at most industrial facilities. Alternatively, or in addition, that pallet apparatus may be made of plastic, metal or composite materials. Some components of the pallet apparatus may be made of different materials.

**[0018]** In one embodiment, in the storage position length of the pallet apparatus is less than 2,48 metres. In one embodiment, in the storage position length of the pallet apparatus is less than 2,45 metres. In the storage position the pallet apparatus fits transversely in a truck load. In one embodiment the pallet apparatus is configured to fit transversely in the truck load. In one embodiment the pallet apparatus is configured to fit transversely in an intermodal container. The pallet apparatus may be lifted by a truck loader, using the fork fitting into the horizontal base 10. In one embodiment the fork fits between the longitudinal support beams 23, 24 of the vertical support 20.

**[0019]** Throughout this document, "longitudinal" is defined as the direction of the lowest support beams, allowing the forks to be inserted beneath the pallet apparatus for lifting the pallet apparatus. This direction also defines the length of the pallet apparatus. Width of the pallet apparatus may be even more than the length - the length is defined by the side loading of the truck load and/or the truck bed. The width of the pallet apparatus may differ as pallet apparatuses may be designed according to the product it is intended to carry. The automotive glass may be wide, even several metres, so the pallet apparatus may be equally wide. The width of the pallet apparatus may be increased by increasing the number of longitudinal beams to the horizontal base and to the vertical support.

**[0020]** In one exemplary embodiment the vertical support 20 comprises two sections: a first support 21 and a second support 22. The first support 21 provides the inclined plane for the glass to be transported. In the most simplified form the vertical support 20 comprises the first

support 21 that is locked in the inclined position. In the example of FIG. 1 the second support 22 supports the first support 21 in the support position. The first support 21 is connected to the horizontal base 10 by the first hinge 14, wherein the first hinge 14 is between a first end 15 and a second end 16 of the horizontal base 10. In one embodiment the first hinge 14 is positioned between the middle of the horizontal base 10 and the second end 16 of the horizontal base 10.

**[0021]** The second support 22 is connected to the horizontal base 10 by at least one second hinge 17. The second hinge 17 is at the second end 16 of the horizontal base 10. In the support position the first support 21 and the second support 22 lean against each other and the first support 21 provides the inclined plane for the automotive glass. In the storage position, as illustrated in FIG. 2, the second support 22 folds along the second hinge 17 to flat position, to the same plane as the horizontal base 10 and the first support 21.

**[0022]** In one exemplary embodiment, in the support position the first support 21 comprises a first surface 25 facing down and the second support 22 comprises a second surface 26 facing up. The first surface 25 is configured to lean on the second surface 26 in the support position. When the pallet apparatus is folded from the storage position to the support position, the second support 22 is configured to keep the first support 21 in the inclined position. The first surface 25 and the second surface 26 provide simple means to temporarily secure the vertical support 30 while erecting the structure. The contact between the first support 21 and the second support 22 may be secured with additional means. The friction between the first surface 25 and the second surface 26 may be sufficient to hold the structure in place until further securing means are in place. In one embodiment the pallet apparatus is made of plank wood - the friction between two wooden planks keeps the structure in place. In one embodiment the first surface 25 is a part of a first rectangular locking block and the second surface 26 is a part of a second rectangular locking block. The rectangular locking blocks may be made of plank wood or plywood, wherein they are easy and economical to manufacture by using only straight cuts.

**[0023]** FIG. 2 illustrates the exemplary embodiment, wherein the horizontal base 10 comprises at least two longitudinal base beams 12, and the vertical support 20 comprises at least two longitudinal support beams 23. The base beams 12 and the support beams 23 are interleaved in the storage position.

**[0024]** In one embodiment the horizontal base 10 comprises four base beams 12, 13. The vertical support 20 comprises four longitudinal support beams 23, 24 at the first support 21 and four longitudinal support beams 30, 31 at the second support 22, wherein the base beams 12, 13 and the support beams 23, 24, 30 and 31 are interleaved in the storage position. In one embodiment the ends of the base beams 12, 13 and the ends of support beams 30, 31 of the second support 22 are facing

each other in the storage position.

**[0025]** FIG. 3 illustrates the example of FIG. 1 and FIG. 2 from alternative angle in the support position. In one embodiment the second support 22 is connected to the horizontal base 10 via a connecting member 32, wherein the connecting member 32 is connected to the side of the horizontal base beam 12, 13 and to the side of the second support beam 30, 31. In one embodiment the connecting member 32 is an extended portion of the base beam 12, 13. The base beam 12, 13 comprises in one embodiment two planks of wood connected side by side, wherein the extension of the base beam 12 acts as the connecting member 32.

**[0026]** In one embodiment, in the support position the first support 21 and the second support 22 are connected at the top portion by locking means 35. In one embodiment, in the transport position the first support 21 and the second support 22 are connected by a locking means 35. The first support 21 and the second support 22 are in parallel position with the horizontal base 10. The lower portions of both the first support 21 and the second support 22 are connected by hinges 14, 17 to the horizontal base. The locking means 35 connect the upper portions of the first support 21 and the second support 22 together, thereby forming a rigid structure to the pallet apparatus. The rigid structure enables the pallet apparatus to be lifted by forks inserted by the beams 12, 13, 23, 24, 30 and 31 under the apparatus. Multiple pallet apparatuses may be stacked on top of each other and the resulting stack stays rigid and safe during a truck transport.

**[0027]** In one embodiment the locking means 35 is a bar extending transversely into the first support 21 and the second support 22 being in interleaved position. The interleaved position may be either the transport position or the support position. The bar may be a threaded bolt. In the present example the bar has not threads, instead the bar is secured by a securing pin made of wire that travels around the beams.

**[0028]** FIG. 4 is an alternative angle to the same embodiment, wherein the connection between the first support 21 and the second support 22 is slightly open. The locking means 35 extends through holes 41 drilled into the first support 21 and holes 42 of the second support 22. The first support 21 has only single hole 41 for the locking means 35 at the end of each support beam. The second support 22 has two holes at different parts of the support beam 30, 31, the first hole matching the position of the first support's hole 42 in the transport position and the hole 42 for the support position. The hole for the transport position is not visible in FIG. 4.

**[0029]** FIG. 5 illustrates schematically one exemplary embodiment of the vertical support's 20 top portion. The first support 21 comprises at least two longitudinal support beams 23. The second support 22 comprises at least two longitudinal support beams 30, configured to interleave with the longitudinal support beams 23 of the first support 21 in the support position. The top portion of the vertical support 20 is reclosable. In one embodiment, the

first support 21 comprises a locking block 50 configured to interact with the interleaving beam 30 of the second support 22. Alternatively, in the embodiment shown in FIG. 5, the second support 22 comprises the locking block 50 configured to interact with the interleaving beam 23 of the first support 21. The locking block 50 comprises a shape configured to resist vertical movement against the interleaving beam. In this example the shape is the nudge forming the second surface 26. The interleaving beam comprises a second shape configured to match said shape of the locking block 50. In this example the second shape is the recess forming the first surface 25.

**[0030]** FIG. 6 illustrates schematically one exemplary embodiment of the vertical support's 20 top portion, having alternative arrangement to the shape of FIG. 5. In this example the shape comprises holes 60 in the locking block 50. The interleaving beam comprises pins 61 configured to enter the holes 60 in the support position. In one embodiment the locking block 50 is made of wood. The pins 61 are in one embodiment wooden pins or dowels. Alternatively, the pins 61 may be made of plastic or metal.

**[0031]** FIG. 7a and FIG. 7b illustrate schematically two alternative views on exemplary embodiment of the vertical support's 20 top portion. In this arrangement, the locking block 50 comprises a first fork 71 and the interleaving beam comprises a second fork 70 transversely to the first fork 71. The first fork 71 and the second fork 70 are configured to interleave in the support position. The first fork 71 and the second fork 70 may be made of metal.

**[0032]** FIG. 8 illustrates schematically one exemplary embodiment of the pallet apparatus. Compared to the embodiment of FIG. 1, the dimensions between the horizontal base 10 and the vertical support 20 have been modified, yet the total length of the pallet apparatus is less than 2,48 metres. In this embodiment, the vertical support 20 is taller and respectively, the horizontal base 10 is shorter. In the embodiment of FIG. 8 length of the horizontal base 10 is 0,80 m and the distance from the front edge of the horizontal base 10 to the first hinge 14 is 0,33 m. Height in the support position is 1,32 m.

**[0033]** Dimensions for the embodiment of FIG. 1 comprise: length of the horizontal base 10 is 1,14 m; distance from the front edge of the horizontal base 10 to the first hinge 14 is 0,67 m. Height in the support position is 1,31 m in this embodiment, but the shorter horizontal base 10 would allow even taller structure.

**[0034]** A pallet apparatus for transportation of automotive glass is disclosed, comprising a horizontal base configured to receive a forklift fork and a vertical support having at least one inclined plane for the automotive glass standing on the horizontal base. The vertical support is connected to the horizontal base by at least one first hinge. The vertical support is configured to fold along the first hinge between a support position and a storage position. In the storage position, the vertical support is longitudinally parallel and in the same plane as the horizontal

base and length of the pallet apparatus is less than 2,48 metres. In one exemplary embodiment, the vertical support comprises: a first support connected to the horizontal base by the first hinge, wherein the first hinge is between a first end and a second end of the horizontal base; and a second support connected to the horizontal base by at least one second hinge, wherein the second hinge is at the second end of the horizontal base; wherein in the support position the first support and the second support lean against each other and the first support provides the inclined plane. In one exemplary embodiment, in the support position the first support comprises a first surface facing down and the second support comprises a second surface facing up, wherein the first surface is configured to lean on the second surface in the support position. In one exemplary embodiment the horizontal base comprises at least two longitudinal base beams; and the vertical support comprises at least two longitudinal support beams; wherein the base beams and the support beams are interleaved in the storage position. In one exemplary embodiment, the horizontal base comprises four base beams; and the vertical support comprises four longitudinal support beams at the first support and four longitudinal support beams at the second support, wherein the base beams and the support beams are interleaved in the storage position. In one exemplary embodiment, the horizontal base comprises four base beams; the vertical support comprises four longitudinal support beams at the first support, wherein the base beams and the support beams of the first support are interleaved in the storage position; and the vertical support comprises four longitudinal support beams at the second support, wherein the ends of base beams and the ends of support beams of the second support are facing each other in the storage position. In one exemplary embodiment, the second support is connected to the horizontal base via a connecting member, wherein the connecting member is connected to the side of the horizontal base beam and to the side of the second support beam. In one exemplary embodiment, in the support position the first support and the second support are connected at the top portion by a locking means. In one exemplary embodiment, in the transport position the first support and the second support are folded into parallel position and connected by a locking means. In one exemplary embodiment, in the locking means is a bar extending transversely into the first support and the second support being in interleaved position. In one exemplary embodiment, the first support comprises at least two longitudinal support beams; the second support comprises at least two longitudinal support beams configured to interleave with the longitudinal support beams of the first support in the support position; and the first support comprises a locking block configured to interact with the interleaving beam of the second support or the second support comprises the locking block configured to interact with the interleaving beam of the first support; wherein the locking block comprises a shape configured to resist vertical movement against the

interleaving beam; and the interleaving beam comprises a shape configured to match said shape of the locking block. In one exemplary embodiment, the locking block comprises a first fork and the interleaving beam comprises a second fork transversely to the first fork, wherein the first fork and the second fork are configured to interleave in the support position. In one exemplary embodiment the pallet apparatus it is made of wood.

[0035] Any range or device value given herein may be extended or altered without losing the effect sought.

[0036] Although at least a portion of the subject matter has been described in language specific to structural features and/or acts, it is to be understood that the subject matter defined in the appended claims is not necessarily limited to the specific features or acts described above. Rather, the specific features and acts described above are disclosed as examples of implementing the claims and other equivalent features and acts are intended to be within the scope of the claims.

[0037] It will be understood that the benefits and advantages described above may relate to one embodiment or may relate to several embodiments. The embodiments are not limited to those that solve any or all of the stated problems or those that have any or all of the stated benefits and advantages. It will further be understood that any reference to 'an' item refers to one or more of those items.

[0038] The steps of the methods described herein may be carried out in any suitable order, or simultaneously where appropriate. Additionally, individual blocks may be deleted from any of the methods without departing from the spirit and scope of the subject matter described herein. Aspects of any of the examples described above may be combined with aspects of any of the other examples described to form further examples without losing the effect sought.

[0039] The term 'comprising' is used herein to mean including the method blocks or elements identified, but that such blocks or elements do not comprise an exclusive list and a method or apparatus may contain additional blocks or elements.

[0040] It will be understood that the above description is given by way of example only and that various modifications may be made by those skilled in the art. The above specification, examples and data provide a complete description of the structure and use of exemplary embodiments. Although various embodiments have been described above with a certain degree of particularity, or with reference to one or more individual embodiments, those skilled in the art could make numerous alterations to the disclosed embodiments without departing from the spirit or scope of this specification.

## Claims

1. A pallet apparatus for transportation of automotive glass, comprising:

a horizontal base (10) configured to receive a forklift fork; and

a vertical support (20) having at least one inclined plane for the automotive glass standing on the horizontal base (10);

**characterized in that:**

the vertical support (20) is connected to the horizontal base (10) by at least one first hinge (14);

the vertical support (20) is configured to fold along the first hinge (14) between a support position and a storage position; and in the storage position, the vertical support (20) is longitudinally parallel and in the same plane as the horizontal base (10); and length of the pallet apparatus is less than 2,48 metres.

2. A pallet apparatus according to claim 1, **characterized by** the vertical support (20) comprising:

a first support (21) connected to the horizontal base (10) by the first hinge (14), wherein the first hinge (14) is between a first end and a second end of the horizontal base (10); and

a second support (22) connected to the horizontal base (10) by at least one second hinge (17), wherein the second hinge (17) is at the second end of the horizontal base (10); wherein in the support position the first support (21) and the second support (22) lean against each other and the first support (21) provides the inclined plane.

3. A pallet apparatus according to claim 2, **characterized in that** in the support position the first support (21) comprises a first surface (25) facing down and the second support (22) comprises a second surface (26) facing up, wherein the first surface (25) is configured to lean on the second surface (26) in the support position.

4. A pallet apparatus according to any of the claims 1 to 3, **characterized in that** the horizontal base (10) comprises at least two longitudinal base beams (12); and the vertical support (20) comprises at least two longitudinal support beams (23); wherein the base beams (12) and the support beams (23) are interleaved in the storage position.

5. A pallet apparatus according to claim 4, **characterized in that** the horizontal base (10) comprises four base beams (12, 13); and the vertical support (20) comprises four longitudinal support beams (23, 24) at the first support (21) and four longitudinal support beams (30, 31) at the second support (22), wherein the base beams (12, 13)

and the support beams (23, 24, 30, 31) are interleaved in the storage position.

6. A pallet apparatus according to claim 4, **characterized in that** the horizontal base (10) comprises four base beams; 5  
the vertical support (20) comprises four longitudinal support beams (23, 24) at the first support (21), wherein the base beams (12, 13) and the support beams of the first support (21) are interleaved in the storage position; and 10  
the vertical support (20) comprises four longitudinal support beams (30, 31) at the second support (22), wherein the ends of base beams (12, 13) and the ends of support beams (30, 31) of the second support (22) are facing each other in the storage position. 15
  
7. A pallet apparatus according to claim 6, **characterized in that** the second support (22) is connected to the horizontal base (10) via a connecting member (32), wherein the connecting member (32) is connected to the side of the horizontal base beam and to the side of the second support (22) beam. 20
  
8. A pallet apparatus according to any of the claims 2 to 7, 25  
**characterized in that** in the support position the first support (21) and the second support (22) are connected at the top portion by a locking means (35). 30
  
9. A pallet apparatus according to any of the claims 2 to 8, 35  
**characterized in that** in the transport position the first support (21) and the second support (22) are folded into parallel position and connected by a locking means (35). 40
  
10. A pallet apparatus according to claim 8 or claim 9, **characterized in that** in the locking means (35) is a bar extending transversely into the first support (21) and the second support (22) being in interleaved position. 45
  
11. A pallet apparatus according to any of the claims 2 to 10, **characterized in that** 45  
the first support (21) comprises at least two longitudinal support beams; the second support (22) comprises at least two longitudinal support beams configured to interleave with the longitudinal support beams of the first support (21) in the support position; 50  
and  
the first support (21) comprises a locking block (50) configured to interact with the interleaving beam of the second support (22) or the second support (22) comprises the locking block (50) configured to interact with the interleaving beam of the first support (21); wherein 55  
the locking block (50) comprises a shape configured

to resist vertical movement against the interleaving beam; and  
the interleaving beam comprises a shape configured to match said shape of the locking block (50).

12. A pallet apparatus according to claim 11, **characterized in that** the locking block (50) comprises a first fork and the interleaving beam comprises a second fork transversely to the first fork, wherein the first fork and the second fork are configured to interleave in the support position.
  
13. A pallet apparatus according to any of the claims 1 to 12, **characterized in that** it is made of wood.

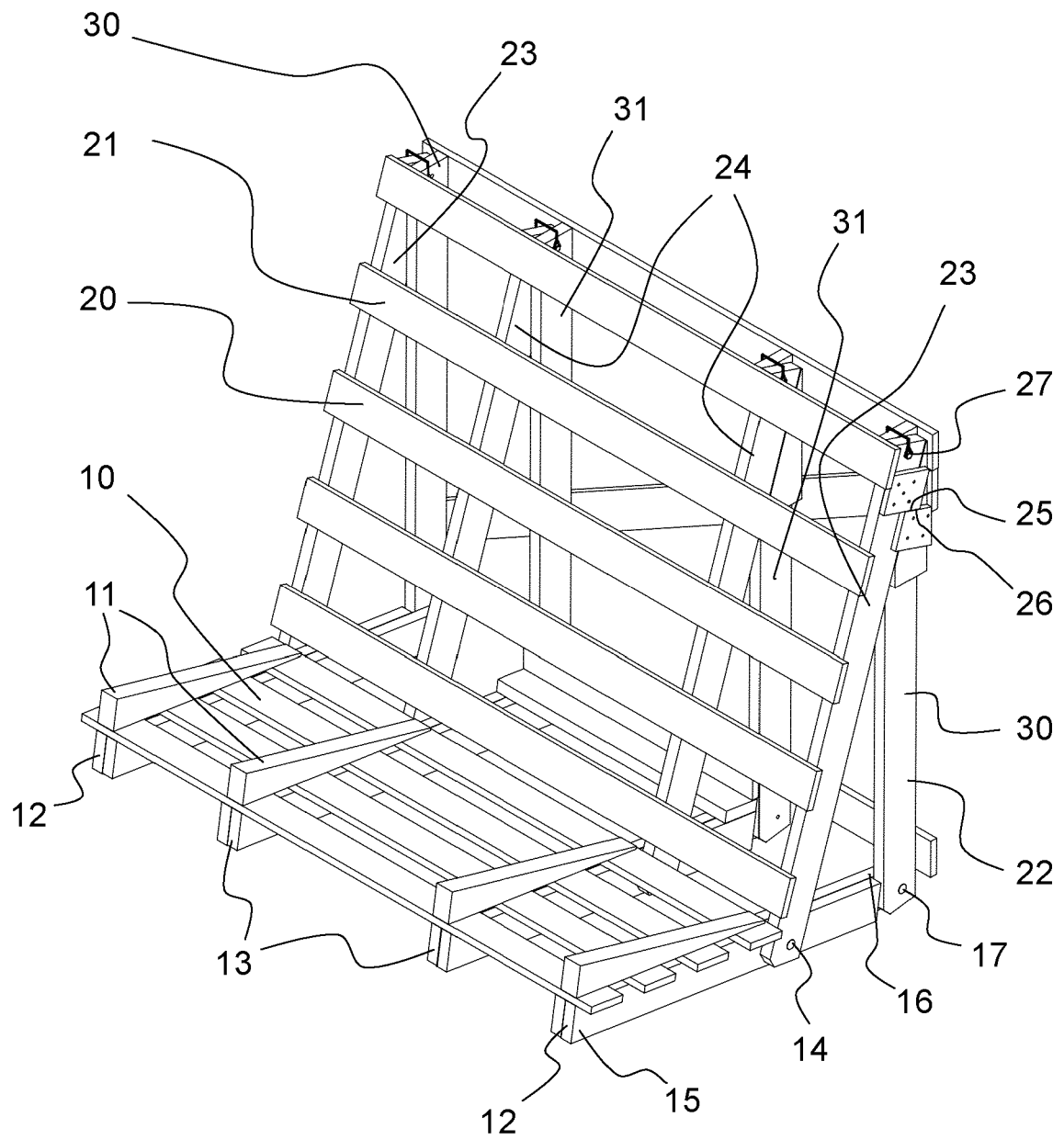


Fig.1



Fig. 3

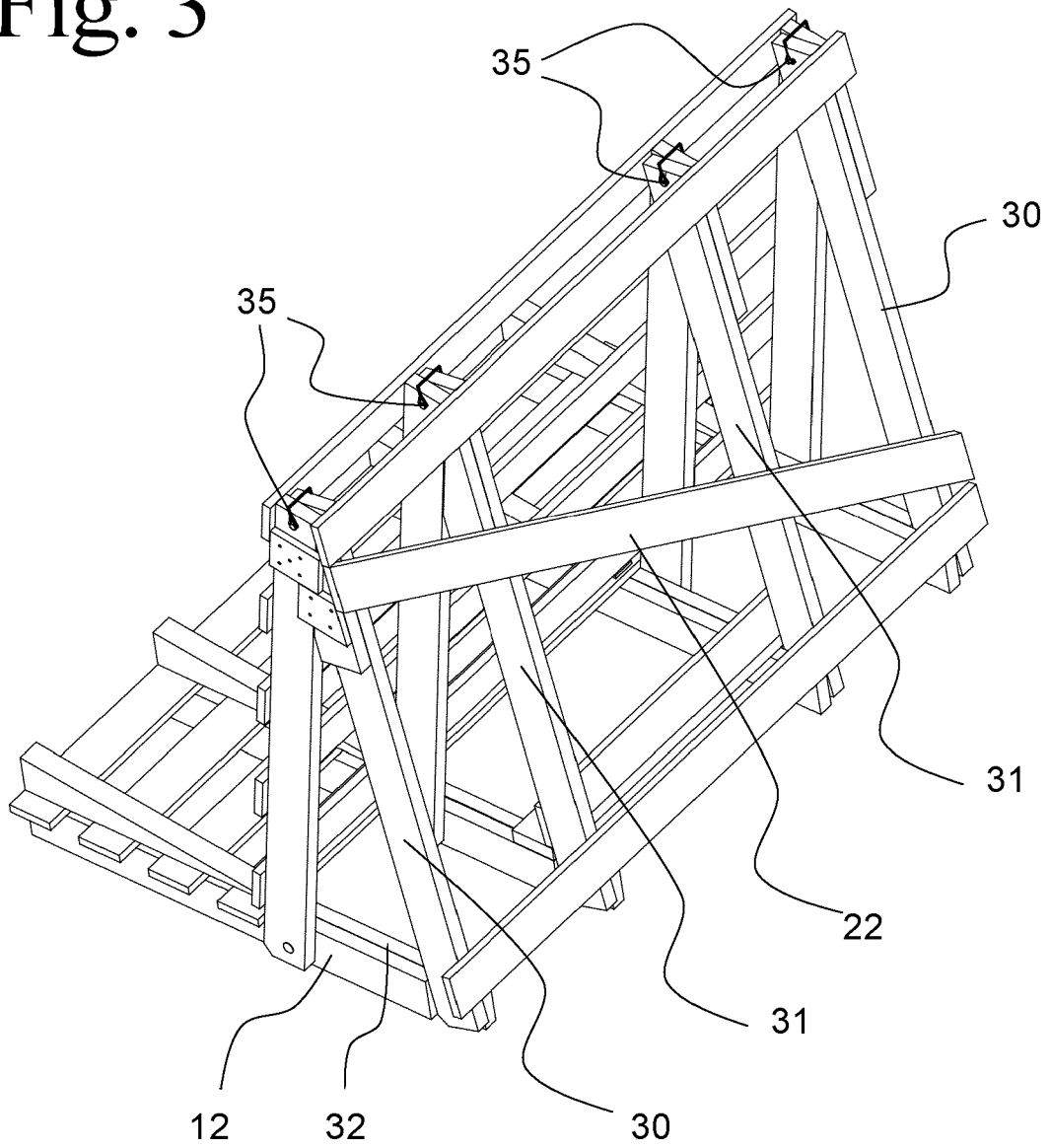
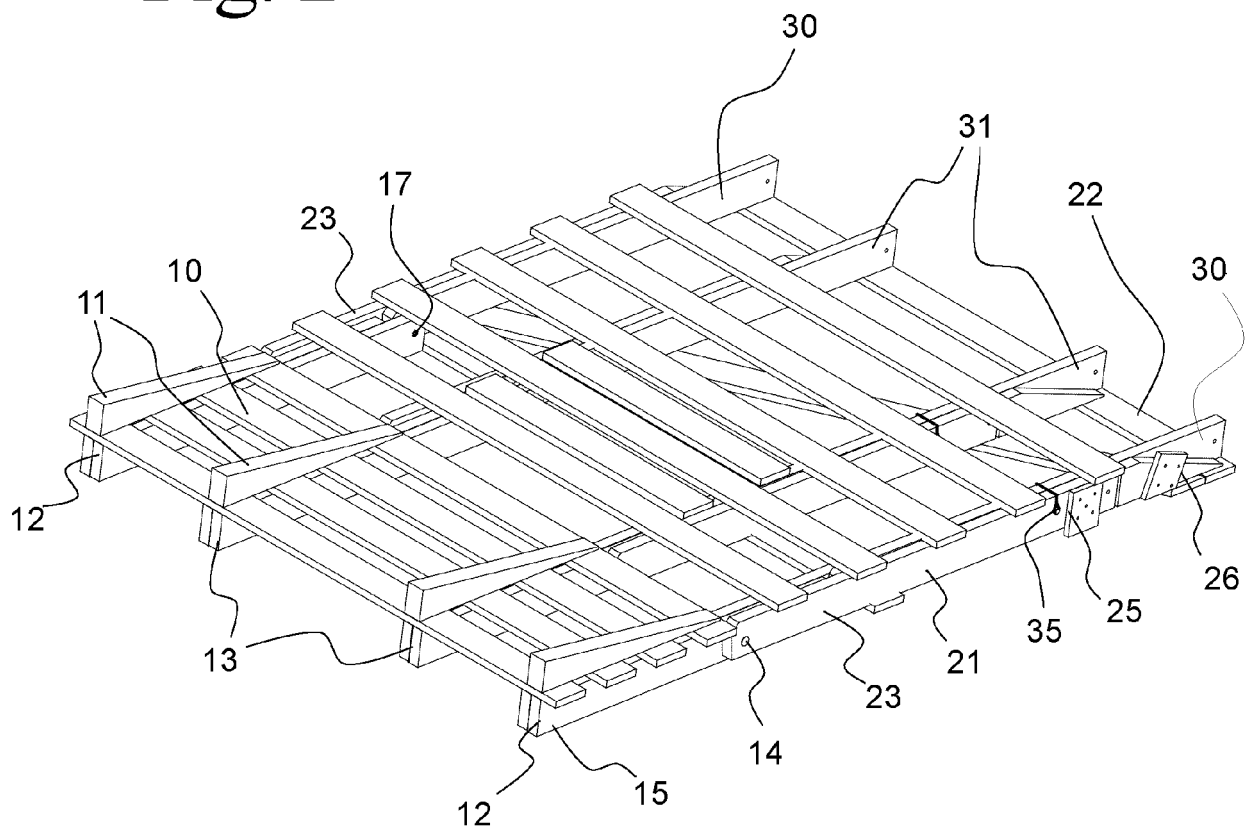


Fig. 2



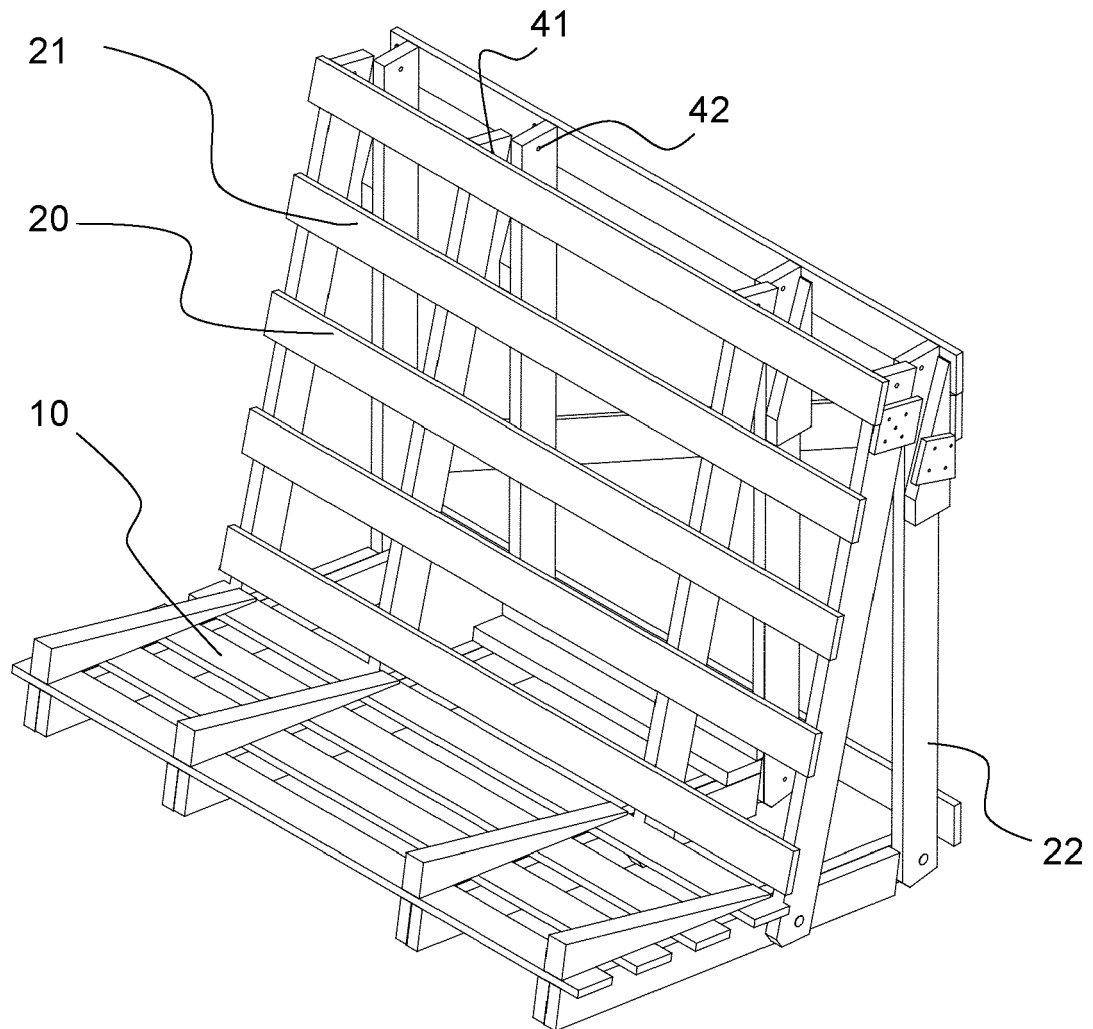


Fig. 4

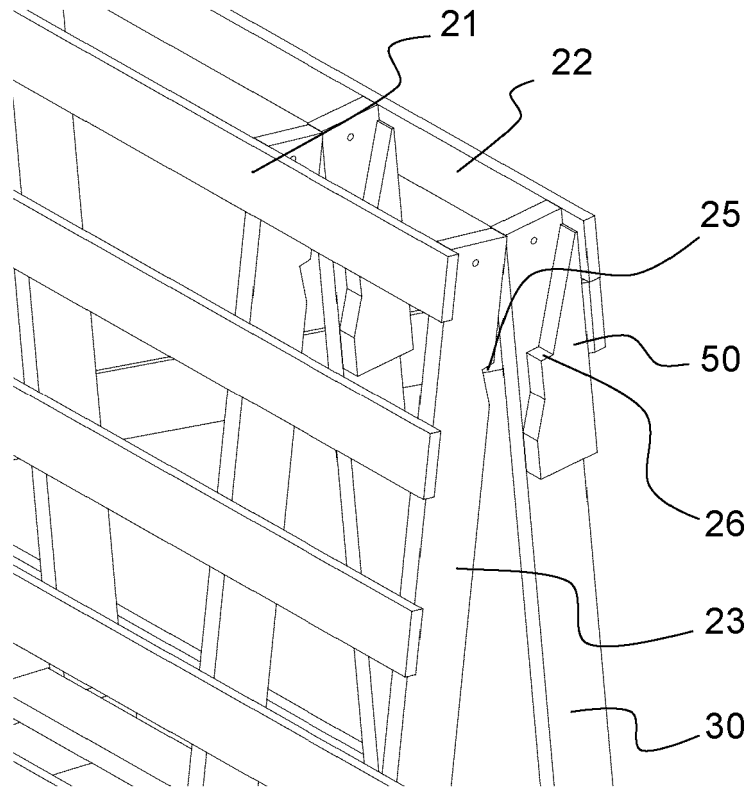


Fig. 5

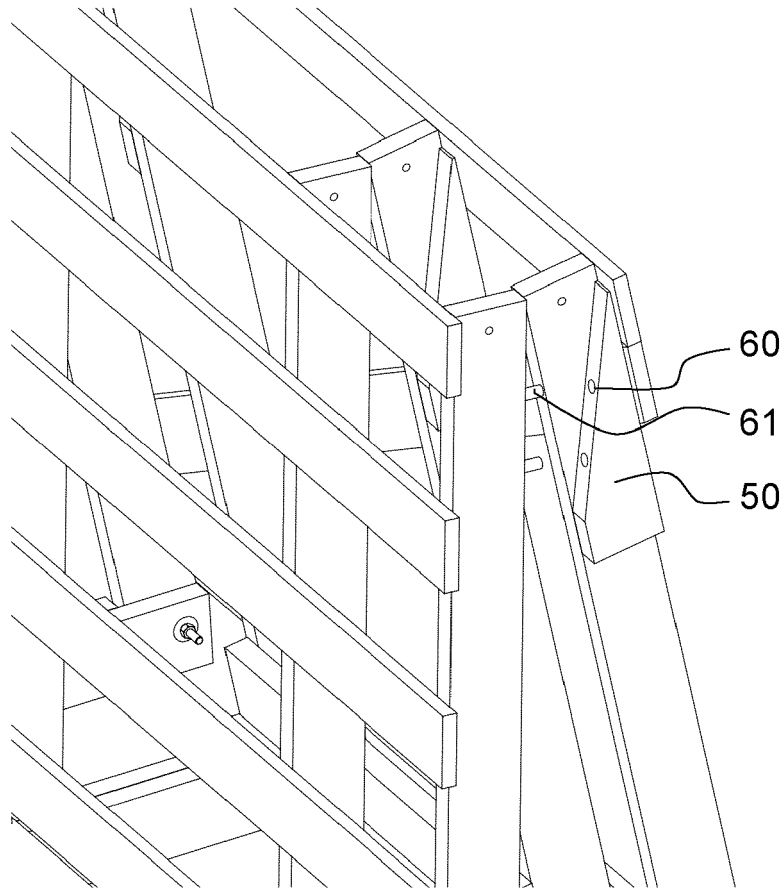


Fig. 6

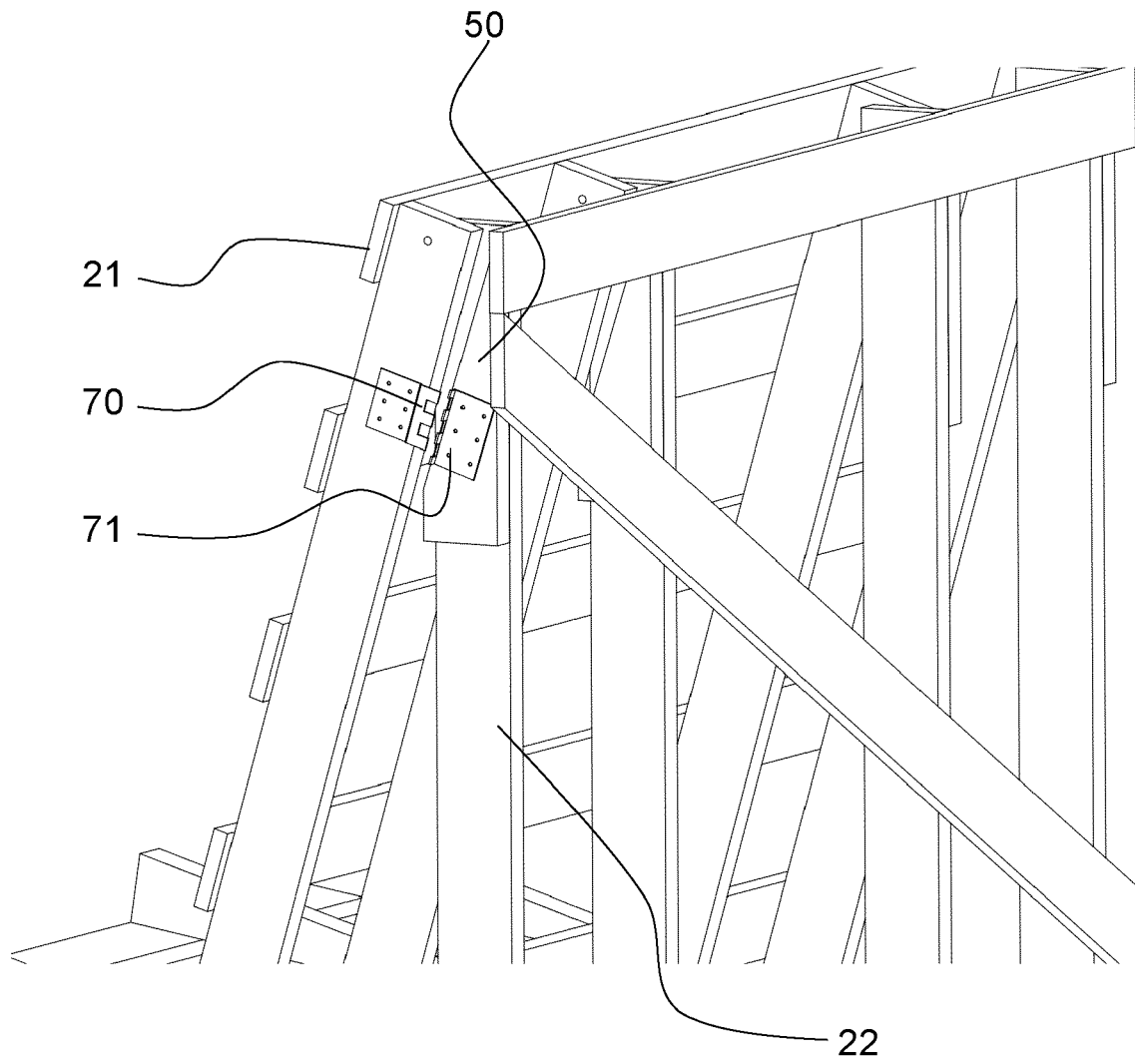


Fig. 7a

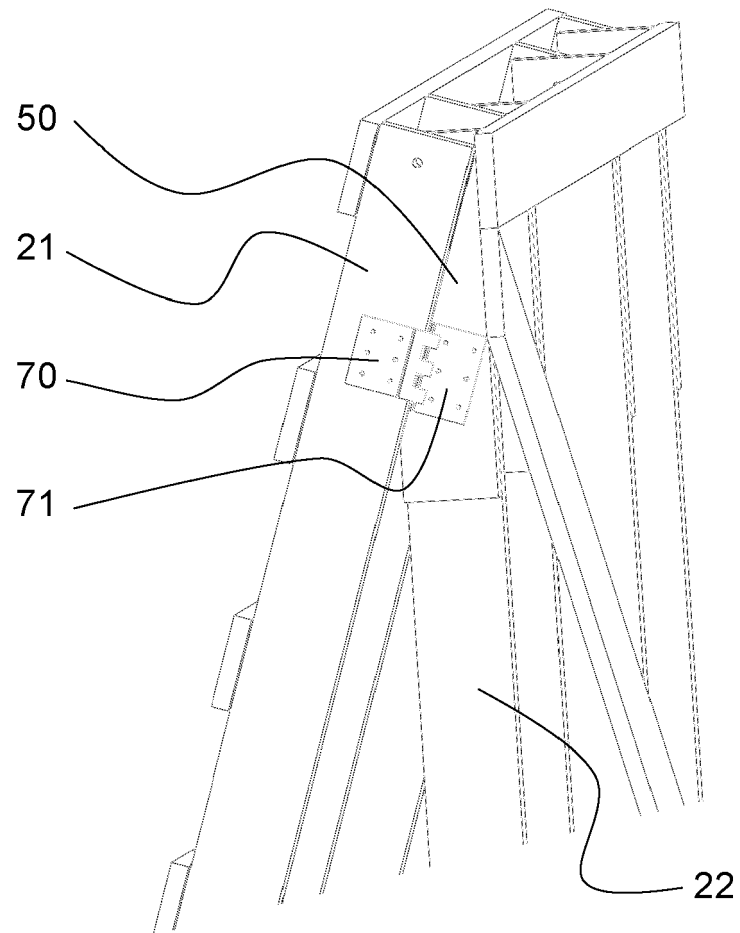


Fig. 7b

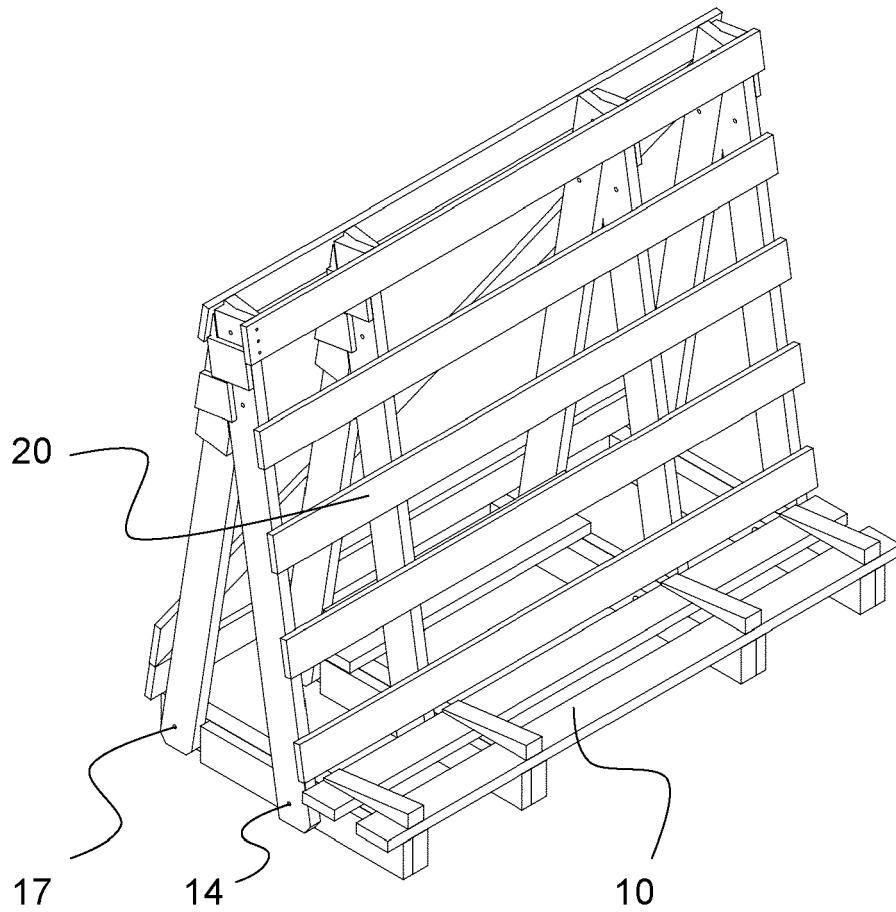


Fig. 8





## EUROPEAN SEARCH REPORT

 Application Number  
 EP 20 16 5708

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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