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(54) **CONFIGURABLE, REPAIRABLE, AND RECYCLABLE CARGO PALLET**

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(57) **ABSTRACT**

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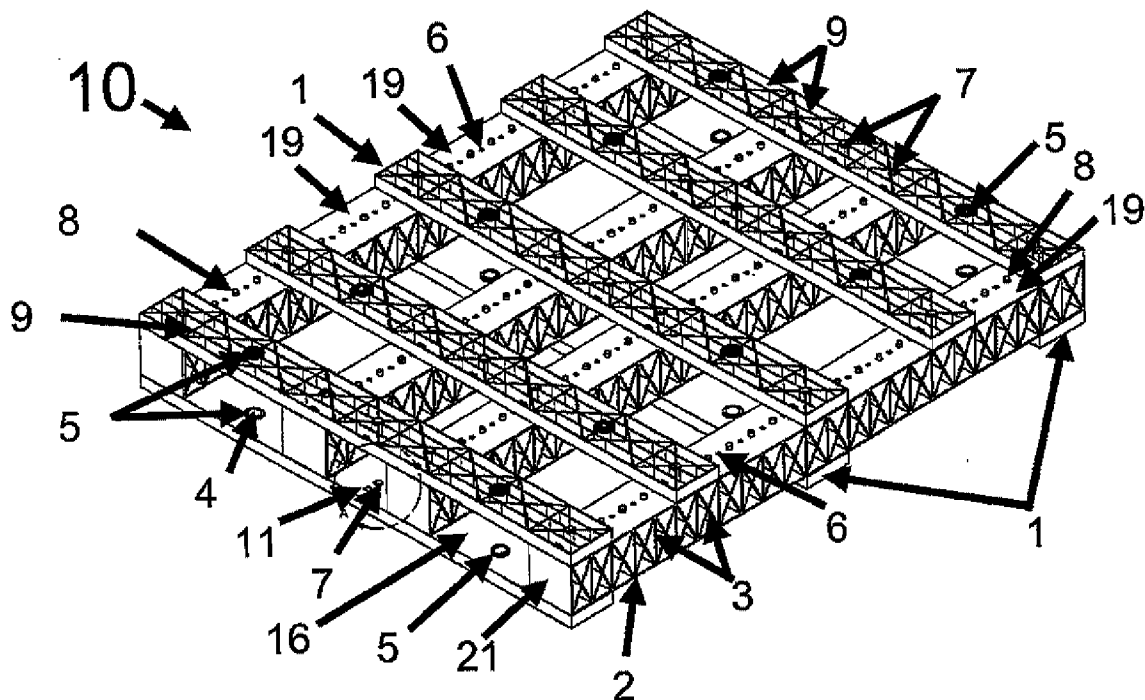
The present invention relates to a lightweight and versatile pallet and its manufacturing and assembling method. It consists of the design of a repairable, recyclable, and reusable pallet with a modular structure, configurable load capacity, and with non-slip rubber surfaces to prevent sliding of the cargo on the pallet and of the pallet on the ground, shelf, and forklift or other pallet handling equipment. This pallet is to be used in numerous commercial and industrial applications. An embodiment of the platform members used to form the bottom and top surfaces of the pallet can be used to construct other flat platforms such as walls, floors, and molds for pouring concrete structures.

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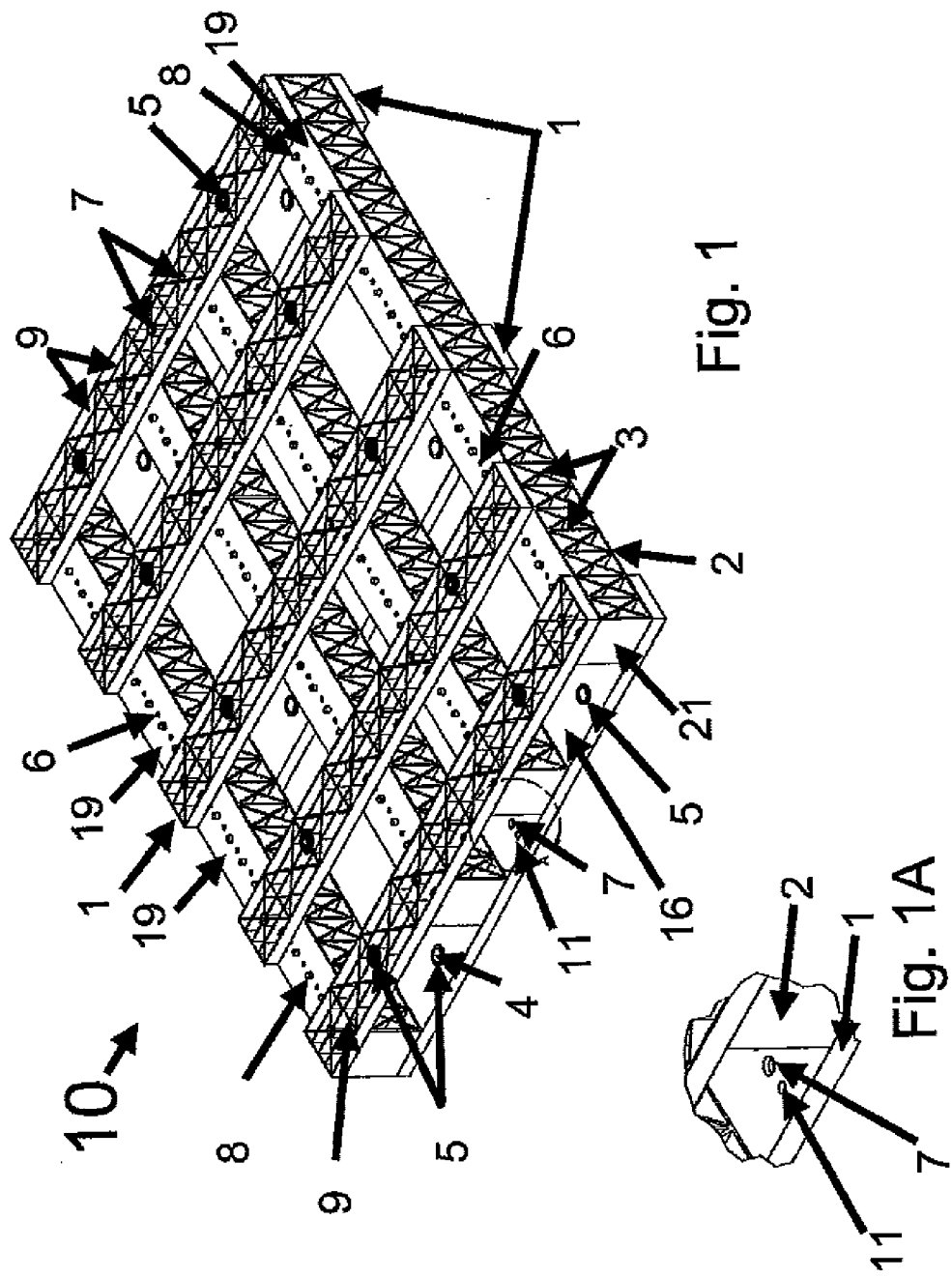


Fig. 1

Fig. 1A

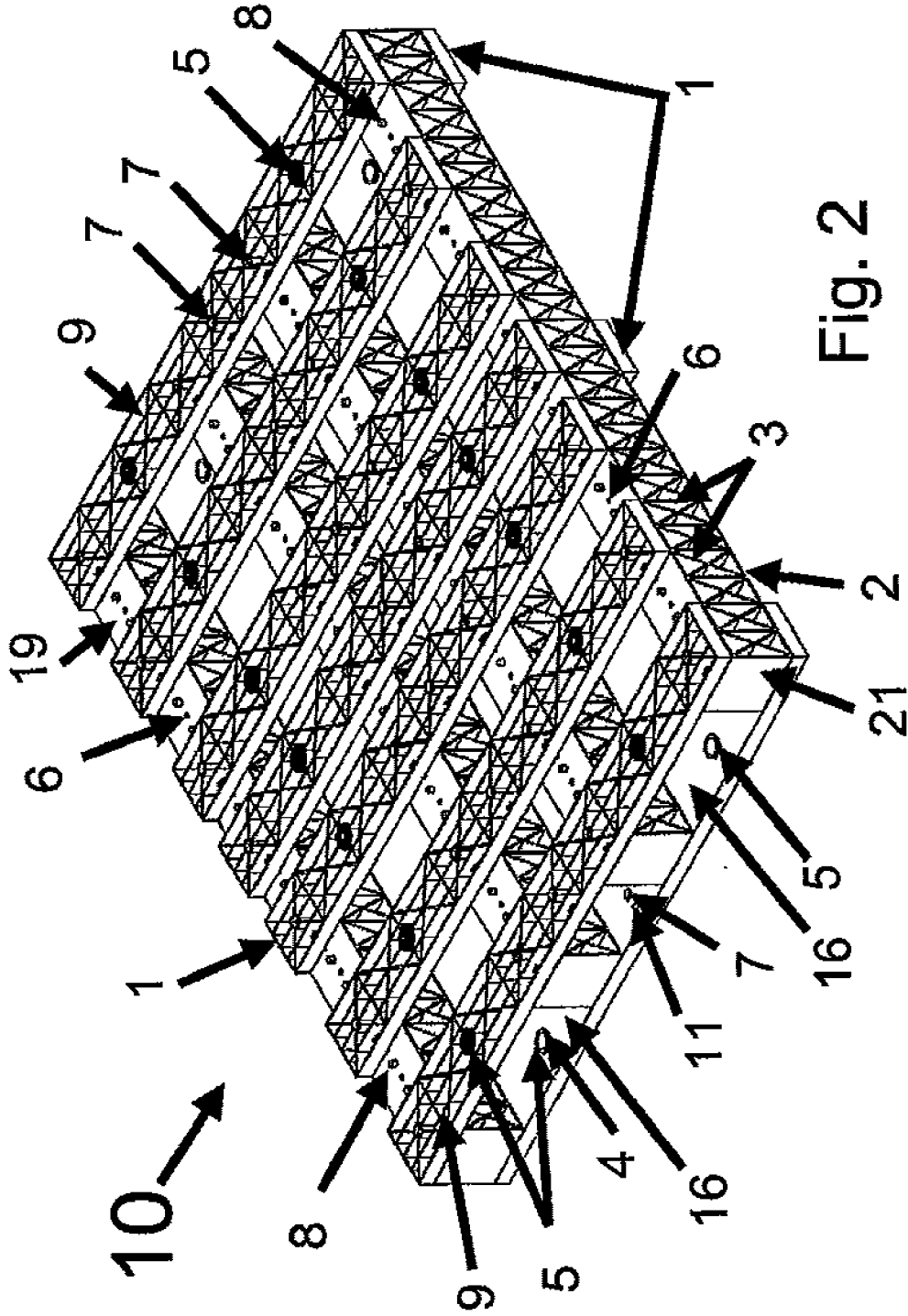
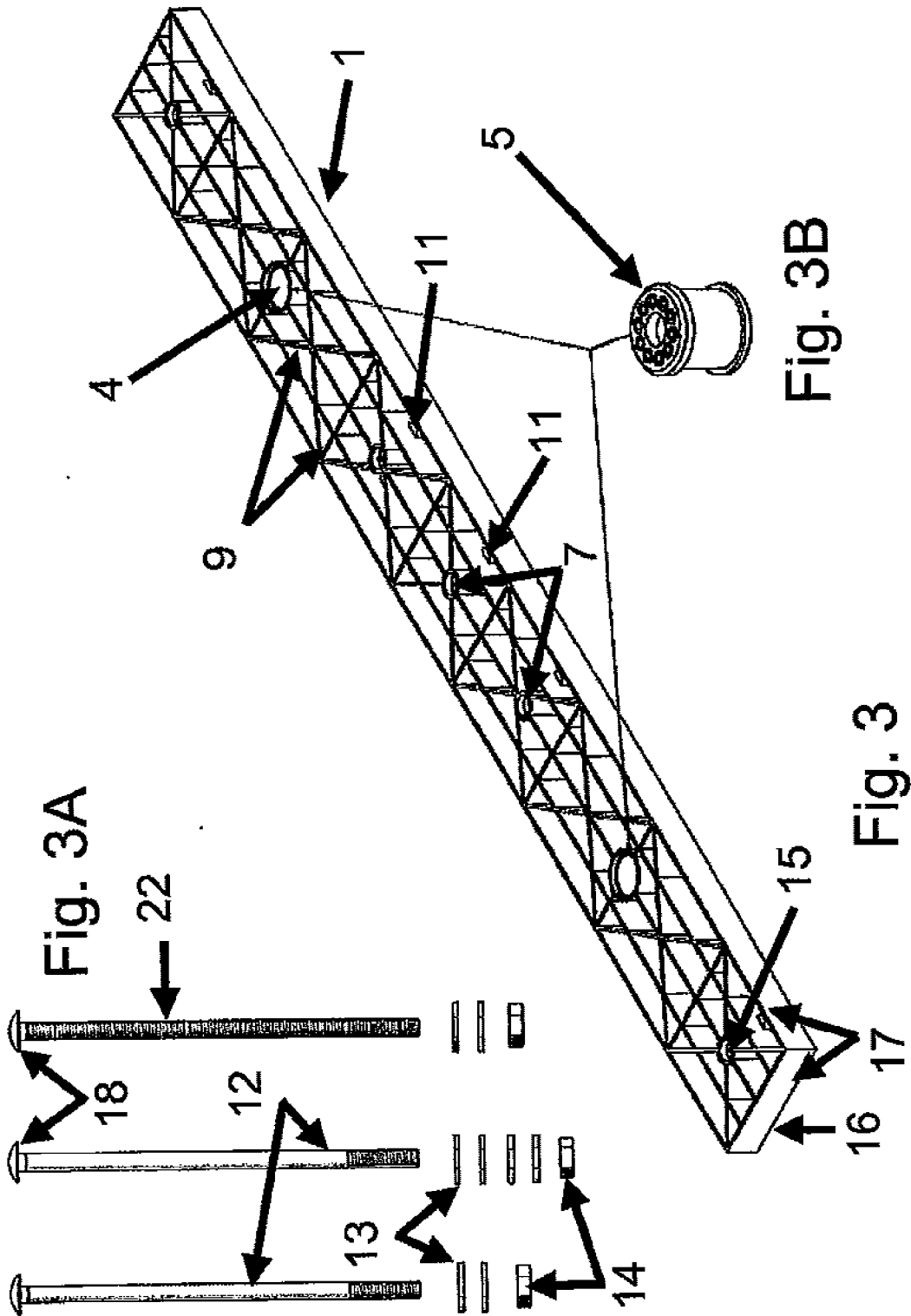
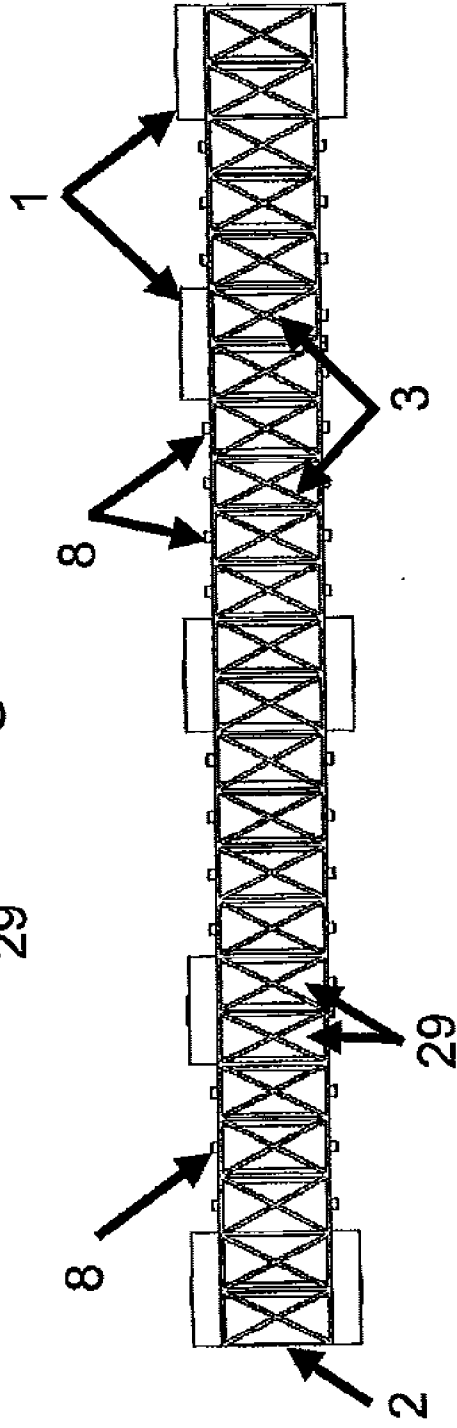
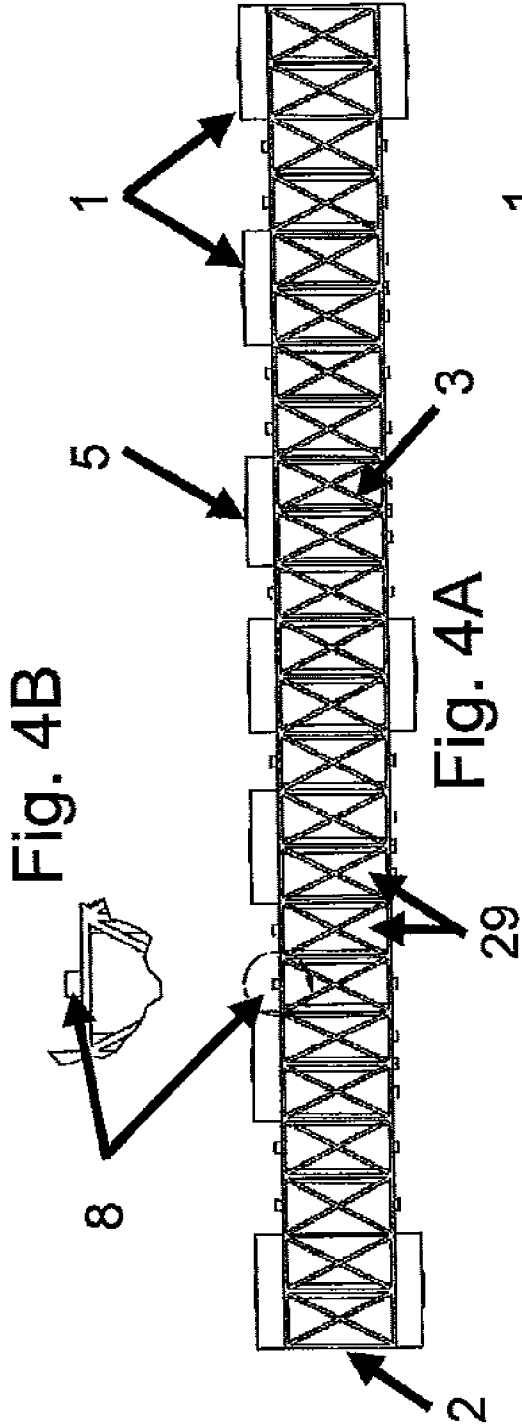


Fig. 2





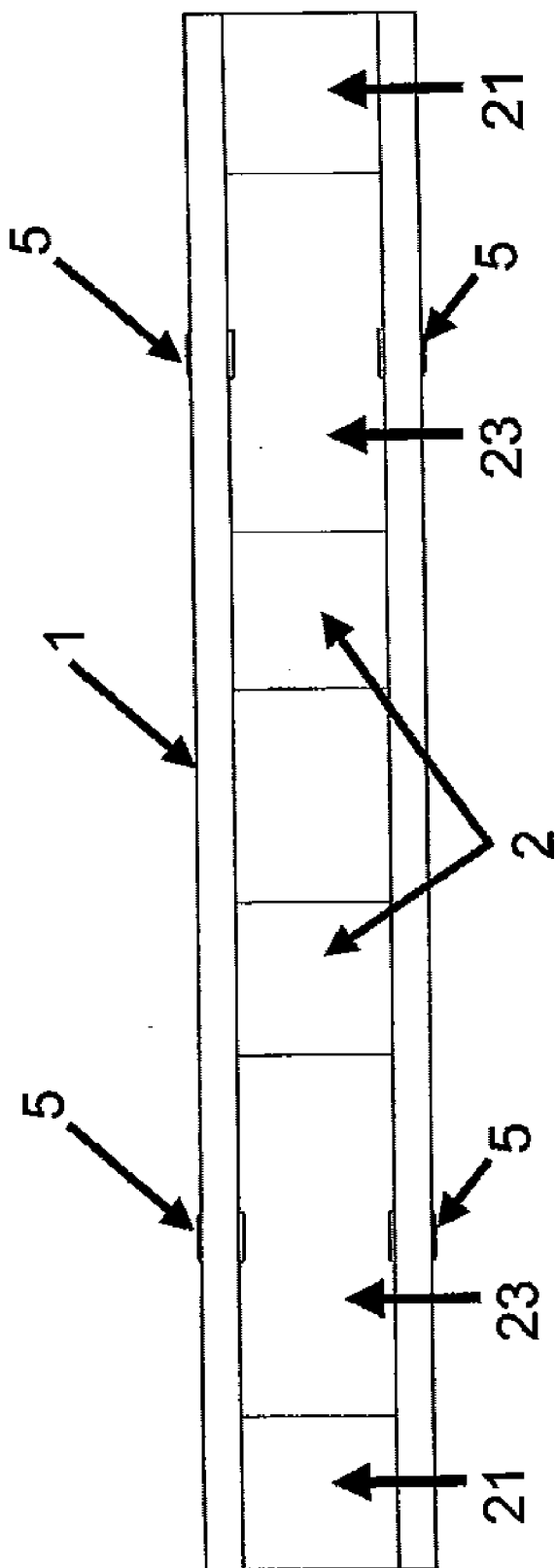
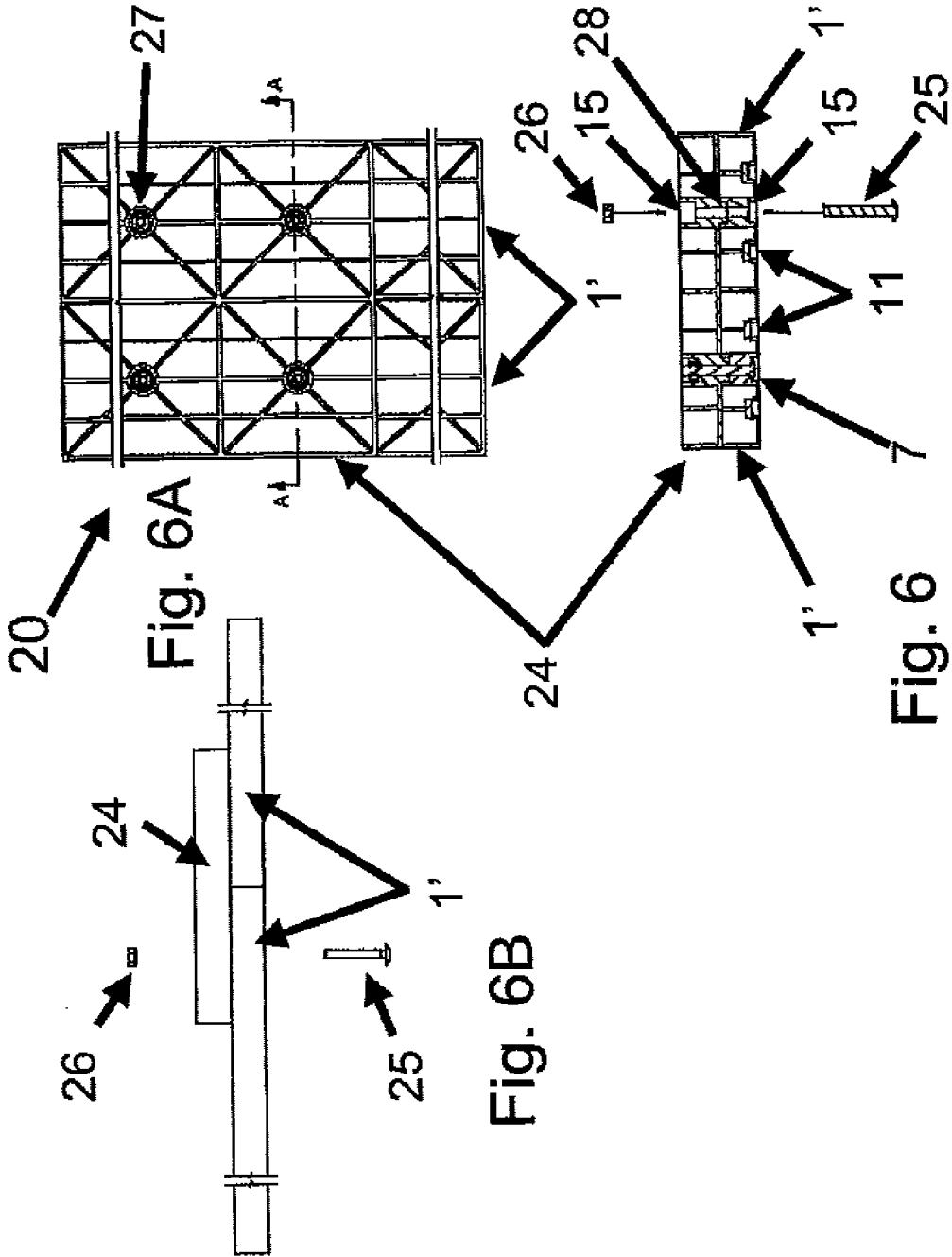


Fig. 5



## CONFIGURABLE, REPAIRABLE, AND RECYCLABLE CARGO PALLET

### OTHER RELATED APPLICATIONS

**[0001]** The present application is related to pending PCT application No. PCT/CR09/000,001, filed on Dec. 18, 2009, belonging to the same applicant, Edgar Hidalgo Vargas.

### BACKGROUND OF THE INVENTION

**[0002]** 1. Field of the Invention

**[0003]** The present invention relates to a configurable, repairable, recyclable, and adjustable load capacity cargo pallet and to its manufacturing and assembling method.

**[0004]** 2. Description of the Related Art

**[0005]** The applicant considers that the closest references correspond to the references discussed below. However, they differ from the present invention in that none of them disclose a simple design of a repairable, recyclable, and reusable cargo pallet with the following characteristics:

**[0006]** a) A modular structure with configurable load capacity by varying the robustness and/or the number of the components that make up the new pallet.

**[0007]** b) Non-slip rubber surfaces are used to prevent sliding of the cargo on the pallet and of the pallet on the ground, shelf, or forklift.

**[0008]** c) Platform members that are identical on the top and bottom of the new pallet are engaged to central beams through conical protuberances on the beams that are accommodated on corresponding conical holes in the platform members. These conical protuberances contribute to carry shear stresses and to prevent relative motion of the platform members and the beams.

**[0009]** d) Platform members with connecting means to form walls, floors, molds for pouring concrete, and other similar structural applications.

**[0010]** The applicant herein, Edgar Hidalgo Vargas, has pending patent application number PCT/CR09/000,001. Patent application PCT/CR09/000,001 claims a manufacturing method and the configuration of structural members to construct recyclable lightweight pallets that have configurable load capacity for multiple applications. However, in the present invention, the new pallet is partially based on the invention disclosed in the PCT/CR09/000,001 patent application, incorporating changes and innovations to create a new pallet that is more versatile and with a more efficient manufacturing process. The main differences between this invention and the patent application PCT/CR09/000,001 are that the new invention is characterized by: a) having conical protuberances along central beams that are inserted into corresponding conical holes in platform members to obtain stability, engagement, and rigidity of the pallet; b) having platform members that are all identical and are placed on both the top and bottom sides of the pallet, and with non-slip rubber blocks that protrude out from both sides of the platform members; and c) having central beams designed to replace the spacers, or legs, of patent application PCT/CR09/000,001, in order to create a simpler modular pallet with greater load capacity.

**[0011]** In U.S. Pat. No. 5,458,069 for a plastic skid and method of manufacture, the patentee discloses a skid, or pallet, made with central rails and cross members or runners perpendicularly connected to the rails at the top and bottom of the rails. The cross members are connected to the rails

through the rail posts that are inserted into corresponding runner openings to which the posts are welded. As another option of connecting such runners to the rails, the posts are threaded and the runners have corresponding openings to receive such threaded posts and to fasten them with threaded nuts that lock the runners onto the rails. The rails have flanges and reinforcing ribs along both sides of their webs; the rails have two channels at their bottom side to insert a forklift to manipulate them. However, it differs from the present invention in that it does not have the characteristics mentioned above at the beginning of this section.

**[0012]** In U.S. Pat. No. 6,837,170 B2 for a modular pallet, the patentee discloses a pallet made with central stringers and deck members or runners perpendicularly connected to the stringers at the top and bottom of the stringers. The deck members are connected to the stringers through grooves, locking buttons, and locking sockets that on the top and bottom sides of the stringers are used for interlocking themselves with the deck members. The stringers have flanges and reinforcing ribs along both sides of their webs; the stringers also have two channels at their bottom side to insert a forklift to manipulate them. However, it differs from the present invention in that it does not have the characteristics mentioned above at the beginning of this section.

**[0013]** In US patent publication No. 2008/0105168 A1 for an assembly type pallet, the applicant discloses disassemblable pallets formed by single-piece platforms, or as other options, by platforms made with a grid structure obtained by connecting several deck boards perpendicularly to each other. Such platforms or grid structures make up the superior and inferior pallet surfaces, which are separated by cylindrical or rectangular spacing legs, and they are connected by threaded means to join such platforms while maintaining the spacing legs between the two platforms. However, it differs from the present invention in that it does not have the characteristics mentioned above at the beginning of this section.

**[0014]** In Patent WO 97/17263, the patentee discloses a disassemblable pallet made with single-piece platforms to form the superior and inferior surfaces of the pallet, separated, and connected with blocks with engaging means to join both platforms and form the pallet. However, it differs from the present invention in that it does not have the characteristics mentioned above at the beginning of this section.

**[0015]** In U.S. Pat. No. 6,352,039 for a plastic pallet, the patentee discloses a pallet made of thermoplastic material, which is formed by interconnecting several members without using mechanical connections but instead using adhesives or thermal welding. However, it differs from the present invention in that it does not have the characteristics mentioned above at the beginning of this section.

**[0016]** In U.S. Pat. No. 5,337,681 for a recyclable plastic pallet, the patentee discloses a plastic recyclable pallet made by perpendicularly interlocking slats and rails. However, it differs from the present invention in that it does not have the characteristics mentioned above at the beginning of this section.

**[0017]** In U.S. Pat. No. 4,843,976 for a plastic pallet, the patentee discloses a plastic pallet formed by two single-piece platforms with flat surfaces and joined by cylindrical spacers with interlocking connecting features. However, it differs from the present invention in that it does not have the characteristics mentioned above at the beginning of this section.

**[0018]** In U.S. Pat. No. 4,597,338 for a pallet, the patentee discloses a plastic pallet formed by two single-piece plat-



forms with flat surfaces, but joined by rectangular spacers that interlock to the platforms to form the pallet. However, it differs from the present invention in that it does not have the characteristics mentioned at the beginning of this section.

[0019] Even though several pallets have been designed in the past, the applicant believes that none of them discloses a design of a repairable, recyclable, and reusable cargo pallet with a modular structure, configurable load capacity, and with non-slip rubber surfaces to prevent sliding of the cargo on the pallet and of the pallet on the ground, shelf, and forklift. In addition, the platform members of this invention form other platforms to construct walls, floors, molds for pouring concrete, and other similar applications.

[0020] Other documents describing the closest subject matter provide for a number of more or less complicated features that fail to solve the problem in an efficient and economical way. None of these patents suggest the novel features of the present invention.

#### SUMMARY OF THE INVENTION

[0021] This invention is a new cargo pallet that is repairable, reusable, recyclable, lightweight, robust, and configurable to different load capacities to transport and store a great variety of loads. This invention consists of an industrializable pallet and its manufacturing and assembling process to substitute traditional wooden pallets; consequently, a positive impact on the environment is achieved by preventing deforestation. The pallet of this invention is a versatile, low-cost, long useful life, robust, and non-slip pallet, to be not only acceptable to replace wooden pallets but also to improve them while performing the same or similar functions. While the wooden pallets are disposable, the plastic pallets of this invention are to be continuously reusable, and if an entire pallet or some of its parts are damaged, they can be repaired, and the damaged parts can be recycled. Other advantages of the plastic pallets in this invention, with respect to wooden pallets, are that they do not produce splinters and they do not need thermal or chemical treatments. The new pallet is built with strong and lasting components to obtain a long useful life of the pallet; the connection of the components is made in such a way to avoid deformations of the pallet when the pallet is subjected to impacts or under normal use.

[0022] The pallet of this invention is to transport and store loads and it is constructed with central beams with an I-shaped cross section and with platform members, or deck boards, with a U-shaped cross section. Both, the platform members and the beams have flat surfaces connected with grids of reinforcing ribs that are interconnected and run longitudinal, transversal, and diagonally along their entire length. The platform members and the beams are perpendicularly coupled to each other, with the platform members at the bottom and top sides of the beams; several platform members in parallel create the top and bottom platforms of the pallet. Since the new pallet is made with identical platform members at its top and bottom, the pallet could be reversible depending on the number of platform members that are connected at its top and its bottom sides. Empty spaces are created between the bottom and top platforms of the pallet in order to allow its manipulation with forklift or similar handling equipment.

[0023] The thickness of the flange and web of the central beams, thickness of the walls of the platform members, and thickness of the reinforcing ribs along the beams and the platform members can be adjusted in the manufacturing process to make the beams or platform members more or less

robust. To prevent sliding of the cargo on the pallet and of the pallet on the ground, shelves, or forklift, non-slip rubber blocks are inserted in several places along the platform members. The I-shaped beams of the pallet have a row of conical protuberances, or conical pins, centered along their flat top and bottom surfaces, and they are used to create interference and engagement action with the platform members when such conical protuberances are inserted in the corresponding conical holes on the flat surfaces of the platform members to avoid relative displacement or rotation between the beams and the platform members and to contribute carrying shear stresses between the platform members and the beams. These conical protuberances are also used to keep the main components of the pallet together in a stable manner even when small dimensional changes occur due to possible variations in temperature, loads, or stress relaxation. The beams are assembled parallel to each other by connecting platform member perpendicular to the beams to form the top and bottom non-slip platforms of the pallet to transport or store cargo. The beams are separated to leave empty spaces that are used to manipulate the pallet by allowing inserting the forks of forklifts or similar material handling equipment. Between each pair of said conical protuberances of the beams, there is a hole that coincides with another hole in the platform members when they are aligned to be coupled; such holes might be threaded or not and are used to insert bolts that strongly connect and fasten the platform members and the beams to form the pallet. Therefore, the platform members and beams of the new pallet are characterized by having holes that coincide and are evenly spaced to attach them with bolts, washers, and nuts. The flat sides of the platform members have corresponding conical holes to insert said conical protuberances of the beams, and between each pair of these conical holes, there are holes of larger diameter to insert the bolts and accommodate the washers and nuts used to connect the beams and the platform members.

[0024] This invention is a new adjustable load capacity pallet constructed by interconnecting and interlocking beams and platform members made through the plastic injection molding method. The adjustable load capacity of the pallet can be achieved in numerous ways, by varying the thicknesses of the walls and/or the reinforcing ribs of the beams and/or platform members and by varying the number of beams and/or the number of platform members at the top and/or bottom of the pallet. The platform members have U-shaped cross section and flat ends and they have a grid of interconnected reinforcing ribs that runs perpendicular, longitudinal, and diagonally along the members from one end to the other. The central beams of the pallet are constructed with U-shaped cross section, flat ends, and with a grid of interconnected reinforcing ribs that runs at each side of the web of the beam in a perpendicular, longitudinal, and diagonal way along the length of the beams. Centered along the beams, and on the top and bottom surfaces, there are rows of conical protuberances required to be inserted into corresponding conical holes in the flat surfaces of the platform members to speed up the pallet assembling process and to facilitate alignment and engagement between the beams and the platform members, and to maintain a stable and robust connection that prevents slippage or relative rotation between the central beams and the platform members.

[0025] The platform members for the new pallet can be used to build platforms for other applications, for example, they can be connected to build walls, floors, and molds or

retention walls for concrete pouring such as in the construction of houses, sidewalks, columns, and similar.

[0026] Other features of this invention are presented in the following sections of the description of the invention, which gives a detailed explanation with reference to the accompanying drawings in order to fully disclose the invention, but without intending to impose limitations to it.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0027] With the above and other related objects in view, the invention consists in the details of construction and combination of parts to form a cargo pallet as will be more fully understood from the following description, when read in conjunction with the accompanying drawings in which:

[0028] FIG. 1 represents an embodiment of pallet 10, constructed with central beams 2 that are placed parallel to each other and connected to platform members 1 that are perpendicularly attached to the central beams 2 at their top and bottom sides. The load capacity of the pallet 10 is configurable depending on the thicknesses of web 29, ribs 3 and 9, and the other walls of beams 2 and members 1, and/or the number of central beams 2 and/or number of platform members 1 at both sides of the central beams 2. FIG. 1 presents a pallet model 543, meaning that it has 5 platform members 1 on the top, 4 central beams 2, and 3 platform members 1 at the bottom of the pallet 10.

[0029] FIG. 1A shows an enlarged section of pallet 10 with a view of holes 7 and 11.

[0030] FIG. 2 shows a pallet 10 model 743, meaning that it has 7 platform members 1 on the top, 4 central beams 2, and 3 platform members 1 at the bottom of the pallet 10.

[0031] FIG. 3 shows details of the platform members 1, with the grid of ribs 9 that run along the length of the platform members 1, with holes 4 that are used to insert non-slip rubber blocks 5, holes 7 are used to insert bolts 12 or 22, the accommodations 15 are used to place the washers 13, the heads 18 of bolts 12 or 22, and the nuts 14; it also shows several conical holes 11. Some bolts 12 are fully threaded, like bolt 22, and in such case, they require that holes 6 and 7 be also threaded.

[0032] FIG. 3A show bolts 12 and 22, washers 13 and nuts 14 used to connect the platform members 1 to the central beams 2 to form the pallet 10.

[0033] FIG. 3B shows a non-slip rubber block 5 which are inserted onto holes 4 in platform members 1.

[0034] FIG. 4 is a view of the pallet 10, model 543, showing the lateral sides of the central beams 2, with web 29, and the grid of ribs 3 connected along the central beams 2; also, there are conical protuberances 8, which are required to align and engage beams 2 to the platform members 1, these conical protuberances 8 of the beams 2 are inserted in the conical holes 11 of platform members 1 to prevent slippage and relative rotation of the beams 2 and platform members 1; said conical protuberances 8 and the conical holes 11 are required to maintain a stable connection between the beams 2 and platform members 1 even in critical operating conditions involving changes in temperature and loading conditions.

[0035] FIG. 4A is a view of the pallet 10, model 743, showing the lateral sides of the central beams 2, with web 29, and the grid of ribs 3 connected along the central beams 2; also, there are conical protuberances 8.

[0036] FIG. 4B shows an enlarged view of a single conical protuberance 8 on the central beams 2.

[0037] FIG. 5 is a view of pallet 10 that is perpendicular to the view shown in FIG. 4, and it presents the assembly of the

platform members 1 and central beams 2, the non-slip rubber blocks 5, and the empty spaces 23 to insert the forks of a forklift truck or other pallet handler.

[0038] FIG. 6 presents platform members 1', which represent another embodiment of platform members 1 but without the holes 4, and they are attached to each other with connecting pieces 24, bolts 25 and nuts 26 to form flat platforms 20 of configurable size depending on the number of members 1' and connecting pieces 24 used to construct it.

[0039] FIG. 6A represents the cross sectional view AA in FIG. 6 showing platform members 1' attached to connecting pieces 24 using bolts 25 and nuts 26.

[0040] FIG. 6B represents a lateral view of FIG. 6 showing platform members 1' attached to connecting pieces 24 using bolts 25 and nuts 26.

#### DETAILED DESCRIPTION OF THE EMBODIMENTS OF THE INVENTION

[0041] Considering the characteristics of this invention as explained above, the new pallet 10 is described in more detail next when read in conjunction with the accompanying drawings, in which:

[0042] Referring to FIGS. 1 and 2, this invention is identified as pallet 10 that is configurable for different applications and load capacities depending on the number and the thickness of the walls of the central beams 2 and platform members 1 and also depending on the thickness of the reinforcing ribs 3 and 9. Several central beams 2 are placed parallel to each other and connected with platform members 1 at the top and at the bottom sides of the beams 2. As shown in FIGS. 1 and 2, the number of platform members 1 at the top of beams 2 could be the same as or different to the number of members 1 at the bottom of beams 2. The pallet model is specified by three numbers indicating the number of platform members 1 at the top, the number of central beams 2, and the number of platform members 1 at the bottom of the pallet 10; for example, in FIG. 1, the pallet 10 is a 543 model, which means that it has five platform members 1 at the top, four central beams 2, and three platform members 1 at the bottom of the pallet 10. Similarly, FIG. 2 is a model 743 of the pallet 10.

[0043] FIGS. 1, 2 and 3 show the platform members 1 with a flat face 16 and flat sidewalls 17; on the side opposite to the flat face 16, it has a grid of ribs 9 longitudinal, transversal, and diagonally connected along the platform members 1; it has holes 4 to insert non-slip rubber blocks 5 to prevent slippage of the pallet 10 and its cargo. Platform members 1 also have holes 7 that are used to insert bolts 12 or 22; said holes 7 have housing 15 to accommodate the heads 18 of bolts 12 and 22, the washers 13, and the nuts 14. FIG. 3 shows several conical holes 11 on the platform members 1 that are used to insert the conical protuberances 8 of the central beams 2.

[0044] FIGS. 1, 2, 4 and 5 show the central beams 2 which have web 29, flat ends 21 and flat surfaces 19 identical on its top and bottom sides, and both of its lateral sides consist of grids of reinforcing ribs 3 that are longitudinal, transversal, and diagonally connected along the central beams 2; located along the central beam 2 and centered on the top and bottom flat surfaces 19, there are rows of conical protuberances 8; between each pair of conical protuberances 8, there are holes 6, which are used to insert bolts 12 or 22 that also cross the platform members 1 through the holes 7; said conical protuberances 8 are inserted into conical holes 11 on the platform members 1 to align and engage them and prevent relative

displacement or rotation of the platform members 1 and the central beams 2. Bolt 12 could be fully threaded as bolt 22 in FIG. 3A and in such case, holes 6 and 7 are also threaded to match bolt 22. Bolts 12 or 22, washers 13 and nuts 14 are used to attach the platform members 1 at the top and bottom of the central beams 2 to form the pallet 10. Washers 13 can also be placed next to the head of the bolts 12 or 22, and between platform members 1 and beams 2.

[0045] FIG. 6 shows the platform member 1', which is another embodiment of platform members 1 made without the holes 4; several of said platform members 1' are placed adjacent to each other and attached with connecting pieces 24 and at least four bolts 25 and nuts 26 to construct flat platforms 20 that are configurable in size depending on the number of members 1' and pieces 24 that are connected to each other. Platforms 20 are made by attaching members 1' and connectors 24 and they can be used as walls, floors, and molds for concrete pouring applications. Bolts 25 are inserted into holes 7 of the platform members 1' that coincide with holes 27 of connecting parts 24 to form adjustable size flat platforms 20. As shown in FIG. 6A, connecting parts 24 have holes 27 and protuberances 28 that match accommodations 15 in members 1' to align and secure them with bolts 25 and nuts 26. The platform members 1' and connecting pieces 24 have accommodations 15 to place the head of bolts 25 and the nuts 26

[0046] The above description refers to the best embodiments of the objectives and characteristics of the present invention. Various configurations and applications of the new pallet can be obtained due to the versatility of the modular components that make up the new pallet 10. In addition, similar components 1' to the platform members 1 of the new pallet 10 can be connected to form walls, floors, and molds to pour concrete. All the information disclosed in here should be interpreted merely as illustrative and not in a restrictive sense for this invention.

What is claimed is:

1. A reusable, repairable, recyclable, with configurable load capacity pallet 10, characterized by having two main components: the central beams 2 and platform members 1 which have grids of reinforcing ribs 9 and 3, respectively, whose thickness is adjustable in the manufacturing process to vary the strength and robustness of the pallet 10; several of these main components are interconnected, conical protuberances 8 on said central beams 2 are inserted into conical holes 11 in said platform members 1; at least two of the central beams 2 are placed in parallel and at their top and bottom sides they are aligned and coupled perpendicularly to a variable number of platform members 1; said platform members 1 and central beams 2 are secured and interlocked with bolts 12 or 22, washers 13, and nuts 14; said pallets 10 have empty spaces 23 to insert the forks of a forklift or other pallet handler; the number and the thickness of the walls of said platform members 1 and/or central beams 2 is adjustable to configure the load capacity of the pallet 10; the thicknesses of the walls 16, 17, 19, and 21, web 29, and the grids of reinforcing ribs 9 and 3 of said platform members 1 and/or central beams 2 are also adjustable to configure the load capacity of the pallet 10.

2. The pallet 10 of claim 1 is characterized by having central beams 2 which have flat ends 21, web 29, and flat surfaces 19 that are identical at its top and bottom, with its lateral sides having a grid of reinforcing ribs 3 longitudinal, transversal, and diagonally connected along the central beams 2; centered on the flat surfaces 19 and located along the central beams 2, there are rows of conical protuberances 8; between each pair of conical protuberances 8, there are holes 6 that could be smooth or threaded to insert bolts 12 or 22.

3. The pallet 10 of claim 1 is characterized by having platform members 1 with a flat surface 16 and flat sidewalls 17; on the opposite side to the flat surface 16, there is a grid of reinforcing ribs 9 longitudinal, transversal, and diagonally connected along the platform members 1; said platform members 1 have holes 7 to insert bolts 12 or 22; said holes 7 have housings 15 to accommodate the heads 18 of bolts 12 or 22 or the nuts 14 and also to accommodate the washers 13; said holes 7 are threaded to insert bolts 22.

4. The pallet 10 of claim 1 is characterized by having non-slip rubber blocks 5 that are inserted into holes 4 in the platform members 1 to prevent slippage of the pallet 10 on the floor, shelf, or forklift or other pallet manipulating devices, and also to prevent slippage of the cargo on the pallet 10.

5. The pallet 10 of claim 1 is characterized by having aligning and engaging means consisting of conical protuberances 8 that are inserted in conical holes 11 of platform members 1 to contribute carrying shear stresses and to prevent relative displacement or rotation between the platform members 1 and beams 2; pallet 10 also has interlocking and connecting means that consist of bolts 12 or 22, whose heads 18 are lodged in the accommodations 15 at the ends of the holes 7 of the platform members 1, said bolts pass through holes 7 in platform members 1 and holes 6 in the central beams 2, and at the other end of the bolts 12 or 22, opposed to the heads 18, washers 13 are placed, and nuts 14 are threaded onto the bolts 12 or 22 and lodged in the accommodations 15 at the ends of the holes 7 of the platform members 1; the washers 13 can also be placed next to the heads 18 of the bolts 12 or 22, and between platform members 1 and beams 2.

6. The pallets of claim 3 are characterized by forming flatbeds or platforms on the top and bottom of pallet 10; platform members 1 are modified by removing the holes 4 to create other platform members 1'; two or more of said platform members 1' are placed adjacently and attached to each other using connecting pieces 24, bolts 25, and nuts 26 to construct flatbeds 20 of adjustable size and robustness depending on the number of platform members 1' and connectors 24 that are connected together; said connecting pieces 24 have at least four holes 27 to coincide with holes 7 of the platform members 1', said connecting pieces 24 have at least four protuberances 28 that are inserted into the accommodations 15 of the platform members 1', said bolts 25 are inserted into holes 7 of the platform parts 1' that match the holes 27 in connectors 24 to assemble the adjustable size platform 20; said connectors 24 have holes 27 and protuberances 28 that match the accommodations 15 of members 1' to align and secure them with bolts 25 and nuts 26; said platforms 20 are used as walls, floors, and molds for concrete pouring applications.

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