

Cargo pallet having two decks joined by projections on the surfaces.

DESCRIPTION

[0001] The present invention relates to the field of cargo pallets and in particular,
5 to a cargo pallet that is portable and lightweight for the transportation of goods in various carrier vehicles.

[0002] Cargo pallets have been used for transporting goods for over a century. The early pallets were made of wood. One embodiment of the early pallet included
10 a first set of between three to five wooden planks arranged in parallel to each other and being nailed to a second set of between three to five parallel wooden planks. The first set of wooden planks was known as a deck, with the second set of wooden planks being located beneath the first set and orientated transversely (at a right angle) to said first wooden set of planks. The second set of wooden
15 planks provided support to the first set of wooden planks and aided in the even distribution of the load imposed thereon.

[0003] Over time, the cargo pallet evolved and today, a standard pallet, according to the International Standards Organization (ISO), measures 100 by 120 by 12 cm
20 (slightly less than 40 inches by 48 inches by 5 inches). It weighs between about 15 to about 21 kilograms (kg) when unladen. Most pallets can easily carry a load of 1,000 kg (about 2,000 lb.). The gradual advent of containers for the transport of nearly all goods has spurred the use of pallets because the containers always offer the clean and level surfaces needed to make pallet movement economical.
25 The ISO standard pallets also fit neatly into ISO containers, which in turn fit neatly on container ships, trains and trucks. The size of the cargo pallet is also standardized to fit any mobile forklift or other jacking device.

[0004] Today, over half a billion pallets are manufactured each year and about
30 two billion pallets are in use across the United States alone. Over 90% of all pallets are made of wood, consuming close to 12% of all the lumber produced in the United States. Present day pallets essentially retain the shape and form of the early pallets in that it they too have a deck, and beneath the deck, supports are

present. Some pallets may even include a second deck below the supports. Most present day cargo pallets are still made of wood though in some cases, of plastic, metal and even paper.

5 **[0005]** As mentioned, although cargo pallets have been in use for over a century, only recently, has the environmental impact of pallets been a cause of concern. In particular as a result of the continued use of wooden pallets, two major environmental concerns have been raised. The first environmental concern stems from the fact that wooden pallets are prone to having parasitic infestations. When
10 infested pallets are shipped to foreign countries, these parasites constitute in introduction of a non-indigenous species to the local ecological system (eco-system), which creates a threatening ecological imbalance therein. A further drawback is that the parasites may have an adverse effect on the cargo being transported by the pallet as such.

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[0006] In order to prevent the introduction of such parasites to the local eco-system, global protocols, such as the International Plant Protection Convention (IPPC), have been introduced. The IPPC is a multilateral treaty to harmonize regulations governing those imports that could impact the physical condition of
20 forests and crops. Under the IPPC, the ISPM 15 describes phytosanitary (plant protection) measures to reduce the risk of introducing and/or spreading pests associated with wood packaging material made of coniferous and non-coniferous raw wood, in the course of international trade. Pests of particular concern are the pinewood nematode [found in the United States, Canada, Mexico and Japan
25 (where it is not a threat due to the existence of natural predators)] and the Asian Long-Horned Beetle (which is found in China and several other locations and is a threat to forests of the United States), for example.

[0007] Several countries have begun implementing measures to comply with the
30 IPPC for wood packaging materials and have established two options. The first option requires methyl bromide (MB) fumigation. In this option, the wood packaging material is fumigated with methyl bromide to eliminate any pest infestation that may be present in the raw wooden pallets. The second option

requires the heat treatment (HT) of the wooden pallet. In this second option, the wood packaging material is heated to a minimum core temperature of 56°C for a minimum of 30 minutes. ISPM 15 requirements apply to all species of coniferous (softwood) and non-coniferous (hardwood) packaging materials.

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[0008] Unfortunately, while the above-mentioned measures have been adopted to protect the environment, the implementation of either of the options to ensure ISPM 15 compliance has led to a reduction in business efficacy. In this regard, additional costs have to be incurred by businesses to ensure that the pallets that
10 transport their goods comply with the provisions of the IPPC. In addition, at any point of inspection, should a pallet bearing goods be found to be ISPM 15 non-compliant, it will be destroyed and the goods thereon have to be re-palletized on approved pallets (ISPM 15 compliant pallets) at cost to the shipper.

15 **[0009]** Apart from the above-mentioned environmental impact from using wooden pallets, the second environmental concern is the amount of wood, which is derived from forests, required to sustain the production of such pallets. According to the Rainforest Action Network, an environmental group, nearly one million acres of forest are chopped down annually to manufacture wooden pallets.

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[0010] In order to overcome the difficulties in conforming to the ISMP 15 standards and in response to the environmental impact of raw wooden pallets, as mentioned earlier, plastic pallets have been introduced. Examples of plastic pallets are disclosed in Japanese patent application JP 2005-320057, Australian patent
25 AU 730573 and PCT application WO 2006/032816 A1. JP 2005-320057 discloses a pallet made entirely of plastic. The pallet comprises a flat rectangular deck. In each corner of the flat rectangular deck, a through-hole is formed. Each through-hole has a corresponding leg that extends into the through-hole and is attached directly therein (i.e. directly to the pallet at the circumference of the through-hole).
30 The height of the leg is the minimum required to lift the flat plate of the ground sufficiently so that a forklift may be utilized to transport the pallet.

[0011] AU 730573 describes a plastic pallet having a planar platform (deck) supported by a plurality of legs. The platform is formed from a plurality of plastic sheets while the each of the plurality of legs is formed from the combination of two halves. The legs are first assembled and then, later affixed to the planar platform
5 in a circumferentially spaced relation around the periphery of the platform. The plastic pallet may further include a second platform acting as a base for the pallet.

[0012] PCT application WO 2006/032816 A1 discloses a pallet made of plastic material. The pallet includes a substantially rectangular tray (deck), which is
10 supported by legs. The legs extend along and beyond the length of tray and are reinforced.

[0013] Although the pallets described in the aforesaid patent and patent applications overcome the difficulties in ensuring ISPM 15 compliance, other
15 problems such as manufacturing costs and portability are associated with plastic pallets in addition to the problem of the plastic pallets being non-biodegradable. Incidentally, the weight of a pallet has always been a problem even with the existing wooden pallets. The average air freight cost for a pallet is about USD\$20 per kilogram (DHL standard air freight rates). Accordingly, the cost of transporting
20 a standard pallet (which as mentioned earlier weighs between about 15 – 21 kg) alone is approximately between USD\$320 – \$420. Hence, the costs of shipping the standard pallet on its own can have an impact on the total transportation costs.

[0014] In order to overcome the difficulties associated with plastic pallets, U.S.
25 patent application US 2005/0229819 A1 discloses a hybrid pallet having a deck which is supported by a plurality of support structures. Each deck support structure has a plurality of prongs protruding therefrom to penetrate and engage the underside of the deck, thereby causing the support structures to be attached to the deck. The deck is fabricated from waterproofed linerboard facings while the
30 support structures are formed from plastic materials via extrusion processes.

[0015] However, there still exists a need for a cargo pallet that is environmentally friendly, ISPM 15 compliant, of low weight and is yet economical to manufacture.

In addition, there is also a need for such a pallet to be portable. In this regard, a cargo pallet according to the present invention, as defined in the appended claims and as described below, overcomes the aforesaid difficulties.

5 [0016] In a first aspect of the cargo pallet according to the present invention, said cargo pallet includes a planar top deck with an upper surface and an opposing lower surface. The planar top deck has a plurality of hollow projections integrally formed therewith and extending therefrom. Each of said hollow projections has its one end opening to the upper surface and its other end as a closed mating
10 surface. The cargo pallet also includes a planar bottom deck with an upper surface and an opposing lower surface. The upper surface of the bottom deck has a plurality of hollow projections integrally formed therewith and extending therefrom. Each of said hollow projections has its one end opening to the lower surface and its other end as a closed mating surface.

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[0017] The top deck and bottom deck are arranged with respect to each other such that the upper surface of the bottom deck is parallel to and faces the lower surface of the top deck. In addition, the positioning of each of the hollow projections of the bottom deck corresponds to those of the top deck; and the
20 mating surfaces of the hollow projections of the top deck mate with, and are securable to, the mating surfaces of the hollow projections of the bottom deck.

[0018] The hollow projections extending from the top and bottom decks respectively are cup-like and may be of any suitable shape. Examples of suitable
25 shapes that the hollow projections may adopt include, but are not limited to, cone-shaped, triangular, rectangular or cylindrical shapes.

[0019] In one embodiment of this first aspect of the present invention, at least one mating surface of a hollow projection of the top deck includes a protruding portion
30 that is adapted to fit into a corresponding recess on a corresponding mating surface of a hollow projection of the bottom deck. Alternatively, at least one mating surface of a hollow projection of the bottom deck may include a protruding portion adapted to fit into a corresponding recess on a mating surface of a hollow

projection of the top deck. The protruding portion and its corresponding recess may be of any suitable shape. Examples of such suitable shapes include, but are not limited to, annular, triangular, elliptical or rectangular shapes.

5 **[0020]** In another embodiment, at least one mating surface or a selection of mating surfaces of hollow projections of the top deck may include a protruding portion adapted to be received into a corresponding recess of at least one or a selection of mating surfaces of hollow projections of the bottom deck. The remaining mating surfaces of hollow projections of the top deck may include a
10 recess adapted to receive a protruding portion of at least one or the remaining mating surfaces of hollow projections of the bottom deck. Accordingly, the mating surfaces of the top deck may have a mix of protruding portions and recesses that correspond to respective recesses and protruding portions on the mating surfaces of the bottom deck.

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[0021] In all the embodiments described herein, the mating surfaces of the top deck and/or the bottom deck may be planar or of non-planar complementary shape. In one embodiment, the mating surfaces of both the top and bottom decks contact their respective corresponding mating surfaces completely and in entirety
20 when assembled. In another embodiment, the mating surface may contact its corresponding mating surface only partially. For example, in such an embodiment, the protruding portions (which are integrally formed) may have the shape and form as the legs used in Australian Patent AU 730573.

25 **[0022]** Each of the hollow projections opening to the upper or lower surface of the top and bottom decks respectively is adapted to accommodate therein at least a portion of another hollow projection when the decks are stacked. Accordingly this allows for the stacking of top decks, bottom decks and a mix of top decks on bottom decks as well since the hollow projections of the bottom decks may
30 accommodate the hollow projections of the top deck.

[0023] This mode of stacking the decks in a securable way (via said accommodation of hollow projections) is actually known in the pallet industry as

nesting. Having nestable components of a pallet means that, from a logistics point of view, the storage and transportation of the nested components is easier as compared to non-nestable pallet components. These nestable components are typically transported to where they are needed and then assembled for use.

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[0024] The positioning of the hollow projections of the bottom and top decks of the present invention may follow that of a circumferentially spaced apart relationship around the periphery of the respective decks where at least one further hollow projection may be centrally located on the respective decks. This distribution is typical of known cargo pallets where the supports are positioned such that they are able to best transfer the load borne by the pallet to the ground. In an exemplary embodiment, the top deck and bottom deck may be substantially rectangular. In this exemplary embodiment, the hollow projections may be distributed such that each corner of the rectangular decks has a hollow projection and each mid point between the corner hollow projections also has a hollow projection. In addition, a further hollow projection may be centrally located.

[0025] In another embodiment of the first aspect of the invention, the bottom deck of the cargo pallet includes a plurality of cut-ins along at least two of its peripheral edges. These cut-ins are to allow for the adaptation of said pallet for storage and transport in cargo and/or commercial aircraft, for example. In an exemplary embodiment, the bottom deck may include two cut-ins along each of its peripheral edges or along at least two peripheral edges, such that each of the two cut-ins is located on either side of the midpoint of the peripheral edge.

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[0026] Generally speaking, the feature of having cut-ins is applicable to any cargo pallet having a top deck with an upper surface and an opposing lower surface, and a bottom deck with an upper surface and an opposing lower surface. In known cargo pallets having a top and bottom deck, the top deck and bottom deck may be co-joined by a plurality of legs therebetween, where said legs may be arranged in a symmetrically spaced relationship with respect to each other. In such cargo pallets cut-ins may be incorporated such that the periphery of the bottom deck has

at least one cut-in resulting in either its longitudinal or lateral dimension being reduced at said cut-in.

[0027] In an exemplary embodiment, a cargo pallet may have a bottom deck that includes at least one pair of cut-ins, wherein each cut-in of the pair is symmetrically arranged on opposite sides to each other and along the periphery of the bottom deck. The resulting effect of having a pair of cut-ins arranged on opposing sides thereof is that overall width or length of the bottom deck (or lower deck) is reduced at the point of the cut-ins. This feature is applicable to all cargo pallets of the present invention, and to pallets found in the prior art, and is further described below and with reference to **Figures 6A – 6D**.

[0028] In the first aspect of the cargo pallet, the decks and hollow projections are fabricated from any suitable class of material. Suitable classes of materials include, but are not limited to, plastics, metals, wood derivatives or any combination thereof. Examples of suitable plastics include, but are not limited to, polycarbonate, acrylic and polyethylene terephthalate (PET). Examples of suitable metals include, but are not limited to, steel, titanium, aluminum or alloys thereof. Examples of wood derivatives include, but are not limited to, compressed wood chips or paper-based materials.

[0029] In all the embodiments of the invention according to the first aspect, the mating surfaces of the hollow projections may be further securable to each other by thermal bonding, fasteners, adhesives, snap-fit mechanisms or press-fit mechanisms.

[0030] In a specific exemplary embodiment of the cargo pallet according to the first aspect of the invention, the cargo pallet includes a planar top deck and a planar bottom deck, each with an upper surface and an opposing lower surface. The top deck has nine hollow projections integrally formed therewith and extending therefrom. Each of said hollow projections has its one end opening to the upper surface and its other end as a closed mating surface. The bottom deck has nine hollow projections integrally formed therewith and extending therefrom.

Each of said hollow projections having its one end opening to the lower surface and its other end as a closed mating surface. The top deck and bottom deck are arranged with the upper surface of the bottom deck being parallel to and facing the lower surface of the top deck such that the positioning of each of the hollow
5 projections of the bottom deck correspond to those of the top deck; and the mating surfaces of the hollow projections of the top deck mate with, and are securable to, the mating surfaces of the hollow projections of the bottom deck. The securing of the mating surfaces of the hollow projections of the top deck and bottom deck may be further reinforced by any of the means described above.

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[0031] The distribution of the nine hollow projections of either the top deck or bottom deck is such that eight of the nine are in a circumferential relationship around the periphery of the decks. In the case where said decks are rectangular in shape, each corner has a hollow projection while the midpoints of each side of the
15 rectangle include four hollow projections making a total of eight. The ninth hollow projection, in this embodiment, is located at the centre of the rectangular deck.

[0032] In all embodiments of the cargo pallet according to the first aspect of the invention, each of the mating surfaces of each of the hollow projections include a
20 drainage hole offset from the centre of said mating surface. Accordingly, when said top deck and bottom deck are arranged with the upper surface of the bottom deck being parallel to and facing the lower surface of the top deck, and when the mating surfaces of the hollow projections of the top deck and bottom deck mate and are secured, the drainage holes of the hollow projections of the top deck align
25 with the drainage holes of the hollow projections of the bottom deck to form what may be considered to be a through-hole extending from the top deck to the bottom deck.

[0033] The drainage hole allows any water that may accumulate as a result of
30 adverse weather to be drained from the pallet. This significantly reduces the possibility of the accumulation of stagnant water, which may lead to the breeding of parasites such as mosquitoes, for example.

[0034] In all the preceding embodiments and those that follow, in order to comply with ISO standards, and to allow for the pallet in question to be handled by forklifts globally, the top deck and bottom deck are separated by a vertical distance of at least about 10.0cm. This distance is judged to be when said top deck and bottom
5 deck are arranged with the upper surface of the bottom deck being parallel to and facing the lower surface of the top deck, and when the mating surfaces of the hollow projections of the top deck and bottom deck mate and are secured. Accordingly, in this first aspect of the invention, it follows that the combined height of the hollow projections of the top deck and bottom deck are about 10.0cm
10 altogether.

[0035] In one embodiment of the first aspect of the cargo pallet, a mating surface of a hollow projection has an inner surface that includes a recess adapted to accommodate a screw. This is particularly suitable when the mechanism for
15 connecting the top deck and bottom deck is by fasteners such as screws, for example. In this embodiment, the recess found on the internal surface of the mating surface of the hollow projection (which may belong to either the top and/or bottom deck), allows the screw to not only be screwed through this mating surface but also through the corresponding mating surface of the other deck. In addition,
20 the recess may be chamfered to accommodate the screw head as well. By having the recess accommodate the screw head, the internal surface of the mating surface is level even after the top deck is secured to the bottom deck via said screw fasteners.

[0036] Alternatively, a mating surface of a hollow projection of one deck (such as the top deck, for example) may simply have a recess in connection to a through-hole. The recess, may be chamfered such that when a screw is inserted into said
25 recess the threaded portion of the screw passes through the through-hole and the screw head is accommodated in the chamfered recess. In this embodiment, a corresponding mating surface of the other deck (such as the bottom deck, for
30 example) does not have a matching through-hole. Accordingly, when the screw in the through-hole is screwed the threaded portion of the screw penetrates the

mating surface without a through-hole. As such, the top deck is secured to the bottom deck via the screw head and threaded portion of the screw.

[0037] In the fabrication of the cargo pallet according to the first aspect of the invention, separate molds are used to form the top and bottom decks individually prior to said decks being assembled together to form the cargo pallet as described above. Such a mold for fabricating a top deck of a cargo pallet typically includes a die having a cavity. The cavity is complementary in shape to a top deck of a pallet having an upper surface and an opposing lower surface having a plurality of hollow projections integrally formed therewith and extending therefrom. The mold cavity is also shaped such that it forms each of said hollow projections to have its one end opening to the upper surface of the top deck and its other end as a closed mating surface, wherein said mating surface has an extruded annular portion adapted to be received by a corresponding annular recess.

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[0038] Correspondingly, the mold for fabricating the bottom deck also includes a die having a cavity. However in this case, the cavity is complementary in shape to a bottom deck of a pallet having an upper surface and an opposing lower surface, said upper surface having a plurality of hollow projections integrally formed therewith and extending therefrom. The mold cavity is also shaped such that it forms each of said hollow projections to have its one end opening to the lower surface of the bottom deck and its other end as a closed mating surface, wherein said mating surface has a recess adapted to receive a corresponding protruding portion.

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[0039] In the case of the mold for fabricating the bottom deck, in another embodiment thereof, the cavity of the mold is complementarily shaped so as to form the aforesaid cut-ins in the bottom deck. Typically, the cut-ins are symmetrically formed around the periphery of the bottom deck. In the embodiment where the bottom deck is rectangular, the cut-ins may be formed on one, two, three or four peripheral edges of the deck. In addition, each peripheral edge may also have more than one cut-in. As such, in all embodiments having the feature of a cut-in, the longitudinal or latitudinal dimension of the deck is reduced.

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[0040] In a second aspect of the cargo pallet according to the present invention, the top deck and bottom deck, as described earlier, are arranged with the upper surface of the bottom deck being parallel to and facing the lower surface of the top deck such that the mating surfaces of the hollow projections of the bottom deck mate with, and are securable to, the lower surface of the top deck. Correspondingly, the mating surfaces of the hollow projections of the top deck mate with, and are securable to, the upper surface of the bottom deck. As such, in this embodiment, there is no alignment or contact between the mating portions of the hollow projections of the top and bottom decks. Rather, the mating surfaces contact either the upper surface of the bottom deck or the lower surface of the upper deck.

[0041] A third aspect of the cargo pallet according to the present invention includes a deck with an upper surface and an opposing lower surface, having a plurality of through-holes extending from the upper surface to the lower surface of the deck. The cargo pallet also includes a plurality of support structures, each of which is attached to the deck, via a corresponding through-hole. Each support structure includes a leg having a through-hole and a leg fastener. The leg is arranged with its first end in abutment with the lower surface of the deck and in alignment thereto, such that the central longitudinal axes of rotation of the through-holes of the leg and the deck are collinear. The leg fastener has a head which has a larger diameter than the through-hole of the deck and engages the upper surface and secures the leg to the deck when threaded through the respective aligned through-hole of the deck and its corresponding leg.

[0042] Typically, as in the first and second aspects, the deck is, but is not limited to being, rectangular and may be substantially rectangular in shape, especially in an embodiment where the corners are rounded. The dimensions of the deck are in accordance with the ISO and are 100 cm (width) by 120 cm (length). The thickness of the deck may vary according to the load it is subjected to. A thicker deck may have the advantage of being less susceptible to bending moments and

therefore, is also less likely to crack under loading but may cause the pallet, as a whole, to weigh more.

[0043] As mentioned, the deck has a plurality of through-holes extending from
5 the upper surface to the lower surface. In exemplary embodiments of this third aspect, the deck may have anywhere between four to nine through-holes. The through-holes may be distributed along the periphery of the deck and in some embodiments of the third aspect, the through-holes may be located in the centre of the entire deck as well.

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[0044] One exemplary embodiment of the third aspect is one where the deck is rectangular and has four through-holes, each through-hole is located at a respective corner of the rectangular deck in a symmetrical manner. In another exemplary embodiment where the rectangular deck has five through-holes, the
15 first four through-holes are located at the corners as in the previous exemplary embodiment while the fifth through-hole is located in the centre of the entire deck.

[0045] A further illustrative embodiment of the third aspect is one where the deck has nine through-holes. Again, five of the nine through-holes are located at the
20 corners and in the centre of the rectangular deck, as in the previous embodiment. The remaining four through-holes are each located, along the peripheral edge, but equidistant from any two corner through-holes. In other words, the remaining four through-holes are located at the respective mid-points between the four through-holes located at the corners of the rectangular deck. Generally, although the
25 distribution of through-holes over the deck may vary, it is typically done evenly (or symmetrically) over the deck in order to allow for an even distribution of the laden weight when in use.

[0046] As mentioned, the pallet also includes a plurality of support structures,
30 each of which is attached to the lower surface of the deck via a corresponding through-hole. Each support structure includes a leg of a given height and a leg fastener. Typically, the height of the leg should be sufficient to raise the deck above ground-level such that a standard forklift is capable of carrying out forklift

operations on the pallet concerned. In an exemplary embodiment, a typical height of the support may be about 12 cm, in accordance with ISO standards.

[0047] In one exemplary embodiment of the third aspect, the leg may simply be a
5 hollow tube with an inner diameter that corresponds to that of the respective through-holes of the deck. In this embodiment, the leg may be considered to be a bush (mechanical).

[0048] In another exemplary embodiment, the leg may include an outer hollow
10 tube; and an inner hollow tube that is concentric to the outer hollow tube. In this embodiment, the inner hollow tube substantially defines the latitudinal cross-sectional area of the through-hole of the leg. The inner hollow tube is held or supported in its concentric position by at least one supporting rib. The at least one supporting rib extends radially from the outer surface of the inner hollow tube to
15 the inner surface of the outer hollow tube.

[0049] In one embodiment of the third aspect, the at least one supporting rib may extend perpendicularly between the inner and outer hollow tubes. In this embodiment, two (180 degrees apart), three (120 degrees apart), four (90 degrees
20 apart), six (60 degrees apart) and eight (45 degrees apart) supporting ribs may be utilized, but is not limited thereto. Alternatively, the at least one supporting rib may extend tangentially from the inner hollow tube to the outer hollow tube.

[0050] Alternatively, each supporting rib may be a simple bar that joins the inner
25 hollow tube to the outer hollow tube. Alternatively, the supporting rib may be an entire planar fin that extends not only between the inner hollow tube and the outer hollow tube but also along the height of the entire leg (outer hollow tube).

[0051] As mentioned earlier, each of the plurality of legs is associated with a
30 corresponding through-hole of the deck. Each leg is arranged with respect its corresponding through-hole such that a first end of the leg abuts the lower surface of the deck leaving the second end of the leg free. The alignment and orientation of the leg with respect to the deck is such that the central longitudinal axes of

rotation (which are taken to pass through the origin of the cross-section of the respective through-holes) of the through-holes of the leg, and that of the corresponding through-hole of the deck, are collinear. In other words, each through-hole of the deck and the through-hole of the leg associated therewith is
5 vertically oriented and aligned such that by virtue of the abutment of the leg to the lower surface of the deck, an at least substantially continuous through-hole is formed by both the through-hole of the deck and that of the leg.

[0052] As also mentioned earlier, each support structure also includes a leg
10 fastener. The leg fastener has a head which is of a larger diameter than the through-hole of the deck. Extending from the head is a elongated tube-like body. When the leg fastener is threaded (with its elongated tube-like body first) through a through-hole of the deck and subsequently through a through-hole of a corresponding leg, the head of the leg fastener, engages the upper surface of the
15 deck and prevents any further movement of the leg fastener into the leg, when the leg fastener is fully inserted. Accordingly, the leg fastener, having its head in connection with the upper surface of the deck and its elongated tube-like body in connection with the leg, secures said leg to the lower surface of the deck.

20 **[0053]** The securing of the leg to the deck by the leg fastener, as described above, may be achieved by serrations, snap-fit mechanisms or press-fit mechanisms on the elongated body of the leg fastener. In one exemplary embodiment where the elongated body of the leg fastener has serrations, the serrations may be miniature teeth like structures, or threads similar to those on
25 screws, designed to cut into the boundary of the through-hole of the leg, thereby engaging the leg and securing it against the lower surface of the deck.

[0054] In another exemplary embodiment of the third aspect of the invention where the leg fastener secures the leg to the deck via snap-fit means, the
30 elongate tube-like body of the leg fastener, and the respective through holes of the leg and/or deck, may include complementary undercuts and ribbed features that are adapted to receive and lock the leg fastener to the leg.

[0055] In yet another exemplary embodiment of the third aspect where the leg fastener secures the leg to the deck via press-fit means, the elongate tube-like body of the leg fastener may be of a slightly larger diameter than that of the through hole of the leg. As such, when the leg fastener is pressed (or inserted) into the through-hole of the leg, via the through-hole of the deck, a tight fit is formed between the elongated tube-like body of the leg fastener and the through-hole of the leg, thereby securing the leg to the lower surface of the deck.

[0056] In another embodiment, the cargo pallet according to the third aspect of the present invention further includes a second deck. The second deck is similar to the first deck in that it too has an upper surface and an opposing lower surface as well as a plurality of through-holes extending from the upper surface to the lower surface. In addition, the positioning and arrangement of through-holes of the second deck correspond to those of the first deck. This embodiment also includes a plurality of second leg fasteners as well.

[0057] As described above in the earlier embodiments of the third aspect having only one deck, the second deck is also arranged to abut the leg, except that it abuts the second end of the leg. Again, the orientation of the second deck is similar to that of the first deck (i.e. parallel). Furthermore, the arrangement of the second deck is such that the central longitudinal axes of rotation of the through-hole of the leg and the through-hole of the second deck are collinear thereby forming a substantially continuous through-hole through the leg and second deck.

[0058] In this embodiment having a second deck, each of the second leg fasteners engage the lower surface of the second deck and secure the leg to the upper surface of the second deck when threaded through (or inserted) the aligned through-holes of the of the second deck and the leg, respectively. As such, when the elongated tube-like body of all the leg fasteners is of equal length, then the first leg fastener may simply contact (without being fixed) the second leg fastener at the midpoint of the height of the leg.

[0059] Alternatively, the first and second leg fasteners may not contact each other if the sum of the lengths of their elongated tube-like bodies is less than the height of the leg. In this embodiment, a gap is present between the first and second leg fasteners within the inner hollow tube.

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[0060] In yet another alternative embodiment the elongated tube-like body of all the leg fasteners may not be of equal length, i.e. the length of the elongated tube-like body of the first leg fastener is less (or more) than that of the second leg fastener. When the length of the elongated tube-like body of the first leg fastener
10 is less (or more) than that of the second leg fastener, the leg fasteners, when inserted, may have an overlapping relationship, or, as mentioned above, be contacting each other or not contacting each other thereby leaving a gap in between.

15 **[0061]** In the embodiment resulting in an overlapping relationship, a press-fit may result between the two leg fasteners thereby also securing the leg and decks therebetween together. In this embodiment, as a result of the overlap, one leg fastener may be adapted to accommodate the overlapping section of the other leg fastener in a snap-fit manner or tight-fit manner with the aid of suitable serrations
20 and/or threading mechanisms.

[0062] As such, in any of the embodiments of the third aspect of the invention where the leg fasteners are of equal or differing lengths, the securing means between the second leg fastener and its corresponding leg may be achieved by
25 adhesive means, serrations, snap-fit mechanisms or press-fit mechanisms on the elongated body of the leg fastener.

[0063] As in the embodiment of the first aspect, a cargo pallet having two decks may also be adapted to be suitable for storage and transport in cargo and/or
30 commercial aircraft, for example. This is achieved by the second deck having a plurality (two or more) of cut-ins along each or at least two of its peripheral edges.

[0064] In a further exemplary embodiment, the bottom (or lower) deck may include at least two pairs of cut-ins with each pair located on opposing peripheral edges of the bottom deck. In this embodiment, each cut-in of the respective pairs is located at either side of the midpoint of the peripheral edge such that either the
5 longitudinal or lateral dimension of the bottom deck is reduced at the cut in. A more detailed description of this particular embodiment is provided in the description of **Figures 6A – 6D** which follows later.

[0065] The cargo pallet of all the aspects of the present invention may also further
10 include a Radio Frequency Identification (RFID) tag located within the support structure, embedded in the top deck or bottom deck, or within the hollow projections.

[0066] The various components of the cargo pallet, such as the deck (inclusive of
15 the hollow projections as in the first aspect of the present invention) and support structures may be fabricated from any suitable material, for example, a material such as plastic, metal, a wood or plant derivative or any combination thereof. Examples of suitable plastics include, but are not limited to, polycarbonate, acrylic and polyethylene terephthalate (PET). Examples of suitable metals include, but
20 are not limited to, steel, titanium, aluminum and alloys thereof. Examples of suitable wood or plant derivatives include, but are not limited to compressed wood chips, paper-based materials, bamboo plants, maize plants and palm trees.

[0067] In one specific exemplary embodiment of the third aspect, the deck (top
25 and bottom) is molded from compressed wood chips and each of the plurality of support structures is made from plastic, such as any one of the above-mentioned plastics, for example. In this specific embodiment the wood chips are first dried and then placed in a compression mold along with a suitable binder material. This is followed by the application of heat and pressure.

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[0068] A typical range of the temperature within the compression mold is between about 150°C to about 250°C, for example. A more specific temperature range that may be used is between about 180°C to about 200°C, for example. A suitable

pressure range that may be applied during compression molding varies between about 6 MPa to about 21 MPa, for example. As for the first and second aspects according to the present invention, the top and bottom decks having the hollow projections may also be formed via compressed wood chips and in a similar
5 manner as described herein.

[0069] The wood chips may be obtained from wood waste such as sander dust, sawdust, chips and logs, for example. The wood chips used may be about 3cm – about 15cm in length, and may have a thickness of between about 0.01cm – about
10 0.18cm, and a width of about 7cm or less. An example of a suitable binder material may be, but is not limited to, a formaldehyde based material or polyethylene. The binder protects the wood chips that form the deck from breaking and absorbing moisture. As such, the moisture content of decks manufactured from wood chips via compression molding is typically about ten percent or less.

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[0070] A more detailed method of preparation of wood chips for compression molding is described, for example, in U.S. patent 4,408,544 and is hereby incorporated by reference with regard to describing a method of compression molding a deck of a pallet. However, the mold used in connection with the method
20 as described in this U.S patent pertains to the fabrication of an entire pallet via compression molding. As such, a suitable mold to form the requisite cavities, indentations and surfaces of just a deck, when used in conjunction with the method of preparation of wood chips for compression molding as disclosed in the aforesaid U.S. patent is capable of fabricating a deck of the cargo pallet according
25 to the present invention. Another exemplary method of manufacturing a deck from wood chips via compression molding is also disclosed in U.S. patent 4,385,564 and is also hereby incorporated by reference.

[0071] As for the various components of the support structure according to the
30 third aspect of the invention, they may be fabricated by injection molding, for example. In a further embodiment, should more strength be required for the various components of the cargo pallet, a metal skeletal structure for the

components may be fabricated followed by insert molding to provide a coating of a suitable polymer, for example.

[0072] Another means of strengthening the top (upper) and bottom (lower) decks
5 is to include at least one v-shaped notch that runs, in either a continuous or discontinuous manner, across the upper surface or lower surface of the respective decks. In the case of the top deck, it may include at least one v-shaped notch that runs, in either a continuous or discontinuous manner, across the upper surface or lower surface of said top deck in a typically symmetrical pattern. As for the bottom
10 deck, the same applies in that it too includes at least one v-shaped notch that runs, in either a continuous or discontinuous manner, across the upper surface or lower surface in a typically symmetrical manner. It should also be noted that the v-shaped notches may run laterally or transverse or a combination thereof across the top and bottom decks. In further exemplary embodiments, the notches may be
15 u-shaped, rectangular in shape or a combination of any of the above-mentioned shapes of notches.

[0073] It is to be noted that all description pertaining to the first aspect of the invention is interchangeably applicable to the second and third aspects of the
20 invention as well and vice versa. In this regard, the description to the top (upper) or bottom (lower) decks of the first aspect of the cargo pallet may also apply to the top and bottom decks of the second and third aspects of the cargo pallet where possible.

25 **[0074]** In order to aid in the further understanding of the present invention, various exemplary embodiments of the cargo pallet are described below with reference to the attached drawings in which:

[0075] **Figures 1A – 1D** show a top deck of an exemplary embodiment of the first
30 aspect of the invention;

[0076] **Figures 2A – 2D** show a bottom deck of an exemplary embodiment of the first aspect of the invention;

[0077] **Figures 3A – 3D** show the assembly of the top deck of **Figure 1** and the bottom deck of **Figure 2** to form said exemplary embodiment of a first aspect of the invention; **Figures 3E and 3F** show another embodiment of the top and bottom
5 deck according to the present invention;

[0078] **Figures 4A – 4B** show the assembly of an exemplary embodiment of a third aspect of a cargo pallet according to the present invention;

10 [0079] **Figures 5A – 5D** show the first exemplary embodiment of **Figures 4A – 4B** of the cargo pallet in an assembled form;

[0080] **Figures 6A – 6D** show an exemplary second embodiment of a third aspect of the cargo pallet in an assembled form;

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[0081] **Figures 7A – 7D** show an exemplary third embodiment of a third aspect of the cargo pallet in an assembled form;

[0082] **Figures 8A – 8D** show an exemplary fourth embodiment of a third aspect
20 of the cargo pallet in an assembled form;

[0083] **Figures 9A – 9C** show an embodiment of a second aspect of the present invention; and

25 [0084] **Figures 10A – 10C** show three embodiments of internal surfaces of mating surfaces of a top deck and bottom deck.

[0085] **Figures 1A – 1D** show various views of a top deck **100** of an exemplary embodiment of the first aspect according to the invention. In **Figure 1A**, the top
30 deck **100** has an upper surface and an opposing lower surface and includes a plurality of hollow projections **102**. Each hollow projection **102** extends from the lower surface and has one end opening to the upper surface of the top deck while its other end is closed to form a closed mating surface. As shown, the top deck in

this illustrative example is rectangular in shape and has eight hollow projections **102** distributed evenly around its periphery and one hollow projection **103** in the centre of said rectangular top deck.

5 **[0086]** **Figure 1B** shows a side view of the top deck **100** of the pallet. From this view the hollow projections **102** are shown. Each hollow projection **102** includes an annular projection **104** that extends from the closed mating surface of the hollow projections **102**.

10 **[0087]** **Figures 1C** and **1D** show the bottom view (lower surface) and top view (upper surface) of the top deck **100** respectively. In **Figure 1C**, the hollow projections **102** are shown to include an opening **106** that is offset from the centre of the hollow projection **102**, as shown. The opening **106** permits drainage of any fluid that may accumulate in the hollow projections **102** due to weather variations.
15 The annular projections **104** are also shown. In addition, the top deck also includes 'v-shaped' notches **109** that are continuous and run near the periphery of the top deck. These 'v-shaped' notches serve to reduce bending along the top surface and bottom surfaces of the deck thereby strengthening said deck in load bearing operations. As mentioned earlier, the notches may also be u-shaped or
20 rectangular in shape, for example.

[0088] **Figures 2A – 2D** show various views of a bottom deck **200** of an exemplary embodiment of the first aspect according to the invention. **Figure 2A** shows the bottom deck **200** having an upper surface and a lower surface. The
25 bottom deck **200** includes a plurality of hollow projections **202** extending from the upper surface of the bottom deck **200**. Each hollow projection **202** of the bottom deck **200** includes an annular recess **204** that is adapted to accommodate therein either in a fixed or removable manner, the annular projection **104** as described above. **Figure 2B** shows a side view of the bottom deck **200** having hollow
30 projections **202**.

[0089] **Figure 2C** and **2D** show the bottom (lower surface) and top (upper surface) views of the bottom deck **200** respectively. As in the top deck **100**, the

hollow projections **202** of the bottom deck **200** also include openings **206** for the same purposes as those labeled **106**. In the **Figure 2D**, the annular recesses **204** and the opening **206** is clearly illustrated. **Figures 2C** and **2D** also show that the bottom deck **200** includes cut-ins **208**. Cut-ins **208** are useful for adapting the cargo pallet for storage and transportation in commercial aircraft, for example. In **Figure 2C**, the bottom deck also includes 'v-shaped' notches **209** similar to those described earlier and indicated with the reference sign **109**.

[0090] **Figures 3A – 3D** show the assembly of the top deck **100** of **Figure 1** and the bottom deck **200** of **Figure 2** to form an exemplary embodiment of the cargo pallet **300** according to a first aspect of the invention. **Figure 3B** shows how the top deck **100** and the bottom deck **200** are aligned with respect to each other such that the upper surface of the bottom deck **200** is parallel to and faces the lower surface of the top deck **100**. In addition, the positioning of each of the hollow projections **202** of the bottom deck **200** corresponds to the hollow projections **102** of the top deck **100**; and the mating surfaces of the hollow projections **102** of the top deck mate with, and are securable to, the mating surfaces of the hollow projections **202** of the bottom deck. **Figures 3C** and **3D** show the bottom and top view of the embodiment of **Figure 3A**.

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[0091] **Figure 3E** is essentially an embodiment of **Figure 1C** with the exception that the 'v-shaped' notches **109** of **Figure 1C** is no longer continuous but is discontinuous and distributed across the top deck shown in **Figure 3E**. The discontinuous 'v-shaped' notches **309** are symmetrically distributed and serve to reduce bending along the top surface and bottom surfaces of the top deck. **Figure 3F** shows a bottom deck having discontinuous 'v-shaped' notches **309** distributed along the length and width of the bottom deck. The function of the 'v-shaped' notches **309** is similar to those indicated with the reference sign **109**.

[0092] **Figures 4A – 4B** show the assembly of the cargo pallet according to the present invention. In this embodiment, the cargo pallet includes a first deck **10** and a second deck **16**, each having an upper surface and a lower surface. The first deck **10** includes a plurality of through-holes **15** that extend from its upper surface

to the lower surface. The second deck **16** also includes a plurality of through-holes **13**, which correspond to those of the first deck. As shown in **Figure 4A**, the four corners of the decks **10** and **16** each have a through-hole. In addition, there are four through-holes **15** and **13** at the midpoints along the peripheral lengths of the respective decks **10** and **16**. A final through-hole **15** and **13** is formed at the centre of the entire top and bottom deck decks **10** and **16** bringing the total number of through-holes on each of the decks **10** and **16** to nine.

[0093] **Figure 4A** also shows a plurality of support structures. Each support structure includes a leg **14**, a top deck fastener **12** and a bottom deck fastener **11**. When the support structure is assembled together, it joins the first deck **10** to the second deck **16** via the leg **14**. A more detailed drawing of the support structure is shown in **Figure 4B** and is correspondingly described below.

[0094] As mentioned, **Figure 4B** is an enlargement of the support structure in **Figure 4A**, and shows a partial sectional view of the leg **14**. The leg **14** includes an outer hollow tube **2** having an inner circumferential surface area. Within the outer hollow tube **2**, in a concentric arrangement, is an inner hollow tube **4**. The inner hollow tube **4** has an external circumferential surface from which eight ribs **6** extends radially outwards to the inner surface of the hollow tube **2**. The ribs **6** also extend over the entire height of the leg **14**. The inner hollow tube **2** may also be supported by at least just one rib, if necessary.

[0095] In **Figure 4B**, the hollow tube **2** is circular; however, both the outer hollow tube **2** and the inner hollow tube **4** may be of any other shape. For example, when seen from its diametric cross sectional view, the leg **2** may be rectangular, triangular, pentagonal, hexagonal or any other polygonal shape. The height of the legs is also adapted to provide sufficient distance between the first deck and the second deck such that a typical forklift may insert its lifting mechanism therebetween to transport the pallet.

[0096] **Figure 4B** also shows the first and second leg fasteners **12** and **11**, which each have a head end **1** and an elongate tube-like body **3** extending therefrom.

The leg fasteners **12** and **11** are adapted to be accommodated by the inner hollow tube **4**. The head end **1** of each of the leg fasteners **12** and **11** is typically larger in diameter than the diameter of the through-holes **15** and **13**. Said head end **1** is adapted to allow for only the elongate tube-like body **3** to enter and to be threaded
5 (or inserted) into the inner hollow tube **4** and through-holes **15** and **13**. The head end **1** may be adapted to fit into an indentation or recess (not shown) that may be formed around the through-holes **15** and **13**, thereby resulting in a flat surface on the top and bottom decks **10** and **16**.

10 **[0097]** During assembly, the leg abuts the lower surface of the first deck and the upper surface of the second deck. The inner hollow tube **4** of each of the legs **14** is aligned with the through-holes of the first and second decks **10** and **16** such that a substantially continuous through-hole is formed from the first deck **10** through to the second deck **16**, with the inner hollow tube **4** of the leg **14** forming the
15 intermediate portion of that continuous through-hole. Following the alignment, the leg fasteners **12** and **11**, are threaded through the through-holes **15** and **13**, respectively in order to secure the decks **10** and **16** together. In this regard, depending upon the length of the elongate tube-like body **3** of the respective leg fasteners **11** and **12**, the leg fasteners may either attach themselves to the inner
20 hollow tube **4**, i.e. each leg fastener occupying half of the height of the inner hollow tube. Alternatively, if the elongate tube-like body of the second fastener is sufficiently long enough, the first leg fastener **12** may attach and secure itself to the second leg fastener **11**.

25 **[0098]** The attachment means for the leg fasteners **12** and **11** may be snap-fit means, press-fit means, friction welding or any commonly known adhesion bonding means. With regard to snap-fit or press-fit means, the elongate tube-like body **3** may be adapted accordingly to include the necessary mechanism such as undercuts, grooves, recesses and/or serrations that are designed to cut into the
30 inner circumferential surface area of the inner hollow tube **4**.

[0099] **Figures 5A – 5D** show a first exemplary embodiment of the cargo pallet. The **Figures 5A – 5D** illustrate the isometric, side, top and bottom views of the

pallet respectively. **Figure 5C**, which shows the first deck having nine first deck leg fasteners **12**. The top deck **10** shown has essentially five main horizontal sections **20** and three main vertical sections **30**, all of which are integrally formed as a single part. In contrast, the second deck **16** of **Figure 5D** includes just three horizontal **40** and vertical **30** sections each, all of which are also formed as a single integral part.

[00100] It should be noted that there is no upper limit on the number of horizontal and vertical sections that the decks **10** and **16** may include, and is subject to practicality given that the decks **10** and **16** are load bearing members. However, a lower limit on the number of sections exists in that each deck **10** and **16** may be formed as a single section, i.e. a solid planar part with no gaps.

[00101] **Figures 6A – 6D** show a second exemplary embodiment of the cargo pallet. The only difference between the embodiment of **Figure 5** and this present embodiment is that the second deck **16** includes a plurality (two or more) of cut-ins **18** along its peripheral edges. The cut-ins may be about 5.0 cm – about 8.0 cm inwards along the plane of the deck **16** and towards the centre thereof. The cut-ins **18** serve to reduce the length and breadth of selected portions of the deck **16** in order to allow for this embodiment of the pallet to be accommodated in transport vehicles such as commercial or cargo aircraft, for example.

[00102] **Figure 6D** shows that bottom view of the deck **16**. Each cut-in **18** has a corresponding cut-in **18** diametrically opposite to it. Accordingly, the plurality of cut-ins **18** is symmetrical about the central axes (vertical or horizontal), as seen from this view. Basically, each peripheral edge of the deck **16** has at least two cut-ins **18**. In the case of there being just two cut-ins **18**, each one is located on either side of the midpoint of the edge of the deck **16**. The corners of the cut-ins **18** in the present embodiment are shown to be tapered inwards but they may also be straight, concave or convex in shape.

[00103] **Figures 7A – 7D** show a third exemplary embodiment of the cargo pallet and is essentially the same in all aspects to the embodiment of **Figure 2**, except

that the first deck **10** is patterned differently. **Figure 7C** shows that the deck **10** has a plurality of circular and major segment features cut out from what would otherwise be a solid deck.

5 **[00104] Figures 8A – 8D** show a fourth exemplary embodiment of the cargo pallet. Essentially, this embodiment is similar to that of **Figure 6** except that it now incorporates the first deck as shown in **Figure 7**.

[00105] Figures 9A – 9C show a side view of a second aspect of the invention.
10 **Figure 9A** illustrates a top deck **98** having an upper surface and an opposing lower surface. The top deck **98** has integrally formed therewith a plurality (two or more) of hollow projections **92**. Each hollow projection **92** extends from the lower surface of the top deck **98** and has one end **95** opening to the upper surface of the top deck **98** while its other end **97** is closed to form a closed mating surface. In this
15 embodiment, the closed mating surface has a protrusion **94** extending therefrom. In the centre of the top deck **98**, a recess **96** is formed and is capable of accommodating therein a corresponding protrusion **94**.

[00106] Figure 9B illustrates a bottom deck **99** having an upper surface and an
20 opposing lower surface. The bottom deck **99** has integrally formed therewith a plurality (two or more) of hollow projections **92** although only one is shown in the present side view. Each hollow projection **92** extends from the upper surface of the bottom deck **99** and has one end **95** opening to the lower surface of the bottom deck **98** while its other end **97** is closed to form a closed mating surface. In
25 this embodiment, the closed mating surface has a protrusion **94** extending therefrom. At either end of the bottom deck **99**, a recess **96** is formed and is capable of accommodating therein a corresponding protrusion **94**.

[00107] Figure 9C shows a side view of the top deck **98** assembled with the
30 bottom deck **99** to form a cargo pallet according to an aspect of the present invention. From this view the hollow projections **92** are shown. Each hollow projection **92** has its respective protrusion **94** that extends from the closed mating surface of the hollow projections **92** and engages the corresponding recess **96**.

Accordingly, the closed mating surfaces of the hollow projections **92** of the top and bottom decks, in effect, mate with the upper surface of the bottom deck and the lower surface of the top deck respectively.

5 **[00108]** It is to be noted that the above mentioned features of the first aspect of the invention such as the shape and form of the hollow projections, cut-ins, RFID tags, fabrication materials, securing mechanisms and manufacturing processes are also applicable to the second aspect of the invention.

10 **[00109]** **Figures 10A – 10C** show three embodiments of mating surfaces **97** of a top deck **98** and bottom deck **99**. The top decks **98** and the bottom decks **99** of each of the respective figures include a hollow projection. The hollow projection of the top deck **98** (and similarly for the bottom deck) has one end **95** that opens to an upper surface (lower surface) of the top deck **98** (bottom deck **99**) and its other
15 end that forms a closed mating surface **97**.

[00110] In **Figure 10A** the closed mating surface **97** of the hollow projections of the top and bottom decks have an internal surface that includes a recess **801**. The recess **801** is chamfered such that it is able to accommodate the head of a screw.
20 As both the hollow projections of the top and bottom deck have said recess **801**, during assembly, the screw may be screwed into either the top deck **98** or the bottom deck.

[00111] In **Figure 10B**, unlike **Figure 10A**, the internal surface of the closed
25 mating surface **97** of the hollow projection of the bottom deck **99** does not have a recess **801**. As such, in this embodiment, the screw may only be inserted from the top deck **98** during the assembly process.

[00112] In **Figure 10C** the internal surface of the closed mating surface **97** of the
30 hollow projection of the bottom deck **99** is identical to that in **Figure 10B**. In this embodiment, the internal surface of the closed mating surface **97** of the hollow projection of the top deck **98** includes a recess **801**. The recess **801** has its one

end chamfered while its other end opens to a through-hole **802** that extends right through the closed mating surface **97**.

[00113] During assembly, the through-hole **802** permits a screw to be inserted
5 therein with the screw head being accommodated by the chamfered recess. The
fastening of the top deck **98** to the bottom deck **99** takes place when the screw is
screwed in and penetrates the closed mating surface **97** of the hollow projection of
the bottom deck **99** thereby forming the cargo pallet. It is to be noted that although
the fastening mechanisms and features are illustrated (in **Figures 10A – 10C**) and
10 described in relation to the first aspect of the invention, said description is also
applicable to the second aspect of the present invention as well.

[00114] The above description of the various exemplary embodiments of the cargo
pallet according to the present invention is merely illustrative. As such, the present
15 invention should not be construed as being limited only to those embodiments
described herein but rather, as defined by the claims appended hereto.

CLAIMS

What is claimed is:

1. A cargo pallet comprising:

a planar top deck with an upper surface and an opposing lower surface having a plurality of hollow projections integrally formed therewith and extending therefrom such that each of said hollow projections has its one end opening to the upper surface and its other end as a closed mating surface; and

a planar bottom deck with an upper surface and an opposing lower surface, said upper surface having a plurality of hollow projections integrally formed therewith and extending therefrom, each of said hollow projections having its one end opening to the lower surface and its other end as a closed mating surface;

wherein said top deck and bottom deck are arranged with the upper surface of the bottom deck being parallel to and facing the lower surface of the top deck such that the positioning of each of the hollow projections of the bottom deck correspond to those of the top deck; and the mating surfaces of the hollow projections of the top deck mate with, and are securable to, the mating surfaces of the hollow projections of the bottom deck.

2. The cargo pallet according to claim 1, wherein at least one mating surface of a hollow projection of the top deck comprises a protruding portion adapted to fit into a corresponding recess of a mating surface of a hollow projection of the bottom deck.
3. The cargo pallet according to claim 1, wherein at least one mating surface of a hollow projection of the bottom deck comprises a protruding portion adapted to fit into a corresponding recess of a mating surface of a hollow projection of the top deck.
4. The cargo pallet according to claim 1, wherein at least one mating surface of a hollow projection of the top deck comprises a protruding portion adapted

to fit into a corresponding recess of a mating surface of a hollow projection of the bottom deck; and at least one mating surface of a hollow projection of the bottom deck comprises a protruding portion adapted to fit into a corresponding recess of a mating surface of a hollow projection of the top deck.

5. The cargo pallet according to any of the preceding claims, wherein each of the plurality of hollow projections opening to the upper or lower surface of the top and bottom decks respectively is adapted to accommodate therein at least a portion of another hollow projection when the decks are stacked.
6. The cargo pallet according to any of the preceding claims, wherein the positioning of the hollow projections of the bottom and top decks follows that of a circumferentially spaced apart relationship around the periphery of their respective decks with at least one hollow projection centrally located on the respective decks.
7. The cargo pallet according to any of the preceding claims, wherein the top deck and bottom deck are substantially rectangular.
8. The cargo pallet according to claim 7, wherein the bottom deck comprises at least one cut-in along at least two of its peripheral edges.
9. The cargo pallet according to any of claims 7 or 8, wherein the bottom deck comprises two pairs of cut-ins with each pair located on opposing peripheral edges of the bottom deck and with each cut-in of the respective pairs being located at either side of the midpoint of the peripheral edge such that either the longitudinal or lateral dimension of the bottom deck is reduced at the cut in.
10. The cargo pallet according to any of the preceding claims, further comprising a Radio Frequency Identification (RFID) tag located within the hollow projection, top deck or bottom deck.

11. The cargo pallet according to any of the preceding claims wherein the decks and hollow projections are fabricated from a material selected from the group consisting of plastic, metal, wood derivatives or any combination thereof.
12. The cargo pallet according to claim 11, wherein the plastic includes polycarbonate, acrylic and polyethylene terephthalate (PET).
13. The cargo pallet according to claim 11, wherein the metal includes steel, titanium, aluminum or alloys thereof.
14. The cargo pallet according to claim 11, wherein wood derivatives include compressed wood chips or paper-based materials.
15. The cargo pallet according to any of the claims 2 – 14, wherein the mating surfaces of the hollow projections are further securable to each other by thermal bonding, fasteners, adhesives, snap-fit mechanisms or press-fit mechanisms.
16. A cargo pallet comprising:
 - a planar top deck with an upper surface and an opposing lower surface having nine hollow projections integrally formed therewith and extending therefrom, such that each of said hollow projections has its one end opening to the upper surface and its other end as a closed mating surface; and
 - a planar bottom deck with an upper surface and an opposing lower surface, said upper surface having nine hollow projections integrally formed therewith and extending therefrom, each of said hollow projections having its one end opening to the lower surface and its other end as a closed mating surface;
 - wherein said top deck and bottom deck are arranged with the upper surface of the bottom deck being parallel to and facing the lower surface of the top deck such that the positioning of each of the hollow projections of the

bottom deck correspond to those of the top deck; and the mating surfaces of the hollow projections of the top deck mate with, and are securable to, the mating surfaces of the hollow projections of the bottom deck.

17. The cargo pallet according to any of the preceding claims, wherein each of the mating surfaces of each of the hollow projections comprises a drainage hole offset from the centre of said mating surface and positioned such that the drainage holes of the hollow projections of the top deck align with the drainage holes of the hollow projections of the bottom deck when said top deck and bottom deck are arranged with the upper surface of the bottom deck being parallel to and facing the lower surface of the top deck, and when the mating surfaces of the hollow projections of the top deck and bottom deck mate and are secured.
18. The cargo pallet according to any of the preceding claims, wherein the top deck and bottom deck are separated by a distance of at least about 10cm when said top deck and bottom deck are arranged with the upper surface of the bottom deck being parallel to and facing the lower surface of the top deck, and when the mating surfaces of the hollow projections of the top deck and bottom deck mate and are secured.
19. The cargo pallet according to any of the preceding claims, wherein the mating surfaces of the hollow projections have an inner surface that includes a recess adapted to accommodate a screw therein.
20. A planar top deck of a cargo pallet comprising:
 - an upper surface and an opposing lower surface having a plurality of hollow projections integrally formed therewith and extending therefrom such that each of said hollow projections has its one end opening to the upper surface and its other end as a closed mating surface,
 - wherein at least one mating surface has a protruding portion adapted to be received by a corresponding recess.

21. A planar bottom deck of a cargo pallet comprising:

an upper surface and an opposing lower surface, said upper surface having a plurality of hollow projections integrally formed therewith and extending therefrom, each of said hollow projections having its one end opening to the lower surface and its other end as a closed mating surface,

wherein at least one mating surface has a recess adapted to receive a corresponding protruding portion.

22. A planar bottom deck according to claim 21, further comprising at least one cut-in along its periphery such that either its longitudinal or lateral dimension is reduced at the cut-in.

23. A mold for fabricating a top deck of a cargo pallet comprising:

a die having a cavity;

wherein said cavity is complementary in shape to a top deck of a pallet having an upper surface and an opposing lower surface having a plurality of hollow projections integrally formed therewith and extending therefrom such that each of said hollow projections has its one end opening to the upper surface and its other end as a closed mating surface, and

wherein at least one mating surface has a protruding portion adapted to be received by a corresponding recess.

24. A mold for fabricating a bottom deck of a cargo pallet comprising:

a die having a cavity;

wherein said cavity is complementary in shape to a bottom deck of a pallet having an upper surface and an opposing lower surface, said upper surface having a plurality of hollow projections integrally formed therewith and extending therefrom, each of said hollow projections having its one end opening to the lower surface and its other end as a closed mating surface,

wherein at least one mating surface has a recess adapted to receive a corresponding protruding portion.

25. The mold of claim 24, wherein the cavity is complementary in shape to also provide at least one cut-in along the periphery of the bottom deck such that either the longitudinal or lateral dimension of said bottom deck is reduced at the cut-in.

26. A cargo pallet comprising:

- a top deck with an upper surface and an opposing lower surface, and
- a bottom deck with an upper surface and an opposing lower surface,
- wherein said top deck and bottom deck are co-joined by a plurality of legs therebetween, said legs being arranged in a symmetrically spaced relationship with respect to each other, and

- wherein the periphery of the bottom deck comprises at least one cut-in such that either the longitudinal or lateral dimension of the bottom deck is reduced at the cut-in.

27. A cargo pallet according to claim 26, wherein the bottom deck comprises at least one pair of cut-ins, wherein each cut-in is symmetrically arranged on opposing sides of the periphery of the bottom deck.

28. A cargo pallet comprising:

- a deck with an upper surface and an opposing lower surface, having a plurality of through-holes extending from the upper surface to the lower surface of the deck; and

- a plurality of support structures, each of which is attached to the deck, via a corresponding through-hole, each support structure comprising:

- a leg having a through-hole with its first end arranged in abutment with the lower surface of the deck and in alignment thereto, such that the central longitudinal axes of rotation of the through-holes of the leg and the deck are collinear; and

- a leg fastener;

- wherein a head of the leg fastener has a larger diameter than the through-hole of the deck and engages the upper surface and secures

the leg to the deck when threaded through the respective aligned through-hole of the deck and its corresponding leg.

29. The cargo pallet according to claim 28, further comprising:

a second deck with an upper surface and an opposing lower surface, having a plurality of through-holes extending from the upper surface to the lower surface of the deck wherein said through-holes correspond to those of the first deck; and

a plurality of second leg fasteners;

wherein the upper surface of the second deck is arranged in abutment with a second end of each leg such that the central longitudinal axes of rotation of the through-hole of each leg, and the corresponding through-holes of the second deck are collinear; and each of the second leg fasteners engages the lower surface of the second deck and secures the leg to the second deck when threaded through the respective aligned through-holes of the second deck and its corresponding leg.

30. The cargo pallet according to claims 28 or 29, wherein each of the first leg fasteners contacts and secures itself to each of its corresponding second leg fasteners, thereby also securing the leg therebetween to the lower surface of the first deck and upper surface of the second deck, respectively.

31. The cargo pallet according to claim 30, wherein the first and second leg fasteners and/or through-hole of each leg comprise serrations, snap-fit mechanisms or press-fit mechanisms.

32. The cargo pallet according to any of claims 29 – 31, wherein the second deck comprises a plurality of cut-ins along at least two of its peripheral edges.

33. The cargo pallet according to any of claims 29 – 32, wherein the second deck comprises at least two pairs of cut-ins with each pair located on opposing peripheral edges of the bottom deck and with each cut-in of the

- respective pairs being located at either side of the midpoint of the peripheral edge such that either the longitudinal or lateral dimension of the bottom deck is reduced at the cut in.
34. The cargo pallet according to any of the claims 28 – 33, wherein the leg comprises a hollow tube having an inner diameter that substantially corresponds to the diameter of the through-holes of the deck.
35. The cargo pallet according to any of claims 28 – 33, wherein the leg comprises:
- an outer hollow tube; and
 - an inner hollow tube concentric to the outer hollow tube, such that the inner hollow tube substantially defines the latitudinal cross-sectional area of the through-hole of the leg;
 - wherein the inner hollow tube is supported with respect the outer hollow tube by a plurality of supporting ribs arranged therebetween.
36. The cargo pallet according to any of the claims 28 – 35, further comprising a Radio Frequency Identification (RFID) tag located within a support structure.
37. The cargo pallet according to any of the claims 28 – 36, wherein the deck and support structures are fabricated from a material selected from the group consisting of plastics, metals, wood derivatives or any combination thereof.
38. The cargo pallet according to claim 37, wherein plastics include polycarbonate, acrylic and polyethylene terephthalate (PET).
39. The cargo pallet according to claim 37, wherein metals include steel, titanium, aluminum and alloys thereof.
40. The cargo pallet according to claim 37, wherein wood derivatives include compressed wood chips or paper-based materials.

41. The cargo pallet according to any of the claims 28 – 36, wherein the deck is made of compressed wood chips and each of the plurality of support structures is made of plastic.
42. The cargo pallet according to any of the claims 28 – 41, wherein the deck is rectangular.
43. The cargo pallet according to any of the claims 28 – 42, wherein the deck comprises at least four through-holes symmetrically distributed from each other.
44. The cargo pallet according to claim 43, wherein the respective decks further comprise an additional through-hole located at the centre of said decks.
45. The cargo pallet according to any of claims 28 – 44, wherein the deck is rectangular and comprises nine through-holes, wherein one through-hole is located at the centre of the deck, four through-holes are located at each of the corners of the deck and the remaining four through-holes are located at the four mid-points between the four through-holes located at each of the corners of the deck.
46. The cargo pallet according to any of the preceding claims, wherein each of the respective decks further comprise at least one notch that runs, in a continuous manner, across the upper surface or lower surface of the respective decks.
47. The cargo pallet according to any of the preceding claims, wherein each of the respective decks further comprise at least one notch that runs, in a discontinuous manner, across the upper surface or lower surface of the respective decks.

48. The cargo pallet according to claim 46 or 47, wherein the at least one notch is v-shaped, u-shaped or substantially rectangular in shape.
49. The top deck according to any of claims 1 – 20, 23 or any of claims 26 – 48, further comprising at least one notch that runs, in either a continuous or discontinuous manner, across the upper surface or lower surface.
50. The bottom deck according to any of claims 1 – 19, 21 – 22, 24 – 27 or any of claims 29 – 48, further comprising at least one notch that runs, in either a continuous or discontinuous manner, across the upper surface or lower surface.
51. The top or bottom decks according to claim 48 or 49, wherein the at least one notch is v-shaped, u-shaped or substantially rectangular in shape.
52. A cargo pallet comprising:
- a planar top deck with an upper surface and an opposing lower surface having a plurality of hollow projections integrally formed therewith and extending therefrom such that each of said hollow projections has its one end opening to the upper surface and its other end as a closed mating surface; and
 - a planar bottom deck with an upper surface and an opposing lower surface, said upper surface having a plurality of hollow projections integrally formed therewith and extending therefrom, each of said hollow projections having its one end opening to the lower surface and its other end as a closed mating surface;
- wherein said top deck and bottom deck are arranged with the upper surface of the bottom deck being parallel to and facing the lower surface of the top deck such that the mating surfaces of the hollow projections of the bottom deck mate with, and are securable to, the lower surface of the top deck; and the mating surfaces of the hollow projections of the top deck mate with, and are securable to, the upper surface of the bottom deck.