

PALLET

Field of the Invention

The present invention relates generally to a
5 pallet. More particularly, the invention relates to the
construction of a strong lightweight pallet.

Background of the Invention

In the course of storage or transportation, goods
10 are usually placed on a mobile platform such as a pallet
to enable machines such as a forklift to lift-up the
pallet and hence the goods. In this way, goods may be
stacked on the pallet and be transported around with
ease. Given the heavy nature of the loads involved, it
15 is desirable that a pallet is made of strong and robust
materials such as wood. In fact, wooden pallets have
been used extensively in the transportation industry.

However, wood is inherently heavy and may not be
suitable in some applications, such as air
20 transportation, where weight is a major concern.

Furthermore, wood is easily infested by microbes and
insects. In countries like the USA or Europe, there are
strict governmental regulations requiring wooden pallets
to be treated with chemicals to prevent against organism

contamination. Given that wood itself is a costly material, the additional statutory requirement to treat wooden pallets and to maintain its organism free condition has increased the overall costs of transportation substantively. Furthermore, it is desirable to have a pallet which may be used several times and which may be disposed off thereafter.

As evidenced from the above discussion, it is desirable to provide an alternative to wood in the construction of a pallet, which is lightweight but durable and which may ameliorate one or more of the abovementioned problems.

Summary of the Invention

In accordance with the present invention there is provided a pallet for storage or transportation of goods comprising:

a plurality of first runners arranged in parallel spaced apart locations in a first direction; and

a plurality of second runners arranged in parallel spaced apart locations in a second direction which is orthogonal to said first direction;

wherein said first and second runners interlock with one another to form a base; and wherein said

runners comprise layers of planar board overlaid on each other and compacted to form a composite elongate beam.

Preferably, bottom surfaces of both said first and second runners lie in the same plane such that both may
5 contact a floor in use.

Preferably, said planar board comprises fiber board or card board.

Preferably, said layers of planar board are formed from a single folded board.

10 Or alternatively, said layers of planar board are individual boards.

In accordance with another aspect of the present invention, there is provided a pallet for transportation of goods comprising:

15 a plurality of first runners arranged in parallel spaced apart locations in a first direction; and

a plurality of second runners arranged in parallel spaced apart locations in a second direction which is orthogonal to said first direction;

20 wherein the first and second runners interlock with one another to form a base;

wherein bottom surfaces of both said first and second runners lie in a common plane so as to both contact a floor in use; and

wherein said first and second runners comprise planar board being creased to form a series of foldable sub-boards, said sub-boards being folded and compacted to form a composite elongate beam.

5 Preferably, said first runners comprise a plurality of notches opening upwards and said second runners comprise a plurality of notches opening downwards for interlocking engagement.

 Preferably, the notches are of a height which
10 allows both said first and second runners, when interlocked, to have bottom surfaces contacting a floor.

 Preferably, the notches are cut to about half the height of each runner.

 Preferably, the pallet comprises a planar deck
15 attached on top of said base to form a horizontal platform.

Brief Description of the Drawings

20 Fig. 1 shows a base and top deck of a pallet;
 Fig. 2 shows a longitudinally arranged runner;
 Fig. 3a shows a planar board for a longitudinally arranged runner which has been creased into a series of foldable sub-boards;

Fig. 3b shows the folded sub-boards of a longitudinally arranged runner;

Fig. 4 shows a laterally arranged runner;

Fig. 5a shows a planar board for a laterally arranged
5 runner which has been creased into a series of foldable sub-boards;

Fig. 5b shows the folded sub-boards of a laterally arranged runner;

Fig. 6 shows the interlocking cruciform joint structure
10 of a base;

Fig. 7 shows an alternative embodiment of the invention, a base for a 2-way entry pallet; and

Fig. 8 shows a complete 4-way entry pallet.

15 **Preferred Embodiments of the Invention**

The pallet 100 comprises a planar deck 102 and a base 105 formed from a plurality of longitudinally arranged runners 108 and laterally arranged runners 112. The runners 108, 112 are interlocked with one another
20 orthogonally at every intersection in a cruciform manner as shown in Fig. 1, for example, in a cross-lap type joint.

Each runner 108 is an elongate composite beam comprising notches 205 and 215 created along the length

of the runner 108 as shown in Fig. 2. The notches 205 and 215 are formed along the lower section 210 of the runner 108 at spaced apart locations and extend through the thickness 202 of the runner 108. The lower section 5 210 of the runner 108 is defined as a boundary which covers an area extending from the bottom planar surface 200 of runner 108 to its mid-point 230. The notches 205 and 215 are formed such that they open downwardly and are generally perpendicular to the planar surface of a 10 supporting surface, such as a warehouse floor. The notches 205 and 215 are preferably of rectangular shape with top walls and side walls being perpendicular to each other.

The runner 108 comprises notches 205 formed near 15 end locations 218 and 220 along the lower section 210 of the runner 108. Another notch 205 is formed near the middle location 235 of the runner 108, in between end locations 218 and 220. Notches 215 are formed at spaced apart locations between notches 205 along the lower 20 section 210 of the runner 108. Preferably, the height of notches 205 reaches the midpoint 230 of runner 108 while the height of notches 215 extends slightly beyond the midpoint 230 of runner 108.

Each runner 108 is an elongate beam which may be formed by a single piece of planar board 300 as shown in Fig. 3a, which has been creased, e.g. scored, to form a series of foldable sub-boards 303. The sub-boards 303
5 may then be folded together in accordion style to form the composite beam structure of runner 108 as shown in Fig. 3b, in which for example, the beam comprises a plurality of vertically oriented layers of board.

Rectangular cuttings 308, 312, 315 and 318 of
10 specific sizes are disposed at regular spaced apart locations of each sub-board 303, for example through die-cutting, so that when the series of sub-boards 303 are folded, the cuttings form the notches 205 and 215.

The left end portion 304 of the board 300 shown in
15 Fig. 3a comprises two sub-boards 303a and 303b, together with top and bottom surface portions 305 and 306. The end portion 304 wraps about the other sub-boards 303 when they are folded-up, so that the two end sub-boards 303a and 303b form the two outer sub-boards of the beam
20 structure. The cuttings 308 and 312 are accordingly of larger size than the cuttings 315 and 318, so as to accommodate the width of the top surface portion 305.

Alternatively, if rectangular cuttings 308, 312, 315 and 318 are not pre-cut on the surface of planar

board 300, machines may be used to cut through the compacted layers of sub-board to produce notches 205 and 215.

To improve the compactness of the beam and
5 therefore its strength, each sub-board 303 may be bonded or fastened to its adjacent sub-boards to form a strong composite elongate beam. Various bonding or fastening means, which include for example, glue, staples, plastic or rubber fasteners may be used. In a preferred
10 embodiment, glue is used to bond the sub-boards together. Various hot or cold glues such as Fuller, Henkel or Borden's may be used.

Preferably, the planar board 300 is made of fiber board material. Other materials which exhibit similar
15 durability and lightweight characteristics, such as card board, may also be used. Even more preferably, board, such as fiber board or card board, with single or multiple corrugated layers inside may be used to provide enhanced tensile strength to individual runner 108. The
20 external surface of the planar board 300 is preferably made of Kraftliner paper.

Apart from folding the sub-boards 303 in an accordion manner, for example as described above, the runner 108 may also be formed by stacking a plurality of

individual sub-boards (not shown) on top of one another. Each sub-board may also be bonded or fastened to its adjacent sub-boards to improve the compactness of the composite beam.

5 The thickness 202 and the length of the runner 108 may be varied depending on the intended use of the pallet 100. Generally, the strength of each runner 108 is dependent on the number of layers of sub-board used (which affects the thickness 202) and the thickness of
10 each sub-board. However, each runner 108 is preferably constructed of the same thickness to allow an even distribution of force across pallet 100.

 The notches 205 of longitudinally arranged runners 108 are shaped and sized to interlock with corresponding
15 notches 405 of laterally arranged runners 112 as shown in Fig. 4.

 Each laterally arranged runner 112 is also an elongate composite beam with notches 405 and 415 created at spaced apart locations along the length of the runner
20 112.

 The notches 415 are formed along the lower section 420 of the runner 112 while the notches 405 are formed along the upper section 440 of the runner 112. The notches 415 and 405 are disposed at spaced apart

locations along the length of the runner 112. The lower section 420 of the runner 112 is defined as a boundary which covers an area extending from the bottom planar surface 410 of runner 112 to its mid-point 430. The
5 area located above the midpoint 430 is defined as the upper section 440 of runner 112.

The notches 415 are formed such that they open downwardly and are generally perpendicular to the planar surface of a supporting surface, such as a warehouse
10 floor. However, notches 405 are formed to open upward and facing away from the planar surface of the supporting surface. The notches 415 and 405 are preferably of rectangular shape.

The runner 112 comprises notches 405 formed near
15 end locations 452 and 458 along the upper section 440 of the runner 112. Another notch 405 is formed near the middle location 455 of the runner 112, in between end locations 452 and 458. Notches 415 are formed along the lower section 420 of the runner 112 at spaced apart
20 locations between notches 405. Preferably, the depth of notches 405 reaches the midpoint 430 of runner 112 while the height of notches 415 extends slightly beyond the midpoint 430 of runner 112.

Each runner 112 is an elongate beam which may be formed by a single piece of planar board 500 as shown in Fig. 5a, which has been creased to form a series of foldable sub-boards 503. The sub-boards 503 may then be
5 folded together in accordion style to form the composite beam structure of runner 112 as shown in Fig. 5b, in which for example, the beam comprises a plurality of vertically oriented layers of board.

Rectangular cuttings 510, 512, 508 and 513 of
10 specific sizes are disposed at regular spaced apart locations of each sub-board 503, they are for example die cut, so that when the series of sub-boards 303 are folded, the cuttings form the notches 405 and 415.

The left end portion 504 of the board 500 shown in
15 Fig. 5a comprises two sub-boards 503a and 503b, together with top and bottom surface portions 505 and 506. The end portion 504 wraps about the other sub-boards 503 when they are folded-up, so that the two ends sub-boards 503a and 503b form the two outer sub-boards of the beam
20 structure. The cuttings 510 and 512 are accordingly of larger size than the cuttings 508 and 513, so as to accommodate the width of the top and bottom surface portions 505 and 506.

Alternatively, if rectangular cuttings 510, 512, 508 and 513 are not pre-cut on the planar board 500, machines may be used to cut through the compacted layers of sub-board to produce notches 405 and 415.

5 To improve the compactness of the beam and therefore its strength, each sub-board 503 may be bonded or fastened to its adjacent sub-boards to form a strong composite elongate beam. Various bonding or fastening means, which include for example, glue, staples, plastic
10 or rubber fasteners may be used. In a preferred embodiment, glue is used to bond the sub-boards together. Various hot or cold glues such as Fuller, Henkel or Borden's may be used.

Preferably, the planar board 500 is made of fiber
15 board material. Other materials which exhibit similar durability and lightweight characteristics, such as card board, may also be used. Even more preferably, fiber board with single or multiple corrugated layers inside may be used to provide enhanced tensile strength to
20 individual runner 112. The external surface of the planar board 500 is preferably made of Kraftliner paper.

Apart from folding the sub-boards 503 in an accordion manner, for example as described above, the runner 112 may also be formed by stacking a plurality of

individual sub-boards (not shown) on top of one another. Each sub-board may also be bonded or fastened to its adjacent sub-boards to improve the compactness of the composite beam.

5 The thickness 460 and the length of the runner 112 may be varied depending on the intended use of the pallet 100. Generally, the strength of each runner 112 is dependent on the number of sub-boards used (which affects the thickness 460) and the thickness of each
10 sub-board. However, each runner 112 is preferably constructed of the same thickness to allow an even distribution of force across pallet 100.

 The pallet 100 is assembled by interlocking a plurality of longitudinally arranged runners 108
15 orthogonally to a plurality of laterally arranged runners 112 at every intersection as shown in Fig. 6.

 Each intersection node 603 comprises a notch 205 of runner 108 inserted orthogonally into a notch 405 of runner 112. Preferably, the runners are of the same
20 height. Even more preferably, the height of each notch 205 and 405 is half the height of each runner. This allows all the runners, when interlocked, to touch the ground surface for maximum load support.

This manner of interlocking also advantageously results in a firm, reliable and robust coupling between the longitudinally arranged runners 108 and laterally arranged runners 112 to withstand commonly experienced
5 longitudinal, lateral or axial rotational forces during normal pallet handling. Furthermore, the pitch between the runners may be increased to increase the load bearing capacity of the pallet.

The 3x3 beams assembly as shown in Fig. 6 results
10 in a 4-way entry pallet. Such a pallet allows a forklift to insert its twin prongs for lifting purposes via notches 215 or notches 415 from any 4 sides of the pallet. A pallet may also be constructed as a 2-way entry pallet, for example a 2x3 beams, as shown in Fig.
15 7, which only allows the twin prongs of a forklift to be inserted via notches 215 from the front side or back side of the pallet.

The notches 215 and 415 in a 4-way entry pallet, apart from accommodating the forklift prongs, also have
20 an advantage of keeping the pallet lighter. However, in a 2-way entry pallet, notches 415 are not necessary in the runners 112 for forklift prongs entry and may be omitted in the design. However, the notches 415 are

preferably included in the runners 112 to make the pallet lighter.

The final assembly involves capping a layer of planar board 102 on top of the base 105 of crossed-beams to form the complete pallet 100 as shown in Fig. 8. The planar board 102 is preferably made of fiber board material. Other materials which exhibit similar durability and lightweight characteristics, such as card board, may also be used. Even more preferably, board, such as fiber board or card board, with single or multiple corrugated layers inside may be used to provide enhanced rigidity. The external surface of the planar board 102 may be made of Kraftliner paper. The planar board 102 may be glued or otherwise attached to the base.

While we have shown and described specific embodiments of the present invention, further modifications and improvements will occur to those skilled in the art. We desire it to be understood, therefore, that this invention is not limited to the particular forms shown and we intend in the append claims to cover all modifications that do not depart from the spirit and scope of this invention.

What is claimed is:

1. A pallet for storage or transportation of goods comprising:

5 a plurality of first runners arranged in parallel spaced apart locations in a first direction; and

a plurality of second runners arranged in parallel spaced apart locations in a second direction which is orthogonal to said first
10 direction;

wherein said first and second runners interlock with one another to form a base; and

wherein said runners comprise layers of planar board overlaid on each other and compacted to form
15 a composite elongate beam.

2. The pallet claimed in claim 1, wherein bottom
surfaces of both said first and second runners lie
in the same plane such that both may contact a
20 floor in use.

3. The pallet claimed in claim 1 or claim 2, wherein
said first runners comprise a plurality of notches
opening upwards and said second runners comprise a

plurality of notches opening downwards for interlocking engagement.

4. The pallet claimed in claim 3, wherein said notches
5 are of a height which allows both said first and second runners, when interlocked, to have bottom surfaces contacting a floor.
5. The pallet claimed in claim 3 or claim 4, wherein
10 said notches are cut to about half the height of each runner.
6. The pallet claimed in any preceding claim, wherein
said planar board comprises fiber board or card
15 board.
7. The pallet claimed in any preceding claim, wherein
said planar board comprises corrugated board.
- 20 8. The pallet claimed in any preceding claim, wherein
said layers of planar board are compacted together with glue.

9. The pallet claimed in any preceding claim, wherein the pallet is a 2-way entry pallet.
10. The pallet claimed in any of claims 1 to 8, wherein
5 the pallet is a 4-way entry pallet.
11. The pallet claimed in any preceding claim, wherein the pallet comprises a planar deck attached on top of said base to form a horizontal platform.
- 10
12. The pallet claimed in claim 1, wherein said runners arranged in a first direction and said runners arranged in a second direction are arranged at a pitch which can be increased to enhance the load
15 bearing capacity of said pallet.
13. The pallet claimed in any preceding claim, wherein layers of planar board are formed from a single folded board.
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14. The pallet claimed in any of claims 1 to 12, wherein the layers of planar board are individual boards.

15. The pallet claimed in any preceding claim, wherein the first and/or second runners include notches along their lengths between the points where the runners interlock.

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16. The pallet claimed in any of claims 3, 4, 5 or 15, wherein said layers of planar board include pre-cut openings therein that form said notches on overlaying the layers of board on each other.

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17. The pallet claimed in any preceding claim, wherein the layers of planar board are vertically oriented.

18 A pallet for transportation of goods comprising:

15 a plurality of first runners arranged in parallel spaced apart locations in a first direction; and

a plurality of second runners arranged in parallel spaced apart locations in a second direction which is orthogonal to said first direction;

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wherein the first and second runners interlock with one another to form a base;

wherein bottom surfaces of both said first and second runners lie in a common plane so as to both contact a floor in use; and

5 wherein said first and second runners comprise planar board being creased to form a series of foldable sub-boards, said sub-boards being folded and compacted to form a composite elongate beam.

10 19. The pallet claimed in claim 18, wherein said first runners comprise a plurality of notches opening upwards and said second runners comprise a plurality of notches opening downwards for interlocking engagement.

15 20. The pallet claimed in claim 19, wherein said notches are of a height which allows both said first and second runners, when interlocked, to have bottom surfaces contacting a floor.

20 21. The pallet claimed in claim 19 or 20, wherein said notches are cut to about half the height of each runner.

22. The pallet claimed in any of claims 18 to 21, wherein the pallet comprises a planar deck attached on top of said base to form a horizontal platform.