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(54) IMPROVEMENTS IN OR RELATING TO PALLETS

(71) We, AIRFLEX CONTAINERS LIMITED, a British Company, of Brettenham House, Lancaster Place, Strand, London, WC2E 7EN, and CHRISTOPHER DANIEL DOWLING HICKNEY, a British Subject, of 5 Heathside, Hinchley Wood, Esher, Surrey, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to pallets, which term is intended to include stillages.

According to the present invention there is provided a pallet comprising a base including a rigid air impermeable load carrying surface and a groove or slot which completely surrounds the load carrying surface, the cross-sectional area of the groove or slot being narrowest adjacent the mouth of the groove or slot, and an air impermeable envelope wholly or partly of flexible material for covering the load carrying surface, the mouth of the envelope being adapted to be inserted into the groove or slot and held in fluid-tight pressure engagement with at least part of the walls of the groove or slot so as to define a totally enclosed space above the load carrying surface, the envelope or the base having valve means for controlling an air outlet from the enclosed space.

Preferably, a flexible tube is provided around the mouth of the envelope the tube being insertable into the groove or slot and inflatable therein into said fluid-tight pressure engagement.

In a preferred embodiment of the invention, the envelope comprises an outer flexible skin and an inner flexible skin, the inner skin being collapsible into closely fitting movement restraining engagement with goods on the load carrying surface, and the space between the two skins being pressurisable to inflate the outer skin to serve as a resilient shield for the goods.

The outer skin and the inner skin may be connected together by a flexible tube around the mouth of the envelope, the tube being inserted into the groove or slot and

inflatable therein into said fluid-tight pressure engagement.

Alternatively, the base may include a second continuous groove or slot within the area bounded by the first-mentioned groove or slot and completely surrounding a smaller area of the load carrying surface, the cross-sectional area of the second groove or slot into said fluid-tight pressure engagement.

The or each tube may be formed by turning back the mouth edge of the envelope or skin and sealing the edge to the wall of the envelope or skin around the mouth thereof.

Alternatively, the or each tube may be formed separately and then attached to the envelope.

In one embodiment of the invention, posts may be provided around the first-mentioned groove or slot, shuttering being arranged to lie between the posts and to be urged thereagainst by the inflated outer skin to provide a rigid shield for the goods.

The mouth of the or each groove or slot may be flush with the load carrying surface of the pallet. Alternatively the groove or slot or at least one of the grooves or slots, may be formed by a continuous channel shaped member having an inwardly projecting rib on each side wall adjacent the mouth of the groove or slot which is proud of the load carrying surface. The channel shaped member may be integral with, or secured to, a surface of the pallet. There may be two channel members each providing a groove or slot, or a double channel member may provide both grooves or slots.

The first-mentioned groove or slot may be formed as a slot between an outer clamping member which encircles a base member including the load carrying surface, the side walls of the base member against which the outer clamping member can be clamped being provided with an outwardly projecting rib adjacent the mouth of the slot which is flush with the load carrying surface. The or each slot may be provided with two or more ribs adjacent its mouth.

The base preferably comprises a substantially planar upper surface, constituting the load carrying surface, and a parallel

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substantially planar lower surface, there being provided apertures there between for receiving the forks of a fork lift truck. Such a pallet may conveniently be transported on a roller or ball conveyor, whereas slats of a conventional pallet would tend to jam between the rollers or balls. Preferably the base is rectangular, the apertures being positioned so that the forks of a fork lift truck can enter any one of the four sides of the base.

A plurality of pallets as described herein may be provided, the spaces defined by the envelopes and bases being interconnected. The spaces between the inner and outer skins of each envelope may be interconnected where each pallet has an envelope comprising two skins. Where the enclosed spaces are interconnected, all the envelopes may be collapsed by applying suction to one envelope; if desired, only that one envelope may have the said valve means.

Means may be provided to monitor and control the pressure in the envelope. Such means may include a pressure sensitive switch or switches and a pump or pumps. An alarm may be provided to indicate if the pressure in an envelope rises above a predetermined level, and/or drops below a predetermined level.

Means, for example a further valve, may be provided for replacing some of the air removed from the or each envelope by another gas (e.g. an inert gas or nitrogen).

A pallet according to the invention may have holes about its periphery the dimensions and spacings of the holes being such that the pallet may be arranged in any corner of a standard rectangular 108" x 88" aircraft pallet with the longitudinal axes of the two pallets parallel and at least some of the holes in the two pallets mating.

The invention also includes such a pallet in combination with a standard rectangular 108" x 88" aircraft pallet. Such a pallet may be secured to the strong point fittings of an aircraft floor.

By way of example, specific embodiments of the invention will now be described, with reference to the accompanying drawings, in which:—

Figure 1 is a perspective view of a pallet according to the invention;

Figure 2 is a section through part of the pallet of Figure 1;

Figure 3 is an underplan of the pallet as shown in Figure 1;

Figure 4 is a view of a larger known pallet to which the pallet shown in Figure 1 may be attached;

Figure 5 is a perspective view, partly broken away, of details of the base of the pallet shown in Figure 1;

Figure 6 is a plan view of part of the base structure shown in Figure 5;

Figure 7 is a cross-section through the base structure shown in Figure 5;

Figure 8 is a cross-sectional view of an alternative through a further base structure for the pallet shown in Figure 1; and

Figure 9 shows an alternative embodiment of a part of the pallet shown in Figure 1.

Referring first to Figures 1 to 3 a pallet base 10 comprises a substantially flat upper surface 11 and a parallel substantially flat lower surface 12, which is surrounded by a lower peripheral flange 13. In each side of the pallet are two openings 14, which are symmetrically spaced apart so that the forks of a fork lift truck may enter the pallet from any side to lift and transport the pallet. In addition to the spaces 14 or as an alternative, other lifting means such as lifting rings may be provided. The substantially flat lower surface of the pallet makes it conveniently transportable on roller or ball conveyors, or by slings.

Secured to the upper face of the pallet is a continuous channel member 15 and, as best seen in Figure 2, this channel member defines a peripheral groove 16 having a narrow mouth 17 formed by inwardly projecting ribs 17a. The area of the upper surface of the pallet bounded by the channel member is substantially impermeable to air and an impermeable flexible envelope 18 (shown partially in dotted lines in Figure 1 is connected to the pallet with its mouth secured in the channel member.

As best seen in Figure 2 the envelope comprises an inner skin 19, an outer skin 19a, and a tube 20 at the mouth of the envelope. The envelope is made from one larger envelope, the mouth edge of which has been turned outwardly and folded well back to form the outer skin, the inner skin being formed by the portion of the walls of the larger envelope which have not been folded back. The free edge of the outer portion is drawn together and sealed to close the outer skin 19a. The two skins are welded together at 21 to complete the tube 20 formed by the fold. The tube 20 is provided with a valve so that once inserted in the channel member 15, the tube can be inflated to substantially fill the channel as shown in Figure 2, thereby sealing the envelope to the pallet and preventing withdrawal of the tube from the channel.

Valve means on the pallet, or on the envelope, are provided so that the inner skin 19 may be evacuated by suction to draw it closely about any goods on the pallet in movement restraining engagement therewith. Further valve means are provided so that pressure gas may be introduced to the space between skins 19 and 19a to inflate skin 19a so that it provides a resilient shield for the goods on the pallet.

Sockets may be provided at the corners of the pallet (one such socket 22 being shown in Figure 1) so that four posts may be applied to the four corners of the pallet respectively, to turn the pallet into a post pallet for stacking purposes. The posts may conveniently comprise L section members with the 90° angle of the L facing the centre of the pallet. Shuttering such as boards or plates (not shown) may be provided to fit between adjacent posts such that movement of the shuttering outwardly of the pallet is prevented by the flanges of the L shaped members, inflation of the outer skin 19a causing the shuttering to be pressed against these flanges and held in position to provide a rigid shield for the goods on the pallet.

As shown in Figure 3, each longitudinally portion of the flange 13 has five oval holes therein, which are aligned longitudinally, each having semicircular ends of $\frac{15}{32}$ of an inch radius and straight sides, each .875 inches in length. The holes are arranged at 10.5 inch intervals. As viewed in Figure 3, the two lower holes 23 are positioned so that the centre of the upper semicircular end of each is spaced by 5.937 inches from the lower edge of the pallet. Each of the upper holes 24 is arranged so that the centre of its upper hemispherical end is spaced by 5.062 inches from the upper end of the pallet.

Each transverse end of the pallet has four pairs of circular holes of .937 inches diameter, the spacing between the holes of each pair being 1.375 inches. Corresponding holes of each pair are spaced at 10.5 inch intervals. As viewed in Figure 3, the centre of each hole 25 is spaced by 5.063 inches from the left hand side of the pallet, and the centre of each hole 26 is spaced by 6.437 inches from the right hand side of the pallet.

The object of the holes above described is to enable the pallet to be mounted on a standard 108 inches by 88 inches aircraft pallet of the kind shown in Figure 4, with the pallet according to the invention arranged at a corner of the aircraft pallet, the longitudinal axes of the two pallets being parallel. As shown in Figure 4, such an aircraft pallet has ten holes along each longitudinal edge, each hole being .875 inches in diameter. The holes are arranged at 10.5 inch intervals. The aircraft pallet also has eight holes of similar size spaced along each shorter edge with similar spacing. The centre of each end hole of the longitudinal rows of holes is spaced from the centre line of each adjacent row of transverse holes by 5.062 inches, and the centre of each end hole of each transverse row of holes is spaced from the centre line

of the adjacent row of longitudinal holes by a distance of 5.562 inches.

Since the arrangement of the holes on the pallet according to the invention enables it to be positioned longitudinally in any of the four corners of the aircraft pallet with at least some of the holes in the two pallets mating, four identical pallets according to the invention can be arranged side by side in positions A, B, C and D on the aircraft pallet and secured thereto by bolts or like securing members passing through mating holes. Alternatively, or in addition, clamps may be provided to secure the pallets together, and a cover for the pallets may be secured thereto by securing means passing through mating holes. A suitable clamp may comprise a cruciform member which can be arranged with its upright bisecting the aircraft pallet transversely, so that the cruciform engages the inner edges of all four smaller pallets according to the invention, the free ends of the upright and cross-bar being secured to the aircraft pallet.

The pallet base 10 shown in Figures 5 to 7 comprises an upper panel 27, a lower panel 28, and an intermediate section comprised of two pairs of intersecting parallel box section members 29. The open ends of the pairs of box section members provide four pairs of apertures 14 for receiving the forks of a fork lift truck. The spaces between the apertures 14 are closed by Z section members 30.

In the alternative arrangement shown in Figure 8, the box section members 29 are replaced by "top hat" section members 31.

Figure 9 shows an alternative means for connecting the flexible envelope to a pallet base 32 which has two continuous peripheral ribs 33 on its side wall 34. The mouth 35 of an envelope 36 is clamped against the ribs 33 by a peripheral clamping ring 37. The clamping ring 37 may be adjustable in circumference so that the mouth of the envelope may be clamped or released as required against the ribs 33 within the slot formed by the clamping ring and the side wall 34. For example the clamping ring 37 may be in the form of a large jubilee clip.

The invention is not restricted to the features of the foregoing examples. For instance the pallet 32 shown in Figure 9 may have less than two, or more than two peripheral ribs 33.

Furthermore the dimensions of the holes in the pallet shown in Figures 1 to 3 are not intended to be limiting.

A plurality of pallets each constructed according to the invention may be provided, the spaces defined by the envelopes and bases of each pallet being interconnected. Where the pallets each have an envelope comprising two skins, the spaces

between the inner and outer skins of each envelope may be interconnected.

WHAT WE CLAIM IS:—

5 1. A pallet comprising a base including a rigid air impermeable load carrying surface and a groove or slot which completely surrounds the load carrying surface, the cross-sectional area of the groove or slot being narrowest adjacent the mouth of the groove or slot, and an air impermeable envelope wholly or partly of flexible material for covering the load carrying surface, the mouth of the envelope being adapted to be inserted into the groove or slot and held in fluid-tight pressure engagement with at least part of the walls of the groove or slot so as to define a totally enclosed space above the load carrying surface, the envelope or the base having valve means for controlling an air outlet from the enclosed space.

25 2. A pallet as claimed in claim 1, in which a flexible tube is provided around the mouth of the envelope, the tube being insertable into the groove or slot and inflatable therein into said fluid-tight pressure engagement.

30 3. A pallet as claimed in claim 1, in which the envelope comprises an outer flexible skin and an inner flexible skin, the inner skin being collapsible into closely fitting movement restraining engagement with goods on the load carrying surface, and the space between the two kinds being pressurisable to inflate the outer skin to serve as a resilient shield for the goods.

40 4. A pallet as claimed in claim 3, in which the outer skin and the inner skin are connected together by a flexible tube around the mouth of the envelope, the tube being insertable into the groove or slot and inflatable therein into said fluid-tight pressure engagement.

45 5. A pallet as claimed in claim 3, in which the base includes a second continuous groove or slot within the area bounded by the first-mentioned groove or slot and completely surrounding a smaller area of the load carrying surface, the cross-sectional area of the second groove or slot being narrower adjacent the mouth of the second groove or slot, the mouth of the outer skin being insertable into the first-mentioned groove or slot and the inner skin being insertable into the second groove or slot, each skin being adapted to be held in fluid-tight pressure engagement with at least part of the walls of the respective groove or slot.

60 6. A pallet as claimed in claim 5, in which a respective flexible tube is provided around the mouth of both the outer skin and the inner skin, each tube being insert-

able into and inflatable within the respective groove or slot into said fluid-tight pressure engagement.

70 7. A pallet as claimed in claim 2, or claim 6, in which the or each tube is formed by turning back the mouth edge of the envelope or skin and sealing the edge of the wall of the envelope or skin around the mouth thereof.

75 8. A pallet as claimed in any of claims 3 to 7 in which posts are provided around the first-mentioned groove or slot, shuttering being arranged to lie between the posts and to be urged thereagainst by the inflated outer skin to provide a rigid shield for the goods.

80 9. A pallet as claimed in any previous claim, in which the mouth of the or each groove or slot is flush with the load carrying surface.

85 10. A pallet as claimed in any of claims 1 to 8, in which the groove or slot, or at least one of the grooves or slots, is formed by a continuous channel shaped member having an inwardly projecting rib on each side wall adjacent the mouth of the groove or slot which is proud of the load carrying surface.

90 11. A pallet as claimed in any previous claim, in which the first-mentioned groove or slot is formed as a slot between an outer clamping member which encircles a base member including the load carrying surface, the side walls of the base member against which the outer clamping member can be clamped being provided with an outwardly projecting rib adjacent the mouth of the slot which is flush with the load carrying surface.

95 12. A pallet as claimed in claim 10 or claim 11, in which the or each groove or slot is provided with two or more ribs adjacent its mouth.

100 13. A pallet as claimed in any previous claim, in which the base comprises a substantially planar upper surface, constituting the load carrying surface, and a parallel planar lower surface, there being provided apertures therebetween for receiving the forks of a fork lift truck.

105 14. A pallet as claimed in claim 13, in which the base is rectangular, the apertures being positioned so that the forks or a fork lift truck can enter any of the four sides of the base.

110 15. A plurality of pallets as claimed in any previous claim, the spaces defined by the envelopes and bases being interconnected.

115 16. A plurality of pallets as claimed in claim 15 when dependent on any of claims 3 to 8, in which the spaces between the inner and outer skin of each envelope are interconnected.

120 17. A pallet as claimed in any of claims 130

between the inner and outer skins of each envelope may be interconnected.

WHAT WE CLAIM IS:—

1. A pallet comprising a base including a rigid air impermeable load carrying surface and a groove or slot which completely surrounds the load carrying surface, the cross-sectional area of the groove or slot being narrowest adjacent the mouth of the groove or slot, and an air impermeable envelope wholly or partly of flexible material for covering the load carrying surface, the mouth of the envelope being adapted to be inserted into the groove or slot and held in fluid-tight pressure engagement with at least part of the walls of the groove or slot so as to define a totally enclosed space above the load carrying surface, the envelope or the base having valve means for controlling an air outlet from the enclosed space.
2. A pallet as claimed in claim 1, in which a flexible tube is provided around the mouth of the envelope, the tube being insertable into the groove or slot and inflatable therein into said fluid-tight pressure engagement.
3. A pallet as claimed in claim 1, in which the envelope comprises an outer flexible skin and an inner flexible skin, the inner skin being collapsible into closely fitting movement restraining engagement with goods on the load carrying surface, and the space between the two kinds being pressurisable to inflate the outer skin to serve as a resilient shield for the goods.
4. A pallet as claimed in claim 3, in which the outer skin and the inner skin are connected together by a flexible tube around the mouth of the envelope, the tube being insertable into the groove or slot and inflatable therein into said fluid-tight pressure engagement.
5. A pallet as claimed in claim 3, in which the base includes a second continuous groove or slot within the area bounded by the first-mentioned groove or slot and completely surrounding a smaller area of the load carrying surface, the cross-sectional area of the second groove or slot being narrower adjacent the mouth of the second groove or slot, the mouth of the outer skin being insertable into the first-mentioned groove or slot and the inner skin being insertable into the second groove or slot, each skin being adapted to be held in fluid-tight pressure engagement with at least part of the walls of the respective groove or slot.
6. A pallet as claimed in claim 5, in which a respective flexible tube is provided around the mouth of both the outer skin and the inner skin, each tube being insertable into and inflatable within the respective groove or slot into said fluid-tight pressure engagement.
7. A pallet as claimed in claim 2, or claim 6, in which the or each tube is formed by turning back the mouth edge of the envelope or skin and sealing the edge of the wall of the envelope or skin around the mouth thereof.
8. A pallet as claimed in any of claims 3 to 7 in which posts are provided around the first-mentioned groove or slot, shuttering being arranged to lie between the posts and to be urged thereagainst by the inflated outer skin to provide a rigid shield for the goods.
9. A pallet as claimed in any previous claim, in which the mouth of the or each groove or slot is flush with the load carrying surface.
10. A pallet as claimed in any of claims 1 to 8, in which the groove or slot, or at least one of the grooves or slots, is formed by a continuous channel shaped member having an inwardly projecting rib on each side wall adjacent the mouth of the groove or slot which is proud of the load carrying surface.
11. A pallet as claimed in any previous claim, in which the first-mentioned groove or slot is formed as a slot between an outer clamping member which encircles a base member including the load carrying surface, the side walls of the base member against which the outer clamping member can be clamped being provided with an outwardly projecting rib adjacent the mouth of the slot which is flush with the load carrying surface.
12. A pallet as claimed in claim 10 or claim 11, in which the or each groove or slot is provided with two or more ribs adjacent its mouth.
13. A pallet as claimed in any previous claim, in which the base comprises a substantially planar upper surface, constituting the load carrying surface, and a parallel planar lower surface, there being provided apertures therebetween for receiving the forks of a fork lift truck.
14. A pallet as claimed in claim 13, in which the base is rectangular, the apertures being positioned so that the forks or a fork lift truck can enter any of the four sides of the base.
15. A plurality of pallets as claimed in any previous claim, the spaces defined by the envelopes and bases being interconnected.
16. A plurality of pallets as claimed in claim 15 when dependent on any of claims 3 to 8, in which the spaces between the inner and outer skin of each envelope are interconnected.
17. A pallet as claimed in any of claims 130



1 to 14, in which holes are provided about the periphery of the base, the dimension and spacing of the holes being such that the pallet can be arranged in any corner of a standard 108" × 88" aircraft pallet, known *per se*, with the longitudinal axes of the two pallets parallel and at least some of the holes in the pallet being in alignment with the corresponding holes on the known aircraft pallet.

18. A pallet as claimed in claim 17, in

combination with a known 108" × 88" aircraft pallet.

19. A pallet substantially as hereinbefore described with reference to any of Figures 1 to 3, Figure 4, Figures 5 to 7, Figure 8 or Figure 9 of the accompanying drawings.

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