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PALLET CONTAINER



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The invention relates to a pallet container with a thin-walled rigid inner container of thermoplastic material for the storage and transport of liquid or flowable contents, including a cage-like bar frame closely surrounding as support jacket the plastic container, and a bottom pallet for placement of the plastic container and secure attachment of the support jacket.

Prior Art

Such pallet containers with support jacket of wire cage type or cage bar type are generally known, e.g., from U.S. 4,676,373 (Schn./W).

The securement of the cage jacket to the bottom pallet, the latter may be configured as flat pallet of plastic, wood or steel bar frame, is realized by means of fasteners, such as, for example, screws, clasps, clamps, or claws, engaging over or through the lower, horizontally wrapped-around frame bar. The fasteners are, e.g., nailed, pinned, bolted or welded, in case of steel bar frames, onto the upper deck or the upper outer rim of the pallet. In case of a support jacket of the cage bar type, the cage bars can be configured as open or closed profile with round cross section or rectangular cross section.

For their industrial application, the pallet containers must pass an official inspection and meet certain quality criteria. For example, internal pressure tests as well as drop tests with filled pallet containers are performed from certain drop heights, i.a. also at extremely low temperatures (- 20 °C). The most unfavorable case is hereby the diagonal drop onto the one lower pallet end side, which carries the bottom outlet valve of the inner plastic container.

Such drop tests have shown that the inner container tends to shift relative to the

bottom pallet during ground impact. The attachment points of the cage jacket are hereby overstrained in particular on the impact end face and in neighboring lateral peripheral regions and partly torn off the bottom pallet. The securement of the lower rim of the support jacket on the pallet represents hereby a crucial problem area. As the fixation of the cage jacket is established only at few areas, the cage jacket, especially when a bar cage is involved, is deformed very unevenly and warped; hereby the lower attachment points can tear off the bottom pallet and the thin-walled plastic container may be damaged by torn off cage parts.

Problem: Pallet containers or combination-IBCs (IBC = Intermediate Bulk Container) of the type involved here are used for the transport of liquids (like, for example, hazardous chemicals). They are configured as pallet containers, have, preferably, a fill volume of 1000 liters, and are composed of pallet, cage jacket and inner plastic container (PE-HD). The inner container, which is closely surrounded by the cage jacket, is normally provided with an upper fill opening and a lower outlet fitting.

At diagonal drop test upon the lower critical pallet end face (the area where the outlet fitting of the inner container is disposed), the inner container with the liquid content has the tendency to slip laterally and to shift in the direction of the forward or lower cage wall. The surge forces of the content and the thrust force of the inner container must be absorbed primarily by the forward cage wall. The ground impact of a filled pallet container results in the diagonal drop test to quite significant elastic and plastic, i.e. permanent, deformations, and to catastrophic deformations and damage to the inner container, when the cage jacket and pallet have insufficient strength. The area around the outlet fitting is hereby predominantly at risk.

The test conditions during drop test include that the inner container is absolutely

tight and no content leaks from the outlet fitting or overstressed stretching areas of the inner plastic container, and that the pallet container is still maneuverable, i.e. can be picked up by a fork lift and transported. These are essential preconditions for the pallet container to receive official approval for use with hazardous liquid contents.

Object of the present invention is to provide a pallet container with increased strength against mechanical stress (high drop strength), which achieves a decrease of transverse forces on the wall of the cage-like bar frame during diagonal drop with simple constructive means, to thereby enable issuance of a respective official permit for the pallet container for application or use with liquid contents in the upper hazard class.

Solution:

This object is attained in accordance with the present invention by a pallet container which is provided within the support area of the inner plastic container on the surface of the bottom pallet or on the surface of an intermediate plate with respective means which - as viewed in the direction of the horizontal plane - result in an increase of the slip resistance between the downwardly pointing outer surface of the bottom of the inner container and the upwardly pointing surface of the bottom pallet or the intermediate plate.

On the basis of the recognition that the comparably smooth bottom of the inner plastic container does not have a substantial slip resistance upon the comparably smooth surface of the bottom pallet or an intermediate plate disposed, optionally in-between (e.g. as dampening element or as support plate of sheet metal or plastic, e.g. foamed polystyrene on a metal frame pallet), when the pallet container is positioned at a inclination and in particular during a diagonal drop, and that the filled inner container is able to slide to the side without appreciable

friction resistance, the arrangement of slip-resistant or slip-reducing means realizes at a diagonal ground impact that the kinetic energy within the dropping filled inner plastic container is consumed at least in part by the means and the entire energy does not have to be absorbed by the lower cage basket wall.

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As a consequence, the inner container is substantially prevented from shifting relative to the pallet during the drop test, and relief of the forward and lower support frame is realized. This results in less deformation of the cage frame of a pallet container configured in accordance with the invention and thus in applicability for hazardous liquid and flowable contents up to class 6 (highest approval quality).

According to an embodiment of the invention, there are provided projections which project outwards (downwards) within the bottom wall of the inner plastic container, and respective dimples, which are formed in the surface of the intermediate plate or/and in the surface of the bottom pallet and point inwards (downwards), for interlocking engagement in positive manner.

Although the pallet container known from the afore-mentioned U.S. 4,676,373 discloses a collecting trough which is inset in mid-section of the bottom wall of the inner container between two pallet boards of a wood pallet and extending to the outlet valve, however, this inset collecting trough is not bounded within the support surface inner container / bottom pallet but rather extends to the forward edge of the bottom pallet. Since it does not extend across, the collecting trough does not provide protection for the outlet valve as the inner container can slip unimpeded in the direction of the forward pallet edge. An effective positive connection within the meaning of the present invention (transverse to the direction of the forward pallet edge for protection of the outlet valve) is neither provided nor suggested.

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According to another preferred embodiment of the invention, there are provided dimples, which point inwards (upwards) within the bottom wall of the inner plastic container, and projections, which are formed in the surface of the intermediate plate or/and in the surface of the bottom pallet and point outwards (upwards), for interlocking engagement in positive manner to thereby establish a form-fitting connection. In order to provide a sufficient effect as "slip brake", the interlocking form-fitting elements (anti slip elements) should have an engagement height of about 5 mm to 50 mm, preferably about 20 mm.

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- 10 The form-fitting elements can hereby advantageously be slanted to the side to permit a slide-off of the inner container in extreme load situations and to thereby preclude a tearing of the plastic bottom wall. The slant of the form-fitting elements should have an angle between about 45° and 85°, preferably about 80°.
- 15 According to a further embodiment of the invention, the form-fitting elements have an outwardly limited flat extension within the support surface of the inner plastic container upon the bottom pallet and are configured, e.g. as circular, triangular or polygonal form-fitting element. According to another variation, the form-fitting elements may have a linear extension and configured, e.g., as
- 20 circular, triangular, polygonal or cross-shaped form-fitting element, which is open at least to one side (to enable an emptying of residue).

The form-fitting elements include elevations on the pallet surface and respective indentations in the support surface of the inner container bottom, or elevations, i.e. projections, in the support surface of the inner container bottom and respective recesses (= indentations) in the pallet surface. Both variations may be realized side-by-side at the same time.

The inventive form-fitting elements, arranged within the support surface and outwardly limited, effectively inhibit or reduce a slip-off of the inner container in all

possible directions.

5 A form-fitting element may be made, e.g., of a flat metal plate, plastic plate or wooden plate, having a downwardly projecting pin (e.g. diameter of about 200 mm, height of about 30 mm, pin diameter of about 25 mm, pin height of about 40 mm). The pallet surface has formed therein corresponding indentations (here bores), e.g., at four locations, for insertion of the pins of the form-fitting elements. The support surface of the bottom of the inner container must then have dimples or indentations at respective locations. In this simple manner, each
10 existing bottom pallet of wood, plastic or steel, can be retrofitted for such pallet containers, when, e.g., a new inner container is utilized with respective dimples in the bottom for reconditioning a used pallet container.

15 According to a preferred embodiment, the bottom of the inner container is constructed along the central pinch-off seam with at least one outwardly (downwardly) projecting pin projection which engages in a corresponding recess or slit in the top of the bottom pallet or interposed intermediate plate, and is secured, e.g., by means of a pin inserted transversely at the underside of the pallet deck. In this way, the common disadvantage of an upward pulling of the
20 bottom of the inner container, as a result of shrinkage stress in the thicker pinch-off seam, and impediment to a complete emptying of residue from the inner container are further prevented.

25 Exemplified embodiments of the invention will now be explained and described in more detail with reference to the drawing, in which:

Fig. 1 is a side view of a pallet container according to the invention;
Fig. 2 is a longitudinal section through a plastic bottom pallet;
Fig. 3 is a schematic cutaway view of an inner container and bottom
30 pallet;

- Fig. 4 is a top view of a bottom pallet according to the invention;
 Fig. 5 is a partial cross section through the bottom pallet of Fig. 4;
 Fig. 6 is a partial view of inner container and bottom pallet with form-fitting element;
 5 Fig. 7 is a partial view of inner container and bottom pallet with form-fitting element;
 Fig. 8 is a partial view of inner container and bottom pallet with form-fitting element;
 Fig. 9 is a front view of an inner container with form-fitting elements;
 10 Fig. 10 is a side view of the inner container with form-fitting elements;
 Fig. 11 is a partial view inner container and bottom pallet with form-fitting element; and
 Fig. 12 is a cross sectional view of the form-fitting element of Fig. 11.
- 15 The pallet container 10 shown in Fig. 1 includes a thin-walled rigid inner container 12 of thermoplastic material for storage and transport of liquid and flowable contents, a cage-like bar frame 14, which closely surrounds as support jacket the inner plastic container 12, and a bottom pallet 16 for placement of the inner plastic container 12 and secure fixation to the cage-like bar frame 14. The
 20 drawn circles in the region bottom of the inner container and top of the bottom pallet 16 should illustrate the application site of the form-fitting element 18 of the present invention. In the event, an additional intermediate plate is arranged between inner container 12 and bottom pallet 16 and made e.g. of steel sheet or plastic for covering an open bar frame pallet, or of foamed polystyrene to serve
 25 as dampening element, the measures according to the invention, like, e.g., several form-fitting elements, are provided between these three parts, in any event they are in direct effective contact with the bottom of the inner container.

In Fig. 2, the form-fitting means 18 are also marked by illustrated circles. A
 30 form-fitting connection is realized by a dimple 22 in the bottom of the inner

container 12 and a respective elevation or a projection 20 on the top of the bottom pallet 16, as schematically illustrated in Fig. 3. The arching or the projection 20 on the pallet top may also be realized by separate attachment elements or insert elements, optionally, with desired breaking point (cf. Figs. 6 and 7).

The plan view in Fig. 4 shows the bottom pallet 16 with four round form-fitting elements 20 in the corner areas. The inner container has then the upwardly directed indentations at respective locations in the bottom. Furthermore in addition, or as alternative solution, two Velcro strips 48 and two bonding pads 50 are illustrated. The bonding pads may be realized, e.g., by a double-stick film or by areas coated flatly with adhesive. Likewise, the Velcro strips are bonded to the bottom pallet and the bottom of the inner container. These elements based on frictional connection and adhesive connection may also be advantageously be used later for each existing pallet container.

The surface of the bottom pallet 16 is - like correspondingly the bottom of the inner container, configured slightly or flatly inclined funnel shaped toward the central center through 52, which leads to the outlet fitting. Provided within the center trough 52 are several slits 38 for positive engagement of respective pin-like projections 30 of the bottom of the inner container 12, when the inner container 12 is placed thereon.

Fig. 5 shows a partial section through the right-hand lower form-fitting element 20 (marked by circle drawn in dashdot line).

As shown in Fig. 6, a form-fitting element 18 may be made, e.g., of a flat metal plate, plastic plate or wooden plate, having a downwardly projecting pin 26 (e.g. diameter of about 200 mm, height of about 30 mm, pin diameter of about 25 mm, pin height of about 40 mm). The pallet surface has formed therein corresponding

indentations, configured as bores 24 here, at e.g. four locations, for insertion of the pins 26 of the form-fitting elements 18. The bottom of the inner container 12 must then have dimples 22 or indentations at respective locations. The pins 26 may be provided with a desired breaking point, which tears off when subjected to overload, so that the bottom of the inner container cannot be damaged.

A slightly different solution is illustrated in Fig. 7. Here, e.g., a round, form-fitting element 18 engages simultaneously upwards into the dimple 22 of the inner container 12 and downwards into a respective dimple 28 in the support surface of the bottom pallet 16 to establish in the direction of the horizontal plane an effective positive connection.

Fig 8 shows partially a portion of the bottom of the inner plastic container 12 with two pin-like projections 30 which positively engage in respective dimples 28 or slits 38 in the surface of the bottom pallet 16. The projections 30 may be round or of slender length; they are molded during blow-molding process as integral piece in the pinch-off seam from the bottom flash of the inner container 12 and may also be provided with a respective desired breaking point 44. Fig. 9 illustrates a front view to show the projections 30 formed along the pinch-off seam on the bottom of the inner container 12, whereas Fig. 10 shows a side view thereof. The projections 30 positively engage in the respective slits 38 of the bottom pallet 16 (cf. Fig. 4).

The partial sectional illustration of Fig. 11 shows yet a particular embodiment with a pin projection 36 along the pinch-off seam 34 on the bottom of the inner container 12. The pin 36 is inserted in a slit 36 in the top deck of the bottom pallet 16 and is securely fixed against the pallet top deck by means of a securing pin 42 placed across through a respectively provided bore 40 from below.

A side view of the pin 36 is depicted in Fig. 12 and also provided with desired

breaking points 44 and/or 46. The desired breaking points 44, 46 are intended to safely prevent overstress of the bottom of the inner container in case of extreme load.

- 5 It is especially relevant that the form-fitting elements, frictional engagement elements and bonding elements minimize a slip-off of the inner container on the pallet surface in any direction and especially toward the forward pallet edge, where the outlet fitting of the inner container is located, and appreciably reduce thrust forces of the inner container upon the forward cage wall, and become
- 10 effective by their "restraining action".

The illustrated measures enable retrofitting in accordance with the present invention of each and every existing pallet of wood, plastic or steel for all pallet containers.

List of Reference Numerals

10	pallet container
12	inner container
14	cage-like bar frame
16	bottom pallet
18	form-fitting elements
20	projection (16)
22	dimple (12)
24	bore (16)
26	pin (18)
28	dimple (16)
30	pin projection (12)
32	outlet opening
34	pinch-off seam
36	pin projection (12/34)
38	slit (16)
40	bore (36)
42	securing pin
44	desired breaking point
46	desired breaking point
48	Velcro strip
50	bonding pads
52	center trough (16)

CLAIMS

1. Pallet container (10) with a thin-walled rigid inner container (12) of thermoplastic material for the storage and transport of liquid or flowable contents, including a cage-like bar frame (14) closely surrounding as support jacket the inner plastic container (12), and a bottom pallet (16) for placement of the inner plastic container (12) and secure attachment of the support jacket, characterized in that there are provided, within the support area of the inner plastic container (12) on the surface of the bottom pallet (16) or on the surface of an intermediate plate, respective means (18) which - as viewed in the direction of the horizontal plane - result in an increase of the slip resistance between the downwardly pointing outer surface of the bottom of the inner container (12) and the upwardly pointing surface of the bottom pallet (16) or intermediate plate.
2. Pallet container according to claim 1, characterized in that the means for increase of the slip resistance are configured as frictional connection elements or/and bonding elements (=adhesive elements).
3. Pallet container according to claim 1, characterized in that the means for increase of the slip resistance are configured as form-fitting elements (18).
4. Pallet container according to one of the preceding claims 1 or 3, characterized in that there are provided in the bottom wall of the inner plastic container (12) and in the surface of the bottom pallet (16) or in an intermediate plate placed in-between, suitable means which interlock in positive manner, as viewed in the direction of the horizontal plane.

5. Pallet container according to one of the preceding claims 1 to 4, characterized in that there are provided within the bottom wall of the inner plastic container (12) outwardly (downwardly) pointing material projections (30, 36), and in the surface of the intermediate plate or/and in the surface of the bottom pallet (16) respective dimples or slits (38) pointing inwards (downwards), for interlocking engagement in positive manner.
6. Pallet container according to one of the preceding claims 1 to 5, characterized in that there are provided dimples (22) which point inwards (upwards) within the bottom wall of the inner plastic container (12), and projections or attachments (18), which are formed in the surface of the intermediate plate or/and in the surface of the bottom pallet (16) and point outwards (upwards), for interlocking engagement in positive manner to establish a form-fitting connection.
7. Pallet container according to one of the preceding claims 1 to 6, characterized in that there are provided inwardly (upwardly) pointing dimples (22) within the bottom wall of the inner plastic container (12) and also in the surface of the intermediate plate or/and respective inwardly (upwardly) pointing dimples (28) also in the surface of the bottom plate, wherein a form-fitting element (18) is placed into the dimples (22, 28) for positive engagement in both corresponding dimples (22, 28) to thereby establish a form-fitting connection.
8. Pallet container according to one of the preceding claims 1 to 7, characterized in that the interlocking form-fitting elements (18) have an engagement height of about 5 mm to 50 mm, preferably about 20 mm.

9. Pallet container according to one of the preceding claims 1 to 8, characterized in that the form-fitting elements (18) are sloped laterally at an angle between 45° and 85°, preferably about 80°.

5 10. Pallet container according to one of the preceding claims 1 to 9, characterized in that the form-fitting elements (18) are limited toward the outside within the support surface inner plastic container / bottom pallet and exhibit hereby a flat extension, which means, e.g., are configured as circular, triangular or polygonal form-fitting element.

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11. Pallet container according to one of the preceding claims 1 to 10, characterized in that the form-fitting elements (18) are limited toward the outside within the support surface inner plastic container / bottom pallet and exhibit hereby a linear extension, which means, e.g., as circular, triangular,
15 polygonal or cross-shaped form-fitting element which is open at least to one side.

12. Pallet container according to one of the preceding claims 1 to 11, characterized in that frictional connection elements or bonding elements
20 (=adhesive elements), preferably bonding pads (48), adhesive strips, Velcro elements (50) or bonding areas, are provided between the surface of the bottom pallet (16) or/and an intermediate plate disposed thereon and the bottom of the inner container (12) to establish a very strong adhesive/bonding effect in the direction of the horizontal plane while easily
25 be detachable again in vertical direction (for easy replacement of the inner container).

13. Pallet container according to one of the preceding claims 1 to 12,
characterized in that the bottom of the inner container (12) is constructed
along the central pinch-off seam (34) with at least one outwardly
(downwardly) projecting pin projection (36) which engages in a
5 corresponding recess or slit (38) in the top of the bottom pallet or
intermediate plate disposed in-between, and is secured therein.
14. Pallet container according to one of the preceding claims 1 to 13,
characterized in that the projecting or engaging form-fitting elements (18, 26,
10 30, 36) are provided with at least one desired breaking point (44, 46).