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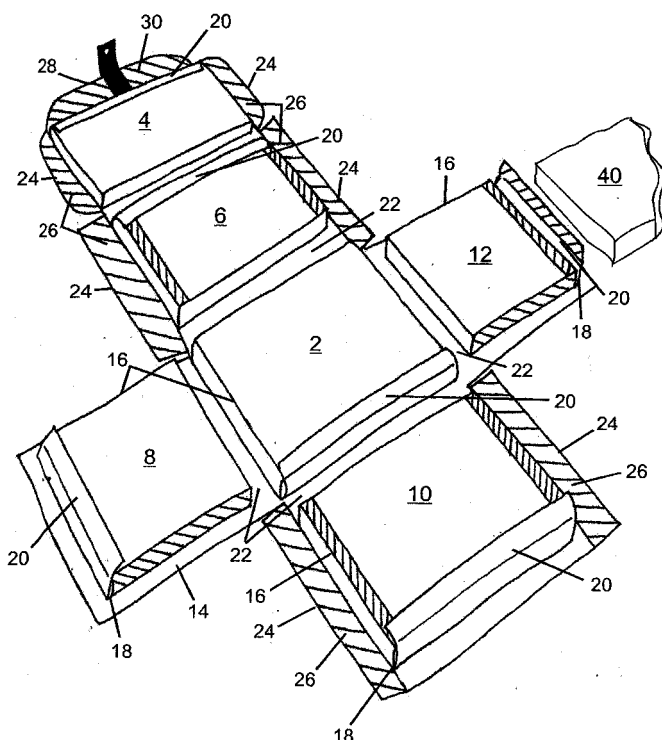
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(54) Thermally insulative containers

(57) A compact container with a high degree of thermal insulation for transporting products, particularly for primary health care, can be folded to a flat pack for ease of storage. The container is formed from a single sheet (14) of flexible sheet material, which can be wiped clean, defining wall panels (2-12). Each wall panel has a pock-

et (18) containing a vacuum insulation panel (40) formed of fumed silicon dioxide with pores having dimensions in the nanometer range. Free edges of the sheet (14) have flaps (24, 28) carrying strips of Velcro tape (26, 30) forming releasable joints for holding the container in the erected condition.

Figure 1



EP 1 384 685 A1

Description

[0001] This invention relates to thermally insulative containers, particularly though not exclusively for transporting pharmaceutical products and other products having application to health care, particularly primary health care.

[0002] The common vacuum flask, consisting of two concentric thin glass walls separated by a very high vacuum region, provides a thermally insulative container with extremely good thermal insulation. It is however a very fragile construction and is normally used only for holding fluids.

[0003] Various types of thermal containers in the form of boxes or bags are in common use, where the wall panels contain a porous plastic foam material, e.g. polyurethane or expanded polystyrene typically with pore diameters between 10 and 100 microns (μm). These provide a degree of thermal insulation, and are commonly used in consumer applications. However, to provide a substantial degree of insulation, the foam material must be thick, of the order of centimetres or inches, and is therefore too bulky for many mobile applications, particularly for primary health care situations, where for example a nurse has personally to transport products.

[0004] A type of material which has recently been developed in the form of wall panels for thermal containers, and which has far superior characteristics to plastics foam, both in terms of thermal insulation and mechanical strength and stability, is known as VIP - vacuum insulation panels. VIP includes a compound such as fumed silicon dioxide having pore diameters less than $1\mu\text{m}$ in diameter, and preferably in the range 10 to 100 nanometres (nm), enclosed in an air tight envelope, with a moderate vacuum pressure, for example of less than 10 mbar existing within the envelope. The pore diameters are so small that heat convection by movement of air is prevented or at least significantly restricted, since air molecules within the pores are trapped and prevented from significant movement. Such a VIP will be referred to herein as "vacuum insulation panels of the type described".

[0005] There are other known types of vacuum insulation panel formed of open cell foam, where because of the larger pore diameter, high vacuum conditions need to be maintained within an air tight envelope to ensure adequate thermal insulation.

[0006] There is a need for containers for transporting products for health care applications, particularly hand portable containers for primary health care applications, safely, and under thermally insulated conditions, the containers desirably being compact and not bulky, at least when stored.

Summary of the Invention

[0007] The present invention provides a thermally insulative container, foldable to a flat pack for storage, the

container comprising a plurality of wall panels which in the erected condition are joined together by joints, each wall panel being formed of a sheet material, and each wall panel including holding means, the holding means of each wall panel holding at least one vacuum insulation panel of the type described, which covers at least the greater part of the wall panel, such that in the erected container, the vacuum insulation panels of adjacent wall panels are positioned sufficiently closely together to restrict significant thermal leakage there between, and wherein at least some of the joints between adjacent wall panels are releasable to permit the adjacent wall panels to be moved away from each other to enable the container to be folded up into a flat pack. Vacuum insulation panels of the kind described are compact, with excellent thermal characteristics, and are therefore preferred with the invention. However, the invention extends to other vacuum insulation panels as described above, which may be preferred in certain circumstances.

[0008] In a further aspect therefore, the invention provides a thermally insulative container, foldable to a flat pack for storage, the container comprising a plurality of wall panels which in the erected condition are joined together by joints, each wall panel being formed of a sheet material, and each wall panel including holding means, the holding means of each wall panel holding at least one insulation panel comprising a cellular material enclosed in an air tight envelope under vacuum conditions, which covers at least the greater part of the wall panel, such that in the erected container, the insulation panels of adjacent wall panels are positioned sufficiently closely together to restrict significant thermal leakage there between, and wherein at least some of the joints between adjacent wall panels are releasable to permit the adjacent wall panels to be moved away from each other to enable the container to be folded up into a flat pack.

[0009] The container in accordance with the invention provides a high degree of thermal insulation, and is not bulky in construction. It may therefore be used as a hand portable container in health care applications, for example. It can be folded into a flat pack by releasing joints between the wall panels. As preferred, the sheet material of the wall panels comprises a single piece of woven or continuous plastics material, which is moisture resistant and can therefore be wiped clean. When laid open flat, the sheet material is in the form of a cross, with the arms of the cross being formed by the wall panels. Where the sheet material is formed as a single piece, the joints between adjacent wall panels are formed by the flexible sheet material. Free edges of the sheet material carry releasable joint means, such as Velcro tape, so that the free edges can be interconnected by the releasable joint means to form the erected container. In alternative forms, the sheet material may be formed of more than one piece, the separate pieces being interconnected along joint lines by further releasable joint means.

[0010] As preferred, there are four side wall panels, a top wall panel and a base wall panel to provide a rectangular container: However, three or more than four wall panels are possible, for containers of a polygonal shape

[0011] The insulation panel of each wall panel is preferably held in a pocket formed of a pocket sheet of the same material as said flexible sheet material and sealed thereto along its edges, but leaving one edge free as an opening. A flap may form a cover for the pocket opening. Alternatively, the holding means may be of any desired type: for example, it may comprise straps for holding the vacuum insulation panel against said sheet material.

Brief Description of the Drawings

[0012] A preferred embodiment of the invention will now be described, with reference to the accompanying drawings, wherein:

Figure 1 is a perspective view of the preferred embodiment in a laid-open condition, and showing a vacuum insulation panel as a separate item;

Figure 2 is a plan view corresponding to Figure 1; and

Figure 3 is a perspective view of the container in an erected position with the top panel partially open.

Description of the Preferred Embodiment

[0013] Referring to Figures 1 and 2, a preferred form of a hand portable thermally insulative container according to the invention is shown in laid open condition and comprises a base wall panel 2, a top wall panel 4 and sidewall panels 6, 8, 10, 12. In its laid open condition, the container is in the form of a cross or crucifix with side wall panels 8, 10, 12 forming three arms of the cross, and the longer fourth arm being formed by top wall panel 4, joined to base wall panel 2 via side wall panel 6. The container is formed from a single piece of sheet material 14. The material is a woven plastics material, such as nylon. This material is moisture resistant, and can be wiped clean of fluids and solid products for hygiene. A pocket sheet 16 of the same type of material is secured to single piece 14 at each wall panel in order to provide a pocket 18. The edges of the pocket sheet 16 are secured to the sheet 14 by welding or sewing and an open end of the pocket 18 has a cover flap 20 for covering the open pocket. The pocket 18 covers essentially the whole extent of the respective panel, apart from a small external margin, as can be seen in Figure 2.

[0014] The spaces 22 between the panels, comprising solely the flexible sheet material 14, form flexible joints between the panels. Side edges of wall panels 6, 10 and top wall panel 4 have edge flaps 24, each flap carrying a strip of Velcro tape 26. In addition, top wall panel 4 has a top flap 28, which also carries a strip of Velcro tape 30. As can be seen in Figure 3, strips of

Velcro tape 32 are positioned on the underside of sheet material 14, as shown in Figures 1 and 2, for connecting with Velcro tape strips 26, 30. Thus, the flaps 24, 28 and Velcro strips 26, 30, 32, provide releasable joints, and a means of assembling the container to the erected condition as shown in Figure 3, and then disassembling the container to the flat position shown in Figures 1 and 2.

[0015] Each pocket 18 contains a vacuum insulation panel 40 of the type described, as indicated in Figure 1, and formed of fumed silicon dioxide. Each panel 40 fits closely within the respective pocket 18 so as to be held securely therein and is sealed inside by top cover flap 20, which has Velcro tape on its underside to connect with a further strip of Velcro tape along the top of the pocket.

[0016] The exterior of the container has carrying handles 50, a top cover securing clasp 52, pockets for identification information, etc.

[0017] With the insulation panels 40 fitted within the pockets 18 of each wall panel, the container as shown in Figure 1 may be folded up to a flap-pack condition, merely by folding the panels one upon the other. Alternatively, it may be preferred to take out one or all of the vacuum insulation panels of the type described before folding the container up to a flat-pack condition.

[0018] In order to erect the container, from the position shown in Figure 1, the sidewall panels 6, 8, 10, 12 are first folded upwardly about joint lines 22 to stand perpendicular to base panel 2. Flaps 24 are then folded over the sides of adjacent side panels as shown in Figure 3 so that the respective pieces of Velcro tape interconnect. These flaps of Velcro tape therefore form releasable joints between the respective sidewall panels. In that condition, as shown in Figure 3, the top wall panel 4 may then be folded down on top of the side wall panels and its side flaps and top flap 24, 28 may be folded over so that the strips of Velcro tape 26, 30 interconnect with Velcro strips 32 to form a totally sealed container, with the flaps 24, 28 forming releasable joints between all panels. As can be seen in Figure 3, in the erected condition, the sidewall panels are positioned so that the pockets 18 of panels 6 and 10 have their side edges abutting against the pocket edges of end panels 8, 12. In addition, the lower edges of the pockets of wall panels 6, 8, 10, 12 abut against the upper pocket surface of base panel 2. When top panel 4 is folded over the wall panels, the upper pocket edges of the wall panels abut against the lower pocket surface of panel 4. Thus, there is formed a container with no significant thermal leakage paths between the panels. Although there is in practice a certain spacing between the edges of the insulating wall panels in the erected condition as a result of the flexibility necessary for assembling and disassembling the container, the amount of heat that can be conducted along these spaces is negligible.

Claims

1. A thermally insulative container, foldable to a flat pack for storage, the container comprising a plurality of wall panels which in the erected condition are joined together by joints, each wall panel being formed of a sheet material, and each wall panel including holding means, the holding means of each wall panel holding at least one insulation panel comprising a cellular material enclosed in an air tight envelope under vacuum conditions, which covers at least the greater part of the wall panel, such that in the erected container, the insulation panels of adjacent wall panels are positioned sufficiently closely together to restrict significant thermal leakage there between, and wherein at least some of the joints between adjacent wall panels are releasable to permit the adjacent wall panels to be moved away from each other to enable the container to be folded up into a flat pack. 5 10 15 20
2. A thermally insulative container, foldable to a flat pack for storage, the container comprising a plurality of wall panels which in the erected condition are joined together by joints, each wall panel being formed of a sheet material, and each wall panel including holding means, the holding means of each wall panel holding at least one vacuum insulation panel of the type described, which covers at least the greater part of the wall panel, such that in the erected container, the vacuum insulation panels of the type described of adjacent wall panels are positioned sufficiently closely together to restrict significant thermal leakage there between, and wherein at least some of the joints between adjacent wall panels are releasable to permit the adjacent wall panels to be moved away from each other to enable the container to be folded up into a flat pack. 25 30 35
3. A container according to Claim 1 or 2, including a single piece of flexible sheet material forming all said wall panels. 40
4. A container according to Claim 3, wherein said single piece is in the form of a cross. 45
5. A container according to Claim 3 or 4, wherein a plurality of edges of said single piece have flaps, adjacent the wall panels, carrying releasable securing means for forming releasable joints for securing the container in the erected condition. 50
6. A container according to Claim 5, wherein the releasable securing means comprises Velcro tape. 55
7. A container according to any preceding claim, wherein each said holding means comprises a pocket formed by a piece of sheet material, attached to the wall panel.
8. A container according to Claim 7, the holding means including a flap forming a cover for the pocket opening.
9. A container according to Claim 7 or 8, wherein a respective insulation panel forms a close fit within each said pocket.
10. A container according to claim 2, wherein each vacuum insulation panel of the type described comprises nanoporous fumed silicon dioxide.
11. A container according to any preceding claim, including one or more exterior handles for hand carrying the container.
12. A kit of parts for a thermally insulative container, foldable to a flat pack for storage, the container comprising a plurality of wall panels, each wall panel being formed of a sheet material, means for joining said wall panels together, and each wall panel including holding means, for holding at least one insulation panel of cellular material enclosed in an air tight envelope under vacuum conditions, such that in the erected container, the insulation panels of adjacent wall panels are positioned sufficiently closely together to restrict significant thermal leakage there between, and wherein at least some of the joining means are releasable to allow adjacent wall panels to be moved away from each other to enable the container to be folded up into a flat pack, and the kit of parts including a plurality of said insulation panels for fitting in said holding means.

Figure 1

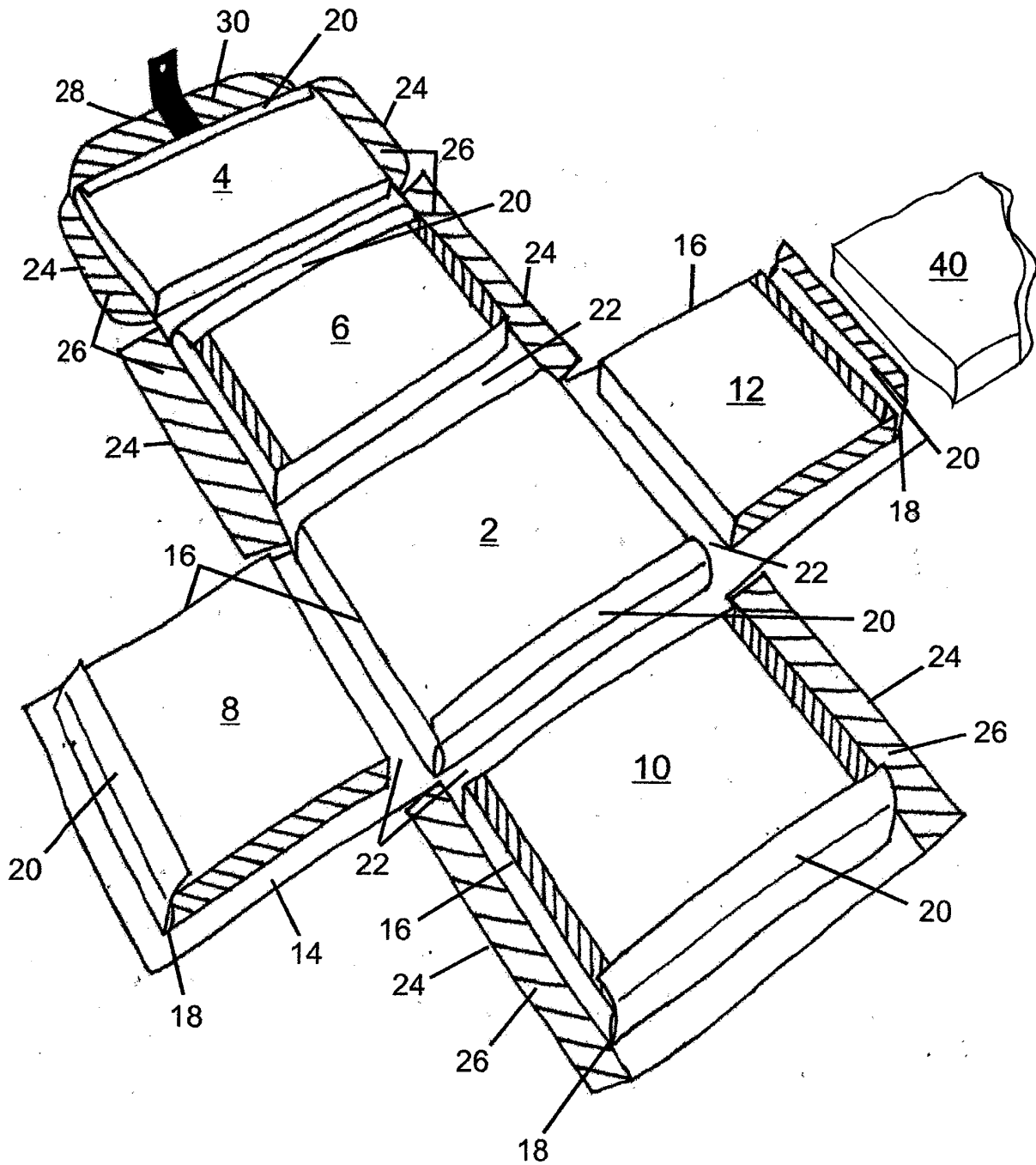


Figure 2

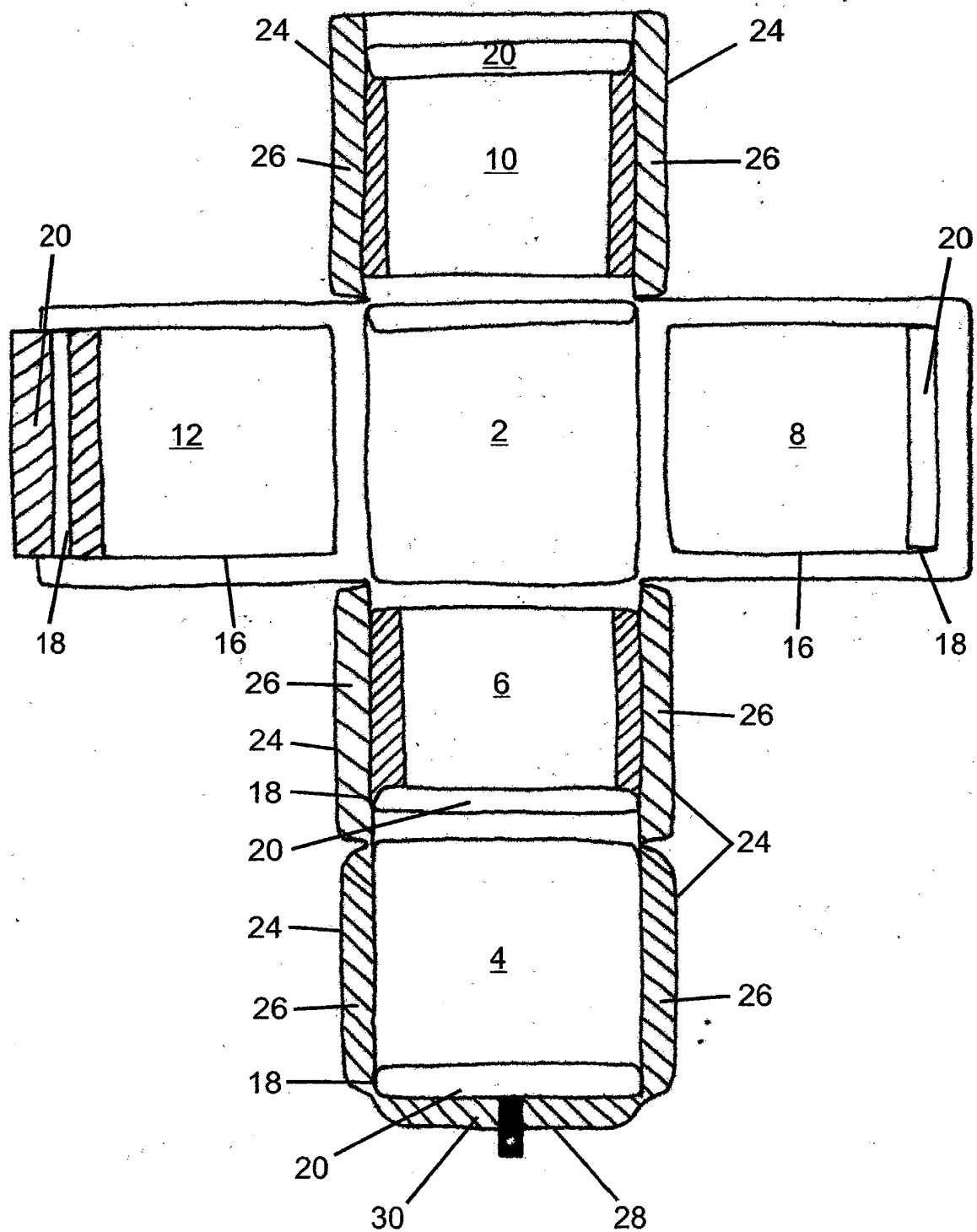
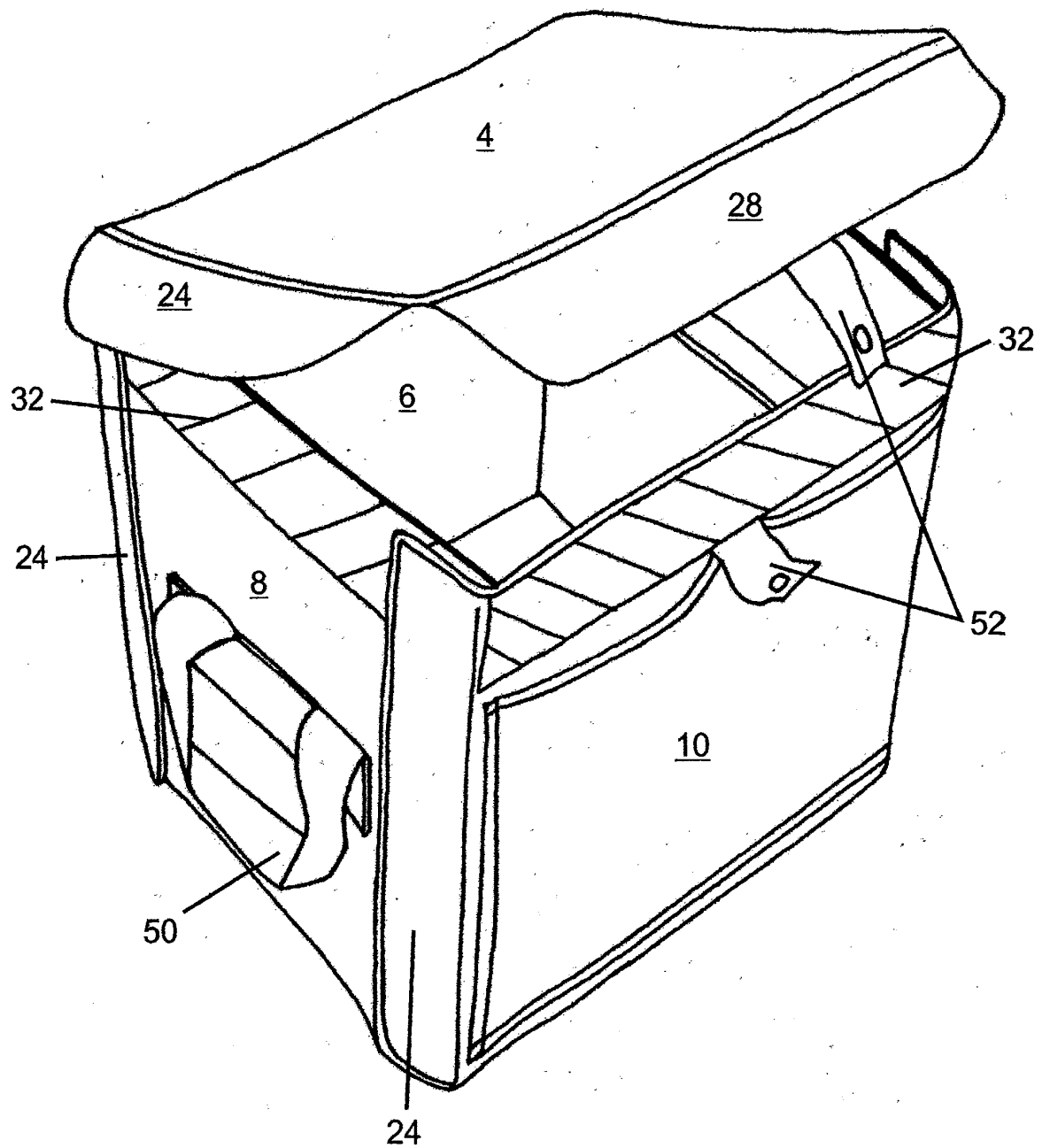


Figure 3





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EUROPEAN SEARCH REPORT

Application Number
EP 03 25 4617

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	US 6 220 473 B1 (LEHMAN) 24 April 2001 (2001-04-24) * column 6, line 57 - line 63 *	1-12	B65D81/38
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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
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Place of search		Date of completion of the search	Examiner
THE HAGUE		6 November 2003	Newell, P
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 03 25 4617

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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