LIDDED STORAGE BOX FOR VEHICLES

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ABSTRACT

A composite lid for a vehicle storage container for use in a truck bed has an outer sheet metal member including a top portion having a first inner surface with a rim portion extending around a periphery of the top portion. The lid has an inner sheet metal member positioned in a spaced apart relationship to the top portion, where the inner sheet member has a second inner surface opposed to the first inner surface to define an enclosed interior. The lid has a sandwich panel fixedly secured in the enclosed interior for reinforcing the structural integrity of the lid, where the panel has a corrugated core bonded to the interior of both the inner and outer sheet metal members. The panel is composed of the corrugated core of a cellulosic honeycomb structure bonded between an upper paper layer and a lower paper layer.
Fig. 7

100

102

Form outer sheet member

104

Size inner sheet member

106

Attach lid hardware

108

Fasten sandwich member to outer sheet member

110

Fasten sandwich member to inner sheet member

112

Fasten outer member to inner sheet member around periphery

114

Attach lid to box
LIDDED STORAGE BOX FOR VEHICLES

[0001] The present invention relates to storage containers for mounting to vehicles, and in particular to covered external storage containers for trucks.

BACKGROUND OF THE INVENTION

[0002] Truck bed tool boxes are a common accessory for pick-up trucks which have limited storage capabilities. These boxes are typically designed for outdoor exposure and are mounted in an open bed of the pick-up truck, generally just to the rear of the passenger compartment. The tool boxes have a rectangular open topped receptacle which is covered by one or more lids, which are attached by hinges along an upper edge of the receptacle. The tool boxes also employ lift cylinders to help retain the lid in an open position. For durability purposes, the tool boxes are typically constructed of sheet material with individual panels welded or mechanically fastened to provide the box structure.

[0003] The box lids can encounter repetitive loadings and are therefore susceptible to undesirable deformation. Current lid designs use heavy structural members fastened on the underside of the lid to increase planar rigidity, thereby inhibiting the lid from becoming permanently deformed and therefore misaligned relative to the box. This resistance to deformation inhibits any misalignment that can result in sealing failure between the box and lid, which can result in costly repair or replacement of the tool box.

[0004] One disadvantage with current lid designs is that they are undesirably too heavy to be solely supported by the lift cylinders due to the need for the heavy structural members. U.S. Pat. appl. No. 2001032848 by Giddens et al. describes a lid having a top sheet member, a liner sheet member, and an expanded foam material deposited between the members in a defined interior cavity. Although the lid design by Giddens et al. does not use individual structural members, the presence of the foam can still produce a reinforced lid that is too heavy for support solely by the lift cylinders.

[0005] It is an object of the present invention to provide a composite lid to obviate or mitigate at least some of the above presented disadvantages.

SUMMARY OF THE INVENTION

[0006] Truck bed tool boxes are a common accessory for pick-up trucks and are typically designed for outdoor exposure and are mounted in an open bed of the pick-up truck. The tool boxes have a rectangular open topped receptacle which is covered by one or more lids, which are attached by hinges along an upper edge of the receptacle. The tool boxes also employ lift cylinders to help retain the lid in an open position. The box lids can encounter repetitive loadings and are therefore susceptible to undesirable deformation, such that current lid designs use heavy structural members fastened on the underside of the lid to increase planar rigidity, thereby inhibiting the lid from becoming permanently deformed and therefore misaligned relative to the box. The use of additional structural members can make the lids undesirably too heavy to be solely supported by the lift cylinders. Alternatively, a composite lid for a vehicle storage container has an outer sheet metal member including a top portion having a first inner surface with a rim portion extending around a periphery of the top portion. The lid has an inner sheet metal member positioned in a spaced apart relationship to the top portion, where the inner sheet member has a second inner surface opposed to the first inner surface to define an enclosed interior. The lid has a lightweight sandwich panel fixedly secured in the enclosed interior for reinforcing the structural integrity of the lid, where the panel has a corrugated core bonded to the interior of both the inner and outer sheet metal members. The panel can be composed of the corrugated core of a cellular honeycomb structure bonded between an upper paper layer and a lower paper layer.

[0007] According to the present invention there is provided a composite lid for a vehicle storage container. The lid comprises an outer sheet member including a top portion having a first inner surface with a rim portion extending around a periphery of the top portion; an inner sheet member positioned in a spaced apart relationship to the top portion; the inner sheet member having a second inner surface opposed to the first inner surface to define an enclosed interior; and a sandwich member fixedly secured in the enclosed interior for reinforcing the structural integrity of the lid, the sandwich member having a corrugated core bonded on one side to the first inner surface and bonded on the other side to the second inner surface.

[0008] According to a further aspect of the present invention there is provided a method of manufacturing a composite lid for a vehicle storage container. The method comprises the steps of forming an outer sheet member to include a top portion having a first inner surface and a rim portion extending around a periphery of the top portion; bonding one side of a sandwich member to the first inner surface, the sandwich member having a corrugated core; and bonding a second inner surface of an inner sheet member to the other side of the sandwich member for positioning the inner sheet member in a spaced apart relationship to the top portion, the second inner surface opposed to the first inner surface to define an enclosed interior; wherein the sandwich member reinforces the structural integrity of the lid by having the corrugated core bonded to both the first inner surface and the second inner surface.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] These and other features of the preferred embodiments of the invention will become more apparent in the following detailed description in which reference is made to the appended drawings wherein:

[0010] FIG. 1 is a top perspective view of a lidded container;

[0011] FIG. 2 shows an open perspective view of the container of FIG. 1;

[0012] FIG. 3 is a section 3-3 side view of the composite lid of FIG. 1;

[0013] FIG. 4 is a bottom view of the composite lid of FIG. 1;

[0014] FIG. 5 is an expanded view of a honeycomb stiffener of the container of FIG. 1;

[0015] FIG. 6a is a side view of the stiffener of FIG. 5;

[0016] FIG. 7 is a process for manufacturing the lid of FIG. 1; and
DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0018] Referring to FIGS. 1 and 2, a container 10 includes a cover or lid 12 for covering a storage receptacle or box 14 that is adapted for fastening to a vehicle (not shown), such as but not limited to in the interior of an open cargo area of a pick-up truck. The box 14 has upwardly extending end walls 16 connected on either end to upwardly extending side walls 18, around a periphery of a bottom wall 20, to define an open topped interior 22. The end walls 16 can be configured to provide generally horizontal support surfaces 24 for attaching to the adjacent vehicle (not shown). The lid 12 is connected to the box 14 along one edge by a hinge 26 or other suitable flexible means for permitting the lid 12 to remain attached to the box 14 in both open and closed configurations, as shown in FIG. 2 and FIG. 1 respectively. A series of hydraulic or pneumatic actuators 28 are connected between the box 14 and lid 12 to allow the lid 12 to remain in the open configuration, as desired by a user (not shown). A lock or fastening means 30 can be provided on the box 14 for coupling with a corresponding lock 32 on the lid 12, in order to secure the lid 12 when positioned in the closed configuration. The box 14 and lid 12 are preferably made of sheet metal material, such as steel or aluminum, approximately 1.5-2.0 mm in thickness. The exterior surface of the container 10 can be patterned with a raised relief 34, such as but not limited to diamond plate construction.

[0019] Referring to FIG. 3, the lid 12 has an outer sheet member 36 fastened to an inner sheet member 38 to define an enclosed interior 40. The sheet members 36, 38 also form a rim 39 extending around a periphery of the lid 12, as well as a top portion 43 and side portions 37. The rim 39 extends around the periphery of the lid 12 and has a hem portion 41 on three sides of the lid 12 which excludes the rim 39 adjacent to the hinge 26. The inner and outer sheet members 36, 38 of the lid 12 are fastened about their periphery, such as but not limited to by corner welds 42 or other mechanical means. The inner sheet member 38 can have hem portion 70 on both sides of the member 38 along the length of the inside surface 46. An inside surface 44 of the sheet member 36 and an inside surface 46 of the sheet member 38 are positioned in an opposing spaced apart relationship to provide adequate clearance for positioning of a reinforcement or sandwich member 48 in the interior 40. The lid 12 also has a coupling 50 for attaching one end of the actuators 28 to an inner surface 45.

[0020] Referring to FIGS. 3 and 4, a series of the sandwich members 48 are positioned in a distributed manner in the interior 40, such as to help reinforce and thereby prevent the lid 12 from undesired bending or becoming otherwise deformed due to applied forces to the rim 39 and/or the top and side portions 43, 37. Inclusion of the sandwich members 48 in the interior 40 allows for a sufficiently rigid construction of the composite lid 12 to be made from sheet metal materials, while providing the composite lid 12 of sufficient overall thickness and lightness to be operated by the actuators 28 and held in the open configuration as desired. The sandwich member 48 has face sheets or layers 52 that are bonded to the surfaces 44, 46, thereby providing an integral composite lid 12 consisting of metal sheet members 36, 38 and sandwich members 48.

[0021] Referring to FIGS. 5 and 6, each sandwich member 48 has the face layers 52 that are bonded to a corrugated core 54, such as but not limited to honeycomb, in order to provide what is typically referred to as a sandwich panel that is used in a wide variety of applications where high strength and light weight are desired. The face layers 52 can be made from a wide variety of materials, such as but not limited to paper, metal, plastics, and composites. The core 54 consists of a corrugated cross-sectional shape, as a hexagonal shown in FIG. 5, circular shapes, or any other polygonal shapes such as but not limited to triangular and quadrilateral. The corrugated core 54 can be made from a wide variety of materials including cellulose (e.g. paper), metals (e.g. aluminum), plastics, and composite materials such as but not limited to carbon or glass fibre composite materials, resin impregnated papers, and the like. The face layers 52 use adhesive 56 or other suitable mechanical fasteners for bonding the sandwich member 48 to the sheet members 36, 38. Preferably, the core 54 is made of a cellulosic material formed in a honeycomb structure, due to its desirable strength to weight ratio and resistance to fatigue failures and deformation. For example, the sandwich members 48 can be composed of face layers 52 made of virgin Kraft paper and bonded by water soluble glue to the corrugated cardboard honeycomb core 54.

[0022] Referring to FIG. 7, during manufacture 100, the composite lid 12 is made by forming 102 the outer sheet member 36 to define the initial open topped interior 40 having the top surface 43 and the surrounding rim 39. The side portions 37 can have a chamfer or bevel formed 103 at the junction between the top portion 43 and the rim 39 to provide a relatively narrow angled flat surface around the upper periphery of the lid 12, if desired. The inner sheet member 38 is sized 104 to fit inside the rim 39 periphery and the lock 32 and cylinder coupling 50 hardware are attached 106 to the inner surface 45. One side of the sandwich members 48 are then fastened 108 to the surface 44 of the sheet member 36. The sheet member 38 is then positioned between the rim 39 periphery, locatable by the chamfered side portion 37 if present, and then the surface 46 is fastened 110 to the other side of the sandwich members 48 to enclose the interior 40. The sheet members 36, 38 can then be fastened 112, preferably mechanically, around the inner rim 39 periphery, such as but not limited to by welds 42. Fastening of the sheet members 36, 38 around the rim 39 periphery can help to reinforce the integral coupling between the sandwich member 48 and the sheet members 36, 38, in order to inhibit separation of the sheet members 36, 38 from the sandwich member 48 during operation of the lid 12 when attached to the box 14. It is recognised that the sandwich members 48 are positioned towards the centre of the interior 40 and away from the rim 39, when welds 42 are employed, to help reduce the occurrence of any damage to the sandwich members 48 during assembly of the lid 12. It is further recognised that a single enlarged sandwich member 48 can be substituted for the series of smaller sandwich members 48 (shown in FIG. 4), if desired. The assembled composite lid 12 can then be fastened 114 to the box 14 by the hinge 26.
Referring to FIG. 8, an alternative embodiment of the composite lid 12 is shown. It should be noted that a sandwich member 68 has the upper face layer 52 bonded by adhesive 56 (see FIG. 5) to the inner surface 44 of the outer sheet member 36. However, the corrugated core 54 of the sandwich member 68 is connected on the top to the upper face layer 52 but on the bottom to an inner sheet member 58. Accordingly, the inner sheet member 58 can be made of materials similar to the outer sheet member 36. Therefore, the sandwich member 68 is composed of the core 54 bonded to both the upper face layer 52 and the inner sheet member 58, which is used to enclose the interior 40 while also being part of the structure of the sandwich member 68.

For the sandwich members 48, 68, it is recognized that an important consideration is the fastening means, such as adhesive 56, which is used to bond the face layer(s) 52 and inner sheet member 58 to the core 54. The fastening means should securely attach the layer(s) 52 and member 58 to the core 54 in order for loads to be transmitted from the outer sheet member 36 to the inner sheet member 58 through the core 54, while inhibiting separation of the component parts of the sandwich member 48, 68. For example, if the fastening means between the core 54 and the layer(s) 52 and/or member 58 fails, the structural rigidity of the composite lid 12 may be compromised. It is noted that the fastening means of the core 54 can be important in sandwich panels that use honeycomb cores 54 because of the relatively small area over which the honeycomb edges contact the surfaces of the face layer(s) 52 and member 58.

Referring to FIGS. 4, 6, and 8, coverage of adhesive 56 on either the layer 52 or core 54, for attaching the respective sandwich numbers 48, 68 to the inner sheet member 38, 58, can be discontinuous about a region 72 adjacent to couplings 50, which attach the actuator 28 to the lid 12. For example, attachment of the coupling 50 by welding to the inner sheet member 38 can cause warping of the member 38, thus helping to promote delamination of the adhesive if present in the region 72. Accordingly, it is preferable to exclude application of adhesive 56 between the sandwich member 48, 68 and the sheet member 38, 58 in the region 72 where through attachment of the coupling 50 there.

Although the invention has been described with reference to certain specific embodiments, various modifications thereof will be apparent to those skilled in the art without departing from the spirit and scope of the invention as outlined in the claims appended hereto.

1. A composite lid for a vehicle storage container, the lid comprising:

   an outer sheet member including a top portion having a first inner surface with a rim portion extending around a periphery of the top portion;

   an inner sheet member positioned in a spaced apart relationship to the top portion, the inner sheet member having a second inner surface opposed to the first inner surface to define an enclosed interior; and

   a sandwich member fixedly secured in the enclosed interior for reinforcing the structural integrity of the lid, the sandwich member having a corrugated core bonded on one side to the first inner surface and bonded on the other side to the second inner surface.

2. The composite lid of claim 1, wherein the sandwich member further comprises a first face layer that is attached between the corrugated core and the first inner surface.

3. The composite lid of claim 2, wherein the sandwich member further comprises a second face layer that is attached between the corrugated core and the second inner surface.

4. The composite lid of claim 2, wherein the corrugated core is bonded directly to the second inner surface of the inner sheet member.

5. The composite lid of claim 4, wherein the outer sheet member and the inner sheet member are made of similar material.

6. The composite lid of claim 5, wherein the material is metal selected from the group comprising steel and aluminum.

7. The composite lid of claim 3 further comprising a plurality of mechanical fasteners for securing the inner sheet member to the outer sheet member around the rim periphery.

8. The composite lid of claim 4 further comprising a plurality of mechanical fasteners for securing the inner sheet member to the outer sheet member around the rim periphery.

9. The composite lid of claim 2, wherein the corrugated core is a honeycomb structure.

10. The composite lid of claim 9, wherein the honeycomb structure has a cross-sectional shape selected from the group comprising polygonal and circular.

11. The composite lid of claim 10, wherein the cross-sectional shape is hexagonal.

12. The composite lid of claim 2, wherein the corrugated core is made of material selected from the group comprising metals, plastics, and composites.

13. The composite lid of claim 2, wherein the first face layer is made of material selected from the group comprising metals, plastics, and composites.

14. The composite lid of claim 9, wherein the first face layer is made of cellulosic material.

15. The composite lid of claim 14, wherein the honeycomb structure is made of cellulosic material.

16. The composite lid of claim 15 further comprising side portions for positioning the outer sheet member to the inner sheet member in the spaced apart relationship.

17. The composite lid of claim 16 further comprising the inner sheet member having a coupling configured for coupling with at least one actuator for opening the lid when connected to a box of the container.

18. The composite lid of claim 17, wherein the bonding of the sandwich member is discontinuous around a region of the second inner surface adjacent to the coupling, the discontinuous bonding region for inhibiting delamination of the bonding between the sandwich member and the second inner surface.

19. The composite lid of claim 2 further comprising a plurality of the sandwich members.

20. The composite lid of claim 19, wherein the plurality of sandwich members are positioned in a central region of the enclosed interior and spaced from the periphery of the rim.

21. A method of manufacturing a composite lid for a vehicle storage container, the method comprising the steps of:

   forming an outer sheet member to include a top portion having a first inner surface and a rim portion extending around a periphery of the top portion;
bonding one side of a sandwich member to the first inner surface, the sandwich member having a corrugated core; and

bonding a second inner surface of an inner sheet member to the other side of the sandwich member for positioning the inner sheet member in a spaced apart relationship to the top portion, the second inner surface opposed to the first inner surface to define an enclosed interior;

wherein the sandwich member reinforces the structural integrity of the lid by having the corrugated core bonded to both the first inner surface and the second inner surface.

22. The method of manufacturing the composite lid of claim 21 further comprising the step of attaching a first face layer between the corrugated core and the first inner surface.

23. The method of manufacturing the composite lid of claim 22 further comprising the step of attaching a second face layer between the corrugated core and the second inner surface.

24. The method of manufacturing the composite lid of claim 22 further comprising the step of securing the inner sheet member to the outer sheet member around the rim periphery by a plurality of mechanical fasteners.

25. The method of manufacturing the composite lid of claim 23, wherein the corrugated core is a honeycomb structure made of a cellulose material.

26. The method of manufacturing the composite lid of claim 21, wherein the bonding of the sandwich member in discontinuous around a region of the second inner surface adjacent to an actuator coupling for inhibiting delamination of the bonding between the sandwich member and the second inner surface, the actuator coupling configured for coupling with at least one actuator for opening the lid.