

**A folding/unfolding transport container and a method of folding and
unfolding a transport container**

Field of the invention

This invention relates to a folding/unfolding transport container and a method of folding and unfolding a transport container.

Background of the invention

Boxes are commonly used in transporting, moving, conveying, sorting and storing goods and materials, and are employed by a diversity of industries such as trucking, warehousing, manufacturing, office moving and household goods moving.

Large-capacity containers are used for easy transfer of goods and cargo from one transporting vehicle to another or for shipping cargo overseas or overland.

Containers have been universally adopted for the transportation of cargo because this form of shipment has eliminated the need for transferring the cargo manually or by conventional means from one vehicle to another during the transport to a certain destination.

The main disadvantage of conventional containers which are formed by a rigid prismatic structure results from the fact that after use and delivery, the empty containers must be transported from their destination to a point of loading from where they are shipped back to points of re-use.

The requirement to reposition empty containers is one of the more persistent problems in the container transport industry. Empty container transport involves high costs, particularly for shipping lines, since they generally bear these container management costs. Not surprisingly, shipping lines try to reduce the costs of moving empty containers as much as they can. Most strategies are focused on matching cargo with empty containers. Due to trade imbalances transport movements of empty containers remain to some extent unavoidable.

These operations are economically disadvantageous because the empty container, which is a rigid structure, occupies in the transporting means a space which otherwise could be occupied by containers with cargo.

Therefore, foldable containers are an attractive option from the point of view of saving transport costs as well as handling and storage costs. So far, however, such containers have not been introduced successfully.

In order to eliminate these disadvantages resulting from the use of rigid-structure, prismatic containers, containers with collapsible structure components have been designed and built. In such containers the walls can be folded onto the base so that after discharge of the cargo, the empty container will occupy less space in the collapsed state for transport.

Containers with folding walls usually comprise reinforcing or retaining members of the walls. These members may get lost and therefore may cause

serious inconvenience in the assembly or unloading of such containers with complicated structure elements.

Collapsible containers of this type are a solution to the problem of dead space occupied once the cargo has been delivered since in the collapsed state, the height of the containers is substantially reduced and at least four collapsible containers can be transported in place of one rigid container.

When special designs are incorporated in the hinge joints to prevent the entry of foreign material, it is hard to obtain the required sealing effect because in prolonged use of the containers, a number of problems develop at the hinge joints. The problems and failures cause additional expenses with the resulting disadvantages in the handling of this type of cargo containers.

US 4177907 relates to a shipping container for the transport of goods. This container has all its walls connected together by means of hinges and thus in the folding down operation, as in the reverse one of erection, no wall is completely freed from the remaining ones. It discloses that the manoeuvres consequently become quicker and safer and the structure of the container assumes greater rigidity in comparison with those containers in which one or more walls have to be detached completely. This container on folding / collapsing folds vertically down to the base.

US 4630746 provides an improved collapsible, stackable storage or shipping container in which the respective walls, end sections and corresponding hinge elements by which the sections are pivotally connected are all formed of a molded plastic material and wherein each of the corresponding adjacent pivotally connected walls or wall sections and their corresponding aligned

hinge elements are interconnected by transverse pivot pins of plastic or metal.

However, the above-mentioned patents do not disclose a foldable transport container which substantially folds horizontally against a side wall and in which the process of folding can be facilitated using external automatic apparatus.

Object and summary of the invention

To obviate the aforesaid drawback, the present invention provides a transport container which can be folded and unfolded conveniently.

It is another object of the present invention to provide a transport container which can be folded and unfolded automatically using an apparatus rather than manually.

Brief description of the accompanying drawings:

The features of this invention are set forth with particularity in the appended claims. The invention, together with its objects and advantages thereof may be best understood by reference to the following description taken in conjunction with the accompanying drawings, in which like reference numerals identify substantially like elements in the several figures and in which:

Figure 1 shows a schematic diagram of a folding container according to the present invention.

Figure 2 represents folding sides FS1 and FS2 of the folding container.

Figure 3 shows the folded state of the folding container after the first folding step.

Figure 4 shows the folding edges in the surface B and surface T₁ of the folding container

Figure 5 represents the folded state of the folding container after the second folding step

Figure 6 represents the final folded condition of the folding container

Figure 7 shows a base folding mechanism to fold the base of the container, in its starting position

Figure 8 describes the final position of the base folding mechanism

Detailed description of the invention

For the purpose of promoting an understanding of the principles of the invention, reference will now be made to the embodiment illustrated in the drawings and specific language will be used to describe the same. It will nevertheless be understood that no limitation of the scope of the invention is

thereby intended, such alterations and further modifications in the illustrated bag, and such further applications of the principles of the invention as illustrated therein being contemplated as would normally occur to one skilled in the art to which the invention relates.

Figure 1 shows a schematic diagram of a folding container according to the present invention. The transport container comprises a folding base ("B"), a folding top ("T"), two folding sides ("FS1" and "FS2") and two straight sides ("SS1" and "SS2").

The side SS1 has doors which can be used for loading / unloading. During the folding process, the side SS1 is moved towards the side SS2 in the first step. These sides do not have any folding hinges and are straight. The base is divided into two or more sections. For example into first section (B1) and second section (B2). The sides of the container having sealing mechanisms to prevent entry of liquids in the container. All the sides of the container also having openings to facilitate the loading and unloading of the container.

The sides FS1 and FS2 fold inward in a zig-zag manner into two or more folds, along folding edges. In Figure 2 the sides are schematically shown with one hinge each along edges E1 and E2 in the middle resulting in a two-fold.

Figure 3 shows the folded state of the folding container after the first folding step.

In the first step of folding the container side SS1 is moved towards the side SS2 and the sides FS1 and FS2 are simultaneously folded inwards.

Figure 4 shows the folding edges in the surface B and surface T of the folding container. The top is then folded along a folding line E3 (hinge) parallel to the side SS1 at a distance of "D1" from the edge between SS2 and T and allowed to drop.

Figure 5 represents the folded state of the folding container after the folding of the surface B second folding step.

Figure 6 represents the final folded condition of the folding container. The side B has a folding line E4 parallel to the side SS2 at a distance of "D2" from the parallel to the edge between B and SS2.

Figure 7 shows a hinge mechanism to fold the base. This is a mechanism to attach a hinge to a thick plate so that there is no gap at the hinge and the folding takes place by 90 degrees resulting in the final position as shown in Figure 8. The initial position of the mechanism is such that the mechanism does not protrude on the surfaces B1₁ and B2₁ of the base as shown in Figure 7. In the open condition of the container the surfaces B1₁ and B2₁ are thus totally free and can be used for keeping goods without any interfering objects or protrusions.

As can be seen in Figures 7 and 8 the first link (L1) is rigidly connected to the first section of the base (B1). The second link (L2) is connected to the second section of the base (B2) by a first rotation axis (R1) at one end and at the other end to the first link (L1) by a second rotation axis (R2). The third link (L3) is connected to the first link (L1) at one end by a third rotation axis

(R3) and to the second part of the base (B2) at the other end by a fourth rotation axis (R4).

Figure 8 describes the final position of the linkage mechanism. At the end, the part B2 of the base is at right angles with respect to the part B1, and there is no interference between B1 and B2 either during the folding or after.

All documents cited in the description are incorporated herein by reference. The present invention is not to be limited in scope by the specific embodiments and examples which are intended as illustrations of a number of aspects of the invention and any embodiments which are functionally equivalent are within the scope of this invention. Those skilled in the art will know, or be able to ascertain using no more than routine experimentation, many equivalents to the specific embodiments of the invention described herein.

We claim:

1. A foldable transport container comprising:
 - a planar foldable base (B), said base divided into two or more sections (B1, B2),
 - a foldable top (T) divided into at least two sections, each section being coupled to its immediate next section by a top folding mechanism that facilitates the folding of said top;
 - at least two opposing sides (SS1, SS2) connected to the base at one end and to the top at the other end; and
 - at least two foldable panels (FS1, FS2) connecting to the said sides, said panels having a folding mechanism to fold them inwards so as to facilitate the horizontal folding of the panels.
2. A foldable transport container as claimed in claim 1 further comprising a base folding mechanism connecting the parts B1 and B2 for facilitating the folding of the base in order to fold the container.
3. A foldable transport container as claimed in claim 2, wherein the base folding mechanism is a hinge or any other equivalent mechanism.
4. A foldable transport container as claimed in claim 2, wherein the base folding mechanism comprising a plurality of links (L1, L2, L3);

said first link (L1) is rigidly connected to the first section of the base (B1),

said second link (L2) is connected to the second section of the base (B2) by a first rotation axis (R1) at one end and at the other end to the first link (L1) by a second rotation axis (R2), and

said third link (L3) is connected to the first link (L1) at one end by a third rotation axis (R3) and to the second part of the base (B2) at the other end by a fourth rotation axis (R4).
5. A foldable transport container as claimed in claim 1, wherein the container having sealing mechanisms at all edges having relative movement to prevent entry of fluids in the container.

6. A foldable transport container as claimed in claim 1, wherein any of the sides or top or base of the container openings to facilitate the loading and unloading of the container.

7. A foldable transport container comprising:

- a planar foldable base (B), said base divided into two or more sections (B1, B2), each section being coupled to its immediate next section by a base folding mechanism that facilitates the folding of the said base;
- a foldable top (T) divided into at least two sections, each section being coupled to its immediate next section by a top folding mechanism that facilitates the folding of said top;
- at least two opposing sides (SS1, SS2) connected to the base at one end and to the top at the other end;
- at least two foldable panels (FS1, FS2) connecting to the said sides, said panels having a folding mechanism to fold them inwards so as to facilitate the horizontal folding of the panels,
- said base folding mechanism comprising a plurality of links (L1, L2, L3);
- said first link (L1) is rigidly connected to the first section of the base (B1),
- said second link (L2) is connected to the second section of the base (B2) by a first rotation axis (R1) at one end and at the other end to the first link (L1) by a second rotation axis (R2), and
- said third link (L3) is connected to the first link (L1) at one end by a third rotation axis (R3) and to the second part of the base (B2) at the other end by a fourth rotation axis (R4).

6. A foldable transportable container substantially as herein described with reference to the accompanying drawings.