

Folding Container with Elastically Suspended Floor

FIELD AND BACKGROUND OF THE INVENTION

The present invention relates to containers used for shipping and displaying produce and, in particular, it concerns a folding container with an elastically suspended floor useful in shipping and displaying produce.

A growing trend in retail industries is the shipping of produce in containers which are also suitable for displaying and selling the produce at a retail outlet. This greatly reduces the labor involved in transferring produce from shipping containers to display units and arranging product displays. The present invention is particularly, although not exclusively, related to shipping containers (alternatively referred to as "crates", "boxes" or "bins"), typically made from molded plastic materials, which are at least partially foldable so as to reduce the volume of the containers for return (empty) transport. One typical set of examples to which the present invention is applicable are containers referred to as "bulk-boxes" of horizontal dimensions 60x80 cm or 60x40 cm, and of height 75-110cm.

When containers such as these are used for dispensing retail produce, the "top of the pile" moves downwards as the upper items are removed. This may make it more awkward for a customer to access the goods, requiring him or her to bend over and reach downwards to take the remaining goods. Additionally, there is a negative psychological effect according to which the produce left at the lower height is perceived by customers as "left over" or old, and hence is considered less desirable.

For these and other reasons, it would be advantageous to provide a shipping and display container which would provide a self-raising floor which would tend to raise the perceived height of the pile of produce as produce is removed. At the same time, it would be advantageous if the self-raising floor did

not interfere with folding of a folding container to facilitate reduced volume return transportation in a conventional manner.

SUMMARY OF THE INVENTION

5 The present invention is a shipping and display container with elastically suspended floor.

According to the teachings of the present invention there is provided, a container comprising: (a) a set of four walls, each of the walls being implemented as a folding wall having at least one folding portion deployable between an upright container-forming position and a folded position; (b) a floor deployed
10 within and vertically displaceable relative to the set of walls; and (c) a suspension arrangement including at least four elastic suspension elements, the suspension arrangement being deployed to suspend the floor relative to the set of walls such that, when the floor is loaded with a first load, the floor assumes a lowered position and, when a part of the load is removed, the suspension arrangement
15 raises the floor towards a raised position.

According to a further feature of the present invention, each of the elastic suspension elements includes a length of an elastomeric material.

According to a further feature of the present invention, each of the elastic suspension elements includes a helical spring.

20 According to a further feature of the present invention, the set of walls feature an arrangement of stopper features deployed to engage the floor so as to define a fully raised position.

According to a further feature of the present invention, the stopper features are deployed below the folding portions.

25 According to a further feature of the present invention, each of the suspension elements is attached to the folding portion of one of the walls.

According to a further feature of the present invention, there is also provided a base fixedly attached to the set of walls below the floor.

According to a further feature of the present invention, the base is configured to provide at least one channel for insertion of a pallet jack for lifting the container.

There is also provided, according to a further feature of the present invention, a container comprising: (a) a set of four walls; (b) a floor deployed within and vertically displaceable relative to the set of walls; and (c) a suspension arrangement including at least four elastic suspension elements, the suspension arrangement being deployed to suspend the floor relative to the set of walls such that, when the floor is loaded with a first load, the floor assumes a lowered position and, when a part of the load is removed, the suspension arrangement raises the floor towards a raised position, the suspension arrangement further including an adjustment mechanism configured for adjusting an effective length of the elastic suspension elements.

According to a further feature of the present invention, the adjustment mechanism is configured to adjust an effective length of the elastic suspension elements between an operative length wherein the floor is elastically biased towards a raised position and an inoperative length wherein the floor assumes the lowered position even in the absence of an applied load.

According to a further feature of the present invention, the adjustment mechanism is configured to simultaneously adjust an effective length of all of the elastic suspension elements substantially equally.

According to a further feature of the present invention, the adjustment mechanism includes a rotatable drum associated with the floor, each of the elastic suspension elements being linked to the drum so that rotation of the drum effects simultaneous adjustment of an effective length of all of the elastic suspension elements.

According to a further feature of the present invention, the adjustment mechanism further includes a handle accessible from an upper surface of the floor for manually rotating the drum.

According to a further feature of the present invention, the adjustment mechanism further includes a locking arrangement for locking the drum in at least one position relative to the floor.

5 According to a further feature of the present invention, the adjustment mechanism further includes a ratchet arrangement for allowing rotation of the drum to shorten an effective length of the elastic suspension elements and to inhibit rotation of the drum to lengthen an effective length of the elastic suspension elements.

10 According to a further feature of the present invention, the adjustment mechanism further includes a ratchet override mechanism selectively operable to release the ratchet arrangement to allow rotation of the drum to lengthen an effective length of the elastic suspension elements.

BRIEF DESCRIPTION OF THE DRAWINGS

15 The invention is herein described, by way of example only, with reference to the accompanying drawings, wherein:

FIGS. 1A and 1B are a side view and an isometric view, respectively, of a first embodiment of a container, constructed and operative according to the teachings of the present invention, with a front wall removed to show an elastically suspended floor in an unloaded fully-raised position;

20 FIGS. 2A and 2B are views similar to Figures 1A and 1B, respectively, showing the elastically suspended floor in a partly-loaded intermediate position;

FIGS. 3A and 3B are views similar to Figures 1A and 1B, respectively, showing the elastically suspended floor in a fully-loaded lowered state;

25 FIGS. 4A and 4B are isometric views of the container of Figure 1A in a partly folded state, Figure 4B having a front wall removed to reveal the internal folded configuration;

FIGS. 5A and 5B are isometric views of the container of Figure 1A in a fully folded state, Figure 5B having a front wall removed to reveal the internal folded configuration;

FIGS. 6A and 6B are isometric views of a second embodiment of a container, constructed and operative according to the teachings of the present invention, with a front wall removed to show a floor in a lowered state and in a raised elastically-suspended state, respectively;

FIGS. 7A and 7B are isometric views of the floor and suspension arrangement alone from the container of Figure 6A shown in the lowered state and the raised elastically-suspended state, respectively;

FIGS. 8A and 8B are views similar to Figures 7A and 7B, respectively, cut-away to show details of an adjustment mechanism for adjusting an effective length of said elastic suspension elements;

FIGS. 9A is a view similar to Figure 7B with an upper surface of the floor removed; and

FIGS. 9B and 9C are enlarged views of the region of Figure 9A designated "A" showing a ratchet arrangement in an operative and an overridden state, respectively.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention is a shipping and display container with elastically suspended floor.

The principles and operation of containers according to the present invention may be better understood with reference to the drawings and the accompanying description.

By way of introduction, the present invention is a foldable container in which a shelf or "floor" for supporting produce within the container is suspended via elastic suspension elements from the walls of the container, when in its open state, so as to automatically adjust the height of the floor, and hence of the

produce, as a function of the weight of the produce within the container. The invention will be presented herein with reference to two non-limiting examples: first, a basic embodiment will be described with reference to Figures 1A-5B; then, with reference to Figures 6A-9C, an alternative embodiment including an adjustment mechanism will be described.

Referring now to the drawings, Figures 1A-5B show a container, generally designated **10**, constructed and operative according to the teachings of the present invention, for shipping and display of produce. Generally speaking, container **10** includes a set of four walls **12**, **14**, **16** and **18**, and a floor **20**, deployed within and vertically displaceable relative to the set of walls. A suspension arrangement, including at least four elastic suspension elements **22**, is deployed to suspend floor **20** relative to the set of walls such that, when the floor is loaded with a first load (not shown), the floor assumes a lowered position (Figures 3A and 3B) and, when a part of the load is removed, the suspension arrangement raises the floor towards a raised position (Figures 2A-2B and Figures 1A-1B).

At this stage, it will already be appreciated that the present invention provides a solution to the aforementioned disadvantages of user inconvenience and the psychological “end of the pile” effect by gradually raising the level of the lower produce as a function of the remaining weight as the top layers are removed.

Before addressing the features of the invention in more detail, it will be helpful to define certain terminology as used herein in the description and claims. Firstly, where reference is made to elements being “elastic” or operating “elastically”, it should be noted that these terms are used herein in their broadest sense to refer to any element which provides a resilient restoring force without undergoing significant permanent deformation during each cycle of motion. Thus, the “elastic suspension elements” of the present invention may be implemented using a length of an elastomeric material, a helical spring or any other stretchable element with suitable properties. Most preferably, the

suspension elements are formed, primarily or exclusively, from an elastomer material, such as natural or synthetic rubber. Elastomeric suspension elements are not generally susceptible to damage through bending during folding of the container, which may in certain circumstances be problematic for helical metallic
5 springs or the like.

The term "container" is used herein as a generic term for containers, crates, boxes, bins and the like, independent of the construction materials from which they are formed and independent of whether they have solid walls or open vented structures. Furthermore, the term "container" is used to include a structure
10 in which the suspended floor of the present invention is the only base of the structure formed by the set of four walls.

Turning now to the features of container **10** in more detail, four suspension elements **22** are typically used, although additional suspension elements (e.g., six total) may be optionally be provided, preferably deployed
15 symmetrically. Optionally, the number of suspension elements may be varied, for example by doubling-up each element in each corner, to accommodate produce of different weights. Alternatively, or additionally, the suspension elements may be interchangeably attached, allowing replacement of the suspension elements with suspension elements having different thicknesses, lengths or other
20 mechanical properties, all according to the intended use of the container. Furthermore, combinations of suspension elements of different lengths or otherwise differing properties may be used together to provide a desired force vs. displacement function, for example, rendering the force vs. displacement function more linear than would be achieved with a single elastic suspension
25 element.

Container **10** is preferably of a type where opposite pairs of walls fold inwards. Suspension elements **22** are preferably attached to the pair of walls **12** and **16** configured to fold first. In the preferred implementation illustrated herein, this is the pair of sides **12** and **16** extending along the shorter sides of the

container. This has a particular advantage, as seen in Figures 4B and 5B, that the height of the folding portion of the walls folds into the larger ("length") dimension, thereby reducing the amount of overlap of the folded walls. This minimizes the interference of the first-to-fold side 16 with suspension elements 5 22 of the second-to-fold side 12.

The set of walls optionally feature an arrangement of stopper features 23 (only one shown) deployed to engage the floor so as to define a fully raised position (Figures 1A and 1B). This allows implementation of the suspension elements with a degree of pre-tensioning in the fully raised position so that they 10 reach the fully raised position while there is still some load applied to floor 20. In certain particularly preferred implementations, stopper features 23 are deployed to define a fully raised position of floor 20 which is no higher than the level of hinges in the first-to-fold sides of a foldable container, thereby ensuring that the floor does not reach a position which would interfere with folding of the 15 container walls.

In the particularly preferred implementation shown here, container 10 includes a base 24 fixedly attached to the set of walls below floor 20. This helps to ensure structural integrity and rigidity of the container as a whole, and renders the container usable in a conventional manner if the floor and suspension 20 arrangement are removed. In the preferred implementation shown here, base 24 is configured to provide at least one channel 26, 28 for insertion of a pallet jack (not shown) for lifting the container.

Turning now to Figures 6A-9C, there is shown a second preferred embodiment of a container, generally designated 30, constructed and operative 25 according to the teachings of the present invention. Container 30 is generally similar to container 10 described above, and equivalent elements are designated similarly. It is a particularly preferred feature of this embodiment of the present invention that container 30 includes a suspension-element length adjustment mechanism 32 for adjusting the effective length of the suspension elements 22.

Typically, the “effective length” of the suspension elements is the length from a point of attachment to the container walls to the point of entry to floor 20. Preferably, the suspension-element length adjustment mechanism is manually operable (directly by hand, or by use of a mechanical “key”), and preferably
5 simultaneously adjusts the length of all of the suspension elements in a similar manner.

Provision of a suspension-element length adjustment mechanism serves one or both of two important functions. One function is to allow adjustment of the lifting force to make the mechanism useful for produce of different weights.
10 Thus, for potatoes or watermelons, the suspension elements are shortened more to provide a greater lifting force than for less dense, or less densely packed, produce. As a result, the same container can be used to maintain a comfortable top-of-the-stack level for dispensing a wide range of produce. It will be noted that this function may also be used to advantage in a container which is not
15 foldable.

The second function is release of tension in the suspension elements prior to folding of the container for return shipping or storage, thereby ensuring that there are no potentially dangerous or inconvenient stresses or a tendency to open.

Prior to loading with produce, the effective length of the suspension
20 elements is adjusted (shortened) so as to define a level of tension for the fully loaded state and/or the position of the fully raised state. Here too, mechanical stopper features may be provided to separately define a fully-raised position.

Turning now to the features of this embodiment in more detail, a non-limiting example of a preferred implementation of adjustment mechanism 32 is
25 illustrated in Figures 7A-9C. In this case, the adjustment mechanism is based on a drum or wheel 34, deployed primarily below or within floor 20, to which suspension elements 22 are anchored. Rotation of wheel 34, for example by turning a handle 36 accessible from the upper side of floor 20, causes winding in of suspension elements 22 simultaneously from the state of Figure 8A to that of

Figure 8B, thereby shortening their effective length and/or pre-tensioning them against stopper elements. In the example shown here, the suspension elements wind onto a reduced diameter spool surface which is located between upper and lower disks, the upper disk having been removed in Figures 8A and 8B for clarity of presentation. The handle may be recessed into the floor, or may be a removable "key" used by authorized personnel only. Optionally, a locking mechanism may be operated automatically by folding down of the handle or removal of the key.

Once a desired length or degree of tension is achieved, the wheel is locked against rotation, for example, by insertion of one or more locking pin through holes formed in the wheel and the floor, or more preferably by a ratchet mechanism such as illustrated in Figures 9B and 9C below.

Referring specifically to Figure 9B, drum **34** is here formed with an outer edge formed as a saw-toothed gear wheel against which a spring-biased ratchet arm **38** bears. This configuration allows rotation of the drum clockwise as shown to shorten an effective length of elastic suspension elements **22**, but inhibits rotation of the drum in the reverse direction, preventing lengthening of the elastic suspension elements. This conveniently allows shortening of the suspension elements to raise floor **20** and/or pre-tension it against stopper features, then maintaining the desired level of tension during loading and unloading of produce. When the contents of the container have been removed, lowering of floor **20** is performed by turning a release lever **40** with an eccentric cam form which bears on ratchet arm **38**, disengaging it from the teeth of drum **34** so as to override the ratchet arrangement and allow rotation of the drum to lengthen an effective length of the elastic suspension elements to an inoperative length, allowing floor **20** to assume the position of Figure 6A ready for folding of the container and return transportation.

It will be clear to one ordinarily skilled in the art that many other implementations of a suspension-element length adjustment mechanisms are

possible. By way of a further non-limiting example, a similar result may be achieved by use of a scissors mechanism under the floor. Furthermore, it should be noted that the suspension-element length adjustment mechanism may alternatively be deployed as part of the walls of the container rather than in the
5 floor.

Referring now to both of the above embodiments, the particularly preferred implementations shown here have fold-down openings **42** in an upper part of at least one of the side walls of the container. Because of the rising motion of the floor, these access openings can be positioned relatively high in the walls
10 and still afford sufficient access for a customer to the produce within the container. In the preferred examples illustrated here, the fold-down openings extend down to no more than about a third of the total fillable depth of the container when the floor is in its lowered/loaded state.

The range of motion of floor **20** is preferably at least about 10%, more preferably at least 20%, and most preferably at least 25% of the total fillable
15 depth of the container. The maximum height reached by the floor is typically no more than about 70% of the total fillable depth of the container.

The container may be made from any material. Most preferably, the invention is implemented using molded plastic containers. As mentioned above,
20 the container may be adapted, for example as shown, to be handled by a pallet jack or fork lift.

It will be appreciated that the above descriptions are intended only to serve as examples, and that many other embodiments are possible within the scope of the present invention as defined in the appended claims.

WHAT IS CLAIMED IS:

1. A container comprising:
 - (a) a set of four walls, each of said walls being implemented as a folding wall having at least one folding portion deployable between an upright container-forming position and a folded position;
 - (b) a floor deployed within and vertically displaceable relative to said set of walls; and
 - (c) a suspension arrangement including at least four elastic suspension elements, said suspension arrangement being deployed to suspend said floor relative to said set of walls such that, when said floor is loaded with a first load, said floor assumes a lowered position and, when a part of the load is removed, said suspension arrangement raises said floor towards a raised position.
2. The container of claim 1, wherein each of said elastic suspension elements includes a length of an elastomeric material.
3. The container of claim 1, wherein each of said elastic suspension elements includes a helical spring.
4. The container of claim 1, wherein said set of walls feature an arrangement of stopper features deployed to engage said floor so as to define a fully raised position.
5. The container of claim 4, wherein said stopper features are deployed below said folding portions.

6. The container of claim 1, wherein each of said suspension elements is attached to said folding portion of one of said walls.

7. The container of claim 1, further comprising a base fixedly attached to said set of walls below said floor.

8. The container of claim 7, wherein said base is configured to provide at least one channel for insertion of a pallet jack for lifting the container.

9. The container of claim 1, wherein said suspension arrangement further includes an adjustment mechanism configured for adjusting an effective length of said elastic suspension elements.

10. The container of claim 9, wherein said adjustment mechanism is configured to adjust an effective length of said elastic suspension elements between an operative length wherein said floor is elastically biased towards a raised position and an inoperative length wherein said floor assumes said lowered position even in the absence of an applied load.

11. The container of claim 9, wherein said adjustment mechanism is configured to simultaneously adjust an effective length of all of said elastic suspension elements substantially equally.

12. The container of claim 9, wherein said adjustment mechanism includes a rotatable drum associated with said floor, each of said elastic suspension elements being linked to said drum so that rotation of said drum effects simultaneous adjustment of an effective length of all of said elastic suspension elements.

13. The container of claim 12, wherein said adjustment mechanism further includes a handle accessible from an upper surface of said floor for manually rotating said drum.

14. The container of claim 12, wherein said adjustment mechanism further includes a locking arrangement for locking said drum in at least one position relative to said floor.

15. The container of claim 12, wherein said adjustment mechanism further includes a ratchet arrangement for allowing rotation of said drum to shorten an effective length of said elastic suspension elements and to inhibit rotation of said drum to lengthen an effective length of said elastic suspension elements.

16. The container of claim 15, wherein said adjustment mechanism further includes a ratchet override mechanism selectively operable to release said ratchet arrangement to allow rotation of said drum to lengthen an effective length of said elastic suspension elements.

17. A container comprising:
- (a) a set of four walls;
 - (b) a floor deployed within and vertically displaceable relative to said set of walls; and
 - (c) a suspension arrangement including at least four elastic suspension elements, said suspension arrangement being deployed to suspend said floor relative to said set of walls such that, when said floor is loaded with a first load, said floor assumes a lowered position and, when a part of the load is removed, said suspension arrangement raises said floor towards a raised position, said suspension arrangement further including an adjustment mechanism

configured for adjusting an effective length of said elastic suspension elements.

18. The container of claim 17, wherein said adjustment mechanism is configured to adjust an effective length of said elastic suspension elements between an operative length wherein said floor is elastically biased towards a raised position and an inoperative length wherein said floor assumes said lowered position even in the absence of an applied load.

19. The container of claim 17, wherein said adjustment mechanism is configured to simultaneously adjust an effective length of all of said elastic suspension elements substantially equally.

20. The container of claim 17, wherein said adjustment mechanism includes a rotatable drum associated with said floor, each of said elastic suspension elements being linked to said drum so that rotation of said drum effects simultaneous adjustment of an effective length of all of said elastic suspension elements.

21. The container of claim 20, wherein said adjustment mechanism further includes a handle accessible from an upper surface of said floor for manually rotating said drum.

22. The container of claim 20, wherein said adjustment mechanism further includes a locking arrangement for locking said drum in at least one position relative to said floor.

23. The container of claim 20, wherein said adjustment mechanism further includes a ratchet arrangement for allowing rotation of said drum to shorten an effective length of said elastic suspension elements and to inhibit

rotation of said drum to lengthen an effective length of said elastic suspension elements.

24. The container of claim 23, wherein said adjustment mechanism further includes a ratchet override mechanism selectively operable to release said ratchet arrangement to allow rotation of said drum to lengthen an effective length of said elastic suspension elements.