

A STORAGE ASSEMBLY FOR STORING PERISHABLE MATERIAL

Technical Field

5 The present invention relates, in general terms, to a storage assembly. More particularly, the present invention relates to a storage assembly for storing perishable material, and a method for use of such an assembly.

Background

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Currently, perishable materials are warehoused either in bins or tubs, or by plastic wrapping the perishable materials while they sit on a pallet. Such perishable material may be grain, rice or similar, that is usually stored in flexible bags.

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Bins or tubs are opened topped, rigid receptacles into which the bags of perishable material are deposited. It is time-consuming and cumbersome to lift the bags out of the tubs, and may cause back injury. Moreover, only the top layer of bags is visible. Therefore, it can be difficult to identify whether pests
20 have infiltrated the packaging of the bags and are spoiling the material stored therein.

In general, warehousing involves storing a large amount of goods in vertical racks. Perishable goods, when wrapped in plastic on a pallet, have a tendency
25 to slump (i.e. move and sag) over time. As a result, heavy bags (up to 20kg each, stored in loads of 1 ton) can drop from racking that can be 15m high, 17m high or even higher. This poses a significant safety concern to workers and equipment at ground level beside the racks, and to the racks themselves. Moreover, even if slumping is identified before the perishable goods fall from
30 the racks, slumping perishable goods are poorly balanced on the pallet. This makes removal of the pallet by traditional means – e.g. a forklift – difficult and potentially dangerous.

Pests can also penetrate plastic wrapping relatively easily, to gain access to
35 goods. Holes in plastic wrapping, for example those caused by pests, also

provide points for ingress of oxygen and moisture. Further degradation can also occur due to ultraviolet (UV) light penetration and discolouration of the goods. This affects the market value of the goods over a short period of time. Accordingly, storing goods in plastic wrapping over longer periods of time
5 reduces the value of those goods and becomes rapidly financially unviable.

In addition, there is a huge amount of plastic waste generated by plastic wrapping goods for storage, as the plastic is single-use.

10 It would be desirable to overcome or ameliorate at least one of the above-described problems, or at least to provide a useful alternative.

Summary

15 Disclosed herein is a storage assembly for storing perishable material, including:
a base adapted to store perishable material thereon, the base being adapted for lifting by a pallet lifting machine;
a cover shell comprising:
a top and sidewall, the top and sidewall together being shaped to
20 fit over, and surround, perishable material on the base; and
a sealing member, the sealing member being adapted to seal against the base to substantially inhibit ingress of air into the storage assembly; and
a purging assembly provided on one or both of the base and cover shell,
25 connectable to a modified atmosphere source, and for delivering modified atmosphere into the storage assembly from the modified atmosphere source.

Advantageously, when compared with disposable wrapping of the prior art, the present storage assembly is a returnable, reusable, effective and
30 environmentally sustainable design solution.

The seal created between the cover shell and base can be made substantially air-tight to ensure minimum to zero air leakage.

The cover shell may be substantially rigid and adapted to be lifted and fitted over the perishable material.

5 The rigid structure of the cover shell can enable purging at higher pressure than for a flexible wrapping storage system. The atmosphere can thus rapidly reduce to <1% Oxygen, while inserting Nitrogen.

10 The cover shell may have a cuboid shape with a bottom surface removed so the cover shell can be fitted over the perishable material. In this context, a "cuboid" refers to any generally cubic shape, which includes rectangular prisms.

The base may be substantially flat. The base may comprise an upper surface on which the perishable material is deposited, the upper surface being flat. The cover shell may also seal against that upper surface.

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The cover shell may comprise a lower peripheral edge for abutting the base, to seal against the base. The sealing member may be provided along the lower peripheral edge.

20 The base may comprise a peripheral sealing member, the sealing member of the cover shell contacting the peripheral sealing member to seal the cover shell against the base. The sealing member may comprise an elongate, flexible seal and the peripheral sealing member may comprise a rigid rib that presses into the sealing member to seal the cover shell against the base.

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30 The assembly may further comprise a locking mechanism for fixing the cover shell onto the base. The locking mechanism may be arranged to press the cover shell and base together, to apply pressure to the sealing member. The locking mechanism may comprise one or more locking devices on each of four sides (i.e. of the sidewall) of the cover shell or base. Each locking device may comprise an oval cross-section bar rotatably mounted on a first one of the cover shell and base and extending parallel to the sealing member, and wherein a second, different one of the cover shell and base comprises a projection over which the oval cross-section bar can be fitted, such that rotation of the oval

cross-section bar to point a major axis of the oval cross-section towards the projection increases pressure applied to the sealing member.

5 The purging assembly may comprise one or more valves located on the top of the cover shell or on the sidewall near the top. Where more than one valve is provided, each valve may be accessible from one side of the assembly when stored in a pallet storage system.

10 The base may comprise an upper portion and a lower portion, the upper portion being configured to seal against the cover shell and the lower portion being configured as a pallet.

Also disclosed herein is a method of storing perishable material, including the steps of:

15 loading perishable material onto a base of a storage assembly as described above;
fitting the cover shell over the perishable material, thereby to surround the perishable material;
sealing the cover shell to the base to inhibit ingress of air; and
20 purging the storage assembly, by the purging assembly, with a modified atmosphere.

The cover shell may be substantially rigid, and fitting the cover shell over the perishable material comprises lifting the cover shell over the perishable material
25 and onto the base.

Sealing the cover shell to the base may comprise compressing the sealing member between the sidewall and base. Compressing the sealing member between the sidewall and base may comprise actuating a locking mechanism to
30 press the cover shell onto the base. Actuating the locking mechanism may comprise actuating a plurality of locking devices located along the sealing member when the cover shell is fitted over the perishable material, onto the base.

Purging the storage assembly may comprise connecting the purging assembly to the modified atmosphere source and delivering the modified atmosphere from the source into the storage assembly.

- 5 Advantageously, using storage assemblies in accordance with present teachings can ensure air-tight storage and maintenance of oxygen content at under 1% of the atmosphere within the storage assembly, for a period of at least 6 months from the date on which the cover shell was sealed onto the base.
- 10 As used herein, the term "substantially rigid" as used in relation to the cover shell means the cover shell remains in fixed shape during normal use. This can include lifting the cover shell on to and off from the base. The skilled person will appreciate the sealing member may have some flexibility, without detracting from the function of the general, substantial rigidity of the cover shell.

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- The term "surround", as used in relation to the cover shell (i.e. its top and sidewall) surrounding the perishable material, refers to the sidewall of the cover shell forming most, or the entirety, of the side walls of the storage assembly. Thus, the cover shell and base (which is generally flat or planar) together
- 20 encapsulate or enclose the perishable material.

- The phrase "substantially inhibits ingress of air into the storage assembly" means that the atmosphere within the storage assembly can be modified when compared with the surrounding atmosphere (i.e. that around the storage
- 25 assembly). It is appreciated that, over time, small leaks may allow dilution of the atmosphere within the storage assembly by the surrounding atmosphere.

Brief description of the drawings

- 30 Embodiments of the present invention will now be described, by way of non-limiting example, with reference to the drawings in which:

Figure 1 is a top perspective view of a storage assembly according to an embodiment of the invention;

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Figure 2 is a top perspective view of a base of a storage assembly according to Figure 1;

5 Figures 3a and 3b are side views, respectively offset by 90°, of the base of Figure 2;

Figure 4 is a bottom perspective view of the base of Figure 2;

10 Figure 5 is a top perspective view of multiple bases, each being such as shown in Figure 2, stacked atop one another;

Figure 6 is a side view of two bases according to Figure 2, stacked atop one another and Figure 6a is a close-up, partial view of those two bases;

15 Figure 7 comprises a top and a bottom view of the cover shell of the storage assembly of Figure 1;

20 Figure 8, comprising Figures 8a to 8d, shows an exemplary embodiment of a locking device in a disengaged condition, in a partially engaged condition, and in an engaged condition (in Figures 8a, 8b and 8c respectively) as well as an alternative embodiment of a locking device (in Figure 8d);

Figure 9 is a flow diagram of a method for storing perishable material according to an embodiment of the invention; and

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Figure 10 shows (a) a top perspective view of a storage assembly of Figure 1, close-up partial views of corners of cover shell and base with the cover shell (b) nearly in position on the base and (c) with the cover shell in position on the base, and (d) an illustration of a cover shell in position on a floor.

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Detailed description

Disclosed herein are rigid storage assemblies that are reusable, facilitate easy access to goods stored therein, are not subject to slumping or can contain or
35 limit such slumping (e.g. the substantial rigidity of the cover shell may be

sufficient so that slumping of goods against the internal wall of the cover shell will not distort or deform the cover shell), enable rapid purging of internal atmosphere, protect against ingress of UV light, pests and other contaminants. The storage assemblies comprise a cover shell and base that seal together to
5 contain perishable goods in a reliable and efficient manner.

Such a storage assembly 100 is shown in Figure 1. The storage assembly 100 may be referred to as modified atmosphere packaging (MAP) due to its ability to have its internal atmosphere modified to preserve the perishable goods
10 (herein interchangeably referred to as perishable material(s)) for longer than would be possible in ambient atmosphere.

The storage assembly 100 broadly comprises a base 102 and a cover shell 104. The cover shell 104 includes a top 106 and sidewall 108. The top 106 and
15 sidewall 108 are together shaped to fit over, and surround, perishable material on the base 102. Perishable material is stored on the base 102, and the base 102 is adapted for lifting by a pallet lifting machine – e.g. a forklift. The atmosphere is purged by a purging assembly provided on the cover 104.

20 The purging assembly presently comprises two holes 110 that penetrate the cover shell 104. A modified atmosphere source (not shown) can be connected to these holes by a gas delivery system, to facilitate purging (i.e. delivery of modified atmosphere from the modified atmosphere source into the storage assembly 100). Alternatively, the gas delivery system may form part of the
25 purging assembly. The gas delivery system may comprise a valved inflow conduit connected to one of the two holes 110, and a valved outflow conduit connected to the other of the two holes 110, or any other arrangement that will be understood by the skilled person. In other embodiments, the purging assembly comprises a valve for each of one or more of the holes in the cover
30 shell or base.

With reference to Figure 2, the base 102, which may be referred to as a MAP Box Pallet Base, can have any dimensions. Presently, the base measures 1.2m by 1m (or 1.035m), being the standard pallet dimension for storage racks. The
35 base 102 is substantially flat or has a “flat bed” design. In this context,

"substantially flat" refers to their being, as presently shown, no sidewall or, in other embodiments, only a very short sidewall. This enables perishable material to be laterally loaded onto and unloaded from the pallet base, rather than vertically loaded and unloaded per a tub or bin arrangement.

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In addition, the base 102 forms a continuous surface (i.e. no penetrations/holes/apertures/openings) on which the perishable goods are to be located. This avoids loss of internal atmosphere through the base 102. In some embodiments, the base 102 may comprise holes similar to holes 110, to
10 facilitate monitoring or modification of the internal atmosphere of the storage assembly 100. In this circumstance, the base 102 would not provide an absolutely continuous surface. Such holes may be, or may form part of, the purging assembly in such embodiments.

15 The base 102 comprises a peripheral sealing member 114. The peripheral sealing member 114 extends around a periphery of the base 102. In the present context, a "periphery of the base" will be understood to include a sealing member disposed at the very edge of the base 102, but also to include a sealing member set slightly inwardly of the edge of the base 102. The function of the
20 peripheral sealing member 114 is to be contacted by the sealing member 133 of the cover shell 104 to seal the cover shell 104 against the base 102. Thus, "peripheral", "periphery" and similar will be taken to mean disposed sufficiently toward an edge of the base 102 to facilitate that contact.

25 The peripheral sealing member 114 may be rigid – e.g. formed from the same plastics material as the base 102 as a whole, such as high-density polyethylene (HDPE) or linear low-density polyethylene (LLDPE) – or may comprise a flexible seal. However, it is desirable that the peripheral sealing member be rigid to reduce the likelihood for damage during loading and unloading of perishable
30 goods onto and from the base 102.

The base 102 comprises an upper portion 116 and a lower portion 118 as shown in Figure 3. The upper portion 116 is configured to seal against the cover shell 104 and the lower portion 118 is configured as a pallet. Perishable goods are
35 loaded onto the upper portion 116 and as the cover shell 104 is deposited onto

the base 102, the peripheral sealing member 114 comes into contact with the sealing member 133 of the cover shell 104 to seal the storage assembly 100.

There may be no clear transition from the upper portion 116 to the lower portion
5 118. However, the two portions will fulfil at least their respective functions as described above.

In some embodiments, the base 102 may not comprise the lower portion 118. Instead, the base 102 may be configured to rest upon a pre-existing pallet. For
10 example, the base 102 may comprise a downwardly extending rib or protrusion(s) to fix a location of the base 102 on a pre-existing pallet. Such arrangements will be understood by the skilled person in view of the present disclosure.

15 The base 102 is reinforced with steel rods to ensure rigidity during transportation and storage. This rigidity reduces deformation of the storage assembly 100, thereby mitigating air leakages. Such steel rod arrangements will be understood by the skilled person.

20 The underside 120 of the base 102 comprises a raised surface as shown in Figure 4. The raised surface comprises a series of raised panels 122. These raised panels 122 are positioned to fit within the peripheral sealing member 114 of an adjacent base 102 when a number of bases 102 are stacked atop one another. The stacking of bases is shown in Figure 5, and Figures 6 and 6a show
25 the interleaving or positioning of the raised panels 122 within the peripheral sealing member 114.

This prevents direct contact between the base 102 and the top of the peripheral sealing member 114. Thus, the potential for damage to the peripheral sealing
30 member 114 is reduced which, in turn, reduces the likelihood of damage to the sealing member 133 of the cover shell 104. In addition, the base 102 includes notches 152 – one notch 152 is provided in each corner of the base 102. The cover shell 104 includes a corresponding protrusion 154 for each notch 152. The protrusion 154 is shaped to be received in a respective notch 152. This achieves
35 two purposes: firstly, receiving of protrusions 154 in notches 152 helps to align

the cover shell 104 with and on the base 102; and, secondly, when the cover shell 104 is positioned on the floor 156, the protrusions 154 elevate the sealing member 133 – see Figure 7 – from the floor, thus reducing the potential for damage to the sealing member 133.

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As described with reference to Figure 1, the cover shell 104 comprises a top 106 and sidewall 108. The top 106 and sidewall 108 are together shaped to fit over, and surround, perishable material on the base 102. The cover shell 104 also includes a sealing member 133. The sealing member 133 is adapted to seal
10 against the base 102 to substantially inhibit ingress of air into the storage assembly 100.

The cover shell 104 also includes a lower edge, or lower peripheral edge, 126 as shown in Figure 7, for abutting the base 102 to seal against the base 102.
15 Thus, the lower edge 126 is that which is positioned on the base 102 during use. In the embodiment shown, the sealing member 133 is provided along the lower peripheral edge 126. The sealing member 133 may be considered part of the lower peripheral edge 126.

20 The sealing member 133 is a flexible seal – e.g. an industrial grade rubber seal or silicon gasket. In particular, the sealing member 133 comprises an elongate, flexible seal. The sealing member 133 forms a continuous loop – although it may be made from one or more fixed lengths of sealing material disposed end-to-end – on the cover shell 104.

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In some embodiments, the base 102 may not have any corresponding sealing member, such as the peripheral sealing member 114. Instead, the sealing member 133 of the cover shell may conform to part of the base 102 – e.g. the top surface of the base 102 – and thereby form a seal. However, presently, the
30 sealing member 133 seals against the peripheral sealing member 114 of the base 102 to seal the cover shell 104 and base 102 together. To this end, as shown in Figure 2, the peripheral sealing member 114 comprises a rigid rib that presses into the sealing member 133 to seal the cover shell 104 against the base 102.

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The cover shell 102 is substantially rigid and adapted to be lifted and fitted over the perishable material. The perishable material is thereby contained in the storage assembly 100 in an air-tight manner when the sealing member 133 seals against the base 102. It will be appreciated that air-tight seals may, over
5 time, experience some small amount of leakage. As such, "air-tight" does not mean that under no circumstances will there be loss or dilution of internal atmosphere (i.e. the atmosphere within the storage assembly 100 when the cover shell 104 and base 102 are sealed together), in perpetuity. A reasonable construction should be taken of the term "air-tight".

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The cover shell 104 has a cuboid shape – e.g. cubic or, in the present case, a rectangular prism – with a bottom surface removed so the cover shell 104 can be fitted over the perishable material. The base 102 thus forms the bottom surface of the cuboid shape. While the shape is a cuboid shape, there may be a
15 slight taper of the cover shell 104 – e.g. upward taper when the cover shell 104 is in use on the base 102 – and its corners or edges may be rounded. However, the general cuboid shape will be clearly observable as shown in Figure 1.

The storage assembly 100, including cover shell 104, is 1.35 meters tall and is
20 thus, with the base dimensions specified above, suitable for Very Narrow Aisle ("VNA") racking storage. Moreover, the storage assembly 100 will desirably have a gross weight that does not exceed 30kg and can withstand content weight – weight of perishable goods – of up to 1 metric ton.

25 The cover shell 104 shown in Figure 7 is made from LLDPE through rotational moulding. Other fabrication processes may be used. The sidewall 108 is presently 4mm thick as indicated by arrows X, though any desired thickness can be used. The cover shell 104, and/or the base 102, can be made from fire resistant material, flame retardant material, UV-stabilised, non-toxic material
30 and materials having other combinations of properties. The cover shell 104 and/or base 102 may also be a multi-layered structure formed by, for example, an internal wall and external casing between which is an air gap or insulation, to improve temperature control within the storage assembly 100.

Similar to the base 102, the cover shell 104 may include a reinforced steel frame (not shown). The frame may be embedded into the cover during manufacturing process, to provide additional strength at the seal and reduce warpage of the cover shell 104 during movement and storage. In some embodiments, the atmosphere within the storage assembly 100 will be purged prior to racking the storage assembly 100, and thus it is necessary to ensure warping does not occur so that gaps are not temporarily created between the cover shell 104 and base 102, and the modified atmosphere within the storage assembly 100 is not diluted by mixing with ambient atmosphere during racking.

The cover shell 104 may be made sufficiently strong so that negative or positive pressure can be used in the internal atmosphere. Alternatively, the pressure within the assembly may be the same as ambient atmospheric pressure around the assembly.

The perishable goods for which the storage assembly 100 is envisaged to be used will be edible goods, such as rice and other grains. Particularly for long-term storage – e.g. 6 to 12 months – it is important that the atmosphere within the storage assembly 100 be maintained to reduce oxidation of the perishable goods. As mentioned above, the atmosphere may be modified through 2 holes 110, which are presently each shaped to receive a quick coupling valve: one such valve will be used for Nitrogen insertion or delivery (i.e. modified atmosphere delivery) and the other such valve will be used for oxygen or ambient environment extraction – or, in any case, extraction of the atmosphere within the storage assembly 100.

Thus, in an embodiment, the purging assembly comprises one or more valves located on the top 106 of the cover shell 104 or on the sidewall 108 near the top 106, so that the valve or valves can be accessed from one side of the assembly 100 (e.g. the same side regardless of the number of valves) when stored in a pallet storage system such as racks.

In addition, a sample port 128 – see Figure 1 – may be installed to enable sampling of the internal atmosphere (i.e. the atmosphere within the storage assembly 100), by manual or automated means.

To ensure the cover shell 104 remains in fixed position on the base 102, the storage assembly comprises a locking mechanism 112 for fixing the cover shell onto the base – see Figure 1. The locking mechanism 112 is arranged to press
5 the cover shell 104 and base 102 together, to apply pressure to the sealing member 133.

To achieve this, the locking mechanism 112 shown in a disengaged/unlocked condition in Figure 8a includes a plurality of locking devices 130 on each of four
10 sides of the cover shell 104 and base 102 – in some embodiments, there may be a single locking device, or more than one locking device as needs be. Each locking device 130 is formed in two parts, with one part 131 on the cover shell 104 and one part 138 on the base 102, the two parts engaging to fix the cover shell 104 to the base 102. In the present case, each locking device 130
15 comprises a locking bar 132 (presently having a handle 140) that extends parallel to the sealing member 133 and is movably (e.g. rotatably) mounted on the cover shell 104 – it may be similarly mounted to the base 102 in other embodiments. The locking bar 132 is mounted by arms 134 to opposite sides of a projection 136 and can be rotated on the arms 134 (though, in some cases,
20 the bar 132 may be integrally formed with/fixed in position on the arms 134 and thus not rotatable thereon). A corresponding projection 138 is provided on the base 102, for each locking device 130. Upon positioning the cover shell 104 on the base 102, the projections 136 of each locking device 130 align and the bar 132 can be rotated over the pair of projections 136, 138 to hold them
25 together as shown in Figure 8b.

The locking bar 132 has an oval cross-section, or an otherwise irregular cross-section, such that it has a major axis and a minor axis. Presently, rather than providing an oval cross-section along the full length of the bar 132, the bar 132
30 instead has a series of projections 139 that provide an oval (or generally oval) cross-section at locations where there is a projection. Thus, the major axis extends at relevant locations (i.e. where there is a projection) through the projections – in an upward direction, along axis X-X, with reference to Figure 8a – whereas the minor axis extends transversely thereto – in an upward direction
35 with reference to Figure 8b, and along axis Y-Y in Figure 8a. Once the bar 132

is positioned over the projections 136, 138 the major axis points inwardly with respect to the storage assembly 100 as shown in Figure 8b – e.g. perpendicular to the sealing member 133. Rotation of the bar 132 to point the major axis towards the projection 138, and thus generally towards the sealing member
5 133, increases pressure applied to the sealing member 133 – see Figure 8c.

Slightly modified embodiments are shown in Figure 8d. The slightly modified locking device includes a bar 132' having an oval cross-section, a handle 140' and arms 134', the arms 134' being essentially the same as arms 134. A further
10 modification is shown by oval cross section bar 132'' which is angled slightly (e.g. at 45° to arms 134') to facilitate insertion under projection 138 and, upon rotation of the handle 140' by 90° downwardly towards the base, will rotate such that the major axis of the cross-section of the bar 132'' points upwardly and away from the assembly. Thus, the handle 140' in each case is biased to remain
15 in the locked condition.

The present locking devices, also referred to as locking clamps, may be able to withstand a force in excess of 200kg, each.

20 The storage assembly 100 can be manufactured by rotational moulding, injection moulding or another process. The material can be any suitable material, such as HDPE or LLDPE. The storage assembly is reusable but may also be selected to be formed, partially or entirely, from recyclable materials such that in the event of damage to the cover shell 104 or base 102 (which may
25 be referred to as a pallet base 102), they can be recycled.

As a result, storage assembly 100 is a returnable container or assembly that is sufficiently robust for use both as internal storage and for external delivery.

30 Figure 9 is a flow chart of a method 142 of storing perishable material – e.g. using the storage assembly 100. The method 142, broadly includes the steps of:

Step 144: loading perishable material onto a base of a storage assembly 100;

Step 146: fitting the cover shell 104 over the perishable material, thereby to surround the perishable material;

Step 148: sealing the cover shell 104 to the base 102 to inhibit ingress of air; and

5 Step 150: purging the storage assembly, by the purging assembly 110, with a modified atmosphere.

As described with reference to Figure 1, the cover shell 104 is substantially rigid. Fitting the cover shell 104 over the perishable material per step 146 will
10 generally involve lifting the cover shell 104 over the perishable material (not shown) and onto the base 102.

Step 148, of sealing the cover shell 104 to the base 102, can involve compressing the sealing member 133 between the sidewall 108 and base 102.
15 This may be achieved by actuating a locking mechanism, such as locking mechanism 112, to press the cover shell 104 onto the base 102. For example, using the oval cross-section bar 132 described with reference to Figure 8, compression can be achieved to press the cover shell 104 and base 102 together. In this embodiment, there are multiple locking devices, and thus step
20 148 will involve actuating the plurality of locking devices 130, which will be located along the sealing member 133 when the cover shell 104 is fitted over the perishable material, onto the base 102. The locking devices 130 may be actuated in a specific sequence, or by any other process.

25 Step 150 involves purging the storage assembly 100, for example, by connecting the purging assembly to a modified atmosphere source (i.e. a source, such as a gas canister or reservoir, containing the modified atmosphere for delivery to one or more of said assemblies) and delivering the modified atmosphere (e.g. Nitrogen and/or other inert and/or non-toxic gas) from the
30 source into the storage assembly 100.

An overall objective of the storage assembly, or MAP Box, 100 may be to allow Nitrogen Purging (displacing oxygen with nitrogen), to take place with 2 valves (nitrogen inbound and air vacuuming) and to achieve an oxygen level of under
35 2% within the MAP Box 100.

The top cover or cover shell 104 design allows the user to stack goods (e.g. rice) onto a pallet – base 102 – using their normal stacking process and to cover the loaded pallet with the cover shell 104. The cover shell 104 is designed with
5 a silicone, or similar, seal to create an air tight environment within the storage assembly 100.

In the present embodiment, purging with modified atmosphere amounts to Nitrogen purging. This process is effective to reduce oxygen (O_2) levels to PPM
10 (parts per million) level.

Personnel only need to attach 2 hoses – e.g. onto holes 110 – and then start the purging process at the touch of one button on a programmable logic control (PLC) control panel. One hose is connected for Nitrogen (N_2) insertion, and the
15 other for Oxygen (O_2) extraction, as discussed above. The purging process is anticipated to take 3 - 5 minutes per storage assembly to achieve $<1\%$ O_2 .

Purging may be reiterated, or topped up, periodically. This will be done in the event that the O_2 level in the storage assembly 100 increases to an undesirable
20 level. To determine when to perform further purging, an oxygen or gas sensor may be attached to, or integrated into, the storage assembly 100. For example, a sensor may be attached to a port 128 of Figure 1.

The above storage assembly 100 and method of use 142 endeavour to provide
25 a reusable storage methodology that facilitates rapid purging of internal atmosphere, long storage life and without degradation of contents.

It will be appreciated that many further modifications and permutations of various aspects of the described embodiments are possible. Accordingly, the
30 described aspects are intended to embrace all such alterations, modifications, and variations that fall within the spirit and scope of the appended claims.

Throughout this specification and the claims which follow, unless the context requires otherwise, the word “comprise”, and variations such as “comprises”
35 and “comprising”, will be understood to imply the inclusion of a stated integer

or step or group of integers or steps but not the exclusion of any other integer or step or group of integers or steps.

5 The reference in this specification to any prior publication (or information derived from it), or to any matter which is known, is not, and should not be taken as an acknowledgment or admission or any form of suggestion that that prior publication (or information derived from it) or known matter forms part of the common general knowledge in the field of endeavour to which this specification relates.

Claims

1. A storage assembly for storing perishable material, including:
 - a base adapted to store perishable material thereon, the base being
 - 5 adapted for lifting by a pallet lifting machine;
 - a cover shell comprising:
 - a top and sidewall, the top and sidewall together being shaped to fit over, and surround, perishable material on the base; and
 - a sealing member, the sealing member being adapted to seal
 - 10 against the base to substantially inhibit ingress of air into the storage assembly; and
 - a purging assembly provided on one or both of the base and cover shell, connectable to a modified atmosphere source, and for delivering modified atmosphere into the storage assembly from the modified atmosphere source;
 - 15 wherein the base comprises a peripheral sealing member, and the sealing member of the cover shell contacts the peripheral sealing member to seal the cover shell against the base.
2. An assembly according to claim 1, wherein the cover shell is substantially
- 20 rigid and adapted to be lifted and fitted over the perishable material.
3. An assembly according to claim 2, wherein the cover shell has a cuboid shape with a bottom surface removed so the cover shell can be fitted over the perishable material.
- 25 4. An assembly according to any preceding claim, wherein the base is substantially flat.
5. An assembly according to any preceding claim, further comprising a
- 30 locking mechanism for fixing the cover shell onto the base.
6. An assembly according to claim 5, wherein the locking mechanism is arranged to press the cover shell and the base together, to apply pressure to the sealing member.

7. An assembly according to claim 5 or 6, wherein the locking mechanism comprises one or more locking devices on each of four sides of the cover shell or the base.
- 5 8. An assembly according to claim 7, wherein each locking device comprises an oval cross-section bar rotatably mounted on a first one of the cover shell and the base and extending parallel to the sealing member, and wherein a second, different one of the cover shell and the base comprises a projection over which the oval cross-section bar can be fitted, such that rotation of the oval cross-
10 section bar to point a major axis of the oval cross-section towards the projection increases pressure applied to the sealing member.
9. An assembly according to any preceding claim, wherein the purging assembly comprises one or more valves located on the top of the cover shell or
15 on the sidewall near the top, so that the valve or valves are accessible from one side of the assembly when stored in a pallet storage system.
10. An assembly according to any preceding claim, wherein the base comprises an upper portion and a lower portion, the upper portion being
20 configured to seal against the cover shell and the lower portion being configured as a pallet.
11. An assembly according to any preceding claim, wherein the cover shell comprises a lower peripheral edge for abutting the base, to seal against the
25 base.
12. An assembly according to claim 11, wherein the sealing member is provided along the lower peripheral edge.
- 30 13. An assembly according to claim 4, wherein the sealing member comprises an elongate, flexible seal and the peripheral sealing member comprises a rigid rib that presses into the sealing member to seal the cover shell against the base.