

WHAT IS CLAIMED IS:

1. A passively-controlled shipping system for temperature-sensitive materials, the passively-controlled shipping system comprising:
 - (a) an insulated container, the insulated container having a payload space dimensioned to accommodate a pallet and a pallet-sized payload; and
 - (b) a quantity of phase-change material disposed within the insulated container;
 - (c) wherein the passively-controlled shipping system is dimensioned so that four such shipping systems may be seated within the footprint of a PMC sheet having dimensions of 125 inches x 96 inches.
2. The passively-controlled shipping system as claimed in claim 1 wherein the passively-controlled shipping system has maximum outer length and width dimensions of about 61¼ inches and about 47¼ inches, respectively.
3. The passively-controlled shipping system as claimed in claim 2 wherein the passively-controlled shipping system has a maximum outer height of less than 64 inches.
4. The passively-controlled shipping system as claimed in claim 3 wherein the passively-controlled shipping system has a maximum outer height of about 62½ inches.
5. The passively-controlled shipping system as claimed in claim 1 wherein the payload space is dimensioned to accommodate alternatively a standard US-sized pallet and corresponding payload and a standard European-sized pallet and corresponding payload.
6. The passively-controlled shipping system as claimed in claim 1 wherein the passively-controlled shipping system is configured to maintain a payload disposed within the insulated container within a desired temperature range for at least 4 days.
7. The passively-controlled shipping system as claimed in claim 6 wherein the passively-controlled shipping system is configured to maintain a payload disposed within the insulated container within a desired temperature range for at least 5 days.
8. The passively-controlled shipping system as claimed in claim 6 wherein the desired temperature range is 2°C to 8°C.
9. The passively-controlled shipping system as claimed in claim 6 wherein the desired temperature range is 15°C to 25°C.

10. The passively-controlled shipping system as claimed in claim 1 wherein the passively-controlled shipping system is configured to withstand being stacked two-high when not in use without undergoing structural damage.
- 5 11. The passively-controlled shipping system as claimed in claim 10 wherein the passively-controlled shipping system has a tare weight of about 500-525 kg.
12. The passively-controlled shipping system as claimed in claim 11 wherein the passively-controlled shipping system has a maximum payload weight of about 700 kg.
- 10 13. The passively-controlled shipping system as claimed in claim 1 wherein the insulated container comprises a frame, the frame defining a closed space, the closed space comprising the payload space.
14. The passively-controlled shipping system as claimed in claim 13 wherein the frame is made of a composite material.
- 15 15. The passively-controlled shipping system as claimed in claim 14 wherein the composite material comprises a fiberglass composite.
16. The passively-controlled shipping system as claimed in claim 15 wherein the frame has a wall thickness not exceeding about 6 mm.
17. The passively-controlled shipping system as claimed in claim 13 wherein the insulated container further comprises at least one vacuum insulated panel, the at least one vacuum insulated panel being disposed outside the frame.
- 20 18. The passively-controlled shipping system as claimed in claim 17 wherein the frame comprises a bottom, a top, a front, a rear, a left side, and a right side, wherein the at least one vacuum insulated panel disposed outside the frame comprises a plurality of vacuum insulated panels disposed outside the frame, and wherein at least one of the plurality of vacuum insulated panels is aligned with each of the bottom, the top, the front, the rear, the left side, and the right side of the frame.
- 25 19. The passively-controlled shipping system as claimed in claim 13 wherein the frame comprises at least one thermal break to minimize heat conduction between the closed space within the frame and a space external to the frame.
- 30 20. The passively-controlled shipping system as claimed in claim 19 wherein the at least one thermal break comprises at least one through opening formed in the frame.

21. The passively-controlled shipping system as claimed in claim 20 wherein the frame comprises a bottom, a top, a front, a rear, a left side, and a right side and wherein the at least one thermal break comprises a plurality of through openings in the front and a plurality of through openings in the bottom, none of the through openings
5 being in fluid communication with the enclosed space of the frame.
22. The passively-controlled shipping system as claimed in claim 13 wherein the quantity of phase-change material is disposed within the frame.
23. The passively-controlled shipping system as claimed in claim 22 wherein the quantity of phase-change material is distributed amongst a plurality of phase-
10 change material assemblies, the phase-change material assemblies being coupled to the interior of the frame.
24. The passively-controlled shipping system as claimed in claim 23 wherein the phase-change material consists of a single type of phase-change material.
25. The passively-controlled shipping system as claimed in claim 23 wherein the
15 phase-change material comprises a plurality of different types of phase-change material.
26. The passively-controlled shipping system as claimed in claim 25 wherein the plurality of different types of phase-change material comprises a first phase-change material and a second phase-change material, the first phase-change material being
20 positioned exclusively in a top portion of the enclosed space of the frame and the second phase-change material being positioned exclusively in a bottom portion of the enclosed space of the frame.
27. The passively-controlled shipping system as claimed in claim 23 further comprising a plurality of heat-spreaders, the heat-spreaders being disposed between the payload
25 space and the phase-change material assemblies.
28. The passively-controlled shipping system as claimed in claim 1 wherein the insulated container comprises a frame, an outer shell, and a plurality of vacuum insulated panels, the frame encompassing the payload space, the outer shell being
30 positioned outside of the frame, the vacuum insulated panels being positioned outside of the frame, at least some of the vacuum insulated panels being positioned between the frame and the outer shell.
29. The passively-controlled shipping system as claimed in claim 28 wherein the quantity of phase-change material is distributed amongst a plurality of phase-

change material assemblies, the phase-change material assemblies being coupled to the interior of the frame.

30. The passively-controlled shipping system as claimed in claim 29 further comprising a plurality of heat-spreaders, the heat-spreaders being disposed interior to the phase-change material assemblies.

31. A passively-controlled shipping system for temperature-sensitive materials, the passively-controlled shipping system comprising:

(a) a frame, the frame defining a closed space;

(b) an outer shell, the outer shell being disposed exterior to the frame;

(c) a plurality of vacuum insulated panels, the plurality of vacuum insulated panels being disposed exterior to the frame, with at least some of the vacuum insulated panels positioned between the frame and the outer shell;

(d) a plurality of phase-change material assemblies, the plurality of phase-change material assemblies being disposed interior to the frame; and

(e) a plurality of heat-spreaders, the plurality of heat-spreaders being disposed interior to the phase-change material assemblies.

32. The shipping system as claimed in claim 31, wherein the frame comprises at least one thermal break to minimize heat conduction between the closed space and a space external to the frame.

33. The shipping system as claimed in claim 32 wherein the frame comprises at least one vertical wall, the vertical wall comprising at least one vertical rib.

34. The shipping system as claimed in claim 31 wherein the frame comprises at least one inwardly-facing cavity and at least one outwardly-facing cavity, wherein at least one of the phase-change material assemblies is disposed within one of the at least one inwardly-facing cavity and wherein at least one vacuum insulated panel is disposed within one of the at least one outwardly-facing cavity.

35. The shipping system as claimed in claim 31 wherein at least one of the plurality of heat-spreaders comprises a first portion and a second portion, the first portion and the second portion being hingedly interconnected, the first portion being permanently attached to the frame, the second portion being removably attachable to the frame.

36. The shipping system as claimed in claim 31 wherein the frame comprises a door, the door being hingedly connected to a remainder of the frame.

37. The shipping system as claimed in claim 11 wherein the door hinge comprises a pair of wings interconnected by a flexible bridge and wherein the wings are not mounted parallel to one another.

38. A phase-change material assembly comprising:

- 5 (a) a curtain, the curtain comprising a plurality of pockets, wherein each of the pockets has a pair of ends, each of the pair of ends being permanently closed, wherein at least one of the permanently closed ends is closed only at one or more spots, thereby permitting visual inspection of the contents of the pocket; and
- 10 (b) at least one phase-change material pack disposed within at least some of the pockets, the contents of the at least one phase-change material pack being visible through the end of the pocket closed only at one or more spots.