VACUUM INSULATION FOR AN INTEGRATED REFRIGERATED CONTAINER

FIELD OF INVENTION

[0001] This invention relates generally to a transport refrigeration system and, more particularly, to vacuum insulation bags to be used with blown polyurethane foam to increase the insulation properties of an integrated refrigerated container.

DESCRIPTION OF RELATED ART

[0002] Products such as produce, meat and the like being shipped relatively long distances are conventionally placed within refrigerated containers. These refrigerated containers are specifically designed for conditioning an interior space with a temperature for the products for an extended period of time. The refrigerated containers utilize a transport refrigeration unit for cooling these products during transport. The refrigeration unit is typically secured to the front wall of the refrigerated container and circulates cooled air inside the interior space through evaporator fans which direct the air from the front of the container to the rear.

[0003] Generally, insulation and air leakage is a concern when shipping produce and meat in these refrigerated containers. Typically, refrigerated containers use polyurethane cell foam technology that is injected into the gap separating the outer wall from the inner liner. The polyurethane foam is used for both its insulation properties as well as for its structural integrity. But, air leakage and heat transfer is still an issue when using the polyurethane foam. An insulation technology is required that will overcome the drawbacks of the current cell foam technology being utilized.

BRIEF SUMMARY

[0004] According to one aspect of the invention, an insulation system for a cargo container includes at least one wall having an exterior panel and an interior liner, the exterior panel and the interior liner being substantially parallel to each other; a cavity disposed between the exterior panel and the interior liner, the cavity being coextensive with a surface area of each of the exterior panel and the interior liner; and at least one vacuum insulation bag disposed within the cavity, the at least one vacuum insulation bag being configured for insulating the interior liner from the exterior panel.

[0005] According to another aspect of the invention, a method for insulating a cargo container includes providing at least one wall having an exterior panel and an interior liner, the exterior panel and the interior liner being coextensive to each other; and positioning at least one vacuum insulation bag within a cavity, the at least one vacuum insulation bag being configured for insulating the interior liner from the exterior panel. Also, the cavity is disposed between the exterior panel and the interior liner, the cavity being coextensive with a surface area of each of the exterior panel and the interior liner.

[0006] Other aspects, features, and techniques of the invention will become more apparent from the following description taken in conjunction with the drawings.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0007] Referring now to the drawings wherein like elements are numbered alike in the FIGURES:

[0008] FIG. 1 illustrates a perspective view of an integrated container with a refrigeration system according to an embodiment of the invention;

[0009] FIG. 2 illustrates schematic top view of a cross-section of the side wall of the integrated container according to an embodiment of the invention; and

[0010] FIG. 3 illustrates a top view of a cross-section of the side wall of the integrated container but with reinforcement members inserted within the side wall according to an embodiment of the invention.

DETAILED DESCRIPTION

[0011] Embodiments of an insulated integrated refrigerated container include walls that are formed from an inner liner and an exterior panel and enclose one or more vacuum insulation bags. In embodiments, the vacuum insulated bags are confined or sandwiched within a cavity provided between each of an exterior panel and inner liner, side and rear walls, roof, and floor or in combination with other commonly used insulation materials for improving the insulation properties of insulated integrated refrigerated container. In an embodiment, the vacuum insulation bags are attached to an interior surface of the exterior panel and can be held in place with polyurethane foam having a blowing agent that fills the cavity after the vacuum insulation bags are attached. Other embodiments include reinforcing members when

VACUUM INSULATION FOR AN INTEGRATED REFRIGERATED CONTAINER

FIELD OF INVENTION

[0001] This invention relates generally to a transport refrigeration system and, more particularly, to vacuum insulation bags to be used with blown polyurethane foam to increase the insulation properties of an integrated refrigerated container.

DESCRIPTION OF RELATED ART

[0002] Products such as produce, meat and the like being shipped relatively long distances are conventionally placed within refrigerated containers. Usually, such products are transported in intermodal/ISO shipping containers of the type disclosed in US 5678715 and US2009242552. They may contain an inflatable pillow tank of the type disclosed in US2006/078412 or special ventilating systems such the one disclosed in GB2197638 to assist in the cooling of the produce. Nevertheless, refrigerated containers are specifically designed for conditioning an interior space with a temperature for the products for an extended period of time. The refrigerated containers utilize a transport refrigeration unit for cooling these products during transport. The refrigeration unit is typically secured to the front wall of the refrigerated container and circulates cooled air inside the interior space through evaporator fans which direct the air from the front of the container to the rear.

[0003] Generally, insulation and air leakage is a concern when shipping produce and meat in these refrigerated containers. Typically, refrigerated containers use polyurethane cell foam technology that is injected into the gap separating the outer wall from the inner liner. The polyurethane foam is used for both its insulation properties as well as for its structural integrity. But, air leakage and heat transfer is still an issue when using the polyurethane foam. An insulation technology is required that will overcome the drawbacks of the current cell foam technology being utilized.

BRIEF SUMMARY

[0004] According to one aspect of the invention, an insulation system for a cargo container includes at least one wall having an exterior panel and an interior liner, the exterior panel and the interior liner being substantially parallel to each other; a cavity disposed between the exterior panel and the interior liner, the cavity being coextensive with a surface area of each of the exterior panel and the interior liner; and at least one vacuum insulation bag disposed within the cavity, the at least one vacuum insulation bag being configured for insulating the interior liner from the exterior

panel.

[0005] According to another aspect of the invention, a method for insulating a cargo container includes providing at least one wall having an exterior panel and an interior liner, the exterior panel and the interior liner being coextensive to each other; and positioning at least one vacuum insulation bag within a cavity, the at least one vacuum insulation bag being configured for insulating the interior liner from the exterior panel. Also, the cavity is disposed between the exterior panel and the interior liner, the cavity being coextensive with a surface area of each of the exterior panel and the interior liner.

[0006] Other aspects, features, and techniques of the invention will become more apparent from the following description taken in conjunction with the drawings.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0007] Referring now to the drawings wherein like elements are numbered alike in the FIGURES:

[0008] FIG. 1 illustrates a perspective view of an integrated container with a refrigeration system according to an embodiment of the invention;

[0009] FIG. 2 illustrates schematic top view of a cross-section of the side wall of the integrated container according to an embodiment of the invention; and

[0010] FIG. 3 illustrates a top view of a cross-section of the side wall of the integrated container but with reinforcement members inserted within the side wall according to an embodiment of the invention.

DETAILED DESCRIPTION

[0011] Embodiments of an insulated integrated refrigerated container include walls that are formed from an inner liner and an exterior panel and enclose one or more vacuum insulation bags. In embodiments, the vacuum insulated bags are confined or sandwiched within a cavity provided between each of an exterior panel and inner liner, side and rear walls, roof, and floor or in combination with other commonly used insulation materials for improving the insulation properties of insulated integrated refrigerated container. In an embodiment, the vacuum insulation bags are attached to an interior surface of the exterior panel and can be held in place with polyurethane foam having a blowing agent that fills the cavity after the vacuum insulation bags are attached. Other embodiments include reinforcing members when