ABSTRACT

A process for manufacturing a seamless refrigerator liner involves providing a plastic refrigerator box liner having an opening providing access to the interior thereof and a flange around each opening. A casing is positioned over the liner, the casing having an opening corresponding to the opening in the liner such that the flange of the liner opening extends through the casing opening. The flange is heated such that it melts and conforms to the shape of the casing opening thereby forming a seamless joint.
SEAMLESS REFRIGERATOR LINER AND PROCESS FOR MANUFACTURING SAME

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a process for manufacturing a seamless refrigerator liner. The invention is also directed to the seamless refrigerator liner itself.

[0002] Food service catering trucks are kitchens on wheels. Apart from cooking equipment and accessories, a food service catering truck kitchen is typically equipped with one or more refrigeration units. Federal standards for food service catering trucks require that commercial refrigeration units maintain a certain level of cleanliness. Current methods of constructing refrigeration units and liners therefor create grooves and other surfaces on the refrigeration unit or liner that are difficult to clean to the level required by federal standards.

[0003] Accordingly, there is a need for a refrigeration unit and liner therefor that is easier to clean because of the lack of grooves and/or other surfaces that trap dirt and other contaminants. The present invention fulfills these needs and provides other related advantages.

SUMMARY OF THE INVENTION

[0004] The present invention is directed to a process for manufacturing a seamless refrigerator liner. The process comprises the steps of providing a plastic refrigerator box liner having an opening which provides access to the interior thereof, the liner opening having a flange. The next step involves insulating the liner around said liner opening. A casing is then positioned over the liner. The casing has an opening corresponding to the liner opening such that the flange of the liner opening extends through the casing opening. The flange that extends through the casing opening is then heated such that it melts and conforms to the shape of the casing opening to form a seamless breaker joint.

[0005] The liner opening is created by cutting an offset frame of the liner to form the opening. The offset frame has a flange that remains when the frame is cut. The casing comprises an outer shell, a front casing and a top cover. The casing opening is created by cutting the front face of the casing to form the same. The flange is preferably heated using a jet air furnace that melts the flange conforming to the shape of the casing opening.

[0006] The refrigerator box liner is then inserted into an insulation mold and polyurethane foam insulation is injected into a gap between the liner and the mold. The liner may include a second offset frame with a flange on a top counter of the liner. A second liner opening may then be cut in the offset frame on the top counter and the top cover of the casing may be cut to form a second casing opening corresponding to the opening cut in the top counter of the liner. The second casing opening is aligned with the second liner opening such that the flange of the second liner opening extends through the second casing opening. As with the other flange, the flange extending through the second casing opening is heated such that it melts and conforms to the shape of the second casing opening to form another seamless breaker joint. A refrigerator door is installed over the openings to complete construction of the refrigerator.

[0007] A seamless refrigerator liner comprises a plastic refrigerator box liner having an opening providing access to the interior thereof and a flange around the liner opening. A casing surrounds the liner, the casing having an opening corresponding to the liner opening such that the flange extends through the casing opening. A seamless breaker joint is formed around the casing opening by melting the flange extending therethrough.

[0008] The liner is preferably made from linear low density polyethylene. The liner also preferably has three front openings and one top opening. Insulation is preferably placed between the liner and the casing, the insulation comprising polyurethane foam. The casing is preferably made from stainless steel. Other features and advantages of the present invention will become apparent from the following more detailed description, taken in conjunction with the accompanying drawings which illustrate, by way of example, the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The accompanying drawings illustrate the invention. In such drawings:

[0010] FIG. 1 is a perspective view of the refrigerator box liner of the present invention;

[0011] FIG. 2 is a perspective view of the refrigerator box liner of the present invention showing the offset frames and flanges;

[0012] FIG. 3 is a perspective view of a refrigerator box liner of the present invention with the offset frames cut out;

[0013] FIG. 4 is a perspective view of a refrigerator box liner of the present invention showing the installation of the outer shell and top cover of the casing as well as insulation around the liner opening;

[0014] FIG. 5 is a perspective view of the refrigerator box liner of the present invention after the outer shell and top cover of the casing have been installed as well as the insulation around the openings;

[0015] FIG. 6 is a perspective view of the refrigerator box liner of the present invention showing the installation of the front face of the casing;

[0016] FIG. 7 is a perspective view of the refrigerator box liner of the present invention after the front face of the casing has been installed;

[0017] FIG. 8 is a perspective view of the refrigerator box liner of the present invention showing the installation of the top cover of the casing;

[0018] FIG. 9 is a cross-sectional view of the refrigerator box liner of the present invention taken along the line 9-9 of FIG. 7;

[0019] FIG. 10 is a cross-sectional view of the refrigerator box liner of the present invention taken along line 10-10 of FIG. 8;

[0020] FIG. 11 is a cross-sectional view of the refrigerator box liner of the present invention taken along line 11-11 of FIG. 7; and

[0021] FIG. 12 is a cross-sectional view of the refrigerator box liner of the present invention taken along line 12-12 of FIG. 8.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0022] The present invention is directed to a process for manufacturing a seamless refrigerator box liner and the seamless refrigerator box liner itself. FIGS. 1 through 11 illustrate the steps in constructing a seamless refrigerator box liner according to the present invention. FIG. 1 shows a plastic
refrigerator box liner 10. The refrigerator box liner 10 has at least one offset frame 12 configured to form one or more openings in the refrigerator box liner. Each offset frame 12 has a flange 14 around the frame 12. As illustrated in FIG. 2, each offset frame 12 is cut around its outer edge 16 (illustrated by the dotted lines) such that the flange 14 is left around the resulting opening 18, as shown in FIG. 3. Insulation 20 is then placed around each of the openings 18 and an outer shell 22 of a stainless steel casing is positioned around the liner 10. The step of adding the insulation 20 and outer shell 22 is illustrated in FIG. 4. FIG. 5 illustrates the refrigerator box liner 10 after the insulation 20 and outer shell 22 have been installed. FIG. 6 illustrates the addition of a front face 24 of the stainless steel casing. The front face 24 overlaps the insulation 20 around the openings 18 and is attached to the outer frame 22. The front face 24 has its own openings 26 which correspond to the openings 18 in the liner 10. FIG. 7 illustrates the liner 10 after the front face 24 has been installed. The flange 14 of each opening 18 can be seen extending through the opening 26 in the front face 24.

[0023] FIG. 8 illustrates the addition of a top cover 28 to the liner 10. The top cover 28 has an opening 30 corresponding to an opening 18 on a top counter of the liner 10. The top cover 28 is positioned on the top counter of the liner 10 such that the opening 30 is aligned with the opening 18 on the top counter of the liner 10. FIGS. 9 and 11 illustrate the flange 14 extending through the openings in the casing 26. FIGS. 10 and 12 illustrate the flange 14 after it has been melted and conforms to the openings 26 and 30 to form the seamless breaker joint 32. The formation of this seamless breaker joint 32 around each of the openings 26, 30 leaves no seams inside of the refrigerator liner 10.

[0024] The refrigerator liner 10 is then inserted into an insulation mold (not shown) where polyurethane foam insulation is injected to fill the gap between the liner 10 and the casing parts 22, 24 and 28. Once the seamless liner 10 is manufactured and the insulation is added, the openings are covered with doors and an evaporator is installed to make the refrigerator operational. Shelves in the refrigerator are also available and configured for easy removal for cleaning.

[0025] The refrigerator liner 10 is preferably manufactured from linear low density polyethylene with an integral corner radius on all corners and shelf supports built in. This construction accommodates easy cleaning and eliminates spaces for debris and other particulars to gather. In the preferred embodiment, the liner 10 is provided with three offset frames on the front corresponding to three liner openings. Additionally, there is an offset frame on the top counter to correspond to a fourth opening preferably for holding a condiment tray or other externally accessible container that requires refrigeration.

[0026] The flanges around the openings are melted using a jet air furnace. The furnace consists of a propane heater with a steel air duct. A fan is placed inside the duct to increase the air flow. The air is then directed into a series of flange ducts and dampers. The flange ducts are used in a sequence to reach a desired level of heating on the liner flanges. When the flanges are melted they conform to the surface of the casing around each opening forming the seamless breaker joints. The seamless breaker joint leaves no seam inside the refrigerator unit. Each element of the casing is preferably manufactured from stainless steel.

[0027] Although one preferred embodiment of the invention has been described in detail for purposes of illustration, various modifications may be made without departing from the spirit and scope of the invention.

What is claimed is:
1. A process for manufacturing a seamless refrigerator liner, comprising the steps of:
   providing a plastic refrigerator box liner having an opening which provides access to the interior thereof; the liner opening having a flange;
   insulating the liner around the liner opening;
   positioning a casing over the liner, the casing having an opening corresponding to the liner opening such that the flange of the liner opens extends through the casing opening; and
   heating the flange extending through the casing opening such that it melts and conforms to the shape of the casing opening to form a seamless breaker joint.
2. The process of claim 1, including the step of cutting an offset frame of the liner to form the liner opening, the offset frame having a flange.
3. The process of claim 1, wherein the casing comprises an outer shell, a front face, and a top cover.
4. The process of claim 3, including the step of cutting the front face of the casing to form the casing opening.
5. The process of claim 3, wherein the heating step includes the step of using a jet air furnace.
6. The process of claim 1, further comprising the steps of:
   inserting the refrigerator box liner into an insulation mold and injecting polyurethane foam insulation into a gap between the liner and the mold.
7. The process of claim 1, wherein the liner includes an offset frame with a flange on a top counter.
8. The process of claim 7, including the steps of cutting a second liner opening in the offset frame on the top counter, cutting a top cover of the casing to form a second casing opening, aligning the second casing opening with the second liner opening such that the flange of the second liner opening extends through the second casing opening, and heating the flange extending through the second casing opening such that it melts and conforms to the shape of the second casing opening to form a seamless breaker joint.
9. The process of claim 1, further comprising the step of:
   installing a refrigerator door over the opening.
10. A process for manufacturing a seamless refrigerator liner, comprising the steps of:
   providing a plastic refrigerator box liner having a first offset frame with a flange on a front face and a second offset frame with a flange on a top counter;
   cutting the first offset frame to form a first liner opening which provides access to the interior of the liner, the first liner opening having a flange;
   cutting the second offset frame to form a second liner opening, which provides access to the interior of the liner, the second liner opening having a flange;
   insulating the liner around the first and second liner openings;
   positioning a casing over the liner, the casing having openings corresponding to the first and second liner openings such that the flanges of the first and second liner openings extend through the casing openings; and
   heating the flanges extending through the casing openings such that they melt and conform to the shape of the corresponding casing openings to form seamless breaker joints.
11. The process of claim 10, wherein the casing comprises an outer shell, a front face, and a top cover, and including the step of cutting the front face and the top cover of the casing to form the casing openings.
12. The process of claim 10, wherein the heating step includes the step of using a jet air furnace.

13. The process of claim 10, further comprising the steps of inserting the refrigerator box liner into an insulation mold, injecting polyurethane foam insulation into a gap between the liner and the mold, and installing refrigerator doors over the openings.

14. A seamless refrigerator liner, comprising:
   a plastic refrigerator box liner having an opening providing access to the interior thereof and a flange around the liner opening;
   a casing surrounding the liner, the casing having an opening corresponding to the liner opening such that the flange extends through the casing opening; and
   a seamless breaker joint around the casing opening formed by melting the flange.

15. The seamless refrigerator liner of claim 14, wherein the liner is made from linear low-density polyethylene.

16. The seamless refrigerator liner of claim 14, wherein the liner has three front openings.

17. The seamless refrigerator liner of claim 15, wherein the liner has one top opening.

18. The seamless refrigerator liner of claim 14, further comprising insulation between the liner and the casing.

19. The seamless refrigerator liner of claim 18, wherein the insulation comprises polyurethane foam.

20. The seamless refrigerator liner of claim 14, wherein the casing comprises stainless steel.

* * * * *