

KICK PLATE FOR REFRIGERATED CONTAINER ASSEMBLY

BACKGROUND OF THE INVENTION

[0001] The subject matter disclosed herein relates to refrigeration systems. More specifically, the subject matter disclosed herein relates to air distribution in refrigerated containers utilized to store and ship cargo.

[0002] A typical refrigerated cargo container, such as those utilized to transport a cargo via sea, rail or road, is a container equipped with a refrigeration unit located at one end of the container. The refrigeration unit includes a compressor, condenser, expansion valve and evaporator coil, all located at the end of the container. A volume of refrigerant circulates throughout the refrigeration unit, and one or more evaporator fans of the refrigeration unit blow a flow of supply air across the evaporator coil cooling the supply air and forcing it out into the container.

[0003] The supply air is typically forced downwardly into a kick plate located at a bottom of the refrigeration unit, which is used to direct the supply air to discharge along the cargo container floor, for example, through t-bars arrayed along the floor. A portion of the supply air flows outward and upward from the kick plate, not into the t-bars, but filling side passages between a side wall of the container and a side wall of the refrigeration unit, in some designs. The side passages are closed by a side plate extending vertically between the container side wall and the refrigeration unit to prevent supply air from being discharged directly from the side passages into the cargo container without passing through the t-bars. The side passages, however, also reduce the velocity of supply air discharged through the t-bars along the side walls of the cargo container compared to that discharged nearer the center of the cargo container, resulting in uneven temperature distribution, "hot" and "cold" spots, in the cargo container.

BRIEF DESCRIPTION OF THE INVENTION

[0004] In one embodiment, a refrigerated transportation cargo container includes a transportation cargo container and a refrigeration unit disposed at an end of the transportation cargo container to provide a flow of supply air for the transportation cargo container. The refrigeration unit includes a housing and an evaporator fan to circulate the flow of supply air through the refrigeration unit. A kick plate assembly includes a kick plate extending from the refrigeration unit toward a floor of the cargo container and a baffle plate extending between

the refrigeration unit and a sidewall of the cargo container. The kick plate assembly defines a discharge cavity to direct the flow of supply air toward the floor of the cargo container.

[0005] In another embodiment, a method of cooling a refrigerated cargo container includes circulating a supply airflow across an evaporator of a refrigeration unit disposed in the cargo container. The supply airflow is cooled at the evaporator. The supply airflow is directed through a kick plate assembly. The kick plate assembly includes a kick plate extending from the refrigeration unit toward a floor of the cargo container and a baffle plate extending between the refrigeration unit and a sidewall of the cargo container. The supply airflow is flowed from the kick plate assembly along the floor of the cargo container.

[0006] These and other advantages and features will become more apparent from the following description taken in conjunction with the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] The subject matter, which is regarded as the invention, is particularly pointed out and distinctly claimed in the claims at the conclusion of the specification. The foregoing and other features, and advantages of the invention are apparent from the following detailed description taken in conjunction with the accompanying drawings in which:

[0008] FIG. 1 is a schematic illustration of an embodiment of a refrigerated transportation cargo container;

[0009] FIG. 2 is a schematic illustration of an embodiment of a refrigeration unit for a refrigerated transportation cargo container; and

[0010] FIG. 3 is a cross-sectional view of an embodiment of a refrigeration unit for a refrigerated transportation cargo container.

[0011] The detailed description explains embodiments of the invention, together with advantages and features, by way of example with reference to the drawing.

DETAILED DESCRIPTION OF THE INVENTION

[0012] Shown in FIG. 1 is an embodiment of a refrigerated cargo container 10. The cargo container 10 is formed into a generally rectangular construction, with a ceiling 12, a directly opposed floor 14, opposed side walls 16 and a front wall 18. The cargo container 10 further includes a door or doors (not shown) at a rear wall 20, opposite the front wall 18. The cargo container 10 is configured to maintain a cargo 22 located inside the cargo container 10 at a selected temperature through the use of a refrigeration unit 24 located at the container 10. The cargo container 10 is mobile and is utilized to transport the cargo 22 via, for example, a

truck, a train or a ship. The refrigeration unit 24 is located at the front wall 18, and includes a compressor 26, a condenser 28, an expansion valve 30, an evaporator 32 and an evaporator fan 34 (shown in FIG. 2), as well as other ancillary components.

[0013] Referring to FIG. 2, the refrigeration unit 24 blows return airflow 36 across the evaporator 32 via the evaporator fan 34, thus cooling the airflow 36 to a selected temperature and urges the cooled return airflow 36, now referred to as supply air 38, through a kick plate assembly 40 into the container 10 via, for example, openings 42 in one or more T-bars 44 extending along the floor 14 of the container 10 to cool the cargo 22. As shown in FIG. 2, the kick plate assembly 40 includes a kick plate 46 that forms a discharge cavity 48 at a bottom portion of the refrigeration unit 24 to evenly distribute the supply air 38 along a width 50 (FIG.3) of the cargo container 10 into the T-bars 44. In some embodiments, the kick plate assembly 40 and the discharge cavity 48 are located below the refrigeration unit 24, between the refrigeration unit 24 and the floor 14 of the cargo container 10.

[0014] Referring to FIG. 3, the cargo container 10 is configured with a side passage 52 between a refrigeration unit sidewall 54 and the sidewall 16 of the cargo container 10. To enhance the even distribution of the supply air 38, the kick plate assembly 40 is configured with a baffle plate 56 extending laterally from the refrigeration unit sidewall 54 to the side wall 16 of the cargo container 10. The baffle plate 56 prevents flow of the supply air 38 into the side passage 52 and directs the supply air 38 into the T-bars 44. The baffle plate 56 may be secured in a fixed position relative to the kick plate 46, may be secured to the kick plate 46 via one or more hinges 58 for better serviceability and to allow the kick plate assembly 40 to be adapted to different configurations of cargo container 10 and/or refrigeration unit 24. Further, in some embodiments, as shown, the baffle plate 56 includes a peripheral seal 60 to reduce leakage of the supply air 38 around the baffle plate 56 into the side passage 52.

[0015] While the invention has been described in detail in connection with only a limited number of embodiments, it should be readily understood that the invention is not limited to such disclosed embodiments. Rather, the invention can be modified to incorporate any number of variations, alterations, substitutions or equivalent arrangements not heretofore described, but which are commensurate with the spirit and scope of the invention. Additionally, while various embodiments of the invention have been described, it is to be understood that aspects of the invention may include only some of the described embodiments. Accordingly, the invention is not to be seen as limited by the foregoing description, but is only limited by the scope of the appended claims.

CLAIMS:

1. A refrigerated transportation cargo container comprising:
a transportation cargo container; and
a refrigeration unit disposed at an end of the transportation cargo container to provide a flow of supply air for the transportation cargo container, the refrigeration unit including:
a housing;
an evaporator fan to deliver supply air through the refrigeration unit; and
a kick plate assembly including:
a kick plate extending from the refrigeration unit toward a floor of the cargo container; and
a baffle plate extending between the refrigeration unit and a sidewall of the cargo container;
wherein the kick plate assembly defines a discharge cavity to direct the flow of supply air toward the floor of the cargo container.
2. The refrigerated transportation cargo container of Claim 1, wherein the baffle plate extends between the refrigeration unit and the sidewall of the cargo container.
3. The refrigerated cargo container of Claim 1, wherein the baffle plate is formed integral to the forward face.
4. The refrigerated cargo container of Claim 1, wherein the baffle plate is attached to the kick plate via a hinged connection.
5. The refrigerated cargo container of Claim 1, wherein the kick plate assembly is disposed beneath the refrigeration unit.
6. The refrigerated cargo container of Claim 1, wherein the baffle plate further includes a peripheral seal to prevent leakage around a periphery of the baffle plate.
7. The refrigerated cargo container of Claim 1, wherein the baffle plate prevents direct flow of supply air from the refrigeration unit into a side cavity between the refrigeration unit and the sidewall of the cargo container.
8. A method of cooling a refrigerated cargo container comprising:
urging a supply airflow across an evaporator of a refrigeration unit disposed in the cargo container;
cooling the supply airflow at the evaporator;
directing the supply airflow through a kick plate assembly, the kick plate assembly including:

a kick plate extending from the refrigeration unit toward a floor of the cargo container; and

a baffle plate extending between the refrigeration unit and a sidewall of the cargo container; and

flowing the supply airflow from the kick plate assembly along the floor of the cargo container.

9. The method of Claim 8, wherein the supply airflow is directed through the kick plate assembly disposed beneath the refrigeration unit.

10. The method of Claim 8, further comprising flowing the supply airflow through a plurality of T-bars arrayed along the floor of the cargo container.

11. The method of Claim 8, wherein the baffle plate extends substantially horizontally between the refrigeration unit and the sidewall of the cargo container.

12. The method of Claim 8, wherein the baffle plate is attached to the kick plate via a hinged connection.

13. The method of Claim 8, further comprising sealing a periphery of the baffle plate to prevent leakage of the supply airflow therethrough.

14. The method of Claim 8, further comprising preventing direct flow of supply air from the refrigeration unit into a side cavity between the refrigeration unit and the sidewall of the cargo container via positioning of the baffle plate.