A condenser coil for a refrigerated merchandiser includes a plurality of refrigerant carrying members and a first plurality of fins and a second plurality of fins connected in heat transfer relationship with the refrigerant carrying members. The first and second pluralities of fins are disposed alternately in generally parallel, laterally spaced relationship. In order to reduce the likelihood of fouling by the bridging of fibers between fins at the face of the condenser coil, the leading edge of the first plurality of fins extending upstream with respect to flow of air passing through the condenser coil beyond the leading edges of the second plurality of fins.
FOUL-RESISTANT FINNED TUBE CONDENSER

BACKGROUND OF THE INVENTION

[0001] This invention relates generally to refrigerated cabinets, such as beverage and food service merchandisers, and, more particularly, to a foul resistant condenser for use therewith.

[0002] It has long been the practice to sell soda and other soft drinks by way of vending machines or coin operated refrigerated dispensers for delivering a single can or bottle of beverages. These machines are generally stand alone machines that are plugged into standard outlets and include their own individual refrigeration circuit with both evaporator and condenser coils. Refrigerated merchandisers of this stand alone "plug-in" type are also commonly found in convenience stores, delicatessens, supermarkets and other retail establishments for displaying cold beverages, such as soft drinks, beer, wine coolers, etc. for self-service selection by purchasers. The beverage product, typically in cans or bottles, single or in multi-serving packs, is stored on shelves within the refrigerated display cabinet. To purchase a beverage, the customer opens one of the doors and reaches into the refrigerated cabinet to retrieve the desired product from the shelf.

[0003] Conventional refrigerated merchandisers of this type usually comprise a refrigerated, insulated enclosure defining a refrigerated product display cabinet having one or more glass doors. Refrigerated merchandisers of the stand alone "plug-in" design necessarily include a refrigeration system for providing the cooled environment within the refrigerated display cabinet. Such refrigeration systems include a condenser coil and compressor housed in an equipment compartment separate from and exteriorly of the insulated enclosure defining the refrigerated display cabinet, and an associated evaporator coil housed either within the insulated enclosure or within the equipment compartment in a section thereof separate from the condenser coil and compressor. In such stand alone refrigerated merchandisers, the separate equipment compartment is typically located either below or above the refrigerated display cabinet.

[0004] The compressor, condenser coil and evaporator coil are connected in refrigerant flow circuit in a conventional refrigerant vapor compression cycle. Cold liquid refrigerant is circulated through the evaporator coil to cool the air within the refrigerated display cabinet, which air is circulated over the evaporator coil by an evaporator fan operatively associated therewith. As a result of heat transfer between the air and the refrigerant passing in heat exchange relationship in the evaporator coil, the liquid refrigerant evaporates and leaves the evaporator coil as a vapor. The vapor phase refrigerant is then compressed in the compressor to a high pressure as well as being heated to a higher temperature, as a result of the compression process. The hot, high pressure vapor is then circulated by the compressor through the condenser coil wherein it passes in heat exchange relationship with ambient air drawn or blown across through the condenser coil by a condenser fan disposed in operative association with the condenser coil. As a result, the refrigerant is cooled and condensed back to the liquid phase and then passed through a simple expansion device which reduces both the pressure and the temperature of the liquid refrigerant before it is circulated back to the evaporator coil.

[0005] In conventional practice, the condenser coil comprises a plurality of tubes with a plurality of parallel fins mounted on the tubes and extending in laterally spaced relationship across the flow path of the ambient air stream being drawn or blown through the condenser coil. A condenser fan, disposed in operative association with the condenser coil, passes ambient air from the local environment through the condenser coil. Generally, the greater the tube and fin densities, the more efficient the performance of the coil in cooling the refrigerant. In conventional practice, the parallel fins on the condenser coil are relatively closely spaced so as to provide more heat exchange surface in a given volume for thermal performance.

[0006] U.S. Pat. No. 3,462,966 discloses a refrigerated glass door merchandiser having a fin and tube condenser coil with staggered rows of tubes and a plurality of parallel fins. An associated fan disposed upstream of the condenser coil blows air across the condenser tubes and through the gaps between the parallel fins. U.S. Pat. No. 4,977,754 discloses a refrigerated glass door merchandiser having a fin and tube condenser coil with in-line tube rows and a plurality of parallel fins. An associated fan disposed downstream of the condenser coil draws air across the condenser tubes and through the gaps between the fins.

[0007] However, the greater the fin density, the more susceptible the condenser coil is to being fouled by the accumulation of dirt and fiber, particularly at the face of the condenser coil where fibers tend to bridge between the respective leading edges of neighboring fins. Stand alone merchandisers having a self-contained refrigeration unit including a condenser coil are often in an area of the store or other establishment that is heavily trafficked by people who track in debris and dirt from the outside. This, in turn, tends to expose the condenser coil to airside fouling from debris and dirt entrained in the air passing between the relatively closely spaced fins. With such fouling, the accumulation of dust, dirt and oils impede refrigeration performance. As the condenser coil fouls, the compressor refrigerant pressure rises, which leads to system inefficiencies and possibly compressor failure. Further, stand alone "plug-in" merchandisers are often used in locations where periodic cleaning is not likely to occur.


SUMMARY OF THE INVENTION

[0009] It is a general object of the present invention to reduce the susceptibility of a finned tube condenser coil to airside fouling.

[0010] It is an object of one aspect of the invention to provide a finned tube condenser coil having a leading edge fin spacing that is greater than the fin spacing in the remainder of the condenser coil, thereby reducing the likelihood of airside fouling.
It is an object of one aspect of the invention to provide method for reducing the susceptibility to airside fouling of a finned tube condenser coil.

In one aspect of the invention, a condenser coil is provided for connection in refrigerant flow communication with a refrigerant vapor compression system for passing refrigerant in heat exchange relationship with air passing through the condenser coil. The condenser coil includes a plurality of refrigerant carrying members aligned in generally parallel relationship and a plurality of fins connected in heat transfer relationship with the refrigerant carrying members, the fins extending generally orthogonally relative to the refrigerant carrying members. The plurality of fins is made up of a first plurality of fins and a second plurality of fins disposed alternately in generally parallel, laterally spaced relationship in general alignment with the flow of air passing through the condenser coil. The fins are so arranged with the respective leading edges of the first plurality of fins extending upstream with respect to the flow of air passing through the condenser coil beyond the respective leading edges of the second plurality of fins. Thus, the effective fin spacing at the upstream face of the condenser coil is the spacing between the leading edges of the first plurality of fins, which is twice the spacing between adjacent first and second fins.

In an embodiment, each fin of the first plurality of fins includes a fin extension member affixed to a forward portion thereof whereby the respective leading edges of the first plurality of fins are extended beyond the respective leading edges of the second plurality of fins. In an embodiment, each fin of the second plurality of fins has a leading portion that is folded back upon itself whereby the respective leading edges of the first plurality of fins will extend beyond the respective leading edges of the folded back second plurality of fins.

In another embodiment of the condenser coil, the plurality of fins is made up of a first plurality of fins, a second plurality of fins and a third plurality of fins disposed alternately in generally parallel, laterally spaced relationship in general alignment with the flow of air passing through the condenser coil. The fins are so arranged with the respective leading edges of the first plurality of fins extending upstream with respect to the flow of air passing through said condenser coil beyond the respective leading edges of the second plurality of fins and the third plurality of fins. Thus, the effective fin spacing at the upstream face of the condenser coil is the spacing between the leading edges of the first plurality of fins, which is twice the spacing between adjacent first and second fins. The second and third pluralities of fins may be further arranged such that the respective leading edges of the second plurality of fins extend upstream with respect to the flow of air passing through said condenser coil beyond the respective leading edges of the third plurality of fins.

In another aspect of the invention, a refrigerated merchandiser is provided having an enclosure defining a refrigerated display cabinet, an evaporator coil disposed in constructive relationship with the refrigerated display cabinet; and a condenser coil connected in refrigerant flow communication with the evaporator coil. The condenser coil has a plurality of refrigerant carrying members aligned in generally parallel relationship, and a plurality of fins connected in heat transfer relationship with the plurality of refrigerant carrying members. The fins extend generally orthogonally relative to the refrigerant carrying members and are disposed in generally parallel, laterally spaced relationship in general alignment with a flow of air passing through the condenser coil. The plurality of fins includes a first plurality of fins and a second plurality of fins disposed alternately in generally parallel, laterally spaced relationship with the respective leading edges of the first plurality of fins extending upstream with respect to flow of air passing through the condenser coil beyond the respective leading edges of the second plurality of fins.

In a further aspect of the invention, a method is provided for reducing the susceptibility of fouling on a condenser coil having a plurality of refrigerant carrying members aligned in generally parallel relationship, and a plurality of fins connected in heat transfer relationship with said plurality of refrigerant carrying members and extending generally orthogonally relative to the refrigerant carrying members. The method includes the steps of: providing a first plurality of fins and a second plurality of fins, and disposing the first plurality of fins and the second plurality of fins alternately in generally parallel, laterally spaced relationship in general alignment with a flow of air passing through the condenser coil with the leading edge of the first plurality of fins extending upstream with respect to flow of air passing through the condenser coil beyond the leading edges of the second plurality of fins. In an embodiment, the method includes the step of affixing a fin extension member to a forward portion of each fin of the first plurality of fins. In an embodiment, the method includes the step of folding the leading portion of each fin of said second plurality of fins back upon itself.

In each embodiment of the invention, with a wider spacing between the leading edges of the fins at the face of the condenser coil, the likelihood of fibers in the air flow being sufficiently long enough to be captured on the leading edges of neighboring fins, thereby bridging the gap therebetween, will be reduced. Thus, fouling at the face of the condenser coil will be less likely and generally less severe due to the wider spacing between the leading edges of the fins at the condenser face, while the closer standard fin spacing between the fins in the main body of the condenser coil will be preserved, thereby maintaining acceptable overall thermal performance for the condenser coil.

**BRIEF DESCRIPTION OF THE DRAWINGS**

The invention will be described herein with reference to the exemplary embodiments depicted in the accompanying drawings wherein:

**FIG. 1** is a perspective view of a refrigerated beverage merchandiser;

**FIG. 2** is a sectioned, side elevation view of the refrigerated beverage merchandiser of FIG. 1;

**FIG. 3** is a perspective view of an exemplary embodiment of a condenser coil in accordance with the present invention;

**FIG. 4** is a plan view of the condenser coil of FIG. 3 taken along line 4-4;

**FIG. 5** is a plan view of an alternate exemplary embodiment of the condenser coil of FIG. 3;

**FIG. 6** is a plan view of another exemplary embodiment of the condenser coil of FIG. 3; and
FIG. 7 is a plan view of a further exemplary embodiment of the condenser coil of FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIGS. 1 and 2 in particular, there is depicted a refrigerated cold beverage merchandiser, designated generally by the reference numeral 10, including an interior product display space 100 for holding product 110 to be purchased, such as for example bottled or canned soda, milk, water, juices, fruit drinks, beer and other beverages. Although the invention will be described herein with reference to the depicted embodiment of a refrigerated cold beverage merchandiser, it is to be understood that that invention may be applied to other refrigerated display merchandisers, for example refrigerated cabinets for perishable and frozen commodities, including for example meats, poultry, fish, dairy products, prepackaged frozen foods, and other items that need to be maintained in a refrigerated environment.

The beverage merchandiser 10 includes a cabinet 20 housing a refrigerated interior product display space 100 and a separate equipment compartment 55 disposed separate from, and may be heat transfer insulated from, the refrigerated interior product display space 100. The cabinet 20 has a top wall 22 and a surrounding side wall structure including a rear wall 34, a front wall 32, and opposed generally vertically extending side walls 36 and 38. The cabinet also includes a lower wall 24 disposed between the refrigerated interior product display space 100 located thereabove and the equipment compartment 55 located there beneath.

The interior product display space 100 may be accessed from exteriorly of the cabinet 20 through an access opening, which in the depicted embodiment is an open area at the front of the cabinet. In other embodiments, the access opening might be in the top wall of the merchandiser. This open area may be open to the environment or may be covered, as in the depicted embodiment, by at least one door 40 mounted to the cabinet 20. The door 40 extends across the open area and has a transparent viewing area, for example a glass panel, through which at least a portion of the interior product display space 100 can be viewed. The door 40 is selectively positionable between a closed position covering the open area and an open position in which consumers may reach into the interior product display space 100 to remove a product for purchase. Although the embodiment of the display merchandiser 10 depicted in the drawing has only one door 40, it is to be understood that the display merchandiser may have one, two, three or more doors that collectively cover the open area when in the closed position. The door or doors 40 may be mounted to the cabinet 20 in a conventional manner, for example on hinges for pivotal movement or on a track for sliding movement between an open and closed position.

In the depicted embodiment, the top wall 22, the lower wall 24, rear wall 34 and the side walls 36 and 38 are heat transfer insulated for insulating the refrigerated interior product display space 100, from the environment exterior of the interior product display space 100. A plurality of shelves 112 are disposed within the interior product display space 100. The shelves 112 are adapted as appropriate to support the particular product being displayed for purchase. The shelves may be horizontally disposed shelves, or slightly downward angled gravity-feed shelves, or other shelving configuration suitable for use in displaying product in refrigerated merchandisers. However, the specific number, arrangement and configuration of the shelves 112 is not germane to the invention and is within the skill of one of ordinary skill in the art to select for optimizing the presentation of and the customer accessibility to the particular product being displayed.

A rear panel 134 may be provided spaced inwardly of the rear side wall 34 to establish, in part, a refrigerated air supply duct between the rear side wall 34 and a rear panel 134. The interior product display space 100 within the refrigerated interior of the display cabinet 20 is bounded by the top wall 22, the lower wall 24, the side walls 36, 38, and in part by each of the rear wall 34 and the rear panel 134. In the depicted embodiment, refrigerated air enters into the product display space 100 to cool product displayed therein in part through an air outlet at the upper end of the air supply duct and in part through a plurality of openings provided in the rear panel 134. Refrigerated air is withdrawn from the product display space 100 through an opening provided in the lower wall 24 for recirculation through the evaporator. However, the specific configuration employed for delivering refrigerated air to and withdrawing of air from the product display space 100 is not germane to the invention and is within the skill of one of ordinary skill in the art to select for optimizing the chilling of the product stored within the product display space 100.

In the exemplary depicted embodiment depicted in FIG. 2, the equipment compartment 55 is located within the cabinet 20 beneath the lower wall 24 and is separated by the lower wall 24 from the refrigerated interior product display space 100 of the cabinet 20. The refrigeration unit disposed within the equipment compartment 55 includes an evaporator coil 60 and at least one associated evaporator fan/motor assembly 62, a condenser coil 70 and at least one associated condenser fan/motor assembly 72, and a compressor 74. The evaporator coil 60 and its associated evaporator fan/motor assembly may advantageously be housed within a first section of the equipment compartment 55 which is separated by division wall 68 from a second section of the equipment compartment 55 wherein the condenser 70, its associated condenser fan/motor assembly, and the compressor 74 are housed.

Refrigerant is circulated in a conventional manner between the evaporator coil 60 and the condenser coil 70 by means of the compressor 74 through refrigeration lines forming a refrigeration circuit (not shown) interconnecting the compressor 74, the condenser coil 70 and the evaporator coil 60 in refrigerant flow communication. Cold liquid refrigerant is circulated through the evaporator coil 60 to pass in heat exchange relationship with the air withdrawn from the refrigerated product display space 100, passed over the evaporator coil 60 and thence recirculated back to the product display space by the evaporator fan 62. As a result of heat transfer between the air and the refrigerant passing in heat exchange relationship in the evaporator coil 60, the liquid refrigerant evaporates and leaves the evaporator as a vapor. The vapor phase refrigerant is then compressed in the compressor 74 to a high pressure, as well as being heated to a higher temperature as a result of the compression process. The hot, high pressure vapor is then circulated through the condenser coil 70 wherein it passes in heat exchange relationship with ambient air drawn the grille 12 and drawn or blown by the condenser fan 72 through the condenser coil 70.

Referring now to FIG. 3, the condenser coil 70 is a finned tube coil having a plurality of refrigerant tubes arranged in parallel tube banks 50 in spaced relationship in the direction of air flow through the condenser coil. Each tube
bank includes a plurality of parallel refrigerant tube segments 52 interconnected by tube bends 54 to define a serpentine refrigerant flow path therethrough. The tube banks may be arrayed in an in-line arrangement or a staggered tube arrangement as in conventional practice. Each tube bank may be a single tube bent appropriately to form the serpentine path or a plurality of linear tube segments interconnected at their respective ends by 180 degree elbows to form the serpentine path. In order to increase the heat exchange capacity of the condenser coil 70, a plurality of fins 75 are mounted on the tube segments 52 in parallel, spaced relationship between the respective end plates 76 and 78 of the condenser 70. The fins 75 are typically aligned generally orthogonally to the tube segments 52 and parallel with the direction of airflow through the condenser coil 70. The fins 75 are spaced apart at equal intervals to provide gaps between adjacent fins which form air flow passages through the condenser coil 70.

[0034] As noted previously, air side fouling of the condenser coil 70 often occurs due to the accumulation of dust, dirt, oils and other debris between adjacent tubes and/or adjacent fins of a condenser coil. The applicants have recognized that such air side fouling typically starts with the bridging of an elongate fiber between adjacent fins at the face of the condenser coil 70, i.e. the upstream region of the coil facing the incoming air flow. This bridging occurs when fibers in the air stream become attached by the respective leading edges 77 of a pair of adjacent fins 75 thereby spanning the gap between the fins. Although most smaller dust particles generally pass through the air flow passages between adjacent fins, if a passage is somewhat blocked by the spanning of fibers there across, the small particles tend to collect on those longer fibers with the build up eventually resulting in a fouling of the passage.

[0035] Referring now to FIGS. 4, 5, 6 and 7, in accordance with the invention, the spacing between the leading edges of the fins at the face of the condenser coil 70, also referred to as the leading edge fin spacing, is greater than the fin spacing in the remainder of the condenser coil. In the exemplary embodiment depicted in FIG. 4, a plurality of parallel fins 75A and 75B are arranged alternately in laterally spaced relationship at a uniform fin spacing, W, for example at a conventional fin spacing in range from about 0.2 inches to about 0.75 inches. Ergo, no two fins 75A are neighbors, and no two fins 75B are neighbors. The fins 75B are shorter in depth, i.e. shorter in the direction of airflow through the condenser, than the fins 75A. In the depicted embodiment, the fins 75B are foreshortened so as to terminate between the first bank 50A and second tube bank 50B.

[0036] Thus, with the longer fins 75A and shorter fins 75B arrayed with their respective trailing edges in alignment in alternately spaced arrangement at a fin spacing, W, the leading edge spacing at the face of the condenser coil 70, which is the spacing between the leading edges 77A of the longer fins 75A, is 2W. That is, on the first bank 50A of tubes, the fin spacing is 2W, while on the other tube banks 50B, the fin spacing is only W. With this wider spacing between the leading edges of the longer fins 75A, the likelihood of fibers in the air flow being sufficiently long enough to be captured on the leading edges of neighboring fins, thereby bridging the gap therebetween is significantly reduced. Thus, the likelihood of fouling at the face of the condenser coil 70 will be significantly reduced due to the wider spacing between the leading portion of the fins 75A, while maintaining the closer standard fin spacing between the fins 75A and 75B in the main body of the condenser coil, thereby maintaining acceptable overall thermal performance for the condenser coil 70.

[0037] In the exemplary embodiment depicted in FIG. 5, a plurality of fins 75A, 75B and 75C are arranged alternately in laterally spaced relationship in a parallel array. The fins 75A are longest in depth, fins 75C are shortest in depth, and the fins 75B have a depth intermediate the respective depths of the longest fins 75A and the shorter fins 75C, whereby leading edge 77B of each fin 75B is positioned upstream of the leading edge 77C of its respective neighboring fin 75C and downstream of the leading edge 77A of its respective neighboring fin 75A. No two fins 75A are neighbors, nor two fins 75B are neighbors, and no two fins 75C are neighbors. Thus, the leading edges of neighboring fins are again not aligned. Rather, the fin spacing at the upstream face of the condenser coil 70 is the spacing, 3W, between the leading edges of the longer fins 75A. The fin spacing between the fins 75A, 75C and 75B in the main body of the condenser coil 70 remains at the closer conventional spacing. W. As in the FIG. 4 embodiment, with this wider spacing between the respective leading edges 77A of the longer fins 75A, the likelihood of fibers in the air flow being sufficiently long enough to be captured on the leading edges of neighboring fins, thereby bridging the gap therebetween is significantly reduced. Fouling at the upstream face of the condenser coil 70 is significantly reduced due to this wider spacing between the leading portion of the fins 75A, while maintaining the closer standard fin spacing between the fins 75A, 75C and 75B in the main body of the condenser coil, thereby maintaining acceptable overall thermal performance for the condenser coil 70.

[0038] Referring now to FIG. 6, an alternate embodiment of the fin arrangement depicted in FIG. 4 is shown wherein a plurality of parallel fins are arranged in laterally spaced relationship on the tube banks 50 at a conventional spacing W. In this embodiment, an upstream portion of every other fin 75B is folded back on itself thereby forming a fin arrangement of alternately disposed longer depth fins 75A and shorter depth fins 75B. The fins 75B are shorter in depth than the fins 75A because the respective upstream portion of the fins 75B have been folded back as depicted. Thus, with the longer depth fins 75A and shorter depth fins 75B so arrayed in alternately spaced arrangement at a conventional spacing, W, the fin spacing at the upstream face of the condenser coil 70, i.e. the spacing between the leading edges 77A of the fins 75A, is 2W.

[0039] Referring now to FIG. 7, a further embodiment of the fin arrangement depicted in FIG. 4 is shown wherein a plurality of parallel fins are arranged in a laterally spaced relationship on the tube banks 50 at a conventional spacing W. In this embodiment, the depth of every other fin 75A is increased by attaching a fin extension over its leading edge, thereby forming a fin arrangement of alternately disposed longer depth fins 75A and shorter depth fins 75B. In the depicted embodiment, the fin extension 79 is an elongated u-shaped member which may be slipped over the leading edge of and crimped, or otherwise affixed to, each of the respective fins 75A thereby extending the fin surface in an upstream direction with respect to air flow through the condenser. Thus, with the longer extended depth fins 75A and shorter standard depth fins 75B so arrayed in alternately spaced arrangement at a conventional spacing, W, the fin spacing at the upstream face of the condenser coil 70, i.e. the spacing between the respective leading edges 77A of the fin extensions 79 on the fins 75A, is 2W.
The exemplary embodiments depicted in FIGS. 6 and 7 are particularly useful in field service applications wherein face fouling has been a problem. In such a situation, the field service representative could simply remove the front grill to access the face of the condenser coil and either fold every other fin 75B back upon itself or add fin extensions to every other fin 75A, thereby effectively increasing the fin spacing between the leading edges of the fins at the upstream face of the condenser coil. With this wider spacing between the leading edges of the fins at the face of the condenser coil, the likelihood of fibers in the air flow being sufficiently long enough to be captured on the leading edges of neighboring fins, thereby bridging the gap therebetween will be reduced. Thus, fouling at the face of the condenser coil 70 would be less likely and generally less severe due to the wider spacing between the leading edges of the fins at the condenser face, while the closer standard fin spacing between the fins in the main body of the condenser coil would be preserved, thereby maintaining acceptable overall thermal performance for the condenser coil.

While any increase in fin spacing will somewhat reduce face fouling, experimental data from field analysis indicates that as the front spacing between fins is increased beyond a spacing of about 0.50 inches, the degree of face fouling experienced decreases substantially up to a fin spacing of about 0.75 inches. At fin spacing beyond about 0.75 inches, further improvement appears to be relatively minor. A more complete discussion of the relationship between condenser fouling and fin spacing may be found in co-pending U.S. patent application Ser. No. 10/835,031, filed Apr. 29, 2004, entitled FOIL-RESISTANT CONDENSER USING MICROCHANNEL TUBING, and assigned to Carrier Commercial Refrigeration, Inc., the common assignee to which this application is subject to assignment. The aforementioned co-pending application is hereby incorporated herein in its entirety by reference.

In the exemplary embodiment of the refrigerated beverage merchandiser depicted, the lower wall 24 forms a common wall separating the refrigerated product display space 100 and the equipment compartment 55 there beneath. The lower wall has a top surface that forms the floor or deck of the interior product display space and has an under surface that faces the interior of the equipment compartment. It is to be understood that the condenser coil of the invention will also be useful in reducing condenser fouling on refrigerated merchandisers having the refrigeration unit disposed atop, rather than beneath, the product display space. On such refrigerated merchandisers, the top wall of the refrigerated cabinet forms a common wall separating the refrigerated product display space from the equipment compartment housing the refrigeration unit, with the top wall having a top surface the faces the interior of the equipment compartment and an under surface that forms the ceiling of the product display space.

While the present invention has been particular shown and described with reference to preferred and alternate embodiments as illustrated in the drawings, it will be understood by one skilled in the art that various changes in detail may be effective therein without departing from the true spirit and scope of the invention as defined by the claims.

We claim:

1. A condenser coil for connection in refrigerant flow communication with a refrigerant vapor compression system for passing refrigerant in heat exchange relationship with air passing through said condenser coil, said condenser coil including:
   a plurality of refrigerant carrying members aligned in generally parallel relationship; and
   a plurality of fins connected in heat transfer relationship with said plurality of refrigerant carrying members, said plurality of fins extending generally orthogonally relative to said plurality of refrigerant carrying members and disposed in generally parallel, laterally spaced relationship in general alignment with the flow of air passing through said condenser coil; characterized in that said plurality of fins comprises a first plurality of fins and a second plurality of fins disposed alternately in generally parallel, laterally spaced relationship, each of said first plurality of fins and said second plurality of fins having a leading edge, the leading edge of said first plurality of fins extending upstream with respect to flow of air passing through said condenser coil beyond the leading edges of said second plurality of fins.

2. A condenser coil as recited in claim 1 further characterized in that said fins are disposed in laterally spaced relationship at a fin spacing of less than about 0.4 inches.

3. A condenser coil as recited in claim 1 further characterized in that said fins are disposed in laterally spaced relationship at a fin spacing in the range from about 0.2 inches to about 0.75 inches.

4. A condenser coil as recited in claim 1 further characterized in that each fin of said first plurality of fins include a fin extension member affixed to a forward portion thereof.

5. A condenser coil as recited in claim 1 further characterized in that each fin of said second plurality of fins has a leading portion that is folded back upon itself.

6. A condenser coil for connection in refrigerant flow communication with a refrigerant vapor compression system for passing refrigerant in heat exchange relationship with air passing through said condenser coil, said condenser coil including:
   a plurality of refrigerant carrying members aligned in generally parallel relationship; and
   a plurality of fins connected in heat transfer relationship with said plurality of refrigerant carrying members, said plurality of fins extending generally orthogonally relative to said plurality of refrigerant carrying members and disposed in generally parallel, laterally spaced relationship in general alignment with the flow of air passing through said condenser coil; characterized in that said plurality of fins comprises a first plurality of fins, a second plurality of fins and a third plurality of fins disposed alternately in generally parallel, laterally spaced relationship, each of said first plurality of fins, said second plurality of fins and said third plurality of fins having a leading edge, the leading edge of said first plurality of fins extending upstream with respect to flow of air passing through said condenser coil beyond the leading edges of said second plurality of fins and said third plurality of fins.

7. A condenser coil as recited in claim 4 further characterized in that the leading edge of said second plurality of fins extends upstream with respect to flow of air passing through said condenser coil beyond the leading edge of said third plurality of fins.
8. A condenser coil as recited in claim 6 further characterized in that said fins are disposed in laterally spaced relationship at a fin spacing of less than about 0.4 inches.

9. A condenser coil as recited in claim 6 further characterized in that said fins are disposed in laterally spaced relationship at a fin spacing in the range from about 0.2 inches to about 0.75 inches.

10. A refrigerated merchandiser including:
an enclosure defining a refrigerated display cabinet;
an evaporator coil disposed in operative association with the refrigerated display cabinet; and
a condenser coil connected in refrigerant flow communication with said evaporator coil, said condenser coil having a plurality of refrigerant carrying members aligned in generally parallel relationship, and a plurality of fins connected in heat transfer relationship with said plurality of refrigerant carrying members, said plurality of fins extending generally orthogonally relative to said plurality of refrigerant carrying members and disposed in generally parallel, laterally spaced relationship in general alignment with a flow of air passing through said condenser coil; characterized in that said plurality of fins comprises a first plurality of fins and a second plurality of fins disposed alternately in generally parallel, laterally spaced relationship, each of said first plurality of fins and said second plurality of fins having a leading edge, the leading edge of said first plurality of fins extending upstream with respect to flow of air passing through said condenser coil beyond the leading edges of said second plurality of fins.

11. A refrigerated merchandiser as recited in claim 10 further characterized in that said fins of said condenser coil are disposed in laterally spaced relationship at a fin spacing of less than about 0.4 inches.

12. A refrigerated merchandiser as recited in claim 10 further characterized in that said fins of said condenser coil are disposed in laterally spaced relationship at a fin spacing in the range from about 0.2 inches to about 0.75 inches.

13. A refrigerated merchandiser as recited in claim 10 further characterized in that each fin of said first plurality of fins of said condenser coil includes a fin extension member affixed to a forward portion thereof.

14. A refrigerated merchandiser as recited in claim 10 further characterized in that each fin of said second plurality of fins of said condenser coil has a leading portion that is folded back upon itself.

15. A method for reducing the susceptibility to airside of a condenser coil having a plurality of refrigerant carrying members aligned in generally parallel relationship, and a plurality of fins connected in heat transfer relationship with said plurality of refrigerant carrying members, said plurality of fins extending generally orthogonally relative to said plurality of refrigerant carrying members and disposed in generally parallel, laterally spaced relationship in general alignment with a flow of air passing through said condenser coil; said method comprising the steps of:

- providing a first plurality of fins and a second plurality of fins, each of said first plurality of fins and said second plurality of fins having a leading edge; and
- disposing said first plurality of fins and said second plurality of fins alternately in generally parallel, laterally spaced relationship with the leading edge of said first plurality of fins extending upstream with respect to flow of air passing through said condenser coil beyond the leading edges of said second plurality of fins.

16. A method as recited in claim 15 wherein the step of disposing said first plurality of fins and said second plurality of fins alternately in generally parallel, laterally spaced relationship with the leading edge of said first plurality of fins extending upstream with respect to flow of air passing through said condenser coil beyond the leading edges of said second plurality of fins comprises the step of affixing a fin extension member to a forward portion of each fin of said first plurality of fins.

17. A method as recited in claim 15 wherein the step of disposing said first plurality of fins and said second plurality of fins alternately in generally parallel, laterally spaced relationship with the leading edge of said first plurality of fins extending upstream with respect to flow of air passing through said condenser coil beyond the leading edges of said second plurality of fins comprises the step of folding the leading portion of each fin of said second plurality of fins back upon itself.

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