

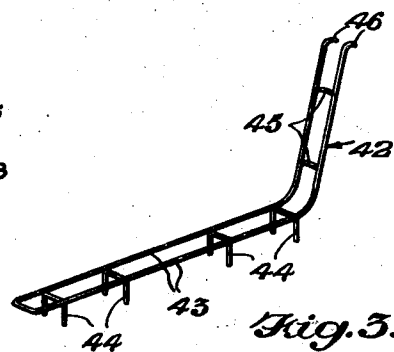
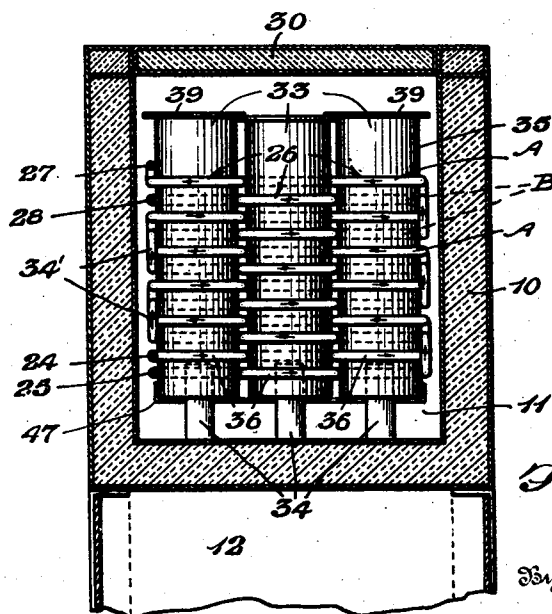
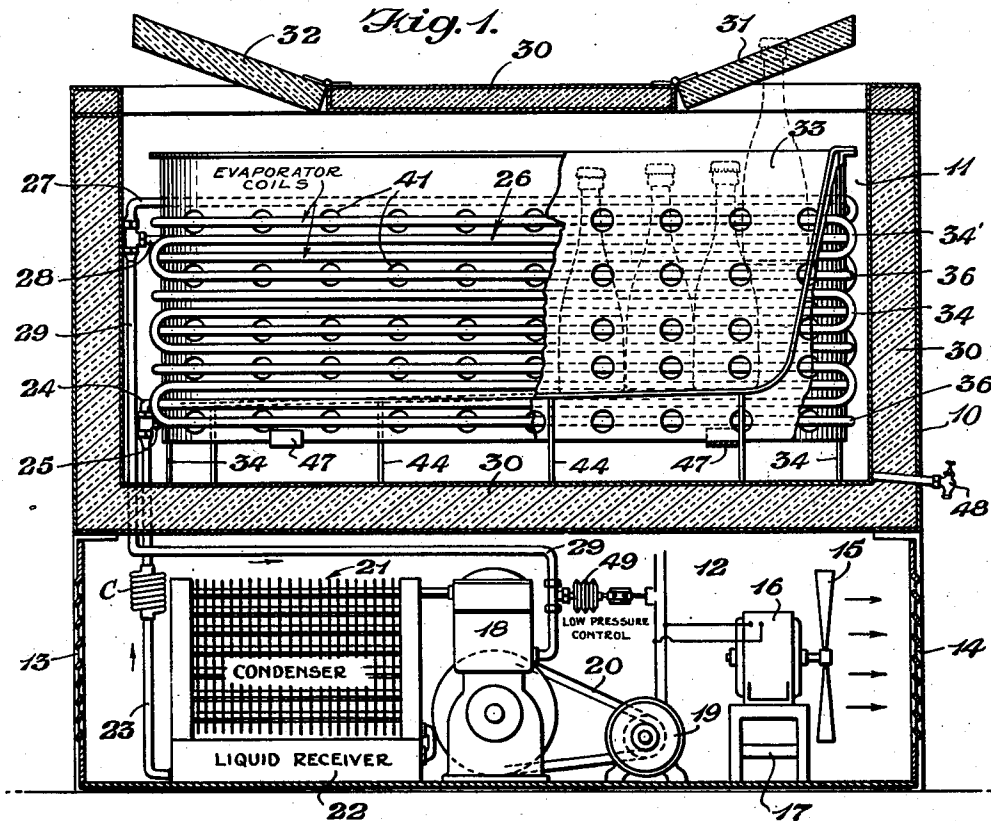
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REFRIGERATING APPARATUS

2,180,237

Filed March 28, 1938

2 Sheets-Sheet 1



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Fig. 2.

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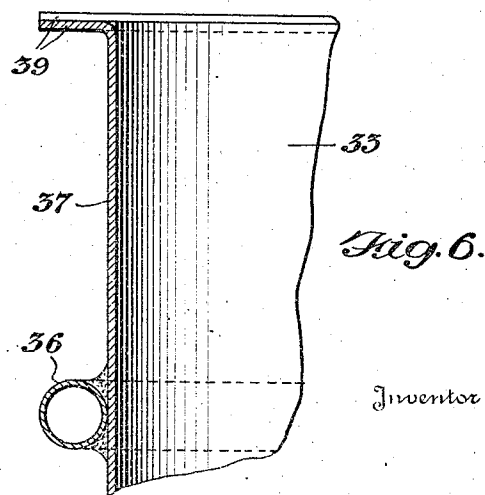
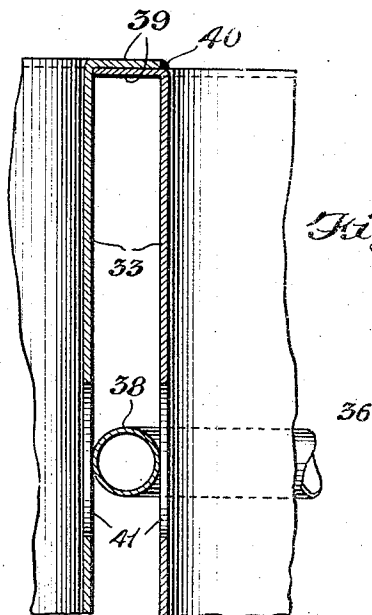
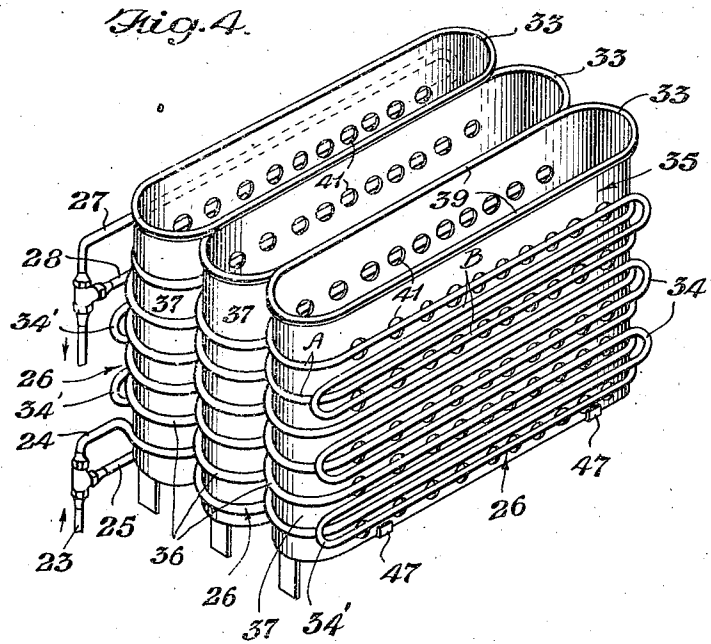
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REFRIGERATING APPARATUS

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,180,237

REFRIGERATING APPARATUS

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Application March 28, 1938, Serial No. 198,527

15 Claims. (Cl. 62-141)

This invention relates to refrigeration apparatus and more particularly to a beverage cooler.

The refrigeration of beverages to the proper and palatable temperature which lies in the range of between 40 and 50° F. under varying load conditions which vary from nothing to the dispensing of several hundred cases of bottled beer for example or other drinks, within a few hours, over a small counter such as is often found on fair grounds and similar places has long been a problem. Beneath the broiling sun at open air public gatherings when the demand for cool beverages is relatively enormous, a selling or dispensing unit having the proper equipment where at all times delivery of beverages at the proper temperatures and in the quantities demanded is indeed unusual.

In the past, ice and ice mixtures have been used as refrigerant but have been found generally unsatisfactory in that great quantities must be utilized to take care of the load requirements, provision must be made for the melting ice, space must be provided for the enormous quantities used, it is frequently necessary to chop the ice into relatively small particles which can be packed about the bottled beverage which absorbs time of the attendant which might better be utilized in the dispensing of the beverage when there is great demand, it involves the provision of transportation of the ice to the dispensing stand and other disadvantages which are obvious.

It has also been proposed in the past that mechanical refrigeration be utilized in the place of ice in the cooling of bottled beverages. Numerous problems have arisen, however, in the solution of the problem of refrigerating beverages with mechanical refrigerating apparatus. It has been found that the general design of mechanical refrigeration apparatus available, is unsuitable for this purpose in that when a great load is placed upon the apparatus the beverages are improperly cooled and the proper temperature is not achieved. Upon increasing the capacity of the refrigeration system to take care of any great loads which can be applied thereto, it has been experienced that under light loads improper chilling is effected and in some cases the beverage is frozen with disastrous results.

It is an object of the invention to provide an apparatus including an evaporator coil for association with conventional compressor and condenser equipment which will properly and efficiently cool beverages under varying load conditions.

It is a further object of the invention to pro-

vide a coil of unitary construction which is particularly adapted when associated with refrigeration translating equipment to rapidly and properly refrigerate relatively large quantities of bottled beverages.

Other objects and advantages of the invention will become apparent from the following description taken in conjunction with the accompanying drawings, wherein:

Fig. 1 is a cross-sectional view of the preferred form of my bottle cooler cabinet;

Fig. 2 is a fragmentary sectional view taken along lines 2-2, Fig. 1;

Fig. 3 is a view in perspective of the bottle supporting rack;

Fig. 4 is a perspective view of the bottle receptacles showing the evaporator coils in position about said receptacles;

Fig. 5 is a fragmentary sectional view of a portion of two receptacles and a portion of the evaporator coils; and,

Fig. 6 is a fragmentary detailed sectional view of an end portion of a receptacle showing a section of evaporator welded thereto.

Referring to the drawings a bottle cooling and dispensing cabinet 10 is provided with an insulated storage compartment 11 and a ventilated machinery compartment 12 provided with air ingress louvres 13 and air egress louvres 14. The machinery compartment is preferably uninsulated as shown and is adapted to house a ventilating fan 15 driven by a motor 16 supported on stand 17. In addition to the ventilating apparatus the machinery compartment houses what is generally termed the high side of a refrigerating system which may take a form of the conventional compression refrigerating system, including a compressor 18 driven by electric motor 19 through the medium of a belt 20. Compressed refrigerant discharged from the compressor 18 is passed to the condenser 21 wherein the refrigerant is translated to a liquid phase and conveyed to the liquid receiver 22. From this receiver the refrigerant in a liquid state is then passed through pipe 23 upwardly through an expansion device which may take the form of a capillary tube C to the initial turns 24 and 25 respectively of the evaporator coils indicated generally at 26. The last two turns 27 and 28 of the evaporator coils 26 lead the expanded refrigerant, now in a gaseous state, to the common suction pipe 29, back to the compressor 18 wherein the gaseous refrigerant is again compressed, passed to the condenser, again liquefied, and successively passed through a similar cycle. This

refrigeration system described is conventionally known as the "dry system" wherein the evaporation of the volatile refrigerant is depended upon to effect refrigeration or the absorption of heat and wherein the liquid volatile refrigerant within the evaporator coils is in the form of globules rather than in the form of solid liquid mass.

In order to better preserve the cold, or absence of heat, from the chamber 11, insulation 30 is incorporated in the construction of those walls of the cabinet 10 which surround the chamber 11. Doors 31 and 32 are provided in the upper wall construction of the chamber 11, whereby bottled beverage may be placed into the cooling compartment and removed therefrom, respectively, in an efficient manner.

In order to facilitate the proper storage and cooling of the bottled beverage within the chamber 11, I have provided a system comprising a series of three elongated open can like receptacles 33, which are placed side by side, see Fig. 2, and which are adapted to be placed within the evaporator coils 26, whereby proper refrigeration of bottled beverage located within the cans or receptacles 33 is effected. Legs 34 are arranged to support the receptacles 33 in their proper positions within the chamber 11, whereby a minimum of space is occupied, yet a place is provided for the location of the evaporator coils 26.

In applying the sections of the evaporator coils 26 to the receptacles 33, a novel and effective procedure is followed whereby two separate evaporators A and B are formed with their coils at different levels occurring alternately at vertically spaced intervals. Another feature of the arrangement of the evaporator coils A and B which make for uniformity of cooling is the fact that opposite ends of the receptacles 33 at adjacent horizontal planes are cooled by these evaporator coils; that is, one end of the receptacles 33 at a given plane is cooled by the evaporator A, while the opposite end on an adjacent plane is cooled by the evaporator coil B. The particular arrangement of the evaporator coils 26 described involves return bends 34' on the outside sides 35 of the receptacles 33. Those portions of the coils 36 which contact the relatively small ends 37 of the receptacles 33 are secured to the walls of the receptacles 33 by suitable autogenous means such as welding, see Fig. 6. The side portions 38 of the evaporator coils 26 are loosely disposed about or between the receptacles 33 as illustrated in Fig. 5. In view of the compact arrangement of the coils, the receptacles may be located relatively close to each other with their rims 39 overlapping, also see Fig. 5. The overlapping rims 39 may be suitably secured to each other as by the autogenous seal 40. The receptacles 33 are adapted to be supported by legs 34 within the chamber 11 which may contain a fluid heat exchange medium such as water, brine or air. To permit the ready flow, such as by thermal convection currents, throughout the chamber 11 of such fluid heat exchange medium, the receptacles 33 are provided with circular openings 41 of a size sufficient to facilitate the proper cooling of bottled beverages within the chamber 11.

To support bottled beverages within the chamber 11 in proper position, a wire rack or stand 42 formed of a bent U-shaped portion 43, a plurality of combination brace and stand elements 44 and braces 45, is located in each receptacle 33, as illustrated in Fig. 1, with the integrally formed bent portions 46 of the rack 42 resting on a portion

of the rim 39 of the receptacle 33 and the legs 44 standing on the floor of the chamber 11.

To better support the receptacles 33 in the proper position within the chamber 11, the straps 47 are secured to the lower portions of the outside walls 35 of the receptacles 33. To more or less insure the permanency of the construction, the receptacles 33 may be fabricated of rust resisting metal such as copper bearing steel, aluminum, or other suitable material.

To provide for the periodic cleaning of the chamber 11, I have incorporated in the construction of that chamber a discharge or drain outlet 48 whereby the chamber 11 may be flushed, washed and drained. The number of coils or sections of the evaporator elements A and B may be increased or decreased in accordance with the load on the system or the capacity of the arrangement desired.

From the above construction it will be understood that applicant has devised a heat exchange apparatus particularly adapted for the lowering in temperature and maintenance of the proper temperature of a large number of bottles containing a beverage whereby service for dispensing of the bottles may be substantially continuous with the beverage at the proper low but not too cold palatable temperature, the particular construction and arrangement of the coils being such as to maintain the heat exchange medium or bath within which the bottles to be cooled are placed at a substantially uniform temperature throughout its volume. This feature is important for even though the capacity of the machine be ample to absorb the required number of heat units, yet if the entire volume of the fluid heat exchange bath be not kept at a substantially uniform temperature, the inevitable result will be that some of the bottles are too cold whereas others are too warm. Applicant's construction has been found to have no such undesirable conditions prevailing; the temperature throughout the bath being substantially uniform despite continuous dispensing of bottled beverage and further that the beverage within the bottles themselves is at the proper palatable temperature. In fact, the bottles under conditions in which dispensing is substantially continuous almost uniformly range between 42 and 44° F.

One of the particular features of applicant's construction which has been found to aid materially in maintaining the required conditions in the fluid heat exchange bath and consequently within the beverage is the novel arrangement of the evaporator coils. This is perhaps, as has already been described, most clearly shown in Fig. 2 wherein arrows indicate the direction of fluid flow within the evaporator coils proper. With the coils interlocked as it were, the fluid within the coils about each metal sleeve 18 does not always travel in the same direction as would be the case if the metal sleeves 18 were encased by a simple spiral.

It is well known that in refrigeration systems of the "dry type" incorporating a rather elongated simple tubular coil that the quantity of heat absorbed by a section of that coil is a function of the amount of liquid particles within that section and those sections which contain little or no liquid particles or within which the vapor is superheated will absorb little or no heat. Applicant by his particular arrangement has deviated from more or less conventional design and has arrived at his novel assembly which results in more uniform distribution of those sections of

the coil which have a measurable amount of liquid particles effecting more uniform refrigeration of the liquid heat exchange bath and consequently more uniform cooling to the desired temperature and maintenance of the beverage at proper temperature conditions. The compressor of the mechanical refrigeration system may be intermittently operated to effect the maintenance of the cooling coils within a desired temperature range, by a conventional low pressure cut-out control 49, whereby when the suction pressure is below that which corresponds to the desired minimum temperatures, compressor operation will cease, and when the suction pressure is above that which corresponds to maximum desired temperature conditions, compressor operation will be initiated.

It will be obvious to those skilled in the art that various changes may be made in this device without departing from the spirit of the invention and therefore the invention is not limited to what is shown in the drawings and described in the specification but only as indicated in the appended claims.

I claim:

1. In a refrigeration system, a cooling element including a metal sleeve and an evaporator coil, said coil extending about a portion of said metal sleeve in one direction and returning in the opposite direction on said sleeve to form a U-shaped part, said returning portion further extending about another section of said sleeve, and an additional run of coil located between the coil extensions of the U-shaped part and crossing said U-shaped part whereby refrigerant will be travelling in opposite directions on one section of said metal sleeve.

2. In a refrigeration system, a cooling element including a pair of perforated metal sleeves having vertical axes and refrigerant evaporator coils, said coils having horizontal runs arranged about said sleeves and generally perpendicular to the axis of said sleeves, the coils about one of said sleeves being vertically offset in relation to the coils about the other of said sleeves, whereby the coil portions of the adjacent sections of said sleeves are generally in interlocked arrangement and further whereby the sleeves may be arranged close to each other, said sleeves having outwardly extending lip-like flanges of a dimension generally corresponding to the outside diameter of the coils.

3. In a refrigeration system, a cooling element including a metal sleeve having a vertical axis and two evaporator coils each having horizontal runs, said metal sleeve being relatively large in comparison with the cross sectional size of the coils, one of said coils wrapped around said sleeve in a plane generally perpendicular to the axis of said sleeve, said second coil wrapped around said sleeve in a direction opposite to that of the first coil and in a plane parallel to that of said first coil but spaced therefrom whereby opposite ends of said relatively large sleeve will be maintained at substantially the same temperature in adjacent planes.

4. In a refrigeration system, a cooling element including a metal sleeve having a vertical axis and two evaporator coils each having horizontal runs, said metal sleeve being relatively large in comparison with the cross sectional size of the coils having a section, one of said coils wrapped around said sleeve generally in a plane perpendicular to the axis of said sleeve, a second coil having a second wrapped around said sleeve in a

direction opposite to that of the first coil section and in a plane parallel to that of said first coil section but spaced therefrom whereby opposite ends of said relatively large sleeve, in adjacent planes, will be maintained at substantially the same temperature, a second cooling element including a similar metal sleeve and third and fourth evaporator coil sections, said third coil section wrapped around said second sleeve in a plane generally perpendicular of the axis of said second sleeve, said fourth coil section wrapped around said second sleeve in a direction opposite to that of the third coil section and in a plane parallel to that of said third coil section but spaced therefrom, said sleeves being arranged closely adjacent each other with the coil sections about said first and second sleeves offset vertically and in interlocking arrangement.

5. In a refrigeration system, a cabinet provided with an inclined rack comprising wire members having hooked portions at their uppermost ends, adapted to support a bottled beverage, bottle inserting and bottle withdrawing means incorporated in said cabinet and located in operative relation to said rack, said cabinet providing partial support for said rack, and a cooling element engaging said hooked portions to provide partial support for said rack.

6. In a refrigeration system, a cabinet provided with an inclined rack adapted to support a bottled beverage, bottle inserting and bottle withdrawing means incorporated in said cabinet and located in operative relation to said rack, said cabinet providing partial support for said rack, and a cooling element providing partial support for said rack, said cooling element including a metal sleeve and an evaporator coil, said coil extending about a portion of said metal sleeve in one direction and returning in the opposite direction on said sleeve to form a U-shaped part, said returning portion further extending about another section of said sleeve, whereby refrigerant will be travelled in opposite directions in section of said metal sleeves.

7. In a refrigeration system, a cabinet provided with an inclined rack adapted to support a bottled beverage, bottle inserting and bottle withdrawing means incorporated in said cabinet and located in operative relation to said rack, said cabinet providing partial support for said rack, and a cooling element providing partial support for said rack, said cooling element including a pair of metal sleeves and refrigerant evaporator coils, said coils arranged about said sleeves and generally perpendicular to the axis of said sleeves, the coils about one of said sleeves being vertically offset in relation to the coils about the other of said sleeves whereby the coil portions of the adjacent sections of said sleeves are generally in interlocked arrangement and further whereby the sleeves may be arranged close to each other.

8. In a refrigeration system, a cabinet provided with an inclined rack adapted to support a bottled beverage, bottle inserting and bottle withdrawing means incorporated in said cabinet and located in operative relation to said rack, said cabinet providing partial support for said rack, and a cooling element providing partial support for said rack, said cooling element including a plurality of metal sleeves and a plurality of evaporator coils arranged in parallel relation, one of said coils contacting each of said sleeves in a single plane in one direction with refrigerant fluid passing in said plane in said one direction relative to the coil through that portion of the coil within

said plane, said coil returning in a second plane spaced from said first plane and in contact with each of said metal sleeves, said second coil arranged in contact with said metal sleeves in a third plane between the first and second planes mentioned.

9. In a refrigeration system, a cabinet provided with an inclined rack adapted to support a bottled beverage, bottle inserting and bottle withdrawing means incorporated in said cabinet and located in operative relation to said rack, said cabinet providing partial support for said rack, and a cooling element providing partial support for said rack, said cooling element including a plurality of metal sleeves and a plurality of evaporator coils arranged in parallel relation, one of said coils contacting each of said sleeves in a single plane with refrigerant fluid passing in said plane in one direction relative to said coil through that portion of the coil within said plane, said coil returning in a second plane spaced from said first plane and in contact with each of said metal sleeves, said second coil arranged in contact with said metal sleeves in a third plane between said first and second planes mentioned, said third coil returning in a fourth plane exterior of said first and second planes and in contact with said metal sleeves.

10. In a refrigeration apparatus, a cabinet including a storage compartment and a machinery compartment, a refrigeration system including a high side located in said machinery compartment and a low side located within said storage compartment, said high side including an adjustable control whereby the low side may be maintained within certain temperature limits, a plurality of inclined racks within said storage compartment for supporting bottled beverage, bottle inserting means and bottle withdrawing means incorporated within said cabinet construction in operative relationship to said racks, a plurality of metallic receptacles open at their tops and bottoms and provided with openings in their sides located within said storage compartment and in association with said racks whereby bottled beverage located on said racks is within the corresponding metallic receptacles, said low side including a multiple coil system in contact with said receptacles, said multiple coil system including coils arranged in a generally horizontal plane about each of said receptacles, the coils about one of said receptacles being offset vertically from the coils of the adjacent receptacle whereby adjacent coils are interlocked when the receptacles are arranged close to each other.

11. In a refrigerating apparatus of the type to cool bottled beverages, a cabinet having a lining capable of holding water or brine, a plurality of metal sleeves of vertical axis and of relatively long narrow horizontal section located within said lining, a plurality of horizontal runs of cooling coils associated with the sides of said sleeves, some of said runs providing means for conveying refrigerant in one direction and some of said runs providing means for conveying refrigerant in an opposite direction, said runs being connected to each other by return bends, and addi-

tional runs horizontally crossing said connections.

12. In a refrigeration apparatus of a type to cool bottled beverages, a cabinet, an evaporator in said cabinet, a rack associated with said cabinet in said evaporator, said rack comprising an inclined bottom portion and a substantially vertical extension therefrom, said vertical extension including a hooked end for association with said evaporator and said inclined bottom portion including legs for association with the bottom wall of the cabinet.

13. In a refrigeration system including a refrigeration circuit, a cooling unit including a plurality of metal sleeves and a plurality of spiral-like evaporator coils arranged in parallel relation in said circuit, means for effecting unidirectional flow through each of said coils and therethroughout, a section of one of said coils contacting each of said sleeves in a single plane with refrigerant fluid passing in said plane in one direction, said coil having a second section returning in a second plane spaced from said first plane and in contact with each of said metal sleeves, a second of said evaporator coils having a section arranged in contact with said metal sleeves in a third plane between the first and second planes mentioned.

14. In a refrigeration system including a refrigeration circuit, a cooling unit including a plurality of metal sleeves and a plurality of spiral-like evaporator coils arranged in parallel relation in said circuit, means for effecting unidirectional flow through each of said coils and therethroughout, a section of one of said coils contacting each of said sleeves in a single plane with refrigerant fluid passing in said plane in one direction, said coil having a second section returning in a second plane spaced from said first plane and in contact with each of said metal sleeves, a second coil having a section arranged in contact with said metal sleeves in a third plane between the first and second planes mentioned, said second coil having a second section returning in a fourth plane exterior of said first and second planes and in contact with said metal sleeves.

15. In a refrigeration system, a cooling unit including a plurality of metal sleeves and a plurality of spiral-like evaporator coils arranged in parallel relationship, one of said coils having a section contacting each of said sleeves in a single plane, said coil having a second section returning in a second plane spaced from said first plane and in contact with each of said metal sleeves, a second coil having a section arranged in contact with said metal sleeves in a third plane between the first and second planes mentioned, said metal sleeves being formed with outwardly extending lip-like flanged rims at their upper portions, the rims extending outwardly a distance generally corresponding to the external diameter of the coils, the rims of adjacent sleeves being slightly one below the other whereby the sleeves may be arranged in relatively close proximity to each other, and means for securing said sleeves to each other located in association with adjacent rims.

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