Oct. 12, 1965 D. E. RUTISHAUSER ETAL 3,210,957

SYSTEM FOR REFRIGERATING DISPLAY CASES

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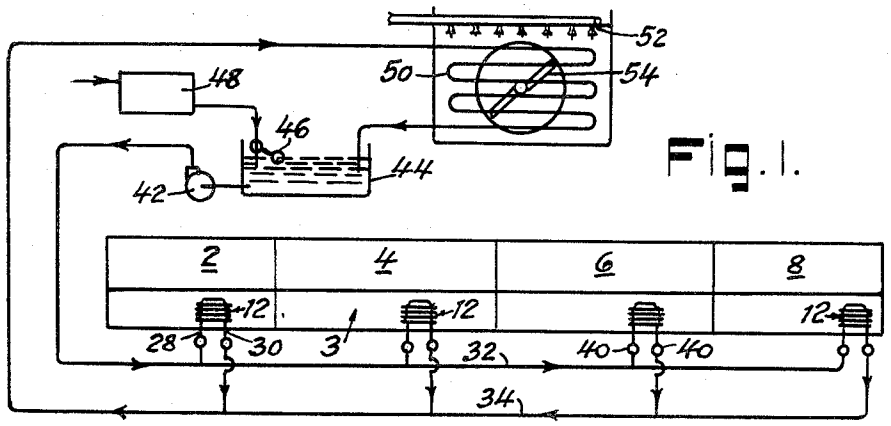

Fig. 1.

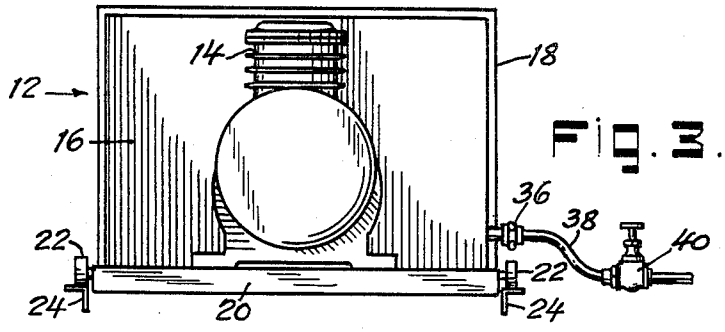

Fig. 3.

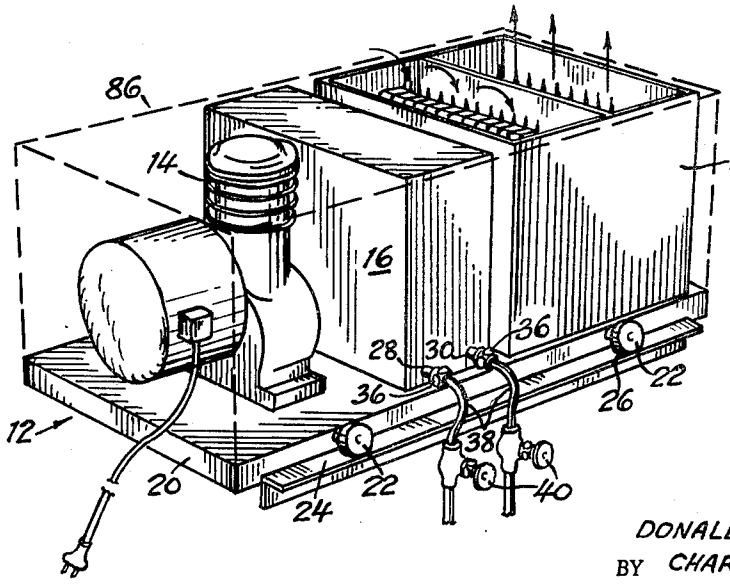

Fig. 2.

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Fig. 4.

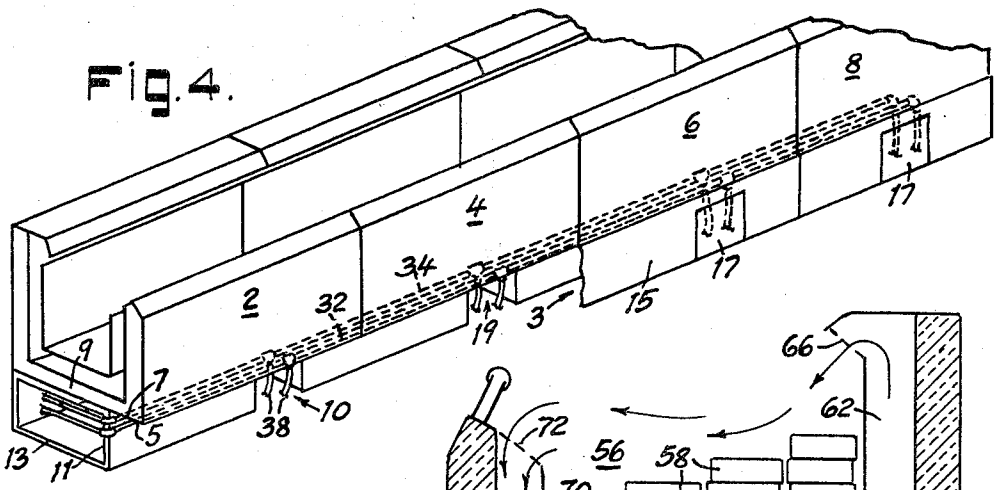
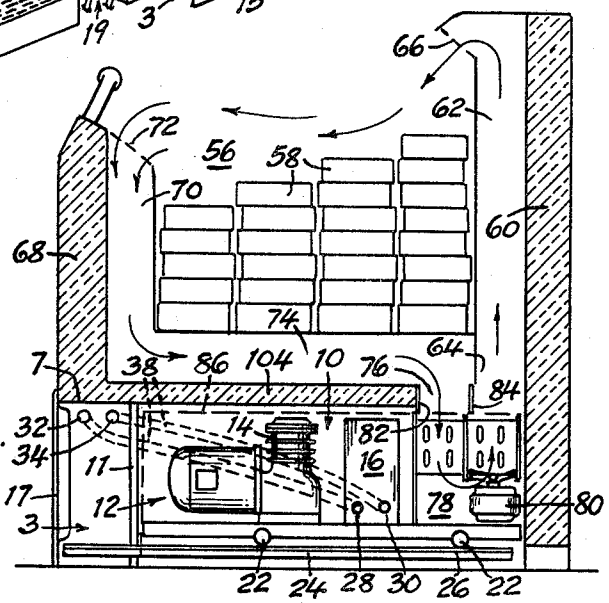


Fig. 5.



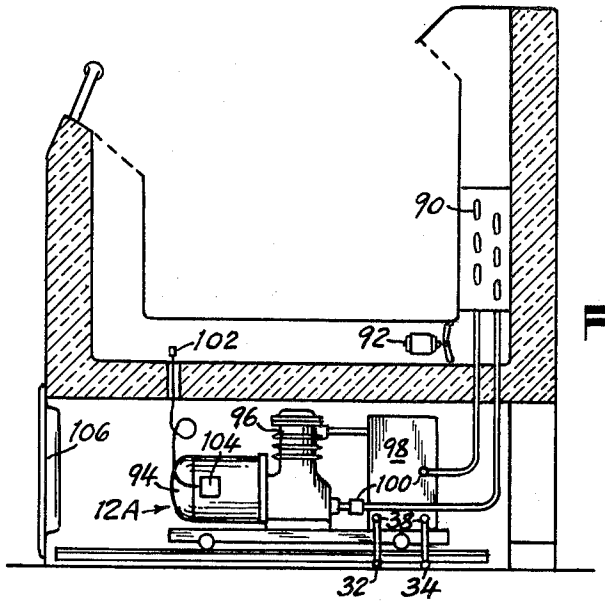


Fig. 6.

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SYSTEM FOR REFRIGERATING DISPLAY CASES

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13 Claims. (Cl. 62—255)

This application is a continuation-in-part of copending application Serial No. 186,405, filed April 10, 1962, now abandoned.

This invention relates to systems for use in operating a plurality of refrigerated display cases or sections of cases and is directed particularly to systems and display cases adapted for use in food markets and other establishments wherein a number of refrigerated devices may be located in end to end relation along a wall or aisle of a store.

Most large food markets today are provided with numerous refrigerated fixtures such as self-service frozen food cases, dairy cases, ice cream cabinets, and the like which are arranged in adjacent positions on one or more walls or aisles of a store. In some instances, each fixture is provided with its own compressor, condenser and evaporator, but in such installations, it is usual to employ an air cooled condenser with a fan which blows air over the condenser. The air thus circulated is heated by the condenser and when discharged into the aisle or elsewhere in the store or market, it raises the temperature of the ambient air and places a heavy load on any air conditioning system used in the store. Moreover, the noise created upon operating numerous fans to cool the condensers is objectionable.

In other installations, a single refrigerating unit may be located in a machine room or basement and the compressed refrigerant conducted to evaporators located in each fixture by means of suitable piping. The condenser in such systems may be either water cooled or air cooled and the heat extracted does not enter the store or establishment where the fixtures are located. However, such installations are often expensive and frequently present difficulties in maintaining different temperatures in different fixtures throughout the store.

When using either system of refrigeration, it is necessary to send a refrigeration expert to the store or location where the display cases are situated in order to make any repairs or adjustments required to maintain the equipment in proper operating condition. Moreover, any delays in making the needed repairs may result in the loss or damage to large quantities of valuable merchandise. As a result, the manufacturers or users of refrigeration equipment must maintain a large staff of highly trained service men available at all times and send them about the country or area where the stores are located to assure continued and proper maintenance of the equipment.

In accordance with the present invention, these limitations and objections to refrigeration systems of the prior art are overcome and new systems and equipment are provided which are less expensive to install and maintain and yet assure continued operation of various types of refrigerated display cases in any establishment.

These results are preferably attained by arranging a plurality of display cases or display case sections in adjacent positions or in end to end relation to form an assembly wherein each case or section has a chamber therein for receiving a refrigerating unit. The refrigerating units employed in the cases of the assembly each has a compressor and a water cooled condenser adapted to be connected to a common cooling system. The units are constructed so that they may be individually moved into

or out of the chamber in any one of the display cases without disturbing any other unit or display case in the assembly. The refrigerating units employed in the practice of the present invention may also include an evaporator and blower for circulating refrigerated air through the display case although in some instances, the evaporator and the blower may be permanently mounted in the display case itself and designed to be separably connected to a refrigerating unit embodying a compressor, condenser and other associated elements required for providing a suitable supply of refrigerant to the evaporator in the display case.

In either type of display case, the refrigerating unit embodying the compressor and condenser (with or without the evaporator and blower) is self-contained and preferably is in the form of a hermetically sealed assembly. Each unit further is removable from the display case so that it may be readily replaced by another similar unit while the first is taken to a centrally located shop or location for repair or adjustment by men working normal business hours. Moreover, by using water cooled condensers in such units, it is possible to provide the system with common cooling water supply and return lines to which all of the refrigerating units employed in the assembly of display cases or display case sections may be individually connected and disconnected at will. Thus, any local plumber or maintenance man can connect and disconnect a refrigerating unit in the system easily and quickly at any time required so that the produce or merchandise need not lose refrigeration for any extended period. It is also possible in such a system to provide a closed cooling water circuit with a single cooling device located on a roof or elsewhere and to treat or purify the water so as to reduce rust, corrosion or clogging of the condenser and only limited amounts of make-up water need be added to the system.

In order to attain these advantages, it is desirable to arrange the display cases in adjacent positions in the assembly, and preferably in end to end relation, along an aisle or wall of the store or market. Each case or section thereof then may be provided with an elongated service compartment extending the full length thereof. The cases in turn are then arranged in the assembly so that the service compartments therein cooperate to present a common continuous service channel or raceway extending the full length of the assembly. In this way, it is possible to locate the common cooling water feed and return lines for all of the condensers in the common service channel of the assembly. Moreover, the chambers in the display cases or sections thereof which are designed to receive the refrigerating units are arranged to communicate with service compartments in the cases to facilitate the connection and disconnection of the condensers of the refrigerating units to the common water feed and return lines. Furthermore, by locating the service compartments in the lower portion of the front of the display cases and arranging the chambers for the refrigerating units in the lower portion of the display cases so that they face the aisle, the units can be easily inserted and removed from the cases or case sections and access to the continuous service compartment and the common lines therein is greatly facilitated.

Accordingly, the principal object of the present invention is to provide a novel type of refrigerating system and display case assembly.

A further object of the invention is to reduce the cost of installation, repair and maintenance to refrigerated display cases.

An additional object of the invention is to provide a novel type of display case adapted for use in an assembly.

Another object is to provide a novel type of refrigerated fixture wherein the refrigerating unit is removable and replaceable for adjustment or repair at another location.

A specific object of the invention is to provide a novel assembly of display cases and refrigerating means therefor adapted to be located along a wall or aisle of a store or the like.

These and other objects and features of the present invention will appear from the following description thereof wherein reference is made to the figures of the accompanying drawings.

In the drawings:

FIG. 1 is a diagrammatic illustration of a typical refrigerating system embodying the present invention;

FIG. 2 is a perspective illustrating a typical refrigerating unit which may be employed in the system of FIG. 1;

FIG. 3 is an end view of the unit shown in FIG. 2;

FIG. 4 is a perspective illustrating an assembly of display cases embodying the present invention;

FIG. 5 is a vertical sectional view through a typical refrigerated self-service display case embodied in the assembly of FIG. 4; and

FIG. 6 is a view similar to FIG. 5 illustrating an alternative form of display case adapted for use in the assembly of FIG. 4.

The system chosen for purposes of illustration in FIGS. 1 and 4 embodies an assembly including a plurality of display cases or display case sections indicated at **2**, **4**, **6** and **8**. All of the cases or sections in the assembly may be the same or similar if desired. However, in other assemblies, the case **2** may be a frozen food case, case **4** may be a dairy box, case **6** may be an ice cream cabinet, and case **8** may be a refrigerated vegetable stand. Each of the cases may require a different refrigeration capacity or temperature or any two or more cases or sections may be of the same type or require the same refrigerating capacity and temperature.

As shown in FIGS. 4 and 5, each of the display cases has an elongated service compartment **3** located in the lower front portion thereof and extending throughout the length of the case. The upper wall **5** of the service compartment is preferably formed by an over-hang or projection **7** of the bottom **9** of the refrigerated display space within the case. The rear of the service compartment **3** may be open beneath the display case, but it is preferably closed by a panel **11** mounted upon a base or framing **13** of the display case. It is then possible to mount electrical conduits, switches, control means, time clocks and the like on the panel **11** in convenient positions for access through the front of the service compartment. The front of the service compartment is provided with a closure plate **15** which may, if desired, include one or more doors **17** and is designed to present a neat and attractive appearance.

With this construction, the dispaly cases or display case sections, when assembled in adjacent positions or in end to end relation with the service compartments therein communicating or in alignment with each other cooperate to present a continuous, common service channel or raceway extending the full length of the assembly and accessible from the aisle or space in front of the assembled cases.

Each of the cases in the assembly is provided with a chamber **10** designed to receive a refrigerating unit **12**. The chamber **10** is located beneath the bottom **9** of the display space of the case and extends rearwardly from the service compartment **3** and panel **11** (when used) so as to present a front opening **19** communicating with the service compartment and through which the refrigerating unit **12** can be inserted and removed. A door **17** in the closure plate **15** may be aligned with the front opening **19** of the chamber **10** if desired.

The refrigerating units **12** may be of the same or various different capacities for use in different types of display cases or cases having different refrigerating needs but preferably are units which include a compressor **14**, a water cooled condenser **16**, and an evaporator **18** with high and low sides using a capillary tube. These elements of the unit are filled and completely sealed at the factory so that each unit **12** is self-contained and may be heremetically sealed to require a minimum of service.

Each unit is mounted on a base member **20** provided with rollers, skids, or other means **22** which will facilitate insertion and removal of the unit to and from the chamber **10**. Tracks **24** or the like may be located on opposite sides of the chamber **10** to receive and support the rollers of the unit. If desired, the tracks may be provided with depressions **26** or other means for accurately positioning the unit **12** within the chamber **10**.

The condenser **16** is provided with a water inlet pipe **28** and a water outlet pipe **30** designed to be connected to a common cooling water feed line **32** and a common water return line **34** of the system. For this purpose, the water inlet and outlet pipes each of the unit is provided with simple and conventional fittings **36** for attachment to piping or hose connections **38** leading to water feed and return lines **32** and **34** of the system. The common cooling water feed line **32** and the common water return line **34** are located in the continuous common service channel formed by the communicating service compartments **3** of the cases in the assembly and thus extend from one end of the assembly to the other for connection to any or all of the refrigerating units in the display cases. The common lines **32** and **34** may be supported from the projection **7** of the bottom of the display case or by the panel **11** of the service compartment or may rest upon the floor or the framing **13** of the case within the service compartment. The connections **38** by which the refrigerating units **12** are connected to the common lines **32** and **34** are preferably provided with shut-off valves **40** so that the flow of water througth the condenser **16** of the unit may be controlled as desired or the flow can be cut off entirely and the refrigerating unit removed from the system independently of any other unit. Each unit can thus be easily connected into or removed from the system by anv local plumber, maintenance man, or helper.

The water is circulated by means of a pump **42** through the common cooling water feed line **32** to all of the condensers. The water is received from a common source such as the tank **44** which may be provided with a float valve **46** or the like to maintain a constant supply of cooling water available at all times. Furthermore, the water may be supplied to tank **44** through a treating or conditioning unit **48** so that the formation of rust or the accumulation of sediment in the condensers will be prevented.

The water from all of the condensers is passed to the common water return line **34** and carried to the roof or elsewhere for passage through a cooling coil **50** and back to tank **44**. The water in the cooling coil **50** may be cooled by means of a spray **52** or a fan **54** or both or in any other preferred manner. In this way, all of the condensers of all of the units may be cooled effectively whereas the units themselves are readily removable from the system and any one or more units may be removed from or added to the system at will without impairing or influencing the operation of any other unit or fixture in the system. Moreover, it is not necessary to employ refrigeration men or experts to make any change or variation in the system. Conventional water lines with suitably located outlets and conventional electrical lines and outlets can be installed for placement of fixtures at any and various locations in the store or establishment. Thereafter, the store manager and the usual help employed can move or change the fixtures about without requiring any refrigeration men whatever.

In the event any fixture should fail to operate properly at any time, the defective unit in the fixture can be removed and replaced by a new or reconditioned unit. Such replacement can be made very easily by closing

the shut-off valves 40 and disconnecting the fittings 36 through which water is supplied to the condenser from the common feed and return lines 32 and 34. The defective unit 12 is then pulled out of chamber 10 in the fixture and a substitute unit inserted and connected to the lines 32 and 34. Such replacement can be made in a matter of minutes and without calling in a refrigeration man or expert service person. The defective unit can then be returned to a central service and repair location for inspection, adjustment or repairs which, if necessary, may require days for completion. In the meantime, there will be no shutting down of any fixture in the store and no loss or damage to merchandise. Moreover, change or substitution of a unit in one fixture can be made without cutting off or influencing the operation of any other fixture in the system.

In order to permit the use of removable units in refrigerated fixtures, it is, of course, necessary to provide fixtures which are suitably designed and constructed to receive and employ such units. In order to illustrate typical fixtures of this character, reference is made to FIGS. 5 and 6 of the drawings.

FIG. 5 represents a refrigerated self-service display case which may be of the type shown and described in copending application Serial No. 387,448, filed August 4, 1964. The case is open at the top for access to customers and has a display space 56 for receiving articles 58 to be refrigerated while on display. The rear wall 60 of the case is insulated and provided with an air supply duct 62 which has an inlet opening 64 at its lower end communicating with the chamber 10 in which the unit 12 is located. The upper end of the supply duct 62 has an outlet opening 66 which communicates with the upper portion of the display space 56. The front wall 68 of the case is also insulated and provided with an air return duct 70 which is open at its upper end at 72 to draw off air from the display space. The air is conducted beneath the display space through the duct portion 74 to the return outlet 76 which communicates with the chamber 10 adjacent the inlet opening 64 to the air supply duct 62.

The unit 12 embodies an evaporator which, as shown, is located at the inner end of the unit and provided with coils and fins positioned in a refrigerating passage 78. The inlet end of the refrigeration passage 78 is positioned to register with the return outlet 76 of the air return duct 70 when the unit 12 is properly positioned in the chamber 10 with the rollers 22 of the unit positioned in the recesses 26 of the tracks 24. The outlet end of the refrigeration passage 78 is similarly positioned to register with the inlet opening 64 of the air supply duct 62 and a fan or blower 80 is arranged to circulate air through the refrigeration passage 78 and over the evaporator coil and fins therein to reduce the air to the desired low temperature. The air thus refrigerated is then forced through the air supply duct 62 to the display space 56 and is drawn from the display space through air return duct 70 for recooling and recirculation by the unit 12.

In a similar way the water inlet pipe 28 and the water outlet pipe 30 of the water-cooled condenser may be brought into registry with the piping or hose connections 38 or into position to permit ready connection of the fittings 36 thereof when the unit 12 is moved into a predetermined position in the chamber 10. In order to facilitate connection and disconnection of the fittings 36, the connections 38 are preferably flexible although mounted in fixed or predetermined positions on the fixture.

With this construction the fixture as constructed does not embody any refrigerating elements as such, but is only provided with ducts or passages for the circulation of refrigerated air through the case. The ducts provided are arranged to communicate with the chamber 10 in proper locations for registration with the inlet and outlet ends of the refrigeration passage 78 of the unit to be inserted in the chamber 10. As shown in FIG. 5, the return outlet 76 of the air return duct 70 is provided with downwardly extending flexible barriers 82 and 84 which serve to seal the outlet from the chamber 10 and the outlet end of the refrigeration passage 78 without interfering with the insertion or removal of the unit. A closed passage for the circulation of refrigerated air through the case is thus provided and short circuiting of the air and the entrance of undesired ambient air from the chamber 10 is prevented.

While the inlet opening 64 of the air supply duct 62 and the return outlet 76 of the air return duct 70 may be positioned side by side as shown in FIG. 5, they may, of course, be located in any other positions desired or required by the construction of the unit 12 to be employed in the fixture. Thus, for example, the unit 12 may embody an evaporator-blower unit of the type shown and described in U.S. Patent No. 2,929,229 wherein the inlet and outlet ends of the refrigeration passage are located adjacent the opposite ends of the unit. The fixture then should be constructed so that the ends of the air circulating ducts or passages therein are spaced apart and positioned to register with inlet and outlet ends of the refrigerating passage of the unit.

The unit and fixture chosen for purposes of illustration in FIG. 6 differ from that of FIG. 4 in that the evaporator 90 and the blower 92 are constructed as a permanent part of the fixture and the unit 12A embodies only a motor 94, a compressor 96, and a condenser 98. When using this type of assembly, the evaporator 90 and the refrigerant-carrying tubes of the condenser 98 are provided with separable fittings or connections 100 whereas the condenser may be provided with the same separable connections 38 for connecting it to the cooling water supply and return lines 32 and 34.

With this construction, the unit 12A may be simplified and a temperature responsive bulb 102 may be inserted into an opening in the fixture and connected to control means 104 for actuating the motor of the unit. Nevertheless, the unit may be readily removed and replaced by separating the fittings 100 of the evaporator as well as the connection 38 of the water cooling system before removal of the unit from the chamber 10. A new unit can then be inserted into the chamber and connected to the evaporator 90 and the common cooling water lines 32 and 34 in a relatively short time and without calling in a refrigeration expert.

The form of the motor, compressor, and condenser assembly illustrated in the drawings is intended to be illustrative only since the shape, size and appearance of hermetically sealed elements of this character may differ altogether from that shown and the cover or housing indicates in dotted lines at 86 in FIG. 2 will enclose the assembly and present a neat streamlined appearance adapted to the most suitable and efficient design of the elements enclosed therein.

It will thus be apparent that the form, type and arrangement of the elements of the combination used in the system are capable of many variations and changes in order to adapt the invention to any installation desired. In view thereof, it should be understood that the particular embodiments of the invention shown in the drawings and described above are intended to be illustrative only and are not intended to limit the scope of the invention.

We claim:

1. An assembly of refrigerated cases comprising a plurality of cases arranged in adjacent positions, each of said cases having a service compartment extending from one end of the case to the other, the service compartments in said cases communicating with each other and cooperating to form a common service channel extending from one end of the assembly to the other, a refrigerating unit in each of said cases for refrigerating articles in the case, each of said refrigerating units including a water cooled condenser, common cooling water feed and return lines located in

said common service channel and extending to all of said cases, and connections extending from said common lines to the condenser of each of said refrigerating units.

2. An assembly of refrigerated cases as defined in claim 1 wherein valve means are located in the connections between the cooling water feed line and the water cooled condenser of each refrigerating unit.

3. An assembly of refrigerated cases as defined in claim 1 wherein said common cooling water feed and return lines form a part of a closed circuit including a water cooling means.

4. An assembly of refrigerated cases as defined in claim 1 wherein each of said cases has a chamber therein with an opening communicating with the service compartment in the case, and the refrigerating unit is movable into and out of a predetermined position in said chamber through said opening.

5. An assembly of refrigerated cases as defined in claim 4 wherein the connections between the water cooled condenser of the refrigerating unit and the common cooling water feed and return lines include flexible elements establishing a separable connection between said lines and the condenser.

6. A system for use in the display and merchandising of refrigerated products comprising a plurality of refrigerated display cases arranged adjacent an aisle, said display cases having display spaces therein each of which is provided with a bottom and with a front wall facing on the aisle and extending upward from the bottom of the case, each case further being provided with a chamber located beneath the bottom of the case and presenting an access opening facing toward said aisle below the front wall of the display space, each of said cases having a separate means therein for refrigerating its display space, said separate means including a water cooled condenser located in the chamber in the case, a common cooling water feed line and a common water return line extending parallel to said asile and located rearwardly of the front walls of said display cases and adjacent to the chambers in said cases, said common cooling water feed line having connections extending therefrom to the condenser in each case, said common return line also having a connection extending therefrom to the condenser in each case, means for circulating water through said common lines to and from each of said condensers, and means for cooling the water thus circulated.

7. A system for the display of refrigerated products comprising a plurality of display cases assembled in end to end relation on a floor and located at one side of an aisle, each of said cases having a display space therein provided with a bottom portion adjacent the front of the case which is elevated above the floor, the space beneath said bottom portion of each of said cases extending the full length of the case and being aligned with a similar space in an adjacent case to provide a common elongated service channel extending substantially the full length of the assembled cases in a position to be accessible from said aisle, a chamber in each of said cases below the bottom portion of the display space therein and having an opening facing toward the front of the case and communicating with said common service channel, an independently operable refrigerating unit associated with each of said cases, each of said units including a water cooled condenser, said refrigerating units being movable through said opening into and out of the chambers in the display cases, a common cooling water feed line located in said service channel and extending substantially the full length thereof, connections extending from said common cooling water feed line to each of said condensers, a common water return line located in said service channel and extending substantially the full length thereof, said return line being connected to each of said condensers for receiving water therefrom, means for circulating water through said common lines and condensers, and means for cooling the water thus circulated.

8. A system as defined in claim 7 wherein an independently operable control valve is located in the connection between the cooling water feed line and each condenser for controlling the flow of cooling water through the condenser.

9. A system as defined in claim 7 wherein the cooling water supply line and the water return line are included in a closed circuit, and the means for cooling the water circulated through the condensers is located at a point remote from the assembled display cases.

10. An assembly for handling refrigerated products comprising a plurality of thermally insulated cases located in adjacent positions, each of said cases being provided with a service compartment accessible from the exterior thereof, the service compartment in each case extending from one end thereof to an opposite end thereof, said cases being assembled with the opposite ends of the service compartments therein communicating with the service compartments of adjacent cases at opposite ends thereof and cooperating to provide a common service channel extending throughout substantially the entire length of the assembled cases, an independently operable refrigerating unit associated with each of said cases, common service lines located in said common service channel and extending throughout substantially the entire length thereof, and separable connections extending from said common service lines to each of said units.

11. In a refrigerating system comprising a plurality of fixtures to be refrigerated, each of said fixtures having a chamber therein, units movable into and out of the chambers of said fixtures, each of said units including a compressor and a water cooled condenser having a water inlet and a water outlet, a common water feed line, a common water return line, said common lines each having connections extending to and terminating adjacent each of said chambers, detachable means for attaching said connections to the water inlets and water outlets of the condensers of each of said units, means in one of said common lines for circulating water through said common lines and connections to the condensers in each of said units and common cooling means to which said common lines are connected for cooling the water circulated through said common lines end to end from each of said condensers.

12. A refrigerating system comprising a plurality of fixtures to be refrigerated, each of said fixtures having a chamber therein, units movable into and out of predetermined positions in the chambers of said fixtures, each of said units including a compressor and a water cooled condenser having a water inlet and a water outlet, said unit also including an evaporator connected to said condenser for receiving refrigerant therefrom and means for circulating air over said evaporator and through said fixture, a common water feed line, a common water return line, connections extending from the common water feed line and the common water return line to each of the chambers in said fixture and including flexible portions detachably connectable to the water inlets and water outlets of the condensers of said units, means in one of said common lines for circulating water through said common lines and said condensers, and common cooling means to which said common lines are connected for cooling the water circulated through common lines and said condensers.

13. A refrigerating system comprising a plurality of fixtures to be refrigerated, each of said fixtures having a chamber therein, air circulating ducts in said fixtures having the ends thereof terminating adjacent and communicating with said chamber, units movable into and out of predetermined positions in the chambers of said fixtures, each of said units including a compressor, a water cooled condenser having a water inlet and a water out-

let, an evaporator connected to said condenser for receiving refrigerant therefrom, a refrigeration passage in each unit in which said evaporator is located, the ends of the refrigeration passage in said units registering with the ends of the ducts in said chambers when said units are in said predetermined positions, means for circulating air through the refrigeration passages and ducts of said units and fixtures to refrigerate said fixtures, a common water feed line, a common water return line, detachable means for connecting the water inlets and water outlets of each of the condensers of said units to said common water feed and return lines respectively, means in one of said common lines for circulating water through said common lines and each of said condensers, and cooling means to which said common lines are connected for cooling the water circulated through common lines and said condensers.

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