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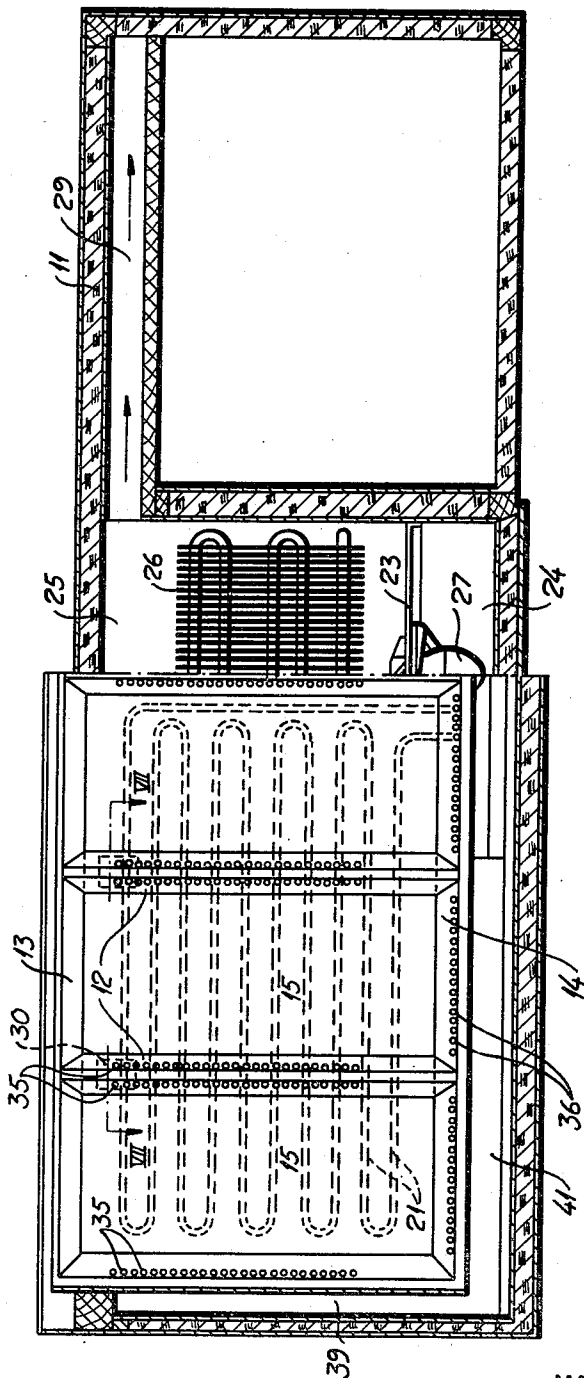
M. E. RYDIN
COUNTER REFRIGERATION

2,608,068

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3 Sheets-Sheet 2

Fig. 2



INVENTOR
MARTIN E. RYDIN
BY *Paulmier & Paulmier*
ATTORNEYS

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3 Sheets-Sheet 3

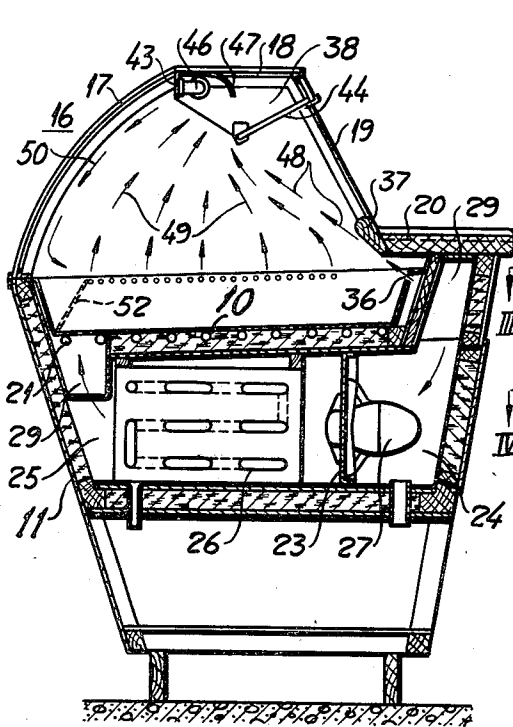


Fig. 3

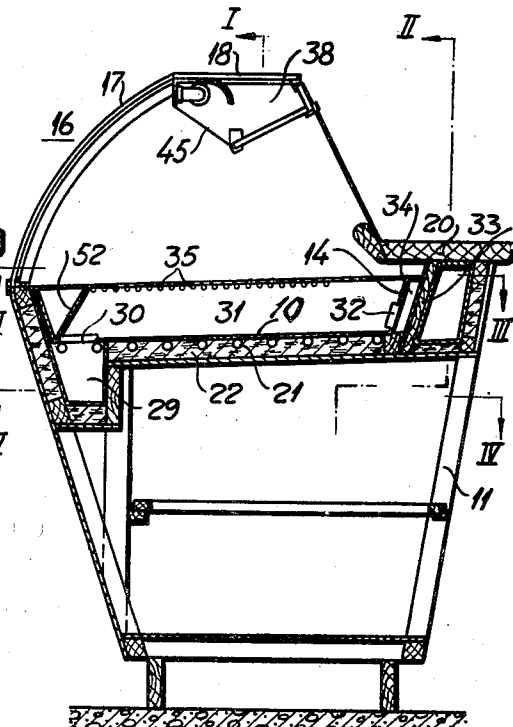
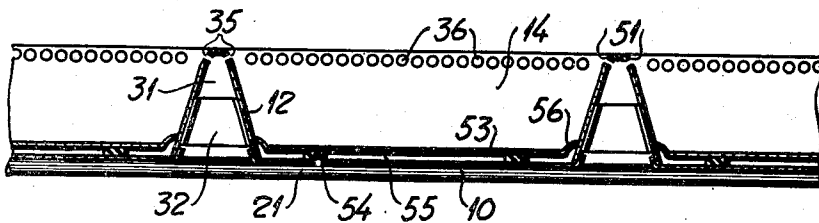


Fig. 4

Fig. 5



INVENTOR
MARTIN E. RYDIN
BY *Toulmin & Toulmin*
ATTORNEYS

UNITED STATES PATENT OFFICE

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COUNTER REFRIGERATION

Martin Emanuel Rydin, Stockholm, Sweden

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13 Claims. (Cl. 62—89.5)

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This invention relates to display counters, and particularly to refrigerated display counters especially adapted for use in displaying meats and the like.

It is estimated that in butchers' shops, as a rule, only fifty to sixty per cent of the working time of the shop attendants is effectively utilized in serving customers. The rest of the working time is partly used for keeping the goods and the shop in order, but a very considerable percentage constitutes lost time.

The reasons for these unsatisfactory conditions come primarily from the difficulties of properly preparing the meat. The goods are generally displayed in too large units so that it must be cut for each sale, and even the cutting up of the carcass into major divisions is, in many cases, carried out in the shop proper while the customer has to wait. A much more rapid service to the advantage of both the customers and the shop attendants could be secured if the cutting work were carried out in the cutting room separate from the sales room by persons skilled in this particular work, so that the attendants in the shop could be free to devote themselves exclusively to the sale of pre-cut meat displayed in chilled counters. The described organization of the shop work cannot be carried through, however, with the aid of refrigerating counters of the types hitherto available, partly because the refrigerating system employed in the known types of chilled counters would cause the meat displayed to suffer too large a loss of weight, and partly because in such counters the display of the goods is very unsatisfactory.

The present invention has for its object to provide a chilled service and display counter, particularly for meat and similar articles of food, in which an effective cooling of the goods displayed is obtained with a minimum loss of weight and with a complete display of the goods so that the customer can make his choice quickly.

According to the present invention a refrigerating counter having the desired properties has been obtained by providing a chilled counter plate covered by a protective hood of glass or other transparent material with a number of substantially upwardly directed outflow apertures for chilled air, which apertures are so arranged that there are formed underneath the hood cold storing spaces, which at the bottom are limited by the chilled counter plate and at the sides and on top by more or less closed curtains of upwardly flowing cold air. Within the spaces thus embraced by cold air curtains may be placed trays

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for the completely pre-cut or partially pre-cut meat goods. Through a suitable guiding of the currents of cold air, e. g. by providing in the upper portion of the hood an evacuation duct, which communicates with the space under the hood via a longitudinal slot, and through the selection of a suitable velocity of air flow, it is possible to obtain a stable condition under which the air between the curtains immediately above the displaying trays becomes substantially stationary, whereby the drying-out of the meat is delayed. Provided that the chilled air, when entering the hood, has a sufficient percentage of moisture, the taking up of moisture from the meat becomes, in fact, so small that it is possible to display the meat in very small units without the weight loss exceeding a tolerable value. Due to the complete absence of parts of the refrigerating system immediately above the level of the counter plate, an attractive unobstructed display of the goods for sale is rendered possible.

In cases when means are provided for drawing out the chilled air through an evacuation opening in the upper portion of the hood, the backside of the hood facing the salesmen may be left open. Preferably there are then provided along the rear edge of the counter plate a row of outflow apertures for chilled air, which cause a limiting layer of upwardly flowing cold air to be formed between the warm air in the shop and the interior of the hood. This flowing layer of air prevents any appreciable amount of the heavy cold air from flowing from the hood into the shop and a corresponding amount of lighter warm air from flowing from the shop into the hood at the upper portion thereof to the detriment of the refrigerating economy.

In order to improve the visibility, the transparent front wall of the protective hood may be made sloping forwardly with respect to the vertical plane. Furthermore, the counter plate may be arranged to slope slightly from the back side of the counter down towards the front side, whereby the display of goods is further improved, and it is preferably mounted at such a level above the floor that the attendants do not have to bend down very much to reach the goods displayed.

Other features and advantages of the refrigerating counter according to the invention will appear from the following detailed description of a preferred embodiment with reference to the accompanying drawings.

In the drawings:

Fig. 1 is a front view of a counter according to this invention which shows to the left of the

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vertical center line a vertical longitudinal section on the line I—I of Fig. 4 and, to the right of said vertical center line a vertical longitudinal section on the broken line II—II of Figure 4.

Fig. 2 shows a horizontal section on the lines III—III and IV—IV of Fig. 4 respectively.

Fig. 3 shows a vertical cross section on the line V—V of Fig. 1.

Fig. 4 shows a vertical cross section on the line VI—VI of Fig. 1.

Fig. 5 shows on a larger scale a vertical longitudinal section on the line VII—VII of Fig. 2 through one part of the counter plate with a display tray in place.

Referring to the drawings, reference numeral 10 designates the counter plate, which preferably is made of stainless steel in the shape of a tray having outwardly sloping side walls, the counter plate resting on a downwardly tapering underframe in the form of a box or desk 11. The counter plate 10 slopes somewhat towards the shop or display side and is divided by means of a number of transversely extending ridges 12, which are made of stainless steel plate and have the shape in cross section of an inverted V, into a number of equally large rectangular areas which are limited at the front by the sloping front side wall 13 of the counter plate and at the rear by the sloping rear side wall 14 of the counter plate, so that rectangular shallow recesses 15 are formed, in which may be placed display trays of stainless steel plate or the like. Mounted over the counter plate 10 is a transparent protective hood 16 of glass or the like. For the purpose of obtaining the best possible visibility the front wall of the protective hood 17 is made to slope under an angle of about 50° with respect to the vertical plane, and is preferably given the shape, as shown, of an outwardly curved cylindrical surface, whereas the roof portion 18 is horizontal and forms a service shelf. On its rear side the hood shown is open except for the provision of a supporting stay 19, whereby the service is facilitated, but the hood may also be provided in ordinary manner with normally closed transparent slidable doors or the like.

To facilitate the work of the attendants the counter plate is furthermore mounted at such an elevation above the floor that the attendants do not have to bend down very much to reach the goods displayed on the counter. The front wall of the underframe 11 slopes upwardly in towards the store to enable the customers to stand conveniently close to the counter and observe its contents. At the back the underframe projects past the hood with a portion which carries a working shelf 20 provided with cutting boards and mounting plates for weighing scales.

Housed in the underframe 11 is the refrigerating machinery with its refrigerating pipes through which a cooling agent is circulated. For the cooling of the counter plate 10 from below there are provided a number of refrigerating coils 21, on which the counter plate directly rests. The refrigerating coils 21 rest in turn on a heat insulated horizontal wall 22. In the middle portion of the underframe 11 there is provided, underneath the wall 22, a heat insulated space which is divided by a transverse wall 23 into a rear chamber 24 and a front chamber 25. In the front chamber 25 there is mounted a refrigerating unit 26 provided with cooling fins. Built into the transverse wall 23 is a fan 27 by means of which air is blown from the chamber 24 into the chamber 25. The air passing into the cham-

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ber 25 is chilled, during its passage past the refrigerating unit 26, to the desired temperature, preferably +3° C. or about 37° F., and thereafter enters two distribution ducts 28 and 29 which extend below the plate 10 along the front side of the counter and communicate through square openings 30 in the counter plate 10 with air ducts 31 formed between the upper side of the counter plate and the transversely extending hollow ridges 12, said air ducts 31 communicating through openings 32 in the rear side wall 14 of the counter plate with a distribution duct 34 formed between the outer side of the side wall 14 and a heat insulating wall 33, said duct 34 extending along the entire length of the counter.

Provided in the transversely extending hollow ridges 12 along the upper edge thereof are two rows of closely spaced air outlet apertures 35, having for example a diameter of 10 millimeters and a distance between centres of 14 millimeters, through which apertures cold air is blown upwardly and inwardly over the respective recesses 15 in the counter plate. A similar row of apertures 36 is provided in the rear side wall 14 of the counter plate, through which apertures cold air is blown in an upwardly sloping direction over the counter plate past a guide board 37 extending along the entire length of the counter. The chilled air blown from the said apertures 35 and 36 in under the hood 16 is evacuated through a cold air trap or evacuating duct 38 provided in the upper portion of the hood, said duct communicating with the suction side of the fan 27 through spaces 39 and 40 between double end walls of the protective hood and two ducts 41 and 42 extending from said spaces along the rear side of the underframe 11. According to the drawings the evacuating duct 38 is formed of a vertically positioned metal plate 43 and a sloping glass plate 44, there being formed between said plates adjacent to the front wall of the hood a slit-shaped evacuation opening 45 which extends along the entire length of the hood. At the back of the plate 43 there is mounted a row of illuminating tubes 46 and a reflector 47.

The above described system of intercommunicating ducts and spaces forms a circulation system for air which is closed via the space under the hood. Within the space under the hood the chilled air which is passed through the various apertures in the counter plate forms rather well defined cold air currents, which converge in the upper part of the hood to form a common cold air current which enters the suction slot 45. Thus the chilled air which is passed into the hood through the apertures 36 at the rear edge of the counter plate forms a curtain of flowing cold air which in the main follows the path indicated by the arrows 48, whereas the cold air which is passed through the apertures 35 in the transversely extending hollow ridges forms near the counter plate upwardly and laterally sloping intermediate layers of cold air which flow approximately as indicated by the arrows 49. Within the spaces under the hood, which at the bottom are limited by a rectangular recess 15 in the counter plate and at the sides and on top of the curtains 48 and 49 of upwardly flowing cold air, the air is almost stationary, so that only a relatively slow flow of cold air takes place along the surfaces of meat or other goods placed on trays in the respective recesses. In spite of the fact that the refrigerating counter according to the invention employs flowing cold air for cooling the meat from above, the taking up of moisture from the meat will therefore be comparatively small

and always remain well within permissible limits.

To prevent condensation of moisture on the outside of the protective hood 16, the cold air should be guided in such paths that it does not directly contact the inner side of the protective hood. The rows of apertures 35 in the transversely extending ridges 12 therefore end, as shown, at some distance from the front edge of the counter plate. With this arrangement of the transversely extending rows of apertures 35 there will be set up, in cooperation with the cold air trap, a downwardly directed flow of warmer air from the cold air trap, where the air temperature may be around +12° C. or about 54° F., along the wall of the hood down to the counter plate, as indicated with the arrows 50, the temperature of the protective hood then remaining sufficiently high to prevent condensation of steam on the outer surface thereof. Similarly, the rows of apertures 35 do not reach the rear wall of the counter plate, whereby appreciable leakage of cold air from the interior of the protective hood through its open rear side is avoided.

The transversely extending hollow ridges 12 defining the transverse air distribution ducts 31 may in cross section have the shape shown in Fig. 5. The air outlet openings 36 have the shape of circular holes arranged in rows at opposite sides of the top edge of the ridge in plane portions 51 of the sheet metal forming an angle of about 80° with each other, so that adjacent to the ridges the air jets will slope about 40° with respect to the horizontal plane.

The ridges 12 are preferably detachably secured to the counter plate 10, for example by means of a pin, not shown, which enters a corresponding hole in the rear side wall 14 of the counter plate, and a bolt mechanism, not shown, which cooperates with the front side wall 13 of the counter plate, whereby cleaning of the ridges and of the counter plate is facilitated. Particularly in such cases, when the ridges are detachable, it may be suitable to secure on the underside of each hollow ridge an upwardly and inwardly sloping transverse wall 52 just outside of the opening 30 in the counter plate 10, whereby cold air is effectively prevented from leaking out adjacent the protective hood thus causing condensation of moisture on the front wall of the hood. Said sloping transverse wall 52 also serves to smoothly deflect the air which enters from the opening 30, so that the jets of cold air which emerge through the first holes 35 in the row get a favourable initial direction, it being therefore preferable to provide the transverse wall also in fixed air duct defining ridges.

The goods are preferably cooled before being placed on the counter plate. In case the goods should be too warm when placed on the counter they are, however, comparatively quickly cooled down to the desired temperature. From below the goods are cooled by the chilled counter plate 10, whereas the warm upper side is cooled by cold air which on account of its greater specific gravity drops from above down onto the goods while displacing the air heated by the warm goods.

In order to secure a better balance between the cooling of the goods from below through the intermediary of the chilled counter plate and from above by means of the flowing cold air it may be suitable to place the display trays 53 on heat insulating spacers 54, so that an air space 55 is formed between the bottom of the tray and the counter plate. Said space may suitably communicate with the space below the hood through

openings 56 provided in the side walls of the trays.

The thermostat controlling the intermittently operating refrigerating machinery should preferably be set for operation within narrow temperature limits, so that periods of operation and periods of rest will alternate with high frequency. In this manner defrosting of the chilling unit during the periods of rest is avoided, permitting the moisture of the air to be maintained constant at a suitable value, e. g. 90 per cent. At this percentage of moisture in the cold air the meat displayed may be kept completely fresh with no change in the appearance of the cut surfaces and without any appreciable loss of weight for a considerable time. Tests carried out indicate a cut of meat can be thus displayed for three days and nights or more and still appear freshly cut. When using a refrigerating counter according to this invention it is therefore not necessary to remove the goods to the refrigerating room at the end of the working day, wherefore a considerable amount of labour is saved.

The invention is, of course, not limited to the particular embodiment shown on the drawings and described above, but various modifications are conceivable within the scope of the invention. Thus, an evacuation duct in the upper portion of the hood may in some cases not be required, the cold air being then permitted to leave the hood through the open rear side of the latter, for instance. Furthermore, some of the outlet apertures for cold air provided in the counter plate may be left out and other apertures provided, and the apertures may generally be arranged in another manner and grouped otherwise than shown. Besides being used as a refrigerating counter in ordinary shops, the refrigerating counter may also be used in self-service shops, and it may alternatively be disposed in display windows and in other locations. Furthermore, it may, of course, be used for other goods than meat, for example for fish, cooked food and other perishable provisions.

I claim:

1. In combination in a refrigerating counter, a tray-like counter plate having upwardly extending front and rear sides and upwardly extending lateral end portions, said rear side being provided with a row of substantially upwardly directed air outlets, a hood having a front side extending from the front side of said counter plate upwardly and rearwardly so as to form a show case closed at its front and at the top thereof, while being open at least over the larger portion of its rear, a cooling fan underneath the bottom of said counter plate, cooling means likewise arranged underneath said bottom of said counter plate and adapted to cool air propelled by said fan, conduit means effecting communication between the air space surrounding said cooling means and said air outlets, guiding means adjacent said air outlets for guiding the air passing through said air outlets at a predetermined angle towards the upper portion of said hood, and duct means arranged at the upper portion of said hood and communicating with the interior of the hood and with the suction side of said cooling fan.

2. In combination in a refrigerating counter, a tray-like counter plate with upwardly extending front and rear sides and also with upwardly extending end portions, said rear side having adjacent its upper edge a row of substantially upwardly directed air outlets, chilling means under-

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neath said counter plate for chilling the same, cooling means arranged adjacent to but spaced from the bottom of said counter plate, fan means for passing air over said cooling means, a hood closed at its front, top and end portions and mounted over said counter plate for defining therewith a show case, means effecting communication between the air space surrounding said cooling means and said outlet means, exhaust conduit means adjacent the top of said hood and provided with a slot extending in longitudinal direction of said hood, a guide board adjacent the rear side of said counter plate for guiding the air passed through said outlets to said slot and into said conduit means, and additional guiding means effecting communication between said first-mentioned guiding means and the suction side of said cooling fan.

3. In combination in a refrigerating counter, a tray-like counter plate with upwardly flaring front and rear sides and also with upwardly flaring end portions, said rear side having adjacent its upper edge a row of substantially upwardly directed air outlets, said counter plate also having a plurality of spaced rows of substantially upwardly directed air outflow apertures with said rows extending substantially transverse to the rear side of said counter plate, chilling means underneath said counter plate for chilling the same, cooling means arranged adjacent to but spaced from the bottom of said counter plate, fan means for passing air over said cooling means, first conduit means connecting the air space surrounding said cooling means with said outlets and said air outflow apertures, a hood closed at its front, top and end portions and mounted over said counter plate for defining therewith a show case, second conduit means adjacent the top of said hood and provided with an opening extending in longitudinal direction of said hood, guiding means adjacent the rear side of said counter plate for guiding the air passed through said outlets to said opening and into said second conduit means, and third conduit means effecting communication between said second conduit means and the suction side of said cooling fan.

4. In combination in a refrigerating counter, a tray-like counter plate with upwardly flaring front and rear sides and also with upwardly flaring end portions, said rear side having adjacent its upper edge a row of substantially upwardly directed air outlets, said counter plate being provided with a plurality of transversely extending spaced ridges having substantially upwardly directed air outflow apertures therein, chilling means underneath said counter plate for chilling the same, cooling means arranged adjacent to but spaced from the bottom of said counter plate, fan means for passing air over said cooling means, first conduit means connecting the air space surrounding said cooling means with said outlets and said air outflow apertures, a hood closed at its front, top, and end portions and mounted over said counter plate for defining therewith a show case, second conduit means adjacent the top of said hood and provided with an opening extending in longitudinal direction of said hood, guiding means adjacent the rear side of said counter plate for guiding the air passed through said outlets to said opening and into said second conduit means, and third conduit means effecting communications between said second conduit means and the suction side of said cooling fan.

5. A counter according to claim 4, in which

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the ridges have a cross section resembling an inverted V.

6. A counter according to claim 4, in which the ridges are prism-shaped.

7. In combination in a refrigerating counter, a chilled tray-like counter plate having an upwardly extending front and rear side, a plurality of hollow ridge-like members extending substantially at a right angle to said rear side with each of said hollow ridges having a plurality of substantially upwardly directed apertures arranged in series with regard to each other, the first and the last aperture in each series being spaced from the adjacent front and rear side of said counter plate by a predetermined minimum distance, fan means mounted underneath said counter plate, cooling means arranged to receive air propelled by said fan means, first conduit means effecting communication between the air space around said cooling means on one hand and said air apertures on the other hand, a hood mounted over said counter plate and being closed laterally and at the front and top of said hood while being open at least over the larger portion of its rear, second conduit means arranged at the top of said hood and on the inside thereof and being provided with exhaust openings, guiding means arranged adjacent said outlets for guiding air passing therethrough to said exhaust openings and into said second conduit means, and third conduit means for effecting communication between said second conduit means and the suction side of said fan means.

8. In combination in a refrigerating counter, a chilled tray-like counter plate having an upwardly extending front and rear side, said rear side being provided with a row of substantially upwardly extending air outlets, a plurality of hollow ridge-like members extending substantially at a right angle to said rear side with each of said hollow ridges having a plurality of substantially upwardly directed apertures arranged in series with regard to each other, means for detachably connecting said ridge-like members with said counter plate, fan means, cooling means arranged to receive air propelled by said fan means, first conduit means effecting communication between the air space surrounding said cooling means and said air outlets, guiding means adjacent said air outlets for guiding air passing therethrough at a predetermined angle in an upwardly inclined direction, a hood extending over said counter plate, second conduit means arranged on the inside of said hood adjacent the upper portion thereof for receiving the air passing through said air outlets in inclined upward direction, and third conduit means effecting communication between said second conduit means and the suction side of said fan means.

9. In combination in a refrigerating counter, a chilled tray provided with upwardly extending front and rear sides, the rear side of said counter plate having arranged therein adjacent its upper edge a plurality of substantially upwardly directed air outlets, a plurality of hollow ridge-like members connected to said counter plate and extending substantially transverse to the rear side of said counter plate, each of said hollow members being provided with a plurality of apertures effecting communication between the inside of said hollow members with the outside thereof, a plurality of baffle plates arranged adjacent the front side of said counter plate and respectively associated with said hollow ridge-

like members, said baffle plate being inclined toward said rear side of said counter plate, a hood mounted over said counter plate and said members and defining with said counter plate a show case, fan means arranged at least partially below said counter plate, cooling means arranged to receive air propelled by said fan means, first conduit means effecting communication between the air space surrounding said cooling means on one hand and the interior of said hollow ridge-like members and said outlets on the other hand, second conduit means arranged at the upper portion of said hood and having a slot therein for receiving air from said hood, guiding means mounted adjacent said outlets for guiding air therefrom through said slot into said second conduit means, and third conduit means effecting communication between said second conduit means and the suction side of said fan means.

10. In combination in a refrigerating counter, a chilled counter plate having upwardly extending front, rear and side walls, fan means arranged adjacent to but spaced from said counter plate, cooling means mounted below said counter plate and arranged to receive air propelled by said fan means, a plurality of hollow ridge-like members connected to said counter plate and spaced from each other, said hollow ridge-like members being provided with apertures effecting communication between the hollow space of said members and the outside thereof, said members forming with said counter plate substantially rectangular shallow troughs adapted to receive display trays, the rear side of said counter plate being provided with a plurality of substantially upwardly inclined air outlets, first conduit means connecting said air outlets and the interior of said ridge-like members with the air space surrounding said cooling means, a hood arranged about said counter plate and defining therewith a show case, said counter plate being closed at the front side and top, second conduit means adjacent the top of said hood and provided with a slot for receiving air from inside said hood, guiding means adjacent said air outlets for guiding air therefrom through said slot into said second conduit means, and third conduit means effecting communication between said second conduit means and the suction side of said fan means.

11. In combination in a refrigerating counter, a chilled counter plate, said counter plate having an inclined rear side with a plurality of air outlets directed substantially upwardly, fan means adjacent to but spaced from said counter plate, cooling means for receiving air propelled by said fan means and cooling the same, first conduit means effecting communication between the air space surrounding said cooling means and said air outlets, a transparent hood extending over

said counter plate and having a spherical front and a substantially flat top, exhaust means associated with the top of said hood and communicating with the suction side of said fan means, and guiding means arranged adjacent said outlets for guiding air therefrom into said suction means.

12. In combination in a refrigerating counter, a chilled counter plate having an upwardly extending rear side with a plurality of substantially upwardly extending air outlets, said rear side forming a part of first conduit means communicating with said outlets, a plurality of insulating spacers mounted on said counter plate, a plurality of display trays supported by said insulating spacers, a hood extending over said counter plate and said trays and defining therewith a show case, the space between said trays and said counter plate communicating with the interior of said hood, fan means mounted near said counter plate, cooling means arranged to receive air from said fan means and communicating with said first conduit means, second conduit means mounted adjacent the top of said hood and provided with an inlet opening for receiving air from underneath said hood, and means effecting communication between said second conduit means and the suction side of said fan means.

13. In combination in a refrigerating counter, a chilled tray-like counter plate with upwardly extending front and rear sides and upwardly extending end portions, said counter plate being provided with a plurality of transversely extending spaced ridges having substantially upwardly directed air outflow apertures therein, cooling means underneath said counter plate, fan means for moving air over said cooling means, first conduit means connecting the air space surrounding said cooling means with said air outflow apertures, a second conduit means effecting communication with the suction side of said fan means, a hood having a front side extending from the front side of said counter plate upwardly and rearwardly and being closed at its front, top and end portions, said hood being mounted over said counter plate and forming a show case therewith, and an evacuating duct associated with the top of said hood.

MARTIN EMANUEL RYDIN.

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