March 14, 1967 H. J. TENNISWOOD ETAL 3,308,635

REFRIGERATING APPARATUS

Filed May 3, 1965

3 Sheets-Sheet 1

FIG. 1

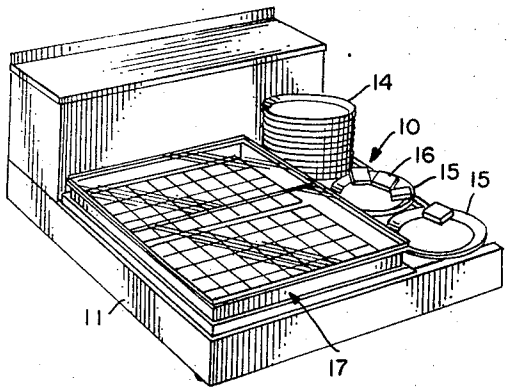


FIG. 2

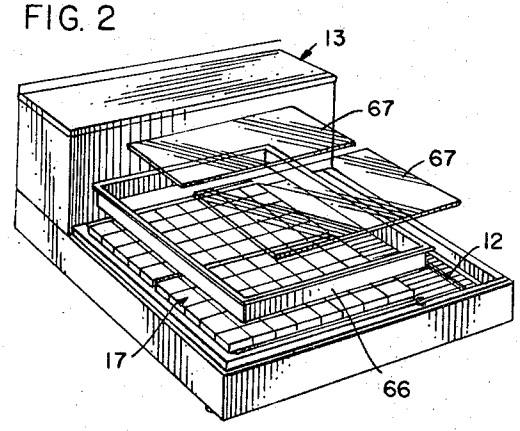
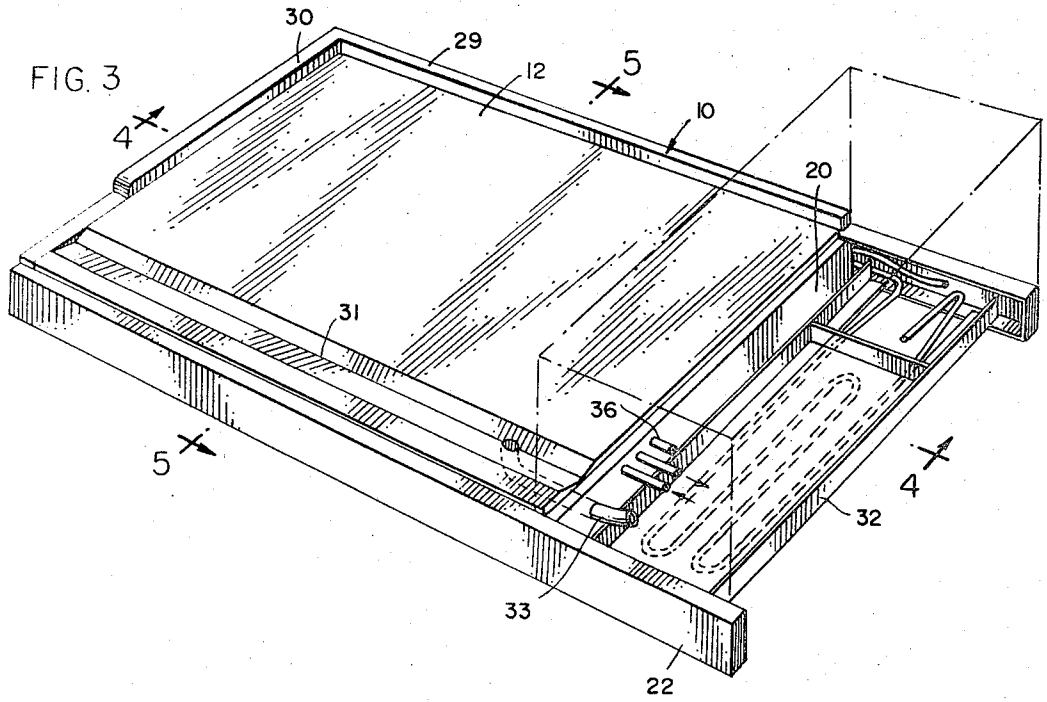


FIG. 3



INVENTORS:
HOWARD J. TENNISWOOD
LEO PETERS

BY: Dawson, Dilton, Fallon, Lungmus & Alexander
ATT'YS

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Filed May 3, 1965 3 Sheets-Sheet 2

FIG. 4

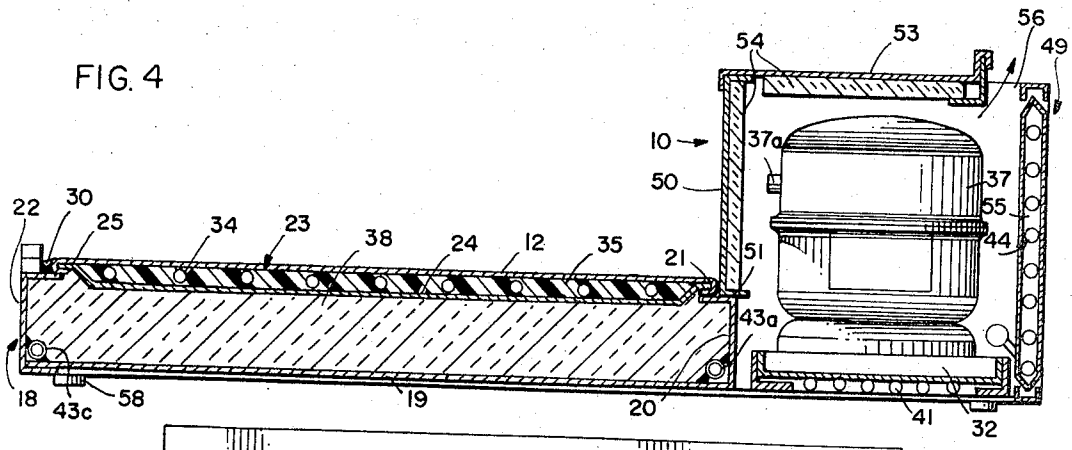
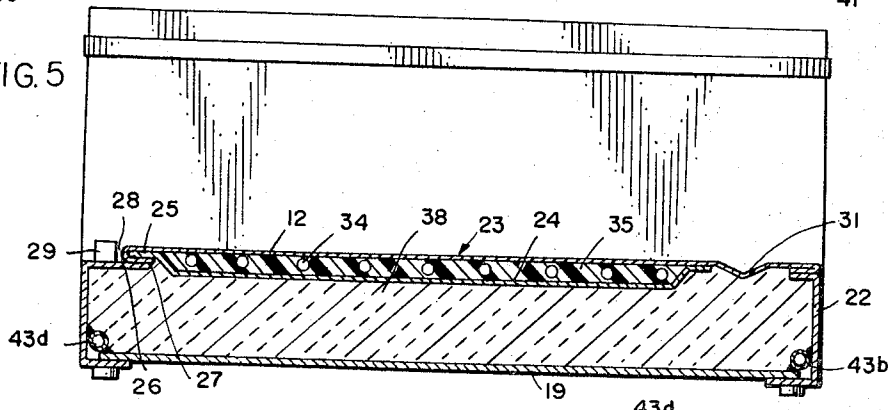


FIG. 5



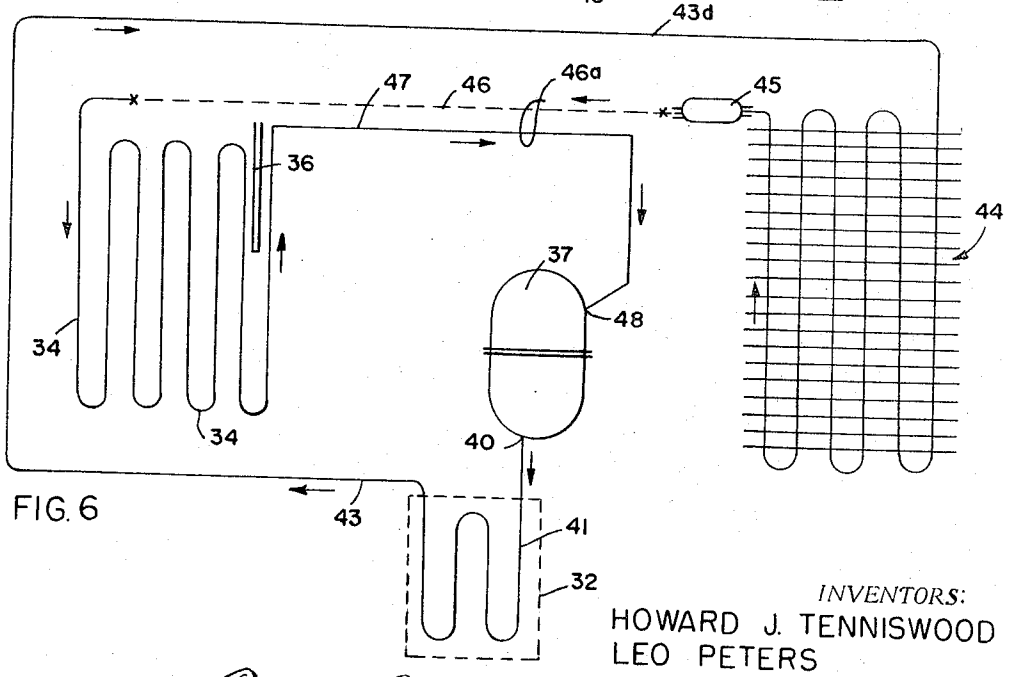


FIG. 6

INVENTORS:
HOWARD J. TENNISWOOD
LEO PETERS

BY: Dawson, Dilton, Fallon, Lungmus & Alexander
ATT'YS

March 14, 1967 H. J. TENNISWOOD ETAL 3,308,635

REFRIGERATING APPARATUS

Filed May 3, 1965 3 Sheets-Sheet 3

FIG. 7

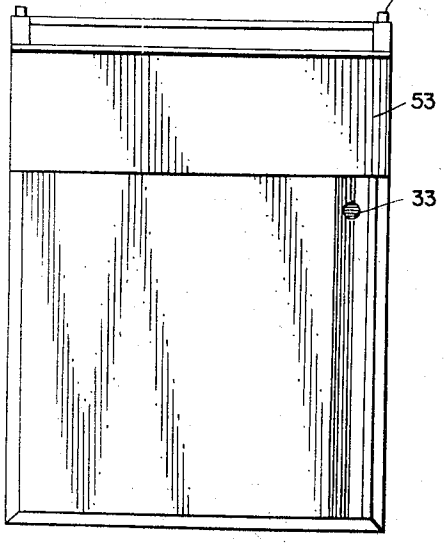


FIG. 8

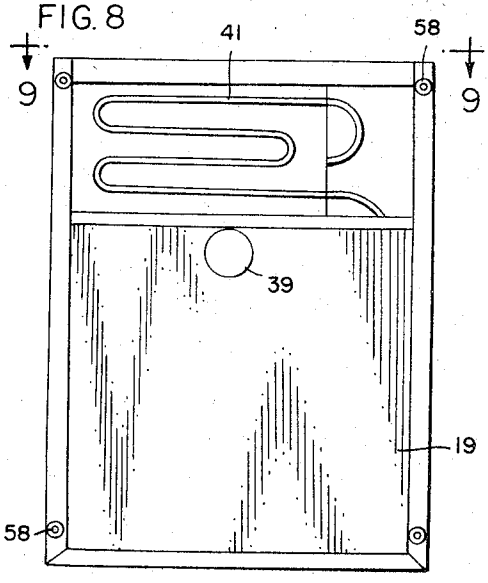


FIG. 9

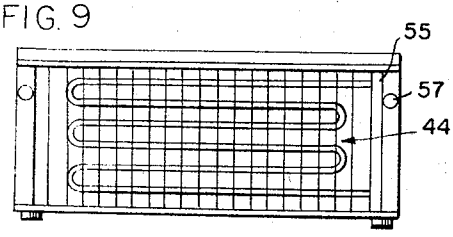


FIG. 10

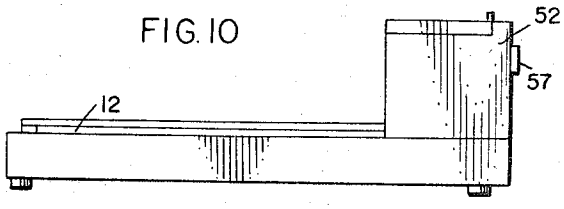
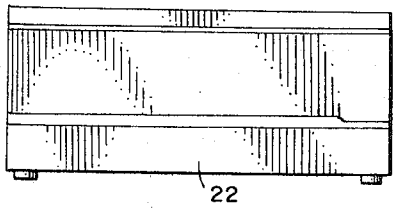


FIG. 11



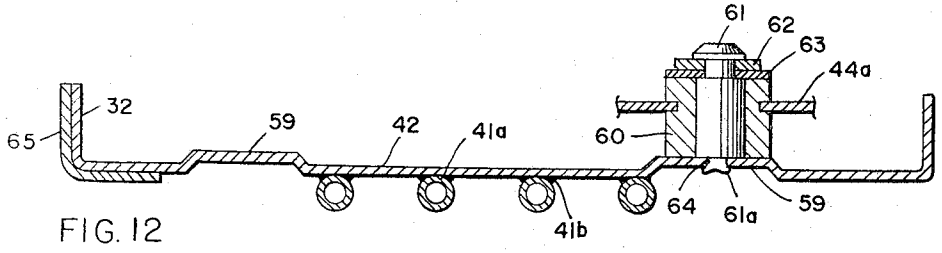


FIG. 12

INVENTORS:
HOWARD J. TENNISWOOD
LEO PETERS

BY: Dawson, Dilton, Fallon, Lungmus & Alexander
ATT'YS

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3,308,635

REFRIGERATING APPARATUS

Howard J. Tenniswood, 212 Richards St., Adrian, Mich. 49221, and Leo Peters, 750 Plymouth Road, SE., Grand Rapids, Mich. 49506

Filed May 3, 1965, Ser. No. 452,629
8 Claims. (Cl. 62—277)

This invention relates to a refrigerating apparatus, and, more particularly, to an electrically energized, mechanically operated, portable refrigerated plate for holding butter patties in restaurants and cafeterias in cold, easy-to-dispense condition.

This invention is useful in connection with the refrigeration of all butter patties, but is particularly advantageous for decorative-surfaced patties, such as those having imprinted or embossed designs. Decorative-surfaced butter makes up about 70% of all butter patties served in eating establishments in the United States. It is this segment of the industry that this invention can serve especially advantageously.

All butter requires refrigeration to prevent the damaging effects caused by softening and melting at normal room temperatures, but decorative-surfaced butter is particularly subject to damage if allowed to touch anything while in a warm condition. All restaurants desire to hold and dispense their surface decorated patties in a manner that eliminates surface damage. But under past methods for holding and dispensing butter patties, this has not been generally possible. Butter patties with designs on their top surfaces, especially embossed (upraised) surfaces, must be kept cold, upright, out of contact with, and away from pressures exerted by another surface. This invention enables these basic requirements to be met in a highly practical, commercially-acceptable manner. In particular, the invention fulfills the need providing refrigerating apparatus for butter patties adapted for use on service islands.

Restaurants and dining rooms that have table service also have service islands near diners' tables. In these islands, waitresses can give rapid service for frequently served staple foods. Such foods always include coffee and butter. Coffee is kept hot by and is dispensed from modern, electrically operated, portable hotplates. Butter by contrast is normally kept cold by and dispensed out of manually-maintained beds of crushed ice or ice water held in bowls or old-fashioned crocks, a method which damages butter. There has been no commercially-practical means for refrigerating surface-decorated butter patties in an efficient, low cost, easy to use and easy to move manner. No modern efficient equipment comparable to that used for hot foods and cold beverages is available for butter. That 70% segment of the butter patties served in restaurants, referred to above, still is held in crushed ice or ice water and is dispensed by jabbing with a fork. This practice is highly unsatisfactory: butter becomes crushed and mutilated, bleached by direct ice contact, speckled with drops of water, and involves waste of butter and time involved in daily preparation, maintenance and cleanup. Further, when butter is held in ice, it becomes too cold and hard for spreading. Such butter breaks bread and at best can only be lumped on—it leaves some areas of bread or rolls heavily covered with butter and other areas completely devoid of it.

It is an object of this invention to provide a solution for the above-mentioned problem. More specifically, it is an object of this invention to provide a means for holding butter patties on restaurant service islands in a cold, quality-preserving, firm-bodied but spreadable condition, without damaging weights or pressures on them, without

the need for daily preparation and cleanup and in a quickly accessible, easy to dispense condition.

Another object is to provide a means for maintaining a steady, concentrated, relatively invariable temperature slightly above freezing for refrigerating butter patties which are held on and are readily accessible for serving from an open area located in a room characterized by a substantially higher ambient temperature.

Still another object of the invention is to provide a refrigerating apparatus, especially suited for the maintenance and reduced temperatures of butter patties in which the deteriorating and unsanitary presence of water condensation is avoided.

Other objects and advantages of the invention may be seen in the details of operation and construction set down in this specification.

The invention is explained in conjunction with an illustrative embodiment in the accompanying drawings, in which—

FIG. 1 is a perspective view of an embodiment of the invention equipped with a sanitary cover and also arranged to support serving plates;

FIG. 2 is a perspective exploded view of the apparatus seen in FIG. 1;

FIG. 3 is an enlarged fragmentary perspective view of the refrigeration plate portion of the apparatus seen in FIGS. 1 and 2;

FIG. 4 is a longitudinal sectional view such as would be seen along the sight line 4—4 applied to FIG. 3;

FIG. 5 is a transverse sectonal view such as would be seen along the sight line 5—5 applied to FIG. 3;

FIG. 6 is a schematic piping diagram of the refrigeration circuit utilized in connection with the apparatus seen in the preceding view;

FIG. 7 is a top plan view of the apparatus of FIG. 1, but without the sanitary cover and serving plates;

FIG. 8 is a bottom view of the structure of FIG. 7;

FIG. 9 is a rear elevational view of the apparatus of FIG. 7;

FIG. 10 is a side elevational view of the apparatus of FIG. 7;

FIG. 11 is a front elevational view of the apparatus of FIG. 7; and

FIG. 12 is an enlarged fragmentary sectional view of the lower righthand portion of FIG. 4 showing the details of construction of the condensate evaporating tray and compressor support.

In the illustration given and with particular reference to FIG. 1, the numeral **10** designates generally the refrigerating apparatus constructed according to the teachings of this invention. The apparatus **10** includes a generally rectangular enclosure **11** providing an upper cooling surface as at **12** (see, particularly, FIGS. 2 and 3). At the rear of the apparatus a higher enclosure generally designated **13** provides a housing for the means for refrigerating the surface **12**.

In FIG. 1, a side portion of the upper cooled surface is used as a storage facility for a stack of serving plates **14** with individual plates being designated **15** and carrying thereon decorative-surface butter patties **16**. At the left in FIGS. 1 and 2, a protective or sanitary sub-assembly generally designated **17** is provided to confine and protect butter patties between periods of peak usage. The details of the sub-assembly **17** will be described in greater detail hereinafter and it will be appreciated that the use of this sub-assembly is optional.

The refrigerating portion of the apparatus **10** can be more readily appreciated from a consideration of FIGS. 4 and 5 which are longitudinal and transverse sections, respectively, of the apparatus as seen in FIG. 3. Referring now to FIG. 4, it will be seen that the surface **12** is

provided by a relatively thin metal plate supported atop a generally rectangular frame generally designated **18**. The frame **18** is defined by a bottom plate or pan **19** which is slightly longer than the plate **12** and which provides an upstanding rear wall as at **20** integral with the bottom plate or wall **19**. Further, the rear wall **20** is inwardly turned at its top edge in order to provide a supporting flange **21**. The remainder of the generally rectangular frame **18** is provided by a C-shaped wrapper or channel portion **22**. The wrapper portion **22** can also be seen in FIG. 3 and is seen to provide the two side walls of the bottom portion of the apparatus **10** as well as the front wall (see also FIG. 11). The channel shape of the wrapper **22** permits a weldable connection between it and the bottom wall **19** so as to develop the rectangular frame **18**.

The refrigerating surface **12** is provided as part of an evaporator unit generally designated **23** (see FIGS. 4 and 5). The unit **23** includes a bottom wall or pan-shaped element **24**. Along its four sides, the pan **24** is equipped with L-shaped flanges as at **25** over which the plate **12** is crimped. The flanges **25** are supported on the inwardly extending flanges **26** of the wrapper **22** and the upper flange **21** of the bottom wall **19**. Serving to thermally insulate the unit **23** from the rectangular frame **18** is flexible urethane tape as at **27** (see FIG. 5) and a silicone sealing compound **28**. The sealing compound **28** extends perimetrically around the flange **25** to reduce conductive thermal transmission. Additionally, the flange **26** along one side and along one end as at **29** and **30** (see FIG. 3) are equipped with a ridge element for the purpose of confining and positioning the sub-assembly **17** and for limiting the possible outflow of condensate developed on the cooling surface **12**.

The condensate developed on the cooling surface **12** is advantageously removed through a depression or drain trough **31** (see particularly FIGS. 3 and 5). The trough **31** is integrally formed in the surface **12** and is coupled to a condensate tray **32** (see FIGS. 3 and 4) by means of a drainage tube **33**.

The evaporator unit **23** further includes a serpentine arrangement of evaporator coils **34** (see FIGS. 4 and 6) which are embedded in a thermally conducting mastic material **35** filling the space between the plate **12** and the pan **24**. Additionally, mounted within the evaporator unit **23** is a tube into which is placed a thermostatic bulb as at **36** (see FIGS. 3 and 6). The thermostatic bulb is coupled to the usual compressor switch **37***a* interposed in the voltage supply line to the compressor **37** (see FIG. 4) for the purpose of energizing and de-energizing the same as cooling requirements are changed.

The evaporator unit **23** is advantageously thermally insulated along the lower side and further optimally supported by means of a rigid urethane foam as at **38** (see FIGS. 4 and 5). For the purpose of filling the space between the bottom wall **19** of the frame **18** and the evaporator unit **23**, the bottom wall **19** is equipped with an access opening as at **39** (FIG. 8) which is closed by a formed plastic cap. In the course of manufacture, liquid-foamed urethane plastic is caused to flow through the opening **39** into the space between the pans **24** and **19**, and after the same has solidified, remains in place and is further preserved against contamination by means of the cap closing the opening **39**.

Referring now to FIGS. 4 and 6, it will be seen that the compressor **37** is equipped with a "hot" gas outlet line as at **40** which has a first portion arranged in serpentine fashion as at **41** under the condensate tray **32**. Thus, the hottest refrigerant is in thermally conducting relation with the condensate tray **32**. Thus, the hottest refrigerant is in thermally conducting relation with the condensate liquid emanating from the cold surface **12**. In FIG. 12, it will be seen that the serpentine tubes **41***a* are bonded to the underside of the bottom **42** of the tray **32** as at **41***b*.

Referring again to FIG. 6, it will be seen that the hot line includes as a second and continuing portion **43**, a tube which extends perimetrically around the frame **18** as at **43***a* (see FIG. 4), **43***b* (see FIG.5), **43***c* (see FIG. 4) and **43***d* (see FIG. 5). The portions **43***a*–**43***d* are bonded to the bottom wall **19** and the wrapper **22** in thermally-conducting relation by means of thermomastic material such as that employed at **35** relative to the evaporator unit **23**. This warms the wrapper **22** and wall **20**, which is in close contact at a point with plate **12**, and prevents condensation from forming on wrapper **22** and wall **20** by virtue of the transfer of heat from the hot line portions **43***a*–**43***d* to the wrapper **22**.

Ultimately, the hot line **43***d* (see FIG. 6) is coupled to the upper portion of a condenser generally designated **44** and which is seen in FIGS. 6 and 9.

Further tracing the refrigerant line in FIG. 6, it will be seen that the outlet of the condenser leads to a dryer and strainer unit **45** and then leads to the evaporator tubes **34** through a restrictor tube or capillary line **46**. The evaporator tubes **34** at their outlet are coupled to a return cold line **47** which is arranged in thermally conductive relation to the restriction tube **46** (as by bonding at **46***a* in FIG. 6), and ultimately the return line **47** leads to the suction inlet **48** of the compressor.

The compressor **37** is housed within an enclosure generally designated **49** (see FIG. 4) and the enclosure **49** is developed by an upstanding front wall **50** of general channel shape and which is seeen to be secured as at **51** to the flange **21**. The enclosure is completed by side walls **52** and a top wall **53** (see FIGS. 10 and 7), respectively. Each of the walls is suitably insulated as at **54** (see FIG. 4) and the top wall **53** adjacent the open back **55** is equipped with a vent **56** permitting the advantageous outflow of air heated by contact with the compressor and which also carries out the evaporated moisture from the condensate tray **32**.

As seen in FIGS .4 and 9, the condenser **44** is positioned in the open back **49** for contact with the air. We find it advantageous to provide bumpers as at **57** (FIGS. 7 and 9) to insure spacing the condenser **44** from any vertical wall. Feet **58** (see FIGS. 4 and 8) are provided on the wrapper **22** to space the apparatus above any supporting surface, and in this connection it will be noted that the serpentine coil arrangement **41** under the condensate tray **32** is also open to the atmosphere. Reference to FIG. 12 reveals that the condensate tray is upset as at **59** so as to provide supports for the compressor **37**. The compressor base flanges **44***a* are positioned within a rubber grommet **60** which in turn is secured to the raised portion **59** by means of a stud **61** riveted at its lower portion as at **61***a*. A hairpin clip **62** in combination with a metal washer **63** insures stable positioning of the compressor base **44***a*. Thus, the condensate tray **32** is immobilized as part of the compressor, yet the support of the compressor (through openings as at **64** in the tray **32**) does not permit gravity outflow of any liquid condensate—this being prevented by the grommet **60**. The condensate tray **32** is additionally integrated with the frame **18** by means of transversely extending angles as at **65** extending between the sides of the wrapper **22**.

As a specific example of the invention, the apparatus **10** has a width of 18" as viewed from the front—see FIG. 11—a height of the surface **12** of 2½", a length of 24" as viewed in FIG. 10. and a height of the compressor enclosure of 8½". The evaporator unit **23** is constructed with 20 gauge stainless steel providing the upper plate **12** and 24 gauge zinc-coated steel providing the pan **24**. The zinc-coated steel is slightly rough in its surface configuration to provide a good anchorage for the urethane foam. The urethane foam has a thickness of about 1¾", while the evaporator unit **23** has a thickness of about ⅜" inside dimension between the plate **12** and the pan **24**. The filling of mastic material has a specific

gravity of approximately 1.5, and this is found advantageous in working as a heat sink surrounding the evaporator coils **34**. The refrigerant is No. 12, a dichlorodifluoromethane operating at approximately 135 p.s.i. head and approximately 25 p.s.i. evaporating pressure. The overall weight of the exemplary unit is 45 lbs., which makes for advantageous portability.

The additional parts indicated to make up the subassembly **17** include a perimetric frame portion **66** which supports transparent removable covers as at **67**.

In the operation of the invention, a horizontally positioned refrigerator plate is utilized on which the butter rests in pressured contact due to the weight of the butter itself. Refrigeration is provided for the butter through conduction of heat—as contrasted to convection, and cooling is maintained by the cooperating pressure from the butter itself, not by air stratification or convection. Heat is transferred out of the butter and into the refrigeration system without movement of either the butter or any refrigerated air.

The construction described is particularly advantageous in operation through utilization of the "heat sink" principle. The evaporator unit **23**, upon being initially subjected to refrigeration, develops a cooling pattern corresponding to the serpentine pattern of the coils **34** therein. However, within minutes the surface temperature on the plate becomes uniform and the serpentine pattern of cooling is erased. Thus, a uniform cooling surface is provided and this stems from the relatively thin sandwich construction of the evaporator unit **23**. The mastic material, coupled with the metal plate and pan and the insulating support provided thereto by the urethane material **38**, makes possible the elimination of the usual type of air sensing temperature control. This further eliminates the undesirable rapid cycling of the refrigeration unit. With the heat sink principle provided in the invention, the undesirable cycling is avoided.

The coaction of the urethane **27** and silicone cement **28** material with the evaporator unit **23** is advantageous in preventing the flow of heat inward from the perimetric walls of the frame **10**. In this respect, it differs from the conventional "thermal break" used in refrigerators. The urethane material constituting the thermal break also seals off the unit from undesirable condensation.

Further in the operation, the air circulating in and about the rear end of the unit follows a chimney pattern in exhausting through the vent **56**. This air creates a slight indraft in and around the condenser **44** and does not impair the operation of the condenser by having to flow out of the rear of the condenser enclosure **13**. Further, the location of the enclosure **13** essentially above the evaporator unit **23** and by providing discharge of air in an upward pattern, prevents unfavorable heat transfer from the mechanical side of the system to the refrigeration side.

The inventive construction provides a continuous and automatic operation without failure over a long life. In achieving this, the operation is fast and uniform in absorbing the heat extracted from the butter when required, but at the same time uniformly releases the heat to the evaporator. Further, the unit is adapted to serve the temperature requirements of the butter alone. Butter in restaurant-cafeteria use requires a refrigerating temperature which ideally is peculiar to it alone. The temperature is about 40° F. or more broadly in the 35–45° F. range. At this temperature, butter is sufficiently cold to maintain fresh quality, sufficiently hard to maintain shape and make dispensing easy, yet sufficiently warm to enable it to come to the ideal soft-spreading temperature of 50° F. when exposed to 70° F. room temperature during the four to eight minute interval between the time of dispensing and the time of spreading by a restaurant patron.

The unit is further advantageous in holding the butter in an open, easily accessible, removable-without-damage, quickly dispensable and sanitary condition. In particular, the butter can be readily removed by utilizing the available restaurant implements, such as forks and knives, to slip the same under a patty to lift and dispense it. It is not necessary to jab, spear or engage in a multilating action in order to grasp and hold a butter patty. Besides providing the advantageous accessibility, the instant invention provides a refrigeration apparatus which is economical to operate, involving a minimum of waste. The butter is provided on a flat exposed surface which can be easily shielded from air currents if desired, but even in the absence of such shielding, the film of colder air surrounding the unit effectively minimizes heat transfer. This is further implemented through the enclosure configuration **13** utilized for the heat generating portions of the apparatus, as pointed out previously.

Further, in operation the unit automatically controls the amount and disposal of water condensate on the outside (topside) of the plate **12**. The inside (underside) is sealed, therefore, and this is advantageous in preventing mold growth, rust and corrosion, maintaining good sanitation in unseen areas, and eliminating the unwanted increase in heat absorption by exposure of both sides of the refrigerator evaporating coil.

While in the foregoing specification, a detailed description of an embodiment of the invention has been set down for the purpose of illustration, many variations in the details herein given may be made by those skilled in the art without departing from the spirit and scope of the invention.

We claim:

1. Refrigerating apparatus comprising a generally rectangular frame, a metal evaporator plate mounted on said frame and providing a generally horizontal exposed upper surface, an evaporator coil mounted in said frame below said plate, a heat conductive material surrounding said coil and contacting the under surface of said plate, a heat insulating material below said heat conductive material and providing a support for said plate within said frame, a compressor compartment in said frame adjacent one edge of said plate and equipped with a compressor operatively coupled to said coil, and drain means in said plate connected to said compartment, said compartment including an enclosure provided as part of said frame, said enclosure projecting vertically above said plate, said enclosure having a pair of vertically extending sides arranged generally parallel to said edge and the enclosure side remote from said plate edge being open and having a condenser coil positioned therein, said condenser coil projecting above said plate.

2. The structure of claim **1** in which said enclosure is equipped with a pan arranged to receive condensate from said drain means, said compressor being equipped with an outlet line arranged below said pan and in heat transfer relation therewith.

3. The structure of claim **1** in which said compressor is equipped with an outlet line disposed perimetrically relative to said frame and separated from said plate by said heat insulating material.

4. The structure of claim **1** in which said enclosure is equipped with a topwall, and an exhaust aperture in said topwall adjacent said remote side.

5. Refrigerating apparatus comprising a generally rectangular open top frame defining side, bottom and end walls, said sidewalls being extended at one end to provide a base for a compressor enclosure, an evaporator unit supported in said frame closing the open top thereof, said unit including a generally horizontal metal top plate of relatively high thermal conductivity, a pan perimetrically secured to said plate and spaced therebelow, refrigerant evaporator coils arranged in serpentine fashion between said plate and pan, and a thermally conductive mastic material filling the space between said pan and plate and surrounding said coils, a relatively rigid thermal insulation material filling said frame in supporting rela-

tion with said unit, a thermally insulating seal between said plate and adjacent portions of said frame, said plate adjacent one side being equipped with a trough-like depression extending substantially between the frame ends, said enclosure including a vertical wall extending the said frame one end wall and said extended side walls, said enclosure further including a top wall and defining thereby an open back, an aperture in said top wall adjacent said open back, a condensate pan in said enclosure adjacent the bottom thereof, a drain connection connecting said depression and condensate pan, a compressor mounted in said enclosure and equipped with inlet and outlet connections, a hot refrigerant line coupled to said outlet and having a first portion disposed in serpentine fashion below said condensate pan and secured thereto, said line having a second portion extending generally perimetrically interiorly of said frame and bonded with thermally conductive material to said frame adjacent the bottom wall thereof, a condenser coil in said enclosure open back, said line second portion being connected to said condenser coil, a cold line connected to said compressor inlet and coupled to one end of said evaporator coil, the other end of said evaporator coil being coupled to said condenser coil, a thermostat embedded in said mastic material, and a switch-equipped source of E.M.F. operably associated with said compressor thermostat.

6. The structure of claim 5 in which said thermal insulating material is a urethane, said pan being constructed of metal and surface bonded to said urethane material.

7. Refrigerating apparatus comprising a generally rectangular frame, a metal evaporator plate mounted on said frame and providing a generally horizontal exposed upper surface, an evaporator coil mounted in said frame below said plate, a heat conductive material surrounding said coil and contacting the under surface of said plate, a heat insulating material below said heat conductive material and providing a support for said plate within said

frame, a compressor compartment in said frame adjacent one edge of said plate and equipped with a compressor operatively coupled to said coil, and drain means in said plate connected to said compartment, said drain means including an elongated trough extending generally perpendicularly to said one edge and adjacent to another edge of said plate, two other edges of said plate being equipped with upstanding walls, and a subframe removably positioned within said walls for hygienically confirming butter patties on said plate.

8. Refrigerating apparatus comprising a generally rectangular frame, a metal evaporator plate mounted on said frame and providing a generally horizontal exposed upper surface, an evaporator coil mounted in said frame below said plate, a heat conductive material surrounding said coil and contacting the under surface of said plate, said conductive material being confined within a generally rectangular pan, said plate constituting a cover for said pan, and insulating cement and tape between said plate and adjacent portions of said frame, a heat insulating material below said heat conductive material and providing a support for said plate within said frame, a compressor compartment in said frame adjacent one edge of said plate and equipped with a compressor operatively coupled to said coil, and drain means in said plate connected to said compartment.

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WILLIAM J. WYE, *Primary Examiner.*