

Oct. 29, 1968

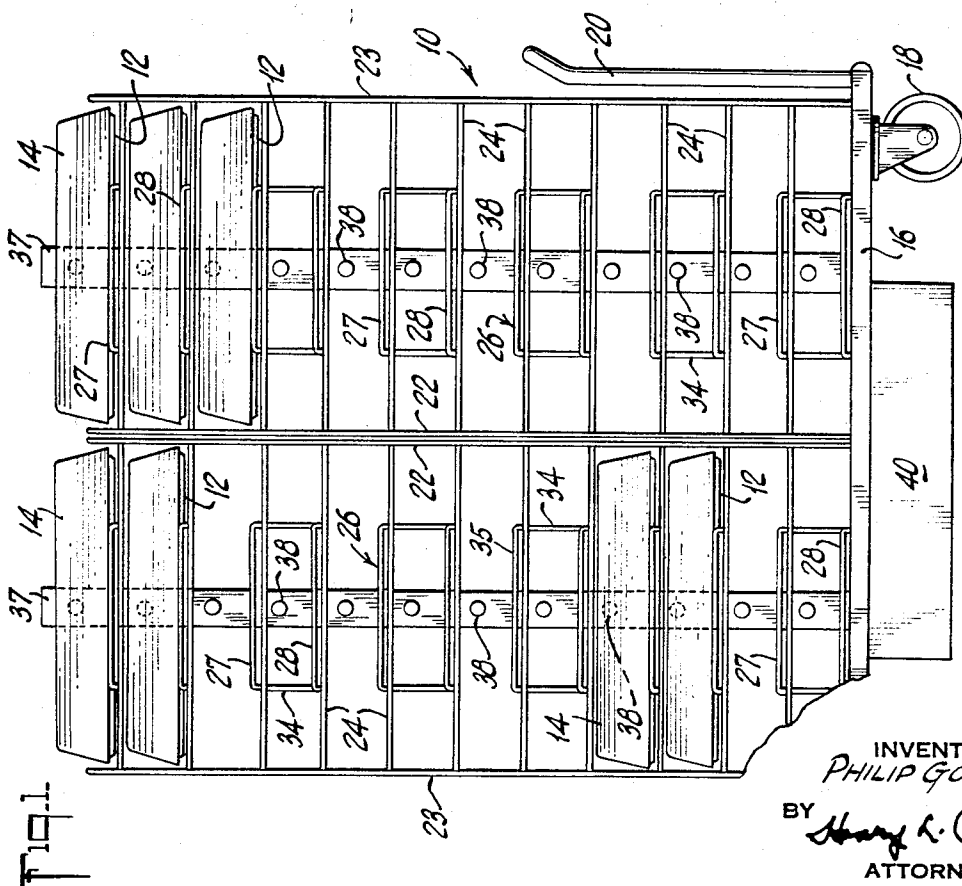
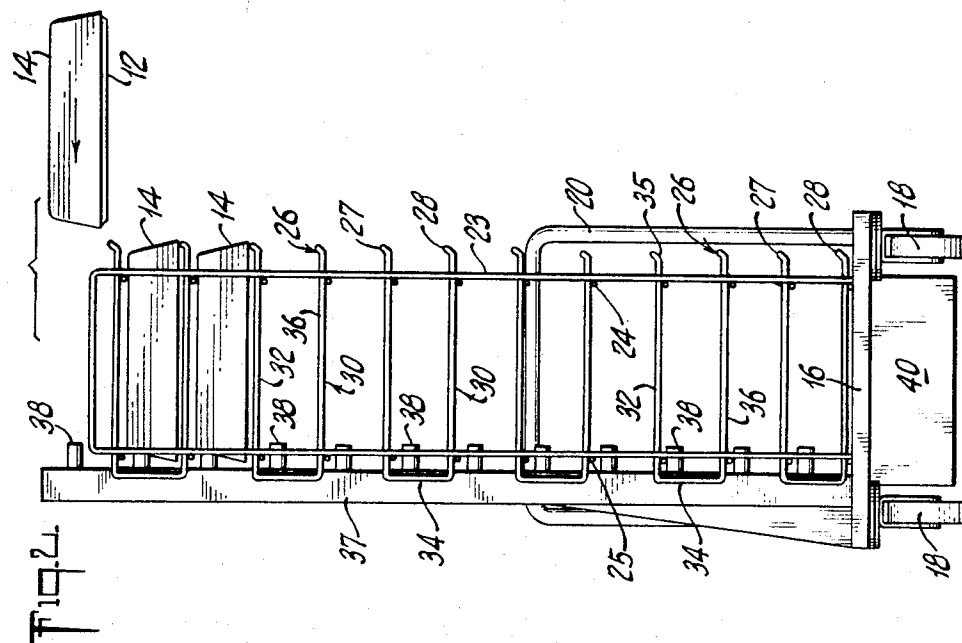
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PORTABLE SERVING EQUIPMENT UTILIZING THE PELTIER PHENOMENON

Filed Nov. 23, 1966

2 Sheets-Sheet 1



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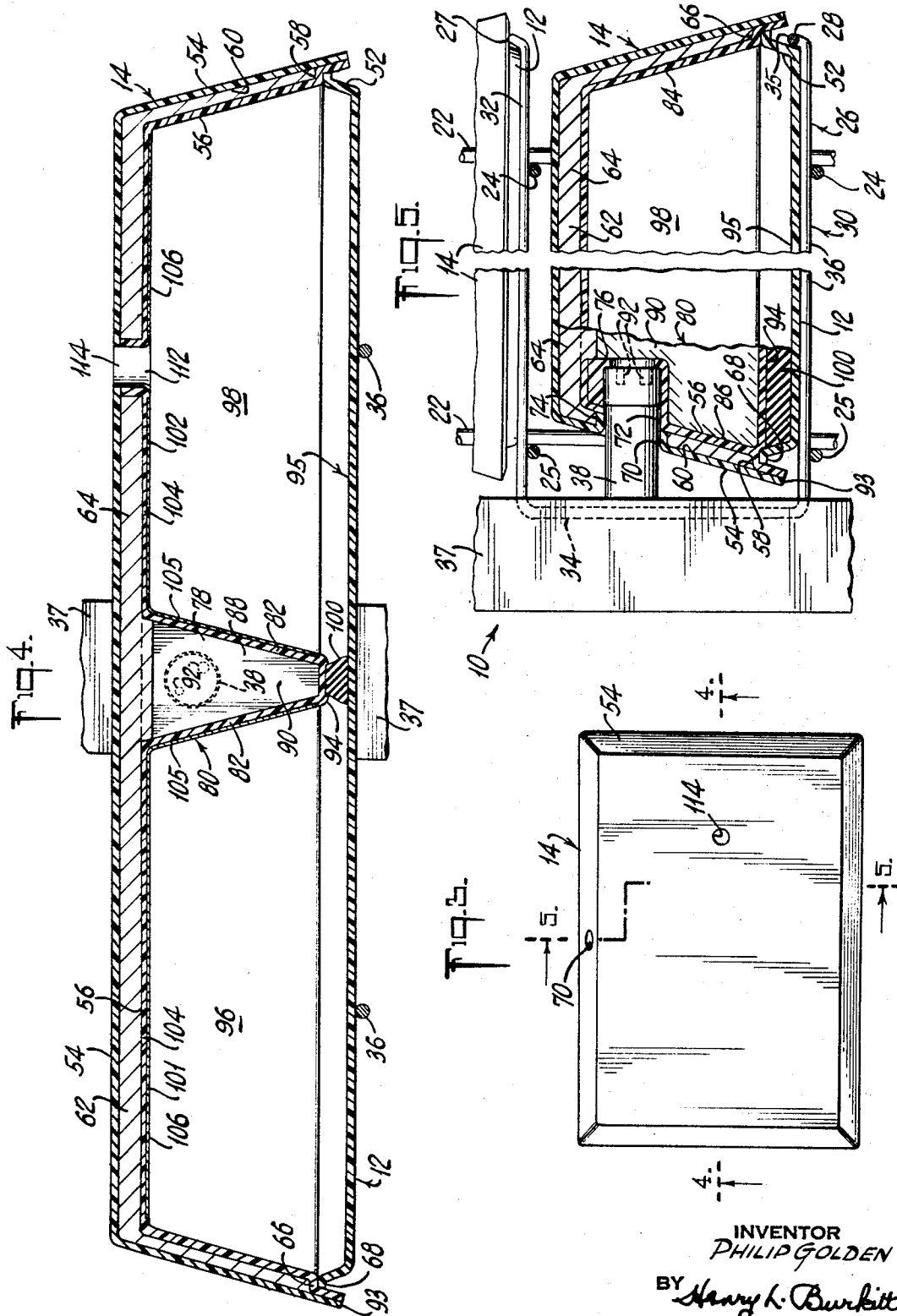
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PORTABLE SERVING EQUIPMENT UTILIZING THE PELTIER PHENOMENON

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This invention relates to portable serving equipment.

The invention herein may be applied in associations other than the specific aspects here to be described. However, a major application is considered in its use where many different meals are served at the same hour, as, for instance, in a hospital. In such institutions, it becomes necessary to provide servings for different patients, set up on trays, where the foods for different patients are different. The trays are transported to an area for delivery of the different dietary requirements to the different patients. Hot and cold foods, in such cases, are provided where necessary. The foods are subject to the usual conditions of loss of heat or intake of heat, during movement from the commissary to the point of delivery, particularly where trays are permitted to stand as the servers make the individual deliveries. Thus food, which should be hot on delivery, has been found to have cooled, and food which should have been cold on delivery will have warmed up to room temperature.

It is an object of the invention to provide means for keeping different materials, disposed, for instance, on a single tray, cold or hot, as desired, until the food is delivered to the person to be served, as, for instance, a patient.

It is an object of the invention to utilize the Peltier phenomenon in a portable carrier provided for the reception of a plurality of trays each designed for the delivery of food to a separate person to be served, and where such trays may be stored so that, by the act of storage, and the assembly of the trays with the storage means, the trays become effective to utilize heat transferred from the portion to be cooled to heat the area to be heated, and thus food to be kept hot will be kept hot, and food to be kept cool will be kept cool.

It is an object of the invention to provide apparatus where, by a simple operation of assembly of a tray, there will result that two sections of a tray may interchange heat so that one section will have its temperature lowered, while the other section will have its temperature raised.

It is an object of the invention to provide, with a portable carrier which has a power source, and means on the carrier, for the reception of a plurality of trays, which automatically connects the trays to the power source when the trays are put into a predetermined position on the carrier, so that the energy derived from the power source is made effective to transfer heat from the cold area to the hot area of the tray, and thus to result in cooling one section of the tray while heating the other section, until the tray is removed for delivery to the patient.

It is an object of the invention to provide a tray with a cover which carries all of the operating elements for maintaining the hot portions of the tray hot, and cold portions on the tray, cold, and the entire maintaining apparatus is made effective by positioning the cover on the tray, and then positioning the tray on a support on a carrier to connect the cover to a power source on the carrier.

Other objects of the invention will be set forth hereinafter, or will be apparent from the description and the drawings, in which are illustrated embodiments exemplifying the invention.

The invention, however, is not intended to be restricted to any particular construction, or any particular arrangement of parts, or any particular application of any such construction or arrangement of parts, or any specific method of operation or use, or any of the various details thereof, even where specifically shown and described herein, as the same may be modified in various particulars, or may be applied in many varied relations, without departing from the spirit and scope of the claimed invention, of which the exemplifying embodiments, herein shown and described, are intended only to be illustrative, and only for the purpose of complying with the requirements of the statutes for disclosure of an operative embodiment, but not to show all the various forms and modifications in which the invention might be embodied.

On the drawings, in which the same reference characters refer to the same parts throughout, and in which are disclosed such practical constructions.

FIG. 1 is a front elevational view of a carrier, embodying features of the invention, having a power source thereon, some of the trays to be associated with the carrier being shown in position;

FIG. 2 is an end elevational view of the carrier shown in FIG. 1, illustrating the disposition of supporting members or shelves, and the means for connecting the power source to the trays, and illustrating the manner in which a tray is moved into position upon a shelf;

FIG. 3 is a plan view of a tray and its cover, as assembled;

FIG. 4 is a detail cross-sectional view, substantially on the line 4—4 of FIG. 3, and to much enlarged scale, of a tray and its cover showing the cover and tray assembled with each other, and showing the tray in the position it assumes upon the shelf of a carrier; and

FIG. 5 is a detail cross-sectional view, substantially on the line 5—5 of FIG. 3, and also illustrating a part of the carrier, and the manner of association of the tray and its cover when the tray is mounted upon a shelf of the carrier.

On the drawings, a carrier 10 is shown supporting a plurality of trays 12 and their accompanying covers 14. The carrier may comprise a platform 16 mounted upon casters 18 or similar wheels, and may have a handle 20 for pulling the carrier. Extending upwardly from platform 16 may be a plurality of uprights 22 and 23. These uprights may be formed of rod in U-shaped form (FIG. 2). The middle uprights 22 may be held together by welding them together. Rods 24 and 25 are extended between and secured, as by welding, to uprights 22 and 23. Thus, a rigid structure may be provided.

Extending horizontally between the uprights a plurality of shelves 26 are provided. The shelves may be made of rod, bent, as shown, into a U-shaped form, and extending both horizontally and vertically. Each U-shaped form may include a pair of transverse members 27 and 28 at its front end. Extending rearwardly from and connecting with these transverse members are a pair of U-shaped members 30 each comprising an arm 32, a cross member 34, and an arm 36. Arms 32 and 36 are secured in place, as by welding, to rods 24 and 25. At their front ends members 27 and 28 are nosed up slightly at 35 to provide a guard against a tray sliding accidentally off a shelf.

Between each pair of arms 32 and 36 there will be an opening for the reception of a combination of a tray 12 and a cover 14 (FIGS. 1 and 2) on shelves 26 thus formed.

Positioned between a pair of cross members 34 and extending substantially vertically is an upright 37. Carried in upright 37 may be conductors (not shown) connecting with a socket 38 (see FIG. 5) at the level of each shelf 26. Carried beneath platform 16 is a receptacle 40

containing a storage battery (not shown) of any desired type. Sockets 38 are electrically connected through conductors carried by upright 37 to the storage battery in receptacle 40.

Tray 12 may be made of any desired material, as, for instance, moldable plastic produced in the usual manner. It is designed for receiving the usual dishes or the like, to be transported through institutions such as hospitals. The tray itself is dished, as shown, to provide an edge flange or wall 52 which extends around the peripheral edge of the tray. The capacity, of course, of the tray is determined by the amount of material to be delivered to a particular patient.

The tray cooperates with cover 14, which likewise may be of any suitable material such as plastic, metal, or the like. In the particular instance shown, the cover is made of a pair of plastic sections 54 and 56, molded to a form such that they may be assembled (FIGS. 4 and 5) with a flanged edge 58 of section 56 fitted tightly and sealed against the inner face 60 of section 54. Before the two sections are assembled in this manner, suitable insulating material 62 may be positioned in space 64 defined between the spaced sections 54 and 56 and sealed off by the engagement of flanged edge 58 with inner face 60. Flanged edge 58 may be formed to provide a ledge 66 to rest upon a flanged edge 68 forming a part of edge flange 52.

Both sections 54 and 56 are provided with accommodating openings 70 and 72 which are sealed by flanged portions 74 on section 54 cooperating with flanged recess 76 on section 56. Flanged portions 74 and flanged recess 76 are located substantially at the central portion 78 of cover 14. A partition or divider 80 (FIG. 4) is formed at this central portion in section 56. Transverse walls 82 are formed to extend from wall 84 to wall 86 of section 56, and provide a cavity 88 in which are positioned modules 90, which are thermoelectric units in accordance with the well known Peltier phenomenon, to function in the manner to be described. These modules are connected electrically to terminals 92 retained in flanged recess 76.

When a tray 12 is positioned upon a shelf 26, with cover 14 in position upon the tray, flanged recess 76 will be in line to engage with a socket 38, so that terminals 92 will engage with proper terminals in socket 38, and thus the act of sliding the tray and the cover upon a shelf completes a circuit from the battery to the modules in cavity 88.

Partition 80 extends so as to terminate just short of bottom edge 93 of cover 14, which is short of the extreme limit of the level of flanged edge 58. Thus, when cover 14 is seated with its ledge 66 resting on flanged edge 68, the bottom face 94 of partition 80 will be spaced upwardly from the inside face of bottom 95 of the tray. For this purpose, to seal the two compartments 96 and 98 thus defined from each other, a piece 100 of any suitable resilient material, such as sponge derived from the silicones, may be positioned upon bottom 95, to be engaged by bottom face 94.

On the inside faces 101 and 102 of walls 104 and 105 of cover 14 in each of compartments 96 and 98, there may be adhered metallic heat conducting sheets 106 which extend to partition 80. These sheets may extend to within cavity 88, or may merely extend down along the inside faces 105 of the separate transverse walls 82.

Now, in accordance with the electrical effect, when modules 90, which are constructed in accordance with the Peltier phenomenon, are energized by the passage of a direct current from the storage battery in receptacle 40, the effect will be that heat will be extracted from one face, for instance, face 101 in compartment 96, and will be transmitted to face 102 in compartment 98. In other words, heat will be extracted from compartment 96 and will be transmitted to compartment 98. In this case, sheets 106 in compartment 96 will carry heat to the neighborhood of the modules, and that heat will then

be transmitted to sheets 106 in compartment 98. Thus, cooling will result in compartment 96, while heating will take place in compartment 98.

In view of the expansion which will result in compartment 98, an opening 112 may be provided in wall 104 of compartment 98 to cooperate with an opening 114 in section 54, the connection between the openings being sealed off against access to space 64, so that insulating material 62 will not be affected.

Thus, when food has been placed upon the tray, and that part of the food which is to be kept warm is placed in compartment 98, while that portion of the food which is to be kept cool is placed in compartment 96, the cover is placed upon the tray so that opening 112 will be positioned over the food to be kept warm. Then the tray is slid upon a shelf 26 until terminals 92 engage in socket 38 when the tray reaches the end position on that shelf. The circuit will then be completed for the passage of direct current through modules 90, with the result that heat will be extracted from sheets 106 within compartment 96, and will be transmitted to sheets 106 in compartment 98. The extraction of heat from compartment 96 will cause cooling at that position; the introduction of heat through sheets 106 in compartment 98 will cause warming of that area. This condition will continue until the tray is withdrawn from the carrier so that the food will be properly conditioned immediately at the time it is taken to the patient or other person for whom it is intended.

Many other changes could be effected in the particular constructions, and in the methods of use and construction, and in specific details thereof, hereinbefore set forth, without substantially departing from the invention intended to be defined herein, the specific description being merely of embodiments capable of illustrating certain principles of the invention.

What is claimed as new and useful is:

1. In combination with a tray having a plurality of separated areas, each separate area providing means to receive material to be heated or to be cooled, a removable cover positioned on the tray; the cover having means to cooperate with the tray to insulate the areas from each other, and means to be activated by the passage of an electric current to cause heat to flow from one area to be cooled to another area to be heated.

2. The combination of claim 1, a support for the tray, and means on the support and the cover for coupling the means-to-be-activated to an electric current source on positioning the tray and the cover on the support.

3. The combination of claim 1, a support having a plurality of shelves, each shelf providing means for receiving a tray, and means at each shelf and associated with each cover for coupling the means-to-be-activated of each tray to an electric current source on positioning a tray and its cover on a shelf.

4. The combination of claim 1, a portable support having an electric power source thereon, the support having a plurality of shelves, each shelf providing means for receiving a tray, and means at each shelf and associated with each cover for coupling the means-to-be-activated of each tray to said electric power source on positioning a tray and its cover on a shelf.

5. The combination of claim 1, the cooperating means on the cover cooperating with the tray for forming the separate areas into separate compartments and insulating the compartments from each other, and the means-to-be-activated by the passage of electric current causing heat to flow from one compartment to be cooled to a compartment to be heated.

6. The combination of claim 1, a support having a plurality of shelves, each shelf providing means for receiving a tray, the cooperating means on the cover cooperating with the tray for forming the separate areas into separate compartments and insulating the compartments from each other, means at each shelf and associated with each cover for coupling the means-to-be-activated

of each tray to an electric current source on positioning a tray and its cover on a shelf, and the means-to-be-activated by the passage of electric current causing heat to flow from one compartment to be cooled to a compartment to be heated.

7. The combination of claim 1, a portable support having an electric power source thereon, the support having a plurality of shelves, each shelf providing means for receiving a tray, the cooperating means on the cover cooperating with the tray for forming the separate areas into separate compartments and insulating the compartments from each other, means at each shelf and associated with each cover for coupling the means-to-be-activated of each tray to said electric power source on positioning a tray and its cover on a shelf, and the means-to-be-activated by the passage of electric current causing heat to flow from one compartment to be cooled to a compartment to be heated.

8. The combination of claim 1, the cooperating means on the cover cooperating with the tray to provide a wall between areas for forming the separate areas into separate compartments and insulating the compartments from each other, and the means-to-be-activated by the passage of electric current causing heat to flow from one compartment to be cooled to a compartment to be heated, the means-to-be-activated being located in the wall.

9. The combination of claim 1, the cooperating means on the cover comprising a partition to cooperate with the tray for forming the separate areas into separate compartments and insulating the compartments from each other, and the means-to-be-activated by the passage of electric current being located in the partition, separate heat conducting means extending from the means-to-be-activated to each compartment, and providing means to conduct heat from a compartment to be cooled to the means-to-be-activated and to be then delivered to the compartment to be heated.

10. The combination of claim 1, the cooperating means on the cover comprising a partition to cooperate with the tray for forming the separate areas into separate compartments and insulating the compartments from each other, and the means-to-be-activated by the passage of electric current being located in the partition, separate heat conducting means extending from the means-to-be-activated to each compartment, said separate heat conducting means not being connected to each other except through the means-to-be-activated, and providing means to conduct heat from a compartment to be cooled to the means-to-be-activated and to be then delivered to the compartment to be heated.

11. The combination of claim 1, the cover having heat-insulating walls, the cooperating means on the cover cooperating with the tray for forming the separate areas into separate compartments and insulating the compartments from each other, and the means-to-be-activated by the passage of electric current causing heat to flow from one compartment to be cooled to a compartment to be heated.

12. The combination of claim 1, the cover having heat-insulating walls, the cooperating means on the cover comprising a partition to cooperate with the tray for forming the separate areas into separate compartments and insulating the compartments from each other, and the means-to-be-activated by the passage of electric current being located in the partition, the walls of each of the compartments having a separate heat conducting liner extending from the means-to-be-activated into that compartment, and providing means to conduct heat from a compartment to be cooled to the means-to-be-activated and to be then delivered to the compartment to be heated.

13. The combination of claim 1, the cover having heat-insulating walls, the cooperating means on the cover comprising a partition to cooperate with the tray for forming the separate areas into separate compartments and insulating the compartments from each other, and the

means-to-be-activated by the passage of electric current being located in the partition, the walls of each of the compartments having a separate heat conducting liner extending from the means-to-be-activated into that compartment, said separate heat conducting liners not being connected to each other except through the means-to-be-activated, and providing means to conduct heat from a compartment to be cooled to the means-to-be-activated and to be then delivered to the compartment to be heated.

14. The combination of claim 1, the cover having heat-insulating walls, the cooperating means on the cover comprising a partition to cooperate with the tray for forming the separate areas into separate compartments and insulating the compartments from each other, and the means-to-be-activated by the passage of electric current being located in the partition, the walls of each of the compartments having a separate heat conducting liner extending from the means-to-be-activated into that compartment, said separate heat conducting liners not being connected to each other except through the means-to-be-activated, and providing means to conduct heat from a compartment to be cooled to the means-to-be-activated and to be then delivered to the compartment to be heated, the electric current source being unidirectional.

15. The combination of claim 1, a portable support having a unidirectional electric power source thereon, the support having a plurality of shelves, each shelf providing means for receiving a tray, the cover having heat-insulating walls, the cooperating means on the cover comprising a partition to cooperate with the tray to provide a wall between areas for forming the separate areas into separate compartments and insulating the compartments from each other, means at each shelf and associated with each cover for coupling the means-to-be-activated of each tray to said electric power source on positioning a tray and its cover on a shelf, and the means-to-be-activated by the passage of electric current being located in the partition, the walls of each of the compartments having a separate heat conducting liner extending from the means-to-be-activated into that compartment, said separate heat conducting liners not being connected to each other except through the means-to-be-activated, and providing means to conduct heat from a compartment to be cooled to the means-to-be-activated and to be then delivered to the compartment to be heated, the means-to-be-activated being located in the wall.

16. The combination of claim 1, a portable support having a unidirectional electric power source thereon, the support having a plurality of shelves, each shelf providing means for receiving a tray, the cover having heat-insulating walls, the cooperating means on the cover comprising a partition to cooperate with the tray to provide a wall between areas for forming the separate areas into separate compartments and insulating the compartments from each other, an electric coupling means located at each shelf and complementary separable electric coupling means associated with each cover, the coupling means being coupled to each other to couple the means-to-be activated of each tray to said electric power source on positioning a tray and its cover on a shelf and the means-to-be-activated by the passage of electric current being located in the partition, the walls of each of the compartments having a separate heat conducting liner extending from the means-to-be-activated into that compartment, said separate heat conducting liners not being connected to each other except through the means-to-be-activated, and providing means to conduct heat from a compartment to be cooled to the means-to-be-activated and to be then delivered to the compartment to be heated, the means-to-be-activated being located in the wall.

17. The combination of claim 1, a portable support having a unidirectional electric power source thereon, the support having a plurality of shelves, each shelf providing means for receiving a tray, the cover having heat-insulating walls, the cooperating means on the cover

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comprising a partition to cooperate with the tray to provide a wall between areas for forming the separate areas into separate compartments and insulating the compartments from each other, an electric coupling means located at each shelf and complementary separable electric coupling means associated with each cover for association with the coupling means at any shelf, the coupling means being coupled to each other to couple the means-to-be-activated of each tray to said electric power source on positioning a tray and its cover on a shelf and the means-to-be-activated by the passage of electric current being located in the partition, the walls of each of the compartments having a separate heat conducting liner extending from the means-to-be-activated into that compartment, said separate heat conducting liners not being connected to each other except through the means-to-be-activated, and providing means to conduct heat from a compartment to be cooled to the means-to-be-activated and to be then delivered to the compartment to be heated, the means-to-be-activated being located in the wall.

18. The combination of claim 1, the cooperating means on the cover comprising a partition to cooperate with the

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tray for forming the separate areas into separate compartments and insulating the compartments from each other, and the means-to-be-activated by the passage of electric current being located in the partition, separate metallic heat conducting layers on the walls of each compartment and extending from the means-to-be-activated into that compartment, said separate heat conducting layers not being connected to each other except through the means-to-be-activated, and providing means to conduct heat from a compartment to be cooled to the means-to-be-activated and to be then delivered to the compartment to be heated.

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