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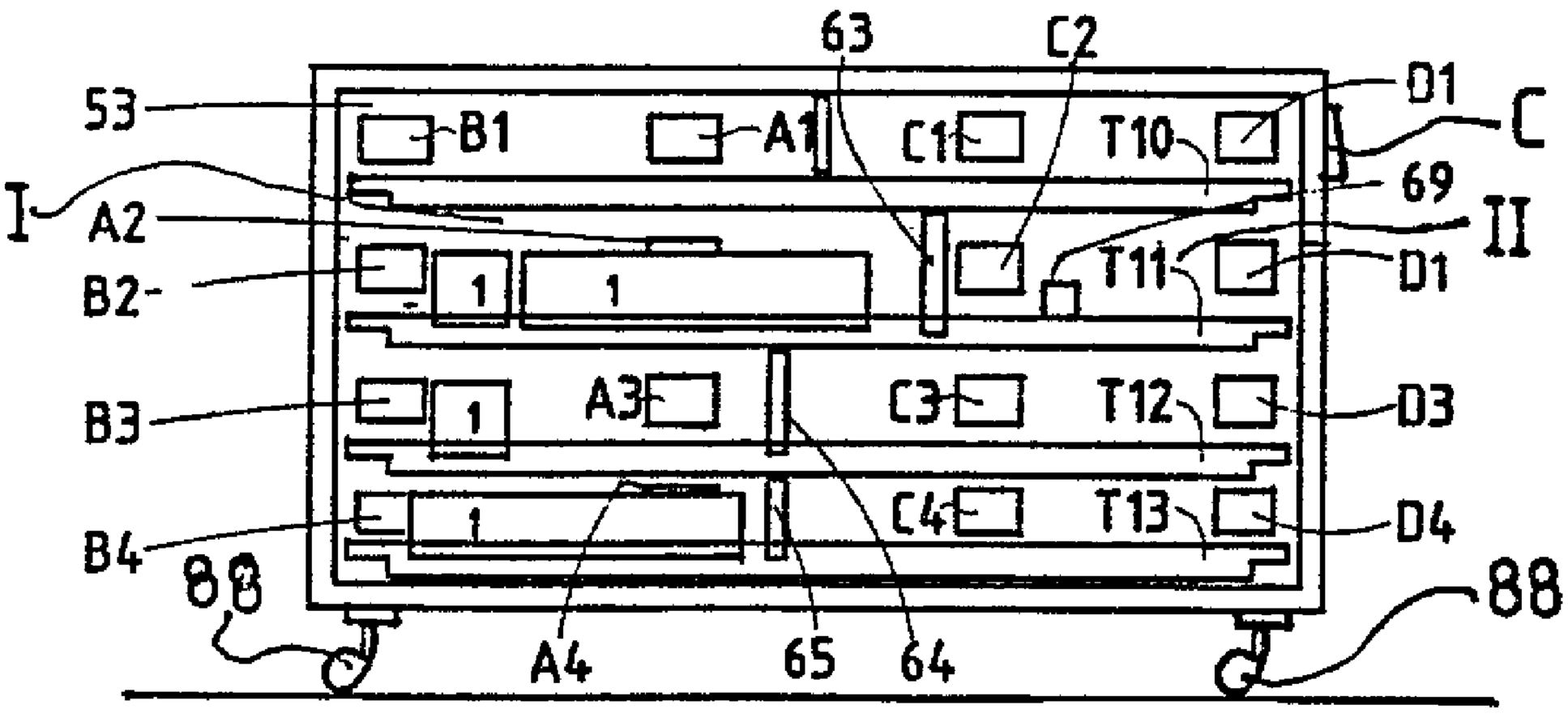
(54) Title: FOOD DISPENSING SYSTEM



(57) Abrégé/Abstract:
A food dispensing system comprises a cabinet adapted for locating within it an array of at least one tray spaced vertically from another tray or from another part of the cabinet characterised by a removable barrier (63, 64, 65) freely locatable on the tray (T11, T12, T13) so that, at least when a combination of tray (T11) and barrier (63) is located in spaced relationship to a further tray (T10) or from another part of the cabinet, then the barrier (63) interacts with the tray (T11) and the further tray (T10) or a part of the cabinet to isolate a first region (I) of the tray from a second region (II) of the same tray; the relative size of the first region (I) and the second region (II) depending on the location of the barrier (63) relative to a datum position on the tray (T11). Typically, the barrier (63) forms a thermal insulation barrier between the first region (I) and the second region (II). The first region (I) is adapted to be kept at a higher temperature than ambient by means of heat exchange with a source of heat (59) in the region (I) or in good heat exchange relationship therewith.

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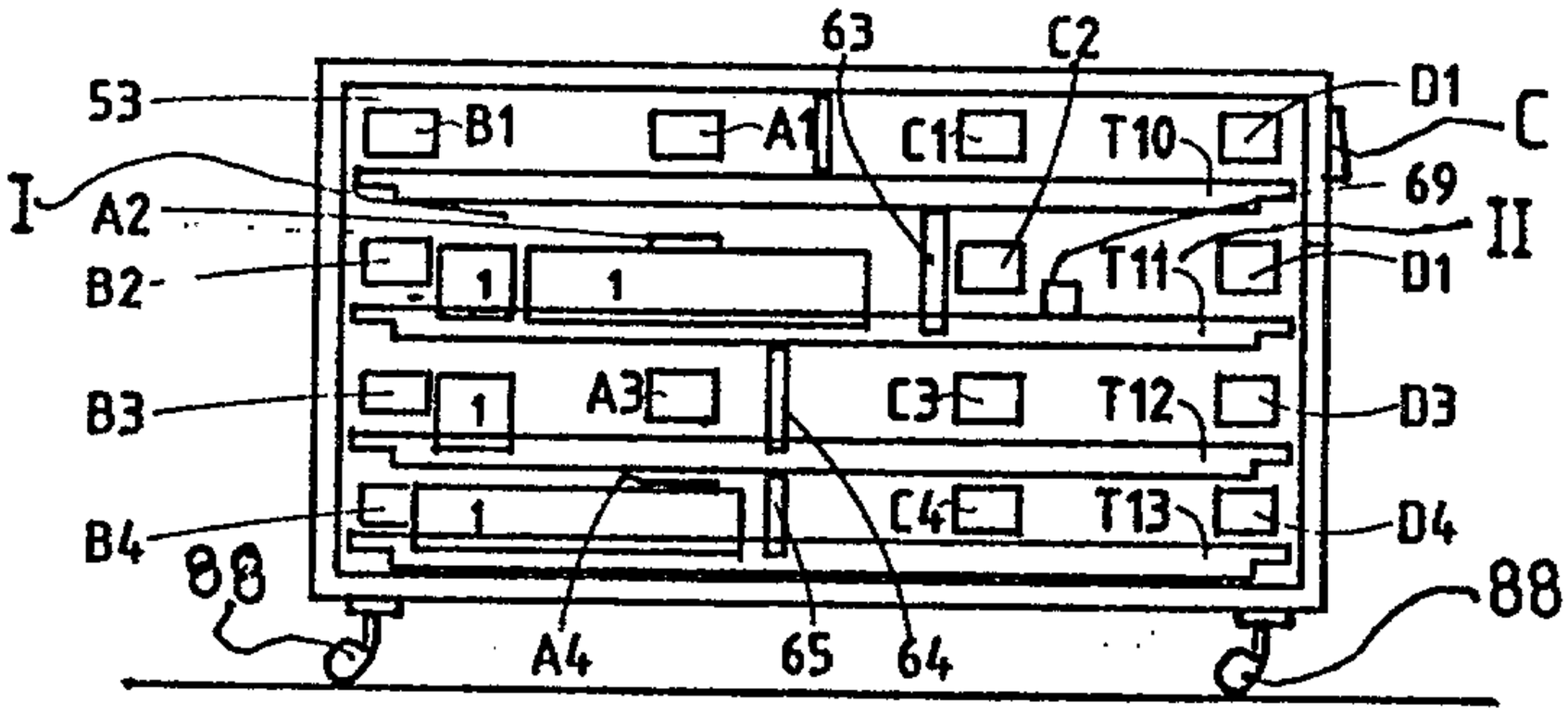

(57) Abstract

A food dispensing system comprises a cabinet adapted for locating within it an array of at least one tray spaced vertically from another tray or from another part of the cabinet characterised by a removable barrier (63, 64, 65) freely locatable on the tray (T11, T12, T13) so that, at least when a combination of tray (T11) and barrier (63) is located in spaced relationship to a further tray (T10) or from another part of the cabinet, then the barrier (63) interacts with the tray (T11) and the further tray (T10) or a part of the cabinet to isolate a first region (I) of the tray from a second region (II) of the same tray; the relative size of the first region (I) and the second region (II) depending on the location of the barrier (63) relative to a datum position on the tray (T11). Typically, the barrier (63) forms a thermal insulation barrier between the first region (I) and the second region (II). The first region (I) is adapted to be kept at a higher temperature than ambient by means of heat exchange with a source of heat (59) in the region (I) or in good heat exchange relationship therewith.

FOOD DISPENSING SYSTEM

TECHNICAL FIELD

This invention relates to a food dispensing system. In particular it is concerned with a system for dispensing food in discrete batches where a temperature difference from ambient needs to be maintained for at least some if not all of the food in each batch.

The dispensing of food is frequently required in an establishment, such as a hospital, where food prepared in one place has to be transferred and dispensed on trays to individuals or groups of individuals located at some distance from the point of preparation. A similar requirement arises in aircraft catering. To ensure that food is effectively transferred a number of requirements must be met. The prepared food, whether hot or cold, needs to be moved from a kitchen or other food preparation area to the location of each consumer while being protected from contamination and deterioration and while being maintained within a predetermined temperature range. Once on location the food temperature are appropriately raised or lowered to the temperature at which it is to be consumed. The cabinet is then opened and the tray presented on a tray along with the necessary eating utensils.

Broadly food dispensing requires that regardless of the method of food preparation or storage for the purpose of consumption at least some of the food on the tray will need to either above, at or below room temperature. The provision of this will be discussed further hereafter.

Once each tray has been used the tray along with utensils, and any waste food, need to be readily recovered from each consumer and then returned to a service area or kitchen to enable the hardware to be cleaned for re-use and waste material disposed of.

Any dispensing system that is used should be user friendly so as to enable food

and utensils to be readily dispensed and recovered without the need to exercise time consuming manual or technical skills. Typically nursing staff who frequently have to deal with the provision of meals should be able to use the system readily without significant intrusion into other more critical and specialised functions. On aircraft large numbers of people need to be supplied with food and the used trays recovered by a relatively small number of cabin staff promptly and in a controlled manner.

Background Art

In one prior art device a dispensing system makes use of a food serving tray is known (UK Patent 1 486 939) incorporating heater elements to enable food to be maintained art a desired serving temperature. The tray comprises a planar support member of thermal insulating material having an upturned peripheral edge. The support member has at least one interruption closed and sealed by a plate or disc of heat conducting material. Each plate or disc is contacted on its underside by a heater housed in the tray which is powered by way of conductors also housed in the tray which conductors extend from the heater to the edge of the tray to an array of electrical contacts. A trolley for housing the trays is equipped with a complementary array of contacts so that with the tray installed in the trolley the individual heaters in each tray are powered by way of the coupled array to maintain the heater in the tray at operating temperature. A tray of this kind while being useful for heated food is not useful for unheated or chilled food. In addition the trays are elaborate units requiring use with a trolley having a complementary electrical supply and connecting system. Both the trays and their trolley require careful maintenance and cleaning.

In a second prior art device (US Patent 4966296) there is provided an integrated food tray incorporating a tray housing. The housing is in the form of a receptacle which is initially integrated but which contains at least two meal course portion containers which are separable. At least one separable portion is designed to carry a meal course which is to be heated in that portion, and at least one separable portion is not intended to be heated but rather is intended to carry a meal course

which is to be served at room temperature or at a temperature cooler than room temperature. The integrated food tray described while providing for the selection, transfer and heating of the food does not actually facilitate the presentation of the prepared food to a consumer. For this purpose a further tray is required. Once used the separable portion containers become waste material and consequently the person serving the food has to gather up the used containers and deposit them into a waste carrier. As a result a considerable amount of waste material is generated in the course of using this tray system.

SUMMARY OF THE INVENTION

According to the present invention, there is provided a food dispensing system comprising a cabinet having an interior volume adapted to receive an array of at least one tray with a vertical spacing between the tray and another tray or another part of the cabinet, the tray having a removable freely locatable divider thereon, the divider having a height comparable to the vertical spacing between the tray and another tray or another part of the cabinet so that the divider isolates a first region of the tray from a second region of the tray.

According to a first preferred embodiment of the present invention, the divider forms a thermal insulation barrier between the first region and the second region.

According to a second embodiment of the present invention, the first region is adapted to be kept at a higher temperature than ambient by means of heat exchange with a source of heat in the first region or in good heat exchange with the first region. Typically, the source of heat may be: a powered heater from which heat is dispensed to by heat transfer to a flow of air and subsequent heat transfer from the heated flow of air to the first region; or a powered microwave heater; or an unpowered source of heat such as previously heated material typically in pellet or block form; or a combination of one or more of these.

According to a third preferred embodiment of the present invention, the second region is adapted to be kept at a lower temperature than ambient by means of heat exchange with a cooling means in the second region or in good heat exchange with the second region. Typically, the cooler means may be: a powered refrigerating unit from which cooling is dispensed by heat transfer to a flow of air and by subsequent heat transfer from the cooled air to the second region; or an unpowered source of cooling such as previously cooled material typically in block form; or a combination of these.

According to a fourth preferred version of the present invention, heating or cooling of the first and second regions are regulated by means of a controller.

According to a fifth preferred version of the present invention, the divider incorporates a heat exchanger.

According to a sixth preferred version of the present invention, the first region of each tray in the cabinet are enabled to communicate with each other by means of a first flowpath and air is displaced around the first flowpath to provide for all first regions to be maintained at a similar temperature either by natural convection or forced convection or a combination thereof.

According to a seventh preferred version of the present invention, the second region of each tray in the cabinet are enabled to communicate with each other by means of a second flowpath and air is displaced around the second flowpath to provide for all second regions to be maintained at a similar temperature either by natural convection or forced convection or a combination thereof.

According to an eighth preferred version of the present invention, the cabinet is adapted for mobile operation.

According to a ninth preferred embodiment of the present invention, the cabinet is equipped with means for coupling the cabinet to an external source of power.

The present invention provides for a food dispensing cabinet particularly for mobile operation where a simple form of tray can have first and second regions of any relative proportions defined on its working surface by means of a removable and freely locatable divider and appropriate amounts of food placed in each region. On inserting the tray and its contents into the cabinet, the divider interacts with a tray or part of the cabinet above it so as to isolate and insulate the first and second regions of the tray from each other.

Thereafter as appropriate the food in the first region is maintained at a temperature above ambient in a number of ways depending on what is convenient. Typically a preheated block can be installed in the cabinet at a location which is in good heat exchange contact with the first region of some or all of the trays. The cabinet is provided with an insulated layer at or near the outside of the cabinet to minimise the flow of heat from the first region. The divider serves to prevent the flow of heat from each first to each second region. Alternatively heating can be by way of a powered heater element such as individual radiant elements or by way of a microwave source. In this case if the cabinet is not filled with loaded trays then only elements in the vicinity of loaded trays need to be operated. In yet another arrangement a fan is used to generate heat transfer by forced convection or natural convection to provide for circulation.

Again as appropriate the food in the second region can be maintained at a temperature below ambient. Typically a pre-cooled block can be installed in the cabinet at a location which is in good heat exchange relationship with second region of some or all of the trays. The divider serves to minimise the flow of heat into the second region so serving to keep the temperature of cooled foodstuffs at the required level. Alternatively cooling can be by way of a refrigeration unit incorporated in the cabinet which provides cooled air for circulation by forced or natural convection or a combination thereof.

The invention further enables flow guide means to be located so as to provide a first flowpath passing through the first regions to enable a flow of heated air to be circulated around the first path to provide for the close control of the temperature of food located in each first region.

Likewise flow guide means can be located so as to provide a second flowpath passing through the second regions to enable a flow of cooled air to be circulated around the second path to provide for the close control of the temperature of food in each second region.

The invention particularly lends itself to food regeneration processes where prepared food stored at a central location can be loaded in appropriate amounts onto trays, the barriers installed on each tray and the cabinet duly loaded. The temperatures of food stored in the trolley can be closely controlled and a suitable temperature change applied for a predetermined period to enable the food to be dispensed from the trolley to the recipients in optimal condition.

The invention facilitates the dispensing process by providing for a tray to be withdrawn from the array in the cabinet, for the divider to be readily removed and stacked on top of the cabinet and for the tray to be then handed to the consumer. Once the used tray is recovered a divider can be recovered from those available on the cabinet top and placed on the tray and the combination is then inserted back into the cabinet.

The used trays and the dividers being of a simple form are readily handled and cleaned prior to re-use. In addition the interior of the cabinet is uncomplicated and is readily cleaned.

BRIEF DESCRIPTION OF DRAWINGS

An exemplary embodiment of the invention will now be described with reference to the accompanying drawings of a mobile hot and cold cabinet for dispensing food of which:

Figure 1 is a plan view; and

Figure 2 is a vertical section on section II-II of Figure 1;

MODE FOR CARRYING OUT THE INVENTION

This embodiment shows means for establishing air flow paths over the trays.

Cabinet 51 serves to house trays T10 to T13. The cabinet 51 has a door 52 to provide access to working volume 53 containing the trays T10 to T13. Chamber 54 has a first section 55 and a second section 56 separated by a flap 57. The flap 57 can be used to link or isolate the sections 55, 56 as required.

Simple barriers are used to define particular air flow paths over the trays. Typically divider 63 on tray T11, divider 64 on tray T12 and divider 65 on tray T13 are used to separate and to insulate from one another two regions of each tray into a hot region I (generally on the left hand side of the partitions as shown in Figure 2) and a cool region II (on the right hand side of the partitions shown in Figure 2). The dividers 63, 64, 65 extend from the front to the back of their respective trays and are similar in height to the clearance above each tray and the tray or compartment roof above so as to prevent cross flow from one region of a tray to another and to thermally insulate the two regions.

By providing barriers 63, 64, 65 as close fitting dividers air bleeds from the hot to the cold side are kept to a minimum if not eliminated. The dividers 63, 64, 65 are conveniently fabricated from any of a number of plastics materials.

First section 55 contains a tangential fan 58 and parallel heating elements 59. On operation of fan 58 air passes out of the first section 55 into working volume 53 by way of a vertical series of apertures A1 to A4 and passes over each tray before returning to first section 55 by a second series of vertical apertures B1 to B4.

Second section 56 provides a second tangential fan 60 and parallel evaporator elements 61 similar in form and function to fan 41 and condenser 40 described in connection with the first embodiment. Air passes out of the second section 56 into

working volume 53 by way of a vertical series of apertures C1 to C4 to pass over each tray before returning to second section 56 by way of a fourth series of vertical apertures D1 to D4.

Typically in this case tray T11 contains three food containers 66, 67 which are to be kept warm and a further container 69 which is to be kept cool.

To use the cabinet 51 the trays T10 to T13 are loaded with food and dividers 63, 64, 65 are positioned to divide the tray up into hot and cold regions. By being separate items the dividers allow for the relative sizes of the hot and cold regions to be readily set at the time the food is added to the tray. Consequently each loading can be set up to make the most efficient use of the heating/cooling systems. The trays are then inserted in the cabinet. In this case both heating and cooling are required. However the system allows of extremely flexible operation. Typically food in a given region can at choice be heated, left at ambient temperature, or cooled. In the present case the flap 57 is moved to isolate the first section 55 from the second section 56.

The first fan 58 and second fan 60 are energised together with the heater elements 59 and evaporator elements 61. As a consequence heated air is generated in first section by way of elements 59 and is driven by the first fan 58 out through each aperture A1 to A4 into working volume 53 to pass over a food tray, so supplying heat to food containers requiring it before passing back into the first section 55 by way of apertures B1 to B4 where it is reheated for further circulation. Cooled air circulates from second section 56 into working volume 53 by way of each of apertures C1 to C4 into working volume 53 to pass over a food tray so removing heat from food containers located in the cooling air path before passing back into second section 56 by way of apertures D1 to D4.

INDUSTRIAL APPLICABILITY

The embodiment provides for food on a conventional tray to be readily maintained at a predetermined temperature by the use of simple barrier in combination with

an air circulating system which provides a paralleled arrangement of air flows over each tray in a vertical array thereof. The use of a tangential fan for generating air flow around a closed path provides a relatively quiet method of displacing air as against a conventional bladed fan. The use of a tangential fan also enables the cabinet and associated equipment to form a relatively compact package. The only external connection needed for the cabinet is to a mains power supply.

A programmer including a microprocessor can also be used to enable the heating and/or cooling flows and their temperatures to be governed in accordance with a predetermined program depending on the way the food is to reach its required dispensing temperature. Given the food has reached its required temperature the use of an insulated cabinet insures that temporary disconnection form a mains power supply to enable the cabinet to be moved and connected to a fresh power supply is readily undertaken without the food temperature changing significantly.

In yet another embodiment a cabinet similar in most respects to that described in connection with Figures 1 and 2 is provided but with no built in heater such a parallel heater elements described in connection with Figures 1 and 2. Instead the heat is provided by way of electrical heating elements incorporated in each movable divider, similar to dividers 63, 64, 65. Each divider is provided on its inner end with a pair of projecting electrical contacts. The rear of the cabinet is equipped with a shrouded busbar arrangement complementing the layout of the contacts so that the action of pushing a divider into place on a tray causes the contacts to engage the busbar and so provided for the energisation of a heater element in the divider. Where a divider equipped with a heater serves to separate a warmed region of the tray from a cooled region the divider incorporates insulation to limit the passage of heat to the cold side of the divider. The use of heating dividers of general type described ensures that the minimum amount of power is used since heat will only be generated in relation to the one tray on which it is used. Consequently it provides for efficient use of a cabinet which carries less than a full complement of food bearing trays.

A number of ways have been described of providing for flows of warmed air

and/or cooled air over specific areas of one or more trays in an array. In general terms the or each discrete flow areas of each tray can be defined either by a barrier on the tray. The use of a tangential fan provides for the efficient circulation of air on two or more flow paths in parallel. The fans and power supplies to the fans and the heating or cooling heat exchangers are located in the cabinet but are well protected from the working region in which the tray array is located. The mobile versions of the cabinet systems are readily supplied with electrical power by a wandering lead and the insulation of the cabinets ensure that heat loss or gain is minimised while the cabinet is disconnected from a power source while being food is being dispensed from it on a working route such as around a hospital ward.

The invention also provides for a cabinet dispensing with a need for an external power supply. This is achieved by equipping the interior of the cabinet with housings for hot and cold materials. Typically heated blocks or pellets of heat retaining material are located so as to readily supply heat to each first region by natural convection/radiation. Chilled blocks of known type are located so as to readily cool each second region by natural convection. In either or both cases a battery powered fan can be used to provide air circulation for each region or set of regions.

What is claimed is:

1. A food dispensing system comprising a cabinet having an interior volume adapted to receive an array of at least one tray with a vertical spacing between the tray and another tray or another part of the cabinet, the tray having a removable freely locatable divider thereon, the divider having a height comparable to the vertical spacing between the tray and another tray or another part of the cabinet so that the divider isolates a first region of the tray from a second region of the tray.

2. A food dispensing system as claimed in Claim 1 wherein the divider forms a thermal insulation barrier between the first region and the second region.

3. A food dispensing system as claimed in Claim 1 or 2 wherein the first region is adapted to be kept at a higher temperature than ambient by means of heat exchange with a source of heat in the first region or in good heat exchange with the first region.

4. A food dispensing system as claimed in Claim 3 wherein the source of heat is: a powered heater from which heat is dispensed to by heat transfer to a flow of air and subsequent heat transfer from the heated flow of air to the first region; or a powered microwave heater; or an unpowered source of heat such as previously heated material typically in pellet or block form; or a combination of one or more of these.

5. A food dispensing system as claimed in Claim 1, 2, 3 or 4 wherein the second region is adapted to be kept at a lower temperature than ambient by means of heat exchange with a cooling means in the second region or in good heat exchange with the second region.

6. A food dispensing system as claimed in Claim 5 wherein the cooling means is: a powered refrigerating unit from which cooling is dispensed by heat transfer to a flow of air and by subsequent heat transfer from the cooled air to the second region; or an unpowered source of cooling such as previously cooled material typically in block form; or a combination of these.

7. A food dispensing system as claimed in Claim 3, 4, 5 or 6 wherein heating and cooling of the first and second regions are regulated by means of a controller.

8. A food dispensing system as claimed in Claim 1, 2, 3, 4, 5, 6 or 7 wherein the divider incorporates a heat exchanger.

9. A food dispensing system as claimed in Claim 1, 2, 3, 4, 5, 6, 7 or 8 wherein the first region of each tray in the cabinet are enabled to communicate with each other by means of a first flowpath and air is displaced around the first flowpath to provide for all first regions to be maintained at a similar temperature either by natural convection or forced convection or a combination thereof.

10. A food dispensing system as claimed in Claim 1, 2, 3, 4, 5, 6, 7, 8 or 9 wherein the second region of each tray in the cabinet are enabled to communicate with each other by means of a second flowpath and air is displaced around the second flowpath to provide for all second regions to be maintained at a similar temperature either by natural convection or forced convection or a combination thereof.

11. A food dispensing system as claimed in Claim 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10 wherein the cabinet is adapted for mobile operation.

12. A food dispensing system as claimed in Claim 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 or 11 wherein the cabinet is equipped with means for coupling the cabinet to an external source of power.

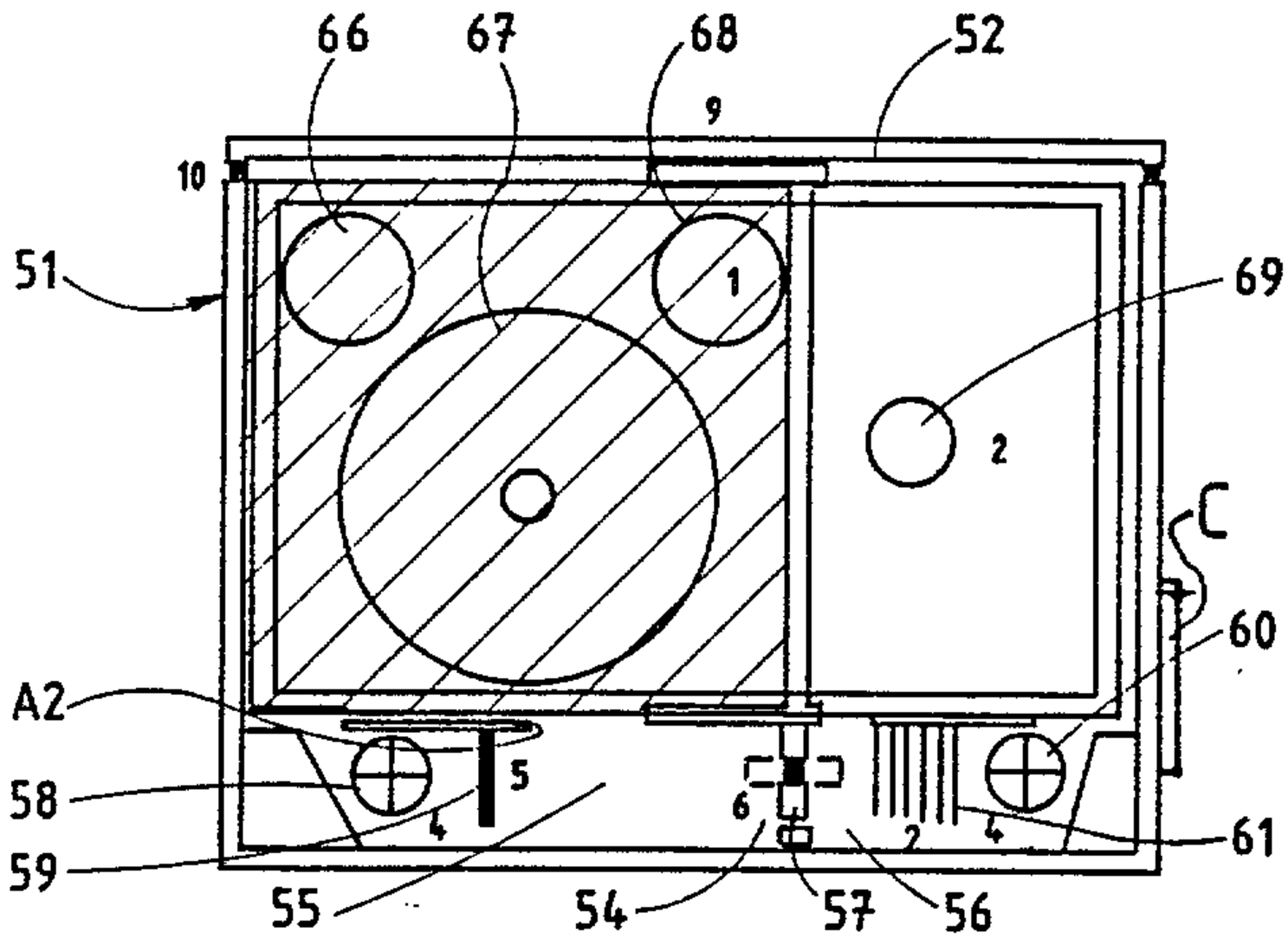
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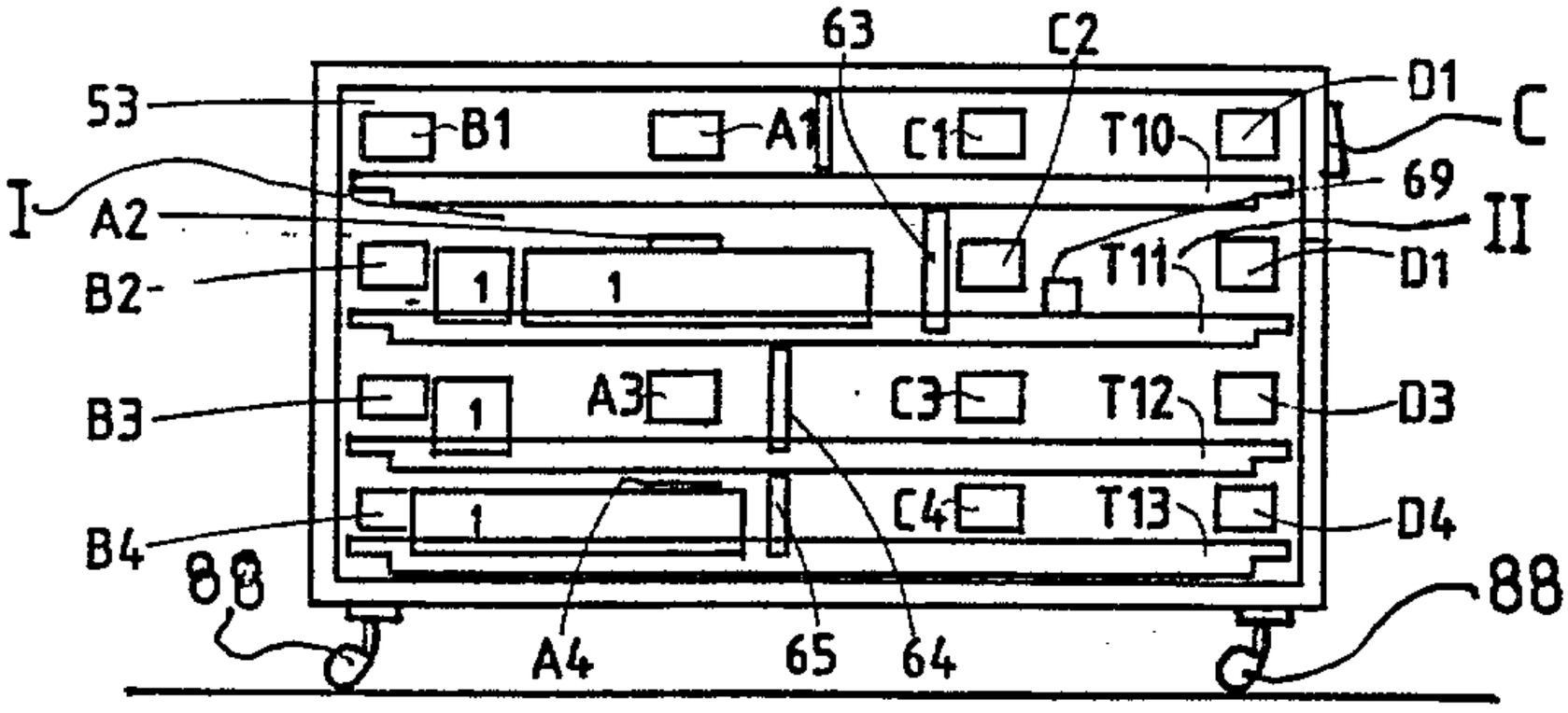
Fig 1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C1
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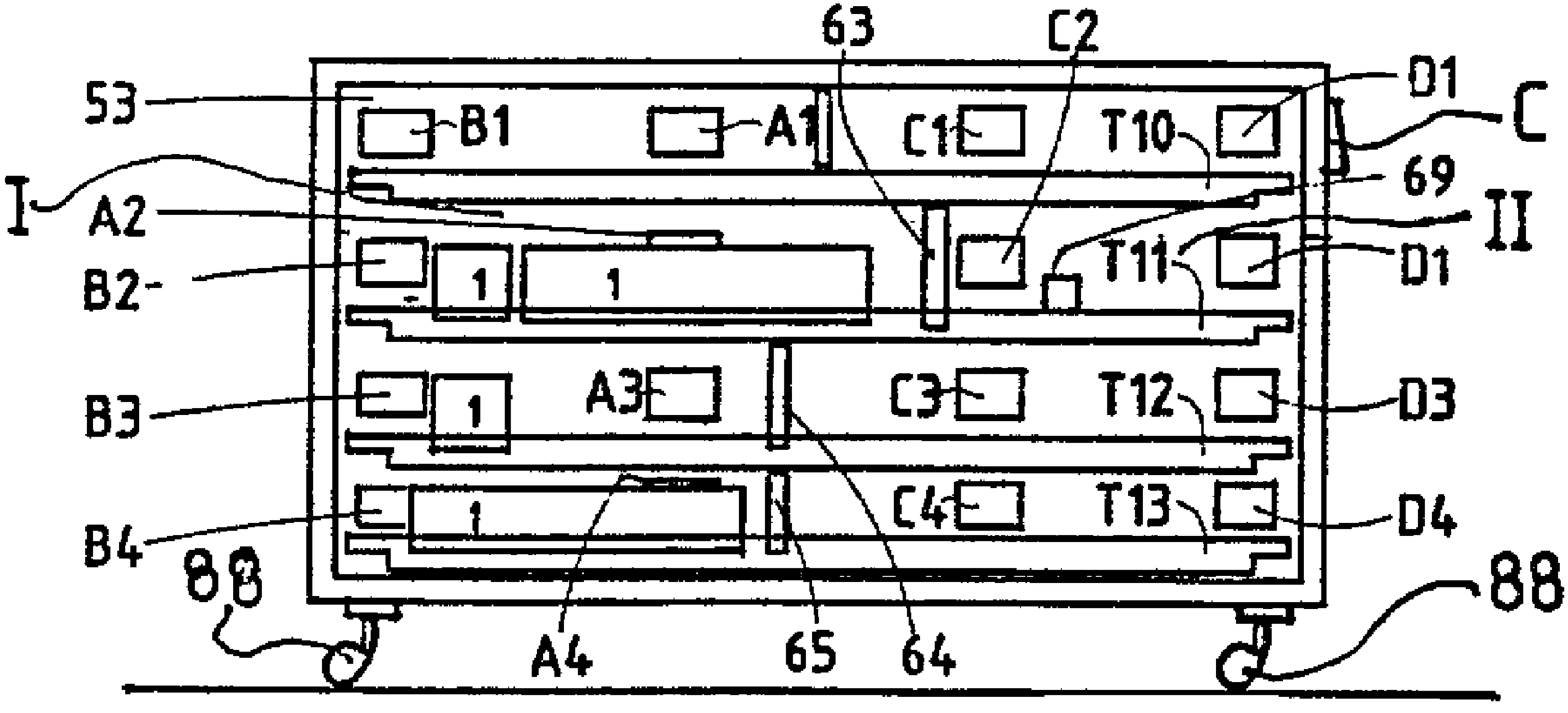
Fig 2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