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(54) **MODULAR TYPE APPARATUS ADAPTED TO STORE IN PARTICULAR FOODSTUFFS**

MODULARE VORRICHTUNG, BESONDERS ZUR LAGERUNG VON NAHRUNGSMITTELN

APPAREIL DE TYPE MODULAIRE CONÇU POUR STOCKER DES DENRÉES ALIMENTAIRES
PARTICULIÈRES

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EP 1 986 528 B1

Description

[0001] The present invention relates to an apparatus adapted to store in particular foodstuffs, according to the preamble of claim 1.

[0002] Manufacturers are increasingly interested in enhancing the perceived value of industrial products through mass customization. Said customization is aimed at satisfying the users, who no longer have to buy a fixed product, because manufacturers try to adapt the product to each user's specific requirements. Since a company is generally able to produce high quantities of standardized products profitably (whereas it has to bear excessive costs for providing a customized product for each user), mass customization allows to manufacture customized products through ordinary practices, starting from standardized production modules. Mass customization requires production flexibility and product modularity, so that a customized product is obtained as an assembly of a number of elements which may be assorted in different ways.

[0003] In the past few years, mass customization has increased considerably in many industrial fields (clothing, mobile telephony, automotive), but such an impetus has not yet been recorded in the field of household refrigeration apparatus. As a matter of fact, apparatus like the refrigerators, freezers and refrigerator-freezers currently on the market are characterized by a high degree of standardization: based on said standardization, a fixed model range is offered which may attract predetermined standard users, who are regarded to be representative of predefined market segments.

[0004] It follows that known refrigeration apparatus do not allow to achieve the users' full satisfaction, because each user can hardly find a product on the market which is perfectly suited to his/her needs. In fact, the functional features of said apparatus do not provide sufficient flexibility: in particular, the number of methods for preserving foodstuffs is limited and the volumes of the internal compartments dedicated to said preservation methods are generally standardized. For instance, refrigerators and freezers can provide just one preservation method, by keeping the internal temperature within a predetermined interval, while refrigerator-freezers can provide just two distinct preservation methods.

[0005] A scant interest in customization shown so far by the refrigeration apparatus industry is confirmed in the related patent literature, which is rather slim and wherein the term "modularity" is often used to indicate the possibility of replacing the functional assembly, i.e. the assembly providing the refrigeration effect (see, for example, patent application EP1547492, which describes a refrigerating display cabinet mainly for commercial use, wherein different functional assemblies may be applied, each being specific for preserving foodstuffs at a certain temperature).

[0006] In patent US3650122, a "modular refrigeration unit" is an apparatus comprising a thermally insulated

container fitted with a refrigerating circuit for cooling said container. The unit itself, which is removable is installed in the recess of a built-in kitchen cabinet. The modularity of the apparatus described in patent US3650122 is actually extremely limited, because essentially said modularity consists merely of a certain adaptability of the volumes of said apparatus depending on the space available in the built-in kitchen cabinet wherein it is to be installed.

[0007] Patent application EP201182 describes a refrigerator which can be obtained by assorting container modules which may be stacked in order to create an upright structure. For the purpose of ensuring the distribution of refrigerating power among the various container modules, there are elements, being modular as well, adapted to supply refrigerating power to the container modules. If on one hand the refrigerator described in patent application EP201182 permits the user to adapt the internal space according to its needs on the other, it suffers a drawback of not being in any way customized; be it regarding the division in zones each having its own method of preservation or be it regarding a combination of eventual accessory devices..

[0008] Patent application EP334414 describes a refrigerator on which auxiliary modules can be positioned in order to increase its capacity, thus allowing to obtain a refrigerator whose volumes can be adapted according to the user's needs. Refrigeration in the auxiliary modules is provided by means of connectors which put the inner space of the auxiliary modules in communication with the refrigerating power supply circuit. The refrigerator described in patent application EP334414 suffers from similar drawbacks as the refrigerator described in patent application EP201182: also in this case, in fact, the modularity of the household refrigeration apparatus only gives the possibility of adapting its capacity depending on the user's needs.

[0009] The above-mentioned prior art, which relates to volume-modular refrigerators, also suffers from the fact that this modularity cannot be easily exploited when using said refrigerators, and is therefore de facto limited to the installation phase. Moreover, in the above-mentioned prior art, said volume modularity is not associated with a corresponding modularity of the refrigerating power generated by the functional unit: it follows that an increase in capacity obtained by adding one or more auxiliary modules may likely lead to a condition wherein at least a part of the refrigerator cannot adequately ensure the preservation method for which it was designed.

[0010] The object of the present invention is to provide an apparatus adapted to store foodstuffs which overcomes the inherent drawbacks of the above-described apparatus. In particular, the present invention aims at providing an apparatus which stands out from prior-art household refrigeration apparatus currently available on the market, since it offers its users a modularity which, besides concerning the overall volume of the apparatus, also relates to other aspects such as the division of the

volume into different zones (each zone being associated with a particular preservation method), and/or the possibility of changing the arrangement of the various modules with the utmost comfort even when using the apparatus, and/or the removability of the various modules, which may be easily detached from the modular apparatus and used, typically for a predetermined time, separately from the functional unit which generates the refrigerating power, and/or the compatibility with any accessory devices (pneumatic vacuum generating device, hygiene care, etc.), and so on.

[0011] The apparatus adapted to attain said objects has the features set out in the annexed claims, which form an integral part of the present description.

[0012] The general idea at the basis of the present invention is to provide a modular type apparatus adapted to store in particular foodstuffs, which comprises:

- i) one or more container elements, each being adapted to keep foodstuffs in a certain state of preservation;
- ii) a functional unit, adapted to generate refrigerating power; and
- iii) means of distribution, adapted to distribute the refrigerating power generated by the functional unit.

[0013] The most advantageous aspects of the present invention will now be described.

[0014] The means of distribution may act as a supporting structure for one or more container elements.

[0015] The container elements comprise connection means providing a connection to the means of distribution, in particular comprise connection means which provide a connection to suitable connection elements applied to the means of distribution: the connection means are adapted to allow refrigerating power to be supplied into the container elements, preferably into the internal compartment of the container elements, and are preferably capable of ensuring that the connection between the container elements and the means of distribution can be removed, so as to allow the container elements to be removed by a user (i.e. also by unqualified personnel, not only by installation, maintenance or service technicians) from the respective installation place. Said connection means and connection elements are so shaped as to allow for a mutual mechanic coupling, thus forming, once coupled, a single connection unit.

[0016] In fact, the Applicant found in the removal of the container elements a very important feature through which the apparatus according to the present invention can offer its users an actual and particularly advantageous modularity. The removal of the container elements allows the user to change, even when using the apparatus, the type and/or arrangement of the container elements comprised in the modular apparatus according to the present invention, thus adapting said apparatus to his/her preferences and/or needs at any time. Furthermore, the removability feature allows the user to advan-

tageously use the container elements not only when they are connected to the means of distribution, but also when they, once disconnected, are carried away at any distance from the means of distribution. In order to provide a correct functionality of the container element for a sufficiently long time interval starting from the removal of the connection to the means of distribution, the container elements may advantageously be fitted with means adapted to keep the container elements properly refrigerated for a long time (e.g. means comprising insulating material adapted to prevent heat entering again, or means adapted to generate refrigerating power inside the container elements).

[0017] In addition to putting the container elements in communication with the means of distribution (thereby allowing refrigerating power to be supplied), the connection means may also be used for ensuring a stable but removable fixing of the container elements with the means of distribution: in such a case, the mechanical stresses acting on the container elements are transferred to the supporting structure, i.e. the means of distribution, through said connection means. As an alternative, the stable but removable fixing of one or more container elements may be obtained through dedicated means being different from the connection means: for example, at least one of the container elements and/or means of distribution may be associated with mechanical connections adapted to allow said container element to be supported by the means of distribution. The removability feature may be given to either all or some container elements: in the latter case, at least one container element is fixedly connected to the functional unit and/or to the means of distribution.

[0018] According to a particularly advantageous embodiment of the present invention, the modular type apparatus adapted to store in particular foodstuffs comprises electronic control means adapted to control the operation of the functional unit and/or the distribution of refrigerating power among the container elements. The electronic control means may be located in the functional unit and/or in the means of distribution and/or in at least one container element, and may use memory means comprising at least one non-volatile memory. User interface means may also be associated with the electronic control means: said user interface means are adapted to allow the user of the apparatus according to the present invention to select at least one operating parameter of the apparatus and/or to provide the user of the apparatus according to the present invention with at least one operating parameter of the apparatus. In fact, the user interface means may comprise:

- i) selection means, adapted to allow the user to activate and deactivate at least one functionality available in the apparatus according to the present invention and/or to select at least one parameter relating to the method for preserving foodstuffs within at least one container element (in particular temperature).

By way of example and not by way of limitation, the selection means comprise knobs and/or push-buttons (which may be touch control devices); and/or ii) display means, adapted to provide the user with at least one piece of information and/or one parameter (typically an operating parameter) relating to the apparatus according to the present invention, which comprise an array of LEDs and/or a display (e.g. a liquid crystal display or an OLED display). In particular, the display means may be used by the electronic control means to display at least one parameter and/or one piece of information relating to at least one container element: for example, if the display means comprise a display, said display may be used for informing the user about the temperature and/or pressure within a certain container element, or about the type and/or expiry date of the foodstuffs contained therein, or about the nature of a fault condition.

[0019] The apparatus according to the present invention may also comprise one or more alarm devices connected to the electronic control means. The electronic control means are adapted to generate an alarm signal based on at least one parameter or one piece of information received from one of the electric loads of the apparatus, e.g. from one of the container elements, and the alarm devices are adapted to warn the user about the alarm condition: for example, should the electronic control means receive a piece of information indicating that the access means of a container element have been left open by the user, the alarm devices will generate an audible and/or luminous signal adapted to attract the user's attention.

[0020] As an alternative to or in combination with said user interface means, the electronic control means may be connected to:

- i) a radiofrequency receiver, thus allowing the user to carry out activation and/or deactivation and/or selection operations through a suitable external device (e.g. a remote control); and/or
- ii) network connection means (Internet, or GSM, or "powerline"), thus allowing the user to send commands to the apparatus according to the present invention and/or to check its operating status from a remote location. In this case, in said remote location it will advantageously be possible to collect information concerning the modular type apparatus, e.g. statistical and/or diagnostic information, as well as to carry out preventive maintenance of the apparatus.

[0021] The modular apparatus according to the present invention will become apparent, together with its further advantages, from the following detailed description and from the annexed drawings, which are supplied by way of non-limiting example, wherein:

- Fig.1 shows schematically a first possible embodiment of the components of the apparatus according to the present invention called "functional unit" and "means of distribution", respectively;
- Fig.2 shows schematically a second possible embodiment of the components of the apparatus according to the present invention called "functional unit" and "means of distribution", respectively;
- Fig.3 shows schematically a first possible embodiment of the component of the apparatus according to the present invention called "container element";
- Fig.4 shows schematically a second possible embodiment of the component of the apparatus according to the present invention called "container element";
- Fig.5 shows schematically a third possible embodiment of the component of the apparatus according to the present invention called "container element";
- Fig.6 shows schematically a fourth possible embodiment of the component of the apparatus according to the present invention called "container element";
- Fig.7 shows schematically a fifth possible embodiment of the component of the apparatus according to the present invention called "container element";
- Fig.8 shows schematically a first possible layout of the apparatus according to the present invention, provided by suitably connecting a plurality of container elements to the components shown in Fig.1; and
- Fig.9 shows schematically a second possible layout of the apparatus according to the present invention, provided by suitably connecting a plurality of container elements to the components shown in Fig.1.

[0022] Fig.1 shows schematically some components of the modular apparatus adapted to store in particular foodstuffs according to the present invention, said components being shaped and reciprocally arranged according to a particular embodiment only representing a first example of the possible embodiments of the apparatus according to the present invention. In particular, Fig.1 illustrates the functional unit 10, adapted to generate refrigerating power, and the means of distribution 20, adapted to distribute the refrigerating power generated by the functional unit 10 among the various container elements and at the same time to act as a supporting structure for the container elements. The functional unit 10 is positioned at the bottom of the modular apparatus and is so shaped as to ensure stability of the entire apparatus; it may be associated with movement means, in particular castors, to allow the user to move the entire apparatus easily. The functional unit 10 comprises the devices adapted to generate refrigerating power: said devices may be of any type, without limiting the inventive concepts of the present invention.

[0023] For example, the refrigerating power may be generated through a heat pump system, commonly known in the art. Such a system uses a refrigerating fluid

which evolves according to a thermodynamic cycle in which it directly or indirectly subtracts heat from the internal compartments of the container elements during its evaporation: thanks to this evolution, the temperature inside the container elements remains within a predetermined range being lower than the temperature of the environment wherein the apparatus according to the present invention is located. The refrigerating fluid used may be any of the following: R134a, R600a, R22, R410a and any other refrigerating fluid commonly used in household refrigeration apparatus. In particular, said heat pump system comprises an evaporator and a condenser, respectively adapted to provide expansion and condensation of the refrigerating fluid, as well as a compressor, adapted to compress the refrigerating fluid. From the compressor outlet, the refrigerating fluid reaches the condenser, downstream of which a dehydrating filter may be placed to trap any impurities and/or moisture. Subsequently, the refrigerating fluid passes through an expansion unit, preferably a capillary tube, used for expanding the refrigerating fluid, then passes through the evaporator and is finally conveyed to the compressor inlet. Compressor and condenser are comprised in the functional unit 10, whereas the evaporator may be distributed among the various container elements or else be comprised in the functional unit 10 as well, depending on whether the refrigerating fluid subtracts heat from the internal compartments of the container elements directly or indirectly. As an alternative to the heat pump system, the refrigerating power may be generated through a Peltier cell system, or through magnetothermal refrigeration, or through thermoacoustic refrigeration.

[0024] In the example shown in Fig.1, it is assumed that the functional unit 10 can generate refrigerating power through a heat pump system and that heat is subtracted from the internal compartments of the container elements of the modular apparatus indirectly, by using a secondary fluid which is first cooled by means of the refrigerating fluid evolving in the heat pump system, and is then conveyed, through the means of distribution 20, into the container elements. The heat pump system is totally placed in the functional unit 10 and cools a secondary fluid adapted to carry the refrigerating power. Advantageously, the secondary fluid is air, which is conveyed into the container elements through the means of distribution 20: this takes place by means of at least one fan device, housed either in the functional unit 10 or in the means of distribution 20. The evaporator, located inside the functional unit 10, may be associated with a defrosting device adapted to keep the evaporator free from any frost accumulations which otherwise would counter the thermal exchange between the refrigerating fluid and the secondary fluid.

[0025] The means of distribution 20 may be provided through association of tubular cross-section elements, which at the same time are characterized by allowing gaseous flows to pass through, in particular the flow of cooled air generated in the functional unit 10, which then

reaches the internal compartments of the container elements, and by acting as a stable supporting structure for the container elements. The material used for manufacturing the means of distribution 20 should be a material having very good characteristics of mechanical strength (to withstand the weight force of the container elements) and also, if possible, a low specific weight (to obtain means of distribution being as light as possible): for example, the means of distribution 20 may be conveniently made of materials such as steel, aluminium alloy and carbon fiber. In Fig.1, the means of distribution 20 are shown as being so structured as to comprise an upright element 27, extending vertically from the functional unit 10, and a plurality of branches 28A-28L, extending substantially horizontally from the upright element 27. To the upright element 27 and/or to the branches 28A-28L one or more connector elements are applied, which are so shaped that they can be coupled to the connecting means of the container elements. This coupling, which allows the cooled air flow and the refrigerating power, carried through said flow, to be supplied into the internal compartment of the container elements, is a stable but removable connection and allows the user to easily remove the container elements from the respective installation places. In the example shown in Fig.1, one of the connection elements 29A-29L is applied to each one of the branches 28A-28L; moreover, two additional connector elements 29M, 29N are applied to the functional unit 10 to allow for a direct connection between the functional unit 10 and some container elements.

[0026] It may be assumed that, in the modular apparatus according to the present invention shown in Fig.1, the coupling between the connection elements 29A-29L and the connection means of each container element, besides putting in communication the container elements with the means of distribution 20 (thus providing the supply of refrigerating power), also performs the function of ensuring a stable but removable fixing of the container elements in the respective installation places. In this case, the mechanical stresses acting on the container elements are transferred to the supporting structure, i.e. to the means of distribution 20, through the connection means and the connection elements 29A-29L, without using any specific mechanical connections for engaging the container elements. By way of example and not by way of limitation, each of the connection elements 29A-29L may be a plug-in connector to be coupled to the connection means of the container elements, which are suitably shaped to obtain a stable but removable connection between the container elements and the means of distribution 20. The coupling between the connection means of a container element and any one of the connection elements 29A-29L puts the means of distribution 20 in communication with the interior of the container element by generating, due to said coupling, a flow section which allows the cooled air flow to be supplied into the internal compartment of the container element.

[0027] Means for mixing cooled air with environmental

air may be associated with at least one of the branches 28A-28L. Said mixing means may be activated, either manually or preferably automatically, when a container element adapted to preserve foodstuffs at a relatively high temperature is connected to said branch: the activation of the mixing means is adapted to let air at room temperature enter said branch and to allow it to be mixed with cooled air.

[0028] Before being conveyed into the container elements, the cooled air may be treated through a centralized hygiene care system, comprising in particular an ionizer and/or an activated carbon filter and/or a bactericidal or photocatalytic coating and/or an ultraviolet-ray light source. Such a hygiene care system may be housed in the functional unit 10 and/or in the means of distribution 20 and has the function of extending the foodstuffs preservation ability of the apparatus according to the present invention.

[0029] After having carried refrigerating power to the container elements and having warmed up by subtracting heat from the foodstuffs, the cooled air can be conveniently evacuated from the container elements, thus allowing the heat subtracted from the foodstuffs to be dissipated and new cooled air to be supplied into the internal compartments of the container elements. Several solutions may be adopted for this purpose, for example:

- i) at least one of the container elements comprises at least one slot, adapted to let the air contained in the container element to flow out of the apparatus according to the present invention. Said slot, which may be obtained in a wall of the container element, may be located in a position suited to optimize the thermal exchange by forced convection between the cooled air flow and the foodstuffs from which heat is to be subtracted. The slot may be kept constantly open, or else be associated with a device which opens it when the pressure within the container element reaches a predetermined value;
- ii) the apparatus according to the present invention comprises air return means allowing the air to return into the functional unit 10. Said air return means, to which one or more container elements are removably connected, is preferably associated with the means of distribution 20. In particular, the air return means may be provided through one or more dedicated connectors (either associated or not with the connection elements 29A-29L) and through a dedicated channel, said connectors having the function of allowing air to flow out of the container elements and said channel having the function of housing the air flow returning to the functional unit 10. The present solution differs from the preceding one because, notwithstanding a higher complexity of the circuits, it offers the advantage of the functional unit 10 having to cool air being colder than room temperature, instead of air at room temperature, thus providing a considerable energy saving.

[0030] The connection elements 29A-29L may be fitted with flow interception and/or partialization means, preferably comprising sectioning device. The flow interception and/or partialization means may be adapted to shut the flow section through which the cooled air flow reaches the interior of a container element as soon as said container element is removed from its installation place: this avoids any dispersion of refrigerating power caused by leakage of cooled air in the environment from the means of distribution 20, thereby improving the efficiency of the modular apparatus according to the present invention. The flow interception and/or partialization means may advantageously be operated so as to stop the cooled air flow after the means for accessing the internal compartment of the container element have remained open for a long time. The flow interception and/or partialization means may allow to adjust the flow rate of the air supplied to a container element by changing the area of the cooled air flow section: based on the refrigerating power required by the container element, said area may have one of a plurality of values comprised between a maximum value, corresponding to the area of a completely open flow section, and a minimum value, corresponding to the area of a completely closed flow section.

[0031] The refrigerating power can be managed and distributed very easily, if it is carried in the form of cooled air: this is why the apparatus shown in Fig. 1, wherein the refrigerating power is supplied into the container elements indirectly by means of cooled air acting as a secondary fluid, offers the advantage of being extremely flexible and versatile, since the refrigerating power is always managed and distributed properly whatever the volume and typology of the container elements connected to the means of distribution 20 and/or to the functional unit 10. As an alternative to the secondary fluid used for the indirect supply of refrigerating power, one may use the same refrigerating fluid evolving in the heat pump system for subtracting heat from the internal compartments of the container elements. In this case, the compressor and the condenser of the heat pump system are comprised in the functional unit 10, while the evaporator is distributed among the various container elements: each container element comprises at least one heat exchanger, which works as an evaporator, and the refrigerating power is directly carried by the refrigerating fluid, which evaporates in the heat exchangers comprised in the container elements and then condenses in the functional unit 10. In addition to supporting the container elements, the means of distribution 20 are also used for conveying the refrigerating fluid from the functional unit 10 to the various heat exchangers, thus distributing the refrigerating power among the various container elements. The connection elements 29A-29L and the connection means of the container elements ensure continuity of the refrigerating fluid supply path, preventing any leakage of refrigerating fluid between the means of distribution 20 and the container elements, which would be particularly dangerous due to the inflammability of many types of refrigerating fluid. In

the case of a heat pump system with direct refrigerating power supply, the means of distribution 20 are adapted to convey the refrigerating fluid into the container elements, whereas the return of the refrigerating fluid takes place in means for the return of the refrigerating fluid into the functional unit 10. The container elements are removably connected to the refrigerating fluid return means, which are preferably associated with the means of distribution 20.

[0032] The direct refrigerating power supply offers the advantage of providing higher efficiency in comparison with the indirect supply, because there are no efficiency losses due to the thermal exchange between refrigerating fluid and secondary fluid. Said advantage is countered by a reduction in the flexibility and versatility of the modular apparatus, in that the refrigerating power is much more difficult to manage, distribute and optimize. Furthermore, the inflammability of the refrigerating fluid absolutely requires the use of connection elements and connection means so shaped as to ensure a watertight seal of the refrigerating fluid not only when the container elements are connected to the means of distribution, but also when the container elements are removed from the modular apparatus.

[0033] In the following part of the present description it will be assumed that the apparatus according to the present invention generates refrigerating power through a heat pump system and distributes said refrigerating power to the various container elements indirectly, by using air as a secondary fluid. These assumptions must however be considered merely as non-limiting examples, because the inventive concepts contained in the present description and in the annexed claims would still remain unchanged should a fluid other than air be used as a secondary fluid, or should the distribution of refrigerating power among the various containers be carried out directly, or should the refrigerating power be generated through a system being alternative to the heat pump system (e.g. through a Peltier cell system, or magnetothermal refrigeration, or thermoacoustic refrigeration, or any other system known to those skilled in domestic refrigeration).

[0034] In the embodiment of the present invention shown in Fig.1, the electronic control means of the modular type apparatus adapted to store in particular foodstuffs are arranged inside a control unit 24, located in the upper part of the means of distribution 20. They are electrically connected to both the electric supply network and to the various electric loads of the apparatus, which are managed by the electronic control means. In particular, if the container elements comprise electric loads (e.g. light sources adapted to illuminate the internal compartment of the container elements, or sensor means, or user interface means) not supplied by power sources (e.g. batteries) being internal to said container elements, the connection elements 29A-29L and/or the connection means are associated with electric connection means (e.g. contact type electric connectors), which ensure

compliance with the electric safety laws in force, without impairing by no means the removal of the connection between the container elements and the means of distribution 20. If the connection elements 29A-29L comprise flow interception and/or partialization means, said means may be electrically connected to the electronic control means, which control the flow interception and/or partialization means so as to optimize the supply of refrigerating power to each container element.

[0035] User interface means are also electrically connected to the electronic control means, said user interface means being, in the embodiment of the present invention of Fig.1, located by way of non-limiting example in the control unit 24 and schematized in the form of an array of LEDs 21A-21C, to notify the user when certain electric loads (e.g. the compressor, if the refrigerating power is generated in the functional unit 10 of the modular apparatus through a heat pump system) are active or inactive and/or if some parameters relating to the operating status of the apparatus (e.g. temperature or pressure within a container element) are below first predetermined values and/or above second predetermined values.

[0036] In the apparatus adapted to store in particular foodstuffs according to the present invention, an embodiment of which is shown in Fig.1, different accessory devices may be integrated which may be associated with the functional unit 10 and/or to the means of distribution 20, for offering specific functionalities to the user of the modular apparatus. By way of example, it may be assumed that the apparatus according to the present invention comprises at least one or more of the following devices:

- i) a refrigerated tank adapted to contain drinks, preferably located inside the functional unit 10 and connected to a dispensing device, in particular a tap or an ice cube dispenser. In the particular case wherein the refrigerated tank contains water, said tank may be connected to the household water supply network, so that the apparatus according to the present invention can, through said dispensing device, provide the user with cold water or ice cubes;
- ii) a vacuum generating device, located inside the functional unit 10, in particular adapted to keep at least one container element (whose internal compartment may be refrigerated or not) at a pressure being lower than atmospheric pressure, in order to safeguard the freshness of the foodstuffs contained in said container element. In order to connect the vacuum generating device to the container element, so that a vacuum can be created therein, the apparatus according to the present invention comprises a pneumatic connection system, preferably associated with the means of distribution 20. The container element wherein a vacuum is created is fitted with access means capable of ensuring airtight sealing and is connected to the pneumatic connection sys-

tem through a connector so shaped as to ensure both removability and tightness of the container element;

iii) a end fitting, adapted to convey refrigerating power into a container element being external to the modular apparatus, housed in the functional unit 10 and/or in the means of distribution 20. Said end may be used by the user as a "cold dispenser" because it allows to supply refrigerating power, in particular in the form of cooled air, for example, to a container element adapted to preserve foodstuffs;

iv) a second end, connected to the vacuum generating device and adapted to generate a vacuum in a container element being external to the apparatus according to the present invention. Said end may be housed in the functional unit 10 and/or in the means of distribution 20 and may be used by the user as a "vacuum dispenser" because it allows to evacuate air, for example, from within a container or a pack adapted to preserve foodstuffs in a vacuum;

v) an air treatment unit, adapted to treat the air of the environment wherein the apparatus according to the present invention is located, preferably comprising a fan and, more preferably, also a conditioner and/or dehumidifier. The air treatment unit may advantageously be positioned above the container elements and, if it comprises a conditioner and/or dehumidifier, it may be fitted with its own system for generating refrigerating power, or else it may use the system adapted to generate refrigerating power (e.g. the heat pump system) included in the functional unit 10;

vi) a centralized lighting system, adapted to illuminate a considerable volume of the apparatus according to the present invention. In the embodiment shown by way of non-limiting example in Fig.1, such a centralized lighting system may advantageously be located in the lower part of the control unit 24, so that the container elements are enveloped by the light beam generated by said centralized lighting system. The centralized lighting system is electrically connected to the electronic control means, which can turn it on/off and modulate its power (e.g. based on the brightness of the environment wherein the modular type apparatus is located, detected through suitable sensor means): in particular, the electronic control means can control the activation of the centralized lighting system according to the method described in the Italian patent application TO2005A000148. Said centralized lighting system may also be used as an alarm device, e.g. when designed to flash in order to draw the user's attention if a condition requiring a user's action should arise;

vii) a device adapted to defrost and/or cook foodstuffs. Such a device may be integrated into the functional unit 10 or into the means of distribution 20 and may be, for example, an electric element cooking oven or a microwave cooking oven.

[0037] Fig.2 shows the same components already illustrated in Fig.1. The shape and reciprocal arrangement of these components are based on a particular embodiment, which represents a second example of the possible embodiments of the apparatus according to the present invention. In particular, the embodiment in Fig.2 differs from the embodiment in Fig.1 for the shape of the means of distribution 20. Also in this embodiment, the means of distribution 20 may be provided through association of tubular cross-section elements, which at the same time are characterized by allowing gaseous flows to pass through, in particular the flow of cooled air generated in the functional unit 10, which then reaches the internal compartments of the container elements, and by acting as a stable supporting structure for the container elements. In Fig.2, the means of distribution 20 are so shaped as to comprise an upright element 27, extending vertically from the functional unit 10; in addition, there may be a pair of side branches 28A-28B and/or one central branch 28C, which extend from the upright element 27 toward the sides and toward the front, respectively.

[0038] To said branches, one or more connector elements may be applied which are so shaped that they can be coupled to the connection means of the container elements (in particular, in Fig.2 the connector elements 29A-29B are applied to the side branches 28A-28B, and the connector elements 29O-29P are applied to the central branch 28C); furthermore, one or more connector elements may be applied directly to the upright element 27 (in particular, in Fig.2, the connector elements 29Q-29S are applied to the upright element 27).

[0039] In the embodiment of the present invention shown in Fig.2, the electronic control means and the user interface means of the modular type apparatus are arranged inside the central branch 28C. In particular, the user interface means may comprise a first zone 22 for activating, e.g. through a touch control device, particular functionalities offered by the apparatus according to the present invention, and a second zone 23 for displaying the extension of the activation zone of said functionalities.

[0040] One or more container elements (some of which are shown by way of non-limiting example in Figs.3-7) may be associated with the modular type apparatus according to the present invention, each of which is adapted to keep foodstuffs in a certain preservation state and preferably comprises at least one refrigerating internal compartment and means for accessing the internal compartment: at least one of the container elements comprises connection means adapted to allow refrigerating power to be supplied by the means of distribution 20 into the container elements, preferably into the internal compartment of the container elements, and capable of ensuring the removal of the connection between the container elements and the means of distribution 20, so that the container elements can be easily removed by the user from the respective installation places. The container elements may therefore be of any type and have any shape and volume, provided that the container elements can

be used for preserving foodstuffs and that at least one of them comprises connection means for establishing a connection to the means of distribution 20 which ensure stability and removal of the connection between the container element and the means of distribution 20, thereby allowing the container element to be easily removed from its installation place.

[0041] The modularity of the apparatus according to the present invention allows the user to associate a plurality of container elements, each having a particular internal operating temperature and a particular internal operating pressure (not necessarily all different from one another) with the functional unit 10 and with the means of distribution 20. As a result of said association, the apparatus according to the present invention may comprise at least one container element adapted to deep-freeze foodstuffs, preferably by maintaining an internal temperature between -25°C and -18°C , and/or at least one container element adapted to freeze foodstuffs, preferably by maintaining an internal temperature between -18°C and -5°C , and/or at least one container element adapted to refrigerate foodstuffs, preferably by maintaining an internal temperature between 0°C and $+5^{\circ}\text{C}$.

[0042] With each removable container element, connection means are associated which are adapted to connect the container element to the connection elements 29A-29L of the means of distribution 20: the connection means and the connection elements 29A-29L are such that the cooled air flow section from the means of distribution 20 to the container element is shut automatically as soon as the container element is removed, and preferably such that they remain unseen when the container element is connected to the means of distribution 20. If the modular type apparatus comprises means allowing the air to return into the functional unit 10, a two-way connector may conveniently be associated with a container element as connection means, which connector provides two distinct sections for the air flow: one for the supply of cooled air into the container element, and one for the return of the air from the container element. Both ways are fitted with an automatic shut-off system, so that any flow is prevented through the connector when the container element has been removed from the means of distribution 20. If the modular type apparatus also comprises a vacuum generating device and a pneumatic connection system, the container element may advantageously comprise, as connection means, a three-way connector, the three ways being dedicated to the cooled air flow to the container element, the return air flow to the functional unit 10 and the connection between the container element and the pneumatic connection system, respectively.

[0043] According to an embodiment of the present invention, shown by way of example and not by way of limitation, the container element may be a container comprising at least one internal compartment, adapted to contain the foodstuffs to be preserved and obtained by moulding or thermoforming a plastic material. Access to

the internal compartment of the container may be provided by a door which may be opened by turning it by means of an opening system with one or more hinges, or else by sliding it frontally by means of a drawer type opening system. Each container element may conveniently be fitted with thermal insulation means, preferably applied to at least one of the walls of the container element. In particular, said thermal insulation means may comprise at least one layer of a material having a high thermal insulation capacity (e.g. foam type rigid polyurethane), or at least one layer of air kept at a significantly lower pressure than atmospheric pressure, e.g. through the above-mentioned vacuum generating device. The thermal insulation means, besides performing their traditional function in household refrigeration apparatus (i.e. limiting heat re-entries and, consequently, reducing the electric energy consumption of said apparatus), in the present invention also perform the function of keeping the foodstuffs contained in a container element properly preserved for a certain time period starting from the moment when the container element is disconnected from the means of distribution 20 and is therefore no longer supplied with refrigerating power. The type and/or thickness of the materials used for manufacturing the container element and the thermal insulation means may be suitably chosen and/or sized depending on the operating temperature and/or pressure of the container element.

[0044] A considerable thermal insulation of the container element may be obtained by designing said container element like a Dewar vessel, i.e. with an external hollow space wherein a vacuum is created, thus minimizing the thermal exchange with the outer environment by conduction and by convection, and with a reflecting internal wall, thus also minimizing the thermal exchange with the outer environment by irradiation.

[0045] In order to improve its ability to perform its function correctly even after having been disconnected from the means of distribution 20, the container element may comprise internally:

- i) at least one element made of a phase change material, which can keep the container element refrigerated for a longer time, in particular through the eutectic stasis which can be obtained at the phase change temperature from the solid state to the liquid state (said element may be provided by using any material typically employed for manufacturing the so-called "cold blocks") and/or
- ii) at least an auxiliary functional unit, adapted to generate refrigerating power inside the container element and supplied through a dedicated power source (e.g. a battery). If the power source is rechargeable and if the electric connection means are associated with the connection means of the container element, said power source may advantageously be recharged when the container element is connected to the means of distribution 20. The auxiliary functional unit may use various systems for

generating the refrigerating power required to keep the foodstuffs properly preserved when the container element has been removed from its installation place. The generation of refrigerating power inside the container element may take place, for example, through a heat pump system, or through a Peltier cell system, or through a magnetothermal refrigeration system, or through a thermoacoustic refrigeration system. In particular, the Peltier cell, i.e. a thin plate formed by two semiconductor materials with one heat absorbing surface and one heat emitting surface, is especially suited to generating refrigerating power inside the container element: in fact, it is particularly fit for refrigerating small internal compartment and only requires cheap, small and easy-to-manage components (the efficiency of the Peltier cell can be increased by insulating it with a ceramic material).

[0046] The ability of preserving foodstuffs in the internal compartment of a container element may be extended by associating the container element with devices capable of acting as active or passive hygiene care means, since they reduce considerably or eliminate entirely those organic agents (bacteria, fungi, etc.) which may deteriorate foodstuffs. These devices may in particular comprise at least one activated carbon filter and/or at least one ionizer and/or at least one bactericidal or photocatalytic coating and/or at least one ultraviolet ray light source (by way of example and not by way of limitation, one or more of the container elements may comprise the "self-cleaning" system described in the Italian utility model application TO2005U000180). A container element may also be associated with defrosting means, in particular electric elements, which are adapted to prevent frost from accumulating on particular components of the container element (e.g. on the internal walls of the compartment of the container element or on the heat exchanger, which works as an evaporator, when the refrigerating power is carried directly by the refrigerating fluid from the functional unit 10 to the container element): in this case, the container element is a specialized foodstuffs preservation module of the so-called "no-frost" type.

[0047] If the apparatus according to the present invention comprises electronic control means adapted to control the operation of the functional unit 10 and of other electric loads comprised in the apparatus and/or to regulate the refrigerating power supplied to the container elements (in particular by acting on the flow interception or partialization means), the container elements may advantageously be provided with devices which allow the electronic control means to perform control actions on the apparatus, in particular on the flow interception or partialization means, on the basis of information and/or parameters received from said devices. In particular, a container element may be provided with memory means, preferably a non-volatile memory, storing at least one piece of information relating to the container element,

and/or with sensor means, adapted to detect at least one parameter relating to the container element.

[0048] The memory means may store information identifying the container element and synthesizing its optimum operating method. Said information, which can be used by the electronic control means in order to effectively manage the resources (in particular the refrigerating power) of the apparatus, may be, by way of example and not by way of limitation, the volume and/or the operating temperature of the container element and/or the presence of any auxiliary functional unit and/or of any electric load, such as a light source, in the container element. Said information may be stored in the above-mentioned memory means in extended form or as a code which univocally identifies, for example, the type of container element and which can be decoded and interpreted by the electronic control means.

[0049] The container element may also be associated with sensor means which can detect the value of one or more parameters being representative of the status of the container element at a certain time instant. By way of example and not by way of limitation, said sensor means may include:

- i) at least one temperature probe, adapted to detect the internal temperature of the container element. The temperature probe may be any sensor known at present by those skilled in the domestic refrigeration art, e.g. an NTC type sensor;
- ii) at least one moisture probe, adapted to detect the relative and/or absolute moisture inside the container element. In fact, moisture is an important parameter for the preservation of some foodstuffs; especially fruit and vegetables;
- iii) a pressure probe, adapted to detect the relative and/or absolute pressure inside the container element. Said pressure probe is preferably associated with the container element, if it is a hermetic container element connected to the vacuum generating device, or if it is supplied with refrigerating power through supply of cooled air and comprises, for discharging the air outside the container element, at least one selective opening slot;
- iv) means for detecting the type of foodstuffs, housed in the container element. According to the present invention, detection means of any typology and technology may be used. By way of example and not by way of limitation, the detection means may be of the optical type (which allow to identify the type of foodstuffs from an image of said foodstuffs) or of the chemical type (which allow to identify the type of foodstuffs from the substances or aromas naturally released by the foodstuffs). Advantageously, the type of foodstuffs may be detected by using a device capable of reading transponder devices associated with the foodstuffs: by so doing, in fact, other useful information may also be obtained in addition to the type of foodstuffs, in particular the expiry date;

v) means for detecting the opening status of the access means of the container element, based on which it is possible, for example, to control the activation of any lighting system being present inside the container element.

[0050] As an alternative to or in combination with the sensor means located inside the container element, other sensor means being representative of the status of the container element at a certain time instant may be arranged on the means of distribution 20 (where they can be more easily connected to the electronic control means), preferably on the connection elements 29A-29L. By way of example, these sensor means may include:

- i) means for detecting whether the connection means of a container element are connected to the connection elements 29A-29L or not. In particular, depending on the detection of said means it is possible to enable or disable the flow of cooled air (or of refrigerating fluid) through the connection elements 29A-29L;
- ii) at least one temperature probe, the detection thereof is used by the electronic control means to indirectly calculate the temperature in any container element being present near said sensor.

[0051] The memory means and/or the sensor means of the container elements are adapted to transmit parameters and/or information to the electronic control means, which, after having received said parameters and/or information, can make use thereof in order to exert at least one control action on the apparatus according to the present invention. An electric cable may be used for transmitting the parameters and/or information from the memory means and/or from the sensor means to the electronic control means, and in particular a contact type electric connector (which by no means limits the removal of the connection between the container element and the means of distribution 20) may be used for transferring said parameters and/or information from the container element to the means of distribution 20. The memory means of the container element may conveniently be located on board of the container element, preferably adjacent to the connection means: such a position is both economically advantageous, in that it does not require the use of dedicated wirings inside the container element, and very efficient, in that the electronic control means can automatically identify the container element as soon as it is connected to the means of distribution 20.

[0052] As an alternative, the transmission of parameters and/or information from the memory means and/or from the sensor means to the electronic control means may take place via radiofrequency, through any communication technology such as BlueTooth, Z-Wave, ZigBee (in accordance with the IEEE 802.15.4 standard), Wi-Fi (in accordance with the IEEE 802.11b and/or later standards), or through any other technology known to techni-

cians working in the radiofrequency communication field. According to a particular case of the above-mentioned radiofrequency transmission, the sensor means employed in the container elements use the RFID technology and are similar to those described in patent application EP1479988, i.e. they comprise at least one transponder device capable of communicating with the electronic control means of the apparatus according to the present invention: said sensor means with transponder device offer the advantage of having no wiring and of requiring no electric power supply, so that they can be easily arranged in any position inside the container element and allow, for example, to carry out precise temperature measurements. Both the transponder devices associated with the foodstuffs and the transponder devices associated with, for example, the sensor means and/or the memory means may be activated through an electronic device, comprised in the functional unit 10 and/or in the means of distribution 20 and/or in at least one container element and associated with the electronic control means, to which it can transmit parameters and/or information after having received them from the transponder devices (as an alternative, the transponder devices may be supplied and/or activated through a dedicated battery, preferably located in a container element).

[0053] Based on the information stored in the memory means and on the parameters detected by the sensor means, the electronic control means can control the actuators of the apparatus according to the present invention: for example, they are adapted to enable the supply of refrigerating power to a container element as soon as its disconnection from the means of distribution 20 is detected, or they are adapted to partialize said refrigerating power depending on the temperature detected by suitable sensor means arranged inside a container element. According to an embodiment of the present invention, at least a portion of the user interface means (which are associated with the electronic control means and which allow the user to select at least one operating parameter relating to the apparatus according to the present invention and/or which may provide the user with at least one operating parameter relating to the apparatus according to the present invention) may be housed in a container element. By way of example, it is conceivable that the container element comprises a display device providing the user with information relating to the container element, such as internal temperature, a list of the foodstuffs contained in the container element, preferably sorted according to their expiry date, any available accessory functionalities (vacuum preservation of foodstuffs, hygiene care system, etc.) together with the on/off status of said functionalities. The display device may also act as a selector device if, for example, it allows to change the internal temperature or the status of the accessory functionalities.

[0054] Container elements of different types may be associated with the apparatus according to the present invention, each being specialized for providing a partic-

ular foodstuffs preservation method. Each container element represents a module which, once connected to the means of distribution 20, is supported stably in its installation place and can be supplied with refrigerating power generated by the functional unit 10, e.g. through supply of cooled air, and which, once disconnected from the means of distribution 20, can be easily carried away and used in a place other than the installation place.

[0055] Below is a list, presented by way of example and not by way of limitation, of some possible container elements which may be comprised in the apparatus according to the present invention:

- i) a container adapted to preserve frozen or deep-frozen foodstuffs, preferably having an operating temperature of about -18°C . Such a container may be conceived as a module fixedly connected to the means of distribution 20 and/or to the functional unit 10 and having a high capacity, or else as a smaller, removable module which the user may use to carry home frozen foodstuffs from the supermarket without the frozen foodstuffs undergoing any change in temperature;
- ii) a container adapted to preserve ice-cream, preferably having an operating temperature of about -13°C . Such a container is a removable module which allows to carry ice-cream by keeping its temperature unchanged for at least 6 hours;
- iii) a container adapted to preserve drinks, e.g. cans of soft drinks or bottles of wine, preferably having an operating temperature of about 10°C . Such a container, which may be fitted with a drawer type opening system, allows to store drinks and, if it is a removable module, also allows to carry drinks by keeping them cold for a long time;
- iv) a container fit for snacks, adapted to contain, for example, fruit-juice, yogurt e sandwiches, preferably having an operating temperature of about 8°C and a thermal inertia of about 8 hours. Such a container can be removed from the apparatus according to the present invention and comfortably carried to school or to the workplace;
- v) a container fit for picnics, adapted to contain, for example, rice salads, sliced cold meats and soft drinks, preferably having an operating temperature between 4°C and 8°C and a thermal inertia of about 8 hours. Such a container can be easily removed from the apparatus according to the invention and used to carry its contents during a picnic;
- vi) a container adapted to preserve fruit and vegetables, preferably having a temperature of about 8°C . Such a container can be removed, for example, to serve fruit directly at table;
- vii) a vacuum container, preferably having an operating temperature of about 8°C and an operating pressure not exceeding 0.05 MPa. Such a container, thanks to the vacuum preservation system (which preferably employs the vacuum generating device

located inside the functional unit 10), can safeguard the freshness of the foodstuffs contained therein;

viii) a variable temperature container, capable of preserving meat, fish and dairy products at the proper temperature. The temperature may be set manually by the user or else adjusted automatically, when the variable temperature container is associated with a foodstuffs recognition system. It is conceivable that said container offers the user a choice among several temperature levels: for example, it may be kept at three different temperature levels (corresponding to 4°C , 8°C and 12°C , respectively) by the refrigerating power supplied thereto;

ix) a container adapted to preserve cosmetics and medicines, the internal temperature thereof (about 12°C) being adapted to preserve the integrity and to avoid any deterioration of some cosmetic and pharmaceutical products.

[0056] Figs.3-7 show schematically some embodiments, annexed to the present description by way of non-limiting example, of container elements which may be comprised in the apparatus according to the present invention. Each of the container elements shown in the illustrations is a specialized module (i.e. a module adapted to keep foodstuffs in a certain preservation state), which receives refrigerating power by means of its association, through the connection means, with the functional unit 10 or the means of distribution 20. The container elements are preferably provided with the propriety of being easily removed and carried by a user, so that they can also be used at any distance from their installation places, disconnected from the functional unit 10 and from the means of distribution 20. In the modular type apparatus according to the present invention, the container elements may be designed according to different layouts.

[0057] Fig.3 shows a first container element 30 which may be used specifically in the apparatus according to the present invention as a freezer module, because it is adapted to freeze foodstuffs and to preserve frozen foodstuffs. Its operating temperature may be comprised between -24°C and -18° . The container element shown in Fig.3 may be so shaped that its internal compartment comprises a first zone and a second zone, for preserving different types of foodstuffs, which are accessible frontally through a drawer type opening system, comprising first access means 31 and second access means 32, which can be operated by the user through grip means 36. Access to the container element 30 may also be provided through a first flap 38 and a second flap 39, adapted to allow the first zone and the second zone, respectively, to be loaded and unloaded from the top. Advantageously, the container element 30 may also comprise user interface means, e.g. a display device arranged on the first flap 38 and/or on the second flap 39 and adapted to provide the user with information such as internal temperature and type of stored foodstuffs.

[0058] Fig.4 shows a second container element 40

which may be used specifically in the apparatus according to the present invention as a module adapted to preserve fresh foodstuffs, especially fruit and vegetables. Its operating temperature is preferably comprised between 2°C and 8°C. Access to the internal compartment is provided through an opening system comprising a vertically hinged door 48, housing means 49, e.g. a metal wire basket, being associated with the inner wall thereof and being adapted to contain the foodstuffs to be preserved inside the compartment of the container element 40.

[0059] Fig.5 shows a third container element 50 which may be used specifically in the apparatus according to the present invention as a module adapted to preserve fresh foodstuffs, especially meat, fish and dairy products. Its operating temperature is preferably comprised between 2°C and 8°C. The internal compartment of the container element 50 may be used entirely for housing foodstuffs: said internal compartment is accessible to the user through an opening system comprising a horizontally hinged door 51.

[0060] Fig.6 shows a fourth container element 60 which may be used specifically in the apparatus according to the present invention as a module adapted to, in particular, preserve bottled or canned drinks. Its operating temperature is preferably comprised between 2°C and 8°C. The access means comprise a vertically hinged door 63. The container element 60 comprises a first basket 64 and a second basket 65 adapted to contain cans and bottles, respectively, which may be fixedly arranged within the compartment (like the first basket 64) or else may rotate together with the door 63 (like the second basket 65).

[0061] Fig.7 shows a fifth container element 70 which may be used specifically in the apparatus according to the present invention as a particularly specialized module to be used after having been removed from its installation place, i.e. disconnected from the apparatus according to the present invention. It has preferably an operating temperature comprised between 2°C and 12°C and a thermal inertia of at least 8 hours, and may be fitted with a vacuum preservation system. The access means comprise a cover 76 which can be lifted to load or unload foodstuffs. The grip means 77, so shaped as to be easily held by the user, make the container element 70 extremely easy to remove from the apparatus according to the present invention and to carry as well.

[0062] The container elements which may be used in the modular type apparatus according to the present invention (some of which are shown by way of non-limiting example in Figs.3-7) are container devices adapted to store in particular foodstuffs and comprise at least one internal compartment adapted to house foodstuffs. One or more of said container devices can be used according to a first operating method, wherein the container device is connected to an external refrigeration power system of distribution, so that refrigerating power can be supplied into the container device, and according to a second op-

erating method, wherein the container device is disconnected from the external system, so that the container device can be removed by the user from its installation place. The container device may comprise:

means for its connection to the external system, being of the detachable type and allowing to perform the switching from the first to the second operating method and from the second to the first operating method; and
thermal insulation means, adapted to keep the foodstuffs housed in the internal compartment of the container element properly preserved for a certain time period starting from the switching from the first to the second operating method.

[0063] In the apparatus according to the present invention, the above-mentioned system being external to the container device, adapted to supply refrigerating power, consists of the means of distribution 20, through which the refrigerating power generated in the functional unit 1 is transferred. As an alternative, the external system adapted to supply refrigerating power may be a domestic refrigerating power network of distribution, i.e. a system connected to a centralized functional unit for distributing the refrigerating power generated by said centralized functional unit to various container devices, preferably of a specialized and/or transportable type, located in different areas of the same kitchen, or in different rooms of the same house, or in different apartments of the same building.

[0064] It is clear from the present description that the present invention makes a remarkable contribution to the achievement of product customization in the field of domestic refrigeration apparatus: as a matter of fact, the apparatus according to the present invention, adapted to store in particular foodstuffs, offers the user the possibility of creating a customized apparatus starting from a series of container elements (i.e. starting from standardized modules), by choosing and assorting said container elements according to his/her preferences and needs. In particular, the present invention allows to arrange the container elements on the means of distribution 20, which act as a supporting structure, according to various layouts differing from one another in the type, number and position of the container elements.

[0065] Fig.8 shows schematically an apparatus 1 according to the present invention, obtained by connecting a plurality of container elements to the components illustrated in Fig. 1, so that the arrangement of the container elements on the means of distribution 20 corresponds to a first possible layout, described herein by way of example and not by way of limitation. In the example of Fig.8, the user 9 of the apparatus 1 has combined the container elements in such a way that the internal temperature of the container elements remains constant or increases as the distance between container element and functional unit 10 increases. Consequently, the container element

30, adapted to freeze foodstuffs and to preserve frozen foodstuffs, is located at the bottom of the apparatus 1 and may be a fixed module. Above the container element 30 there are a container element 40, which is removable and is adapted to preserve fresh foodstuffs, and a container element 60, which is removable and adapted to preserve bottled or canned drinks. Five very specialized removable container elements 70-74 are arranged higher up, including the container element 70, which is particularly specialized for being used after having been removed from its installation place. Two variable temperature container elements 80A-80B are arranged on top, which may be removable modules.

[0066] Fig.9 schematically shows an apparatus 1 according to the present invention, obtained by connecting a plurality of container elements to the components illustrated in Fig.1, so that the arrangement of the container elements on the means of distribution 20 corresponds to a second possible layout, described herein by way of example and not by way of limitation. This layout differs from the preceding one because, in the area immediately above the container element 30, adapted to freeze foodstuffs and to preserve frozen foodstuffs, there are a pair of removable container elements 40A-40B, adapted to preserve fresh foodstuffs, and a container element 50, which is also removable and adapted to preserve fresh foodstuffs, but differs from the container element 40 in capacity and shape. The propriety of one or more of the container elements of the apparatus 1 of being easily removed from the means of distribution 20 is clearly illustrated in Fig.9, wherein the user 9 of the apparatus 1 is carrying away the container element 70 after having removed it from its installation place.

[0067] The present invention clearly overcomes the drawbacks of the above-mentioned prior art because it is an apparatus adapted to store in particular foodstuffs whose modularity not only concerns its volumes, but also other features thereof, among which, for example, the foodstuffs preservation method and volume distribution among the various preservation methods: in fact, the features described herein may all be customized based on the chosen container elements to be associated with the apparatus and based on the chosen layout according to which the container elements are arranged in the apparatus. Furthermore, it should be highlighted that the apparatus according to the present invention can be customized not only at the time of purchase and installation, but also afterwards, when already in use, so that the user can replace any removable container element with another one of a different shape and/or type and can exchange positions of any two or more removable containers.

[0068] The present invention has been described with reference to particular embodiment examples, but it is clear that many changes may be made thereto by those skilled in the art without departing from the protection scope defined by the annexed claims.

Claims

1. Apparatus (1) adapted to store in particular foodstuffs, comprising:

- i) one or more container elements, each of said container elements being adapted to keep foodstuffs in a certain preservation state and comprising at least one refrigerating internal compartment and means for accessing said at least one internal compartment;
- ii) a functional unit (10), adapted to generate refrigerating power; and
- iii) means of distribution (20), adapted to distribute the refrigerating power generated by said functional unit (10),

characterized in that

said means of distribution (20) are adapted to act as a supporting structure for said one or more container elements and that said one or more container elements comprise means for the connection thereof to said means of distribution (20), said connection means being adapted to:

- allow refrigerating power to be supplied into said one or more container elements, preferably into their at least one internal compartment,
- ensure the removal of the connection between said one or more container elements and said means of distribution (20), thus allowing said one or more container elements to be removed by a user,
- ensure a stable but removable fixing of said one or more container elements with said means of distribution (20).

2. Apparatus (1) according to claim 1, **characterized in that** the refrigerating power is generated through a heat pump system that:

- uses a refrigerating fluid,
- is located in said functional unit (10) and
- cools a secondary fluid adapted to carry refrigerating power,

said secondary fluid being air conveyed, through said means of distribution (20), into said one or more container elements.

3. Apparatus (1) according to claim 2, **characterized in that** said air is conveyed into said one or more container elements by means of at least one fan device, said fan device being housed in said functional unit (10) or in said means of distribution (20).
4. Apparatus (1) according to claim 2 or 3, **characterized in that** said air is treated through a preferably

- centralized hygiene care system, in particular comprising an ionizer and/or an activated carbon filter and/or a bactericidal or photocatalytic coating and/or an ultraviolet ray light source, housed in said functional unit (10) and/or in said means of distribution (20).
5. Apparatus (1) according to claim 2 or 3 or 4, **characterized in that** at least one of said one or more container elements comprises at least one slot, adapted to allow the air contained in said at least one of said one or more container elements to flow out. 5 10
 6. Apparatus (1) according to claim 2 or 3 or 4, **characterized by** also comprising air return means allowing the air to return into said functional unit (10), preferably associated with said means of distribution (20), said one or more container elements being removably connected to said air return means. 15 20
 7. Apparatus (1) according to claim 1, **characterized in that** the refrigerating power is generated through a Peltier cell system, or through magnetothermal refrigeration, or through thermoacoustic refrigeration. 25
 8. Apparatus (1) according to claim 1, **characterized in that** at least one of said one or more container elements comprises at least one element made of a phase change material, which can keep said at least one of said container elements refrigerated for a longer time, when the connection between said at least one of said container elements and said means of distribution (20) has been removed, in particular through the eutectic stasis which can be obtained by a change of temperature from the solid state to the liquid state. 30 35
 9. Apparatus (1) according to claim 1, **characterized in that** at least one of said one or more container elements comprises at least one auxiliary functional unit, adapted to generate refrigerating power within said at least one of said container elements, said auxiliary functional unit being supplied through a preferably rechargeable power source, said power source being in particular provided through a connection to the electric power supply network, said connection being in particular established when said at least one of said container elements is connected to said means of distribution (20). 40 45 50
 10. Apparatus (1) according to claim 1, **characterized in that** said functional unit (10) comprises a vacuum generating device, at least one of said one or more container elements being connected to said vacuum generating device through a pneumatic connection system, said pneumatic connection system being preferably associated with said means of distribution (20). 55
 11. Apparatus (1) according to claim 1, **characterized by** comprising electronic control means adapted to control the operation of said functional unit (10) and/or the distribution of refrigerating power to said one or more container elements, said electronic control means being located in said functional unit (10) and/or in said means of distribution (20) and/or in at least one of said one or more container elements and being associated with user interface means, said user interface means being adapted to allow the user (9) of said apparatus (1) to select at least one operating parameter relating to said apparatus (1) and/or to provide the user (9) of said apparatus (1) with at least one operating parameter relating to said apparatus (1).
 12. Apparatus (1) according to claim 11, **characterized in that** at least one of said one or more container elements comprises memory means, in particular a non-volatile memory, at least one piece of information relating to said at least one of said container elements being stored in said memory means, at least one piece of information being measurement of the volume of said at least one of said container elements and/or the operating temperature of said at least one of said container elements and/or the presence of any auxiliary functional unit in said at least one of said container elements and/or the presence of any electric load, preferably a light source, in said at least one of said container elements.
 13. Apparatus (1) according to any of claims 11 or 12, **characterized in that** at least one of said one or more container elements comprises sensor means, adapted to detect at least one operating parameter relating to said at least one of said container elements, said sensor means comprising:
 - at least one temperature probe, adapted to detect the internal temperature of said one or more container elements, and/or
 - at least one moisture probe and/or one pressure probe, adapted to detect the moisture and/or pressure within said one or more container elements, and/or
 - means for detecting the type of the foodstuffs contained in said at least one of said container elements, and/or
 - means for detecting the opening status of the access means of said at least one of said container elements.
 14. Apparatus (1) according to any of claims 11 to 13, **characterized in that** said memory means and/or said sensor means are adapted to transmit via radiofrequency parameters and/or information to said

electronic control means, said electronic control means being adapted to exert at least one control action on said apparatus based on at least one of said parameters and/or information, and **in that** at least one transponder device is associated with said memory means and/or said sensor means and/or said foodstuffs, which is adapted to be activated through an electronic device, said electronic device being comprised in said functional unit (10) and/or in said means of distribution (20) and/or in at least one of said one or more container elements and being preferably associated with said electronic control means.

Patentansprüche

1. Vorrichtung (1), die angepasst ist, insbesondere Lebensmittel aufzubewahren, wobei die Vorrichtung (1) umfasst:

- i) ein oder mehrere Behälterelemente, wobei jedes der Behälterelemente angepasst ist, Lebensmittel in einem bestimmten Konservierungszustand zu halten, und zumindest ein kühlendes internes Fach und Mittel zum Zugreifen auf das zumindest eine interne Fach umfasst;
- ii) eine Funktionseinheit (10), die angepasst ist, Kühlleistung zu erzeugen; und
- iii) Verteilungsmittel (20), die angepasst sind, die durch die Funktionseinheit (10) erzeugte Kühlleistung zu verteilen,

dadurch gekennzeichnet, dass

die Verteilungsmittel (20) angepasst sind, als eine Trägerstruktur für die ein oder mehreren Behälterelemente zu dienen, und dass die ein oder mehreren Behälterelemente Mittel für die Verbindung der Behälterelemente mit den Verteilungsmitteln (20) umfassen, wobei die Verbindungsmittel angepasst sind:

- zu ermöglichen, dass Kühlleistung in den ein oder mehreren Behälterelementen bereitgestellt wird, insbesondere in ihrem zumindest einen internen Fach,
- sicherzustellen, dass die Verbindung zwischen den ein oder mehreren Behälterelementen und den Verteilungsmitteln (20) entfernt werden kann, und es somit zu ermöglichen, dass die ein oder mehreren Behälterelemente durch einen Nutzer entfernt werden,
- eine stabile aber entfernbare Fixierung der ein oder mehreren Behälterelemente mit den Verteilungsmitteln (20) sicherzustellen.

2. Vorrichtung (1) nach Anspruch 1, **dadurch gekennzeichnet, dass** die Kühlleistung durch ein Wärme-

pumpsystem erzeugt wird, das:

- ein Kühlfluid verwendet,
- in der Funktionseinheit (10) angeordnet ist und
- ein sekundäres Fluid kühlt, das angepasst ist, Kühlleistung zu transportieren,

wobei das sekundäre Fluid Luft ist, die durch die Verteilungsmittel (20) in die ein oder mehreren Behälterelemente befördert wird.

3. Vorrichtung (1) nach Anspruch 2, **dadurch gekennzeichnet, dass** die Luft in die ein oder mehreren Behälterelemente mittels zumindest einer Gebläseeinrichtung befördert wird, wobei die Gebläseeinrichtung in der Funktionseinheit (10) oder in den Verteilungsmitteln (20) untergebracht ist.

4. Vorrichtung (1) nach Anspruch 2 oder 3, **dadurch gekennzeichnet, dass** die Luft durch ein vorzugsweise zentrales Hygienebehandlungssystem behandelt wird, das insbesondere einen Ionisator und/oder einen Aktivkohlefilter und/oder eine Bakterien tötende oder photokatalytische Beschichtung und/oder eine Ultraviolettstrahlenlichtquelle umfasst, die in der Funktionseinheit (10) und/oder in den Verteilungsmitteln (20) untergebracht sind.

5. Vorrichtung (1) nach Anspruch 2 oder 3 oder 4, **dadurch gekennzeichnet, dass** zumindest eines der ein oder mehreren Behälterelemente zumindest einen Schlitz umfasst, der angepasst ist, es zu ermöglichen, dass die in dem zumindest einen der ein oder mehreren Behälterelemente enthaltene Luft herausfließen kann.

6. Vorrichtung (1) nach Anspruch 2 oder 3 oder 4, **dadurch gekennzeichnet, dass** die Vorrichtung (1) des Weiteren Luftrückflussmittel umfasst, die es der Luft ermöglichen, in die Funktionseinheit (10) zurückzufließen, wobei die Luftrückflussmittel bevorzugt mit den Verteilungsmitteln (20) verbunden sind, wobei die ein oder mehreren Behälterelemente entferntbar mit den Luftrückflussmitteln verbunden sind.

7. Vorrichtung (1) nach Anspruch 1, **dadurch gekennzeichnet, dass** die Kühlleistung durch ein Peltier-Zell-System oder durch magnetothermische Kühlung oder durch thermoakustische Kühlung erzeugt wird.

8. Vorrichtung (1) nach Anspruch 1, **dadurch gekennzeichnet, dass** zumindest eines der ein oder mehreren Behälterelemente zumindest ein Element umfasst, das aus einem Phasenwechselmaterial hergestellt ist, welches das zumindest eine der Behälterelemente für eine längere Zeit gekühlt halten kann, wenn die Verbindung zwischen dem zumin-

dest einen der Behälterelemente und den Verteilungsmitteln (20) entfernt worden ist, insbesondere durch die eutektische Stauung, die durch eine Temperaturänderung von dem festen Zustand zu dem flüssigen Zustand erhalten werden kann.

9. Vorrichtung (1) nach Anspruch 1, **dadurch gekennzeichnet, dass** zumindest eines der ein oder mehreren Behälterelemente zumindest eine zusätzliche Funktionseinheit umfasst, die angepasst ist, Kühlleistung in dem zumindest einen der Behälterelemente zu erzeugen, wobei die zusätzliche Funktionseinheit durch eine vorzugsweise wiederaufladbare Spannungsquelle versorgt wird, wobei die Spannungsquelle insbesondere durch eine Verbindung zu dem Versorgungsnetzwerk für elektrische Spannung bereitgestellt wird, wobei die Verbindung insbesondere hergestellt wird, wenn das zumindest eine der Behälterelemente mit den Verteilungsmitteln (20) verbunden wird.
10. Vorrichtung (1) nach Anspruch 1, **dadurch gekennzeichnet, dass** die Funktionseinheit (10) eine Vakuumzeugungseinrichtung umfasst, wobei zumindest eines der ein oder mehreren Behälterelemente mit der Vakuumzeugungseinrichtung durch ein pneumatisches Verbindungssystem verbunden ist, wobei das pneumatische Verbindungssystem vorzugsweise mit den Verteilungsmitteln (20) verbunden ist.
11. Vorrichtung (1) nach Anspruch 1, **dadurch gekennzeichnet, dass** die Vorrichtung (1) elektronische Steuermittel umfasst, die angepasst sind, den Betrieb der Funktionseinheit (10) und/oder die Verteilung von Kühlleistung zu den ein oder mehreren Behälterelementen zu steuern, wobei die elektronischen Steuermittel in der Funktionseinheit (10) und/oder in den Verteilungsmitteln (20) und/oder in zumindest einem der ein oder mehreren Behälterelemente angeordnet sind und mit Nutzerschnittstellenmitteln verbunden sind, wobei die Nutzerschnittstellenmittel angepasst sind, es dem Nutzer (9) der Vorrichtung (1) zu ermöglichen, zumindest einen Betriebsparameter, der die Vorrichtung (1) betrifft, auszuwählen, und/oder dem Nutzer (9) der Vorrichtung (1) zumindest einen Betriebsparameter, der die Vorrichtung (1) betrifft, bereitzustellen.
12. Vorrichtung (1) nach Anspruch 11, **dadurch gekennzeichnet, dass** zumindest eines der ein oder mehreren Behälterelemente Speichermittel, insbesondere einen nichtflüchtigen Speicher, umfasst, wobei zumindest eine Information, die das zumindest eine der Behälterelemente betrifft, in den Speichermitteln gespeichert ist, wobei die zumindest eine Information ein Maß des Volumens des zumindest einen der Behälterelemente und/oder die Be-

triebstemperatur des zumindest einen der Behälterelemente und/oder das Vorhandensein irgendeiner zusätzlichen Funktionseinheit in dem zumindest einen der Behälterelemente und/oder das Vorhandensein irgendeiner elektrischen Last, vorzugsweise einer Lichtquelle, in dem zumindest einen der Behälterelemente ist.

13. Vorrichtung (1) nach einem der Ansprüche 11 oder 12, **dadurch gekennzeichnet, dass** zumindest eines der ein oder mehreren Behälterelemente Sensormittel umfasst, die angepasst sind, zumindest einen Betriebsparameter, der das zumindest eine der Behälterelemente betrifft, zu detektieren, wobei die Sensormittel umfassen:

- zumindest einen Temperaturfühler, der angepasst ist, die interne Temperatur der ein oder mehreren Behälterelemente zu detektieren, und/oder
- zumindest einen Feuchtigkeitsfühler und/oder einen Druckfühler, die angepasst sind, die Feuchtigkeit und/oder den Druck in den ein oder mehreren Behälterelementen zu detektieren, und/oder
- Mittel zum Detektieren des Typs der in dem zumindest einen der Behälterelemente enthaltenen Lebensmittel, und/oder
- Mittel zum Detektieren des Öffnungszustandes der Zugriffsmittel des zumindest einen der Behälterelemente.

14. Vorrichtung (1) nach einem der Ansprüche 11 bis 13, **dadurch gekennzeichnet, dass** die Speichermittel und/oder die Sensormittel angepasst sind, über eine Funkfrequenz Parameter und/oder eine Information zu den elektronischen Steuermitteln zu übertragen, wobei die elektronischen Steuermittel angepasst sind, zumindest eine Steueraktion auf die Vorrichtung basierend auf zumindest einem der Parameter und/oder der Information auszuüben, wobei zumindest eine Transpondereinrichtung mit den Speichermitteln und/oder den Sensormitteln und/oder den Lebensmitteln verbunden ist, welche angepasst ist, durch eine elektronische Einrichtung aktiviert zu werden, wobei die elektronische Einrichtung in der Funktionseinheit (10) und/oder in den Verteilungsmitteln (20) und/oder in zumindest einem der ein oder mehreren Behälterelemente enthalten und vorzugsweise mit den elektronischen Steuermitteln verbunden ist.

Revendications

1. Appareil (1) conçu pour stocker des denrées alimentaires particulières, comprenant:

i) un ou plusieurs éléments de conteneur, chacun desdits éléments de conteneur étant conçu pour conserver des denrées alimentaires dans un état de conservation certain et comprenant au moins un compartiment réfrigérant interne et des moyens pour donner accès au dit au moins un compartiment interne ;

ii) une unité fonctionnelle (10) adaptée pour générer une énergie de réfrigération ; et

iii) des moyens de distribution (20) adaptés pour distribuer l'énergie de réfrigération générée par ladite unité fonctionnelle (10),

caractérisé en ce que

lesdits moyens de distribution (20) sont conçus de façon à agir comme une structure de support pour ledit ou lesdits élément(s) de conteneur et **en ce que** ledit ou lesdits éléments de conteneur comprend (comprennent) des moyens destinés à leur connexion aux dits moyens de distribution (20), lesdits moyens de connexion étant adaptés pour:

- permettre à l'énergie de réfrigération d'être fournie dans ledit ou lesdits élément(s) de conteneur, de préférence, dans leur, au moins un, compartiment interne;

- assurer le retrait de la connexion entre ledit ou lesdits élément(s) de conteneur et lesdits moyens de distribution (20), permettant ainsi au dit ou aux dits élément(s) de conteneur d'être retiré(s) par un utilisateur ;

- assurer une fixation amovible, mais stable, dudit ou desdits élément(s) de conteneur avec lesdits moyens de distribution (20).

2. Appareil (1) selon la revendication 1, **caractérisé en ce que** l'énergie de réfrigération est générée à travers un système de pompe à chaleur qui:

- utilise un fluide réfrigérant ;
- est placé dans ladite unité fonctionnelle (10) et
- refroidit un fluide secondaire conçu pour transporter l'énergie de réfrigération,

ledit fluide secondaire étant de l'air acheminé, par l'intermédiaire desdits moyens de distribution (20), dans ledit ou lesdits élément(s) de conteneur.

3. Appareil (1) selon la revendication 2, **caractérisé en ce que** ledit air est acheminé dans ledit ou lesdits élément(s) de conteneur au moyen d'au moins un dispositif de ventilation, ledit dispositif de ventilation étant logé dans ladite unité fonctionnelle (10) ou dans lesdits moyens de distribution (20).

4. Appareil (1) selon la revendication 2 ou 3, **caractérisé en ce que** ledit air est traité par un système de protection de l'hygiène, de préférence centralisé,

comportant en particulier un ioniseur et/ou un filtre au charbon actif et/ou un revêtement bactéricide ou photocatalytique et/ou une source de lumière ultraviolette placée dans ladite unité fonctionnelle (10) et/ou dans lesdits moyens de distribution (20).

5. Appareil (1) selon la revendication 2 ou 3 ou 4, **caractérisé en ce que** au moins l'un dudit ou desdits élément(s) de conteneur comporte (comportent) au moins une fente, conçue pour permettre à l'air contenu dans ledit, au moins un, desdits un ou plusieurs élément(s) de conteneur, de s'écouler.

6. Appareil (1) selon la revendication 2 ou 3 ou 4, **caractérisé par** le fait de comporter également des moyens de renvoi de l'air permettant à l'air de revenir dans l'unité fonctionnelle (10), associés, de préférence, aux dits moyens de distribution (20), ledit ou lesdits élément(s) de conteneur étant connecté(s) de façon amovible, aux dits moyens de renvoi de l'air.

7. Appareil (1) selon la revendication 1, **caractérisé en ce que** l'énergie de réfrigération est générée par un système de pile Peltier, ou par réfrigération magnétothermique, ou par réfrigération thermo-acoustique.

8. Appareil (1) selon la revendication 1, **caractérisé en ce que** au moins l'un dudit ou desdits élément(s) de conteneur comprend au moins un élément constitué d'un matériau à changement de phase, lequel peut maintenir ledit au moins un desdits éléments de conteneur réfrigéré pendant une plus longue durée lorsque la connexion entre ledit au moins un desdits éléments de conteneur et lesdits moyens de distribution (20) a été interrompue, en particulier par l'intermédiaire de l'état eutectique qui peut être obtenu par une variation de température en passant de l'état solide à l'état liquide.

9. Appareil (1) selon la revendication 1, **caractérisé en ce que** au moins l'un dudit ou desdits élément(s) de conteneur comporte au moins une unité fonctionnelle auxiliaire conçue pour générer une énergie de réfrigération à l'intérieur dudit au moins un desdits éléments de conteneur, ladite unité fonctionnelle auxiliaire étant alimentée par une source de courant, de préférence rechargeable, ladite source de courant étant, en particulier, fournie par une connexion au réseau d'alimentation en courant électrique, ladite connexion étant, en particulier, établie lorsque ledit au moins un desdits éléments de conteneur est connecté aux dits moyens de distribution (20).

10. Appareil (1) selon la revendication 1, **caractérisé en ce que** ladite unité fonctionnelle (10) comporte un dispositif générateur de vide, au moins l'un dudit ou desdits élément(s) de conteneur étant connecté au

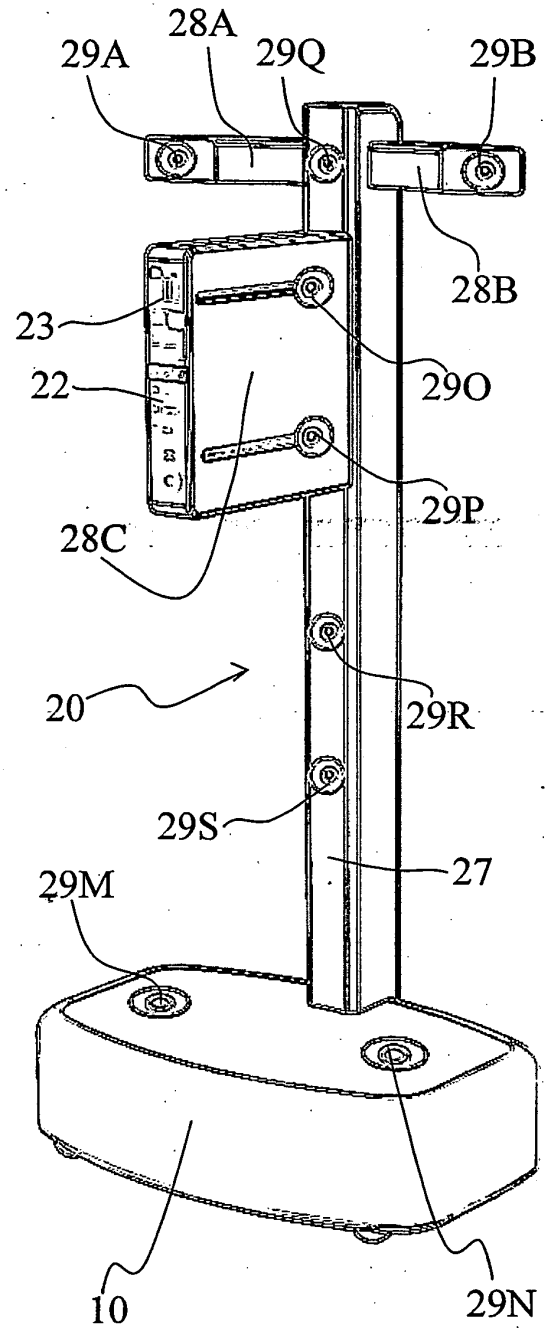
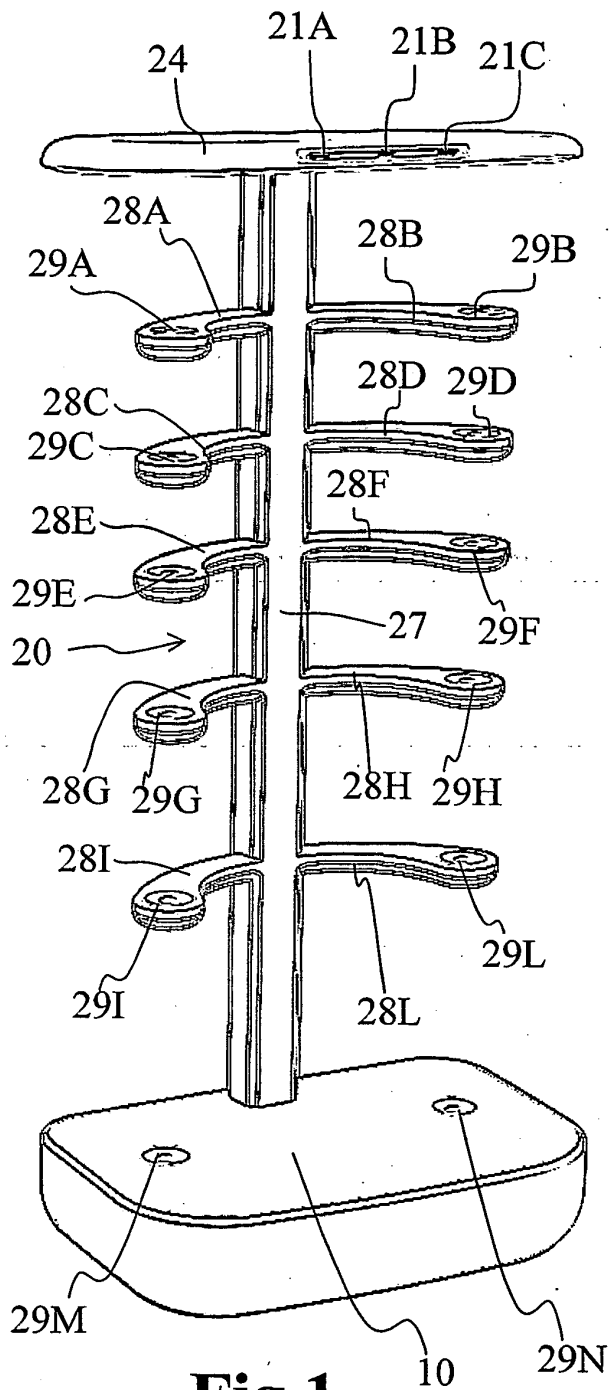
dit dispositif générateur de vide par un système de connexion pneumatique, ledit système de connexion pneumatique étant, de préférence, associé aux dits moyens de distribution (20).

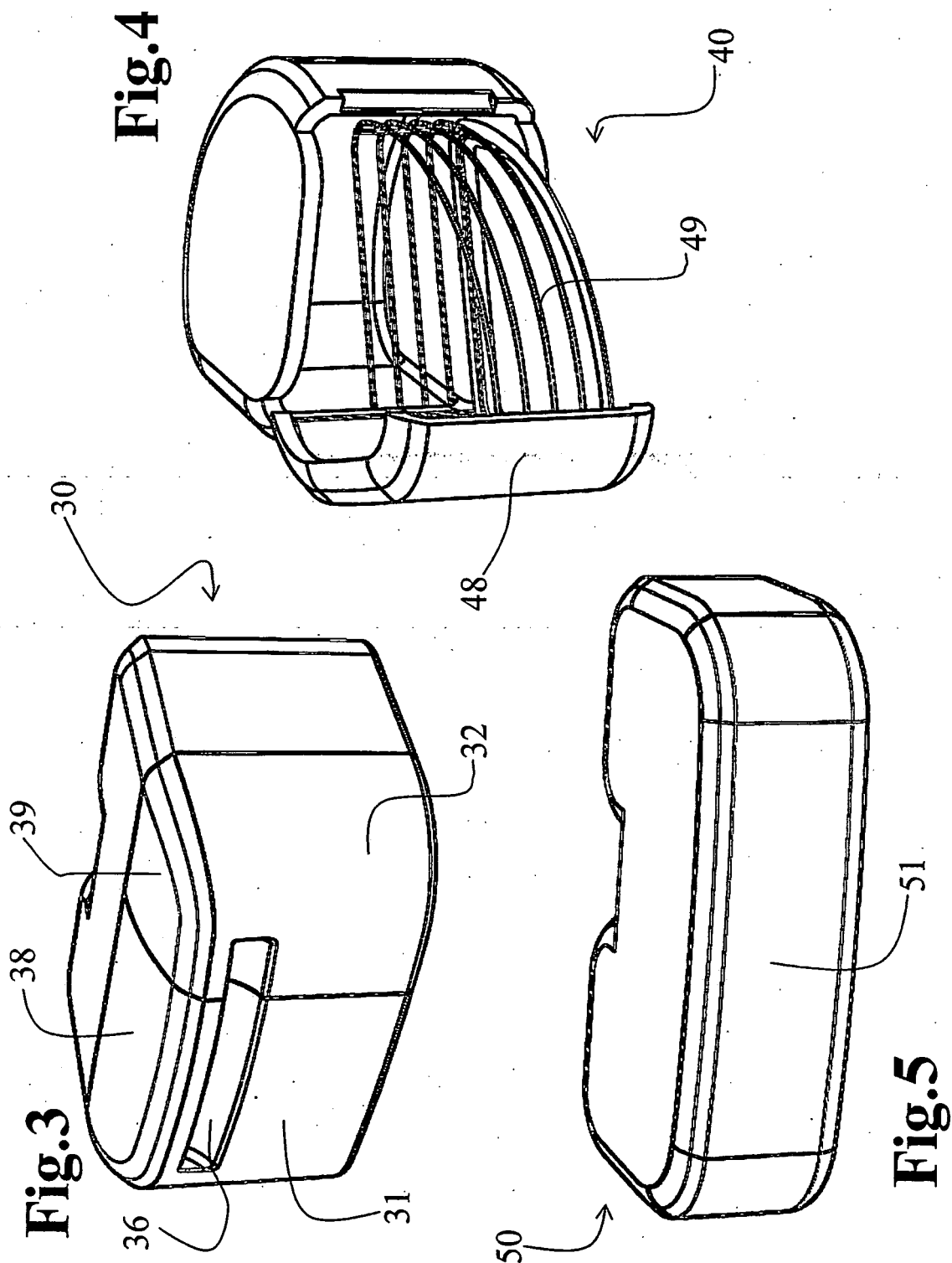
11. Appareil (1) selon la revendication 1, **caractérisé par** le fait de comporter des moyens de commande électroniques adaptés pour commander le fonctionnement de ladite unité fonctionnelle (10) et/ou la distribution de l'énergie de réfrigération au dit ou aux dits élément(s) de conteneur, lesdits moyens de commande électroniques étant logés dans ladite unité fonctionnelle (10) et/ou dans lesdits moyens de distribution (20) et/ou dans au moins l'un dudit ou desdits élément(s) de conteneur et étant associés avec des moyens d'interface utilisateur, lesdits moyens d'interface utilisateur étant conçus pour permettre à l'utilisateur (9) dudit appareil (1) de sélectionner au moins un paramètre de fonctionnement concernant ledit appareil (1) et/ou de fournir à l'utilisateur (9) dudit appareil (1) au moins un paramètre de fonctionnement concernant ledit appareil (1).
12. Appareil (1) selon la revendication 11, **caractérisé en ce que** au moins l'un dudit ou desdits élément(s) de conteneur comprend des moyens de mémoire, en particulier de mémoire non volatile, une partie au moins de l'information se rapportant au dit au moins un desdits éléments de conteneur étant stockée dans lesdits moyens de mémoire, une partie au moins de l'information étant la mesure du volume dudit au moins un desdits éléments de conteneur et/ou la température de fonctionnement dudit au moins un desdits éléments de conteneur et/ou la présence d'une unité fonctionnelle auxiliaire quelconque dans ledit au moins un desdits éléments de conteneur et/ou la présence d'une charge électrique quelconque, de préférence, une source de lumière, dans ledit au moins un desdits éléments de conteneur.
13. Appareil (1) selon l'une quelconque des revendications 11 ou 12, **caractérisé en ce que** au moins l'un dudit ou desdits élément(s) de conteneur comprend des moyens de capteur, conçus pour détecter au moins un paramètre de fonctionnement se rapportant au dit au moins un desdits éléments de conteneur, lesdits moyens de capteur comportant:
- au moins un capteur de température, adapté pour détecter la température interne dudit ou desdits éléments de conteneur, et/ou
 - au moins un capteur d'humidité et ou un capteur de pression, adaptés pour détecter l'humidité et/ou la pression à l'intérieur dudit ou desdits élément(s) de conteneur, et/ou
 - des moyens pour détecter le type de denrées alimentaires contenues dans ledit au moins un

desdits éléments de conteneur, et/ou

- des moyens pour détecter l'état d'ouverture des moyens d'accès dudit au moins un desdits éléments de conteneur.

14. Appareil (1) selon l'une quelconque des revendications 11 à 13, **caractérisé en ce que** lesdits moyens de mémoire et/ou lesdits moyens de capteur sont adaptés pour transmettre, par radiofréquences des paramètres et/ou une information aux dits moyens de commande électroniques, lesdits moyens de commande électroniques étant conçus pour exercer au moins une action de commande sur ledit appareil sur la base d'au moins l'un desdits paramètres et/ou de ladite information, et **en ce que** au moins un dispositif transpondeur est associé aux dits moyens de mémoire et/ou aux dits moyens de capteur et/ou aux dites denrées alimentaires, lequel est conçu pour être activé par un dispositif électronique, ledit dispositif électronique étant logé dans ladite unité fonctionnelle (10) et/ou dans lesdits moyens de distribution (20) et/ou dans au moins l'un dudit ou desdits élément(s) de conteneur et étant, de préférence, associé aux dits moyens de commande électroniques.





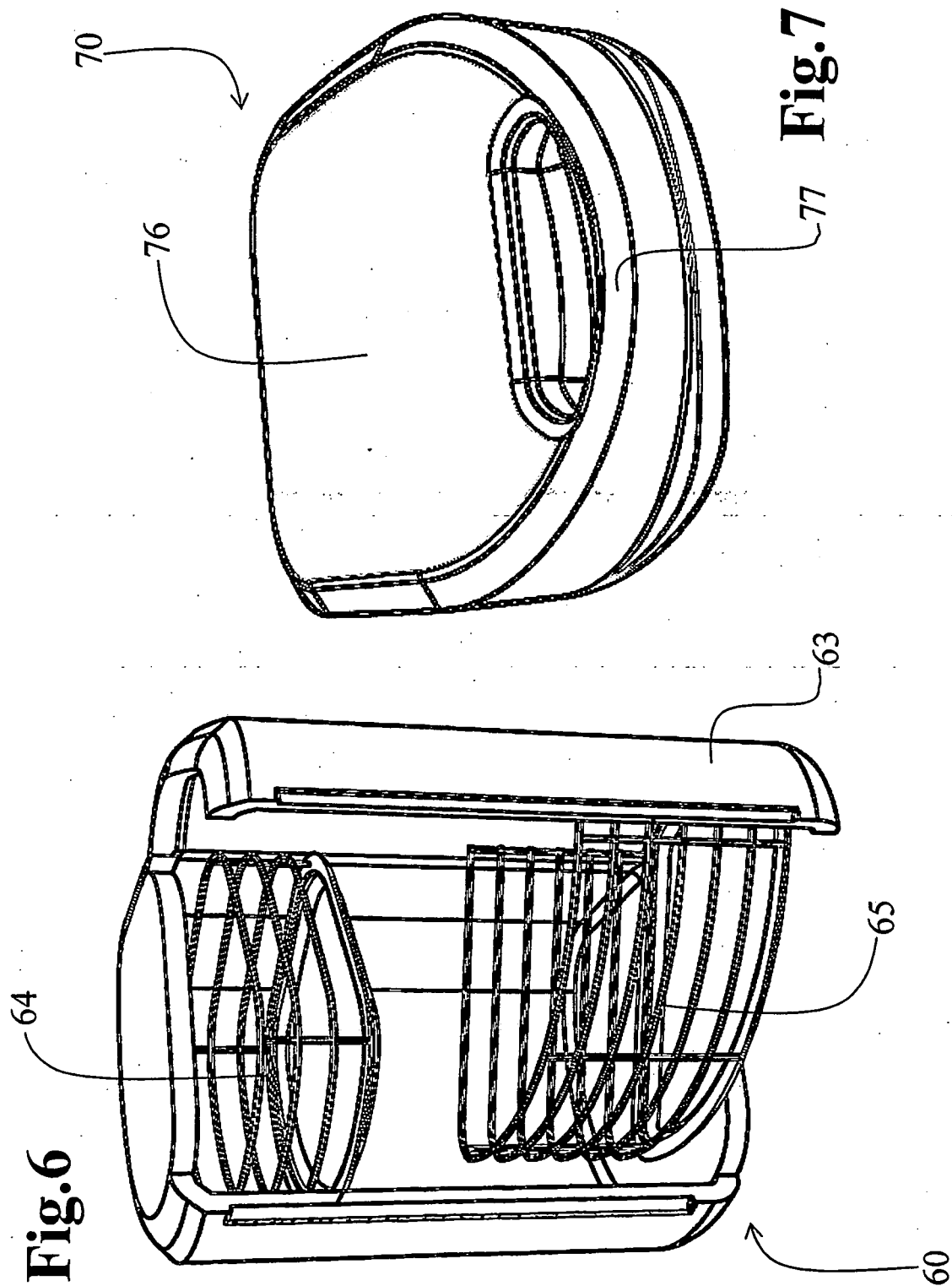


Fig.8

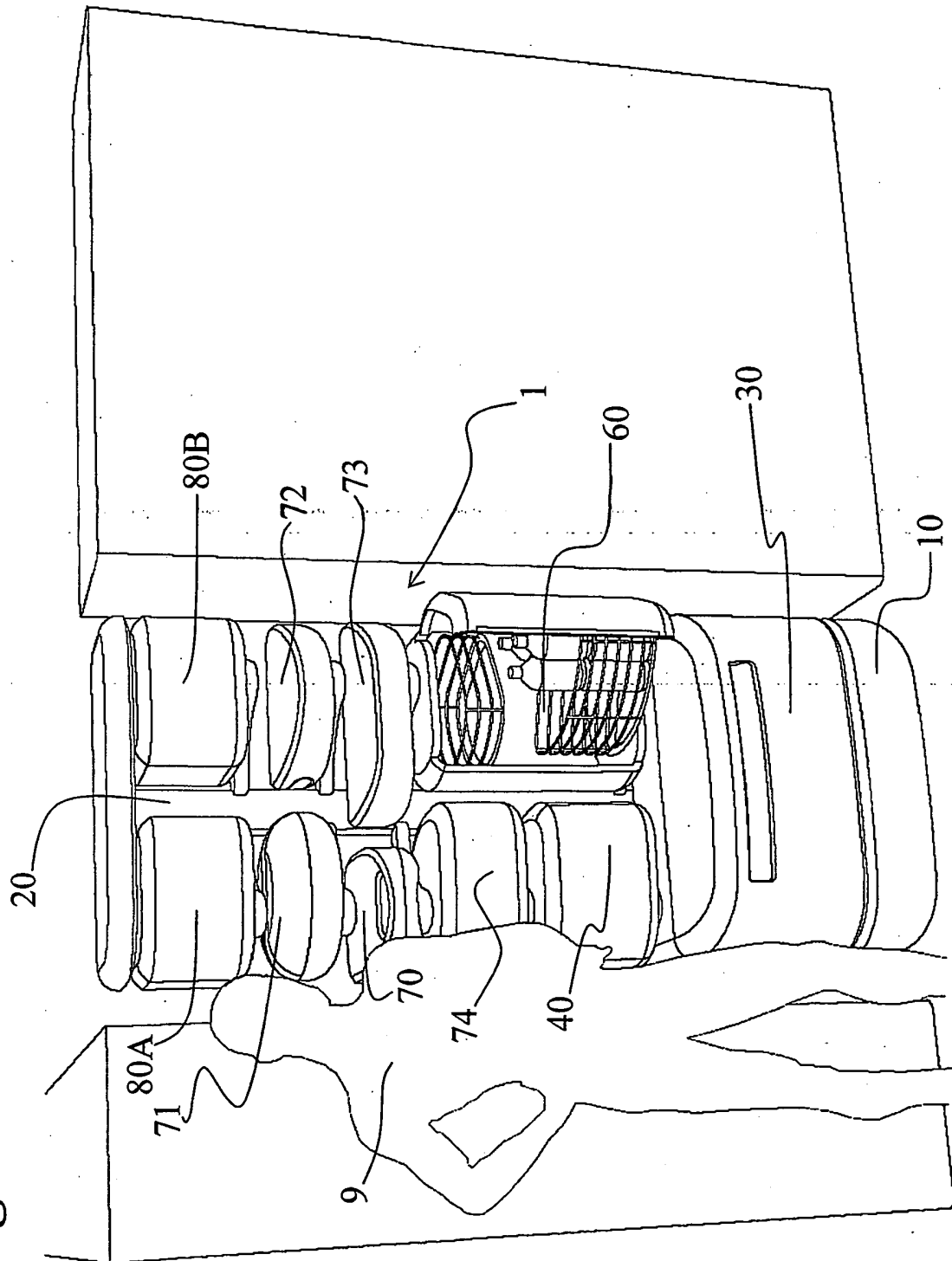
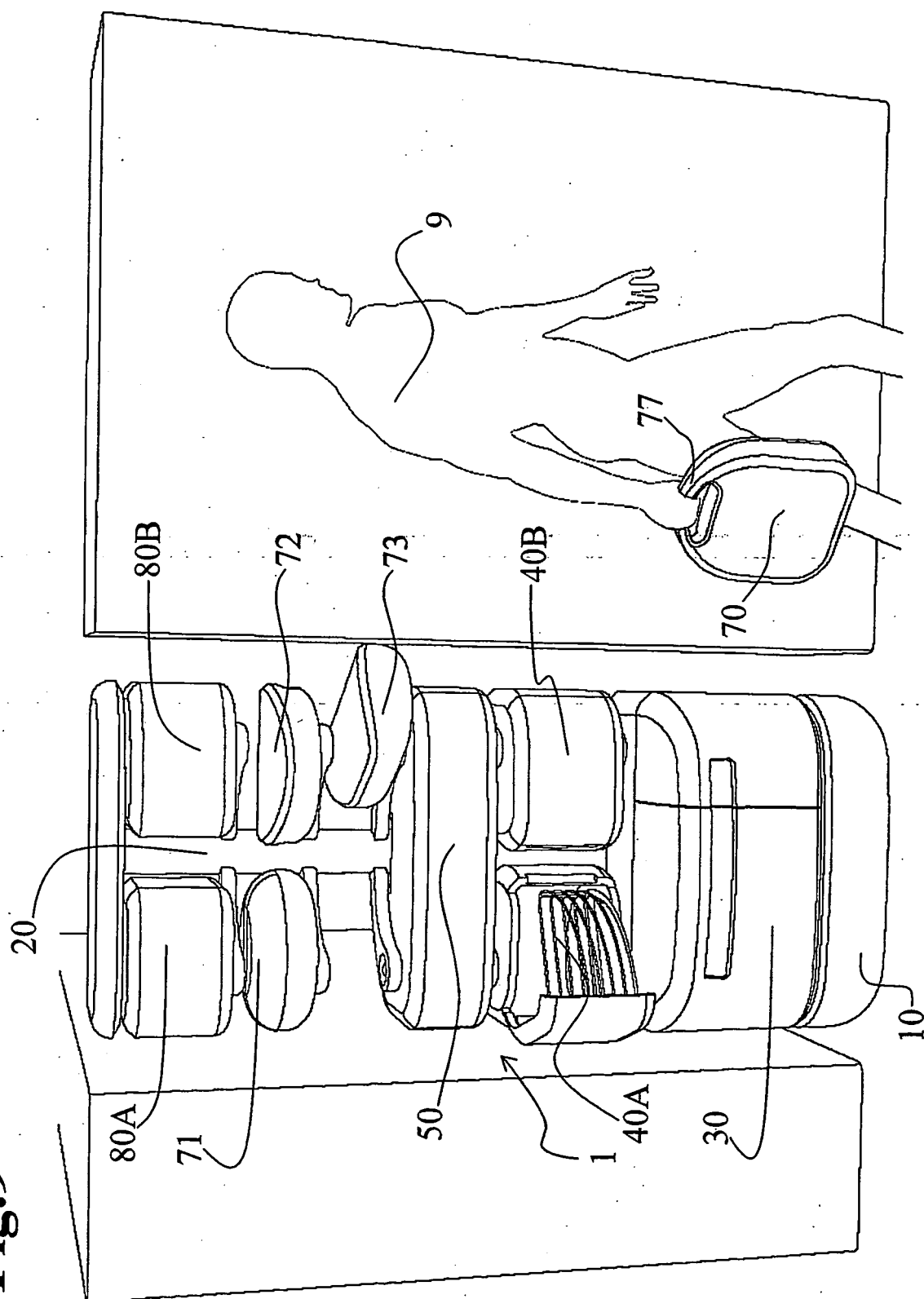


Fig.9



REFERENCES CITED IN THE DESCRIPTION

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