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(54) **Refrigeration appliance with means to indicate the storage life of the stored food items**

(57) A control unit (9) is driven on the basis of data that are indicative of chemical-physical characteristics of the items that are stored for preservation in a refrigerated compartment (4), as well as on the basis of operating parameters that are detected in the same compartment.

The unit (9) periodically combines such data and such parameters so as to correspondingly indicate for each such item, on a display (11), a respective expiry date.

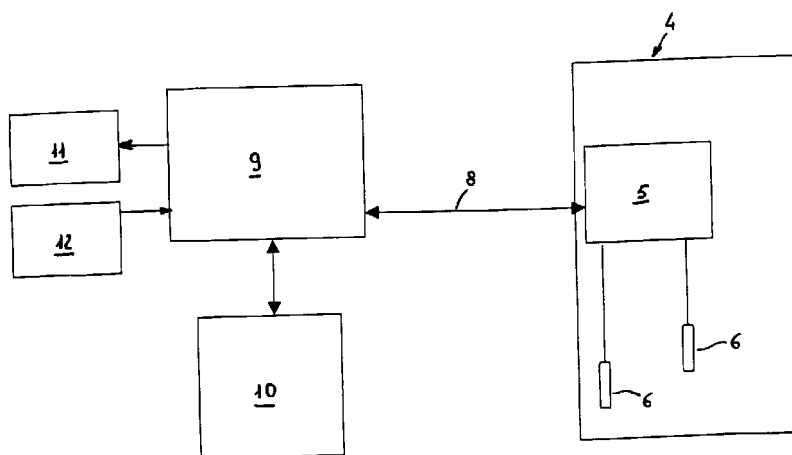


Fig. 2

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Description

[0001] The present invention refers to a refrigeration appliance, in particular a deep freezer, provided with means adapted to indicate the storage life, ie. the useful preservability period, of various items that may be stored therein.

[0002] EP-A-0 189 207 discloses a deep freezer that is provided with selector means adapted to drive a microprocessor with parameters corresponding to the nature or kind of associated items stored therein. Control means detect the time taken to bring the stored items down to their frozen state and drive the microprocessor with a corresponding second parameter. In response to the combination of said parameters, the microprocessor is then able to drive a display unit with a signal that is representative of the storage life, ie. preservability of the frozen items.

[0003] Such a solution enables the user to be automatically informed on the theoretical expiry date of the items stored in the freezer on the basis of the main parameters that actually determine the same expiry with a related decay in the organoleptic, bromatologic, bacteriologic and similar characteristics thereof.

[0004] Such an indication, however, is only based on the characteristics of the items when they are frozen in the refrigeration appliance, but fail to take into account the actual storage conditions under which the same articles are then subsequently kept. As a matter of fact, should sensible variations in some parameters, such as for instance the temperature and/or the humidity, occur during the storage life of the items, eg. food-stuffs, the actual expiry of the same items may undergo substantial alterations and this may of course expose the user to corresponding biological risks that may even be quite serious for his/her health.

[0005] On the other hand, such variations in temperature and/or humidity may be brought about at any moment by any of a number of different events and occurrences, such as for instance a temporary malfunction in the operation of the refrigeration appliance, repeated and/or extended openings of the door thereof, an altered frequency of automatic defrost cycles and the like.

[0006] In order to limit the risks incurred by the user, refrigeration appliances have been proposed which are adapted to detect and indicate any possible excessive and extended, albeit temporary, temperature rise in the compartment in which the items are stored. The indication of the so detected irregular condition persists until the associated control means are reset.

[0007] Such a solution provides a kind of indication that is certainly sure and reliable, but unavoidably generic, so that the user is not in a position to either evaluate the actual extent or nature of the decay suffered by the stored items or, for the matter, discriminate between the items that have actually suffered a deterioration and the ones that can on the contrary be still used

to some extent.

[0008] In fact, a possible variation in storage temperature and/or humidity generally affects the different stored items (eg. meat and vegetables) to a varying extent; furthermore, it can take place as an event of limited intensity and/or duration, such as to somehow alter the preservability of the items, without however fully spoiling it.

[0009] It therefore is a main purpose of the present invention to provide a refrigeration appliance with means for indicating the storage life, ie. the preservability of the therein stored items, which effectively enable the drawbacks of the prior-art solutions to be eliminated.

[0010] In particular, it is a purpose of the present invention to provide a refrigeration appliance of the above cited kind, which is capable of providing an accurate, sure and reliable indication of the storage life, ie. preservability of the therein stored items, in view of enabling the same items to be possibly used selectively in an appropriate manner.

[0011] According to the present invention, these and further aims are reached in a refrigeration appliance provided with means for indicating the storage life of the therein stored items embodying the features as recited in the appended claims.

[0012] The features and advantages of the invention will anyway be more readily understood from the description that is given below by way of non-limiting example with reference to the accompanying drawing, in which:

- Figure 1 is a schematical view of a refrigeration appliance according to the present invention; and
- Figure 2 is a diagrammatical view showing in principle a preferred embodiment of the appliance illustrated in Figure 1.

[0013] With reference to the above cited Figures, the refrigeration appliance can be noticed to be for instance constituted by a deep freezer 3, although it will be appreciated that it may also be constituted by a refrigerator, or even a refrigerator/freezer combination, provided with an access door 7.

[0014] Anyway, the appliance 3 is preferably of the type comprising a (generally known and not shown) refrigerating circuit of the compressor type, adapted to keep at least a compartment 4 intended for the storage of items, such as for instance foodstuffs, at a pre-determined average temperature, eg. -18°C.

[0015] The refrigerating circuit is operated automatically, in a traditional manner, by a control device 5, preferably of a per se known electronic type, which is driven by a plurality of sensors which are indicated generally at 6 in Figure 2 and are adapted to detect, in said storage compartment 4, respective operational parameters or quantities, such as the temperature and/or the humidity of the air, the temperature of the evaporator of the refrig-

erating circuit, the opening of the door 7, and the like.

[0016] The control device 5 communicates via a connection 8 with a control unit 9 which may for instance comprise a Motorola 68HC05B16 or similar microprocessor.

[0017] In turn, the control unit 9 is associated to a non-volatile mass-storage memory 10, such as for instance a magnetic disc or a solid-state memory of the flash or Eeprom type.

[0018] Furthermore, the unit 9 is adapted to drive at least a display device 11, preferably of the graphic type, and to be driven with coded signals from a data input device 12, such as a keyboard or the like.

[0019] In a per se known manner, when one or more items (in particular food items) are placed in the compartment 4, the user can drive the unit 9, via said keyboard or similar means 12, with data that are indicative of the chemical-physical characteristics of the same items, such as for instance the nature (ie. meat, vegetables, etc.) and the quantity (weight and/or volume) thereof.

[0020] In any case, the data so fed into the unit 9 are stored in the associated memory 10 and possibly made visible on the display 11.

[0021] Via the connection 8, the unit 9 is further driven by the control device 5 with the operational parameters detected by the sensors 6. In particular, the microprocessor 9 is so set as to be able to combine the data stored in the memory 10 with the operational parameters entered by the control device 5, such as the temperature and the humidity in the storage compartment 4, the time taken by the refrigeration appliance to bring the items placed in the same compartment down to a frozen state, the number and/or the duration of the openings of the door 7, and the like.

[0022] In a per se known manner, and on the basis of a programme based on theoretical and experimental data that is not a part of the present invention, for each stored item the unit 9 drives the display 11 in such a manner as to indicate the respective expiry date that is expected as a result of the afore mentioned combination of characteristic data and operational parameters.

[0023] The kind of operation that has been described hitherto is substantially known, eg. from the disclosure in the afore cited ER-A-0 189 207.

[0024] According to a feature of the present invention, however, the microprocessor 9 is adapted to carry out the afore cited combination of characteristic data and operational parameters repeatedly throughout the operation of the appliance, ie. preferably periodically, eg. every second, so as to be able to correspondingly update the expiry date expected for each stored item and indicated on the display 11.

[0025] In fact, possible significant temperature and/or humidity variations that may occur in the compartment 4 during the storage of the items to be preserved, as well as possible openings of the door 7, can affect in a substantial manner, albeit to a differing

extent, the expiry date of the same items. For instance, in the case of some items such as meat or the like, an excessive rise in temperature can reduce the period of preservability, or storage life, whereas in the case of other items, such as fruit and vegetables, an increase in humidity may actually bring about an extension of said period.

[0026] Conclusively, it can therefore be stated that the refrigeration appliance according to the present invention enables the correct expiry date, as calculated repeatedly throughout the operation time of the same appliance by taking each time into account all possible significant variations in the operational parameters and, therefore, in the actual storage conditions, to be indicated on the display 11 for each item stored in the compartment 4. This again advantageously enables the user to be reliably informed at any moment on the actual expiry date of all items stored in said compartment 4.

[0027] It will be appreciated that the above described refrigeration appliance may undergo any of a number of possible modifications without departing from the scope of the present invention.

[0028] For example, the unit 9 may be adapted to also drive appropriate alarm indicators adapted to signal the impending (or already occurred) expiry of one or more items.

[0029] Furthermore, the unit 9 and the control device 5 may be implemented in a mutually integrated form, and the keyboard 12 will preferably comprise a key for cancelling the data concerning items that are removed from the compartment 4.

[0030] As an alternative solution, the connection 8 between the control device 5 and the unit 9 may be implemented in the form of a cable, radio-frequency, infrared or similar connection channel, thereby enabling the unit 9 and the associated devices 10-12 to be installed remotely.

Claims

1. Refrigeration appliance comprising at least a compartment (4) adapted to be kept at a pre-determined average temperature for the preservation of items of various kind and nature stored therein, control means (9) being adapted to be driven on the basis of data that are indicative of chemical-physical characteristics of said items in said compartment, as well as on the basis of operational parameters detected in said compartment (4), said control means being further adapted to combine said data and said operational parameters and to drive display means (11) so as to enable them to indicate a respective expiry date expected for each stored item, **characterized in that** said control means (9) are adapted perform such a combination of characteristic data and operational parameters repeatedly throughout the operation of the appliance and to correspondingly update, for each item

stored in said compartment (4), the respective expiry date indicated on the display means (11).

2. Refrigeration appliance according to claim 1, **characterized in that** said control means (9) are capable of performing said combination of characteristic data and operational parameters periodically. 5
3. Refrigeration appliance according to claim 1, **characterized in that** said operational parameters are detected through respective sensors (6) by control means (5) adapted to drive said control means (9) and to control the operation of the appliance (3). 10
4. Refrigeration appliance according to claim 3, **characterized in that** said control means (5) are capable of remotely communicate with said control means (9) through a connection channel (8). 15

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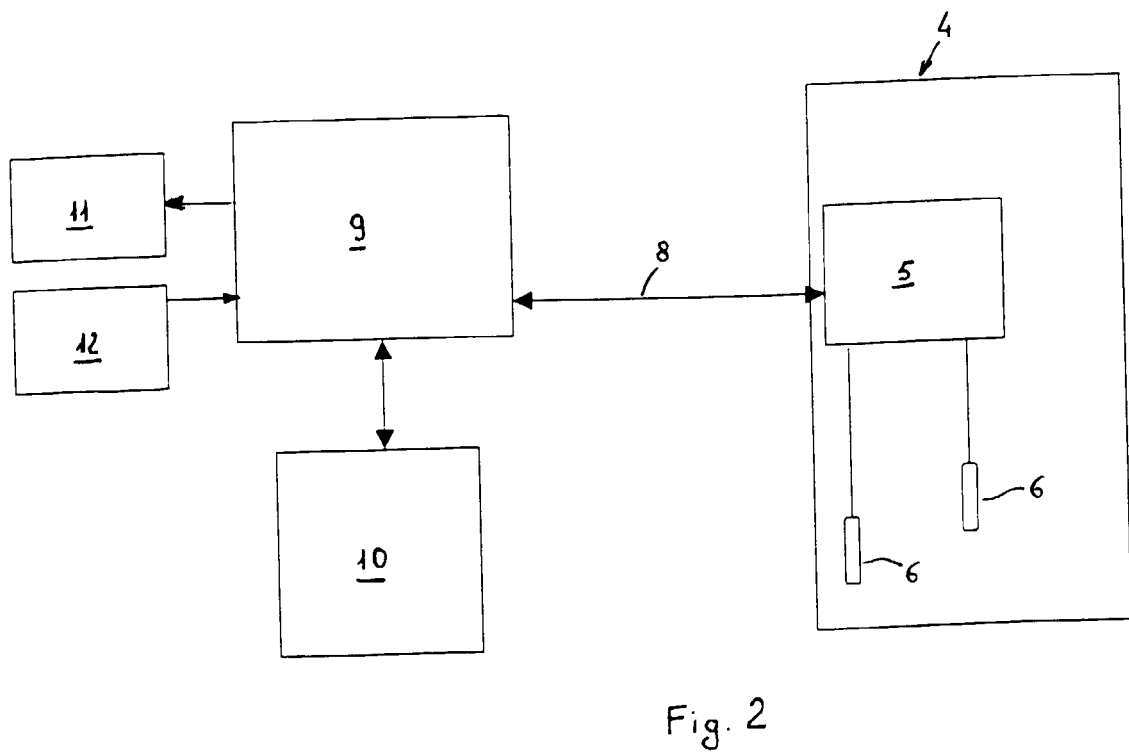
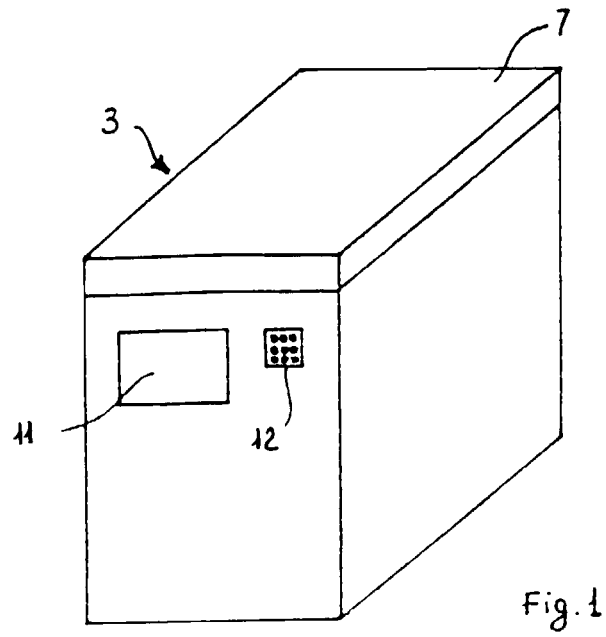
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Application Number
EP 00 10 0050

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The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 5 June 2000	Examiner Boets, A
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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