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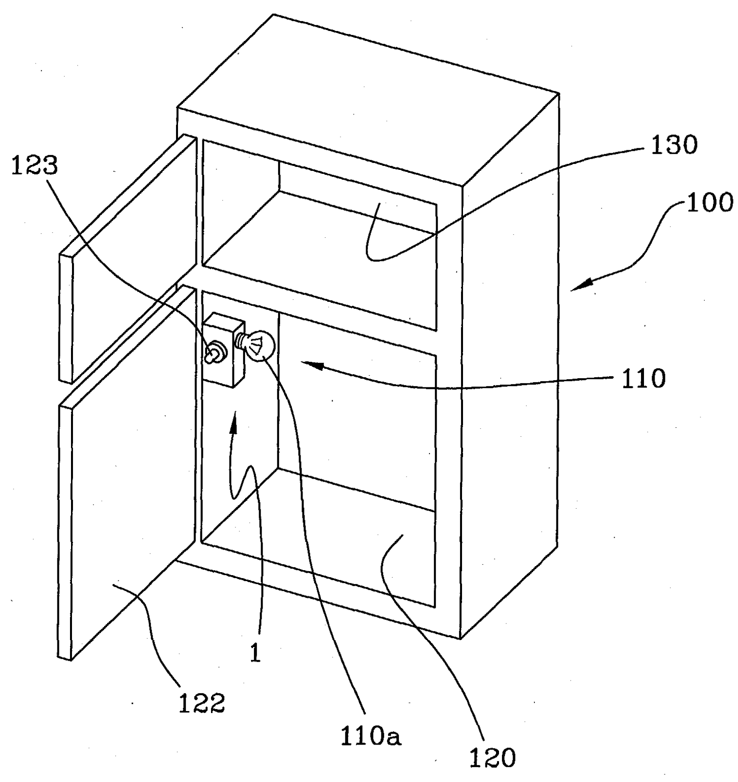
(54) Control device for refrigerating apparatus

(57) A control device for refrigerating apparatus comprises a regulation block (30) to regulate a power delivered to a heating element connectable with a powering unit (20) through an input section (10) and with said heating element (110) of a refrigerating apparatus (100) through an output section (11); the regulation block (30) is provided with a thyristor (40) and a connecting branch (50). The connecting branch (50) defines a conductive path between a first end (41) and an auxiliary input (43) of said thyristor (40).

FIG 1



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Description

[0001] The present invention relates to a control device for refrigerating apparatus.

[0002] It is known that refrigerators for home use presently available on the market have a first refrigerating compartment inside which a temperature of about 4° to 8°C is generally required, a second freezing compartment the temperature of which should be included between -15° and -20°C, and a single compressor; to maintain the desired temperature in both compartments, a respective evaporator is associated with each of them to remove the excess heat through it.

[0003] The compressor is activated at predetermined operating cycles so as to supply the two evaporators with the necessary amounts of refrigerant.

[0004] Activation of the compressor is obtained through a control system detecting the refrigerating-compartment temperature and carrying out operation of the compressor itself at the moment such a temperature overcomes a predetermined threshold value.

[0005] A problem concerning the refrigerating apparatus herein briefly described exists if one of these refrigerators should be used in an environment the temperature of which is substantially the same as or lower than the threshold temperature of the refrigerating compartment.

[0006] In fact, under such conditions, said refrigerating compartment is able to keep its temperature to a value sufficiently low without operating the compressor, due to the fact that, in the absence of external heat, the refrigerating-compartment temperature (i.e. the compartment in which the sensor is placed) has no tendency to increase and therefore does not cause operation of the cooling system.

[0007] Consequently, the freezing compartment as well is not cooled and its temperature begins rising tending to reach a thermal equilibrium with the surrounding environment.

[0008] The resulting drawbacks in the case of possible foodstuffs preserved in such a freezing compartment are well apparent.

[0009] Therefore systems have been studied which involve artificial heating of the refrigerating compartment and, in particular, use of the lamp present in such a compartment (previously only used for lighting purposes) to deliver heat.

[0010] In this way, the refrigerating-compartment temperature is always maintained at least slightly higher than the threshold temperature, independently of the external-environment temperature, so that the compressor is always active and the freezing compartment can keep the desired temperature.

[0011] For the purpose, the lamp is also powered when the refrigerator door is closed; in order to supply the necessary heat amount, the power delivered to the lamp when the door is closed must be of about 7-8 W.

[0012] On the contrary, when the refrigerator door is opened, the lamp must be powered to its full power; usually lamps of 15-25 W are used.

[0013] It is therefore apparent that the lamp is to be powered with a reduced power when it must only supply heat to the refrigerating compartment, in order not to raise the compartment temperature and cause damages to the goods preserved therein.

[0014] The known art offers the availability of different technical typologies for regulation of the power delivered to the lamp and, consequently, dispersed in the refrigerating compartment.

[0015] A first known solution involves connection in series of a diode to the lamp, so as to cut the positive (or negative, depending on the connection direction) half waves and halve the power delivered to the load; however, it is apparent that this solution achieves satisfactory results only if the employed lamp is set to absorb 15 W under usual operating conditions. In fact, by halving this power, the value of 7.5 W is obtained, which is the power required for an optimal heat delivery in the refrigerating compartment.

[0016] Vice versa, should a lamp of different power (20 or 25 W, for example) be used, the heat supplied to the refrigerating compartment would be too much (10 or 12.5 W, respectively).

[0017] The operating limit of the above described technical solution is therefore well evident, taking into account the poor flexibility of use with lamps set to absorb different powers.

[0018] An alternative solution available in the known art consists in replacing said diode with a suitably-sized condenser, to obtain the desired voltage drop; in this way, by selecting condensers of appropriate capacity, the power delivered to the lamp can be reduced by the desired amount.

[0019] However, this second solution as well has some drawbacks.

[0020] In fact, a condenser is set to operate at a well-defined work frequency, and therefore furnish the desired voltage drop exactly at that frequency; it is obvious that, since common supply mains deliver both 50 Hz voltages and 60 Hz voltages, the condenser use may be inappropriate in one of the two case.

[0021] In addition, condensers used for the above purpose must have a capacitance in the order of hundreds of nF and therefore give rise to non-negligible bulkiness problems.

[0022] Accordingly, it is an aim of the present invention to supply a control device for refrigerating apparatus capable of solving the above mentioned drawbacks.

[0023] In particular, it is an object of the invention to make available a control device for refrigerating apparatus capable of correct operation with refrigerators provided with lamps of different powers.

[0024] It is a further object of the invention to provide a control device for refrigerating apparatus having a simple circuit structure and reduced manufacture costs, together with a reduced bulkiness.

[0025] A still further object of the invention is to provide a control device for refrigerating apparatus capable of correct operation 'when connected with supply mains delivering voltages at different frequencies.

[0026] The foregoing and further objects are substantially achieved by a control device for refrigerating apparatus as disclosed in the appended claims.

[0027] Further features and advantages will become more apparent from the detailed description of a preferred embodiment of a control device for refrigerating apparatus given by way of non-limiting example and illustrated in the accompanying drawings, in which:

- Fig. 1 shows a refrigerating apparatus in which the device in accordance with the present invention is employed;
- Fig. 2 shows a block diagram of the refrigerating apparatus in Fig. 1 and the relevant control device;
- Figs. 3, 4, 5, 6 show circuit embodiments of the control device in Fig. 2.

[0028] The control device for refrigerating apparatus in accordance with the present invention has been generally identified in the accompanying figures with reference numeral 1.

[0029] Referring particularly to Figs 1 and 2, the refrigerating apparatus 100 in which device 1 is employed first of all comprises a refrigerating compartment 120 and a freezing compartment 130; associated with the refrigerating compartment is a first evaporator 121, to keep the refrigerating compartment 120 to a first preestablished temperature. This first temperature is generally fixed between 4°C and 8°C.

[0030] Associated with the freezing compartment 130 is in the same manner a second evaporator 131 to keep said compartment to a second preestablished temperature; the second temperature is lower than said first temperature and is currently included between -15°C e -20°C.

[0031] It is to be noted that the above stated values are quite exemplary and relate to refrigerating apparatus for home use; it is apparent that the control device 1 to be described in detail in the following can be used in any typology of refrigerating apparatus 100 having at least two compartments that must be maintained to different temperatures with respect to each other.

[0032] The refrigerating apparatus 100 further comprises a compressor 140 to send a cooling fluid or refrigerant to said evaporators 121, 131 and a condenser 145, interposed between the compressor 140 and evaporators 121, 131.

[0033] Through an appropriate return duct 146, the cooling fluid evaporated in evaporators 121, 131 is conveyed to compressor 140, so that the cooling cycle can be started again.

[0034] In order to enable apparatus 100 to detect its inner temperature and consequently operate compressor 140 and the relevant cooling circuit, said apparatus is provided with a first sensor 150; in particular, the first sensor 150 is positioned in the refrigerating compartment 120 to detect temperature of same.

[0035] An activating device 160 is connected with the first sensor 150, to receive therefrom the detected temperature of the refrigerating compartment 120; depending on this temperature, the activating device 160 carries out operation of compressor 140, in particular when said temperature reaches a predetermined maximum threshold.

[0036] Also disposed within the refrigerating compartment 120 is a lamp 110a to allow appropriate lighting of the refrigerating compartment 120 itself; as better clarified in the following, lamp 110a also acts as a heating element for the refrigerating compartment 120.

[0037] To close the refrigerating compartment 120 and consequently enable correct operation of the refrigerating apparatus 100, the latter is provided with at least one door 122; said door is hinged at a side wall of the refrigerating compartment 120 and can be shifted between a closed condition, at which it closes the refrigerating compartment 120, and an open condition at which it does not close it. Generally movement between the open and closed conditions of door 122 is executed by the user.

[0038] Advantageously, the door 122 is associated with a second sensor 123 detecting the open or closed conditions of the door itself; the information obtained through the second sensor 123 will be used to regulate the lamp 110a supply.

[0039] In fact, a control device 1 is connected upstream of lamp 110a, which device, depending on the open or closed conditions of door 122 as detected by the second sensor 123, carries out regulation of the voltage reaching lamp 110.

[0040] Device 1, in particular, is interposed between the lamp 110a and a powering unit 20 from which the refrigerating apparatus 100 draws the necessary power supply.

[0041] The powering unit 20 practically consists of the mains to which the refrigerating apparatus 100 is connected; this mains can be a 220 V mains, for example.

[0042] In more detail as regards the circuit structure of device 1, referring particularly to Figs. 3, 4, 5 and 6, the control device 1 has an input section 10, for connection with said powering unit 20, and an output section 11 for connection with lamp 110a or, generally, a heating element 110 that must be suitably positioned within the refrigerating compartment 120.

[0043] For regulation of the electric power delivered to lamp 110a, the control device 1 is provided with a regulation block 30, positioned in circuit between the input section 10 and output section 11. In more detail, the regulation block 30 comprises a thyristor 40, i.e. a semiconductor device defined by a succession of four layers, alternately formed with a doping of the "p" type and a doping of the "n" type and having an anode, a cathode, and a control electrode, generally referred to as "gate".

[0044] Therefore, thyristor 40 is provided with a first end 41 defining the anode to be connected with the powering unit 20, with a second end 42 defining the cathode and connected to lamp 110a, and with an auxiliary input 43 defining said gate.

[0045] Associated with thyristor 40 is a connecting branch 50, for connection between the first end 41 and auxiliary input 43 of thyristor 40; in other words, the connecting branch 50 defines a conductive path between the first end 41 and the auxiliary input 43, so that the current running through this connecting branch 50 directly comes from the powering unit 20.

[0046] Practically, conduction of thyristor 40 is started by an activating signal 200 directly drawn from the powering unit 20.

[0047] The connecting branch 50 can be made following different circuit typologies; for example, in Figs. 3 and 5, the conductive path 51 is merely defined by a resistor 52 having a first end 52a connected with the first end 41 of thyristor 40 and a second end 52b to be connected with the lamp 110a.

[0048] Alternatively, the connecting branch 50 can have a slightly more complicated structure: with reference to Figs. 4 and 6, the conductive path 51 can be defined by a first resistor 53, a second resistor 54 and a switch 55.

[0049] The first resistor 53 has a first end 53a connected with the first end 41 of thyristor 40, and a second end 53b connected with a first end 54a of the second resistor 54.

[0050] Switch 55 is set to selectively enable passage of a current flow to the auxiliary input 43 of thyristor 40, this auxiliary input 43 being connected with a second end 54b of the second resistor 54; in more detail, switch 55 is drivable between an operating condition at which it allows the activating signal 200 to flow from the second resistor 54 to the auxiliary input 43 of thyristor 40, and a rest condition at which flowing of the activating signal 200 is inhibited.

[0051] In a preferred embodiment, switch 55 consists of a semi-conductor device and, in particular, a DIAC.

[0052] The regulation block 30 further comprises a condenser 56 connected between the second end 53b of the first resistor 53 and the second end 42 of thyristor 40.

[0053] As shown in Figs. 3 and 4, thyristor 40 can be an SCR 40a; alternatively, as shown in Figs. 5 and 6, thyristor 40 can be a TRIAC 40b.

[0054] Note that the connecting branch 50 is made through use of simple circuit elements that are not programmable (insertion of a microcontroller in the connecting branch 50 is not provided, for example) and almost exclusively with passive elements, apart from the DIAC employed as the switch in some embodiments.

[0055] Device 1 further comprises a selecting block 60 interposed in circuit between the powering unit 20 and said regulation block 30; the selecting block 60, when it is in a first operating condition, defines a direct connection between the powering unit 20 and heating element 110. Vice versa, when it is in a second operating condition, the selecting block 60 connects the first end 41 of thyristor 40 with the powering unit 20; in other words, the selecting block 60 in its second operating condition enables a connection between the heating element 110 and the powering unit 20 through the regulation block 30.

[0056] A possible embodiment of the selecting block 60 contemplates use of a first switch 61 and a second switch 62.

[0057] The first switch 61, when it is in its closed condition, directly connects the heating element 110 with the powering unit 20, whereas when it is in the open condition it does not carry out such a connection.

[0058] Likewise, the second switch 62, when it is in its closed condition defines a connection between the first end 41 of thyristor 40 and the powering unit 20, whereas in its open condition it does not carry out such a connection.

[0059] In this case, corresponding with the first operating condition of the selecting block 60 is the closed condition of the first switch 61, whereas the closed condition of the second switch 62 corresponds to the second operating condition of the selecting block 60.

[0060] Alternatively, the selecting block 60 can consist of a single switch that in a first operating condition directly connects the lamp 110a with the powering unit 20, and in a second operating condition connects the first end 41 of thyristor 40 with the powering unit 20 itself.

[0061] As will be more apparent from the following where operation of device 1 and the refrigerating apparatus associated therewith is discussed, the selecting block 60 is advantageously piloted between its operating conditions depending on the information detected by the second sensor 123; more particularly, when an open condition of door 122 is detected by the second sensor 123, the selecting block 60 is piloted to its first operating condition: in this way, at the moment the user wishes to look at the contents of the refrigerating compartment 120, the lamp 110a is powered to its full power, since the selecting block 60 directly connects the lamp 110a itself with the powering unit 20.

[0062] Vice versa, when the second sensor 123 detects a closed condition of door 122, the lamp 110a must exclusively perform a heating function through delivery of a predetermined amount of heat to the refrigerating compartment 120; therefore, the selecting block 60 is piloted to its second operating condition and the power delivered to the lamp 110a itself is decreased by the regulation block 30.

[0063] Note that to carry out piloting of the selecting block 60, both an electromechanical relay device known by itself and an electronic microprocessor device capable of recognizing the signals generated by the second sensor 123 and consequently activating the selecting block 60 can be employed.

[0064] Operation of the refrigerating apparatus 100 and the control device 1 in accordance with the present invention is now described.

[0065] As above mentioned, when door 122 is opened, the second sensor 123 detects such a condition and, consequently, the selecting block 60 allows a full-power powering of lamp 110a, by its moving to the first operating condition and, in particular, bringing the first switch 61 to the closed condition; in this case, power delivered by lamp 110a will be substantially the lamp power rating shown on the lamp itself (typically, 15 W to 25 W).

[0066] In this way, the necessary lighting to enable the inside of the refrigerating apparatus to be viewed by the user is supplied to the refrigerating compartment 120.

[0067] Subsequently, when the door 122 is closed, the second sensor 123 detects this second condition and directly or indirectly activates the selecting block 60, so that the latter moves to its second operating condition and, in particular, the second switch 62 is piloted to its closed condition.

[0068] The selecting block 60, by interposition of the regulation block 30 and in particular of thyristor 40 between the lamp 110a and powering unit 20, decreases the power delivered to lamp 110a in accordance with a predetermined ratio.

[0069] As briefly described above, when the door 122 keeps closed, it is not necessary for the lamp 110a to be powered to its full power, since its function is no longer that of lighting the inside of the refrigerating compartment 120, but that of giving the same a predetermined heat amount. In fact, should the external temperature go below the reference threshold set for the internal temperature of the refrigerating compartment 120, said compartment would tend to keep its temperature below such a threshold without the aid of the cooling system consisting of compressor 140, condenser 145, evaporators 121, 131 and return duct 146; however, in this situation, since the temperature detected by the second sensor 123 is always below the predetermined threshold, the compressor 140 and the fluid-operated circuit elements associated therewith practically are no longer activated, so that also the cooling activity of the freezing compartment 130 is interrupted. Consequently, the internal temperature of the freezing compartment, in the absence of activation of the cooling system, will start increasing tending to reach a thermal equilibrium with the external environment.

[0070] In the light of the above, the importance of use of a heating element 110 set to carry out heat dissipation in the refrigerating compartment 120 is well apparent.

[0071] Following studies carried out on significant samples of refrigerators presently on the market, it has been evaluated that the optimal power to be delivered by lamp 110a or a general heating element 110, when the door 122 is in its closed condition, is about 7.5 W.

[0072] It is important that this power should be dissipated independently of the lamp 110a power rating and the feeding voltage value, as well as of the frequency of said voltage.

[0073] For the purpose, device 1 and in particular the regulation block 30 are equipped with the above described circuit elements.

[0074] In more detail, with reference to Fig. 3, the SCR 40a at the first operating condition of the selecting block 60 is in a cut-off condition; activation of the SCR 41a is regulated through resistor 52.

[0075] In fact, it is resistor 52 that limits the current flow tending to run from the supply unit 20 to the auxiliary input 43 of the SCR 40a; practically, a drive current of predetermined intensity is required for the SCR 40a (that in this case defines the activating signal 200) to enter the conduction region and, due to resistor 52, this current is caused to flow from the powering unit 20 to the auxiliary input 43.

[0076] Note that the conduction time of thyristor 40 for each period of the feeding voltage and the power correspondingly delivered to lamp 110a are defined depending on the resistance value taken by resistor 53.

[0077] In fact, the mains voltage fed from the powering unit 20 has a sinusoidal shape against time (typically, frequencies are of 50-60 Hz) and the negative half waves are cut by the SCR 40a independently of the activating signal 200; therefore there is an intrinsic reduction of at least 50% in the power delivered to lamp 110a.

[0078] In addition, the SCR 40a as above shown, does not conduct until the activating signal 200 reaches a predetermined intensity, i.e. the feeding voltage reaches a corresponding limit value.

[0079] The SCR 40 therefore conducts in the time interval included between reaching of the limit value by the feeding voltage and return of the feeding voltage to zero.

[0080] Consequently, the positive half waves are partially cut and the power delivered to lamp 110a is correspondingly reduced, through reduction of the heat dissipated by said lamp in the refrigerating compartment 120.

[0081] Note that the maximum voltage usable for activation of the SCR 40a corresponds to the mains voltage peak; therefore, the SCR 40a will conduct for at least one half of each positive half-wave of the mains voltage.

[0082] In the light of the above it is apparent that the power absorbed by lamp 110a can be reduced of from 50% to 75%, depending on the resistance value of resistor 52 affecting the activation moment of the SCR 40a.

[0083] In this way, even if 25 W lamps are employed, it is possible to supply the refrigerating compartment 120 with the required 7.5 W power.

[0084] It should be point out that the SCR 40a can be interposed between lamp 110a and the powering unit 20 so as to completely eliminate the positive half waves of the feeding voltage and partly cut the negative ones; in this case the first end 41 of the SCR 40a is directly connected with lamp 110a, whereas the second end 42 is connected, by means of the selecting block 60, with the powering unit 20.

[0085] The percent reduction of the power supplied to lamp 110a keeps at all events substantially unchanged. Should a too high resistance value for resistor 52 be selected, the SCR 40a would never be brought to conduction, since the current through resistor 52 does not reach the required minimum intensity.

[0086] By way of example, an SCR 40a with an activation current of 200 μA and a 220 V mains (the last mentioned value refers to the effective value of the feeding voltage; the corresponding peak value is 310 V) is to be considered; with a 6.8 MΩ resistor 52, activation of the SCR 40a is obtained when the mains voltage reaches an instantaneous value of 280 V.

[0087] In this case the power delivered to lamp 110a is only 30% of the lamp 110a power rating.

[0088] If, on the contrary, an SCR 40a having an activation current of 20μA is selected, to enter the conduction region when the feeding voltage is 280 V and to therefore deliver 30% of the maximum power to lamp 110a, the resistance value of resistor 52 must be 68 MΩ.

[0089] In the last-mentioned case, should resistor 52 overcome 100 Ω, the SCR 40a would never reach its conduction region.

[0090] A quite similar speech can be done in connection with Fig. 4 and with use of a TRIAC 40b in place of the SCR 40a. The only difference resides in that the TRIAC 40b does not carry out an automatic cutting of the positive or negative half waves, but it is able to conduct along the whole period of the feeding voltage.

[0091] Therefore, the partial cutting that is carried out on the positive half waves is obtained in a quite symmetrical manner also on the negative half waves; consequently since 50% of each half wave can be cut at most, the reduction range of the power delivered to lamp 110a will be 0%-50%, depending on the resistance value of resistor 52.

[0092] With reference to Figs. 5 and 6, a different structure for the connecting block 50, previously described in detail is employed.

[0093] At the time that the regulation block 30 is connected with the powering unit 20 by the selecting block 60, the current from the powering unit 20 progressively loads condenser 56 through the first resistor 53; when voltage at the ends of said condenser 56 reaches a predetermined value (depending on the sizes of the different circuit elements employed), switch 55, normally open, moves to its closed condition enabling the discharge current of condenser 56 to flow to the auxiliary input 43 of thyristor 40, thereby defining the corresponding activation signal 200.

[0094] It is apparent that, in this case, reduction in the power delivered to lamp 110a can be of 0%-50% in case of use of the SCR 40a (Fig. 5) and of 0%-100% in case of use of the TRIAC 40b (Fig. 6); in fact, the voltage stored up at the ends of condenser 56 can be greater than the maximum mains voltage and the intervention of thyristor 40 may be activated even after each half wave of the supply voltage has reached its peak (which is positive or negative, depending on the considered half wave).

[0095] Consequently, the conduction type of thyristor 40 can be defined in any sub-interval of the period (in the case of the TRIAC 40b) or half-period (in the case of the SCR 40a) of the feeding voltage.

[0096] As regards the circuit diagrams reproduced in Figs. 4 and 6, the different elements can take, by way of example, the following values: the condenser 56 capacitance can be 0.15 μF, the first resistor 53 resistance can be 180 kΩ, whereas the second resistor 54 resistance can be 100 Ω.

[0097] With a circuit having the above stated values, by use of the SCR 40a (Fig. 4), 30% of the lamp power rating is supplied to lamp 110a, whereas by use of the TRIAC 40b (Fig. 6), 60% of its maximum power is delivered.

[0098] The invention achieves important advantages.

[0099] First of all, the device 1 can be employed with refrigerators equipped with lamps having different powers, and is therefore characterized by an important versatility of use.

[0100] In addition, the device 1 has a very reduced circuit complexity, together with manufacturing costs quite comparable with those of the devices of the known art.

[0101] Another advantage consists in that the device in accordance with the present invention is able to correctly operate also with mains having voltages of different frequencies.

[0102] A further advantage is represented by the limited bulkiness of the device of the invention, which enables the same to be integrated into circuits already present in the refrigerating apparatus where it is installed.

Claims

1. A control device for refrigerating apparatus comprising:

   - an input section (10) to be connected with a powering unit (20);
   - an output section (11) to be connected with a heating element (110) of a refrigerating apparatus (100);
   - a regulation block (30) interposed between said input section (10) and output section (11) to regulate a power delivered to said heating element (110)

   said regulation block (30) being equipped with a thyristor (40) having a first end (41) connectable with said powering unit (20), a second end (42) connectable with said heating element (110) and an auxiliary input (43) for receiving an activating signal (200),

characterized in that said regulation block (30) further comprises a connecting branch (50) defining a conductive path (51) between said first end (41) and auxiliary input (43) of said thyristor (40).

2. A device as claimed in claim 1, **characterized in that** said connecting branch (50) comprises a resistor (52) having a first end (52a) connected with the first end (41) of said thyristor (40) and a second end (52b) connected with said auxiliary input (43), said conductive path (51) being preferably defined by said resistor (52).

3. A device as claimed in claim 1, **characterized in that** said conductive path (51) comprises:

- a first resistor (53) having a first end (53a) connected with the first end (41) of said thyristor (40) and a second end (53b);
- a second resistor (54) having a first end (54a) connected with the second end (53b) of said first resistor (53) and a second end (54b);
- a switch (55) preferably defined by a semi-conductor device and, in particular, by a DIAC drivable between an operating condition at which it enables said activating signal (200) to flow from said second resistor (54) to the auxiliary input (43) of said thyristor (40) and a rest condition at which it prevents flowing of the activating signal (200),

said regulation block (30) further comprising a condenser (56) connected between the second end (53b) of said first resistor (53) and the second end (42) of said thyristor (40).

4. A device as claimed in anyone of the preceding claims **characterized in that** said thyristor (40) is an SCR (40a).

5. A device as claimed in anyone of claims 1 to 3, **characterized in that** said thyristor (40) is a TRIAC (40B).

6. A device as claimed in anyone one of the preceding claims, **characterized in that** it further comprises a selecting block (60) interposed in circuit between said powering unit (20) and regulation block (30), said selecting block (60) being drivable between a first operating condition at which it enables direct connection between said powering unit (20) and heating element (110) and at least one second operating condition at which it connects the first end (41) of said thyristor (40) with said powering unit (20).

7. A device as claimed in claim 6, **characterized in that** said selecting block (60) comprises:

- a first switch (61) drivable between a closed condition at which it directly connects said heating element (110) with said powering unit (20), and an open condition at which it does not define such a connection;
- a second switch (62) drivable between a closed condition at which it connects the first end (41) of said thyristor (40) with said powering unit (20) and an open condition at which it does not define such a connection.

8. A refrigerating apparatus comprising:

- a refrigerating compartment (120);
- a freezing compartment (130);
- a first evaporator (121) associated with said refrigerating compartment (120) to maintain the same to a first preestablished temperature;
- a second evaporator (131) associated with said freezing compartment (130) to maintain the same to a second preestablished temperature, lower than said first temperature;
- a compressor (140), to send a cooling fluid to said first and second evaporators (121, 131);
- a condenser (145) interposed between said compressor (140) and evaporators (121, 131) to condense the cooling fluid;
- a return duct (146) to cause the cooling fluid in the evaporators (121, 131) to flow towards said compressor (140);
- a first sensor (150) positioned in said refrigerating compartment (120) to detect the compartment temperature;
- an activating device (160) connected with said first sensor (150) and said compressor (140) for activation of the latter depending on the temperature detected by said first sensor (150);
- a lamp (110a) positioned in said refrigerating compartment (120) for lighting of same,

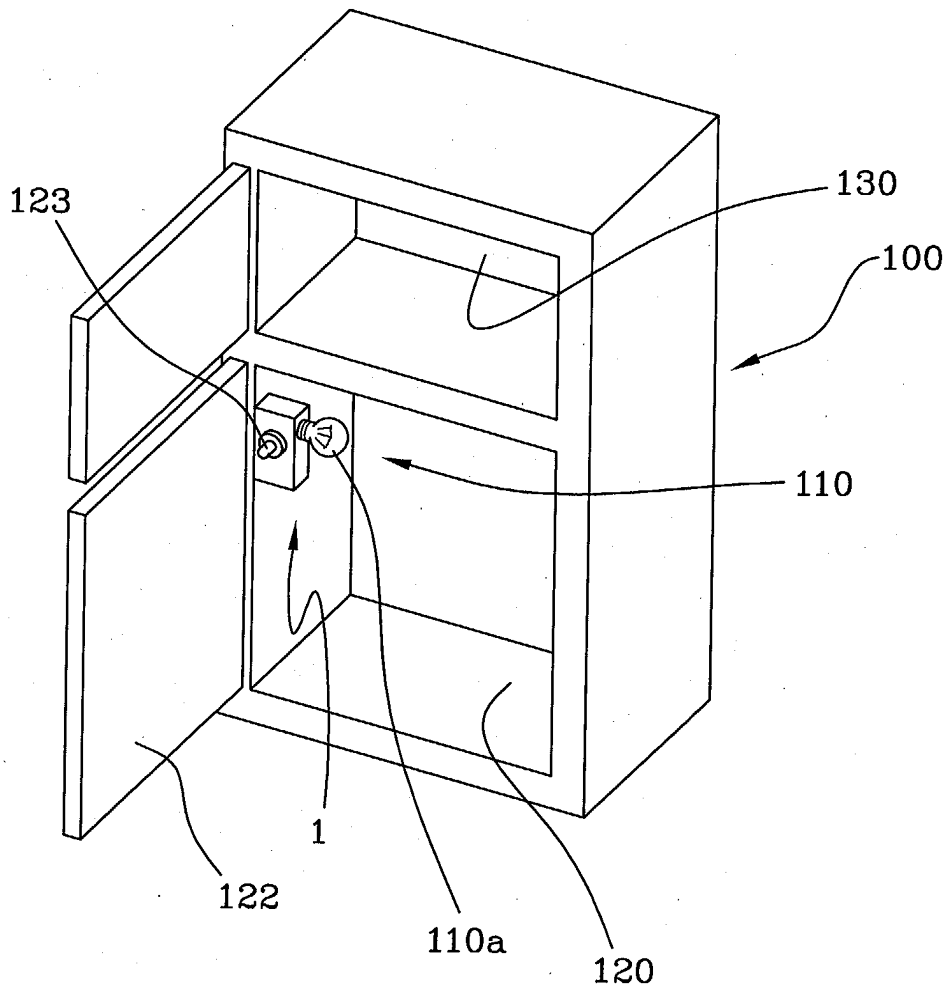
characterized in that it further comprises a control device (1) as claimed in anyone of claims 1 to 7, said lamp (110a) being connected with said control device (1) to define said heating element (110).

9. An apparatus as claimed in claim 8, **characterized in that** it further comprises:

- a door (122) associated with at least said refrigerating compartment (120), said door being shiftable between a closed position at which it closes said refrigerating compartment (120) and an open position at which it does not close it;
- a second sensor (123) associated with said

door (122) to detect the open or closed positions of said door, said sensor (123) being further active on said selecting block (60) to pilot it to its first operating condition, when said door (122) is in its open position, and to pilot said selecting block (60) to its second operating condition when said door (122) is in its closed position.

FIG 1



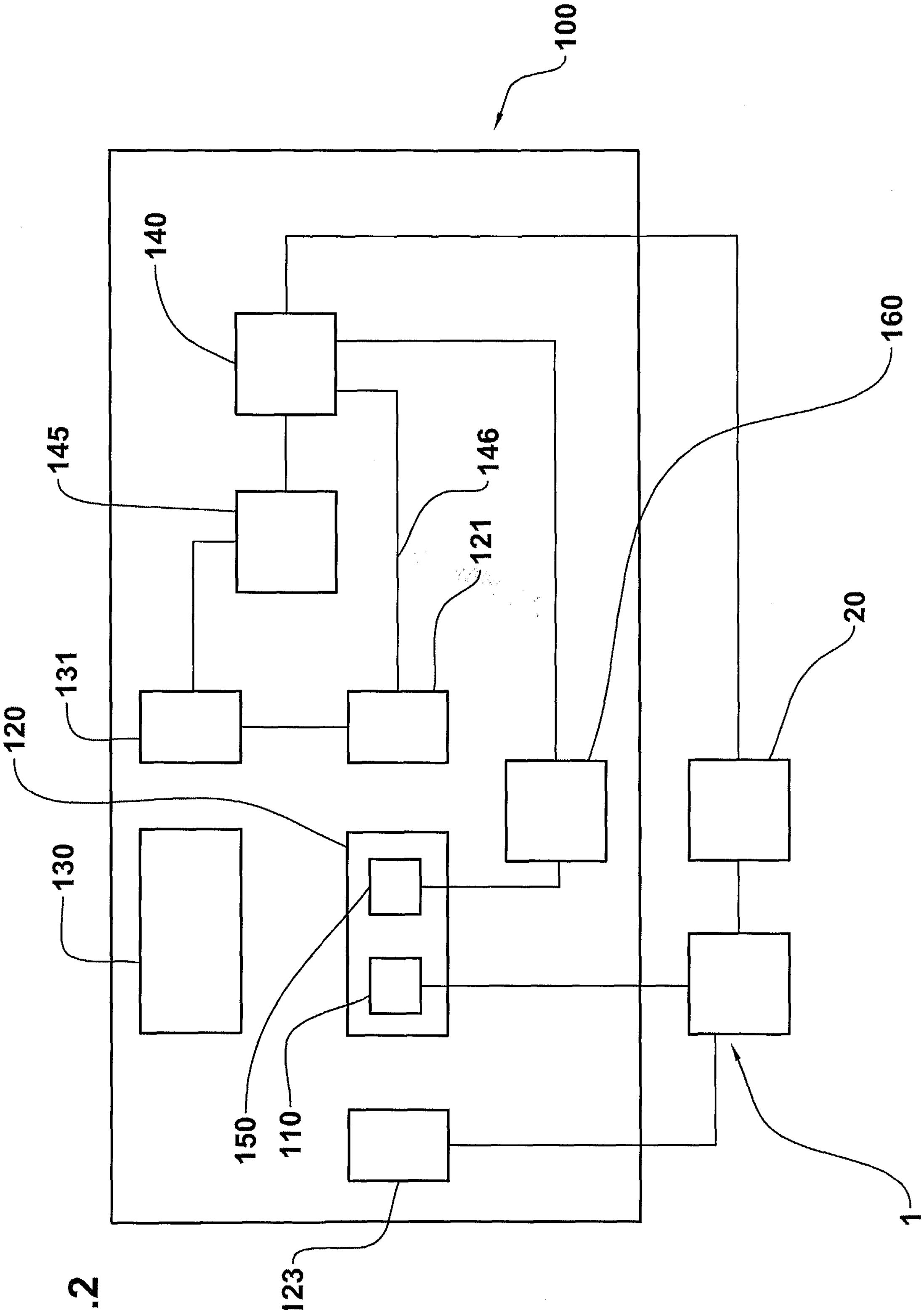
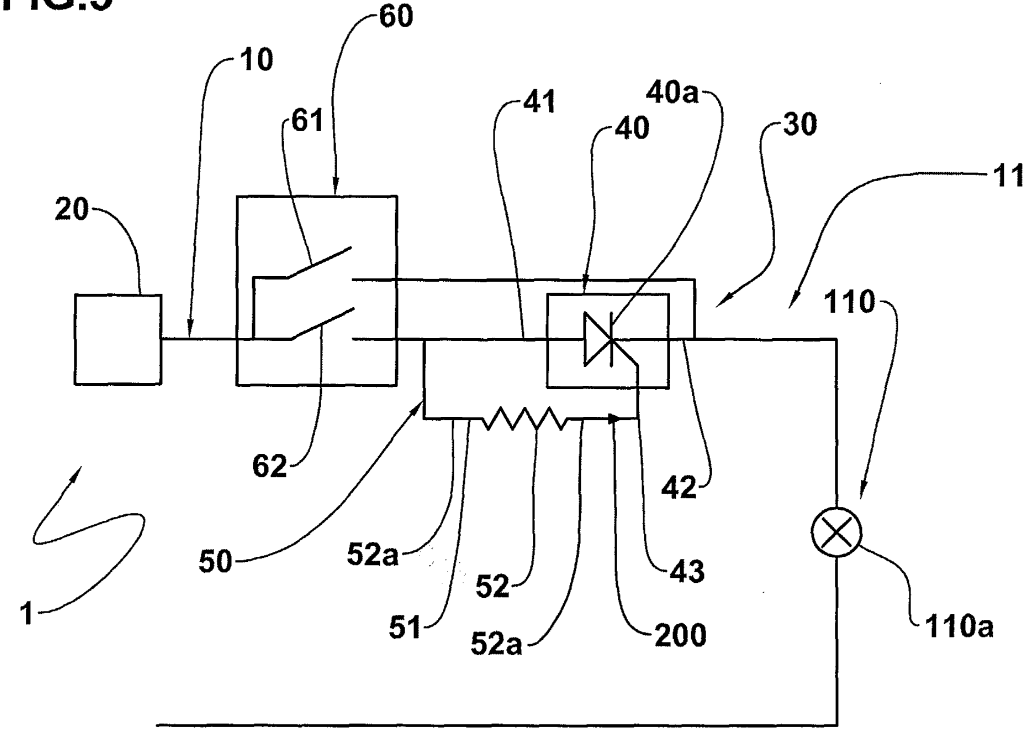


FIG.2

FIG.3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40a
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62
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1
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200
110a

FIG.4

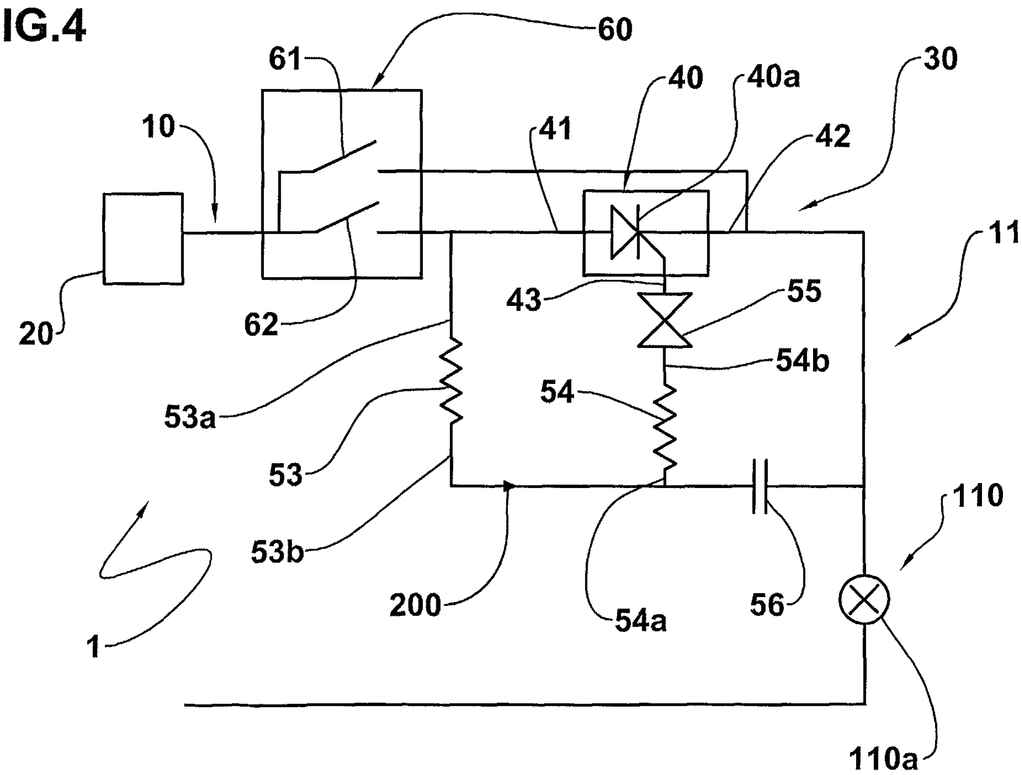

60
61
40
40a
30
10
41
42
11
20
62
43
55
54b
53a
54
53
110
53b
200
54a
56
1
110a

FIG.5

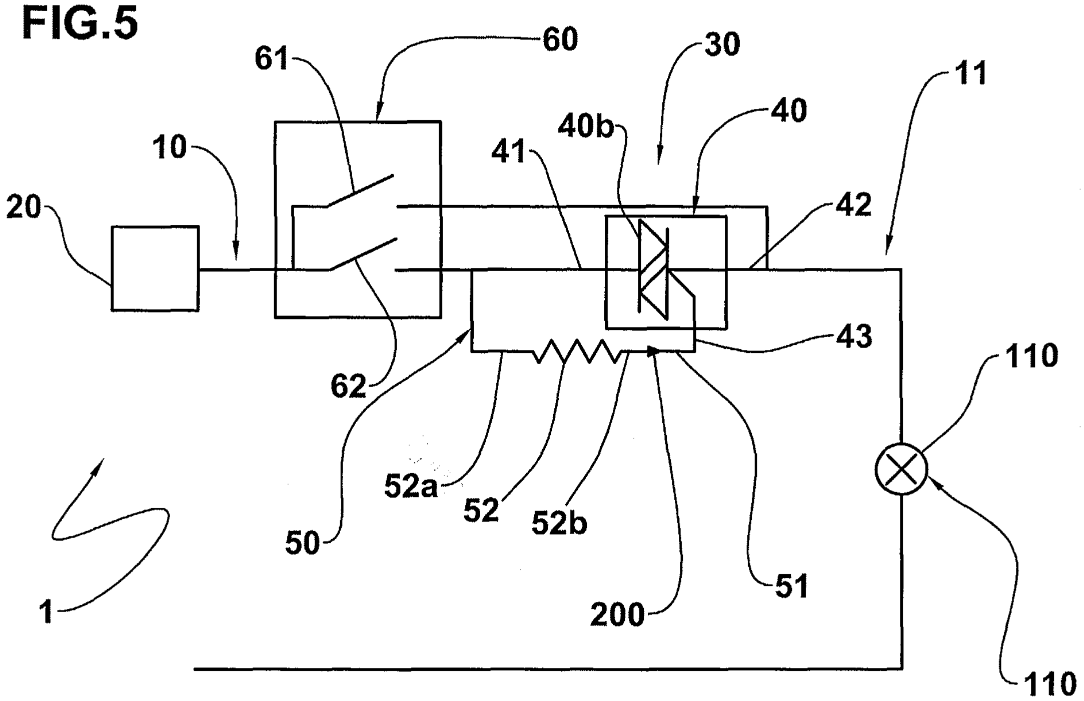
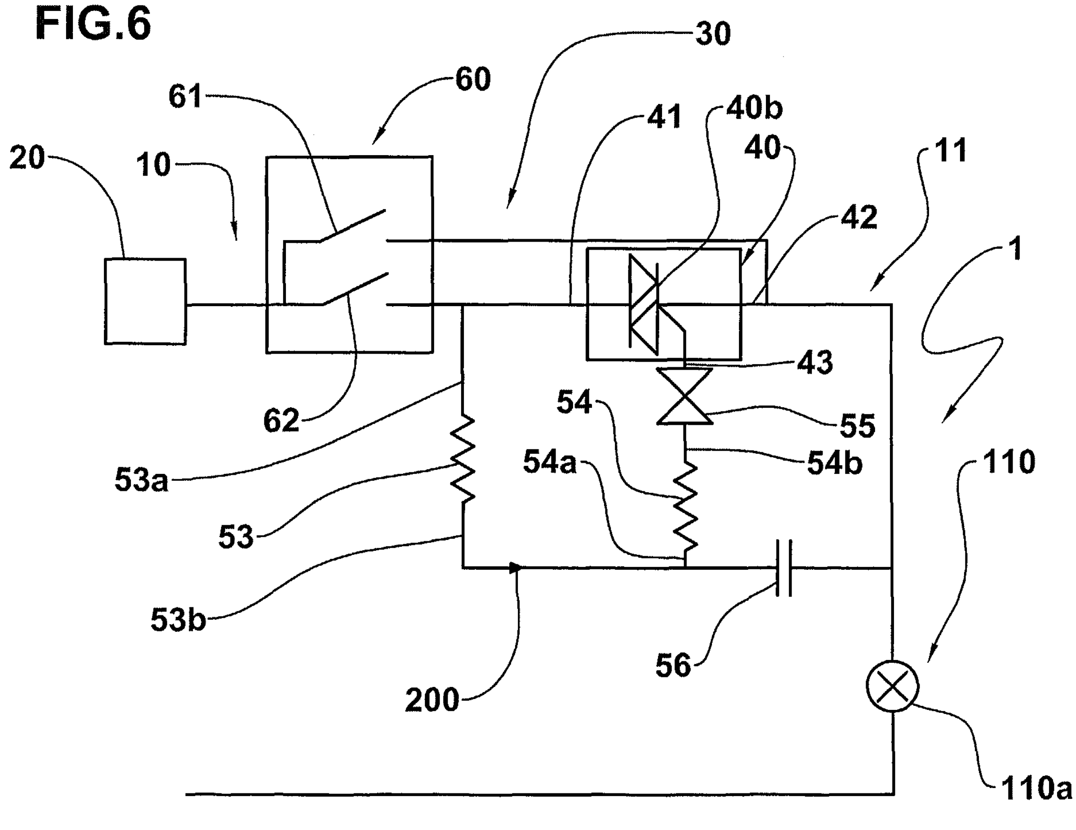

61
60
30
11
40
40b
10
41
20
42
43
110
62
52a
52
52b
50
51
200
1
110

FIG.6


30
61
60
41
40b
20
10
40
11
42
1
43
54
55
54a
54b
110
53a
53
53b
56
200
110a

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EUROPEAN SEARCH REPORT

Application Number
EP 03 42 5182

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