(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 810 411 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
03.12.1997 Bulletin 1997/49

(51) Int Cl.[6]: **F25D 21/06**

(21) Application number: **97830245.3**

(22) Date of filing: **26.05.1997**

(84) Designated Contracting States:
AT BE CH DE DK ES FI FR GB GR IE IT LI NL PT SE
Designated Extension States:
LT LV SI

(30) Priority: **31.05.1996 IT AN960019**

(71) Applicant: **Orion S.r.l.**
60035 Jesi (AN) (IT)

(72) Inventor: **Bocchini, Claudio**
60035 - Jesi (AN) (IT)

(74) Representative: **Baldi, Claudio**
Piazza Ghislieri, 3
60035 Jesi (Ancona) (IT)

(54) Automatic system for the intelligent start-up of the defrosting phases in refrigerator systems

(57) This invention concerns an automatic system to establish the automatic start-up of the defrosting phases in refrigerators according to the instantaneous verification of the actual necessity thereof.

EP 0 810 411 A2

Description

This patent application concerns an automatic system for the intelligent start-up of the defrosting phases in refrigerator systems.

It is common knowledge that the majority of home, commercial and industrial refrigerators are equipped with ventilated refrigerating systems whereby air is circulated in the refrigerator compartment so that the same strikes the evaporator fins on which it is cooled.

During this cooling stage, the humidity in the air condenses, solidifies and is deposited on the evaporator fins giving rise to the gradual formation of ice.

The quantity of ice and the speed with which it forms may vary according to different factors, the most important of which are the relative humidity of the ambient air, the evaporation of the product in the refrigerating compartment as well as the frequency with which the door of the compartment is opened and closed.

It is also known that the formation of this ice layer on the evaporator fins affects the efficiency of heat transmission between the fins and the air in that ice is a good thermal insulator.

All refrigerators are in fact equipped with a thermostatic probe which instantaneously reads the air temperature at the outlet of the evaporator; it serves in fact to activate the compressor when the temperature in the compartment reaches a certain preset threshold and, alternatively to stop the compressor when the temperature has once again dropped below a second preset threshold.

The presence of the ice layer on the evaporator fins interferes with the frequency and the duration of these alternative operating and rest phases of the compressor in that, as mentioned above, the layer of ice limits the thermal exchange properties of the fins.

This naturally lengthens the time required to reduce the temperature in the refrigerator compartment to the preset values and consequently also lengthens the duration of the operating phases of the compressor.

In general terms, it may be stated that in the case of particularly thick layers of ice, it becomes almost impossible to reduce the internal temperature of the refrigerator compartment to the preset values, despite the fact that the compressor at this point will be operating continuously. It follows therefore that a refrigerator must necessarily be defrosted, an operation carried out to remove the layers of ice on the evaporator fins.

Currently defrosting is planned in advance in the sense that the refrigerator manufacturer or even the user, according to his or her personal experience decides in advance that defrosting should be carried out at intervals of so many hours or so many days.

In practice, these instructions are often very approximate and therefore unreliable, especially considering the above variables which may influence the formation of ice; in other words it often happens that the refrigerator is defrosted either too soon or too late with respect to actual requirements.

No one has to day been able to design a system or method which makes it possible to establish analytically and reliably exactly when it is necessary to defrost a refrigerator.

The scope of this invention is to resolve this problem of the current technology used in refrigerator systems.

The system according to the invention in fact makes it possible to start the defrosting process automatically and instantaneously when - thanks to the thermostatic probe normally installed on all refrigerators - there is a reduction in the cooling speed of the air which strikes the evaporator fins beyond a preset value considered as acceptable, and which indicates a reduced thermal exchange of the fins as a result of the formation of an ice layer of a certain consistency on the fins.

In other words, provided that the system according to the invention is based on the verification of the efficiency of the evaporator, it may be stated that this efficiency is evaluated with respect to the major or minor speed with which the air from the evaporator is cooled.

Basically, the evaluation of the cooling speed of the air is performed by means of two components: the thermostatic probe which reads the temperature of the air from the evaporator and a microprocessor which elaborates the data transmitted by the above probe.

This microprocessor can instantaneously determine the speed at which the temperature of the air from the evaporator decreases, on the basis of the data transmitted by the probe. The microprocessor then compares the instantaneous value of the air cooling speed with a preset speed value, under which the microprocessor transmits a signal to activate the defrosting operation.

It is consequently easy to understand that the system according to the invention is particularly useful not only in terms of its undisputed efficiency but also because it may be used on any type of refrigerator without modifying its structure in any way.

Claims

1. An automatic system for the intelligent start-up of the defrosting phases in refrigerator systems characterised by the following operations:

   - instantaneous reading of the temperature of the air from the evaporator;
   - instantaneous transmission of the temperature values read by a microprocessor;
   - calculation of the instantaneous cooling speed of the air by the above microprocessor;
   - comparison by the microprocessor of the instantaneous cooling speed of the air with a preset speed value memorised in the same;
   - transmission by the microprocessor of the signal to activate the defrosting process when the value of the instantaneous air cooling speed

drops below the memorised preset value.

2. An automatic system for the intelligent start-up of the defrosting phases in refrigerating systems according to claim 1 characterised in that the instantaneous reading of the air temperature from the evaporator is taken by the thermostatic probe installed in refrigerators in order to determine the activation and deactivation of the compressor.