COMMONWEALTH of AUSTRALIA  
Patents Act 1952  
APPLICATION FOR A STANDARD PATENT

I/We  
Tatsukiyo Otsuki  
of  
9-25, Saiwaicho, Okayama-shi, Japan

hereby apply for the grant of a Standard Patent for an invention entitled:  

An apparatus for preventing frost from being formed

which is described in the accompanying complete specification.

Details of basic application(s):--

<table>
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<tr>
<th>Number</th>
<th>Convention Country</th>
<th>Date</th>
</tr>
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<tbody>
<tr>
<td>02-065692</td>
<td>Japan</td>
<td>16 March 1990</td>
</tr>
<tr>
<td>02-278067</td>
<td>Japan</td>
<td>17 October 1990</td>
</tr>
</tbody>
</table>

The address for service is care of DAVIES & COLLISON, Patent Attorneys, of 1 Little Collins Street, Melbourne, in the State of Victoria, Commonwealth of Australia.

DATED this FOURTEENTH day of DECEMBER 1990

To: THE COMMISSIONER OF PATENTS

.................................

a member of the firm of DAVIES & COLLISON for and on behalf of the applicant(s)

Davies & Collison, Melbourne
COMMONWEALTH OF AUSTRALIA
PATENTS ACT 1952
DECLARATION IN SUPPORT OF CONVENTION OR NON–CONVENTION APPLICATION FOR A PATENT

In support of the Application made for a patent for an invention
entitled: "AN APPARATUS FOR PREVENTING FROST FROM BEING FORMED"

I, Tatsukiyo OTSUKI,
of 9-25, Saiwaicho,
Okayama-shi, Japan.
do solemnly and sincerely declare as follows:

1. (a) I am the applicant for the patent, or
(b) I am authorized by

the applicant to make this declaration on behalf of

2. (a) I am the actual inventor of the invention, or
(b) I am

the inventor of the invention and the fact upon which the applicant intends to make application is as follows:

3. The basic application as defined by Section 141 of the Act were made
in Japan on the March 16, 1990
by Tatsukiyo OTSUKI
in Japan on the October 17, 1990
by Tatsukiyo OTSUKI
in
by
in

4. The basic application referred to in paragraph 3 of this Declaration were the first application made in a Convention country in respect of the invention the subject of the application.

Declared at Okayama-shi, this 4th day of December, 1990.

Tatsukiyo OTSUKI

DAVIES & COLLISON, MELBOURNE and CANBERRA.
AN APPARATUS FOR PREVENTING FROST FROM BEING FORMED

1. An apparatus for preventing frost from being formed characterized in that an electric conductive material (3) is lined on an inner surface of a wall (6) of a freezing equipment (10) such as a refrigerator and a freezer through an electric insulating material (4) and negative electrons are charged on said electric conductive material lining (3).

2. An apparatus for preventing frost from being formed characterized in that a cooling portion (15) of a freezing machine (2) is electrically insulated from a body portion (12) of said freezing machine (2) and negative electrons are charged on said insulated cooling portion (15).
An apparatus for preventing frost from being formed

The following statement is a full description of this invention, including the best method of performing it known to me/us:
1 Background of the Invention

The present invention relates to an apparatus for preventing frost from being formed on an inner surface of a freezer and on a surface of a cooling portion of a freezing machine.

In the conventional freezing equipment such as refrigerator, freezer and freezing machine, when frost is formed on an inner surface of a wall of the refrigerator or the freezer or on a cooling portion of the freezing machine, in order to remove the frost, there have been used a method in which the cooling operation is stopped and a rise in temperature of the inner surface of the wall or the cooling portion is waited to thereby melt and remove the frost, a method in which the frost is melted and removed by making hot gas flow in the cooling portion. These methods are all defrosting after the frost from being formed. Hitherto, no apparatus for preventing the frost from being formed has been put into practice.

In the conventional defrosting, as explained above, it is waited that the frost is melted due to natural rise in temperature of the frosted portion or the temperature of the frosted portion is forcibly raised. Therefore, there is an energy loss and complex
mechanisms to suitably raise the temperature are needed. Further, accompanying with the rise in temperature of the frosted portion, a rise in temperature of the refrigerated or freezed articles cannot be avoided, so that the defrosting becomes a cause of deterioration in the quality of the articles.

An object of the present invention is to provide an apparatus for preventing the frost from being formed on an inner surface of a wall of a refrigerator or a freezer or a cooling portion of a freezing machine without raising temperature in the freezing equipment such as the refrigerator, the freezer and the cooling portion of the freezing machine, in other words, without resulting the deterioration in the quality of the refrigerated or freezed articles and any energy loss.

Summary of the Invention

In order to attain the above object, an apparatus for preventing frost from being formed according to the invention is characterized in that an electrical conductive member is lined through an electric insulating material layer on an inner surface of a wall of a freezing equipment such as a refrigerator or a freezer and negative electrons are charged on said electrical conductive member.

In another embodiment, a frost preventing apparatus is characterized in that a cooling portion of
a freezing machine is electrically insulated from a body portion of a freezing machine and negative electrons are charged on the insulated cooling portion.

When the negative electrons are charged on the electric conductive lining or the cooling portion, any frost is not formed thereon by an action of the negative electrons.

According to the invention, it is prevented that the frost is formed on an inner surface of a wall of the refrigerator and the freezer or a cooling portion of the freezing machine. Accordingly, there is no need to raise the temperature in the refrigerator or freezer in order to remove the frost and thereby it is avoided to result the deterioration in the quality of the refrigerated or freezed articles. Further, as there is no energy loss to remove the frost, it is possible to reduce the running cost of the refrigerator, the freezer and the like.

Brief Description of the Drawings

Fig. 1 is a vertical cross sectional view of a refrigerator to which an apparatus for preventing frost from being formed according to the invention is applied; Fig. 2 is a vertical sectional view of a refrigerator including a freezing machine to which an apparatus for preventing frost from being formed according to the invention is applied.
Detailed Description of the Preferred Embodiments

With reference to the accompanying drawings, an apparatus for preventing frost from being formed according to the invention is explained.

Fig. 1 shows an embodiment in which an apparatus for preventing frost from being formed according to the invention is applied to a refrigerator. An electric insulating material 4 is adhered on an inner surface of a wall 6 of the refrigerator 10. On a surface of the electric insulating material 4, an electric conductive member 3 is lined so as to surround an interior 5 of the refrigerator 10. A freezing machine 2 is mounted on the wall 6 at a top portion thereof and the freezing machine 2 makes cooled air flow down in the interior 5 of the refrigerator 10. A negative electron generating device 1 is provided on an exterior of the wall 6. The negative electron generating device 1 utilizes a high voltage electrostatic transformer and an alternating current 100 V is impressed on a primary side of the transformer and one pole of a secondary side thereof of high voltage is insulated and only the other one pole is connected with the electric conductive member 3. Thus, negative electrons due to the electric induction are charged on the electric conductive material 3. It has been found that with respect to the value of the electric current on the primary side of the high voltage electrostatic
A transformer, 0.02 A ~ 0.3 A per 1 m$^2$ of an electrode is optimum.

Fig. 2 shows an embodiment in which an apparatus for preventing frost from being formed according to the invention is applied to a freezing machine. The freezing machine 2 mounted on the upper portion of the refrigerator 11 comprises a body portion 12 including a compressor, a condenser, an expansion valve and the like provided at the exterior of the refrigerator 11 and a cooling portion (an evaporator) 14 with heat dissipating fins 15 provided at the interior of the refrigerator 11. The cooling portion 14 is made of an electric conductive metal tube and is connected with the body portion 12 of the freezing machine through electric insulating joints 13 so that it is electrically insulated from the body portion 12. A negative electron generating device 1 is provided at the exterior of the wall 6. In the same way as the explained embodiment, an alternating current of 100 V is impressed on the primary side and one pole of the secondary side of high voltage is electrically insulated and only the other pole is connected with the cooling portion 14. Thus, negative electrons are charged on the cooling portion 14.

A result of comparative tests between the refrigerator and the freezer to which the apparatus for preventing frost from being formed according to the invention is applied and the conventional ones will be
(1) Temperature in refrigerator -3 °C;
    Temperature of the ambient air 10 °C;
    Humidity 50 %

<table>
<thead>
<tr>
<th>Past Time</th>
<th>12 hrs.</th>
<th>24 hrs.</th>
<th>a week</th>
<th>a month</th>
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<tr>
<td>Frost Condition</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>invention</td>
<td>NO</td>
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<td>NO</td>
</tr>
<tr>
<td>prior art</td>
<td>NO</td>
<td>NO</td>
<td>thin frost</td>
<td>heavy frost</td>
</tr>
</tbody>
</table>

(2) Temperature in refrigerator -3 °C;
    Temperature of the ambient air 10 °C;
    Humidity 70 %

<table>
<thead>
<tr>
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<tr>
<td>Frost Condition</td>
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<tr>
<td>invention</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>prior art</td>
<td>NO</td>
<td>thin frost</td>
<td>some frost</td>
<td>heavy frost</td>
</tr>
</tbody>
</table>

(3) Temperature in refrigerator -25 °C;
    Temperature of the ambient air 10 °C;
    Humidity 50 %
(4) Temperature in refrigerator -25 °C;
   Temperature of the ambient air 20 °C;
   Humidity 70 %

A result of comparative tests between the freezing machine to which the apparatus for preventing frost from being formed according to the invention is applied and the conventional ones will be shown hereinafter.

(5) Temperature in refrigerator -3 °C;

<table>
<thead>
<tr>
<th>Past Time</th>
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<td>Frost Condition</td>
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<td>NO</td>
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<td></td>
<td>prior art</td>
<td>thin frost</td>
<td>thin frost</td>
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<td>prior art</td>
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<tr>
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<tr>
<td></td>
<td>prior art</td>
<td>NO</td>
<td>thin frost</td>
<td>heavy frost</td>
</tr>
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As easily understood from the comparative tests shown hereinbefore, the frost forming preventing apparatus according to the invention has a remarkable effect to prevent the forming of the frost.

The reference numerals in the following claims do not in any way limit the scope of the respective claims.
THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. An apparatus for preventing frost from being formed characterized in that an electric conductive material (3) is lined on an inner surface of a wall (6) of a freezing equipment (10) such as a refrigerator and a freezer through an electric insulating material (4) and negative electrons are charged on said electric conductive material lining (3).

2. An apparatus for preventing frost from being formed characterized in that a cooling portion (15) of a freezing machine (2) is electrically insulated from a body portion (12) of said freezing machine (2) and negative electrons are charged on said insulated cooling portion (15).
3. An apparatus for preventing frost from being formed substantially as hereinbefore described with reference to the drawings.

4. The steps, features, compositions and compounds disclosed herein or referred to or indicated in the specification and/or claims of this application, individually or collectively, and any and all combinations of any two or more of said steps or features.

DATED this FOURTEENTH day of DECEMBER 1990

Tatsukiyo Otsuki

by DAVIES & COLLISON

Patent Attorneys for the applicant(s)