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(54) **ICE DETECTION UNIT AND REFRIGERATOR WITH SUCH AN ICE DETECTION UNIT USING HYDRODYNAMIC PROPERTIES OF LIQUIDS AND METHOD FOR DEFROSTING OF A REFRIGERATOR**

(57) The present invention refers to an ice detection unit (1). Said ice detection unit (1) comprises at least a deformable housing (4) for holding an indicator material (6), wherein said indicator material (6) has a phase change temperature at ambient pressure of 1 bar below 3°C, wherein said indicator material (6) is in a liquid phase above said phase change temperature and wherein said indicator material (6) is in a solid phase below said phase change temperature, wherein a volume of said deformable housing (4) changes with the phase of said indicator material (6), a defrost heater circuit (27), an activation or deactivation element (15) for activation or deactivating a defrost heater (30) of said defrost heater circuit (27), wherein the deformable housing (4) and the activation or deactivation element (15) are mechanically coupled, wherein a phase change of indicator material (4) causes a deflection of the activation or deactivation element (15) for activating or deactivating said defrost heater (30).

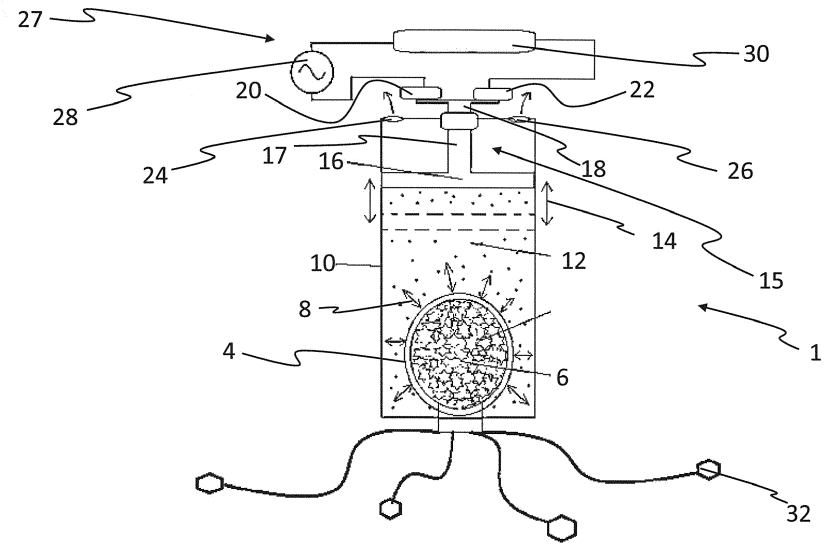

Fig. 1

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Description

[0001] The present invention refers to an ice detection unit according to claim 1, a refrigerator according to claim 10 and a method for operating a refrigerator according to claim 12.

Background of the Invention

[0002] In all no-frost refrigerators, there is a heater on the heat-exchanger for prevent icing. After starting of refrigerator, heat-exchanger starts cooling and icing. This is unwelcome situation by user and inefficient situation by cooling performance of refrigerator. So, there is located a heater on the heat-exchanger in all no-frost refrigerators to prevent icing. After a long certain time (8-12 hours) starting of the refrigerator, the heater works a small certain time (5-10 minutes) for melting the ice. This operation is called as defrost.

[0003] Document US4843830A discloses a differential ice sensing system and method for a cold drink beverage dispenser or the like. The beverage dispenser has an ice bath cooling tank containing a supply of water. A refrigerated cooling surface is provided within the tank so as to freeze a portion of the water into a body of ice. The beverage dispenser has a beverage flow path which is cooled by the liquid in the ice bath. The differential ice sensing system comprises a first conductivity (or impedance) probe which is disposed in the water of the ice bath at a position where it will sense the conductivity of the ice when the body of ice formed on the refrigerated surface attains a predetermined size. A second conductivity probe is disposed within the liquid so that it is maintained in conductivity sensing relationship with the liquid. Each of the probes is responsive to an electric current supplied thereto to measure the electrical conductivity in its vicinity A system is provided for detecting conductivity differences between the first and second probes indicative of the presence of ice at the first probe and for generating a signal indicating presence of ice at the first probe This signal may be utilized to block the flow of refrigerant to the refrigerated surface when the body of ice formed has reached a pre-determined size and to initiate the flow of refrigerant when the body of ice is less than a desired size.

[0004] Document WO0009960A2 discloses an apparatus and method that regulates the size of an ice bank and that prevents short cycling of the compressor therefor and operation thereof at undesired voltages. A microprocessor based control circuit includes a circuit for sensing line voltage combined with an ice bank sensing circuit. The ice bank sensing circuit is of the conductivity sensing type wherein the electrical conductivity between two probes is sensed. The microprocessor continually monitors the probes to determine if refrigeration is needed or not, and continually senses the line voltage to determine if that voltage is within the design limits of the refrigeration compressor. The voltage sensing circuit can also sense if power has been interrupted where the voltage drops to zero.

[0005] Document US3782130A discloses a refrigerator, said refrigerator is arranged to cool part of an area for which an indication of the imminence of ice-formation is required. A first temperature sensitive circuit and a first conductivity probe are situated in that part of the area while a second temperature sensitive circuit and a second conductivity probe are situated outside it. A first differential amplifier compares the conductivities of the conductivity probes and a second differential amplifier compares the outputs of the temperature sensitive circuits. The outputs of one of the differential amplifiers controls the refrigerator while the output of the other differential amplifier provides the said indication.

[0006] Document DE2641600A1 discloses he initiator of a deicing system is used in an evaporator, especially in a heat pump. The initiator has electrode scanning the evaporator surface. The conductivity increased by ice formation switches the deicing device on by a discriminator circuit. The deicing device is started only if the evaporator is actually covered with ice. The deicer is not connected when the environment is cold but dry, nor when the electrode gap is subjected to droplets. The electrode is arranged in front of the end edge of the air baffle plates connected to the evaporator pipe. The effective length of the electrode is short in relation to the end edge. The discriminator circuit switches the deicer on only if the higher conductivity is still present after a delay time. The electrode consists of a head held on a rod fixed on an insulating support on the baffle plate.

[0007] Disadvantages of prior art system are unnecessary power consumption, expensive and complex sensors and/or non-sensitive systems.

[0008] Thus, the main problem is that the presence and amount of ice on the heat-exchanger is not detected simultaneously without sensors. Defrost operation is done automatically with help of periodic programming. Existence of ice and need of heating to melt the ice is unknown. So, this periodic defrost operation causes inefficient situation by energy consume and cooling performance of No-frost refrigerators.

Object of the Invention

[0009] Therefore, it is the object of the present invention to provide an advanced ice detection unit, a refrigerator with such an advanced ice detection unit and a method for operating such a refrigerator.

Description of the Invention

[0010] The before mentioned object is solved by an ice detection unit or ice detection and ice removing unit according to claim 1. The term ice preferably comprises besides ice also snow, but it is possible to limit the term ice also to ice only. The ice detection unit preferably comprises at least a deformable housing for holding an indi-

cator material, wherein said indicator material has a phase change temperature at ambient pressure of 1 bar below 3°C, wherein said indicator material is in a liquid phase above said phase change temperature and wherein said indicator material is in a solid phase below said phase change temperature (and ambient pressure of 1 bar), wherein a volume of said deformable housing changes with the phase of said indicator material, a defrost heater circuit, an activation or deactivation element for activation or deactivating a defrost heater of said defrost heater circuit, wherein the deformable housing and the activation or deactivation element are mechanically coupled, wherein a phase change of indicator material causes a deflection of the activation or deactivation element for activating or deactivating said defrost heater.

[0011] This solution is beneficial, since an operation of the defrost heater unit can be caused in dependency of real conditions inside a cooling device, like a refrigerator. Thus, the lifetime of the heater unit can be increased since it is only operated in case it is necessary and energy losses are also reduced. It is further beneficial since unnecessary power consumption, expensive and complex sensors, non-sensitive systems, microcontroller based systems can be avoided.

[0012] Thus, the solution of the present invention is based on hydrodynamic properties of liquids. The effect is used that when an indication material like water is changed from liquid to solid, volume increases. The inventive unit or system thus includes a preferably durable liquid reservoir for transmission of volume changes from an indication material, in particular liquid water to solid ice, a flexible liquid water-solid ice reservoir respectively a deformable housing for exciting the system respectively unit, preferably a good thermal pallet conductor to receive the heat (coldness) on the different points of heat-exchanger surface, a mobile baffle arm for triggering the defrost operation cycle and preferably air ducts for moving said mobile baffle arm respectively activation and/or deactivation element freely (Be unaffected by the pressure change).

[0013] The indicator material is preferably water or demineralized water or comprises at least 50% water or 75% water or 90% water or 95% water (% means with respect to this invention in case of materials always % of volume or weight but preferably % of volume).

[0014] Further preferred embodiments of the present invention are subject-matter of the dependent claims and/or of the following parts of the specification.

[0015] According to a preferred embodiment of the present invention the volume of deformable housing increases due to freezing, wherein said activation or deactivation element deflects into a first direction and the volume of deformable housing decreases due to melting, wherein said activation or deactivation element deflects into a second direction, wherein the second direction is the opposite direction of the first direction. This embodiment is beneficial since the indication material can expand without causing damages on housing. Preferably no gas is inside said part of deformable housing in which said indication material is arranged. Respectively less than 1% (weight) or less than 0,01% (weight) or less than 0,001% (weight) or less than 0,0001% (weight) of material inside said part of the housing wherein said indication material is arranged is a gas (at 1 bar ambient pressure and 0°C).

[0016] The defrost heater circuit is closed according to a further preferred embodiment of the present invention by activation or deactivation element in case said activation unit is deflected into the first direction and the defrost heater circuit is opened in case said activation unit is deflected into the second direction. This embodiment is beneficial since preferably a direct dependency between freezing of indication material and operation of defrost unit can be set up.

[0017] The activation or deactivation element and deformable housing are arranged according to a further preferred embodiment of the present invention inside a liquid reservoir, wherein said activation or deactivation element is movable arranged inside the liquid reservoir and wherein said activation or deactivation element preferably seals said reservoir. The activation or deactivation element preferably comprises a piston-like element, wherein said piston-like element has a first end for sealing said liquid reservoir and wherein said piston-like element has a second end for closing or opening the defrost heater circuit, wherein the first end and the second end are on opposing sides of the piston-like element. This embodiment is beneficial since a deformation of said deformable housing can be transformed into a longitudinal movement of the activation or deactivation element.

[0018] The liquid reservoir is according to a further preferred embodiment of the present invention filled with an actuation material for deflecting the activation or deactivation element, in particular piston-like element, wherein said actuation material preferably has a phase change temperature at ambient pressure of 1 bar below the phase change temperature of the indicator material, in particular below -2°C or below -3°C or below -4°C or below -5°C, wherein said actuation material is in a liquid phase above said phase change temperature and wherein said indicator material is in a solid phase below said phase change temperature.

[0019] The indication material and the actuation material are both at least in a temperature region between 5°C and 20°C and ambient pressure of 1 bar in a liquid phase. The actuation material is different from the indication material. The actuation material preferably comprises an oil, preferably more than 10% (vol.) and/or additives. Said indication material preferably has no significant volume change, in particular less than 0,1% (vol.) or less than 0,01% (vol.) or less than 0,001% (vol.) or less than 0,0001% (vol.) or less than 0,00001% (vol.), in a temperature range between +10°C and -10°C (at ambient pressure of 1 bar) or between +5°C and -5°C (at ambient pressure of 1 bar).

[0020] The deformable housing and/or the material in-

side the deformable housing is/are according to a further preferred embodiment of the present invention connected to thermal conductors, wherein thermal conductivity of said thermal conductors is higher than thermal conductivity of said actuation material. This embodiment is highly beneficial since the temperature surrounding said liquid reservoir is transferable or applicable to said indication material.

[0021] An operation duration and/or operation temperature of defrost heater is according to a further preferred embodiment of the present invention set up in dependency of a degree of deflection of said activation or deactivation element, wherein at least three or four or five or more than five different operation durations and/or operation temperatures can be set up. This embodiment is beneficial since a degree of heating can be set up in dependency of a deflection of said activation and/or deactivation element.

[0022] The defrost heater circuit comprises according to a further preferred embodiment of the present invention at least an AC source and a heating means and at least two contact elements for setting up a closed connection in case the second end of said preferably piston-like element contacts both contact elements. It is also conceivable that one contact element always contacts the activation and/or deactivation element and the other contact comes in contact in dependency of a deflection of said activation and/or deactivation element.

[0023] The before mentioned object is also solved by a refrigerator, in particular a no frost refrigerator according to claim 10. Such an inventive refrigerator preferably comprises at least a cooling means for cooling down the atmosphere inside the refrigerator, a defrost heater for melting of accumulated ice or snow inside said refrigerator, an ice detection unit according to any of the before mentioned claims respectively described herein for detecting ice inside the refrigerator and for actuating the defrost heater in dependency of detected ice.

[0024] This solution is beneficial since such a refrigerator consumes less energy. Furthermore, the parts of such a refrigerator, in particular the defrost heater is operated less, have a longer live time due to less usage.

[0025] According to a preferred embodiment of the present invention said cooling means is a heat-exchanger and said defrost heater is arranged on or besides or below said heat-exchanger.

[0026] The before mentioned object is also solved by a method for operating a refrigerator. Said method preferably comprises at least the steps: Cooling down a food storage section by means of a cooling means, detecting ice inside the food storage section or on a heat-exchanger by means of operating an ice detection unit according to any of claims 1 to 9, Operating a defrost heater in case the presence of ice is detected.

[0027] An indication material inside a deformable housing freezes according to a further preferred embodiment of the present invention due to the temperature inside said refrigerator, in case the temperature inside said refrigerator is below 0° C (at ambient pressure of 1 bar), wherein the volume of said deformable housing increases due to freezing, wherein a liquid actuation material surrounding said deformable housing is subjected with pressure due to said volume increasing, wherein said actuation material causes a piston-like element due to said pressure to move into a first direction, wherein said piston-like element closes a circuit due to said movement, wherein a defrost heater is operated due to said closed circuit and preferably as long as the circuit is closed or for a predefined time interval. The indication material preferably melts due to the operation of defrost heater, hence the volume of deformable housing decreases due to melting of said indication material, hence the piston-like element moves into a second direction and opens the circuit again due to said movement, wherein the defrost heater stops operating due to said opened circuit.

[0028] This inventive ice detection unit or ice detection and removing unit respectively system can be used both with microcontroller or directly as hardware system with no microcontroller. System preferably works self-controlled. System is preferably completely electrically isolated. For more sensitive defrost activating instead of ON-OFF control, level of mobile baffle arm respectively activation and/or deactivation element can be divided more than one level for contact points of different defrost resistances.

[0029] Further benefits, goals and features of the present invention will be described by the following specification of the attached figures, in which exemplarily components of the invention are illustrated. Components of the systems and methods according to the inventions, which match at least essentially with respect to their function can be marked with the same reference sign, wherein such components do not have to be marked or described multiple times with respect to said figures.

[0030] In the following the invention is just exemplarily described with respect to the attached figures.

Brief Description of the Drawing

[0031]

Fig. 1 shows schematically an ice detection unit according to the present invention and

Fig. 2 shows schematically a refrigerator with an ice detection unit according to the present invention.

[0032] Fig. 1 shows that the working principle of the present invention respectively system is based on hydrodynamics. Due to the property of an indication material 6, in particular water, volume increases in a frozen state and increase in volume is used to trigger a defrost heater circuit. Thus, the system respectively ice detection unit 1 starts receiving from different points coldness prefera-

bly of a heat-exchanger surface preferably with help of good thermal pallet conductors 32. After starting of refrigerator 2, heat-exchanger starts cooling and icing. The coldness is transmitted by good thermal conductors 32 from heat-exchanger surface to flexible liquid water-solid ice reservoir unit 4. At the beginning, flexible liquid water-solid ice reservoir unit 4 respectively deformable housing is water (liquid form) filled. When the received coldness reaches indication material 6 respectively water at freezing level, the indication material respectively water, which is inside of flexible liquid water-solid ice reservoir unit, starts freezing. The volume of frozen indication material 6 respectively water increases and mobile baffle arm respectively activation and/or deactivation element 15 excites the defrost operation. Because of low freezing point liquid in the durable liquid reservoir 10, volume change of water-ice is transmitted to mobile baffle arm 15 respectively activation and/or deactivation unit clearly and because of low freezing point, the liquid respectively actuation material 12 does not freeze in the durable liquid reservoir 10.

[0033] System works self-controlled. There is no need any micro controller. System is preferably completely electrical isolated. For more sensitive defrost activating instead of ON-OFF control, level of mobile baffle arm can be divided more than one level for contact points of different defrost resistances.

[0034] Thus, the present invention refers to an ice detection unit 1. Said ice detection unit 1 comprises at least a deformable housing 4 for holding an indicator material 6, wherein said indicator material 6 has a phase change temperature at ambient pressure of 1 bar below 3°C, wherein said indicator material 6 is in a liquid phase above said phase change temperature and wherein said indicator material 6 is in a solid phase below said phase change temperature, wherein a volume of said deformable housing 4 changes with the phase of said indicator material 6, a defrost heater circuit 27, an activation or deactivation element 15 for activation or deactivating a defrost heater 30 of said defrost heater circuit 27, wherein the deformable housing 4 and the activation or deactivation element 15 are mechanically coupled, wherein a phase change of indicator material 4 causes a deflection of the activation or deactivation element 15 for activating or deactivating said defrost heater 30.

[0035] Said activation and/or deactivation element 15 preferably comprises piston-like element 17. The piston-like element 17 preferably comprises a first end 16 for sealing the liquid reservoir 10. The first end 16 is slideable arranged, thus volume changes of indication material 6 are causing movements of the activation and/or deactivation element 15 with respect to the liquid reservoir 10. A second end 18 of activation and/or deactivation element 15 preferably forms an electric conductor. Said electric conductor 18 can contact a first electrical contact 20 and a second electrical contact 22 for closing a circuit 27. After closing said circuit 27 energy source 28 provides energy for operating defrost heater 30. Activation and/or deactivation element 15 is arranged movable in direction 14. Deformable housing 8 increases volume due to freezing of indication material 6 and decreases volume due to melting of indication material 6. Thermal conductors 32 are preferably provided to transfer heat to indication material 6 or from indication material 6 to surrounding parts. Reference numbers 24 and 26 are indicating ducts for enabling air flow into and out of an area preferably surrounding said piston-like element at least partially.

[0036] Fig. 2 shows a refrigerator 2 comprising an ice detection unit 1 according to the present invention. Said refrigerator 2 further comprises a cooling means, in particular a heat-exchange unit 29. Thermal conductors 33 are preferably on or beside a surface of heat-exchanger 29.

[0037] Thus, the present invention refers to an ice detection unit 1. Said ice detection unit 1 comprises at least a deformable housing 4 for holding an indicator material 6, wherein said indicator material 6 has a phase change temperature at ambient pressure of 1 bar below 3°C, wherein said indicator material 6 is in a liquid phase above said phase change temperature and wherein said indicator material 6 is in a solid phase below said phase change temperature, wherein a volume of said deformable housing 4 changes with the phase of said indicator material 6, a defrost heater circuit 27, an activation or deactivation element 15 for activation or deactivating a defrost heater 30 of said defrost heater circuit 27, wherein the deformable housing 4 and the activation or deactivation element 15 are mechanically coupled, wherein a phase change of indicator material 4 causes a deflection of the activation or deactivation element 15 for activating or deactivating said defrost heater 30.

List of reference numbers

[0038]

1	Ice detection unit
2	refrigerator
4	deformable housing
6	indication material
8	expanding and shrinking direction
10	liquid reservoir
12	actuation material
14	actuation direction
15	activation and/or deactivation element
16	first end
17	piston-like element
18	second end
20	first contact
22	second contact
24	first duct
26	second duct
27	defrost heater circuit
28	energy source (preferably 220V AC)
30	defrost heater
32	thermal pallet conductor

Claims

1. Ice detection unit (1),
at least comprising
a deformable housing (4) for holding an indicator material (6),
wherein said indicator material (6) has a phase change temperature at ambient pressure of 1 bar below 3°C,
wherein said indicator material (6) is in a liquid phase above said phase change temperature and wherein said indicator material (6) is in a solid phase below said phase change temperature,
wherein a volume of said deformable housing (4) changes with the phase of said indicator material (6),
a defrost heater circuit (27)
an activation or deactivation element (15) for activation or deactivating a defrost heater (30) of said defrost heater circuit (27),
wherein the deformable housing (4) and the activation or deactivation element (15) are mechanically coupled,
wherein a phase change of indicator material (4) causes a deflection of the activation or deactivation element (15) for activating or deactivating said defrost heater (30).

2. Ice detection unit according to claim 1,
characterized in that,
the volume of deformable housing (4) increases due to freezing of said indication material (6),
wherein said activation or deactivation element (15) deflects into a first direction
and
the volume of deformable housing (4) decreases due to melting of said indication material (6),
wherein said activation or deactivation element (15) deflects into a second direction, wherein the second direction is the opposite direction of the first direction.

3. Ice detection unit according to claim 1 or claim 2,
characterized in that,
the defrost heater circuit (27) is closed by activation or deactivation element (15) in case said activation unit is deflected into the first direction
and
the defrost heater circuit (27) is opened in case said activation or deactivation element (15) is deflected into the second direction.

4. Ice detection unit according to any of the proceeding claims,
characterized in that,
activation or deactivation element (15) and deformable housing (4) are arranged inside a liquid reservoir (10),
wherein said activation or deactivation element (15) is movable arranged inside the liquid reservoir (10)
and
wherein said activation or deactivation element (15) seals said liquid reservoir (10).

5. Ice detection unit according to claim 4,
characterized in that,
the activation or deactivation element (15) preferably comprises a piston-like element (17),
wherein said piston-like element (17) has a first end (16) for sealing said liquid reservoir (10) and wherein said piston-like element (17) has a second end (18) for closing or opening the defrost heater circuit (27),
wherein the first end (16) and the second end (18) are on opposing sides of the piston-like element (17).

6. Ice detection unit according to claim 4 or claim 5,
characterized in that,
the liquid reservoir (10) is filled with an actuation material (12) for deflecting the piston-like element (17),
wherein said actuation material (12) has a phase change temperature at ambient pressure of 1 bar below the phase change temperature of the indicator material (6), in particular below - 2°C or below -5°C,

wherein said actuation material (12) is in a liquid phase above said phase change temperature and wherein said indicator material (12) is in a solid phase below said phase change temperature.

7. Ice detection unit according to any of the proceeding claims,
characterized in that,
the deformable housing (4) and/or the indicator material (6) inside the deformable housing (4) is/are connected to thermal conductors (32), wherein thermal conductivity of said thermal conductors (32) is higher than thermal conductivity of said actuation material (12).

8. Ice detection unit according to any of the proceeding claims,
characterized in that,
an operation duration and/or operation temperature of defrost heater (30) is set up in dependency of a degree of deflection of said activation or deactivation element (15), wherein at least three different operation durations and/or operation temperatures are set up.

9. Ice detection unit according to any of the proceeding claims,
characterized in that,
defrost heater circuit (27) comprises at least an AC source (28) and a defrost heating means (30) and at least two contact elements (18, 20) for setting up a closed connection in case the second end (18) of said piston-like element (17) contacts both contact

elements (20, 22).

10. Refrigerator (2), in particular no frost refrigerator, at least comprising
a cooling means (29) for cooling down the atmosphere inside the refrigerator (2),
a defrost heater (30) for melting of accumulated ice or snow inside said refrigerator (2),
an ice detection unit (1) according to any of the before mentioned claims for detecting ice inside the refrigerator (2) and for actuating the defrost heater (30) in dependency of detected ice.

11. Refrigerator (2) according to claim 10,
characterized in that
said cooling means is a heat-exchanger (29) and said defrost heater (30) is arranged on or besides or below said heat-exchanger (29).

12. Method for operating a refrigerator (2), at least comprising the steps:

Cooling down a food storage section by means of a cooling means (29),
Detecting ice inside the food storage section or on a heat-exchanger (29) by means of operating an ice detection unit (1) according to any of claims 1 to 9,
Operating a defrost heater (30) in case the presence of ice is detected.

13. Method according to claim 12,
characterized in that
an indication material (6) inside a deformable housing (4) freezes due to the temperature inside said refrigerator (2),
wherein the volume of said deformable housing (4) increases due to freezing,
wherein a liquid actuation material (12) surrounding said deformable housing (4) is subjected with pressure due to said volume increasing,
wherein said actuation material (12) causes a piston-like element (17) due to said pressure to move into a first direction (14),
wherein said piston-like element (17) closes a circuit due to said movement,
wherein a defrost heater (30) is operated due to said closed circuit.

14. Method according to claim 13,
characterized in that
the indication material (6) melts due to the operation of defrost heater (30),
the volume of deformable housing (4) decreases due to melting of said indication material (6),
the piston-like element (17) moves into a second direction and opens the circuit (27) again due to said movement,
wherein the defrost heater (30) stops operating due to said opened circuit (27).

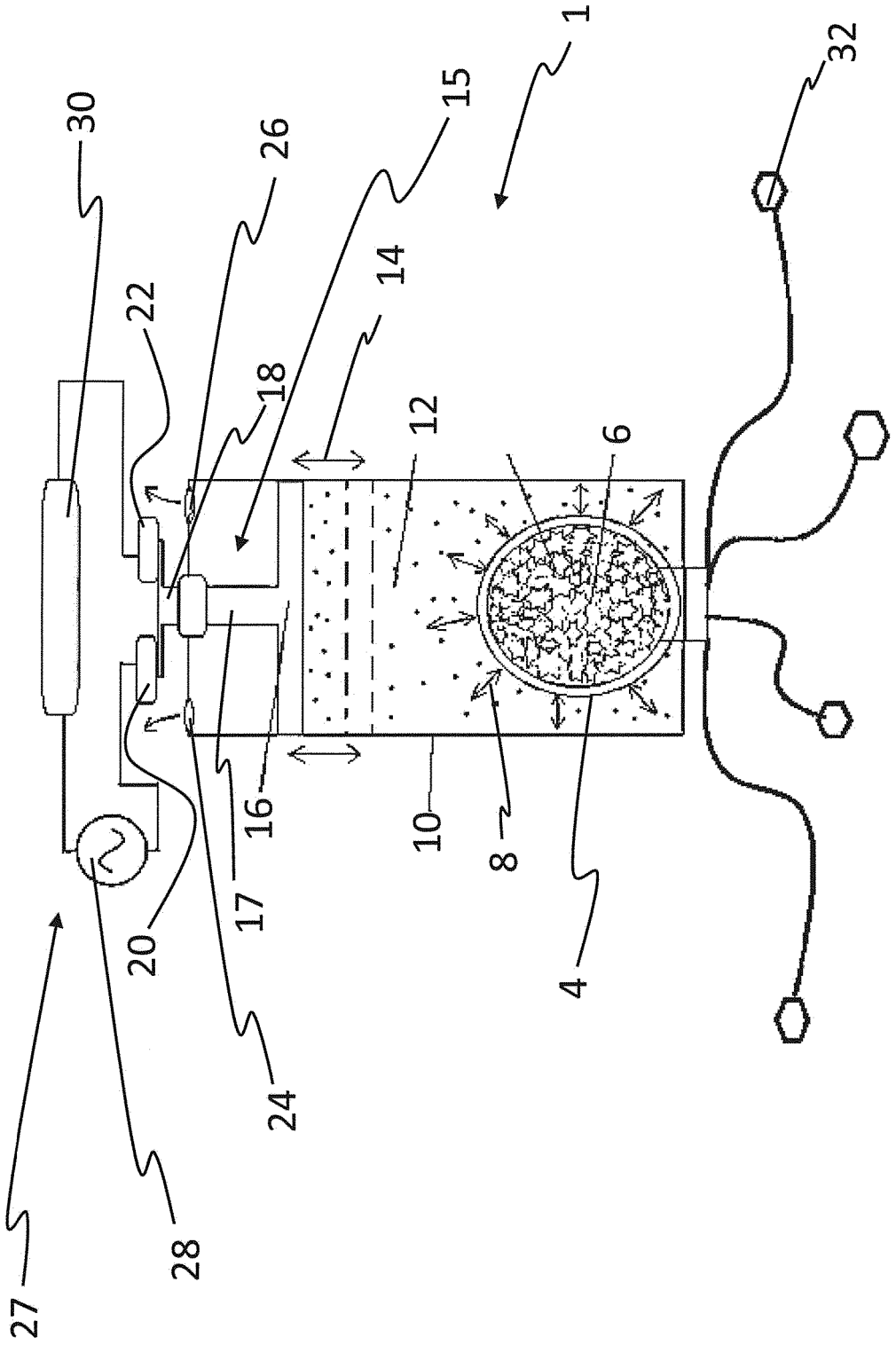

Fig. 1

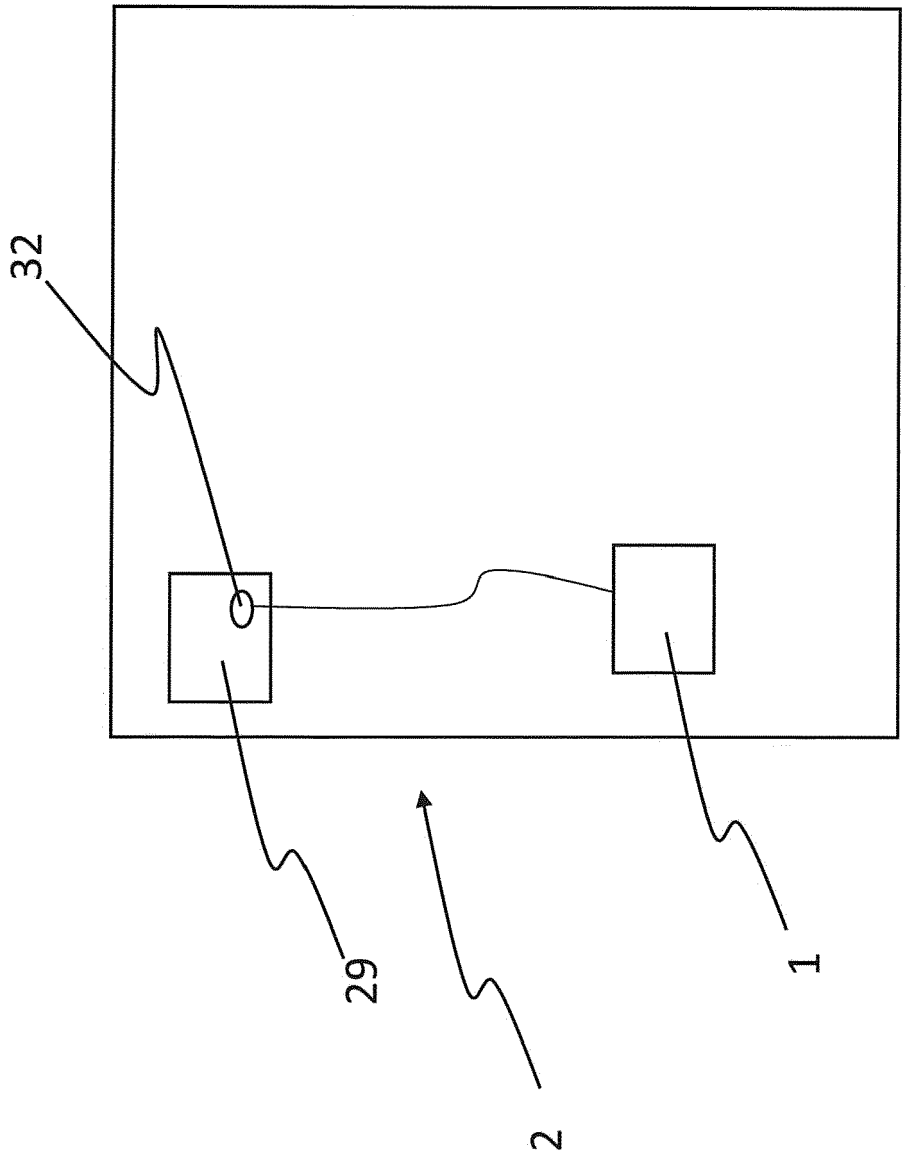

Fig. 2

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EUROPEAN SEARCH REPORT

Application Number
EP 17 15 4044

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	FR 1 303 891 A (ROBERT, FORGEOIS, CABINET R. VANDER-HEYM) 14 September 1962 (1962-09-14) * page 1, line 7 - page 2, line 12; figure 1 * -----	1-5,8-14	INV. F25D21/00 F25D21/02 F25D21/08
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A	GB 859 212 A (DAIRY SUPPLY CO LTD) 18 January 1961 (1961-01-18) * the whole document * -----	1,12	

TECHNICAL FIELDS SEARCHED (IPC)

F25D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	13 July 2017	Kolev, Ivelin

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 17 15 4044

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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13-07-2017

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR 1303891 A	14-09-1962	NONE	
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GB 859212 A	18-01-1961	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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- WO 0009960 A2 **[0004]**
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- DE 2641600 A1 **[0006]**