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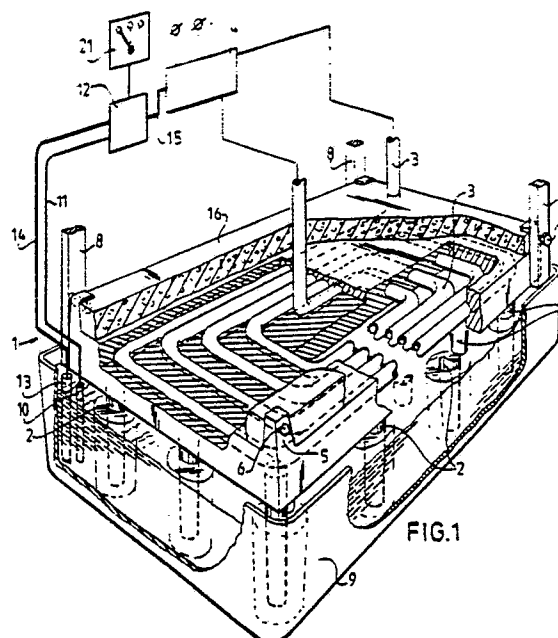
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54 **Apparatus for producing icecubes.**

57 The invention relates to an icecube machine, wherein cooled fingers (2) extend in a vessel (9) of water. By sufficient cooling of said fingers (2), the water round the fingers freezes. The freezing process is ended after a pre-determined period has been elapsed since the reach of a pre-determined temperature of the water or of the fingers. This makes the result independent of the supplied temperature of the water. By varying the pre-determined period, the size of the icecubes can be varied without fundamental changes in the machine. When the freezing process is ended, the fingers (2) are heated, so that the icecubes leave the fingers. Subsequently, the vessel (9) of water is removed, so that the separated icecubes drop into a receptacle.



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APPARATUS FOR PRODUCING ICECUBES

The present invention relates to a method for preparing icecubes by freezing of water, comprising the following steps:

- letting water flow into a vessel until a level, according to which fingers attached to a freezing element provided above the vessel are dipped at least partially in the water;
- letting the freezing element freeze, so that icecubes are formed around the fingers; and
- determining of the freezing process when the icecubes have reached a sufficient size; the removal of the water vessel and the removal of the icecubes from the fingers.

Such a method is known from the Dutch patent application 3.216.597.

According to this known method, the freezing process is terminated when a sensing element for the sensing of the size of the icecubes has determined that said icecubes have reached a certain size. According to said specification, this sensing element takes the shape of a stirring element, driven by a motor, which stirring element has been provided in the vicinity of at least one of said fingers, so that, when the icecubes have reached a certain size, the movement of the stirring element is disturbed and the motor driving the stirring element will be subjected to a movement as a consequence of the disturbance of the movement of the stirring element. The flexible suspension of said motor is such, that, when said motor is moved, a switch is tripped, so that the freezing process is terminated.

This method requires a flexible suspension of the motor, which may lead to frequent defects, possibly also as a consequence of the resulting temperature changes and the condensation resulting therefrom. Further, such a flexible suspension of a motor is not very reliable.

The aim of the present invention is to provide a method for preparing icecubes in a reliable way, which method requires an apparatus, which will not lead to frequent defects.

This aim is reached by having the freezing process extending during a pre-determined period after the reach of a pre-determined temperature.

As a consequence of this method, the requirement for a flexible suspended motor and a switch acting on the movements of said motor is eliminated. Only a measuring member for the measuring of the temperature of the water or of the freezing element is being used, after which the determination of the period of the freezing process takes place fully independently. This does not require any elements, which are subjected to me-

chanical wear and the defects resulting therefrom.

Subsequently, the present invention will be described with the help of the accompanying drawings, wherein:

fig. 1: is a perspective view, partly broken away, of an apparatus according to the present invention;

fig. 2: a perspective view, slanting from underneath of a freezing element according to the present invention during the removal of the icecubes;

fig. 3: a schematic cross-section of a freezing element according to the present invention with a vessel located thereunder; and

fig. 4: a schematic section of a freezing element, composed of two separate elements according to the present invention, with the vessel located underneath.

For the execution of the method according to the present invention, use is made of a block-shaped freezing element 1, comprising conical fingers 2 extending downwardly therefrom. The freezing element 1 comprises a spiral-shaped tube 3. This tube 3 has been connected with a cooling apparatus 4 in a way known in this art. For the fixation of the freezing element 1, this freezing element comprises ears 5, into which holes 6 have been provided. By means of the ears 5 and the holes 6 located therein, the freezing element 1 can be attached to the frame 8 of a icecube apparatus not depicted in the drawing.

A vessel 9 has been provided such under the freezing element 1, that the fingers 2 extend into said vessel. A temperature sensing element 10 has been provided in the vessel, which has been coupled with a controlling member 12, by means of a lead 11. Also a water level sensor 13 has been provided in the vessel, which sensor is also connected with the controlling member 12 through a wire 14. The controlling member 12 has been connected with the cooling apparatus 4 by means of a lead 15. At the upper side of the freezing element 1, a layer of insulating material 16 has been provided.

Fig. 2 shows the fixation of the vessel 9. Two arms 17 have been provided at the vessel 9, of which the ends comprise holes 18. An axle 19, located firmly in the frame of the icecube machine, extend through these holes, so that the vessel 9 can be tilted around the axle 19.

Subsequently the method according to the present invention will be described, wherein use will be made of the apparatus described before. As is shown in fig. 3, initially the vessel 9 is filled with

water by means of a water supply tube 20. The supply of water is measured by a level sensor 13, wherein the signal supplied by the level sensor is led to the control unit 12 by means of the lead 14. This control unit 12 actuates an electric valve 21, provided in the water supply tube 20 such that, when a pre-determined water level has been reached in the vessel, the supply of water is cut off. With the water level thus obtained, the fingers 2 are dipped in the water for a considerable part.

Further the control unit 12 initiates the freezing process, which implies that coolant is lead through the tube 3, which coolant will vaporate mainly in the freezing element, which initiates the freezing process. During this freezing process, the temperature of the water being present in the vessel, respectively of the freezing element is being measured. When the water and so the freezing element have reached a pre-determined temperature, the control unit 12 controls the freezing process such that this, after the reach of the pre-determined temperature is being maintained during a pre-determined period. The basis therefore is that one does not want to have the control of the freezing process dependent on mechanic switching gear, but instead one controls the freezing process with the help of a timing switch, which is of course less prone to defects inherent than mechanical switching apparatus.

One has to take into account that the water, being supplied by the water supply chip 12, has not a constant reproducible temperature. To solve this problem, the freezing process is initiated with the freezing process and the timing switch starts working at the moment, that a certain water temperature has been reached. This will allow a reproducible size of the icecubes.

Further this control offers the possibility to prepare icecubes with different sizes. Thereto a selecting switch 21 is connected with the control unit 12, so that by the actuating of the selecting switch 21, the period of the freezing process taking place after the reaching of a pre-determined water temperature can be varied, so that the size of the icecubes can easily be varied.

When the freezing process has been completed, the control unit 12 makes the connection of the tube 3 with the cooling apparatus 4 such that warm gasses are lead through the freezing element 1. As a consequence thereof the fingers 2 become warm, so that the icecubes will melt from the fingers. Further the vessel 9 has been tilted away by means of the action of the control unit 12 for which action a tilted mechanism, not depicted in the drawing, but known in this art is provided, so that the icecubes melted apart fall down and fall into a receptacle, not depicted in the drawings, where they can be taken out for use. This process

has been depicted in fig. 2.

As has been depicted in fig. 4, with the help of the ears 5, different freezing elements 1 can be composed to one big freezing element. This has the advantage, that with a freezing element 1 of standard sizes, icecube machines with different capacities can be manufactured. Consequently the cost of production is decreased. Of course, the tube 3, through which the coolant flows, have to be connected in series or parallel. Also the capacity of the cooling machine 4 has to be adapted and a bigger receptacle 9 has to be used.

Fig. 4 also shows the temperature sensor 10 for the sensing of the temperature has not been provided in the vessel, but instead on one of the freezing elements. This has the advantages that the temperature sensor is not dipped into water repeatedly, but instead keeps dry, which stretches its life time. As the thermal resistance of the fingers 2 and the freezing element is constant, it is also possible to measure the temperature of the water on the freezing element.

The selection switch enables to control the size of the icecubes to be produced. To this end, the selection switch 21 has been provided on the control panel of the icecube machine, so that the user can easily select the size of the icecubes.

Further the remark is made, that with the apparatus and the method according to DE-A-3.216.597, it is indeed possible to vary the size of the icecubes to be produced, but the stirring element has to be replaced thereto, which of course, can not be executed on every moment, as the icecube machine has to be opened. Such labours will generally only be taken by a engineer. Consequently, the present invention allows to vary the size of the icecubes to be produced in an easy way.

Claims

1. Method for preparing icecubes by freezing of water, comprising the following steps:

- letting water flow into a vessel until a level, according to which fingers attached to a freezing element provided above the vessel are dipped at least partially in the water;
- letting the freezing element freeze, so that icecubes are formed around the fingers; and
- terminating the freezing process when the icecubes have reached a sufficient size, removing of the water vessel and the removing of the icecubes from the fingers, **characterized in** that the freezing process stretches during a pre-determined period after the reaching of a pre-determined temperature.

2. Method according to claim 1, **characterized in** that the pre-determined period is variable.

3. Apparatus for the preparing of icecubes according to one of the preceding claims, comprising:
- a freezing element, comprising fingers extending downwardly therefrom;

- a removable vessel located under the cooling element, which can be filled with water to such a level, that the fingers extend in the water and can be subjected to a freezing process; and
- means for removing the icecubes from the fingers after the freezing process,

characterized by:

- means for measuring the temperature; and
- means for controlling the freezing process such that after the reaching of a certain temperature, this process will be maintained during a pre-determined period.

4. Apparatus according to claim 3, **characterized in** that the means for measuring the temperature are a temperature sensor, located in the vessel.

5. Apparatus according to claim 3, **characterized in** that the means for measuring the temperature are a temperature sensor, located on the freezing element.

6. Apparatus according to one of the claims 3, 4 or 5, **characterized in** that the freezing element is a substantial spiral-shaped tube, which is surrounded by a body, being monolithic with the fingers.

7. Apparatus according to one of the claims 3, 4 or 5, **characterized in** that the freezing element is a substantial zig-zag tube, being surrounded by a body, being monolithic with the fingers.

8. Apparatus according to claim 6 or 7, **characterized in** that the body has been provided with a layer of insulating material at its upper side.

9. Apparatus according to one of the claims 6, 7 or 8, **characterized in** that the freezing element comprises coupling means for coupling with other freezing elements to obtain a multiple freezing element with a bigger size.

10. Apparatus according to one of the claims 3-9, **characterized in** that the fingers are substantially conical.

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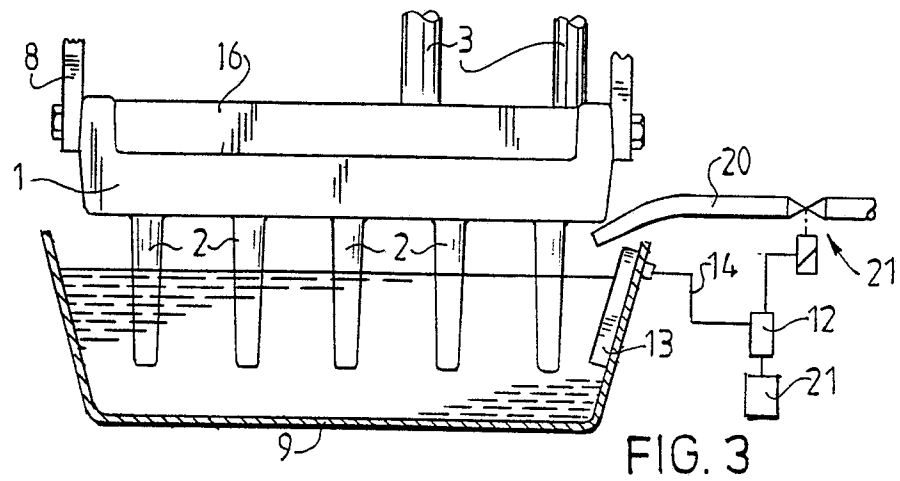
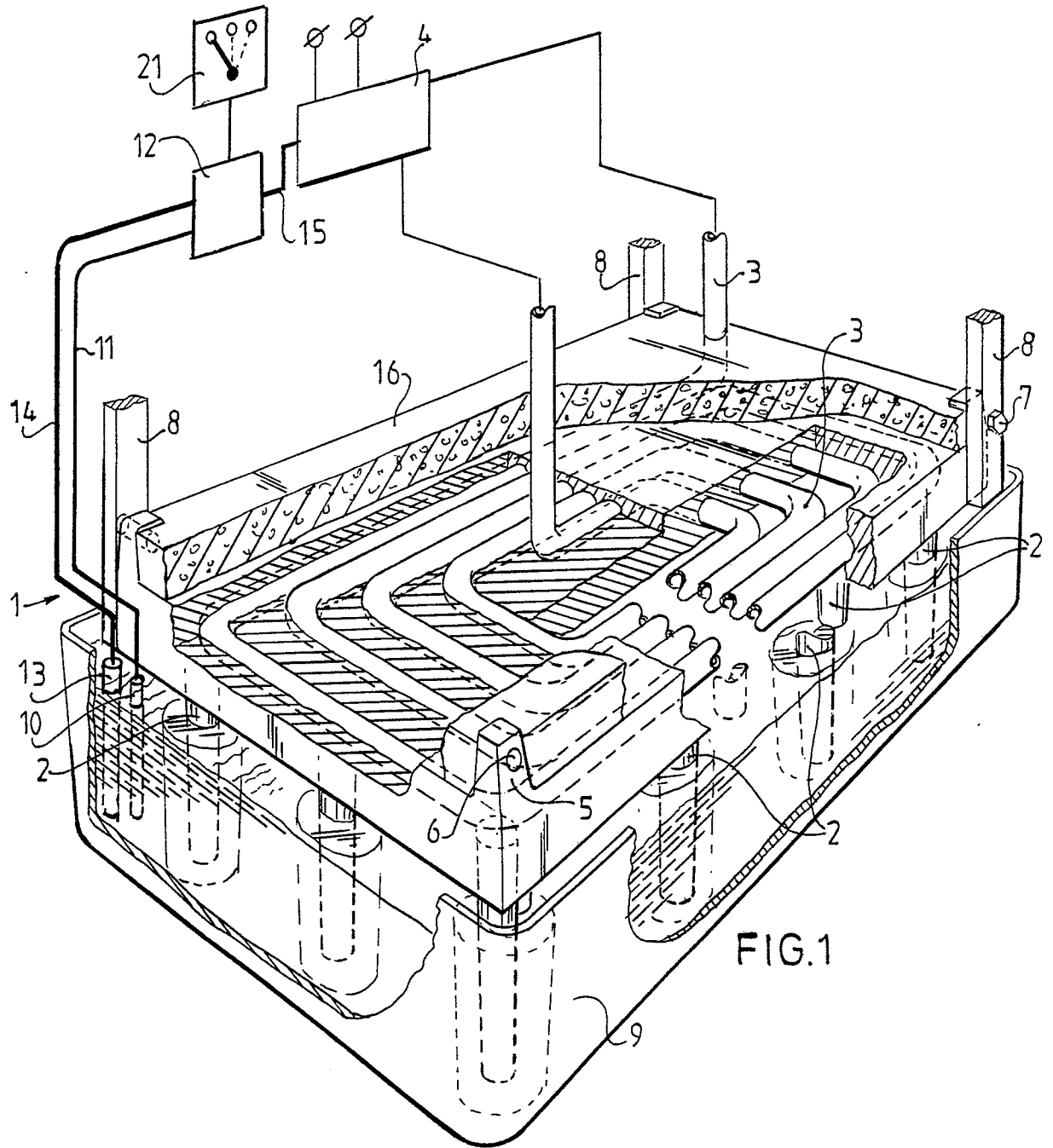
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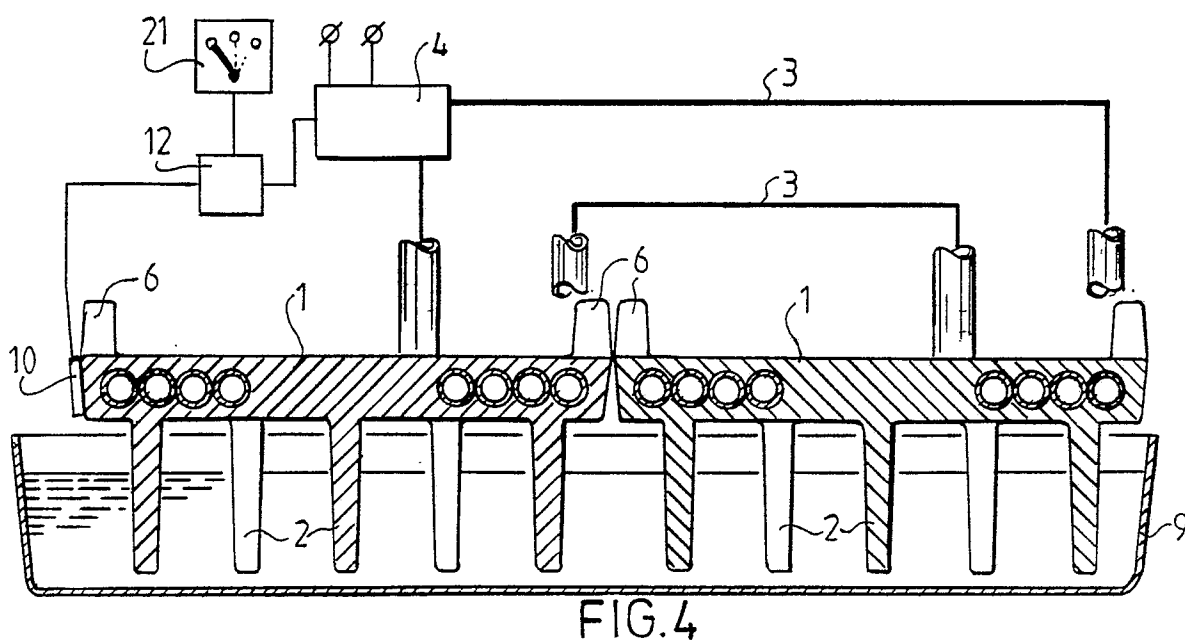
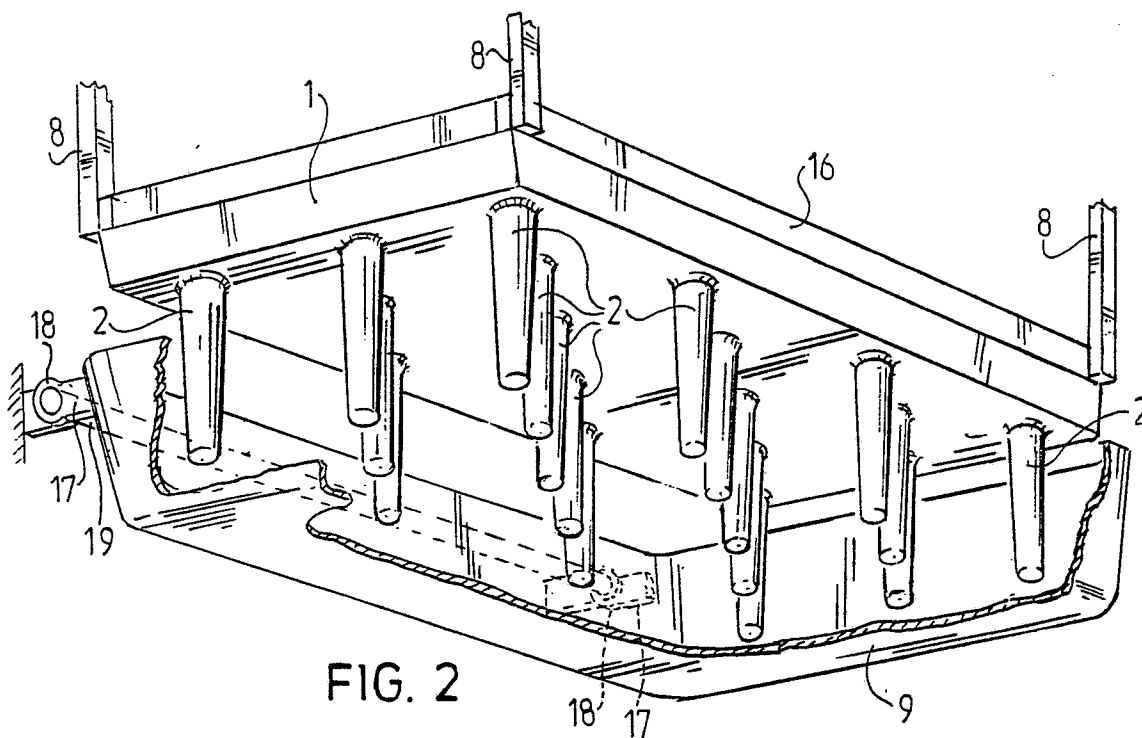
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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
Y	US-A-3 380 261 (HENDRIX et al.) * Whole document *	1-5	F 25 C 1/08
A	---	6,8	
Y	US-A-4 344 295 (LINSTROMBERG) * Whole document *	1-5	
A	---		
A	AU-B- 22 730 (BLAKELY)(1977) * Page 11 *	1,3	
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A	DE-A-2 946 708 (WESSA) * Whole document *	6,10	
A	---		
A	DE-A-2 647 541 (WESSA) * Whole document *	7	
A	---		
A	US-A-3 449 919 (FOX) ---		
A	US-A-3 659 430 (NICHOLS et al.) ---		
A	US-A-2 221 694 (POTTER) ---		TECHNICAL FIELDS SEARCHED (Int. Cl.4)
A	GB-A-2 189 016 (BROWN) -----		F 25 C
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 01-02-1989	Examiner SILVIS H.
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			