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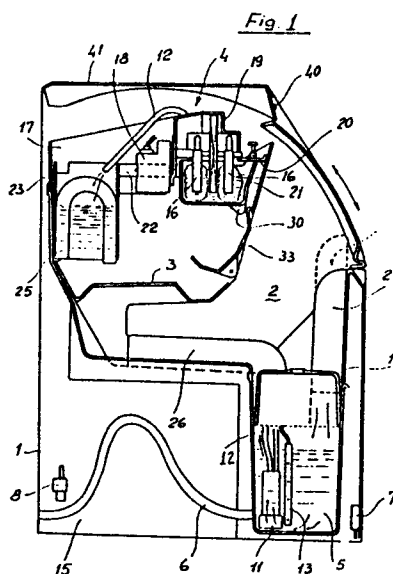
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**(54) Apparatus for automatically and continuously making ice cubes.**

(57) The present invention relates to an apparatus for automatically and continuously producing ice cubes, comprising a thermally insulated supporting frame (1) comprising, in its inside, an ice collecting vessel (2), accessible from the outside, and overlaying a water collecting and re-using tank (5).

Depending on the refrigerating circuit type, i.e. either of the water or air condensing type, that tank (5) may be either independent or not from the outer water supply system coupling, depending on user choice.

A pump (11) for supplying water to an ice making assembly (4) communicates with the mentioned water collecting tank, which ice making assembly comprises an evaporator (16) which may be immersed from a small tank (21) holding water for making ice, said small tank being supported at one end of a counterweighted lever mechanism (22), which is counterweighted, at the other end thereof, by a further variable weight small tank (23) provided with a siphon member (25) for discharging water, which siphon member may be actuated by said pump, through preset operating cycles of the lever mechanism.



## Description

## APPARATUS FOR AUTOMATICALLY AND CONTINUOUSLY MAKING ICE CUBES

The present invention relates to an apparatus for automatically and continuously making ice cubes.

As is known the presently available apparatus for automatically and continuously making ice cubes are generally operatively provided with an evaporating assembly, which is immersed in a water holding small tank, in order to freeze water to form the ice cube about the bottom lugs or the evaporator.

As the ice cube has been formed, it is necessary to remove said small tank and, in the meanwhile, heated fluids, introduced into the bottom lugs, cause the formed ice cubes to be detached from said bottom lugs.

The above mentioned prior art apparatus are affected by drawbacks, relating to the operating steps to be carried out thereby, and, most important, those machines or apparatus comprise a great number of sensing and driving members, which add to the complexity or the apparatus structure.

Yet another problem affecting prior art apparatus is that of detecting the ice amount which is present in the reserve tank, in order to provide the apparatus with the stop command, as said ice amount has reached the preset level.

This control operation is presently carried out by means of thermostatic assemblies, which are rather complex, or comparatively high cost and poor reliability.

Accordingly, the task of the present invention is to overcome the above mentioned drawbacks, by providing an apparatus for automatically and continuously making ice cubes which affords the possibility of carrying out the automatic ice making operative cycles without the need of using complex driving systems, while reducing to a minimum the level control means.

Within the scope of the above mentioned task, it is a main object of the present invention to provide such an apparatus, for making ice cubes, which can be easily fitted to the user needs, owing to the feature that its ice making capability may be quickly and easily modified.

Yet another object of the present invention is to provide such an ice making machine or apparatus including a single driving or operating variably counterweighted member which, in addition to precisely operating, has a greatly simple structure, thereby remarkably reducing its making cost.

Yet another object of the present invention is to provide such an apparatus, for automatically and continuously making ice cubes, which is very safe and reliable in operation.

According to one aspect of the present invention, the above task and objects, as well as yet other objects, which will become more apparent hereinafter, are achieved by an apparatus for automatically and continuously making ice cubes, characterized in that it comprises a thermally insulated supporting frame defining in its inside an ice collecting vessel, accessible from the outside and overlying a water collecting tank, a pump for supplying water to an ice

making assembly communicating with said water collecting tank.

More specifically, the above mentioned ice making assembly comprises an evaporator, which may be immersed in an ice making small tank supported at one end of a lever mechanism which is counterweighted, at the other end, by a variable weight small tank provided with a water discharging siphon member which may be actuated by said pump for driving, with preset cycles, said lever mechanism.

Further characteristics and advantages of the present invention will become more apparent thereafter from the following detailed description of the subject ice cube making machine or apparatus, which is illustrated, by way of an exemplary but not limitative example, in the accompanying drawings, where:

Figs. 1, 2 and 3 schematically illustrate cross-sectional views of the ice making apparatus according to the present invention, respectively in its operative steps of supplying water to the water holding small tank, siphon member actuating and simultaneous lowering and raising of the tank 23;

Figs. 4 and 5 illustrate, on an enlarged scale, the ice making assembly, with the counterweighted lever mechanism represented in its two end of stroke positions.

With reference to the above mentioned figures, the ice making apparatus according to the present invention comprises an outer supporting frame, indicated generally at the reference number 1, which is thermally insulated and defines, in its inside, an ice collecting vessel 2 which is closed at the top by an upper wall 3 for supporting the ice making assembly, indicated at the reference number 4 and which will be illustrated hereinafter.

The ice collecting vessel 2 overlies a water collecting or holding tank 5, consisting of a tank body provided with a safety discharging siphon member 6 and a key locking system indicated at 7 and illustrated in its mounting position.

The water collecting tank 5 may be manually filled or it may be coupled to the water supply system, which is controlled by an electric valve 8.

Moreover, said water collecting vessel 5 is closed at the top by a cover member 10, which may be located at two different positions.

In the first position of said cover member, which is illustrated in figure 1, the water collecting tank volume is increased.

In the other, upturned or reversed position, there is increased the ice collecting vessel volume and decreased the water collecting tank volume, which position may be preferably used as the water tank is coupled to the water supply system.

With the mentioned water collecting tank an immersed pump 11 communicates, the outlet of which leads to the ice making assembly, as it will become more apparent hereinafter.

Moreover a sensing member 13 for detecting the presence of water in the water collecting tank 5 is

arranged inside said water tank.

The ice making assembly, indicated overall at the reference number 4, comprises a refrigerating system 15, operating either with air or water condensing, which is coupled to lug evaporator 16, which are preferably made of nickel clad copper.

The lugs 16 of the evaporator are supported by a supporting frame 17, preferably made of an optically transparent material, thereto there is coupled a known stirring member 18, operating a stirring blade 19 which sense and adjust the cube thickness.

Registering abutment members 20 are furthermore provided, which, as it will appear more clearly hereinafter, adjust the height of said ice cubes.

The lugs 16 may be introduced into an ice making small tank 21 which is mounted at one end of a swinging lever 22, said lever being counterweighted, at the other end thereof, by a variable weight small tank 23.

The tanks 21 and 23 are swingably mounted with respect to the counterweighted lever mechanism 22 and the pivot pins thereof are arranged above the centers of gravity of the small tanks, thereby said tanks are always held, by gravity, in a vertical position.

The small tank 23 is provided with a siphon member 24 which discharges water downward to convey the water to the water collecting vessel 5, through the provision of covering water discharging cup members 26 which are arranged horizontally and vertically, to recover the water level in the water tank 21.

Advantageously, the vertically extending cup member 27 may be raised in order to facilitate the introduction of water into the tank 5.

The water outlet 12 of the pump discharges into the upper portion of the counterweighted tank 23 and operates, as it will become more apparent hereinafter, to actuate the siphon member with preset operating cycles, to discharge water.

The ice making vessel 21 is provided at the bottom thereof with a projecting portion 30 which will abut, during its swinging movement by the counterweighted lever 22, against a baffle member 33 provided for defining an opening through the separating wall 3 so as to discharge the ice cubes made in the vessel 2.

During the upward moving step in the ice making vessel 21, the projecting portion will abut again against the baffle member 33 to bring it to its closure position.

The ice making apparatus further comprises an electronic card electric circuit for controlling the high or low voltage power circuit and the auxiliary circuit, which is provided with detecting sensors 13 for detecting the presence of water in the water tank 5, as well as with a display-acoustic assembly 40 arranged on the top cover member 41 closing the bearing frame 1.

The operation of the ice making apparatus is such that the ice cubes are made as the ice making tank 21 is arranged in its raised position, by immersing the lugs 16 into said tank.

At the start of the operation, water is manually introduced both into the tank 21 and in the tank 23.

Under these conditions, the tank 23 is in its

lowered position, while the tank 21 is in its raised position.

As about the lugs 16 ice is formed, a friction will be developed against the stirring blade 19 to the desired ice cube thickness and the stirring movement of the stirring blade 19 will provide an electric pulse which, for an adjustable time, will operate the immersed pump 11, located in the vessel 5, which will supply water to the variable weight tank 23, to actuate the siphon member 25.

After the set time is lapsed, the pump will be stopped.

As the siphon member is actuated, the tank 23 will be gradually emptied; as the weight of this tank 23 becomes smaller than that of the tank 21, said tank 23 will be upwardly displaced, while the tank 21 will be lowered by gravity in such a way as to cause the baffle member 33 to be tilted, with a consequent opening toward the ice vessel.

The variable weight small tank 23 will be arranged above the small tank 21, thereby recovering the water level inside the tank 21.

A position sensor detects the upward position of the variable weight tank 23 and will actuate, for a time adjustable from 30 to 90 seconds, the hot gas electric or solenoid valve to cause the ice cubes to detach from the lugs 16, fall onto the baffle member 33 and enter the ice vessel or tank.

As the defrozing time is lapsed, the pump 11 will be actuated again for supplying water to the tank 23 to a level unable of operating the siphon member 25.

The tank 23, the weight of which is now greater than that of the tank 21, will be displaced downward, while the ice making tank 21 will be displaced upward, so as to abut against abutment members 20.

The lugs 16 will be immersed again in the tank 21, where water is present, thereby starting a new ice making cycle.

The ice making apparatus will continue to operate to fill the ice vessel in such a degree that the baffle member 33 will be prevented from recovering to its home position, thereby preventing the tank 21 to raise; thus the intermediate position sensor of the tanks will stop the apparatus.

A further safety stop of the ice making apparatus is caused by the sensor 13, arranged in the tank 5, which prevents the apparatus from operating as water is lacking.

From the above disclosure it should be apparent that the invention fully achieves the intended objects.

In particular, the fact is to be pointed out that it is possible, in the ice making apparatus according to the present invention, to drive all the ice making tanks by very simple means.

This driving is simply obtained by exploiting the weight variation of the counterweight tank, by actuating a siphon member.

The invention, as disclosed, is susceptible to several modifications and variations, all of which come within the invention scope.

Moreover, all of the details can be replaced by other technically equivalent elements.

In practicing the invention, the used materials, provided that they are compatible with the intended

use, may be any, according to requirements.

## Claims

1- An apparatus for automatically and continuously making ice cubes, characterized in that it comprises a thermally insulated bearing frame, defining in its inside an ice collecting vessel, accessible from the outside and overlying a water collecting water, a pump for supplying water to an ice making assembly communicating inside said water collecting water, said ice making assembly including an evaporator, effective to be immersed into an ice making tank supported at one end of a lever mechanism which is counterweighted, at the other end thereof, by a variable weight tank provided with a siphon member for discharging water, which can be actuated by said pump for driving, with a preset driving cycle, said lever mechanism.

2- An apparatus, according to the preceding claim, characterized in that said pump arranged in said water tank is of the immersed type.

3- An apparatus, according to the preceding claims, characterized in that said water tank, in the air condenser embodiment thereof, can be selectively coupled to the water system or filled manually.

4- An apparatus, according to one or more of the preceding claims, characterized in that said apparatus, in the case of including a water condenser, is provided with a solenoid valve, in replacement of said pump, while the water collecting water is transformed into a further volume, for collecting ice, the sensors being omitted.

5- An apparatus, according to one or more of the preceding claims, characterized in that said water tank is closed at the top by a cover member, which may be arranged in a first position, in which the volume of said water tank is increased and the volume of said ice collecting tank is reduced, and in a second position in which the volume of said ice collecting tank is increased and the volume of said water tank is reduced.

6- An apparatus, according to one or more of the preceding claims, characterized in that said ice making tank and variable weight tank are pivoted on said lever at a position higher than their center of gravity, in order to hold the vertical position.

7- An apparatus, according to one or more of the preceding claims, characterized in that in said apparatus the assembly comprising the tanks 23 and 21 and levers 22 may be easily removed for cleaning purposes, which operation is carried out by raising the cover member 41 pivoted at the rear.

8- An apparatus, according to one or more of the preceding claims, characterized in that, upon actuating of the siphon member of the variable

weight tank, said variable tank becomes of smaller weight than the ice making tank, with a consequent lowering of the ice making tank, which locates under said variable weight tank which, through said siphon member operates for filling again the ice making tank.

9- An apparatus, according to one or more of the preceding claims, characterized in that it comprises, on said supporting frame, a separating wall defining a zone for housing said ice making assembly, in said wall there being provided a swinging baffle member effective to abut against a projection formed on the ice making tank for tilting it as said ice making tank is lowered to discharge the ice cubes from the ice vessel.

10- An apparatus according to one or more of the preceding claims, characterized in that, with said ice tank filled by ice, said baffle member prevents the ice making tank from raising, with a consequent stopping of the apparatus operation.



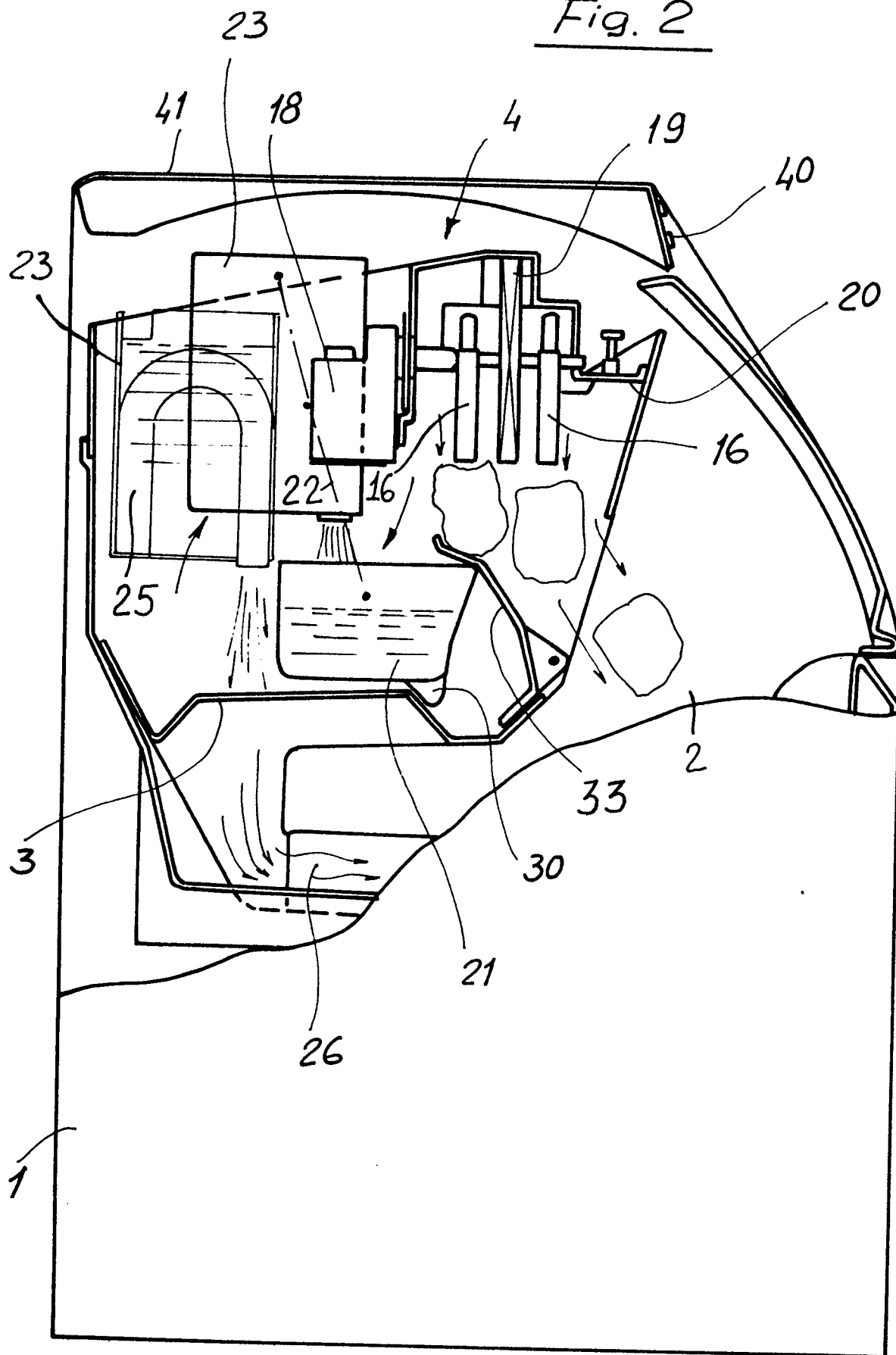
Fig. 2

Fig. 3

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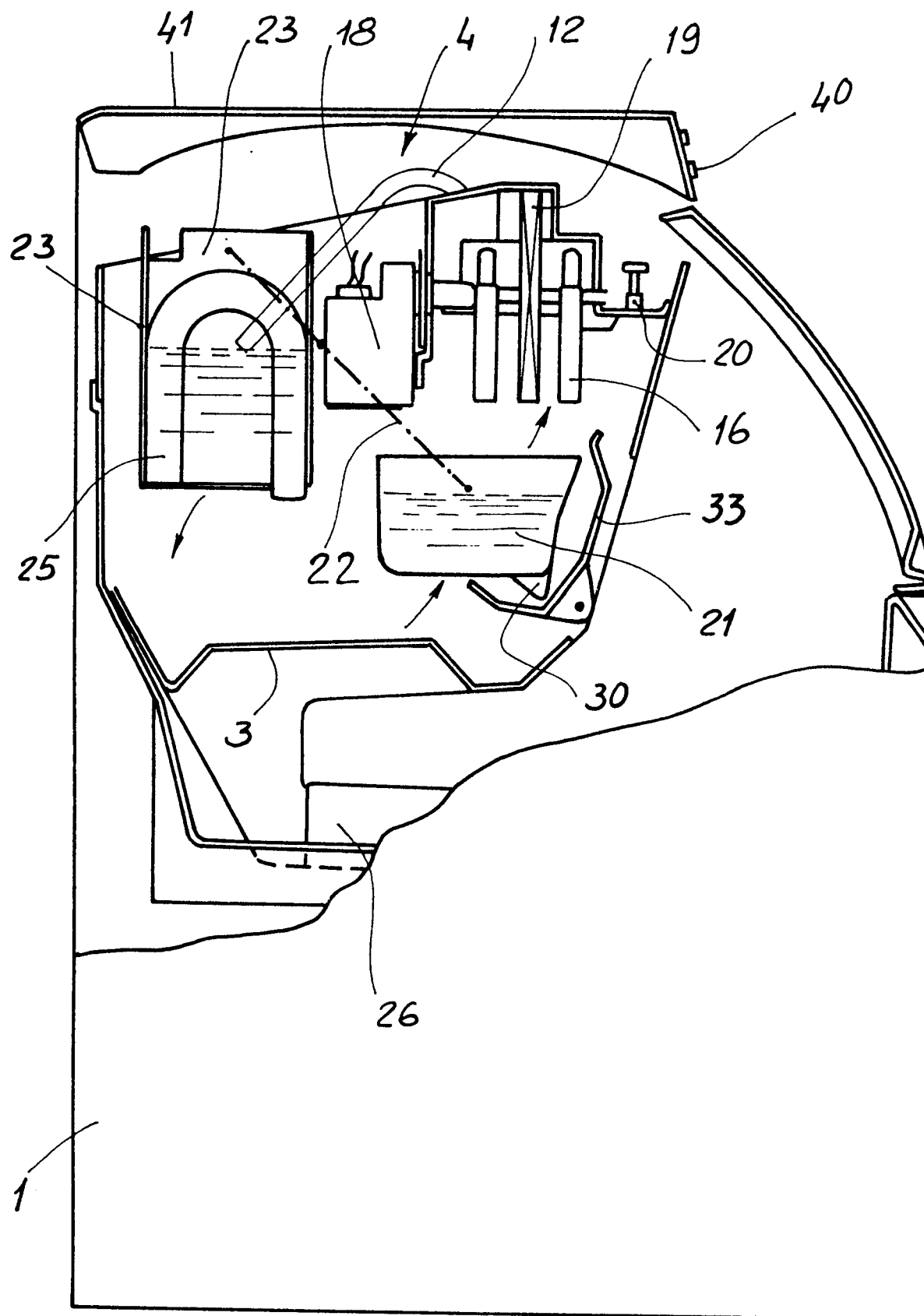
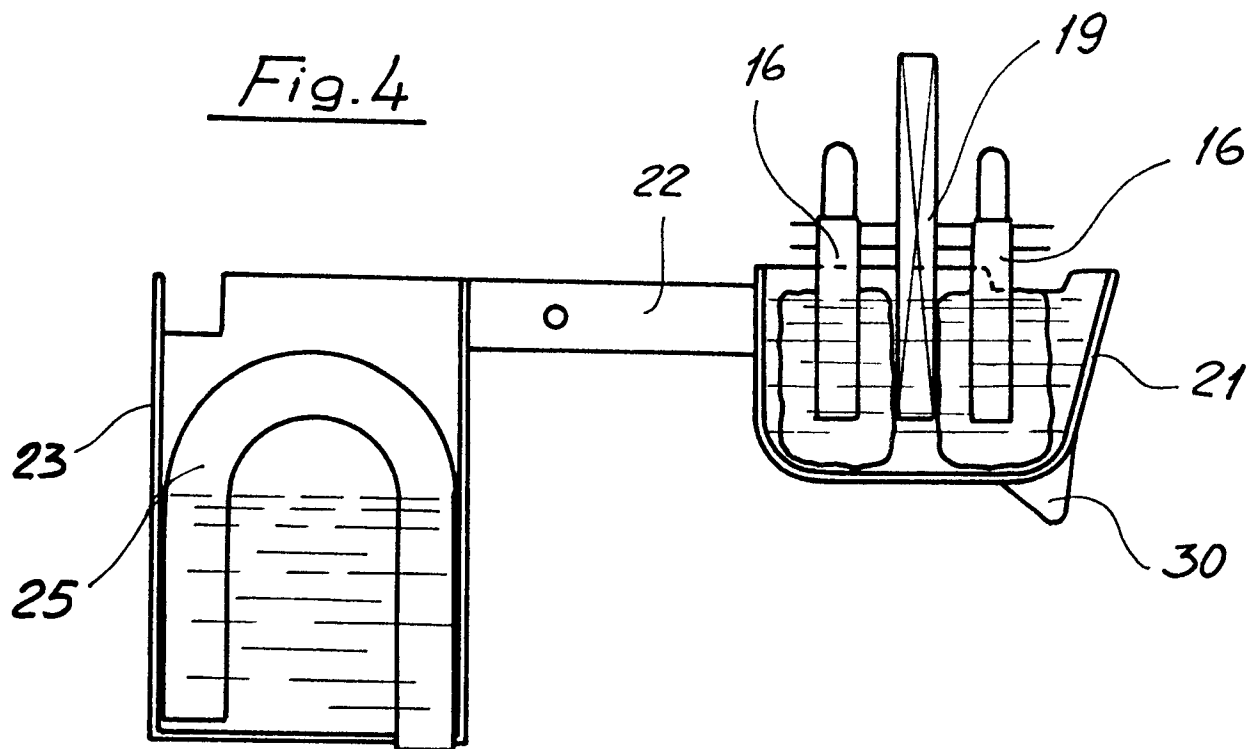
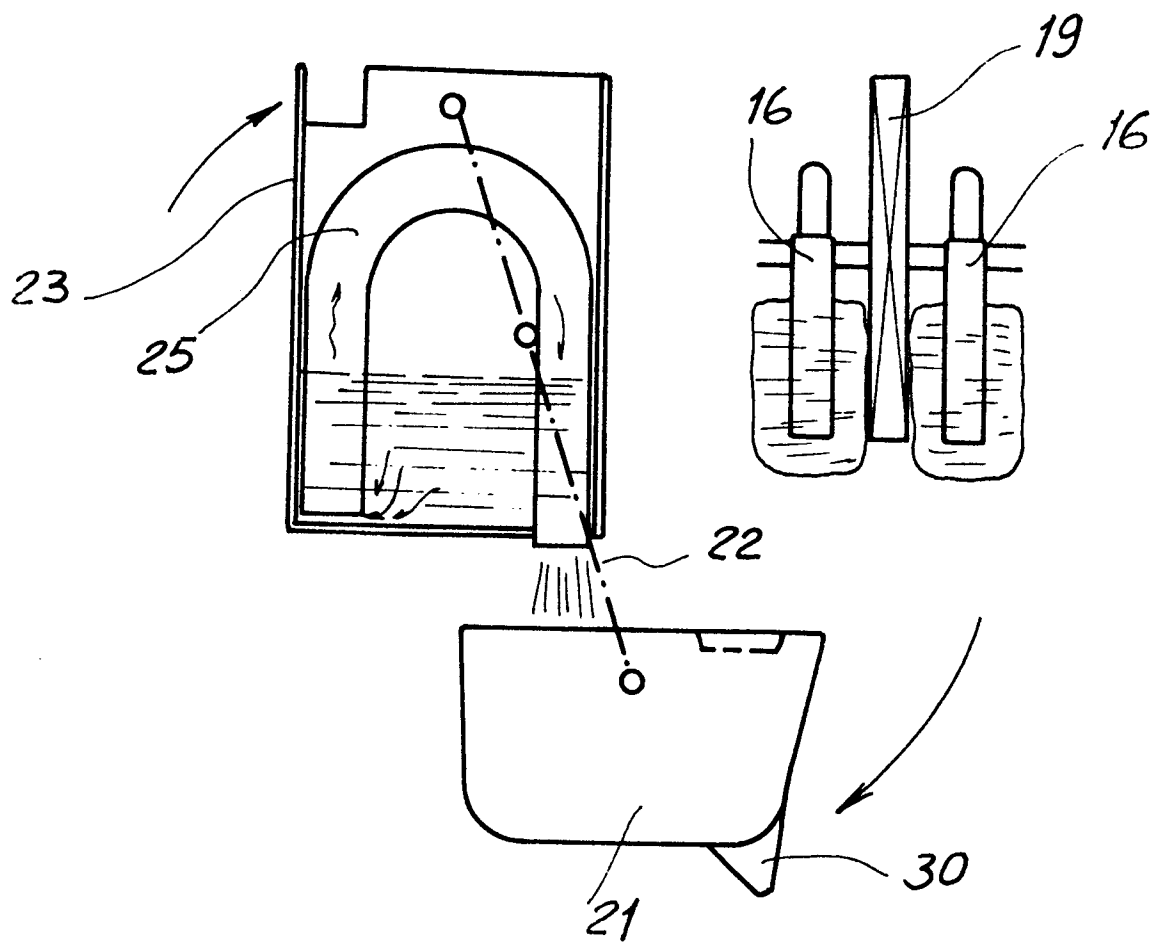


Fig. 4Fig. 5





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)
A	AU-B- 22 730 (BLAKELY) (1977) * Entire document *	1, 2, 9	F 25 C 1/08
A	FR-A-1 060 874 (S.A. DES ATELIERS ET CHANTIERS DE LA LOIRE) * Page 2, left-hand column, line 29 - page 3, left-hand column, line 25; figures 4, 5, 6 *	1	
A	US-A-3 526 100 (BRIEL) * Whole document *	1, 4	
A	US-A-3 149 473 (ARCHER) * Whole document *	1	
A	US-A-2 718 125 (HORVAY)		TECHNICAL FIELDS SEARCHED (Int. Cl. 4)
A	AU-B- 460 312 (BLAKELY)		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 26-03-1987	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	