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(19) **United States**(12) **Patent Application Publication****Portelli**(10) **Pub. No.: US 2004/0182102 A1**(43) **Pub. Date: Sep. 23, 2004**(54) **ICE-MAKING APPARATUS**(30) **Foreign Application Priority Data**

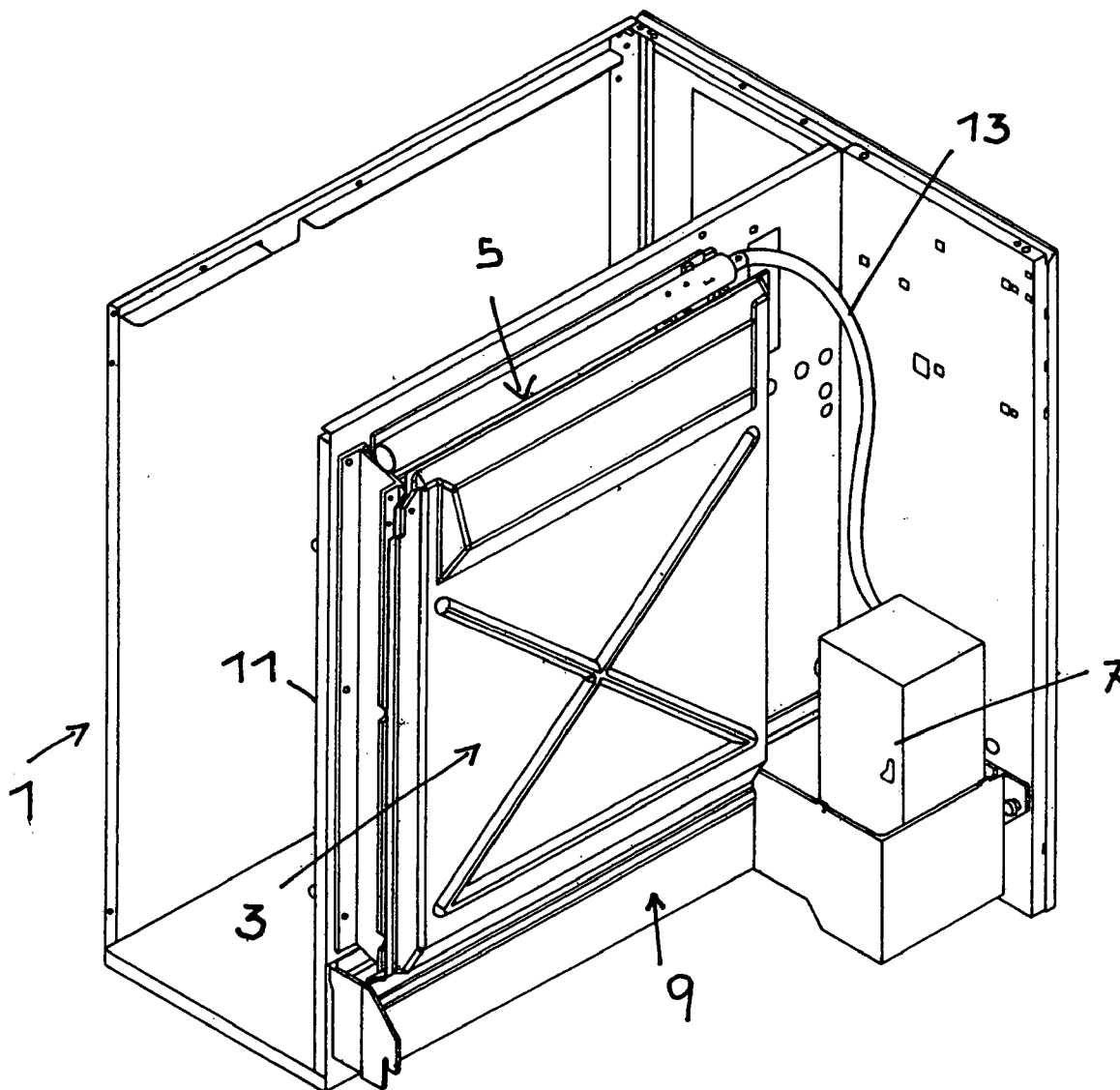
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Paul D. Greeley, Esq.**Ohlandt, Greeley, Ruggiero & Perle, L.L.P.****One Landmark Square, 10th Floor****Stamford, CT 06901-2682 (US)**(51) **Int. Cl.⁷ F25C 1/00**(52) **U.S. Cl. 62/340; 62/348**(57) **ABSTRACT**

An ice cube maker having an evaporator in fluid communication with a flow control device to supply water for making ice cubes is provided. The water is supplied by a pump from a storage tank supported by a support element underneath the evaporator. The storage tank is removably connected to the support element and/or a casing of the ice cube maker.

(73) **Assignee: Castel Mac S.p.A.**(21) **Appl. No.: 10/777,477**(22) **Filed: Feb. 12, 2004**

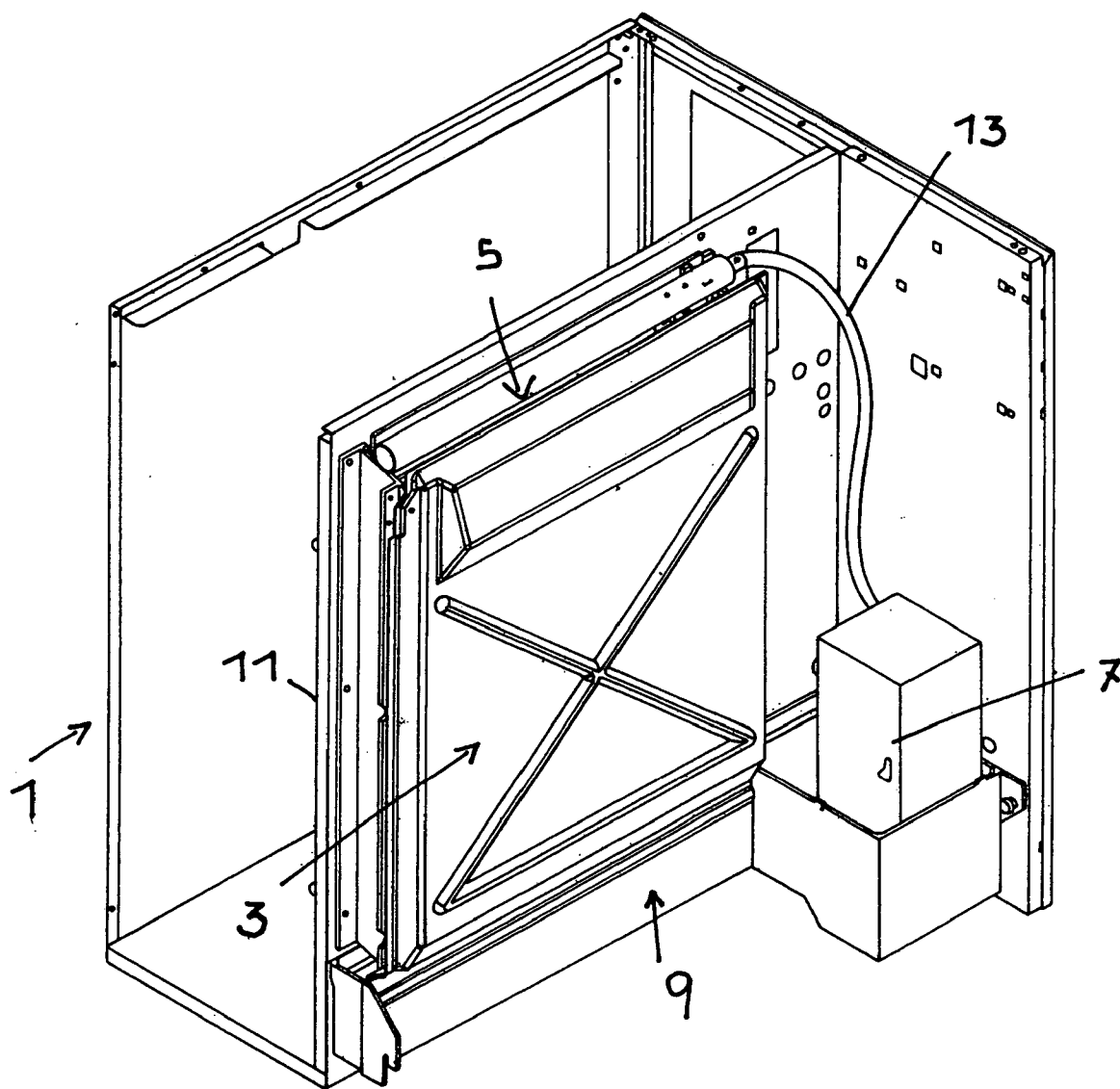
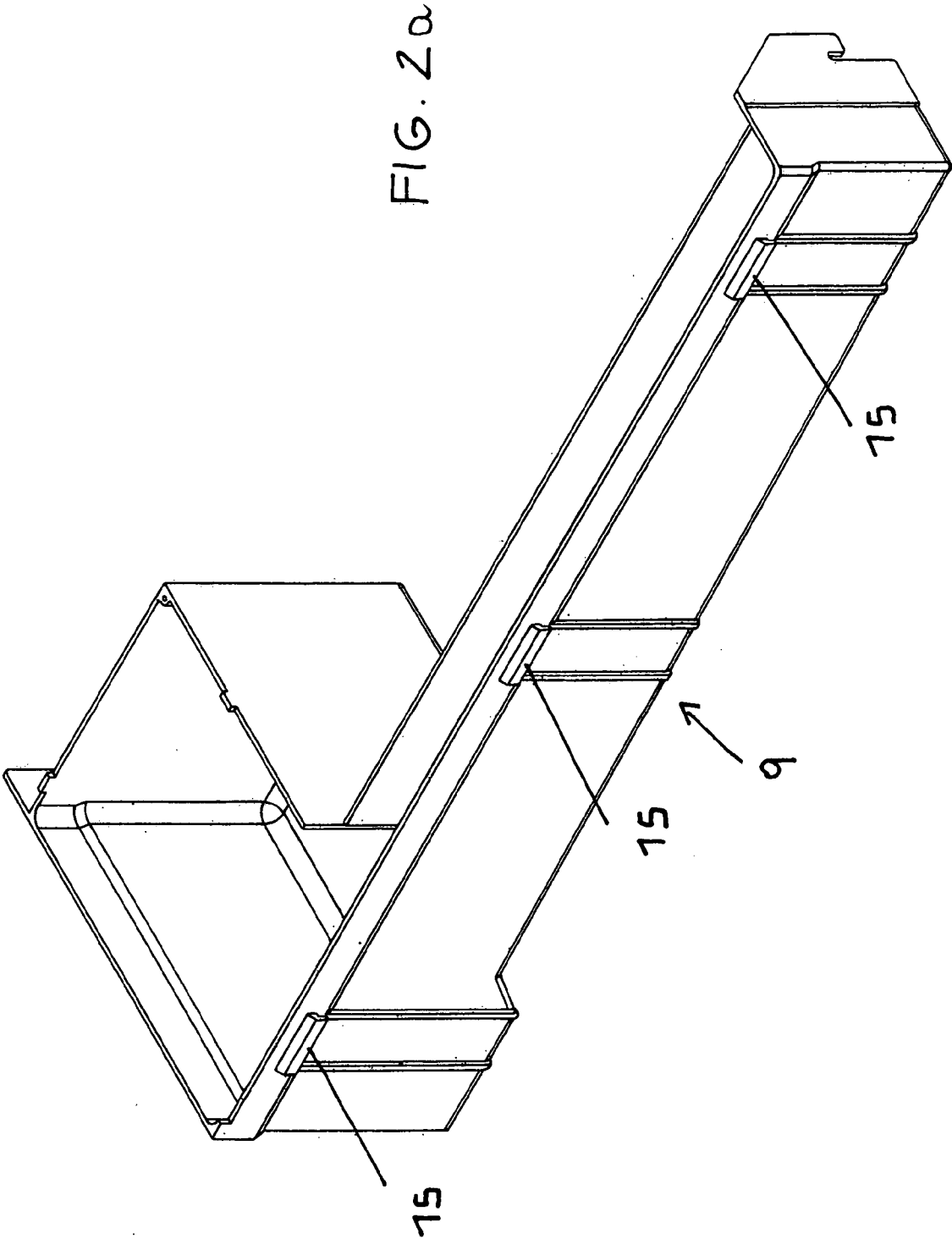


FIG. 1



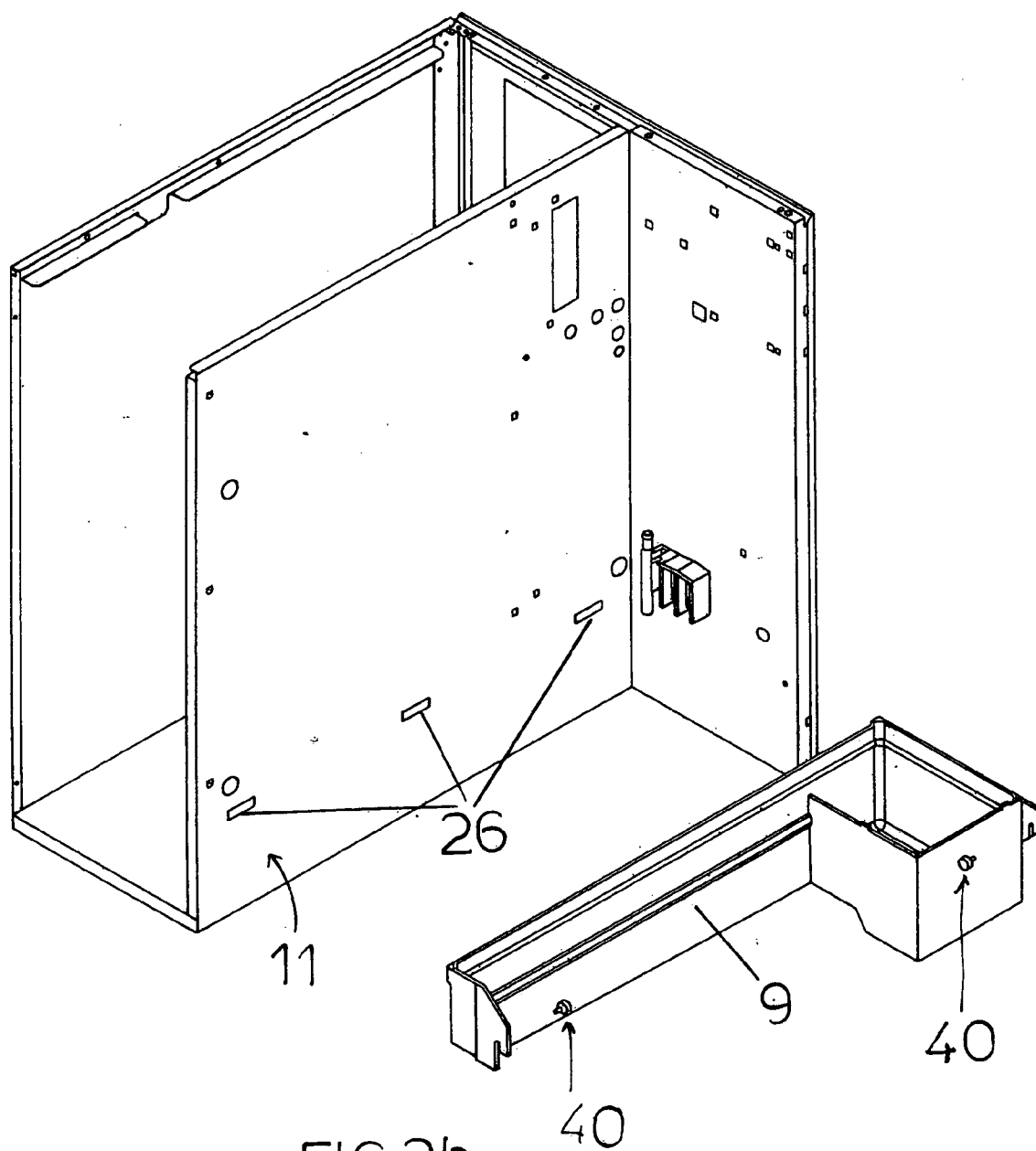
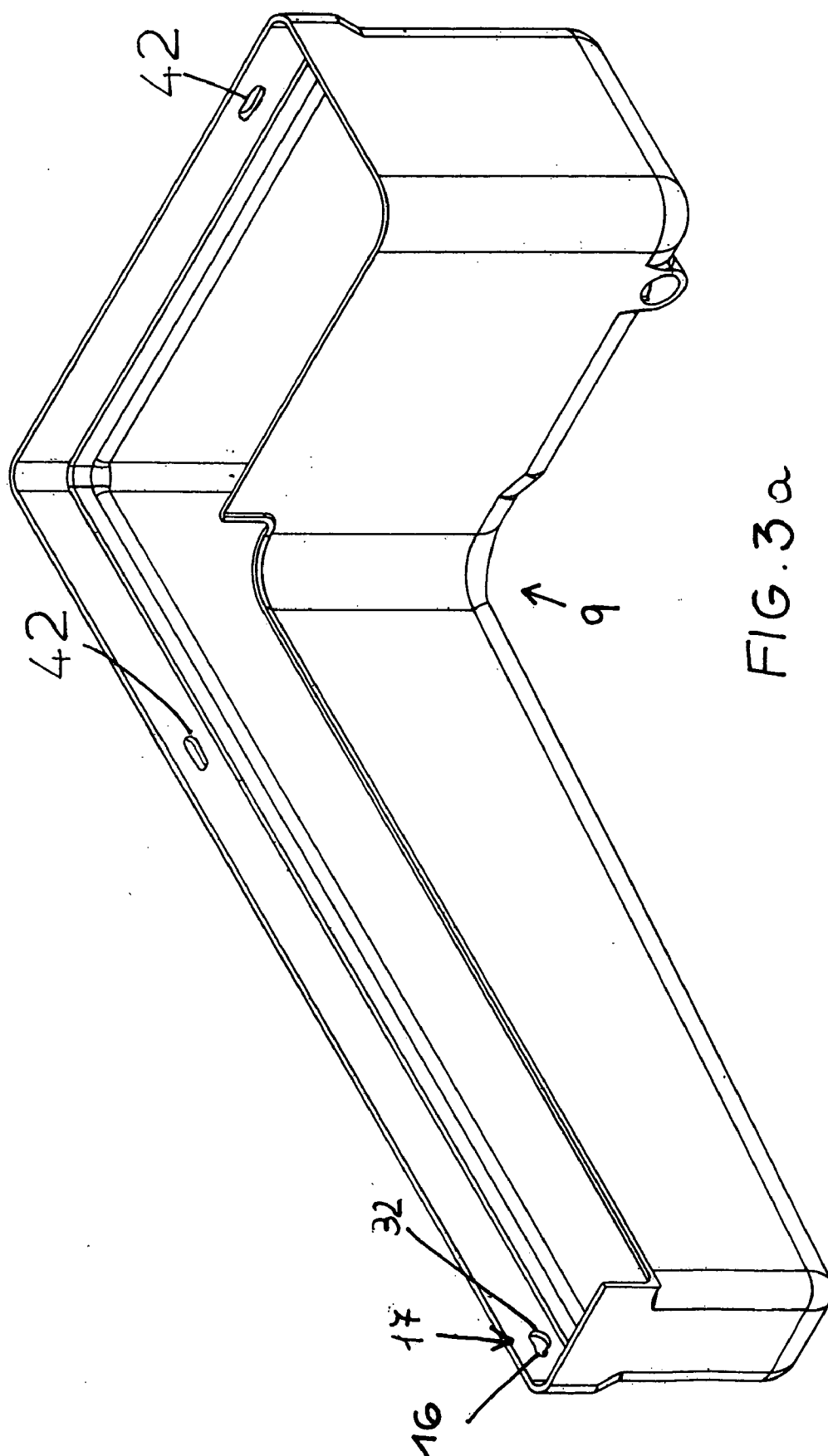


FIG. 2b



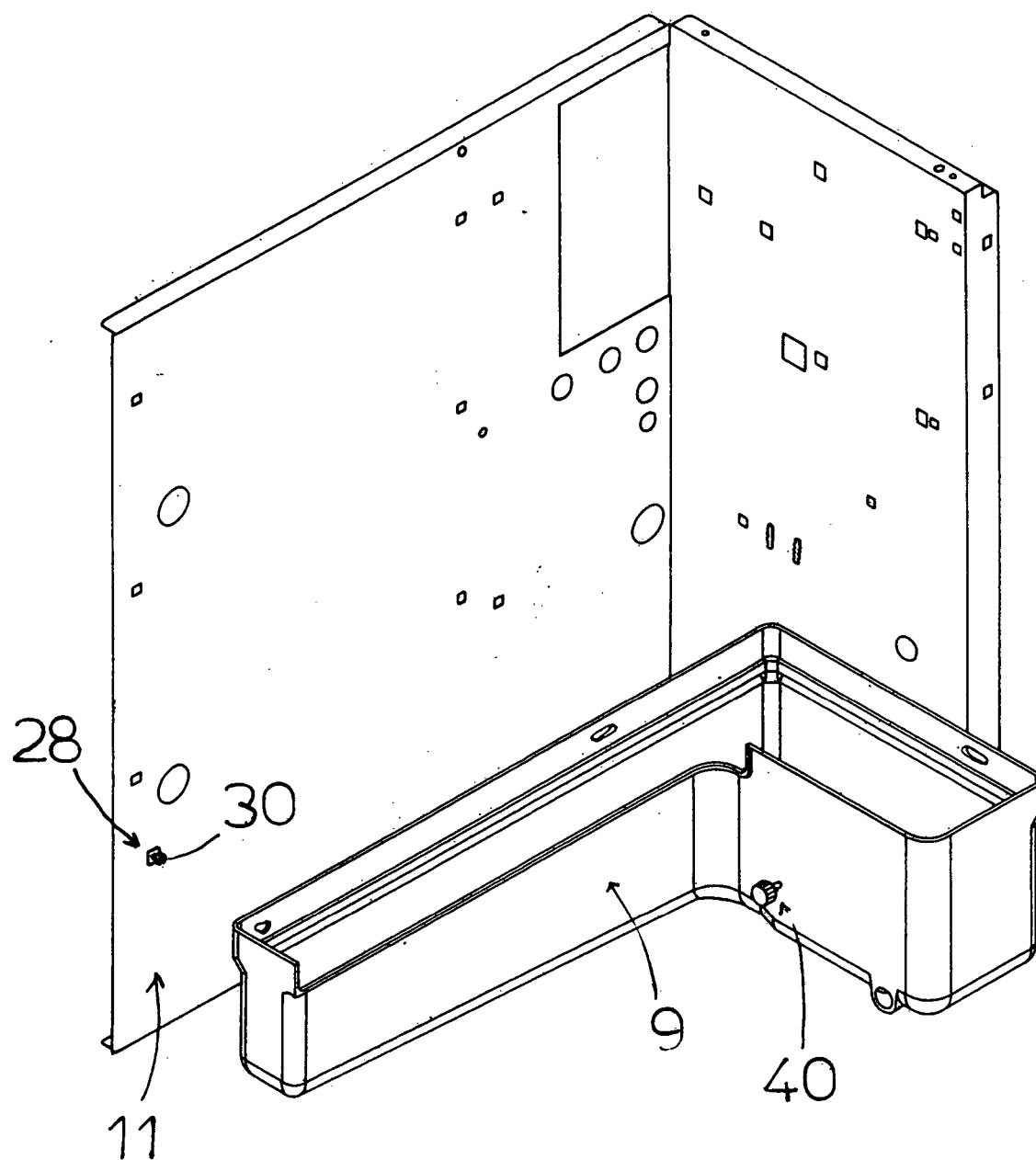


FIG. 3b

ICE-MAKING APPARATUS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority in Italian Application No. M12003A 000465 filed on Mar. 12, 2003, the disclosure of which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

[0002] This invention relates generally to an ice-making machine or ice cube maker and, more particularly, to an ice-making machine with a removable water tank.

[0003] Ice cube makers, and more particularly, ice cube makers with vertical evaporators are known. These ice cube makers have an internal storage tank placed underneath the evaporator that can contain water to be transformed into ice. The water can be taken via a transfer pump to a flow control device, which in turn distributes this water over the surface of the evaporator to form the ice cubes.

[0004] In such an ice maker, the storage tank for the water to be transformed into ice is connected in permanent fashion to the frame as a single, integral piece of the frame, and is difficult to access, even when removing the casing of the ice maker. Furthermore, over the course of time, dirt is formed in the storage tank, there are incrustations from the progressive depositing and buildup of lime contained in the water, and aquatic bacteria and algae grow and proliferate. Accordingly, there is a need to improve the cleanliness and hygiene for the water storage tank.

[0005] The cleaning of these contemporary storage tanks is done through use of sanitizing agents, made to circulate in the storage tank through the operation of the transfer pump. The cleansing and cleaning of the storage tank achieved in this way is unsatisfactory, because it cannot offer an absolute guarantee of the result obtained, since it is not possible or it is extremely difficult to make an inspection and visual check. Furthermore, these storage tanks are sanitized exclusively in the portions that come into contact with the sanitizing agents.

[0006] The technical problem of the present invention is therefore to produce an ice cube maker with an evaporator which makes it possible to eliminate the technical disadvantages of the prior art.

SUMMARY OF THE INVENTION

[0007] In the context of this technical problem, the present invention provides an ice cube maker with an evaporator, where the ice cube maker allows a complete and careful cleaning and sanitization of the storage tank for the water used to make the ice.

[0008] The present invention also provides an ice cube maker with an evaporator, where the ice cube maker enables the cleaning and sanitizing of the storage tank for the water used to make the ice in a relatively simple and rapid manner.

[0009] The present invention provides an ice cube maker with an evaporator, where the ice cube maker enables the cleaning and the sanitizing of the storage tank for the water to make the ice without the need to completely dismantle the ice maker. The technical problem is solved by creating an ice cube maker, of the type containing an evaporator supplied

with water by a water flow device to form ice cubes. The water is drawn by a recirculation pump from a storage tank supported by a support element underneath the evaporator. There is a removable connection between the storage tank and the support element.

[0010] In one aspect, an ice-making machine is provided. The ice-making machine comprises an evaporator, a support element, and a storage tank for storing water to be formed into ice. The storage tank is removably connected to the support element. The storage tank can require movement in at least two different directions to removably connect or disconnect with the support element. The evaporator may also be connected to the support element, and can be disposed above the storage tank. The ice-making machine can further comprise a flow control device and a pump. The flow control device can be in fluid communication with the evaporator and the pump, while the pump can be in fluid communication with the flow control device and the storage tank. The flow control device distributes the water to the evaporator. The evaporator may be a vertical evaporator. The flow control device can be a water sprayer.

[0011] The ice-making machine can further comprise first and second connecting structures. The first and second connecting structures may provide for removable connection of the storage tank with the support element. The first and second connecting structures can be disposed on opposite surfaces of the storage tank and the support element. The opposite surfaces of the storage tank and the support element can be planar. The at least two different directions can be first and second directions. The first direction may be in a plane orthogonal to the opposite surfaces, and the second direction may be in a plane parallel to the opposite surfaces. The second direction can also lie along an axis inclined from vertical. The second direction may lie along a vertical axis. The ice-making machine can also have a housing, and the evaporator, storage tank and support element may be disposed in the housing. The housing may be divided into a plurality of compartments. The support element can also be used to divide the housing into a plurality of compartments. The ice-making machine may also have a wall that substantially isolates the evaporator from the pump. The wall can be pivotable with respect to the evaporator.

[0012] The first connecting structure can be a grappling tooth and the second connecting structure can be a corresponding grappling seat. The first connecting structure may also be a coupling screw having a head, and the second connecting structure may be a slot having a groove, so that the head can selectively hook into the groove. The ice-making machine can further comprise a housing where the first and second connecting structures are disposed on opposite surfaces of the storage tank and the housing. The opposite surfaces of the storage tank and the housing may be a lateral planar face of the storage tank and an opposite planar face of the housing. Either or both of the first connecting structure and the second connecting structure can also be manually controlled. The water storage tank can be a sump. The water storage tank may also be a tank, which catches waste water from the evaporator and recycles it back to a water flow distribution device. The support element can be one or more side walls of the housing and one or more dividing walls of the housing, and the sump may be removably affixed to the side walls and dividing walls.

[0013] In another aspect, a method for removable connection of a storage tank for water to make ice in an ice cube maker that has an evaporator and a support element, is provided. The steps of the method comprise requiring movement of the storage tank in a first direction with respect to the support element and then requiring movement in a second direction with respect to the support element thereby connecting or disconnecting the storage tank with the support element. The first direction and the second direction can be at an angle with respect to each other of 90 degrees or more. The method can further comprise the step of requiring removable connection or disconnection of a lateral planar face of the storage tank with an opposite planar face of a housing of the ice cube maker.

[0014] Other characteristics and advantages of the invention shall become clearer from the description of a preferred but not exclusive embodiment of the ice maker according to the invention, illustrated for purposes of understanding and non-limiting in the appended drawings, in which:

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] **FIG. 1** shows a perspective view of a front portion of an ice maker according to the present invention, whose casing has been partially removed to show internal components;

[0016] **FIG. 2a** shows a perspective view of the storage tank of **FIG. 1** with a first preferred embodiment of the connection structure;

[0017] **FIG. 2b** shows an exploded perspective view of the storage tank and the support element of **FIG. 1**;

[0018] **FIG. 3a** shows a perspective view of the storage tank with a second preferred embodiment of the connection structure; and

[0019] **FIG. 3b** shows an exploded perspective view of the storage tank of **FIG. 3a** and the support element of **FIG. 1**.

DETAILED DESCRIPTION OF THE INVENTION

[0020] Making reference to the indicated figures, an ice cube maker or ice-making machine is shown and indicated generally by reference number **1**. The ice maker **1** comprises a vertical evaporator (not shown, since it is hidden by the corresponding horizontally pivotable wall or lid **3**), which is disposed parallel to the front side of the ice maker **1**. While this embodiment shows a vertical evaporator, the present disclosure contemplates the use of other types and arrangements of evaporators. The ice maker **1** further comprises a flow control device **5** which in this embodiment is a spray device. The spray device **5** supplies or sprinkles the evaporator with water to form the ice. The water is supplied to the spray device **5** by a recirculation pump **7**, which is in fluid communication with a storage tank or sump **9** and draws the water therefrom. The pump **7** is in fluid communication with the spray device **5** through a pipe **13**. The storage tank **9** is removably supported beneath the evaporator by a flat support wall, housing or element **11**, and catches waste water from the evaporator and recycles it back to the spray device **5** via pump **7**. The evaporator is also preferably supported by the support element **11**, which further compartmentalizes the inside of the ice maker **1**, as shown in **FIG. 1** and acts as a dividing wall.

[0021] The spray device **5** is disposed above the evaporator and has a plurality of holes (not shown) which distribute the water, which penetrates by gravity into a plurality of compartments (not shown) for making the ice. While the present invention uses a spray device **5** to distribute the water to the evaporator, the present disclosure contemplates the use of other types of flow control devices for distribution and supply of the water to the evaporator, such as, for example, water distribution tubes.

[0022] The evaporator is part of a refrigerating assembly (not shown), in which a refrigerant fluid circulates. The refrigerating assembly further comprises a compressor that supplies a condenser (preferably provided with a fan for air cooling). The condenser is connected to a laminar flow element and is also connected in turn to the evaporator and then again to the compressor. Other refrigeration components may also be used with the refrigerating assembly. Preferably, at the end of the ice-making process in the compartments, i.e., the freezing cycle, the refrigeration process is reversed and heating of the compartments results in the release of the ice cubes, i.e., the harvest cycle.

[0023] In this embodiment, the ice cubes are taken by gravity along surfaces sloping forward and downward against the lid **3** of the evaporator. Under the action of their own weight, the ice cubes succeed in causing the evaporator lid **3** to pivot open, and they are finally collected in a container (not shown) placed at the bottom of the ice maker **1**. However, the present disclosure contemplates the use of alternative structures and methods of delivering the ice to a container or the like during the harvest cycle. Additionally, as shown in **FIG. 1**, wall or lid **3** isolates the pump **7** from the evaporator when the lid is in a closed position.

[0024] The ice maker **1** has a removable connection for the storage tank **9** with the corresponding support element **11**, which is preferably a releasable connection that does not require tools for removal or engagement. The removable connection is provided at least between one face or surface of the storage tank **9**, preferably, its rear face, and the opposite face or surface of the corresponding support element **11**. More preferably, the rear face is planar and the opposite face of the corresponding support element **11** is also planar. The removable connection operates by at least first and second translational movements or directions of movements or force. Preferably, to engage the storage tank **9** with the supporting element **11**, the first translation movement is situated in a plane orthogonal to the opposing planar faces of the storage tank and the corresponding support element while the second translation movement is parallel to the opposing planar faces. More preferably, the second translation movement may lie along a vertical axis or may be inclined from the vertical.

[0025] Referring to **FIGS. 2a** and **2b**, a removable connection system for the storage tank **9** is shown which requires a second translation movement essentially vertically upward or downward. In this embodiment, the removable connection comprises at least one grappling tooth **15**, and preferably three, disposed on the storage tank **9**. Each of the grappling teeth extend from the back face of the storage tank **9** and are turned vertically downward. The removable connection further comprises at least one grappling seat, and preferably three continuous openings **26** of the support element **11**, each being able to mate with a corresponding grappling tooth **15**.

[0026] The removable connection can also be provided between at least one of the sides, and preferably planar sides, of the storage tank 9 and the opposing planar side of the casing or housing of the ice maker 1. More preferably, this removable connection is manually operated. Most preferably, the removable connection can be formed, for example, by a screw-tight element 40, having a handle at one end by which manual control can be exerted.

[0027] Referring to FIGS. 3a and 3b, a removable connection system for the storage tank 9 is shown which requires a second translation movement downward, but inclined in the vertical direction. In this embodiment, the removable connection comprises at least one coupling screw on the support element 11, and preferably a coupling screw 28 having a head 30 and being partially screwed onto the support element 11. The removable connection further comprises at least one slot on the rear face of the storage tank 9, and preferably a slot 17 formed by an elongated portion 32 which can hook the head 30 of the screw 28 and a groove 16, which extends from the elongated portion 32 with a downward inclination.

[0028] In the embodiment discussed above, the removable connection is provided between the storage tank 9 and the support element 11. However, further removable connection structures can be provided between at least one of the flat sides of the storage tank 9 and the opposing flat side of the casing or housing of the ice maker 1. These removable connection structures are preferably of manual operation. In particular, they can be formed by a screw-tight element 40 in an elongated slot 42, having a handle at one end by which manual control is exerted. The procedure for removable connection of the storage tank 9 therefore calls for connecting its rear planar face to the opposing planar face of the corresponding support element 11 by a first translation movement of the storage tank in a plane orthogonal to the opposing faces and a second translation movement of the storage tank downward in a parallel plane with said opposing planar faces. Preferably, the procedure involves, as seen above, also a removable fixation of at least one of the lateral planar faces of the storage tank 9 to an opposite planar face of the casing or housing of the ice maker 1.

[0029] Referring to the embodiment of the removable connection shown in FIGS. 2a and 2b, the first translation movement introduces each grappling tooth 15 into the corresponding grappling seat 26, while the second translation movement downward produces the hooking of each grappling tooth 15 in the corresponding grappling seat 26.

[0030] Referring to the embodiment of the removable connection shown in FIGS. 3a and 3b, the first translation movement introduces the head 30 of the screw 28 in the elongated part 32 of the corresponding coupling slot 17, while the second downward translation movement allows the shank of the screw 28 to slide in the groove 16 of the coupling slot 17 and produces the coupling of the screw 28 in the slot 17.

[0031] The present invention can also have alternative structures that allow for removable connection of the storage tank 9 to either the support element 1, the casing (housing), or both. Preferably, such alternative structures require movement or application of force in at least two different directions to engage and disengage the storage tank. The two different directions can be at a right angle to each other or greater than 90 degrees.

[0032] While the instant disclosure has been described with reference to one or more exemplary embodiments, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted for elements thereof without departing from the scope thereof. In addition, many modifications may be made to adapt a particular situation or material to the teachings of the disclosure without departing from the scope thereof. Therefore, it is intended that the disclosure not be limited to the particular embodiment(s) disclosed as the best mode contemplated for carrying out this invention, but that the invention will include all embodiments falling within the scope of the appended claims.

What is claimed:

1. An ice-making machine comprising: an evaporator, a support element, and a storage tank for storing water to be formed into ice, wherein said storage tank is removably connected to said support element.

2. The ice-making machine of claim 1, further comprising first and second connecting structures, said first and second connecting structures being capable of removably engaging with each other, wherein said first and second connecting structures are disposed on opposite surfaces of said storage tank and said support element respectively for removable connection of said storage tank with said support element.

3. The ice-making machine of claim 2, wherein said first connecting structure is a grappling tooth, and wherein said second connecting structure is a corresponding grappling seat.

4. The ice-making machine of claim 1, wherein said evaporator is connected to said support element, and wherein said evaporator is disposed above said storage tank.

5. The ice-making machine of claim 4, wherein said storage tank is a sump in fluid communication with said evaporator.

6. The ice-making machine of claim 1, further comprising a housing, wherein said evaporator, said storage tank and said support element are disposed in said housing, and wherein said housing is divided into a plurality of compartments.

7. The ice-making machine of claim 6, wherein said support element divides said housing into said plurality of compartments.

8. The ice-making machine of claim 7, wherein said support element is a sidewall and a dividing wall of said housing, said storage tank being removably affixed to said sidewall and said dividing wall.

9. The ice-making machine of claim 1, wherein said storage tank requires movement in at least two different directions to removably connect or disconnect with said support element.

10. The ice-making machine of claim 9, wherein said at least two different directions are first and second directions, wherein said first direction is in a plane orthogonal to said opposite surfaces, and wherein said second direction is in a plane parallel to said opposite surfaces.

11. The ice-making machine of claim 10, wherein said second direction lies along an axis inclined from vertical.

12. The ice-making machine of claim 2, wherein said first connecting structure is a coupling screw having a head, wherein said second connecting structure is a slot having a groove, and wherein said head can hook into said groove.

13. The ice-making machine of claim 2, wherein said opposite surfaces of said storage tank and said support element are substantially planar surfaces.

14. The ice-making machine of claim 2, further comprising a housing, wherein said first and second connecting structures are disposed on opposite surfaces of said storage tank and said housing.

15. The ice-making machine of claim 14, wherein said first connecting structure or said second connecting structure is manually controlled.

16. The ice-making machine of claim 4, further comprising a flow control device in fluid communication with said evaporator and said storage tank for distributing said water from said storage tank to said evaporator, wherein said storage tank catches waste water from said evaporator and recycles said waste water back to said flow control device.

17. The ice-making machine of claim 16, wherein said evaporator is a vertical evaporator, and wherein said flow control device is a water sprayer.

18. The ice-making machine of claim 10, wherein said second direction lies along a vertical axis.

19. The ice-making machine of claim 14, wherein said opposite surfaces of said storage tank and said housing are a lateral planar face of the storage tank and an opposite planar face of the housing.

20. The ice-making machine of claim 16, further comprising a pump in fluid communication with said flow

control device and said storage tank, wherein said pump provides said waste water from said storage tank to said flow control device.

21. The ice-making machine of claim 20, further comprising a wall that substantially isolates said evaporator from said pump.

22. The ice-making machine of claim 21, wherein said wall is pivotable with respect to said evaporator.

23. A method for removable connection of a storage tank having water which is used to make ice in an ice maker that has an evaporator and a support element, the method comprising the steps of requiring movement of said storage tank in a first direction with respect to said support element and then in a second direction with respect to said support element, thereby connecting or disconnecting said storage tank with said support element.

24. The method of claim 23, wherein said first direction and said second direction are at an angle with respect to each other of 90 degrees or more.

25. The method of claim 23, further comprising the step of requiring removable connection or disconnection of a lateral planar face of said storage tank with an opposite planar face of a housing of the ice cube maker.

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