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(54) **Device for the ice cubes production**

(57) A device for the production of ice cubes is provided by a set of cavities (2) for the freezing of the water and the formation of the cubes.

Said device (1) comprises a set of containers (3),

each one having one or more cavities (2) and having at least two side walls (4,5) and a bottom wall (6) and it comprises a set of ducts (7, 8) of an evaporator of a refrigerating unit. At least one of said ducts (7, 8) is in heat communication with at least one of said walls (4, 5, 6).

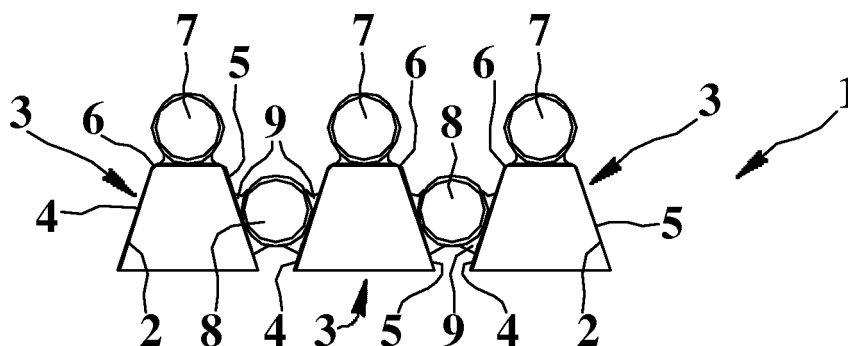


FIG.1

Description

[0001] The present invention refers to the production of ice cubes and in particular it refers to a device for the ice cubes production.

[0002] There are known trays to be filled with water and to be placed into a freezer for producing ice cubes.

[0003] A drawback of said known trays consists in that they are fit for the production of only small amount of ice cubes.

[0004] There are also known devices provided with cavities for the water to be frozen, cooled directly by the evaporator of a freezing plant. A drawback of known devices consists in that they have low efficiency and waste a lot of energy because of the thermal losses.

[0005] An object of the present invention is to propose a device for the ice cubes production fit to assure a high productivity.

[0006] Another object is to propose a device very efficient and having low energy consumption.

[0007] Further object is to propose a device fit to an easy and economical industrial production.

[0008] The characteristics of the invention are underlined in the following with particular reference with the attached drawings, in which:

- figure 1 shows a schematic cross section view of the device for the ice cubes production object of the present invention;
- figure 2 shows a partial top view of the ducts of figure 1;
- figure 3 shows a schematic cross section view of a variant of the device of figure 1;
- figure 4 shows a schematic cross section view of another variant of the device of figure 1;
- figure 5 shows a schematic and plan view of a further variant of the device of figure 1;
- figures 6 and 7 show section views according to the planes VI - VI and VII - VII of figure 5;
- figure 8 shows a schematic and plan view of an inner barrier means of the variant of figure 5;
- figures 9 and 10 show section views according to planes IX-IX and X-X of figure 8;
- figure 11 shows a schematic and plan view of an outer barrier means of the variant of figure 5;
- figures 12 and 13 show section views according to planes XII-XII and XIII- XIII of figure 1;
- figure 14 shows a schematic and plan view of a fur-

ther variant of the device 1;

- figure 15 and 16 show section views according to planes XV - XV and XVI - XVI of figure 14;
- figure 17 shows a schematic and plan view of an inner barrier means of the variant of figure 14;
- figures 18 and 19 show section views according to planes XVIII-XVIII and XIX-XIX of figure 17;
- figure 20 shows a schematic and plan view of an outer barrier means of the variant of figure 14;
- figures 21 and 22 show section views according to planes XXI-XXI and XXII-XXII of figure 20.

[0009] In figures 1 and 2 the numeral 1 indicates the device for the ice cubes production object of the present invention.

[0010] The device 1 is provided with a set of cavities 2, for instance regularly deployed and having truncated pyramid shape, for the freezing of the water, or of another drinkable liquid, and thus for forming cubes of said liquid ice.

[0011] The device 1 comprises a set of containers 3, each one having one or more cavity 2, for instance a container may comprise all the cavities of a line of the array or only a cavity.

[0012] Each container 3 has at least two side walls 4, 5 and a bottom wall 6 for delimiting each cavity.

[0013] For an example the set of containers may be obtained by printing of only a plate, or more plates jointed after the printing, made of metallic material which assures, besides the impermeability and the good thermal conduction, also the possibility of making weldings, for instance soldering or weldings with very fluid alloys also at relatively low temperatures.

[0014] Each device 1 comprises a set of tubular ducts 7, 8, for instance made of copper or copper alloy tube, which work as evaporator for a refrigerating unit which may be connected to said ducts. Said ducts 7, 8 are in heat communication with at least one of said walls 4, 5, 6.

[0015] Particularly the side walls 4, 5 of each cavity are in heat communication with a tubular duct 8 and the bottom wall 6 of each cavity 2 is in heat communication with the other one of said tubular duct 7.

[0016] Said tubular ducts have, for instance, circular section.

[0017] The heat communication among the walls 4, 5, 6 and the ducts 7, 8 is made by means of mutual weldings 9 for instance made by the soldering technique.

[0018] In order to reduce the dimensions of the device, increasing the efficiency thereof, opposing lateral portions of the duct 8 are welded to the faced lateral walls 4, 5 of two adjacent containers 3.

[0019] Referring now also to the variant of figure 3, the tubular ducts 7, 8 have a shaped transversal section and

have longitudinal faces 10, 11, 12 having the same shape of the corresponding walls 4, 5, 6 of the containers 3 which they are welded thereto, in order to be in flow communication.

[0020] As an example, being flat walls, also the longitudinal faces are flat and tilted in a corresponding way to said walls.

[0021] Particularly, a duct 7 may have semicircular or almost oval section, with longitudinal face 12 flat and welded with the flat bottom wall 6 of the containers 3.

[0022] In addition a duct 8 may have two longitudinal faces 10, 11 almost flat and welded to the flat, faced side wall 4, 5 of two adjacent containers 3.

[0023] Consequently to the truncated pyramid shape of the cavity 2, the side walls 4, 5 of each containers 3 converge towards the bottom wall 6 and the duct 8, welded to two adjacent one of them, has a transversal section almost triangular or isosceles trapezium shaped, with two sides 13, 14, made by the longitudinal faces 10, 11 welded to said side walls 4, 5.

[0024] In the variant of figure 4, the side 15 of the section of the duct 8, comprised between the two remaining sides 13, 14, made by the longitudinal faces 10, 11, welded to the side walls 4, 5 of two adjacent containers 3, is made by a third side face 16 of the duct 8 welded to the bottom wall 6 of another container 3 staggered in respect to the first two.

[0025] In said last variant each side of the ducts is in heat communication with a wall of the cavities, assuring the maximum efficiency.

[0026] In the variant of figures 5-13 of the device 1, one of the ducts 8 is made by an interspace 20 delimited by two barrier means, one of them outer 21 and the other one inner 22, each one having a formed plate shape and fit to realize a barrier impermeable to freezing fluids and fit to guide the flow thereof.

[0027] The inner barrier means 22 comprises the containers 3 made integral and thus comprises also the side 4, 5 and bottom 6 walls of the containers 3.

[0028] The bottom wall 6 of the inner barrier means 22 is directly connected to a correspondent bottom portion 23 of the outer barrier means 21.

[0029] Said bottom portion 23 of the outer barrier means 21 has a hole fit to allow the welding, for instance for soldering, of the bottom wall 6 of the inner barrier means 22 and possibly of an optional tubular duct 7.

[0030] The barrier means are preferably obtained by printing of metallic plates which are good thermal conductive and may be welded easily.

[0031] The inner barrier means 22 is shaped like a die with a plurality of deployed cavities.

[0032] The outer barrier means 21 is shaped in such a way to form a recess 24 having a trend like a square wave and fit to contain the cavities 2 walls made in the inner barrier means 22.

[0033] The recess ends 24 form, in cooperation with the barrier inner means 22, an inlet and an outlet for the connection of the interspace 20 to the refrigerating unit

for the flow of the freezing fluid.

[0034] The inner 22 and outer 21 barrier means have respective pass through holes 25, circular or elongated slot shaped at least partially faced each other for the mutual blocking of said barrier means 21, 22 by means of welding.

[0035] In the variant of figures 14-22 of the device 1, the ducts 7, 8 are made by only an interspace 30 delimited by two barrier means, one of them outer 31 and the other one inner 32, each one having a shaped plate shape. The inner barrier means comprises the side 4, 5 and the bottom 6 walls of the containers 3 which are made integral.

[0036] The inner barrier means 32 is shaped like a die with a plurality of deployed cavities 2, the outer barrier means 31 is shaped with a recess 34 having a square wave shape fit to contain the walls of the cavities 2, made in the inner barrier means 32, without matching with the walls.

[0037] Therefore the difference of this variant in respect to the previous one consists in that the bottom wall 6 of the cavities is directly cooled by the same freezing fluid flow which cools the side walls and which flows along the interspace.

[0038] Also in this variant the recess ends 34 form, in cooperation with the inner barrier means 32, an inlet and an outlet for the refrigerating unit and the inner 32 and outer 31 barrier means have respective pass through holes 35 at least partially faced for the mutual blocking.

[0039] In both the last two variants, the shape of the interspace 20, 30 and thus the path of the freezing gas flow is determined by the recess 24, 34 shape.

[0040] The devices 1 of both the last two variants of figure 5-13 and 14-22 comprise a network means 40 fit to prevent the formation of ice or frost bridges among the ice cubes.

[0041] The network means 40 is fixed to the device 1 on the side of the cavities 2 and is fit to cover the portions of the inner barrier means 22, 32 interposed among, or peripheral in respect to, the cavities 2 and fit to leave free the opening of said cavities 2 in order to allow the ice cubes to exit separately.

[0042] The network means 40 is made of plastic material and/or bad thermal conductive material and is fixed by means of screws, rivets, 42 or similar, for instance made of nylon or other thermal insulator, to the pass through holes 25, 35 of the barrier means 22, 32, 23, 33.

[0043] The perimeter of the network means 40 is fixed to the edge of the barrier means 22, 32, 23, 33 by means at least a "C" shaped profile 41.

[0044] Any described embodiments and variants of the device, with a partial exception of the figure 4 one, may be provided with supporting or fixing means with the openings of the cavities turned towards the bottom in order to receive the water of the ice cubes in a nebulized form by means of nozzles oriented towards the top.

[0045] Alternatively the supporting and fixing means may block the device with the cavities towards the top

for the normal filling with water.

[0046] The operating of any variant provides that the freezing fluid flow along the tubular or interspace shaped ducts causes the freezing of the poured or nebulized water into the cavities whose shape make easy the expulsion of the ice cubes, which may be obtained by means of inversion of the freezing cycle or by means of electrical heating and/or device vibration.

[0047] An advantage of the present invention is to provide a device for the ice cubes production fit to assure a high productivity. Another advantage is to provide a device very efficient and having a low energy consumption. A further advantage is to provide a device fit to an easy and economical industrial production.

Claims

1. Device for the production of ice cubes provided by a set of cavities (2) for the freezing of water and the formation of cubes; said device (1) is **characterized in that** it comprises a set of containers (3), each one having one or more cavities (2) and having at least two side walls (4,5) and a bottom wall (6) and it comprises a set of ducts (7, 8) of an evaporator of a refrigerating unit; at least one of said ducts (7, 8) is in heat communication with at least one of said walls (4, 5, 6).
2. Device according to the claim 1 **characterized in that** at least a side of each cavity is made by a wall (4, 5, 6) in heat communication with one of said ducts (7, 8).
3. Device according to the claim 1 or 2 **characterized in that** the heat communication among walls (4, 5, 6) and ducts (7, 8) is made by means of mutual weldings (9).
4. Device according to any of the claims 1-3 **characterized in that** at least a duct (7) is in heat communication with the bottom wall (6) of the containers (3).
5. Device according to any of the claims 1-3 **characterized in that** at least a duct (8) is in heat communication with at least a side wall (4, 5) of the containers (3).
6. Device according to any of the claims 1-3 **characterized in that** at least a duct (8) is in heat communication with the faced side walls (4, 5) of two adjacent containers (3).
7. Device according to any of the claims 1-3 **characterized in that** the ducts (7, 8) have at least a longitudinal face (10, 11, 12) having the same shape of the corresponding wall (4, 5, 6) of the containers (3) which they are in flow communication therewith.
8. Device according to claims 4 and 7 **characterized in that** the longitudinal face (12) of the duct (7) is flat and welded with the flat bottom walls (6) of the container (3).
9. Device according to claims 6 and 7 **characterized in that** the duct (8) has two longitudinal faces (10, 11) almost flat and welded to the flat and faced side walls (4, 5) of two adjacent containers (3).
10. Device according to the claim 9 **characterized in that** the side walls (4, 5) of each container (3) converge towards the bottom wall (6) and **in that** the duct (8) welded to two adjacent one of them has a transversal section almost triangular shaped with two sides (13, 14) made by the longitudinal faces (10, 11) welded to said side walls (4, 5).
11. Device according to the claim 10 **characterized in that** the side (15) of the duct (8) section comprised between the two remaining sides (13, 14) made by the longitudinal faces (10, 11) welded to the side walls (4, 5) of two adjacent containers (3), is made by a third side wall (16) of the duct (8) welded to the bottom wall (6) of another container (3) staggered in respect to the first two ones.
12. Device according to the claim 1 **characterized in that** one of the ducts (8) is made by an interspace (20) delimited by two barrier means, one of them outer (21) and the other one inner (22), each one having a shaped plate shape, whose the inner one (22) comprises the side(4, 5) and bottom (6) walls of the containers (3) which are made integral.
13. Device according to the claim 12 **characterized in that** the bottom wall (6) of the inner barrier means (22) is directly connected to a corresponding bottom portion (23) of the outer barrier means (21).
14. Device according to the claim 13 **characterized in that** the bottom portion (23) of the outer barrier means (21) is welded to a tubular duct (7).
15. Device according to the claim 12 **characterized in that** the inner barrier means (22) is shaped like a die having a plurality of deployed cavities.
16. Device according to the claim 12 **characterized in that** the outer barrier means (21) is shaped with a recess (24) having a square wave shape and fit to contain the cavities (2) walls, made in the inner barrier means (22).
17. Device according to the claim 16 **characterized in that** the recess ends (24) form, in cooperation with the outer barrier means (22), an inlet and an outlet for the refrigerating unit.

18. Device according to the claim 12 **characterized in that** the outer (21) and inner (22) barrier means have respective pass through holes (25) at least partially faced for the mutual blocking of said barrier means (21, 22) by means of welding. 5
19. Device according to the claim 1 **characterized in that** the duct (7, 8) are made by only an interspace (30) delimited by two barrier means, one of them outer (31) and the other inner (32), each one formed like a shaped plate, whose the inner one (32) comprises the side (4, 5) and bottom (6) walls of the containers (3) which are made integral. 10
20. Device according to the claim 19 **characterized in that** the inner barrier means (32) is shaped like a die having a plurality of deployed cavities (2). 15
21. Device according to the claim 19 **characterized in that** the outer barrier means (31) is shaped with a recess (34) with square wave trend and fit to contain the walls of the cavities (2) made in the inner barrier means (32), without matching with said walls. 20
22. Device according to the claim 21 **characterized in that** the recess ends (34) form, in cooperation with the inner barrier means (32), an inlet and outlet for the refrigerating unit (23). 25
23. Device according to the claim 19 **characterized in that** the outer (31) and inner (32) barrier means have respective pass through holes (35) at least partially faced for the mutual blocking of said barrier means (31, 32) by means of welding. 30
35
24. Device according to the claims 12 and 19 **characterized in that** it comprises a network means (40) fixed to the cavities (2) side and fit to cover the portions of the inner barrier means (22, 32) interposed among, or peripheral in respect to, the cavities (2) and fit to leave free the openings of said cavities (2). 40
25. Device according to the claim 24 **characterized in that** the network means (40) is made of a plastic and/or bad conductive material. 45
26. Device according to the claims 18, 23 and 24 **characterized in that** the network means (40) is fixed by means of screws, rivets (42) or similar, to the pass through holes (25, 35) of the barrier means (22, 32, 23, 33). 50
27. Device according to the claim 24 **characterized in that** the perimeter of the network means (40) is fixed to the edge of the barrier means (22, 32, 23, 33) by means at least a profile shaped like a "C" (41). 55

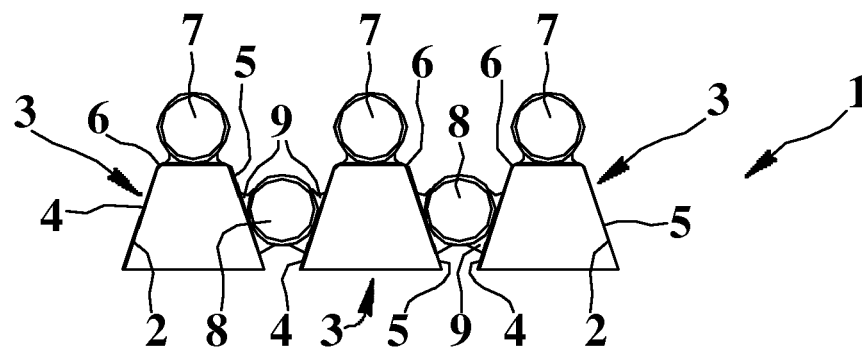


FIG.1

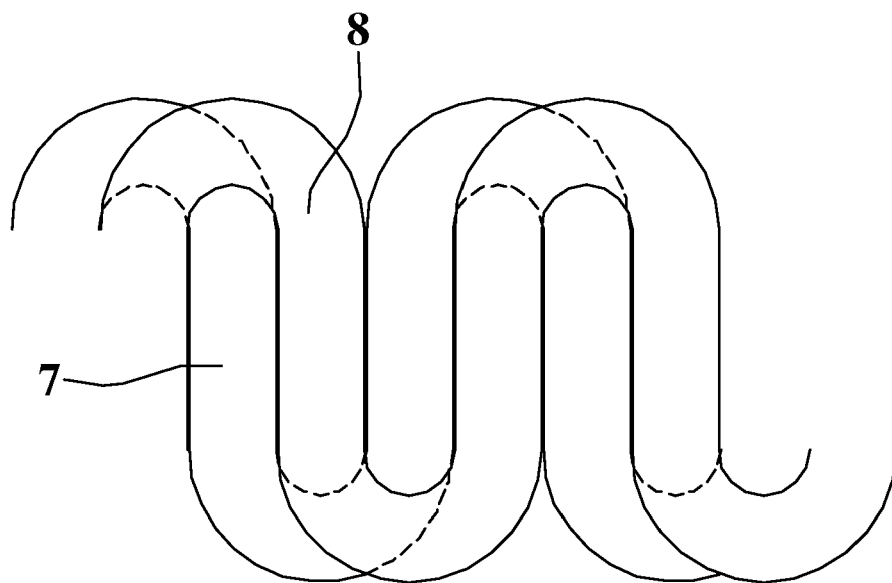


FIG.2

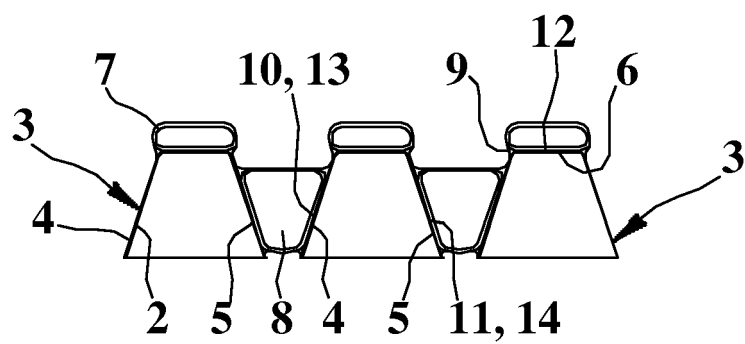


FIG. 3

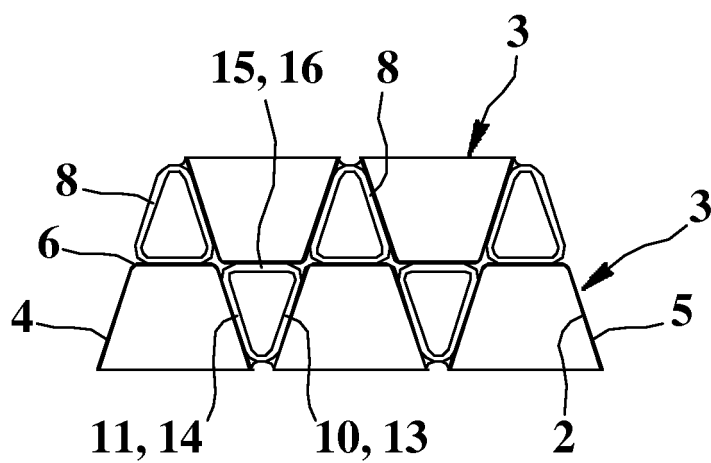


FIG. 4

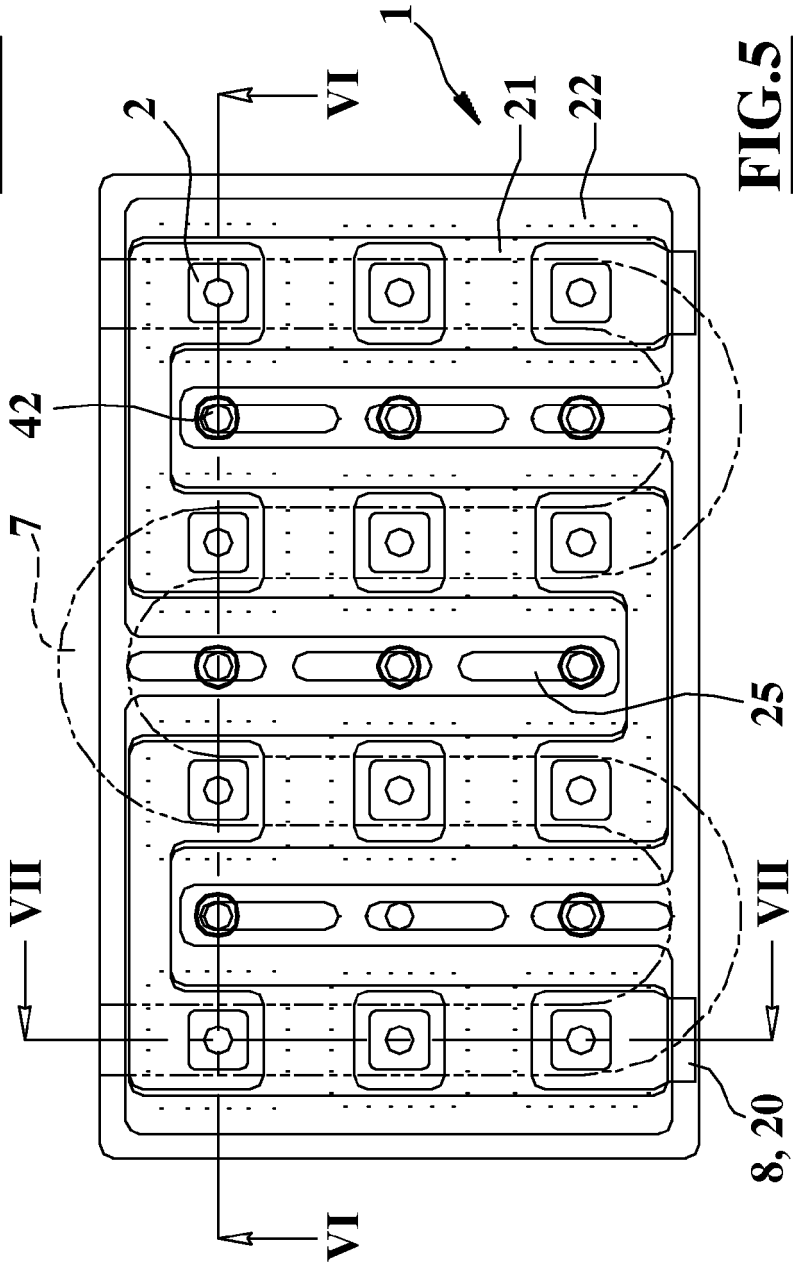
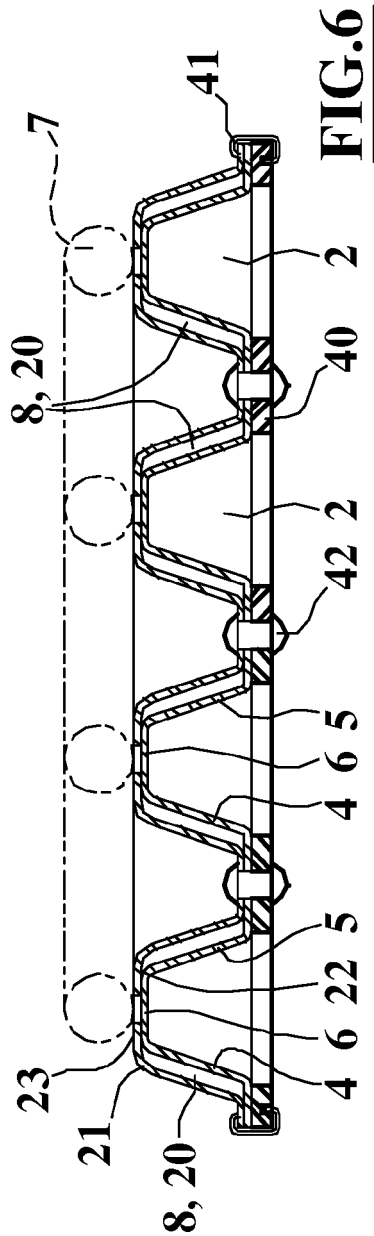
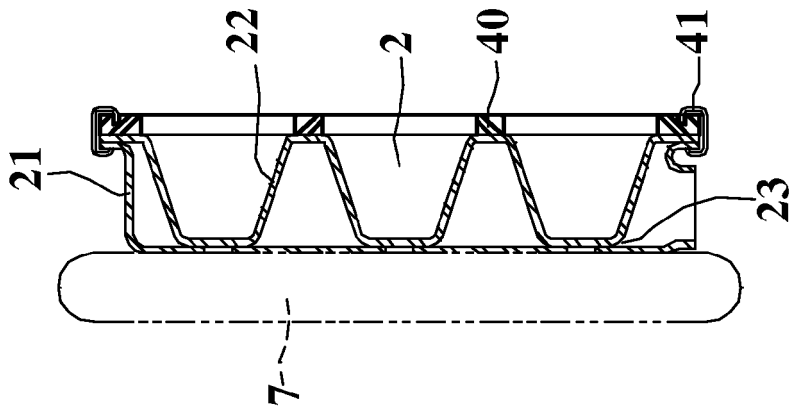


FIG.7



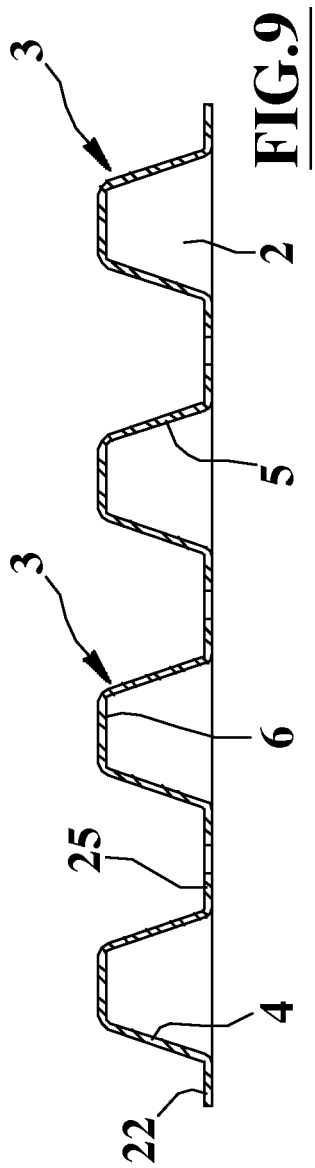
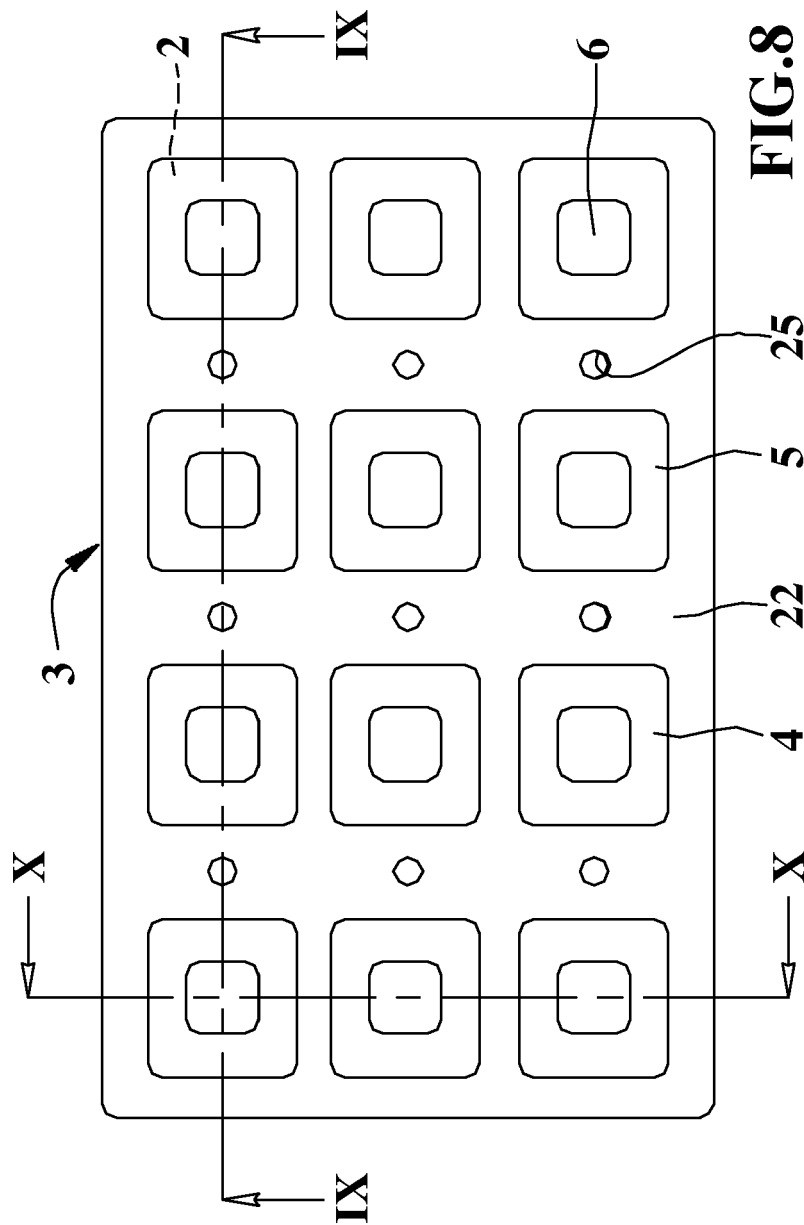
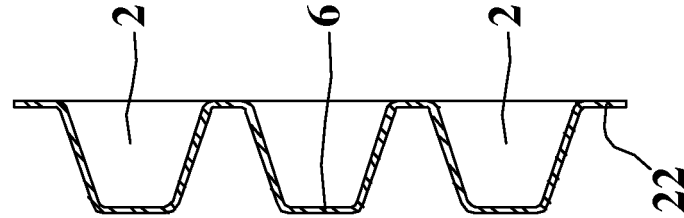
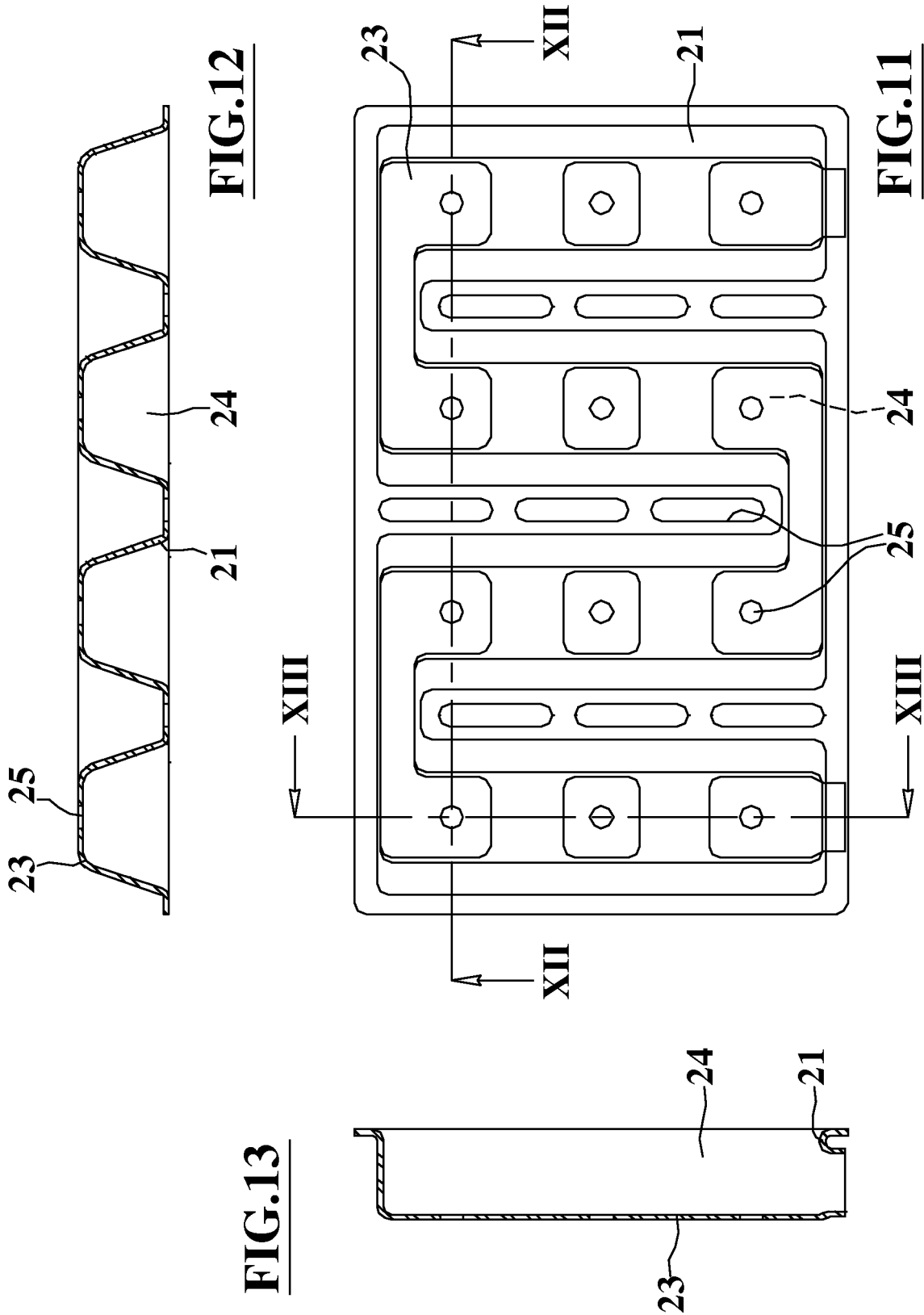


FIG.10





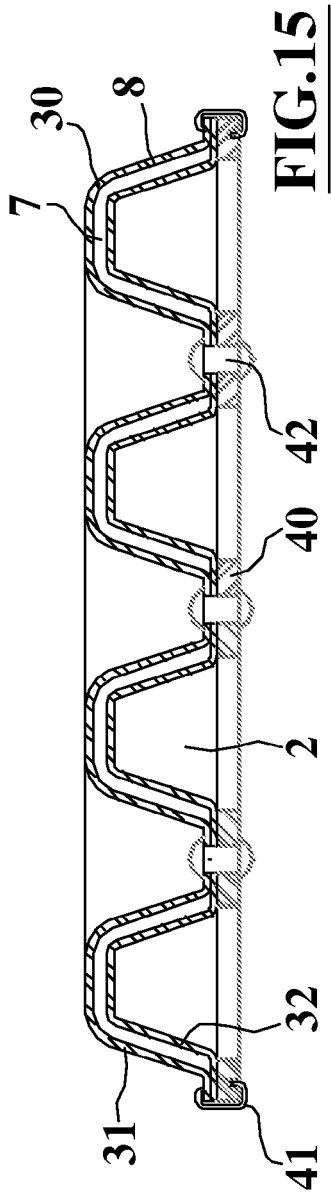
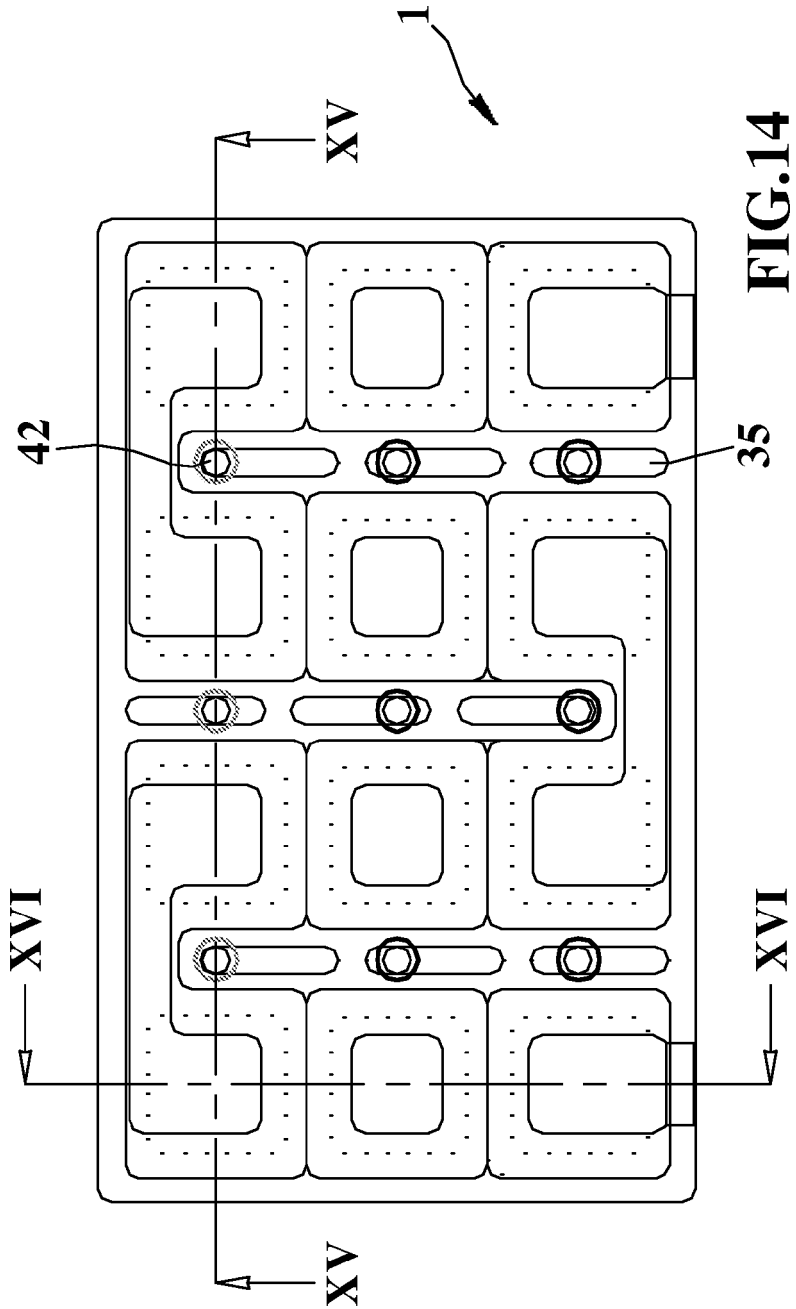
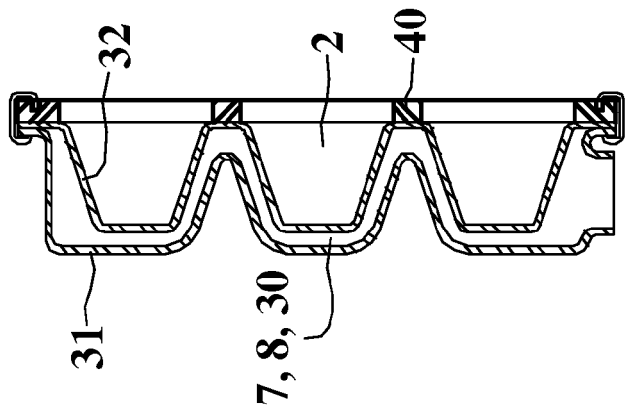


FIG. 16



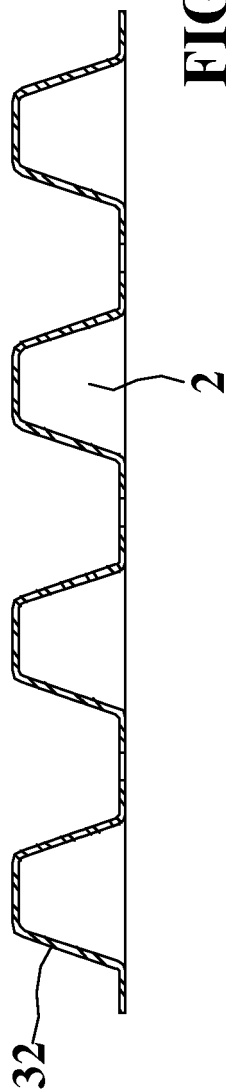


FIG. 18

FIG. 19

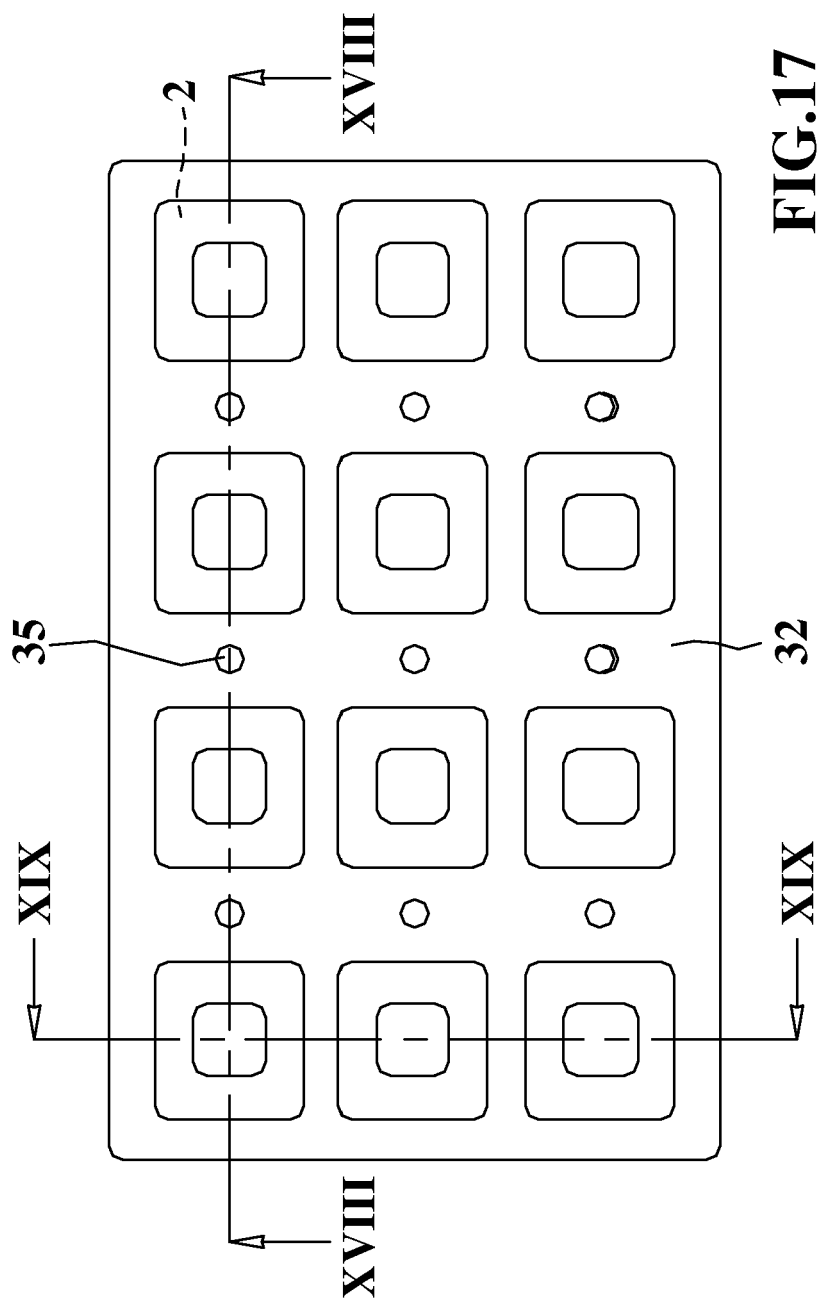
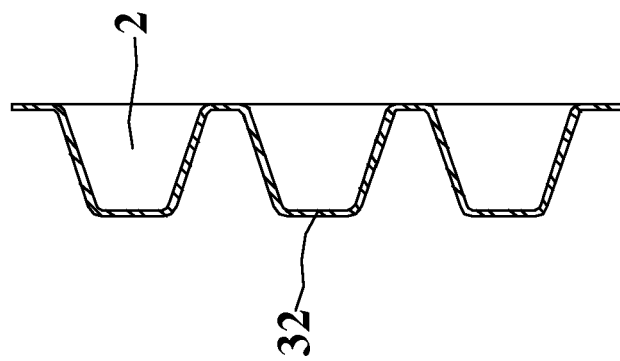


FIG. 17

