United States Patent

Curry, III

[15] **3,654,772**

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[54] ICE MAKER

[72] Inventor: **Robert W. Curry, III,** Louisville, Ky.

[73] Assignee: **General Electric Company**

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[52] **U.S. Cl.** **62/353,** 62/71

[51] **Int. Cl.** **F25c 1/06**

[58] **Field of Search** ..... 62/353, 71, 345; 249/7 G; 18/30 WP

[56] **References Cited**

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2,981,079 4/1961 Fink 62/353

2,971,346 2/1961 Frei 62/71

Primary Examiner—William E. Wayner

Attorney—Walter E. Rule, Francis H. Boos, Jr., Frank L. Neuhauser, Oscar B. Waddell and Joseph B. Forman

[57] **ABSTRACT**

An ice maker of the type comprising a mold including a plurality of cavities interconnected by fluid passages and ejecting means for ejecting ice pieces from the mold. In order to separate the ice pieces, the ejection axes of adjacent cavities slant relative to one another so that the connecting ice webs formed in the passages are broken during ejection of the ice pieces.

10 Claims, 4 Drawing Figures

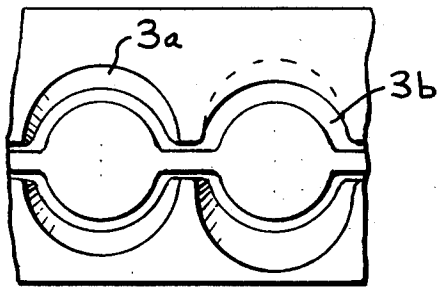
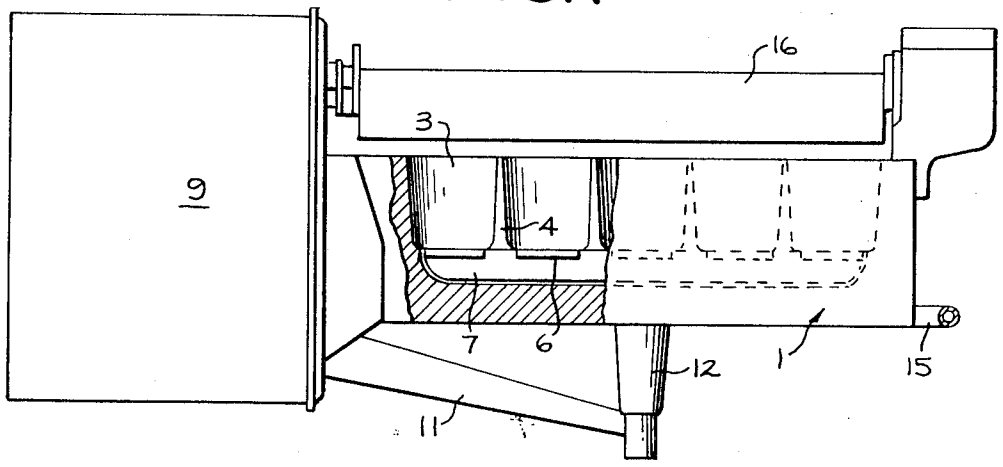


FIG. 1



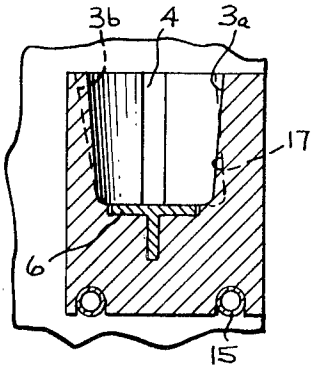


FIG. 2

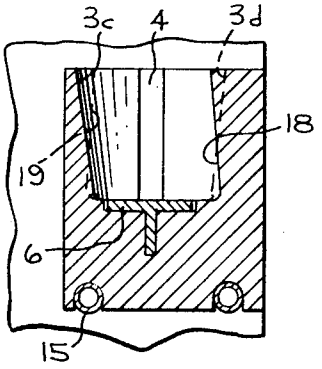


FIG. 4

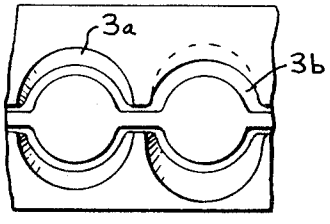


FIG. 3

INVENTOR.
ROBERT W. CURRY III
BY Walter E. Rule
HIS ATTORNEY

ICE MAKER

BACKGROUND OF THE INVENTION

The present invention relates to multiple-cavity ice makers of the type shown and described in U.S. Pat. No. 3,163,017 Baker et al. and U.S. Pat. No. 3,163,018 Shaw issued Dec. 29, 1964. An ice maker of this type comprises a mold including a plurality of vertically aligned cavities spaced from one another with the walls between adjacent cavities each having a passage extending from the top to the bottom thereof for distributing a charge of water between the cavities, a motor driven ejecting means including pads normally positioned in the lower portions of the cavities and movable to a position adjacent the top of the mold for ejecting the ice pieces from the cavities and pivoted sweep or rake means for sweeping the ejected ice pieces into an ice storage receptacle. The ice pieces ejected from the mold are interconnected by webs of ice formed in the passages. Some of these webs are broken during sweeping of the ice pieces from the mold and discharge thereof into a storage receptacle. The fact that some of the stored ice pieces are still connected by webs is of little consequence in most applications of the ice maker since the webs can be easily broken by hand as the ice pieces are removed from the receptacle. However when the ice maker is used in combination with an automatic ice dispenser, such as that described and claimed in U.S. Pat. No. 3,422,994 Alvarez assigned to the same assignee as the present invention, which is designed to dispense individual ice pieces, it is desirable that all of these webs be severed prior to discharge of the ice pieces into the dispenser receptacle.

SUMMARY OF THE PRESENT INVENTION

A primary object of the present invention is to provide an ice maker of the above-described type in which the mold cavities are so constructed and arranged as to break the ice webs during ejection of the ice pieces from the mold.

In accordance with the present invention, a multiple-cavity ice maker of the above described type is provided with a cavity orientation which effects a breaking of the interconnecting webs of ice during simultaneous ejection of the ice pieces from the mold cavities. To this end, the cavities of the mold are arranged or oriented so that the ejection axes of adjacent ice pieces diverge sufficiently to twist and break their interconnecting web as the ice pieces are ejected from the mold.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is an elevational view, partly in section, of an ice maker embodying the present invention;

FIG. 2 is a vertical transverse sectional view taken along line 2—2 of FIG. 1 illustrating one embodiment of the present invention;

FIG. 3 is a plan view of the portion of the mold shown in FIG. 2; and

FIG. 4 is a vertical transverse sectional view of an ice maker mold showing a modification of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

With initial reference to FIG. 1 of the drawing, there is shown an automatic ice maker comprising a mold 1 adapted to be supported on a wall of a freezer compartment of a household refrigerator. The mold includes a plurality of generally cylindrical ice cavities 3 arranged in a straight line longitudinally of the mold and separated from one another by mold end wall portions, each of which includes a vertical passage 4 extending from the top to the bottom of the cavities. These aligned vertical passages provide means for the flow of water from one cavity to another during the mold filling operation. Means for ejecting ice pieces from the cavities includes a plurality of pads or pistons 6, which to a substantial extent form the bottoms of the cavities 3 and which are interconnected by a bar 7 slidably received within the passages 5.

The passages also guide the bar in the operation of the ice maker to eject ice pieces.

Power and control means for operating the ice maker are generally contained within a housing 9 secured to one end of the mold and include a motor (not shown) connected through drive means comprising a lever 11 and a rod 12 to the pads 6 whereby the pads 6 and the ice pieces supported thereon can be elevated simultaneously to a position above the mold cavities 3.

The ice maker also includes a heater 15 for warming the mold to thaw or break the bond between the ice pieces and the cavity walls prior to operation of the ejecting means. After the ice pieces have been raised by the pads to a position substantially above the mold cavities, an elongated rake or sweep 16, pivotally supported above the upper surface of the mold and normally positioned at the rear side of the cavities, is designed to move across the top of the cavities and sweep the ice pieces into a storage receptacle.

As is described in the above mentioned Shaw and Baker et al patents to which reference is made for a more detailed description thereof, the automatic operating cycle of an ice maker of this type comprises filling of the cavities 3 with water, freezing of this charge of water into ice, heating of the mold by energization of the heater 15 to free the formed ice pieces from the cavities, ejection of the ice pieces by movement of the ejection means including pads 6 from their lower position in the bottom of the cavities to a raised position slightly above the upper surface of the mold, pivotal movement of the sweep 16 across the top of the mold for engaging the ejected ice pieces and sweeping the ice pieces from the mold surface and return of the sweep and the pads to their normal position in preparation for the introduction of another charge of water into the cavities.

As the charge of water introduced into the mold fills both the cavities and the passages connecting these cavities, the freezing of this charge of water produces a plurality of ice pieces interconnected by webs of ice formed in the passages. When the ice mold has the cavity and passage configuration and arrangement of the type disclosed in the aforementioned Shaw and Baker patents wherein the passages and cavities are in vertical alignment, the ice pieces ejected from the mold are interconnected by webs of ice. In accordance with the present invention, the mold cavities are so constructed and arranged that the webs of ice connecting adjacent ice pieces are twisted and broken during ejection of the ice pieces from the mold cavities. This twisting and breaking of the ice webs is accomplished by orienting adjacent mold cavities so that ice pieces formed in these cavities have angularly offset ejection paths or axes. The terms "ejection axis" or "ejection path" as used herein refer to the path or direction which a cavity causes an ice piece to follow during the ejection thereof from the cavity.

In describing this arrangement of the cavities, reference is first made to FIG. 1 of the drawing in which it will be seen that the ejection axes of the cavities are vertical and parallel in a longitudinal plane, that is in a plane passing longitudinally of the mold, as for example through the passages 4. In other words, in the longitudinal plane, the ice pieces move vertically from the cavities and follow the same vertically oriented paths as the ejection pads 6.

A twisting of the webs formed in the passages 4 is obtained by laterally orienting adjacent cavities so that ice pieces ejected therefrom follow laterally angling or divergent paths. In the embodiment of the invention illustrated in FIGS. 2 and 3 of the drawing, this has been accomplished by forming every other mold cavity so that its ejection axis, that is the path followed by an ice piece ejected therefrom will be angled laterally of the mold. For example, in a five cavity mold such as that illustrated in FIG. 1, the first, third and fifth mold cavities such as the cavity shown in FIG. 2 in solid lines and indicated by the numeral 3*a* are vertically oriented so that they have an ejection axis which is vertical in the longitudinal and lateral planes while the remaining or alternate mold cavities, one of which is shown in dotted lines in FIG. 2 and indicated

by the numeral 3*b*, laterally slant relative to the cavities 3*a* whereby ice pieces being ejected from these cavities 3*b* follow a path which is non-vertical and hence divergent from the ejection axes of the ice pieces from cavities 3*a*. Since the ice pieces formed in 3*a* follow a vertical ejection axis while the ice pieces formed in 3*b* follow a non-vertical axis, all of the webs of ice formed in the passages 4 as subjected to a twisting action which causes these webs to break between the initial and final stages of the ejection cycle.

In the embodiment of the invention illustrated in FIG. 4 of the drawing, the mold cavities are so arranged that all of their ejection axes are non-vertical in their lateral planes. More specifically, the alternate cavities illustrated in solid lines and indicated by the numeral 3*c* slants laterally in one direction so that their ejection axes also slant in that direction while the intermediate cavities indicated by the numeral 3*d* and shown in dotted line slant in the opposite lateral direction with a corresponding slanting of their ejection axes. In the operation of the mold shown in FIG. 4, all of the ice pieces follow angularly displaced or non-vertical paths as compared with the plane of the passages 4 thus making it possible to provide a greater web-twisting action than in the embodiment shown in FIG. 2.

The lateral angling of the ejection axes of the cavities also has an additional advantage. Since the pads 6 follow a vertical path during the ejection cycle while the ice pieces in such cavities follow a non-vertical path, these ice pieces are laterally titled with reference to the pads resulting in an early breaking of the bonds between the pads and the ice pieces. The ice pieces then slide laterally along the surface of the pads during the remaining portion of the ejection stroke and are free of the pads prior to being swept into the storage receptacle by the sweep 16. Accordingly, the sweep 16 does not have to furnish the energy necessary to break any ice bonds between the ice pieces and the pads.

From a consideration of FIGS. 2 and 3 of the drawing, it will be seen that the ejection axes or paths followed by ice pieces being ejected from the various cavities is determined by the inclination of a side wall portion of the cavities. More specifically, to provide a laterally slanting ejection axis, it is necessary that a lateral wall portion of a cavity, that is a wall portion about 90° removed from a passage 4, such as the side wall portion indicated by the numeral 17 in FIG. 2 or the wall portions 18 and 19 of the adjacent cavities in FIG. 4 slant inwardly from bottom to top in order to direct the ice piece being ejected in an angular path relative to a vertical plane extending through the passages 4.

The remaining wall portions of the various cavities may have any shape or configuration which will not interfere with the free ejection of ice pieces from the cavities. For example, instead of being cylindrical as illustrated, the cavities may be rectangular, oblong, oval or of any other cross-sectional shape provided these cavities also have a draft or taper which will permit the ice pieces to freely travel out of the cavities. Thus the adjacent cavities may be described either in terms of being cavities having angularly divergent ejection axes or paths for the ejected ice pieces or as respectively having opposed wall portions, that is wall portions on opposite sides of the longitudinal plane of the ice webs, which angle inwardly from bottom to top.

While there has been shown and described specific embodiments of the present invention, it will be understood that is is not limited thereto and it is intended by the appended claims to cover all such modifications that fall within the true spirit and scope of the invention.

I claim:

1. An ice maker comprising:
- a mold containing at least two cavities interconnected by a passage extending from the top towards the bottom of said cavities whereby the ice pieces formed in said cavities are interconnected by a web of ice formed in said passage;
- ejection means reciprocable in said cavities for simultaneously ejecting said interconnected ice pieces from said mold;
- the ejection axes of said cavities being at an angle relative to one another sufficient to break said web during ejection of said ice pieces.

2. An ice maker according to claim 1 containing a plurality of cavities extending longitudinally thereof with the ejection axes of adjacent cavities angling lateral relative to one another.

3. An ice maker according to claim 2 in which the ejection axes of alternate cavities are vertical.

4. An ice maker comprising:
- a mold containing a plurality of longitudinally spaced cavities and having aligned vertical passages in the walls separating adjacent cavities extending from the top towards the bottom of said cavities whereby the ice pieces formed in said cavities are interconnected by webs of ice formed in said passages;
- vertically movable ejection means including pads normally forming bottom wall portions of said cavities for simultaneously ejecting said interconnected ice pieces from said mold and an elongate member connecting said pads and guidingly received in said passages;
- the ejection axes of adjacent cavities of said mold being laterally divergent relative to one another sufficient to break the web connecting the ice pieces formed in said adjacent cavities during ejection thereof.

5. An ice maker according to claim 4 in which the ejection axes for alternate cavities are vertical.

6. An ice maker according to claim 4 in which the ejection axes of all of said cavities slant laterally relative to the plane of said passages.

7. An ice maker comprising:
- a mold containing a plurality of longitudinally spaced cavities and having aligned vertical passages in the walls separating adjacent cavities, said passages extending from the top towards the bottom of said cavities whereby the ice pieces formed in said cavities are interconnected by webs of ice formed in said passages;
- vertically movable ejection means including pads normally forming bottom wall portions of said cavities for simultaneously ejecting said interconnected ice pieces from said mold and an elongate member connecting said pads and guidingly received in said passages;
- the ejection axes of adjacent cavities being parallel in a longitudinal plane but laterally slanting relative to one another whereby during ejection of ice pieces from said mold adjacent ice pieces are caused to travel in laterally diverging paths to effect a twisting and breaking of their connecting webs.

8. An ice maker according to claim 7 in which all of said axis slant laterally.

9. An ice maker comprising:
- a mold containing a plurality of longitudinally spaced cavities and having aligned vertical passages in the walls separating adjacent cavities, said passages extending from the top to the bottom of said cavities whereby the ice pieces formed in said cavities are interconnected by webs of ice formed in said passages;
- vertically movable ejection means including pads normally forming bottom wall portions of said cavities for simultaneously ejecting said interconnected ice pieces from said mold and an elongate member connecting said pads and guidingly received in said passages;
- adjacent cavities respectively having a wall portion on opposite sides of the plane of said passages slanting inwardly from the bottom to the top thereof whereby during ejection of ice pieces from said mold adjacent ice pieces are caused to travel in laterally diverging paths to effect a twisting and breaking of their connection web.

10. An ice maker according to claim 9 in which said cavities are substantially cylindrical in cross-section.

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