United States Patent [19]

Webb

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[54] **SENSING ARRANGEMENT FOR ICE MAKER**

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[73] Assignee: **General Electric Company,** Louisville, Ky.

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[52] **U.S. Cl.** **62/137;** 200/61.2

[51] **Int. Cl.** **F25c 5/18**

[58] **Field of Search** 62/137; 200/61.2, 61.21

[56] **References Cited**

UNITED STATES PATENTS

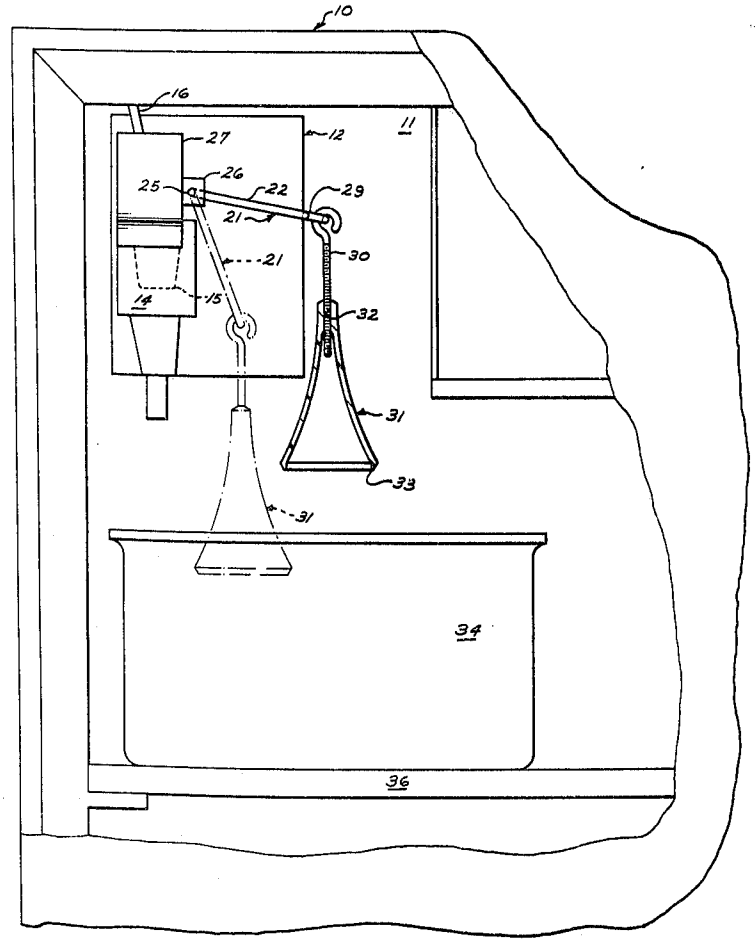
3,016,718	1/1962	Malone	62/137
3,040,542	6/1962	Linstromberg	62/137
3,045,444	7/1962	Todd	62/137

Primary Examiner—Kenneth W. Sprague
Assistant Examiner—James C. Yeung

[57] **ABSTRACT**

When the ice pieces collected in a storage bin or receptacle from an automatic ice maker of a refrigerator reach a predetermined level, a hollow, bell-shaped sensing element, which is adjustably mounted on a threaded screw eye pivotally mounted on a pivoting arm, is prevented from returning to its sensing position by its lower end engaging the ice pieces to stop further harvesting of the ice pieces from the ice maker. The sensing element is raised from its sensing position during each ice making cycle and is returned to its sensing position after a predetermined time period has elapsed. If the ice pieces are at the predetermined level in the receptable which prevents the sensing element from returning to its sensing position, which is usually within the receptacle, the sensing element prevents the bail from being rotated to a position in which another ice harvesting cycle can occur.

4 Claims, 2 Drawing Figures



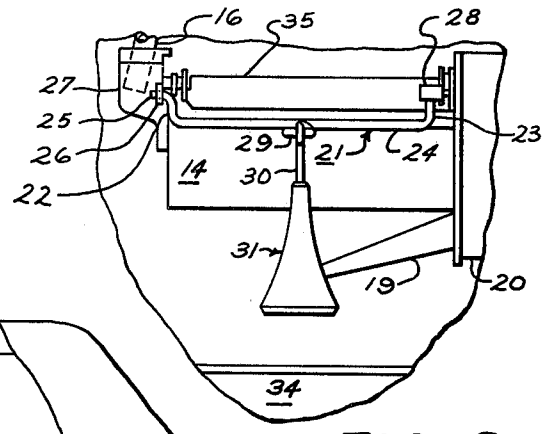

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FIG. 2

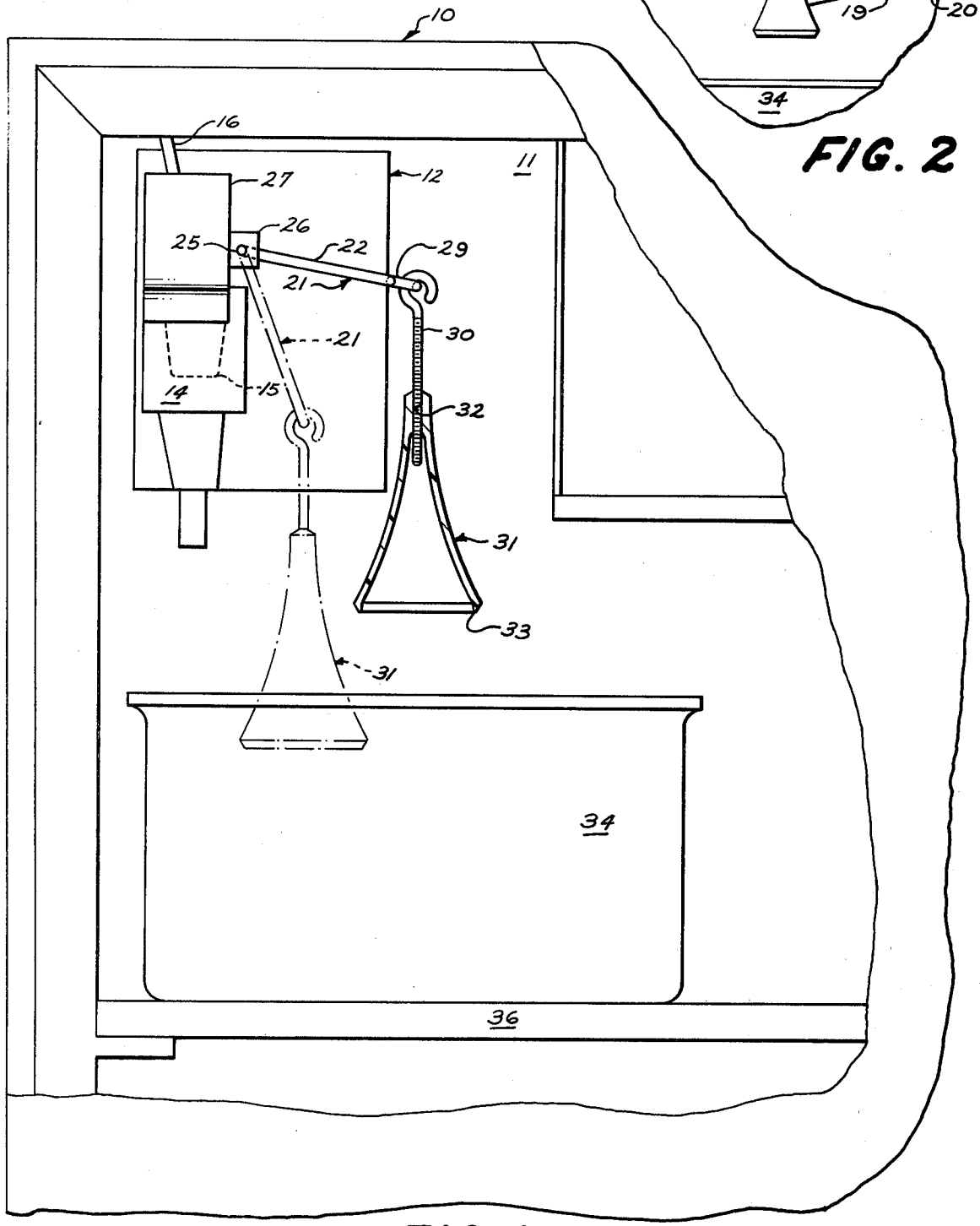
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FIG. 1

SENSING ARRANGEMENT FOR ICE MAKER

BACKGROUND OF THE INVENTION

In automatic ice makers, particularly those used in household refrigerators, a storage receptacle or bin is provided beneath the cavities of an ice mold in which the ice is formed to receive the ejected ice. When this bin or receptacle becomes full of ice pieces, it is desired to inactivate the ice harvesting cycle until the storage bin or receptacle is again able to store the ice pieces. This can occur only when at least some of the ice pieces are removed from the storage bin or receptacle or an empty storage bin or receptacle is substituted for the filled storage bin or receptacle.

It has previously been suggested in U.S. Pat. No. 3,163,017 to Baker et al. and U.S. Pat. No. 3,331,215 to Shaw to employ a feeler arm for activating an ice level sensing switch whenever the storage bin or receptacle becomes full. As shown and described in the aforesaid Baker et al and Shaw patents, the feeler arm is raised after the ice pieces have been ejected from the ice maker following each ice making cycle and lowered after the ice pieces have been received in the storage bin or receptacle. When the ice pieces fill the storage bin or receptacle to a predetermined level, the feeler arm is prevented by the accumulated ice from returning to its position in which the ice level sensing switch can be closed to permit another ice harvesting cycle to occur.

While this type of feeler arm, which can be a rotatably mounted U-shaped piece of wire, is satisfactory in many instances, it has the disadvantage of requiring a substantial amount of space in the freezer compartment of the refrigerator in which the automatic ice maker is disposed because of the length of its swinging arc between the position in which it is disposed to sense when the ice pieces in the storage bin or receptacle have reached the predetermined level and the position to which it is moved during each ice harvesting cycle. The length of this arc through which the feeler arm swings increases the lateral spaced required in the freezer compartment.

The present invention satisfactorily overcomes this problem through utilizing a sensing arrangement in which an arc of a much smaller length is required to swing the sensing arrangement between the position in which it senses whether the ice pieces in the storage bin or receptacle have reached the predetermined level and the position to which it is moved during ejection of the ice pieces from the ice maker following in the ice making cycle. As a result, the space required in the freezer compartment of a refrigerator for the sensing arrangement is substantially reduced. Thus, either the size of the freezer compartment can be reduced or more space can be utilized for storage of other frozen articles.

The sensing position of the sensing element of the present invention is adjustable so that different size storage bins or receptacles can be employed with the sensing element having the position of its ice engaging surface adjusted for the height of the particular size bin or receptacle or for selecting various levels within a particular storage bin or receptacle.

SUMMARY OF THE INVENTION

An object of this invention is to provide a sensor for an automatic ice maker for sensing when the ice pieces in a storage bin or receptacle reach a predetermined level.

Another object of this invention is to provide an ice sensor for an automatic ice maker in which less space is required in the freezer compartment for the sensor.

In accordance with the illustrated embodiment of the invention, there is provided an improved sensing arrangement for an ice maker having an ice mold in which ice pieces are formed and from which the ice pieces are ejected and a receptacle to receive the ejected ice pieces disposed beneath the ice mold. The improved sensing arrangement comprises an arm rotatable from a first position to a second position after the ice pieces are formed in the ice mold and from the second position to the first position after the ice pieces are received in the receptacle. The arm has a member pivotally supported thereon with a sensing element mounted on the pivotally supported member. The sensing element has an ice engaging area larger than an ice piece formed in the ice mold. The pivotally supported member and the sensing element have a combined effective fixed length to enable the ice engaging surface of the sensing element to be in a position to engage ice pieces at a predetermined level when the bail is in its first position and to cause the ice engaging surface of the sensing element to be disposed exterior to the receptacle when the arm is in its second position. The ice engaging surface of the sensing element engages at least one of the ice pieces when the ice pieces in the receptacle are at the predetermined level to prevent the full return of the bail to its first position from its second position to stop the supply of ice pieces from the ice maker to the receptacle.

BRIEF DESCRIPTION OF THE DRAWING

The attached drawing illustrates a preferred embodiment of the invention, in which:

FIG. **1** is a front elevational view of a portion of a freezer compartment of a refrigerator cabinet having an automatic ice maker with which the sensor of the present invention is employed; and

FIG. **2** is a side elevational view of the ice maker and sensor of FIG. **1** when the sensor is in its sensing position in which ice harvesting can occur.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawing and particularly FIG. **1**, there is shown a refrigerator cabinet **10** having a freezer compartment **11** in which is disposed an automatic ice maker **12** of the type shown and described in the aforesaid Baker et al and Shaw patents. It includes a mold **14** having a plurality of mold cavities **15** (one shown) for receiving water from a water supply conduit **16.** The water may be supplied from the usual household source or from a reservoir supported within a fresh food compartment (not shown) as shown and described in the copending patent application of Frank A. Schumacher for "Refrigerator Including Automatic Ice Maker," Ser. No. 314,695, filed Dec. 13, 1972 now U.S. Pat. No. 3,803,862, and assigned to the same assignee as the assignee of this application.

As shown and described in the aforesaid Baker et al and Shaw patents, a lever mechanism **19** (see FIG. **2**) raises an ejection pad (not shown) at the bottom of each of the cavities **15** to raise and eject the ice pieces

therefrom. The lever mechanism **19** is driven by a cam mechanism from a motor (not shown) within a housing **20** to produce the ice harvesting cycle.

The sensing arrangement of the present invention includes a pivotally mounted U-shaped member **21** having a pair of substantially parallel legs **22** and **23** extending from a base **24.** The leg **22** has its end **25,** which is substantially perpendicular to the leg **22,** supported in an ear **26** of a trough **27** of the ice maker **12.** The end of the leg **23** is supported in a rotatably mounted drive coupling **28,** which is driven by the cam mechanism within the housing **20** of the ice maker **12** as shown and described in the aforesaid Baker et al and Shaw patents.

The base **24** of the member **31** has a loop **29** formed therein substantially half way between the legs **22** and **23** to receive and pivotally support a screw eye **30.** A hollow, bell-shaped sensing element **31** has a threaded opening **32** (See FIG. **1**) in its upper end to enable the element **31** to be mounted on the screw eye **30.** Thus, the position of the sensing element **31** on the screw eye **30** is adjustable to vary the combined fixed length of the screw eye **30** and the sensing element **31.**

The sensing element **31** is formed of any suitable plastic material such as high impact styrene, for example. Any suitable thermoplastic material may be readily employed.

Because of its shape, the sensing element **31** has the surface of its lower annular end **33** of a sufficient size to always engage at least one ice piece within a storage bin or receptacle **34** whenever the ice pieces within the storage bin or receptacle **34** reach a predetermined level as determined by the position of the lower end **33** of the sensing element **31** when the sensing arrangement is in the dotted line position of FIG. **1.** This is when the member **21** has been rotated through the coupling **28** to its lowermost position.

The storage bin or receptacle **34** is disposed beneath the mold **14** to receive the ice pieces formed in the mold cavities **15** and ejected therefrom by the lever mechanism **19.** During each ice harvesting cycle as the member **21** is rotated from the dotted line position to the upper solid line position of FIG. **1,** an ice level sensing switch is opened as described in the aforesaid Baker et al. and Shaw patents.

If the ice bin or receptacle **34,** which is supported below the ice maker on a shelf **36** in the freezer compartment **11** of the refrigerator cabinet **10,** becomes filled with ice pieces to the predetermined level and a new batch of ice pieces is ejected from the mold cavities **15,** the added ice pieces prevent the sensing element **31** from returning to the dotted line position of FIG. **1.** As a result, the bail **21** cannot return to the position in which the ice level sensing switch is closed to permit initiation of another ice harvesting cycle by the ice maker **12.**

Considering the operation of the present invention, during each ice harvesting cycle, the member **21** rotates between the dotted line position and the solid line position of FIG. **1** to move the sensing element **31** from its lower or sensing position to an upper position. Whenever the ice pieces in the storage bin or receptacle **34** reach the predetermined level, the member **21** is prevented from returning to the dotted line position of FIG. **1.** This stops further ice harvesting until some of the ice pieces are removed from the storage bin or receptacle **34.**

With only the length of the member **21** forming the arc of rotation, a much smaller amount of lateral space is required in the freezer compartment **11** than when the feeler arm is rotated as in the aforesaid Baker et al and Shaw patents. Also, the screw eye **30** and the sensing element **31** form an effective sensing member of a fixed, although adjustable, length. Thus, adjustment of the desired predetermined maximum level of the ice pieces within the storage bin or receptacle **34** at which ice harvesting is to stop is provided.

A particular advantage of the bell-shaped sensor element **31** is that it positively overlies and engages at least one of the ice pieces when the ice reaches the predetermined level. In other words, its base is larger than an individual ice piece so that it engages at least one ice piece or bridges two or more ice pieces so that it cannot swing or tilt to one side or another as it contacts the mass of ice pieces.

For purposes of exemplification, a particular embodiment of the invention has been shown and described according to the best present understanding thereof. However, it will be apparent that changes and modifications in the arrangement and construction of the parts thereof may be resorted to without departing from the spirit and scope of the invention.

I claim:

1. In an ice maker having an ice mold in which ice pieces are formed and from which the ice pieces are ejected during a harvesting cycle and a receptacle to receive the ejected ice pieces and disposed beneath the ice mold, the improvement comprising:

a member rotatable from a first position to a second position during an ice harvesting cycle and from the second position to the first position after the ice pieces are received in the receptacle;

a second member pivotally supported on said first member and including a hollow and bell-shaped sensing element having an enlarged lower annular end forming the ice engaging surface of said sensing element;

said pivotally supported member and said sensing element having a combined fixed length to enable said ice engaging surface of said sensing element to engage ice pieces at a predetermined level when said first member is above its first position and to cause said ice engaging surface of said sensing element to be disposed above said level when said first member is in its second position, said ice engaging surface of said sensing element being adapted to overlie at least one of the ice pieces when the ice pieces in the receptacle are at the predetermined level to prevent return of said first member to its first position to stop the supply of ice pieces from the ice maker to the receptacle; and

means to vary the position of said sensing element on said pivotally supported member to adjust the combined operative length of said pivotally supported member and said sensing element.

2. The improvement according to claim **1** in which said adjusting means comprises threads on said pivotally supported member and a threaded opening in the upper end of said sensing element.

3. The improvement according to claim **1** including means to adjust the position of said sensing element relative to said pivotally supported member to change the combined fixed length of said pivotally supported member and said sensing element.

4. The improvement according to claim **3** in which said adjusting means comprises threads on said pivotally supported member and a threaded opening in the upper end of said sensing element.

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