POWER CONTROL STRUCTURE FOR ICE MAKERS

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Appl. No.: 11/954,978
Filed: Dec. 12, 2007

Publication Classification
Int. Cl.
F25C 1/00 (2006.01)

ABSTRACT
A power control structure for ice makers includes a control box to control an ice making process and a transmission means located in the control box. The transmission means has a movement range within which an ON/OFF switch is located. A retrievable ice collection tray is provided which has an actuation wall. The transmission means is coupled with an actuation arm extended to a loading/unloading displacement of the actuation wall. When the ice collection tray is unloaded the actuation wall pushes the actuation arm to drive the transmission means to trigger the ON/OFF switch to suspend the ice making process. When the ice collection tray is reloaded the actuation wall pushes the actuation arm again to drive the transmission means to trigger the ON/OFF switch a second time to trigger the ON/OFF switch to start the ice making process of the ice maker.
POWER CONTROL STRUCTURE FOR ICE MAKERS

FIELD OF THE INVENTION

[0001] The present invention relates to a power control structure for ice makers and particularly to a power control structure to automatically suspend or restart ice making process while an ice collection tray is being unloaded or loaded.

BACKGROUND OF THE INVENTION

[0002] Many refrigerators have an automatic ice making system built inside. Refer to FIG. 1 for the general structure of a conventional ice maker. It includes a control box to provide an ice making process, an ice making tray, an ice sweeping element and a retrievable ice collection tray located at a lower side of the ice maker. There is an ice level detection means located above the ice collection tray. After ice cubes have been produced in the ice making tray, the control box orders the ice sweeping element to move the ice cubes from the ice making tray to an ice trough to be accumulated there. During the ice sweeping process the control box suspends ice making process in the ice making tray. If the ice cubes accumulated in the ice trough are saturated and reached a lower detection limit of a linear detection means, the linear detection means is pushed by the accumulated ice cubes and the ice sweeping element is hindered and unable to continue the ice moving process. Namely the ice maker remains at the ice sweeping step and suspends the ice making process. As the ice cubes thaw after a period of time and bond together to become a big and hard ice chunk, the ice sweeping element, ice making tray or control box could be damaged. If damage occurs, or the stored ice cubes are overdue and have to be discarded, or the ice collection tray, ice making tray and ice maker and the like have to be cleaned and put to maintenance after used for a period of time, the ice collection tray has to be unloaded. Before the unloading is made the ice making process must be stopped (otherwise the ice maker will continuously produce ice and no ice collection tray is available to hold the dropping ice cubes). The refrigerator does not have to be power off while the ice making process is suspended. The control box of the conventional ice maker has an external switch control button. Users have to extend their hands deeply inside the ice collection tray to depress the switch control button to turn off the power of the ice maker and unload the ice collection tray. Such a design causes a great trouble to the users. The conventional design has the following drawbacks:

[0003] 1. In the event that the ice level of the accumulated ice cubes in the ice collection tray has passed over the switch control button (especially when the linear detection means is in a malfunctioned condition), users cannot securely touch the switch control button. Moreover, before the power is turned off the ice maker still maintains continuous operation. If users put their hands inside the ice maker, a risky condition could happen, such as inflicting electric shock, hands hurt by operating machine elements or the like.

[0004] 2. The commonly adopted design of the linear detection means has the detection upper limit located below the switch control button. To ensure that the ice level of the accumulated ice cubes does not affect other elements most ice makers have the detection upper limit at the height of the ice collection tray. Namely, when the users unload the ice collection tray, aside from turning off the switch control button, the detection means has to be moved upwards in advance so that the ice collection tray can bypass the detection means and removed. A similar situation also takes places during loading the ice collection tray. However, most users often neglect such procedures. They tend to directly shut down electric power, or often unload or load the ice collection tray forcefully and inadvertently hit the detection means and cause damage of the detection means.

SUMMARY OF THE INVENTION

[0005] The primary object of the present invention is to solve the aforesaid disadvantages. The present invention provides a power control structure that has an actuation arm coupling with loading/unloading process of an ice collection tray to replace the conventional external switch control button. An existing ON/OFF switch is used to suspend or restart ice making process of an ice maker while the ice collection tray is unloaded or loaded. Hence users do not have to put their hands into the ice maker and safety improves.

[0006] To achieve the foregoing object the ice maker according to the invention includes an ice making tray and a control box to provide an ice making process for the ice making tray. The control box has a transmission means located inside and an ON/OFF switch located within a movement range of the transmission means. The ice collection tray is retrievable and has an actuation wall. The transmission means has an actuation arm extended in a loading/unloading displacement of the actuation wall. When the ice collection tray is in an unloading condition the actuation wall pushes the actuation arm to drive the transmission means to trigger the ON/OFF switch to suspend the ice making process of the ice maker. When the ice collection tray is reloaded, the actuation wall pushes the actuation arm again to drive the transmission means to trigger the ON/OFF switch the second time to start the ice making process of the ice maker.

[0007] Another object of the invention is to extend the design and application of the existing transmission means that drives an ice moving blade and a detection means over the ice making tray. In addition, by adopting a single ON/OFF switch electronic signal errors can be prevented.

[0008] The foregoing, as well as additional objects, features and advantages of the invention will be more readily apparent from the following detailed description, which proceeds with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] FIG. 1 is a schematic view of a conventional ice maker in an ice making condition.

[0010] FIG. 2 is a perspective view of a conventional ice maker.

[0011] FIG. 3 is an exploded view of the invention.

[0012] FIGS. 4A through 4D are schematic views of an embodiment of the invention showing loading and unloading conditions of an ice collection tray.

[0013] FIGS. 5A through 5F are schematic views of another embodiment of the invention showing loading and unloading conditions of an ice collection tray.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0014] Please refer to FIGS. 2 and 3 for the power control structure for an ice maker of the invention. The ice maker has an ice making tray 40 to freeze water to become ice cubes 70 and an ice sweeping blade 41 above the ice making tray 40 to move the ice cubes 70 out of the ice making tray 40. There is
a control box 10 at one side of the ice making tray 40 to control transmission of the elements of the ice maker. There is also a retrievable ice collection tray 50 located below the ice making tray 40 to store the ice cubes 70. The ice collection tray 50 and the ice making tray 40 are interposed by an ice level detection arm 31. The control box 10 has a transmission means 20 located inside. The transmission means 20 has a movement range within which an ON/OFF switch 60 is located. The ice collection tray 50 has an actuation wall 51. The transmission means 20 has an actuation arm 30 extended in a loading/unloading displacement of the actuation wall 51.

When the ice collection tray 50 is in an unloading condition the actuation wall 51 pushes the actuation arm 30 to drive the transmission means 20 to trigger the ON/OFF switch 60 to suspend an ice making process. When the ice collection tray 50 is reloaded the actuation wall 51 pushes the actuation arm 30 again to drive the transmission means 20 to trigger the ON/OFF switch 60 the second time to start the ice making process of the ice maker.

[0015] An embodiment of the invention adopts an extended design of the existing transmission means 20 located in the control box 10 that transmits the ice sweeping blade 41 to generate an ice sweeping displacement and the ice level detection arm 31 to generate an ice level detection displacement and the ON/OFF switch 60. The transmission means 20 includes a transmission member 21 coupled to a motor 11, a crank element 22 driven by the transmission member 21 and a driven member 23 coupled to the crank element 22. The crank element 22 has an axis portion 224, a first lever 221 coupling with the transmission member 21 and a second lever 222 coupling with the driven member 23. The first lever 221 is driven by the transmission member 21 to turn about the axis portion 224 so that the second lever 222 is moved along an eccentric displacement to drive the driven member 23. The actuation arm 30 is coupled on the driven member 23 through a transmission shaft 32. The transmission shaft 32 has another end fastened to the ice level detection arm 31. The driven member 23 has an axis 231 coupled with the transmission shaft 32. The driven member 23 and the second lever 222 have respectively a moving slot 232 and a stub 2221 located in the moving slot 232. The stub 2221 is driven by the aforesaid elements and moved in the moving slot 232 to drive the transmission shaft 32 to make the ice level detection arm 31 to generate a detection displacement. The motor 11 has a first gear 111 to output driving power. The transmission member 21 has a second gear 211 to engage with the first gear 111 and an eccentric boss 213 to drive the first lever 221 while the second gear 211 is turning. The second gear 211 has a hub 212 to couple with an axle 42. The axle 42 is extended to the ice making tray 40 and fastened to the ice sweeping blade 41. The second gear 211 drives the ice moving blade 41 to generate an ice sweeping displacement. The crank element 22 also has a third lever 223 turning about the axis portion 224 to generate a second eccentric displacement while the first lever 221 is moving to trigger the ON/OFF switch 60. The third lever 223 further has a pressing portion 2231 corresponding to the ON/OFF switch 60 at a proximate location thereof and an elastic ON/OFF reed 61 (or a button of the ON/OFF switch 60). When the ice moving displacement and detection displacement are started the pressing portion 2231 of the third lever 223 is moved away from the depressing condition of the elastic ON/OFF reed 61 so that the ON/OFF switch 60 is triggered to suspend the ice making process of the ice maker.

[0016] Refer to FIGS. 4A through 4D for operating conditions of loading and unloading the ice collection tray 50. When the ice collection tray 50 is unloaded, the actuation wall 51 (preferably a rear wall of the ice collection tray 50) drives the actuation arm 30 located in the loading/unloading displacement. Meanwhile, aside from triggering the ON/OFF switch 60 by the crank element 22 to suspend the ice making process, the ice moving displacement may also be actuated to remove the remaining ice cubes 70 in the ice making tray 40 to the ice collection tray 50. To simplify the design of the ON/OFF switch 60, one that accepts a simple ON/OFF command may be adopted. The third lever 223 also has a positioning boss 2233 at one end and the control box 10 has a detent lug 12 corresponding to the positioning boss 2233. The detent lug 12 has a slant guiding surface 121 at one end. When the actuation arm 30 is pressed by the ice collection tray 50 to drive the third lever 223 of the crank element 22 to generate the second eccentric displacement, the positioning boss 2233 is moved downwards along the guiding surface 121 to escape the detent lug 12. The detent lug 12 has an elevation difference to latch the positioning boss 2233 to keep the third lever 223 and the ON/OFF switch 60 in a separated condition. It is to be noted that in the invention the ice level detection arm 31 and the actuation arm 30 are coupled on the same transmission shaft 32. The bottom edge of the ice level detection arm 31 may be set higher than the bottom edge of the actuation arm 30 so that when users unload the ice collection tray 50 and the actuation wall 51 hits the actuation arm 30, the ice collection tray 50 does not hit the ice level detection arm 31 during unloading of the ice collection tray 50. Thus damage of the ice level detection arm 31 caused by improper unloading of the ice collection tray 50 can be reduced.

[0017] When the ice collection tray 50 is reloaded, the actuation wall 51 first moves the actuation arm 30 which drives the third lever 223 to move along the guiding surface 121 to release the latch condition of the detent lug 12 and the positioning boss 2233. The third lever 223 depresses the ON/OFF switch 60 to restart the ice making process. The axis portion 224 or any lever (the axis portion 224 is taken as an example in the embodiment) may also be coupled with a return element 2241 (such as a spring to store and release an elastic force) to force the crank element 22 to return to a regular position. To ensure that the positioning boss 2233 returns to the position above the detent lug 12 any lever (the third lever 223 is taken as an example of the crank element 22) is coupled with a retaining element 2232 (such as a spring to store and release an elastic force) to force the third lever 223 to return to a regular position. By means of the invention the ice maker does not have to add an external switch control button. And users do not have to put their hands into the ice maker to do operation. Loading and unloading of the ice collection tray 50 also are safer and more convenient.

[0018] Refer to FIGS. 5A through 5F for loading and unloading conditions of the ice collection tray 50 of another embodiment. In this embodiment the actuation arm 30 is divided into a first contact portion 301 and a second contact portion 302 according to different designed angles of various elements of the transmission means 20. When the ice collection tray 50 is loaded, the bottom edge of the second contact portion 302 is lower than the actuation wall 51, and the bottom edge of the first contact portion 301 is higher than the actuation wall 51. Hence, as shown in FIG. 51B, when the ice collection tray 50 is unloaded the actuation wall 51 pushes the second contact portion 302 to drive the transmission means
to trigger the ON/OFF switch to suspend the ice making process of the ice maker. Meanwhile, the first contact portion is driven and moved to an elevation lower that the height of the actuation wall (referred to as FIG. SC). When the ice collection tray is reloaded, the actuation wall pushes the first contact portion of the actuation arm again to drive the transmission means to trigger the ON/OFF switch the second time to start the ice making process, and the second contact portion returns to its original position (referred to as FIG. SF).

While the preferred embodiments of the invention have been set forth for the purpose of disclosure, modifications of the disclosed embodiments of the invention as well as other embodiments thereof may occur to those skilled in the art. Accordingly, the appended claims are intended to cover all embodiments which do not depart from the spirit and scope of the invention.

What is claimed is:

1. A power control structure for ice makers, comprising:
   an ice maker which has an ice making tray and a control box to provide an ice making process for the ice making tray, the control box having a transmission means located inside that has a movement range which has an ON/OFF switch located therein; and
   a retrievable ice collection tray located below the ice making tray to store ice cubes produced by the ice making tray after the ice making process is finished;
   wherein the ice collection tray has an actuation wall, the transmission means being coupled with an actuation arm extended to a loading/unloading displacement of the actuation wall to drive the transmission means to trigger the ON/OFF switch to suspend the ice making process while the ice collection tray is in an unloading condition; the ice collection tray being reloadable to allow the actuation wall to push the actuation arm to drive the transmission means so that the ON/OFF switch is triggered again to start the ice making process.

2. The power control structure of claim 1, wherein the transmission means includes a transmission member, a crank element driven by the transmission member and a driven member coupled on the crank element; the crank element having an axis portion, a first lever coupled with the transmission member and a second lever coupled with the driven member, the first lever being driven by the transmission member to turn about the axis portion so that the second lever generates an eccentric displacement to drive the driven member.

3. The power control structure of claim 2, wherein the actuation arm is coupled on the driven member through a transmission shaft, the driven member having an axis to couple with the transmission shaft, the driven member and the second lever having respectively a moving slot and a stub located in the moving slot, the transmission shaft having another end fastened to an ice level detection arm.

4. The power control structure of claim 2, wherein the transmission member is coupled on a motor which has a first gear to output driving power, the transmission member having a second gear engaging with the first gear and an eccentric boss to drive the first lever while the second gear is turning.

5. The power control structure of claim 4, wherein the second gear has a hub to couple with an axle which is extended in the ice making tray and coupled with an ice sweeping blade, the ice sweeping blade being driven by the second gear to generate an ice sweeping displacement.

6. The power control structure of claim 2, wherein the crank element further has a third lever turnable about the axis portion to generate a second eccentric displacement while the first lever is moving to trigger the ON/OFF switch.

7. The power control structure of claim 6, wherein the third lever has a pressing portion and an elastic ON/OFF feed corresponding to the ON/OFF switch at a proximate location thereof, the third lever further having a positioning boss at one end and coupling with a retaining element, the control box having a detent lug corresponding to the positioning boss, the retaining element forcing the positioning boss returning to a regular position on the detent lug.

8. The power control structure of claim 2, wherein the axis portion is coupled with a return element to force the crank element to return to a regular position.

9. The power control structure of claim 8, wherein the return element is a spring to store and release an elastic force.

10. A power control structure for ice makers, comprising:
    an ice maker which has an ice making tray and a control box to provide an ice making process for the ice making tray, the control box having a transmission means located inside that has a movement range which has an ON/OFF switch located therein; and
    a retrievable ice collection tray located below the ice making tray to store ice cubes produced by the ice making tray after the ice making process is finished;
    wherein the ice collection tray has an actuation wall, the transmission means being coupled with an actuation arm extended to a loading/unloading displacement of the actuation wall, the actuation arm having a first contact portion and a second contact portion, the actuation wall pushing the second contact portion while the ice collection tray is in an unloading condition to drive the transmission means to trigger the ON/OFF switch to suspend the ice making process; the ice collection tray being reloadable to allow the actuation wall to push the first contact to drive the transmission means so that the ON/OFF switch is triggered again to start the ice making process.

11. The power control structure of claim 10, wherein the transmission means includes a transmission member, a crank element driven by the transmission member and a driven member coupled on the crank element; the crank element having an axis portion, a first lever coupled with the transmission member and a second lever coupled with the driven member, the first lever being driven by the transmission member to turn about the axis portion so that the second lever generates an eccentric displacement to drive the driven member.

12. The power control structure of claim 11, wherein the actuation arm is coupled on the driven member through a transmission shaft, the driven member having an axis to couple with the transmission shaft, the driven member and the second lever having respectively a moving slot and a stub located in the moving slot, the transmission shaft having another end fastened to an ice level detection arm.

13. The power control structure of claim 11, wherein the transmission member is coupled on a motor which has a first gear to output driving power, the transmission member having a second gear engaging with the first gear and an eccentric boss to drive the first lever while the second gear is turning, the second gear having a hub to couple with an axle which is extended in the ice making tray and coupled with an ice sweeping blade, the ice sweeping blade being driven by the second gear to generate an ice sweeping displacement.
14. The power control structure of claim 11, wherein the crank element further has a third lever turnable about the axis portion to generate a second eccentric displacement while the first lever is moving to trigger the ON/OFF switch.

15. The power control structure of claim 14, wherein the third lever has a pressing portion and an elastic ON/OFF reed corresponding to the ON/OFF switch at a proximate location thereof.

16. The power control structure of claim 14, wherein the third lever has a positioning boss at one end, the control box having a detent lug corresponding to the positioning boss.

17. The power control structure of claim 16, wherein the third lever is coupled with a retaining element to force the positioning boss returning to a regular position on the detent lug.

18. The power control structure of claim 11, wherein the axis portion is coupled with a return element to force the crank element to return to a regular position.

19. The power control structure of claim 18, wherein the return element is a spring to store and release an elastic force.

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