A refrigerator comprises one or more chambers to store food or beverage; a power source provided in the refrigerator to provide power; a compressor equipped in the refrigerator and coupled to the power source to compress gas to generate refrigerant gas in the chamber; a door attached on the refrigerator; a display panel equipped on the door; an image capturing device set in the chamber, wherein the image capturing device is electrically coupled to the display panel.
300 providing an image capturing device set in the chamber

330 transmitting signal from the remote terminal

310 switching on the image capturing device and the illumination device

340 receiving the signal by the wireless or wired transmission module

320 transmitting the captured image to the display panel

350 sending the captured image to the transmission module and transmitting the captured image by the transmission module

FIG. 3
REFRIGERATOR WITH A DISPLAY MODULE

FIELD OF THE INVENTION

[0001] The present invention relates generally to a freezer and more particularly to a device to display the items in a refrigerator.

BACKGROUND OF THE INVENTION

[0002] In order to keep temperature-sensitive foodstuffs, especially beverages, an electrically refrigerated cabinet has been used. In refrigeration systems, a refrigerant gas is compressed in a compressor unit. Heat generated by the compression is then removed generally by passing the compressed gas through a water or air cooled condenser coil.

[0003] A problem which has arisen with such refrigeration is that when the front door is opened too often, the extremely cold air within the chamber tends to spill out through the front opening of the refrigerator. This not only undesirably increases the temperature of the refrigeration chamber, but places increased loads on the refrigeration unit as it must operate on a more continuous basis to account for all of the lost cold air from within the chamber.

[0004] It would therefore be desirable to provide an advanced freezer which allowed monitoring the item contain therein.

SUMMARY OF THE INVENTION

[0005] The present invention also provides many additional advantages which shall become apparent as described below.

[0006] The object of the present invention is to provide a refrigerator with a display module.

[0007] The object of the present invention is to provide a refrigerator with a RF (radio frequency) module.

[0008] A refrigerator comprises one or more chamber to store food or beverage. A power source is provided for the refrigerator. A compressor is equipped in the refrigerator and couple to the power source to compress gas to generate refrigerant gas in the chamber. A door is attached on the refrigerator; a display panel equipped on the door. The display panel is equipped on the refrigerator. The image capturing device is set in the one or more chamber used to capture the image of the food or beverage stored in the one or more chamber, wherein the display panel is coupled to the image capturing device for displaying the image captured by the image capturing device. The image capturing device is embedded in the wall of the chamber. The refrigerator further comprises an illumination device set in the chamber to provide the illumination for the image capturing device.

[0009] FIG. 1 shows a function diagram of a refrigerator according to the present invention.

[0010] FIG. 2 shows a refrigerator according to the present invention.

[0011] FIG. 3 shows a flow chart according to the present invention.

[0012] FIG. 4 shows a display panel according to the present invention.

DETAILED DESCRIPTION

[0013] The following description is provided to enable any person skilled in the art to make and use the invention. Various modifications, however, will remain readily apparent to those skilled in the art, since the generic principles of the present invention have been defined herein specifically to provide an overall method and devices for a food storage tracking system.

[0014] FIGS. 1 and 2 show an illustration and a block diagram of the present invention. The refrigerator 100 has one or more chamber 10 to store food or beverage as know in the art. A power source 24 is provided in the refrigerator 100 to provide the power needed. A compressor 12 is equipped in the refrigerator 100 and couple to power source 24 to compress gas to generate refrigerant gas in the chamber 10. Heat generated by the compression is then removed generally by passing the compressed gas through a water or air cooled condenser coil. One or more front door 16 is attached on the refrigerator 100 and could be pivotally opened. A control circuits 110 is embedded in the refrigerator 100 to process the command, signal and instruction from the user.

[0015] One aspect of the present invention is that a display panel 18 is equipped on the refrigerator, preferably, on the front door 16 and coupled to the power source 24 and the control circuits 110. One or more image capturing device 20 is set in the chamber 10. The image capturing device 20 is electrically (or optically) coupled to the display panel 18, control circuits 110. The image capturing device 20 is set in the chamber 10. A switch 22 is provided on the display panel 18 used to turn-on the image capturing device 20. An illumination device 26 is set in the chamber 10 also to provide the illumination for the image capturing device 20 when the image capturing device 20 is power on. The image capturing device 20 and the illumination device 26 could be built-in on or in the wall of the chamber 10. The image capturing device 20 could capture the image in the chamber 10, therefore, the image of the items stored in the chamber 10 could be taken or shot by the image capturing device 20. The image capturing device 20 could be, for example, digital still camera, digital video camera, CCD, CMOS sensor or pinhole camera. The illumination device 26 could be LED, UV light source, lamp or the like. The frequency range of the illumination source may range from substantially 10E13-10E16 Hz. If the image capturing device is capable of operating in the infrared ray spectrum range, the illumination device 26 could be omitted. If the illumination device may illuminate UV-ray spectrum, the bacteria will be eliminated or killed by the UV ray. When the image capturing device 20 is on, the image in the chamber 10 can be captured and send it to the display panel 18, thereby displaying captured image in the form of video or picture on the display panel 18, allowing the user to watch image on the display panel and take a look at what items are stored in the chamber and their location. The image capturing device 20 could be set in each layer of the chamber 10 depending on the necessary. This will provide relative ease to monitor the stored food item without opening the door of the refrigerator. In one embodiment, a LCD screen is provided for the display panel to display item in the chamber 10. Other type display could also be used such as plasma display panel, LED display panel, CRT, FED display panel, EL panel, OEL and OLED panel. The panel further includes On/Off button,
a Mode button. A low-power CMOS (complementary metal oxide semiconductor) microprocessor with integral FLASH maybe employed. A molded plastic case for the screen encloses the circuit board. Power is provided by batteries or, alternately, by the refrigerator itself. The image capturing device 20 includes a charged coupled device (referred to as “CCD”). Further, the image capturing device 20 has the zoom-in and zoom-out functions controlled by the mode button described in FIG. 4. Memory means 22 is coupled to the image capturing device 20 for storing a single frame image that is generated by image signal from the CCD, wires are used to connect the control circuits 110, power source 24 and the display 18. A conical convex lens is accommodated to have an apical angle and the apex is fixed so as to face the object. The image capturing device 20 is available to catch image of an object.

[0016] The details of the base unit now having been explained, one can readily understand the functioning of the entire method. For example, one would discover what item stored in the chamber and their location from the display panel. Another embodiment of the present invention further includes a wireless or wired transmission/receiving module 30 coupled to the image capturing device 20 and the control circuit 110. The wireless or wired transmission/receiving module 30 could be set adjacent to the display panel 18. It should be noted, it is not the only way to set the wireless or wired transmission/receiving module. The transmission/receiving module could be wired (such as ADSL cable or Ethernet device) or wireless transmission (RF, blue-tooth or 802.11x available device). Take the RF module as an example, as know in the art, the RF (wireless transmission/receiving) module includes an antenna connected to a transceiver which is used to receive and transmit signal. As know, the RF module may further include, base band processing unit, DSP and A/D converter. The received signal will turn on the vibration mode or speaker of the cellular phone in the mobile phone application. In the present invention, the received signal will be used to power on the image capturing device 20 (and the illumination device 26). Due to the RF module is not the feature of the present invention, therefore, the detailed description is omitted. The captured image can be transmitted through the RF module 30 by operation frequency while the image capturing device is in function. The captured result can be send to a remote terminal 32 with a transceiver 32a and a display screen 32b, thereby allowing the user to check what item left in the refrigerator. The user may determine what should be supplied. The remote terminal 32 could be, such as remote computer system, portable device (cellular) or TV set. The signal could be transmitted or received through wired network or wireless transmission.

[0017] The present invention discloses and provides a method of monitoring food or beverage in a refrigerator. In step 300, an image capturing device is provided and set in one or more chamber of the refrigerator. Then, next step 310 is to switch on the image capturing device (and the illumination device) to capture the image of the food or beverage stored in the one or more chamber by pushing a button on the refrigerator or remote control through a RF module. Then, the captured image is send 320 to a display panel, wherein the display panel is coupled to the image capturing device for displaying the captured image. As aforementioned, the display panel is set on the refrigerator or remote terminal. If the display panel is set on the remote terminal, a RF module is necessary for the refrigerator. Thus, the method further comprises the steps before capturing the image of the food or beverage: 330 transmitting a signal from a remote terminal to switch on the image capturing device; 340 receiving the signal by the RF module (transmission/receiving module). The method further comprises the step before transmitting the captured image: 350 sending the captured image to the RF module and transmitting the captured image by the RF module to the remote terminal.

[0018] FIG. 4 shows the more advanced version of the current invention. An LCD screen 42 is provided for the display panel to display items captured by the image capturing device. Below the LCD 42 are an On/Off button 44, a layer selection button 46, and a mode button 48 which provide the function of zoom-in and zoom out. At the bottom of the unit are a microphone 50 and a speaker 52 when the instruction input unit includes voice activated technology. A molded plastic case for the screen and other function keys encloses the circuit board. Power on the LCD screen, the cursor is displayed at the beginning. To enter a selected layer, the user moves the cursor on the display. Next the user simply presses the selected layer and the corresponding image capturing device is power on.

[0019] As will be understood by persons skilled in the art, the foregoing preferred embodiment of the present invention is illustrative of the present invention rather than limiting the present invention. Having described the invention in connection with a preferred embodiment, modification will now suggest itself to those skilled in the art. Thus, the invention is not to be limited to this embodiment, but rather the invention is intended to cover various modifications and similar arrangements included within the spirit and scope of the appended claims, the scope of which should be accorded the broadest interpretation so as to encompass all such modifications and similar structures. While the preferred embodiment of the invention has been illustrated and described, it will be appreciated that various changes can be made therein without departing from the spirit and scope of the invention.

What is claimed is:

1. A refrigerator comprising:
   one or more chamber to store food or beverage;
   a compressor equipped in the refrigerator to compress gas to generate refrigerant gas in the one or more chamber;
   a display panel equipped on the refrigerator; and
   an image capturing device set in the one or more chamber used to capture the image of the food or beverage stored in the one or more chamber, wherein the display panel is coupled to the image capturing device for displaying the image captured by the image capturing device.

2. The refrigerator of claim 1, further comprising an illumination device set in the chamber to provide the illumination for the image capturing device.

3. The refrigerator of claim 2, wherein the illumination device includes LED, UV-light or lamp.

4. The refrigerator of claim 1, wherein the image capturing device is selected from the group consisting of digital still camera, digital video camera, CCD, CMOS sensor and pinhole camera.

5. The refrigerator of claim 1, further comprising a transmission/receiving module set in the refrigerator to transmit the captured image to a remote terminal.
6. The refrigerator of claim 6, wherein the remote terminal comprises a receiver and a display, thereby allowing a user to check what item is in the refrigerator.

7. The refrigerator of claim 1, wherein the display panel is selected from the group consisting of LCD panel, plasma display panel, LED display panel, CRT, FED display panel, EL panel, OEL and OLED panel.

8. A refrigerator comprising:
   one or more chamber to store food or beverage;
   a compressor equipped in the refrigerator to compress gas to generate refrigerant gas in the chamber;
   an image capturing device set in the one or more chamber used to capture the image of the food or beverage stored in the one or more chamber; and
   a transmission/receiving module set in the refrigerator and coupled to the image capturing device to transmit the image captured by the image capturing device to a remote terminal.

9. The refrigerator of claim 8, further comprising an illumination device set in the chamber to provide the illumination for the image capturing device.

10. The refrigerator of claim 9, wherein the illumination device includes LED, UV-light or lamp.

11. The refrigerator of claim 8, wherein the image capturing device is selected from the group consisting of digital still camera, digital video camera, CCD, CMOS sensor and pinhole camera.

12. The refrigerator of claim 8, further comprising a display panel equipped on the refrigerator and coupled to the image capturing device.

13. The refrigerator of claim 8, wherein the remote terminal comprises a transceiver and a display, thereby allowing a user to check what item is in the refrigerator.

14. The refrigerator of claim 8, wherein the display panel is selected from the group consisting of LCD panel, plasma display panel, LED display panel, CRT, FED display panel, EL panel, OEL and OLED panel.

15. A method of monitoring food or beverage in a refrigerator comprising:
   providing an image capturing device in one or more chamber of the refrigerator;
   switching on the image capturing device to capture the image of the food or beverage stored in the one or more chamber;
   transmitting the captured image to a display panel set on the refrigerator or a remote terminal for displaying the captured image.

16. The method of claim 15, further comprising following steps before capturing the image of the food or beverage stored in the one or more chamber:
   transmitting a signal from the remote terminal to switch on the image capturing device; and
   receiving the signal by a RF module set for the refrigerator.

17. The method of claim 16, further comprising following step before transmitting the captured image:
   sending the captured image to the RF module;
   transmitting the captured image by the RF module to the remote terminal.