



US 20080196419A1

(19) **United States**

(12) **Patent Application Publication**  
**DUBE**

(10) **Pub. No.: US 2008/0196419 A1**

(43) **Pub. Date: Aug. 21, 2008**

(54) **BUILD-UP MONITORING SYSTEM FOR REFRIGERATED ENCLOSURES**

**Publication Classification**

(76) Inventor: **Serge DUBE, St-Zotique (CA)**

(51) **Int. Cl.**  
**F25D 21/00** (2006.01)  
**F25D 21/14** (2006.01)

(52) **U.S. Cl.** ..... **62/80; 62/150**

Correspondence Address:  
**OGILVY RENAULT LLP**  
**1981 MCGILL COLLEGE AVENUE, SUITE 1600**  
**MONTREAL, QC H3A2Y3**

(57) **ABSTRACT**

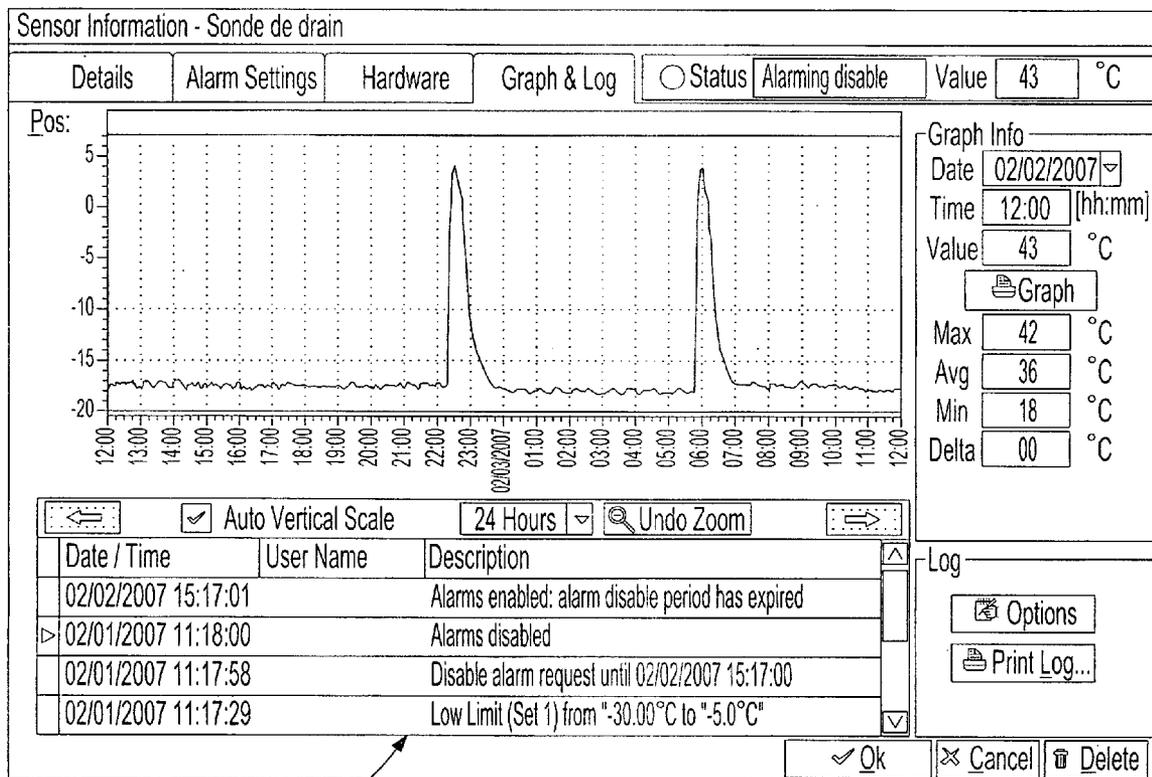
A build-up monitoring system in combination with a refrigerated enclosure comprises a refrigerated enclosure having a drain, a drain basin and a refrigeration unit adapted to maintain refrigerating conditions in the refrigerated enclosure. A build-up detector is positioned with respect to the refrigerated enclosure so as to monitor a level of build-up in the drain/drain basin. A condition analyzer receives detection data from the build-up detector, the condition analyzer identifying from the detection data a build-up in the drain/drain basin requiring an intervention. An interface indicates the requirement for the intervention. A method is provided to identify a build-up requiring an intervention in a drain/drain basin of a refrigerated enclosure.

(21) Appl. No.: **12/031,107**

(22) Filed: **Feb. 14, 2008**

**Related U.S. Application Data**

(60) Provisional application No. 60/890,290, filed on Feb. 16, 2007.



25A

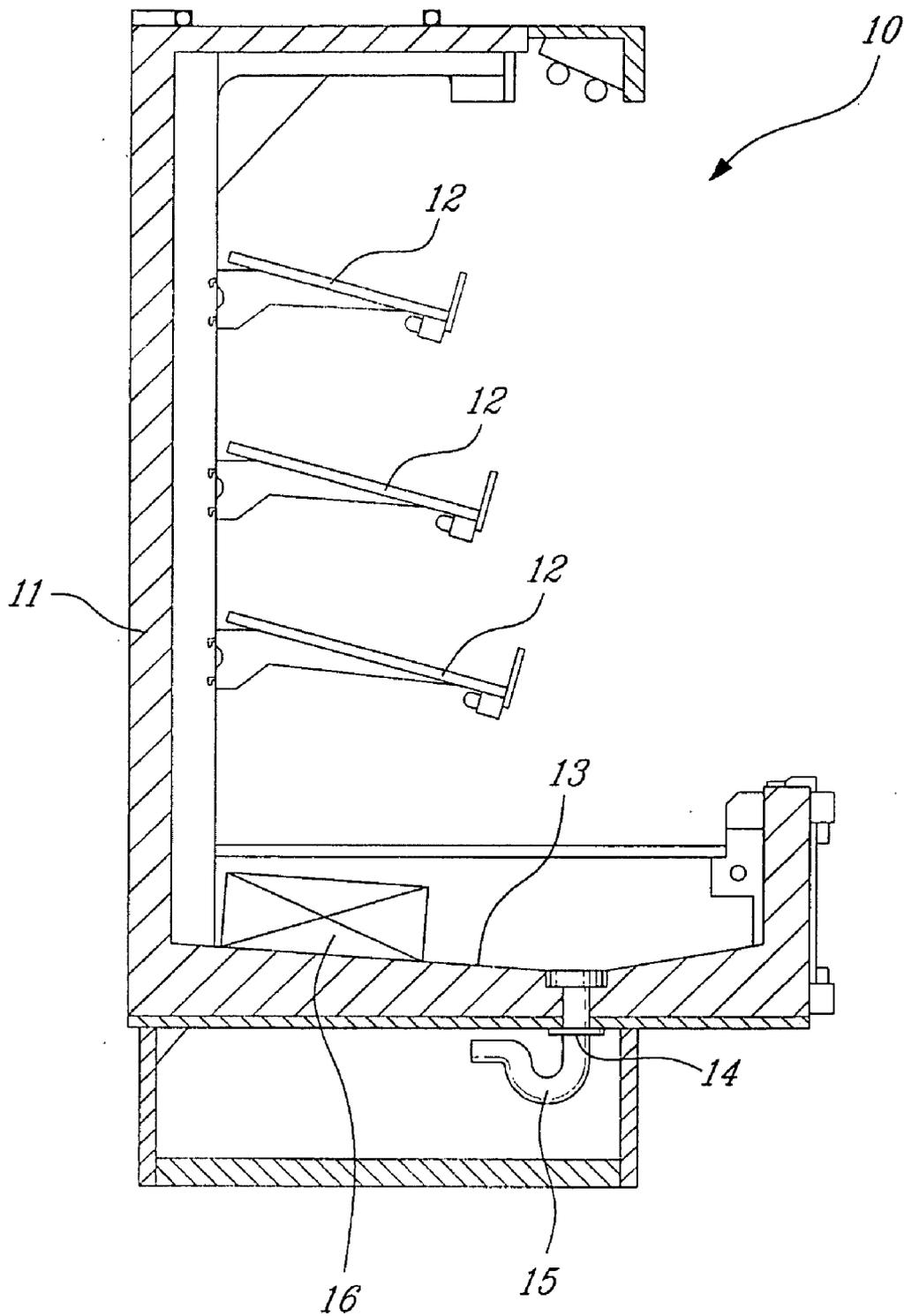


Fig. 1 (PRIOR ART)

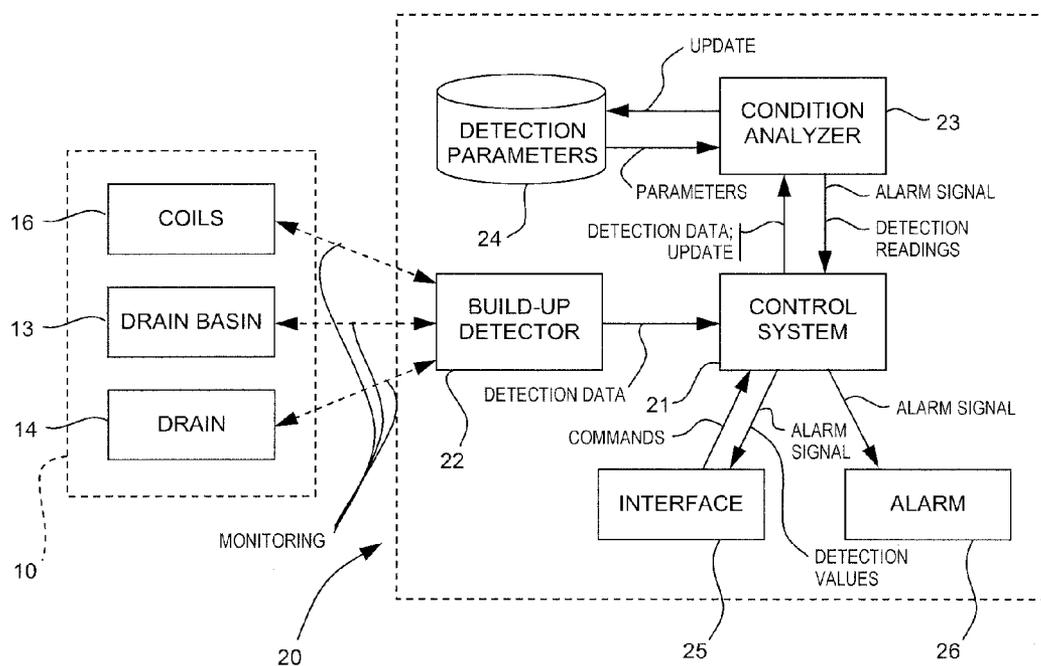


Fig. 2

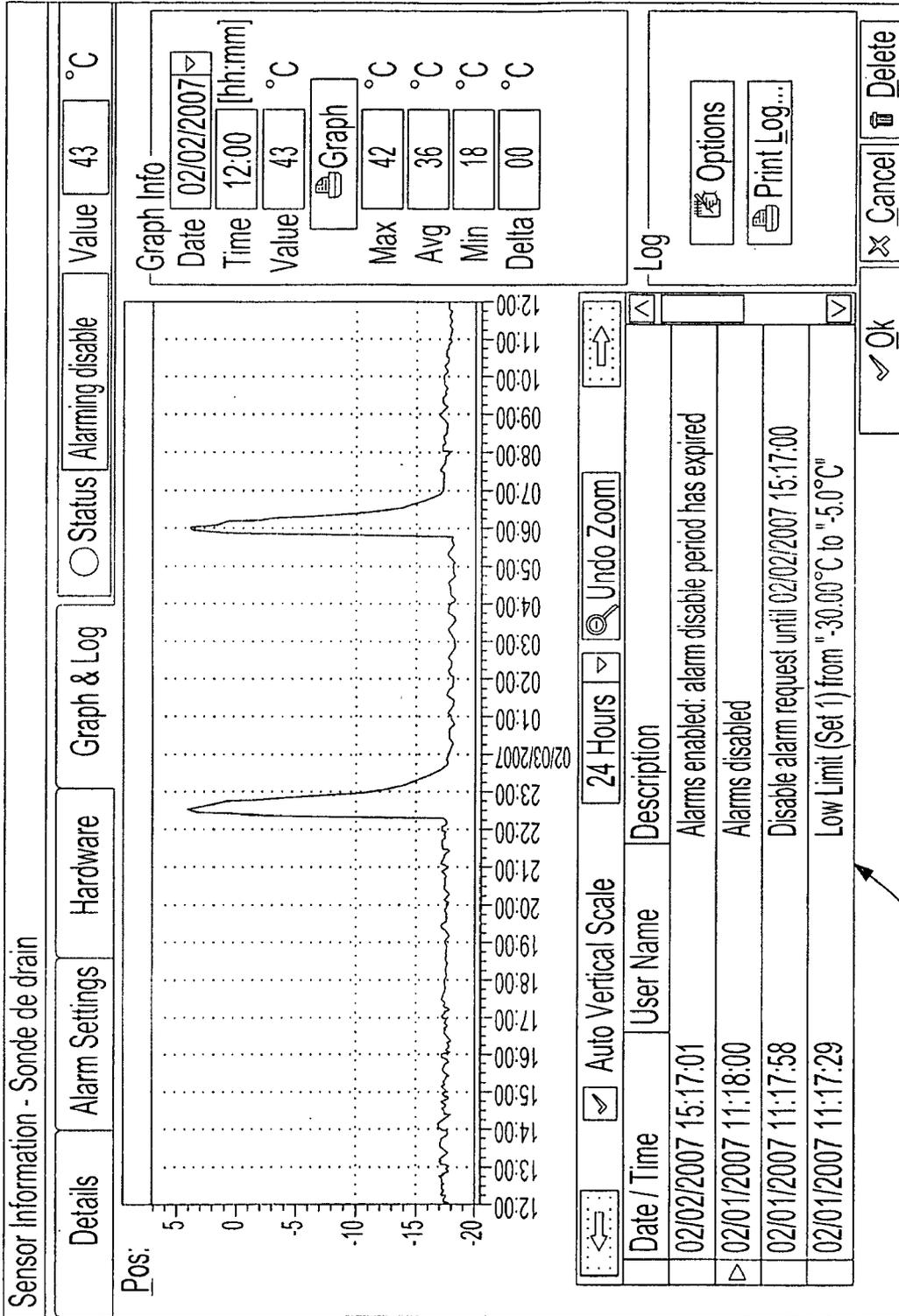


Fig. 3

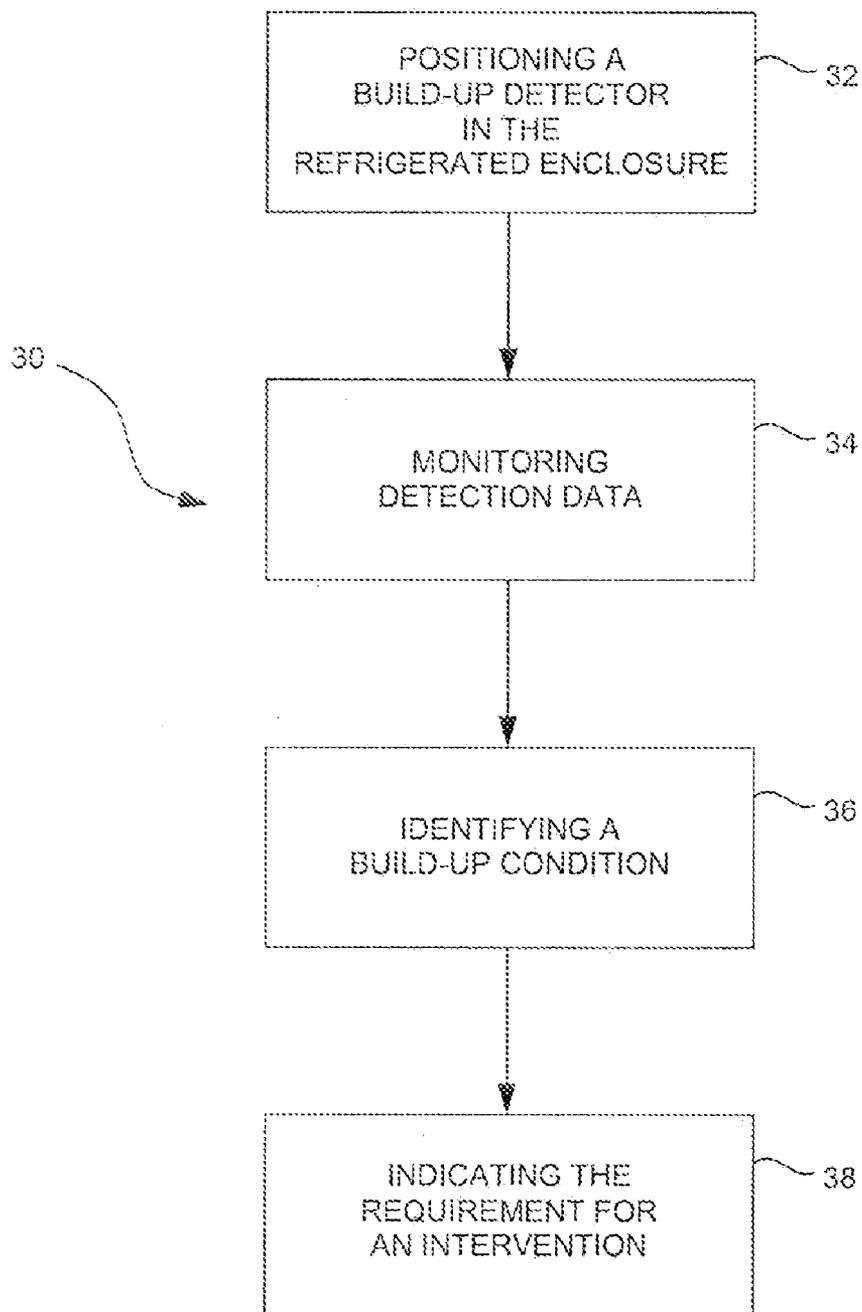


Fig. 4

## BUILD-UP MONITORING SYSTEM FOR REFRIGERATED ENCLOSURES

### CROSS-REFERENCE TO RELATED APPLICATION

**[0001]** This patent application claims priority on U.S. Provisional Patent Application No. 60/890,290, filed on Feb. 16, 2007, by the present Applicant.

### BACKGROUND OF THE APPLICATION

**[0002]** 1. Field of the Application

**[0003]** The present application relates to refrigerated enclosures of the type used in supermarkets and the like to store foodstuff and, more particularly, to a draining of liquid in such refrigerated enclosures.

**[0004]** 2. Background Art

**[0005]** In supermarkets, grocery storages, and industrial storage, amongst other applications, refrigerated enclosures are commonly used to maintain foodstuff at suitable temperatures, or to freeze the foodstuff in order to preserve its freshness.

**[0006]** Referring to FIG. 1 of the prior art, a refrigerated enclosure is generally illustrated at 10. The refrigerated enclosure 10 is defined by a casing 11 that forms an outer shell of the enclosure 10, and within which specific temperature conditions are maintained. Shelves 12 are provided as support for the foodstuff (not shown) that will be refrigerated/frozen in the enclosure 10. A drain basin 13 is provided at a bottom of the casing 11. As such, any residual liquid will be drained via the sloping of the drain basin 13, to the drain 14/siphon 15.

**[0007]** It is observed that the refrigeration unit 16 is in the drain basin 13. The refrigeration unit 16 is typically coils in which a refrigerant circulates, and upon which coils ambient air is blown.

**[0008]** Because of the low temperatures associated with refrigerated enclosures, there is a risk that the residual liquid to be drained by the drain basin 13 will freeze. Moreover, as the refrigeration unit 16 is in some cases adjacent to the drain 14, the temperatures adjacent to the drain 14 are lower than the temperature at the shelves 12, increasing the risk of freezing of the residual liquids. A solid build-up can damage the refrigerated enclosure. For instance, coils of the refrigeration unit 16 have broken because of ice build-ups in the drain, resulting in refrigerant leakage, emergency transfer of foodstuff, and even temporary store closure for maintenance of the refrigeration system.

### SUMMARY

**[0009]** It is therefore an aim of the present application to provide a drain monitor system for refrigerated enclosures that addresses issues associated with the prior art.

**[0010]** Therefore, in accordance with the present application, there is provided

**[0011]** Further in accordance with the present application, there is provided a build-up monitoring system in combination with a refrigerated enclosure, comprising: a refrigerated enclosure having a drain, a drain basin and a refrigeration unit adapted to maintain refrigerating conditions in the refrigerated enclosure; a build-up detector positioned with respect to the refrigerated enclosure so as to monitor a level of build-up in the drain/drain basin; a condition analyzer for receiving detection data from the build-up detector, the condition analyzer identifying from the detection data a build-up in the

drain/drain basin requiring an intervention; and an interface for indicating the requirement for the intervention.

**[0012]** Further in accordance with the present application, there is provided a method for identifying a build-up requiring an intervention in a drain/drain basin of a refrigerated enclosure, comprising: positioning a build-up detector in the refrigerated enclosure; monitoring detection data from the build-up detector; identifying a build-up condition by comparing the detection data with at least one predetermined parameter value for a given time period; and indicating the requirement for an intervention from the build-up condition.

### BRIEF DESCRIPTION OF THE DRAWINGS

**[0013]** FIG. 1 is a sectioned elevation view of a refrigerated enclosure in accordance with the prior art;

**[0014]** FIG. 2 is a block diagram illustrating a build-up monitoring system for refrigerated enclosures, in accordance with an embodiment of the present application;

**[0015]** FIG. 3 is a printout of a user-interface screen as used with the build-up monitoring system of FIG. 2; and

**[0016]** FIG. 4 is a flowchart of a method for identifying a build-up requiring an intervention in a drain/drain basin of a refrigerated enclosure in accordance with another embodiment of the present application.

### DESCRIPTION OF THE PREFERRED EMBODIMENTS

**[0017]** Referring now to FIG. 2, a build-up monitoring system in accordance with an embodiment is generally shown at 20. The monitoring system 20 is used in conjunction with a refrigerated enclosure such as the one illustrated at 10 in FIG. 1. The monitoring system 20 is provided to monitor the refrigerated enclosure for ice build-ups in the drain basin 13, and to alarm maintenance personnel when predetermined levels of build-ups are detected.

**[0018]** The monitoring system 20 has a control system 21, which includes a processing unit. The control system 21 is typically part of a main controller used to operate the refrigeration system of a store/building.

**[0019]** A build-up detector 22 is connected to the control system 21. The build-up detector 22 is positioned within the refrigerated enclosure to monitor ice build-ups, by monitoring the drain basin 13, the drain 14 and/or the coils 16 of the refrigeration unit.

**[0020]** A plurality of configurations are considered for the build-up detector 22. In a first embodiment, the build-up detector 22 is a thermocouple or thermometer positioned within the drain basin 13 and/or in contact with the drain 14. As such, any ice build-up will result in a stabilization of temperature that will be identified by the monitoring system 20.

**[0021]** In a second embodiment, the build-up detector 22 is an optical sensor that will visually monitor the presence of an ice build-up beyond a predetermined level. Different types of optical sensors are considered with, for instance, emitters/receivers, etc.

**[0022]** In a third embodiment, sensors from other industries can be used in the monitoring system 20. For instance, U.S. Pat. No. 5,296,853, issued to Federow et al. on Mar. 22, 1994, discloses a laser ice detector, components of which can suitably be used to form the build-up detector 22. It is also considered to use infrared sensors.

**[0023]** The control system **21** receives detection data from the build-up detector **22**, and transmits the data to the condition analyzer **23**. The condition analyzer **23** is provided to detect ice build-up from the detection data. The condition analyzer **23** triggers an alarm signal once ice build-up beyond a predetermined level is identified by the condition analyzer **23**.

**[0024]** In the embodiment in which the build-up detector **22** is a thermocouple, detection parameters are provided to the condition analyzer **23** by way of a database **24** with such detection parameters. For instance, the detection parameters are a temperature set-point limit or a temperature range along with a time period, whereby detection of a temperature above the set-point limit for more than the time period will have the condition analyzer **23** trigger the alarm signal.

**[0025]** The time period used by the condition analyzer **23** filters out punctual perturbations, such as the shelving of new products that are at room temperature. In such cases, liquids dropping from these products and reaching the drain are temporarily above refrigerated temperatures, and should not be considered as a build-up. Therefore, monitoring such temperatures for an extended time period allows the products to cool down prior to an alarm being triggered.

**[0026]** Moreover, the time period can be used to monitor temperature variations. For instance, temperature readings in refrigerated enclosures **10** vary as a function of numerous factors: refrigerant temperature, air temperature, enclosure doors being opened, new products being shelved in the enclosure **10**. If there is a build-up on the build-detector **22** measuring the temperature, the build-up will act as thermal insulation that will generally prevent temperature variations in the readings of the detector **22**. Accordingly, in an embodiment, a uniform temperature over an extended time period is identified as a build-up by the condition analyzer **23**.

**[0027]** The database **24** is writable, such that the detection parameters are changeable. For instance, if a defrost cycle is run to melt frost on the coils, it may be required to change the detection parameters in the database **24**, although it is preferred that the detection parameters be set so as to exclude a defrost cycle from being detected as ice build-up. Another example in which it is required to change the detection parameters is when the temperature of operation of the refrigerated enclosure is changed (i.e., going from refrigerating meats to vegetables).

**[0028]** In the embodiment in which the build-up detector **22** is an optical sensor or like sensor, the detection data may simply be decoded by the condition analyzer **23**, such as to identify detected build-up signals from the detection data. The database **24** of detection parameters may represent a filter to ensure that the alarm signal is not triggered accidentally. For instance, if an attendant triggers accidentally the optical sensor into detecting an ice build-up, the detection parameters are typically set to prevent an alarm being triggered by such action.

**[0029]** It is considered to provide the monitoring system **20** with a plurality of build-up detectors **22**, with complementary features. For instance, optical sensors can be used in combination with thermocouples, to increase the accuracy of the detection.

**[0030]** Still referring to FIG. 2, the monitoring system **20** has an interface **25** that may be used to display the detection data in suitable format. For instance, referring to FIG. 3, a GUI screen **25A** is illustrated, and shows a temperature detected in a refrigerated enclosure as a function of time. It is

seen that a graph shows a pair of peaks on screen. The peaks are typically the result of defrost cycles being run to remove frost on the coils of the refrigeration units **16** (FIG. 1). The interface **25** may project data that is viewed on a periodic basis by an operator so as to detect ice build-up.

**[0031]** Alternatively, an alarm **26** may be provided, whether on site or through the interface **25** (e.g., in the form of a pop-up window), to indicate that maintenance is required to clear up the drain/drain basin.

**[0032]** The build-up monitoring system **20** described above may be conveniently retrofitted to existing refrigerated enclosures, such as refrigerated enclosure **10** of FIG. 1. More specifically, considering that most industrial refrigeration systems have a centralized processing unit, the condition analyzer **23** may be installed in the centralized processing unit, with the build-up detector/detectors **22** being connected to the centralized processing unit (e.g., wireless) to provide the detection data to the condition analyzer **23**.

**[0033]** FIG. 4 generally illustrates an embodiment for implementing the method for identifying a build-up requiring an intervention in a drain/drain basin of a refrigerated enclosure at **30**.

**[0034]** In Step **32**, at least one of the build-up detectors **22** is installed in the refrigerated enclosure **10** so as to monitor the drain basin **13** or drain **14** for ice build-ups.

**[0035]** In Step **34**, the detection data provided by the build-up detector **22** is monitored. The monitoring is continuous, but may be paused in maintenance periods, such as during a defrost cycle.

**[0036]** In Step **36**, a build-up condition is identified from monitoring of the detection data, over a given time period. The detection data is as a function of the types of build-up detector **22** selected: temperature, visual presence of build-up.

**[0037]** In Step **38**, indication is made to maintenance personnel that an intervention is required due to a build-up condition. For instance, maintenance personnel on-site or off-site may be warned by way of an alarm.

1. A build-up monitoring system in combination with a refrigerated enclosure, comprising:

- a refrigerated enclosure having a drain, a drain basin and a refrigeration unit adapted to maintain refrigerating conditions in the refrigerated enclosure;
- a build-up detector positioned with respect to the refrigerated enclosure so as to monitor a level of build-up in the drain/drain basin;
- a condition analyzer for receiving detection data from the build-up detector, the condition analyzer identifying from the detection data a build-up in the drain/drain basin requiring an intervention; and
- an interface for indicating the requirement for the intervention.

2. The build-up monitoring system according to claim 1, wherein the build-up detector is at least one temperature sensor, the detection data being a temperature value associated with the level of build-up in the drain/drain basin.

3. The build-up monitoring system according to claim 1, wherein the build-up detector is at least one optical switch, the detection data being a visual detection of a build-up in the drain/drain basin.

4. The build-up monitoring system according to claim 1, wherein the build-up detector is wirelessly connected to the condition analyzer.

5. The build-up monitoring system according to claim 1, further comprising a database for storing comparative data, such that the condition analyzer identifies a build-up from the detection data as a function of the comparative data.

6. The build-up monitoring system according to claim 1, further comprising an alarm for indicating the requirement for the intervention.

7. The build-up monitoring system according to claim 6, wherein the alarm is located remotely from the refrigerated enclosure.

8. A method for identifying a build-up requiring an intervention in a drain/drain basin of a refrigerated enclosure, comprising:

positioning a build-up detector in the refrigerated enclosure;

monitoring detection data from the build-up detector;

identifying a build-up condition by comparing the detection data with at least one predetermined parameter value for a given time period; and

indicating the requirement for an intervention from the build-up condition.

9. The method according to claim 8, wherein monitoring detection data comprises monitoring a temperature in the drain/drain basin of the refrigerated enclosure, and identifying a build-up condition comprises comparing the temperature with at least one predetermined temperature value.

10. The method according to claim 9, wherein comparing the temperature with at least one predetermined temperature

value comprises determining that the temperature is above/below the at least one predetermined temperature value for said given time period.

11. The method according to claim 9, wherein comparing the temperature with at least one predetermined temperature value comprises determining that the temperature is outside a selected range of temperature values for said given time period.

12. The method according to claim 8, further comprising pausing the monitoring of detection data for a maintenance period.

13. The method according to claim 12, wherein pausing for a maintenance period comprises pausing during a defrost cycle of a refrigerated enclosure.

14. The method according to claim 8, wherein monitoring detection data comprises visually monitoring the drain/drain basin of the refrigerated enclosure, and identifying a build-up condition comprises comparing a visual monitoring signal with an unobstructed signal value.

15. The method according to claim 8, wherein indicating the requirement for an intervention comprises alarming off-site personnel.

16. The method according to claim 8, wherein monitoring detection data comprises monitoring a temperature in the drain/drain basin of the refrigerated enclosure, and identifying a build-up condition comprises comparing a variation of the temperature over the time period with an acceptable temperature variation value.

\* \* \* \* \*