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(54) **REFRIGERATED SHOWCASE**

(57) Refrigerated showcase (11) comprising a body (1), at least a shelf (3) for supporting good, a transparent door (2), at least a LED bar (4), a (not shown) cooling system, **characterized in that:**
said LED bar (4) further comprises:
- a temperature sensor and/or,
- a humidity sensor and/or,
- an accelerometer for detecting the number of door (2) openings,
- optionally a memory.

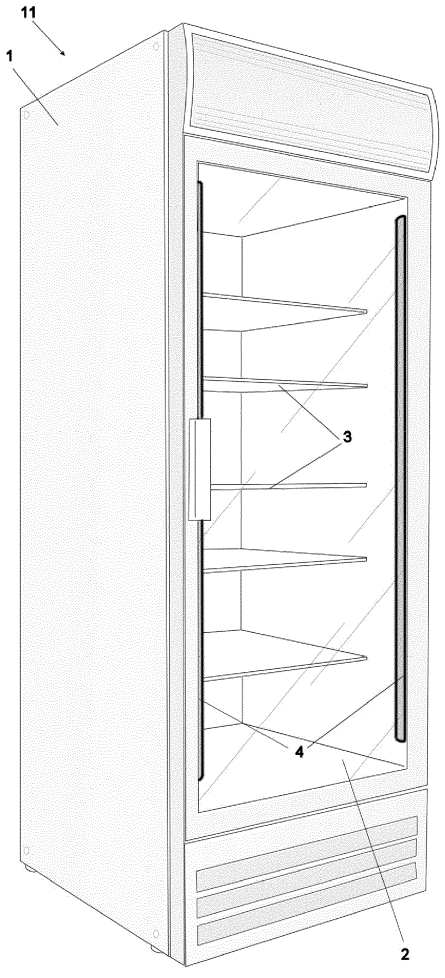

Fig. 1

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Description

[0001] The present invention relates to the technical field of refrigerated showcases. Such apparatuses are well-known in the art, and are used for the refrigerated storage of goods like food, beverages, medications, etc. In particular, the invention relates to a LED bar for lighting such showcases, further comprising at least a sensor for the detection of temperature, humidity, number of door openings, etc.

[0002] Typically a refrigerated showcase comprises:

- A body provided with at least a shelf for supporting refrigerated goods;
- A typically transparent door, so that a client can see the goods inside the showcase;
- A cooling system;
- A lighting system for lighting the goods inside the showcase.

[0003] Such showcases comprise substantially two main kinds of embodiments:

- Vertical showcases similar to domestic refrigerators; a document describing such showcases is e.g. EP3053487 of LG Electronics Inc;
- Horizontal refrigerated cabinets; a document describing such cabinet is e.g. EP0962729 of Bonnet Neve.

[0004] A problem connected to these apparatuses is the control of temperature and humidity in their inside.

[0005] Moreover, for the store manager, or for the owner of the showcase, knowing the number of times the showcase is opened for goods withdrawal by customers, and the proper working of the showcase can be interesting.

[0006] Aim of the present invention is providing a lighting system of the goods arranged in the refrigerated showcase, capable of providing additional performances, like providing information such as

- Temperature;
- Humidity;
- Number of times wherein the door was opened in a unit time;
- Malfunctions.

[0007] This object is achieved by an apparatus and a method having the features of the independent claims. Advantageous embodiment and refinements are specified in the claims dependent thereon.

[0008] The system according to the present invention comprises:

- At least a LED bar for lighting goods;
- At least a sensor for detecting temperature and/or humidity inside said showcase;
- An accelerometer allowing to detect the number of showcase door openings.

[0009] According to a preferred embodiment, said information can be transmitted wirelessly to a portable device, such as a smartphone or a tablet.

[0010] Alternatively, said information can be transmitted wirelessly to a router/gateway, which in its turn transmits them to a remote server, preferably a cloud.

[0011] According to an embodiment, the present invention relates to a refrigerated show case comprising at least one Led bar or at least one lighting device. This Led bar or this lighting device comprises a case-like body in which there is housed a processing unit comprising a processor, peripherals such as a memory, a communication interface with a remote control unit, like a smartphone, a PC, or similar devices, an input port for each of the temperature sensors, humidity sensor and accelerometer for sensing the number of door openings. Furthermore a control program is loaded and executed by the said processing unit coding the instructions for configuring the said processing unit and its peripherals to store in the memory the data related to the measured number of door opening, and/or to the measured temperature and/or to the measured humidity. The control program configuring also the processing unit and its peripherals to reset the stored data about the number of door openings triggered by a command, the said command being available only to selected kind of persons operating the door.

[0012] The present invention relates also to a method for using a refrigerated show-case showing the features of the above system.

1) According to an embodiment of this method, the following steps are provided:

- Measuring the number of acts of opening and/or closing the show-case door;
- Storing the number of acts of opening and/or closing the show-case door;
- Identifying automatically or by command the person operating the door in relation to a predefined classification of persons;
- Authorising a person specifically relating to the classification as service person for carrying out intervention on the show-case to reset the registered number of opening or closing actions of the door or to erase only the number of opening or closing acts of the door operated by the said authorised person;
- Restarting registration of the number of opening or closing action of the door after the authorised person has signalled to have terminated the intervention on the show case and/or rest the memory for registering the said number of opening and/or closing actions of the door

[0013] Further advantages and properties of the present invention are disclosed in the dependent claims and in the following description, in which exemplary embodiments of the present invention are explained in detail based on the drawing:

Figure 1 Axonometric view of a refrigerated showcase.

Figure 2 Simplified block diagram of an embodiment of the present invention integrating a processing unit into the case body of a Led bar or a light source.

[0014] Figure 1 shows a refrigerated showcase 11 comprising a body 1 supporting a plurality of shelves 3 for supporting (not shown) goods on sale. Said showcase 11 is provided with a (not shown) cooling system and with a transparent door 2, so that customers can decide which good they want to buy before opening said door 2: this has the advantage of minimizing the time when the door is open, with obvious benefits in term of electric power consumption.

[0015] Moreover, the refrigerated showcase 11 comprises at least one or preferably two LED bars for lighting the good supported by shelves 3. It is worthwhile noting that Figure 1 shows a preferred embodiment of the present invention, wherein said LED bars 4 are vertical, parallel to the longitudinal axis of the showcase 11 and on the front of the showcase itself. It is apparent that a plurality of bars can be placed in other areas of the showcase, e.g. placed immediately under each shelf.

[0016] Said LED bars 4 must be electrically supplied to light goods, and therefore can advantageously host one or more sensors, which in their turn need to be electrically supplied.

[0017] A sensor can detect the temperature inside the showcase 11; a sensor can detect the level of humidity inside the showcase 11.

[0018] Advantageously, in an embodiment the detecting system can be provided with an acoustic and/or visual alarm, which triggers when the temperature and/or the level of humidity exceeds a predefined threshold.

[0019] In an embodiment, polychromatic LEDs capable of assuming different colours according to the supplied signal are arranged in said LED bar 4. The transmission of wireless data from sensors to a remote system, cloud, portable device, central server can be correlated to a local visual communication associated to said refrigerated showcase and visually recognizable by the user in the form of a coloured light signal by at least a part of the LEDs forming said bar 4. In this way, one or more sensor, a portion of reading, processing/interpreting and transmitting electronics of the signal to remote devices, and a portion of visualization of the status of the showcase detected by the sensors and processed by processing electronics are associated to said LED bar 4.

[0020] Moreover, in an embodiment said LED bar 4 comprises an accelerometer capable of detecting acceleration that, through a suitable algorithm can be converted identifying the number of opening/closing of the door 2 and a memory capable of recording the number of door openings in a unit time and to transfer to portable or fixed devices.

[0021] Obviously, store staff must open the door in order to supply the showcase with goods. Advantageously, in a preferred embodiment, store staff can reset the memory containing the number of door openings, so that the counted number of openings concerns only the openings performed by customers.

[0022] Concerning malfunctioning, a sensor can detect that the door 2 remained open, and transmit this datum to the memory contained in the showcase 11.

[0023] In a preferred embodiment, said parameters (temperature, humidity and number of openings of the door) are sent through a wireless device to a portable device like a smartphone or a tablet inside a predefined distance from the refrigerated showcase 11, e.g. within 5 metres, and provided with an app capable to perform a query on the detecting system of showcase 11.

[0024] Said app is a software capable of receiving said information, showing them on the display of the portable device, and saving statistics concerning said information.

[0025] In an alternative embodiment, the same information can be sent wirelessly to a fixed device like a router and/or a gateway, which in its turn transmits them to a remote server, preferably a cloud.

[0026] In this context, cloud indicates a type of Internet-based computing that provides shared computer processing resources and data to computers and other devices on demand. It is a model for enabling ubiquitous, on-demand access to a shared pool of configurable computing resources (e.g., computer networks, servers, storage, applications and services), which can be rapidly provisioned and released with minimal management effort.

[0027] Even in the case of transmission to a cloud, the cloud itself comprises a software capable of receiving said information, showing said information on the display of an informatic device like e.g. a personal computer, and saving statistics concerning the information itself.

[0028] Said information can be sent in a continuous way both to said portable device and to the fixed device, or can be saved in a memory placed inside the showcase itself. In this second case, the information saved in the memory are transmitted to the portable device or to the fixed device as an answer to a query.

[0029] In an embodiment, the group of the sensors and the device for transmitting information are placed inside LED bar 4 and are electrically supplied by the same wires supplying said LED bar 4.

[0030] In an alternative embodiment, the sensor group and the device for transmitting information are electrically independent from LED bar 4 and can optionally be electrically supplied through a battery.

[0031] In the present invention, a preferred embodiment was described in the form of vertical showcases like the type described in EP3053487, but the fact that

the teachings of this application can be easily applied to horizontal refrigerated cabinets like those described in EP0962729 is obvious to the skilled man.

[0032] According to the example of figure 2, in this embodiment a simplified block diagram is shown of a Led bar 4, comprising a case body 104 and a printed circuit board 204 carrying the LED sources 304 and the electronic circuit driving the LEDs 304. A power source and control unit 404 feeds the driving power for the LED 304 and the controls for driving the LED 304. The power unit 504 feeds also the processing unit 5 which is housed within the case 104 of the LED bar 4. The processing unit 5 is connected to a memory 105 in which a control program is loaded which control program contains the instructions coded in machine readable code which configures the processing unit 5 to carry out the functions according to the present invention and particularly receive at an input port 205 the data from the different sensors measuring the temperature, the humidity or other functional parameters of the show case, receive the data from an accelerometer associated to the door of the show case and the data relating to the functional conditions of the show case 11, particularly the data about malfunctioning events. Such data is stored in a dedicated memory or a dedicated memory area 305.

[0033] A communication interface 405, preferably operating according to a wireless communication protocol allows the processing unit to connect to a remote control device such as a portable pc or a smartphone opr similar in which an app is loaded allowing to exchange data and commands with the processing unit.

[0034] This portable remote control unit can automatically be detected by the processing unit when it comes nearer to the showcase than a certain distance and the portable control unit can signal or be identified as being carried to a person having specific tasks, such as service persons allowing the service person to carry out some tasks which are not available to other persons or user of the showcase. According to the invention the service person is either automatically recognized or recognition takes place by actively sending a signal to the processing unit 5. One of the tasks to which the service person is authorised relates to resetting the memory 205 in relation to the registered number of opening or closing actions of the door. Alternatively the reset can be limited to cancel only the opening and/or closing actions performed by the authorised service person.

1 Showcase body
2 Transparent door
3 Shelves
4 LED bar
104 case
204 printed circuit board
304 LED
404 LED bar power and control unit
11 Refrigerated showcase
5 processing unit
105 program memory
205 sensor input port
305 data memory
405 communication interfaces

Claims

2. Refrigerated showcase (11) comprising a body (1), at least a shelf (3) for supporting good, a transparent door (2), at least a LED bar (4), a (not shown) cooling system,
characterized in that:

said LED bar (4) further comprises:

- a temperature sensor and/or,
- a humidity sensor and
- an accelerometer for detecting the number of door (2) openings,
- a memory.

3. Refrigerated showcase (11) according to claim 1, further comprising a unit detecting functional parameters of the show case and providing data about malfunctioning conditions, a wireless device and an app for transmitting the data measured by the said temperature sensor, the said humidity sensor, the said accelerometer for detecting the, number of door openings and the said unit for detecting data about malfunctioning conditions to a mobile device like a smartphone or a tablet lying within a predefined distance from said showcase (11).

4. Refrigerated showcase (11) according to claim 1, a unit detecting functional parameters of the show case and providing data about malfunctioning conditions, a wireless device and an app for transmitting the data measured by the said temperature sensor, the said humidity sensor, the said accelerometer for detecting the, number of door openings and the said unit for detecting data about malfunctioning conditions to a fixed device like a router or a gateway, capable of transmitting said data to a cloud.

5. Refrigerated showcase (11) according to claims 1-3, further comprising a memory for storing the number of door openings and a reset device associated to the showcase or to the LED bar and resetting the number of door openings stored in the memory after that a human operator has supplied the showcase (11) with goods.

6. Refrigerated showcase (11) according to claims 1-4, wherein said sensors and memory are placed in the LED bar (4) itself and are electrically supplied by the same electric wires supplying said LED bar (4).

7. Refrigerated showcase (11) according to claims 1-4, wherein al least some of said sensors and the memory are a group distinct from said LED bars (4) and optionally are electrically supplied by a battery.

8. Refrigerated showcase (11) according to one or more of the preceding claims in which the Led bar comprises a case-like body in which there is housed a processing unit comprising a processor, peripherals such as a memory, a communication interface with a remote control unit, like a smartphone, a PC, or similar devices, an input port for each of the temperature sensors, humidity sensor and accelerometer for sensing the number of door openings and a control program coding the instructions for configuring the said processing unit and its peripherals to store in the memory the data related to the measured number of door opening, to the measured temperature and to the measured humidity, the control program configuring the processing unit and its peripherals to reset the stored data about the number of door openings triggered by a command, the said command being available only to selected kind of persons operating the door.

9. Method for using the refrigerated show-case according to one or more of the preceding claims comprising the following steps:

Measuring the number of acts of opening and/or closing the show-case door;
Storing the number of acts of opening and/or closing the show-case door;
Identifying automatically or by command the person operating the door in relation to a predefined classification of persons;
Authorising a person specifically relating to the classification as service person for carrying out intervention on the show-case to reset the registered number of opening or closing actions of the door or to erase only the number of opening or closing acts of the door operated by the said authorised person;
Restarting registration of the number of opening or closing action of the door after the authorised person has signalled to have terminated the intervention on the show case and/or rest the memory for registering the said number of opening and/or closing actions of the door.

10. Method for using the refrigerated showcase (11) according to claims 1-7 and to claim 8, wherein a human operator provided with a portable device like a smartphone or a tablet stands within a predefined distance from the refrigerated showcase (11) itself and performs a query on the processing unit (11) and/or its peripherals placed in the showcase of functional status information of the show-case like the measured temperature, the measured humidity, the detected number of door openings, and malfunctioning events making use of a dedicated app.

11. Method for making use of the refrigerated showcase (11) according to claims 1-7, wherein information like temperature, humidity, number of door openings, malfunctioning are transmitted wirelessly to a fixed device like a router or a gateway, which in its turn transmits them to a cloud.

12. Method for making use of the refrigerated showcase (11) according to claim 8 or 9, wherein information concerning temperature, humidity, number of door openings, malfunctioning is saved in a memory inside the showcase (11), and transmitted to a portable or fixed device after a query.

13. Method for making use of the refrigerated showcase (11) according to claims 8-11, wherein a memory for recording the number of door (2) openings is provided and the said memory is re-set by the human operator after she/he supplied said showcase (11) with goods.

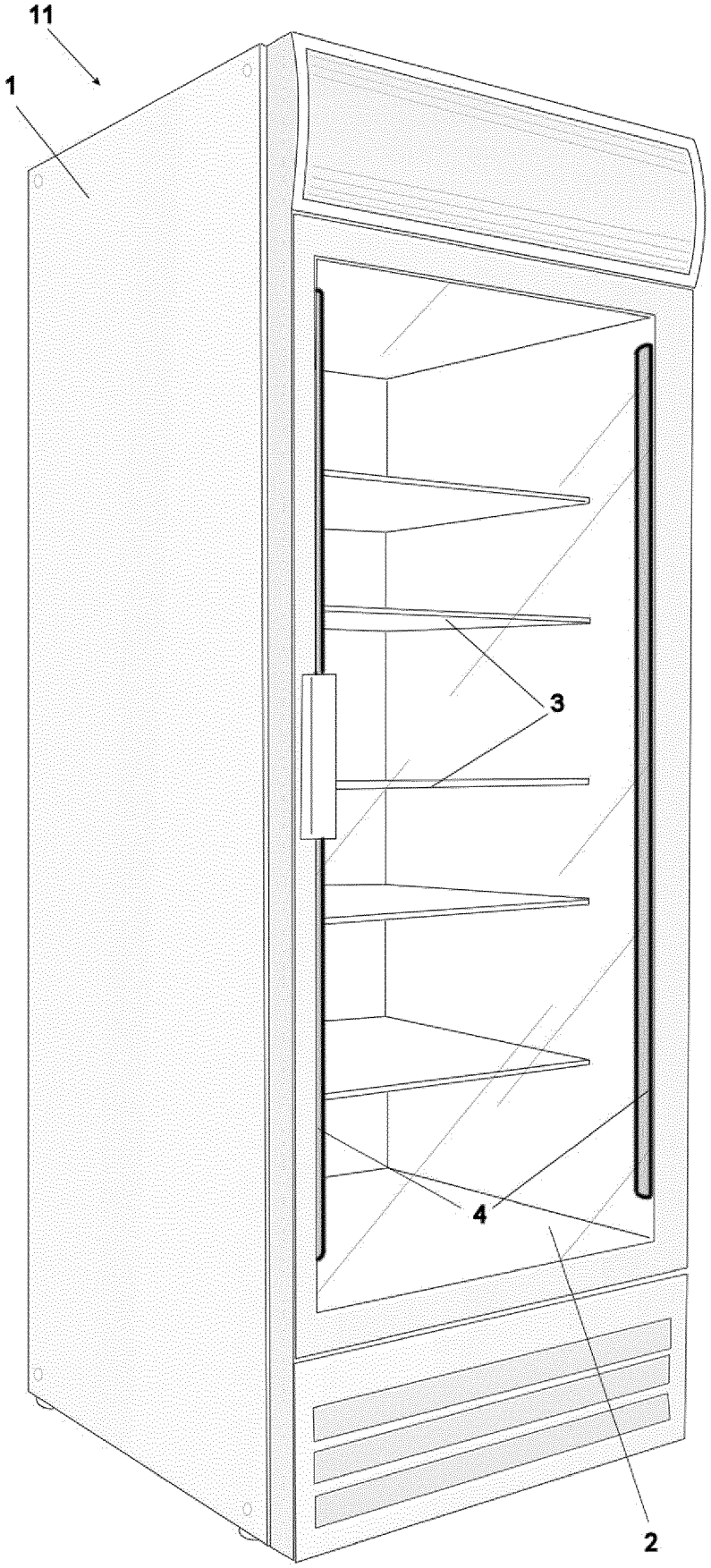

Fig. 1

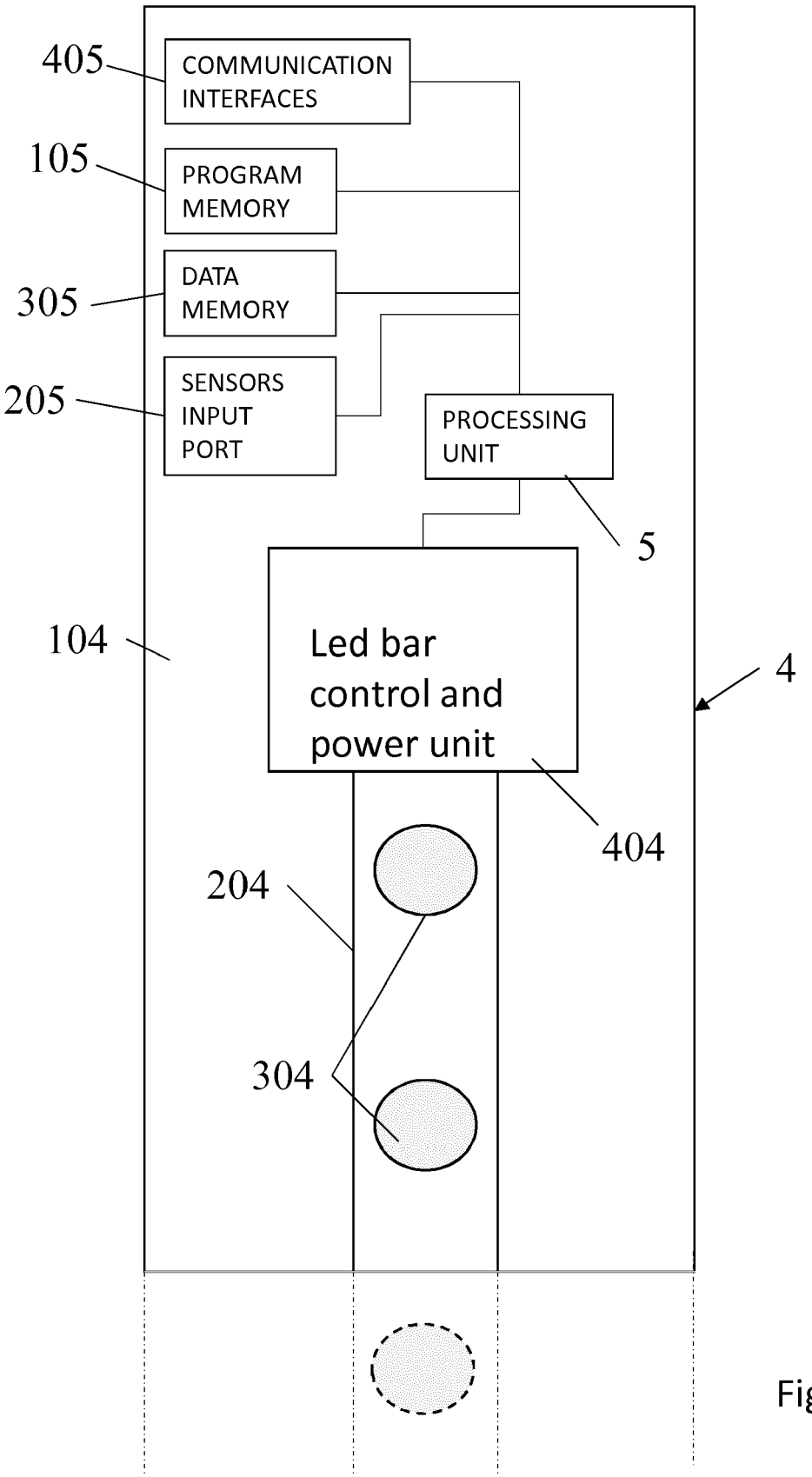
405
COMMUNICATION INTERFACES
105
PROGRAM MEMORY
305
DATA MEMORY
205
SENSORS INPUT PORT
PROCESSING UNIT
5
104
Led bar control and power unit
4
404
204
304

Fig. 2

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EUROPEAN SEARCH REPORT

Application Number
EP 17 19 6584

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2008/064179 A2 (SHELF CONTROL INC [US]; MARSH BRENT [US]) 29 May 2008 (2008-05-29) * paragraph [0035] - paragraph [0126]; figures 1-6 *	1-6	INV. A47F3/04 F25D27/00
A	US 6 722 142 B1 (PAGEL JEFFREY J [US]) 20 April 2004 (2004-04-20) * the whole document *	1-13	
A	CN 204 743 430 U (HEILONGJIANG CHANGLESHAN DAGUO SHAJI DEV CO LTD) 11 November 2015 (2015-11-11) * the whole document *	1-13	
A	CN 202 770 108 U (GUANGDONG CHIGO AIR COND CO) 6 March 2013 (2013-03-06) * the whole document *	1-13	

TECHNICAL FIELDS SEARCHED (IPC)

F21W
F21V
A47F
F25D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	22 January 2018	Kohler, Pierre

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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22-01-2018

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WO 2008064179 A2	29-05-2008	NONE	
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CN 204743430 U	11-11-2015	NONE	
CN 202770108 U	06-03-2013	NONE	

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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- EP 0962729 A **[0003] [0031]**