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(54) **REFRIGERATED SALES CABINET**

(57) A refrigerated sales cabinet (2) comprises a door (8);
a door operation motor configured to move the door (8) between a closed position and an opened position;
a control unit (22);
a door opening sensor (18), particularly a touch or proximity sensor configured to sense, while the door (8) is in its closed position, if a hand of a customer touches the door opening sensor (18) or if a hand of a customer is moved close to the door opening sensor (18) and to transmit a door opening signal indicative of such touch or such movement to the control unit (22); and
wherein the control unit (22) is configured to drive the door operation motor in response to such door opening

signal such that the door operation motor moves the door (8) the from its closed to its opened position; and/or
a door obstruction detection sensor (24), particularly a proximity sensor configured to sense, while the door (8) is in its opened position, if an object, particularly a person or a body part is positioned in the way of the closing movement of the door (8), and to transmit a door closing signal indicative that no object is in the way to the control unit (22); and
wherein the control unit (22) is configured to drive the door operation motor in response to such door closing signal, such that the door operation motor moves the door (8) the from its opened to its closed position.

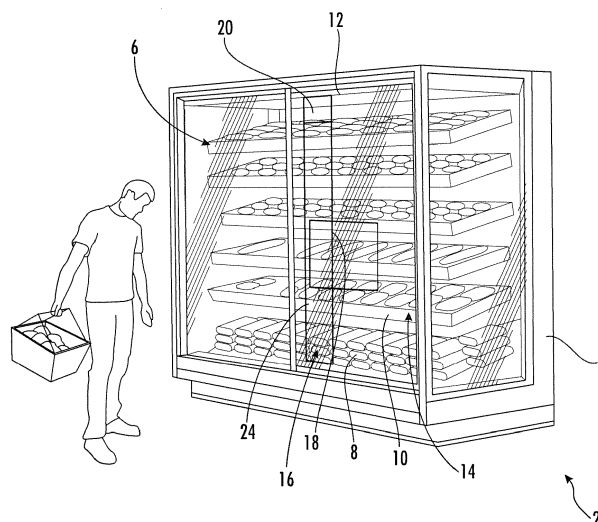


FIG. 1

Description

[0001] The invention relates to a refrigerated sales cabinet.

[0002] Refrigerated sales cabinets in supermarkets are often equipped with doors, either sliding doors or hinged doors, which are operated by the customers who open and close them manually.

[0003] Sometimes, customers do not close the doors fully after having taken goods out of the refrigerated sales space which results in a loss of energy, since cooled air flows out of the refrigerated sales space. Similarly, a loss of energy is present when the cabinet is operated in the same way whether the doors are open or closed.

[0004] Moreover, such refrigerated sales cabinets are not hygienic as thousands of customers per day touch the handles to open and close the refrigerated sales cabinets.

[0005] Accordingly, it is an object of the present invention to provide a refrigerated sales cabinet comprising an improved efficiency and improved hygiene.

[0006] This object is solved completely by the subject-matter of independent claim 1. Particular embodiments are defined in the dependent claims.

[0007] A refrigerated sales cabinet according to exemplary embodiments of the invention comprises a door; a door operation motor configured to move the door between a closed position and an opened position; a control unit; a door opening sensor, particularly a touch or proximity sensor configured to sense, while the door is in its closed position, if a hand of a customer touches the door opening sensor or if a hand of a customer is moved close to the door opening sensor and to transmit a door opening signal indicative of such touch or such movement to the control unit; wherein the control unit is configured to drive the door operation motor in response to such door opening signal such that the door operation motor moves the door from its closed to its opened position; and/or a door obstruction detection sensor, particularly a proximity sensor configured to sense, while the door is in its opened position, if an object, particularly a person or body part is positioned in the way of the closing movement of the door, and to transmit a door closing signal indicative that no object is in the way; and wherein the control unit is configured to drive the door operation motor in response to such door closing signal, such that the door operation motor moves the door from its opened to its closed position.

[0008] For opening and closing the door, the customers do no longer have to grip a handle of the door and move the door manually from its closed to its opened position and likewise from its opened to its closed position. Rather, the customer can open the door by touching the door opening sensor with his/her hand or by approaching/ moving his/her hand close to the door opening sensor. The door opening sensor which can be formed as a touch or proximity sensor will sense that the hand of the customer has touched the door opening sensor or

has moved close to the same and will transmit a door opening signal indicative of such touch or movement to the control unit. The control unit will drive the door operation motor in response to such door opening signal such that the door operation motor moves the door from its closed to its opened position.

[0009] The door obstruction detection sensor which can be formed as proximity sensor senses, while the door is in its opened position, if an object, particularly a person or a body part is positioned in the way of the closing movement of the door and transmits a door closing signal to the control unit if an object is or is not in the way.

[0010] The control unit will drive the door operation motor in response to such door closing signal such that the door operation motor moves the door from its opened to its closed position.

[0011] The door obstruction detection sensor can further be configured to transmit, while the door is in its opened position, a door obstruction signal indicative that an object, particularly a person or a body part, is positioned in the way of the closing movement of the door. The control unit will maintain the door in its opened position as long as it receives a door obstruction signal from the door obstruction detection sensor.

[0012] The capacitance properties of the door obstruction detection sensor differ when a person or a body part or any object is in the way of the closing movement of the door. By using a proximity sensor-based capacitance glass, this capacitance difference can be used to detect an obstruction of the door.

[0013] Both the opening and the closing operations of the door are effected automatically which improves the user-friendliness and facilitates the operation.

[0014] For opening the door, the customer just has to move his/her hand in front of the door opening sensor or just touches the door opening sensor briefly which signals the door to open. The touch/contact or movement close to the sensor is detected reliably by the door opening sensor. This also improves the hygiene of the opening operation, since in case the door opening sensor is formed as a proximity sensor the opening is effected in a contactless manner, and in case the door opening sensor is formed as a touch sensor a comparably long gripping of a handle is replaced by a simple and short touch.

[0015] The closing operation is effected totally contactless which improves both the efficiency and the hygiene of the refrigerated sales cabinet.

[0016] Moreover, since the door obstruction detection sensor reliably causes the closing of the door only if no object, particularly no person, no body part, no pet or anything is positioned in the way of the closing movement of the door, it is avoided that a door might remain open which prevents cooled air from flowing out of the refrigerated sales space and improves the efficiency.

[0017] According to a further advantage, the control unit always has the information about the door opening or closing status available and can use this information to effect an improved refrigeration operation. If the control

unit has received a door closing signal and closed the door, then the control unit has the information that the door is in its closed state. If the control unit has received a door opening signal and opened the door, then the control unit has the information that the door is in its opened state. Likewise, during the opening and closing movements of the door, the control unit has the information that the status of the door is "opening" or "closing", respectively.

[0018] The refrigerated sales cabinet has the capability of real-time door status information and people detection information which can also be used to obtain operational data of the refrigerated sales cabinet

[0019] No handles have to be provided at the doors of the refrigerated sales cabinet, which can contribute to an improved overall appearance of the refrigerated sales cabinet..

[0020] According to a first embodiment, the door opening sensor is formed as a sensor at or within a glass pane of the door. The door opening sensor can be configured to change its conductivity or capacitance in response to a touch or proximity of a person. The door opening sensor can be formed as touch screen type of glass or as a proximity glass.

[0021] By using such kind of opening sensor, and by arranging such sensor on or within a glass pane of the door the change of conductivity or capacitance properties in response to a hand moving close to such door opening sensor or touching the same can reliably be sensed. At the same time the view onto the products displayed within the refrigerated sales cabinet is not compromised by such door opening sensor.

[0022] According to a further embodiment, the door obstruction detection sensor is formed as a sensor at or within a glass pane of the door. The door obstruction detection sensor can be configured to change its conductivity or capacitance in response to proximity of a person. The door obstruction detection sensor can be formed as a proximity glass.

[0023] By using such kind of door obstruction detection sensor, and by arranging such sensor on or within a glass pane of the door the conductivity or capacitance properties of an object, particularly a person or a body part, being in the way of the closing movement of the door can reliably be sensed. At the same time the view onto the products displayed within the refrigerated sales cabinet is not compromised by such door obstruction detection sensor.

[0024] According to a further embodiment, the door obstruction detection sensor is further configured to transmit, while the door is in its opened position, a door obstruction signal indicative that an object, particularly a person or a body part, is positioned in the way of the closing movement of the door. The control unit can be configured to maintain the door in its opened position as long as it receives a door obstruction signal from the door obstruction detection sensor.

[0025] With this embodiment it may be reliably avoided

that the door closes while a customer or any other object is in the way of the closing movement.

[0026] According to a further embodiment, the door obstruction detection sensor is further configured to sense, during a closing movement of the door, if an object, particularly a person or a body part is positioned in the way of the closing movement of the door, and to transmit a door opening or a door stopping signal indicative that an object is in the way; and the control unit is configured to drive the door operation motor to stop the closing movement of the door and/or to open the door again if it receives a door opening or a door stopping signal, which can also be called door obstruction signal from the door obstruction detection sensor during a closing movement of the door.

[0027] With this embodiment it may be reliably avoided that the door comes into contact with a customer who is in or moves into the way of the closing movement of the door.

[0028] According to a further embodiment, the door obstruction detection sensor is configured to sense continuously or at intervals, while the door is in its opened position, if an object, particularly a person or a body part is positioned in the way of the closing movement of the door, and to transmit, continuously or at intervals, a door closing signal indicative that no object is in the way and/or a door obstruction signal indicative that an object is in the way.

[0029] With this embodiment it may be reliably avoided that the door stays in its opened position for too long. If the customer that has opened the door, has for example taken out the desired goods of the refrigerated sales space and has moved away from the refrigerated sales cabinet again, the door obstruction detection sensor will reliably sense that no object is in the way of the closing movement of the door anymore and will cause the door to close. Thereby, energy efficiency is significantly improved in comparison to conventional doors, where it happens often that a door remains open or is not fully closed after the customer has taken out the desired goods from the refrigerated sales space.

[0030] According to a further embodiment, the control unit is configured to transmit an alarm signal indicative of an excess door opening time if it receives door obstruction signals from the door obstruction detection sensor over a predetermined period of time.

[0031] Such alarm signal can be sent to the supermarket owner or to the cabinet service department to warn that the respective door has been in its opened position beyond a predetermined threshold. Transmitting such alarm signal can also contribute to energy efficiency and to detecting malfunction of the refrigerated sales cabinet.

[0032] According to a further embodiment, the refrigerated sales cabinet further comprises a door frame surrounding the glass pane. A microcontroller can be arranged at or embedded within the door frame. Such microcontroller can be configured to transmit at least one of the door opening signal, the door stopping signal, the

door closing signal, and the door obstruction signal to the control unit in a wired or wireless fashion.

[0033] Such microcontroller reliably receives and processes the sensed signal of the change of conductivity or capacitance properties in the glass.

[0034] Alternatively, such microcontroller can also be placed in other parts of the refrigerated sales cabinet.

[0035] With this embodiment the microcontroller can be hidden from the customers' view. Such microcontroller has the function of reliably transmitting at least one of the doors opening signal, the door closing signal and the door obstruction signal to the control unit.

[0036] According to a further embodiment, the control unit is configured to drive at least one evaporator fan of an evaporator arranged within the refrigerated sales cabinet to run with adapted rotational speed. after receiving a door opening signal.

[0037] In one embodiment, the control unit is configured to drive at least one evaporator fan of an evaporator arranged within the refrigerated sales cabinet to run with reduced speed or to stop operation, after receiving a door opening signal. With this embodiment, the energy efficiency of the refrigerated sales cabinet is further improved. In the opened position of the door the at least one evaporator fan runs with reduced speed or even stops, in order to prevent that cooled air continues to be blown over or sucked through the evaporator coils of the evaporator. This avoids waste of energy.

[0038] In another embodiment, the control unit is configured to drive at least one evaporator fan of an evaporator arranged within the refrigerated sales cabinet to run with increased speed, after receiving a door opening signal, in order to create a strong air curtain and avoid too much infiltration. Such embodiment is particularly suitable for refrigerated sales cabinets which are formed as vertical multidecks.

[0039] Likewise, the control unit can be configured to drive at least one evaporator fan of an evaporator arranged within the refrigerated sales cabinet to run with normal operational speed again, after receiving a door closing signal.

[0040] According to a further embodiment, the door is formed as a hinged/pivoting door having a lateral outer portion close to the hinges and a lateral inner portion opposite the lateral outer portion. The hinged door can be pivoted between a closed position in which the door closes the front of the refrigerated sales space of the refrigerated sales cabinet and lies in a vertical front plane of the refrigerated sales cabinet, and an opened position in which the hinged door is pivoted out of such vertical front plane and allows access to the refrigerated sales space of the refrigerated sales cabinet.

[0041] According to a further embodiment, the door opening sensor is arranged at a middle vertical portion of the hinged door, particularly at a middle vertical portion of the lateral inner portion of the hinged door. The door obstruction detection sensor can be arranged at the lateral inner portion of the hinged door, and particularly ex-

tends at least partially over the height of the glass pane of the hinged door. The door opening sensor can be formed as part of the door obstruction detection sensor.

[0042] By arranging the door obstruction detection sensor to extend at least partially over the height of the glass pane of the sliding door also small customers, for example children, can reliably be detected.

[0043] According to a further embodiment, the door obstruction detection sensor, particularly a proximity sensor is configured to sense, while the hinged door is in its opened position, if an object, particularly a person or a body part is positioned between the lateral inner portion of the hinged door, where the door obstruction detection sensor is arranged, and the vertical front plane of the refrigerated sales cabinet, and to transmit a door closing signal indicative that no object is in the way.

[0044] According to a further embodiment, the door is formed as a sliding door having a lateral outer portion close to a side wall of the refrigerated sales cabinet and a lateral inner portion opposite the lateral outer portion. The sliding door is moveable between a closed position in which the sliding door closes the front of the refrigerated sales space of the refrigerated sales cabinet, and in which its lateral inner portion abuts either against a door frame post, a cabinet side wall or an adjacent door, and an opened position in which the sliding door is slid to the side, and in which its lateral inner portion is spaced apart from the respective door frame post, the respective cabinet side wall or the respective adjacent door, thereby allowing access to the refrigerated sales space of the refrigerated sales cabinet.

[0045] According to a further embodiment, the door opening sensor is arranged at a middle vertical portion of the sliding door, particularly at a middle vertical portion of the lateral inner portion of the sliding door. The door obstruction detection sensor can be arranged at the lateral inner portion of the sliding door, and particularly extends at least partially over the height of the glass pane of the sliding door. The door opening sensor can be formed as part of the door obstruction detection sensor.

[0046] According to a further embodiment, the door obstruction detection sensor, particularly a proximity sensor is configured to sense, while the sliding door is in its opened position, if an object, particularly a person or a body part is positioned between the lateral inner portion of the sliding door, where the door obstruction detection sensor is arranged, and the respective door frame post, the respective cabinet side wall or the respective adjacent door.

[0047] According to a further embodiment, the refrigerated sales cabinet further comprises a cabinet frame which can form the front edge of the cabinet body where the doors are arranged. The control unit can be arranged at or embedded within the cabinet frame. The control unit can be formed as part of the cabinet controller.

[0048] According to a further embodiment, the refrigerated sales cabinet further comprises a display and/or a projector configured to display the door status. The

control unit and/or the microcontroller are configured to cause the display and/or projector to display the door status.

[0049] The door opening sensor and/or the door obstruction detection sensor can also be formed by other means, for example through optical sensors, radar, or any other people detection technologies.

[0050] According to a further embodiment, the refrigerated sales cabinet comprises a suitable number of doors, for example one, two, three, four or more doors.

[0051] According to a further embodiment, at least one door of the refrigerated sales cabinet, particularly all the doors of the refrigerated sales cabinet, can be formed as transparent door(s).

[0052] In the following, a refrigerated sales cabinet according to exemplary embodiments of the invention is described in more detail with respect to the enclosed figures.

Fig. 1 shows a perspective view of a refrigerated sales cabinet with its two hinged doors being in their respective closed positions and with a customer standing in front of the refrigerated sales cabinet.

Fig. 2 shows a perspective view of the refrigerated sales cabinet of Fig. 1 with the right hand hinged door being in its opened position, pivoted out of the vertical front plane of the refrigerated sales cabinet and with a customer standing in front of the refrigerated sales space in order to take out goods therefrom and standing in the way of the closing movement of the right hand hinged door.

Fig. 3 shows a perspective view of the refrigerated sales cabinet of Fig. 2 with the right hand hinged door still being in its opened position pivoted out of the vertical front plane of the refrigerated sales cabinet where the customer has moved away from the refrigerated sales cabinet.

Fig. 4 shows a schematic front view of the right-hand side hinged door of the refrigerated sales cabinet of Figs. 1 to 3 with a door opening sensor and of a microcontroller and a control unit.

Fig. 5 shows a schematic front view of the right-hand hinged door of the refrigerated sales cabinet of Figs. 1 to 3 comprising a door obstruction detection sensor and of a microcontroller and a control unit.

Fig. 6 shows a schematic front view of the right-hand hinged door of the refrigerated sales cabinet of Figs. 1 to 4 comprising both a door opening sensor and a door obstruction detection sensor and of a microcontroller and a control unit.

[0053] In figures 1 through 3, the refrigerated sales cabinet 2 comprises a cabinet body 4 with a bottom por-

tion, a rear wall and a ceiling/roof portion as well as side-walls. Within the cabinet body 4, a refrigerated sales space is formed in which refrigerated goods are stored and displayed. The refrigerated sales cabinet 2 comprises at least one evaporator and an expansion device associated therewith, of a vapor compression cycle. Refrigerant flows through such vapor compression cycle which comprises, in addition to the expansion device and the evaporator, a compressor unit, a condenser/liquefier and refrigerant conduits circulating a refrigerant there-through. The at least one evaporator can be equipped with an evaporator fan configured for blowing or sucking air over the coils of the evaporator.

[0054] The front side of the refrigerated sales cabinet 2 is equipped with two doors 8 which are formed as hinged/pivoting doors in the embodiments of the Figures, but can also be formed as sliding doors.

[0055] Both doors 8 can be pivoted by means of hinges that are mounted to the vertical side posts of the cabinet body 4. Both doors 8 comprise a lateral outer portion 14 close to the hinges and a lateral inner portion 16 opposite the lateral outer portion 14. Both doors 8 can be pivoted between the closed position depicted in Fig. 1 in which the doors 8 close the front of the refrigerated sales space of the refrigerated sales cabinet 2 and lie in a vertical front plane of the refrigerated sales cabinet 2, and an opened position in which the doors 8 are pivoted out of such vertical front plane and allow access to the refrigerated sales space of the refrigerated sales cabinet 2, as can be seen in Figs. 2 and 3.

[0056] At least one door operation motor (not shown) is provided and configured to move the doors 8 between the closed and the opened positions.

[0057] The refrigerated sales cabinet 2 comprises for example two doors 8, namely a lefthand door 8 and a right-hand door 8. The doors can be transparent. As a matter of course, refrigerated sales cabinets can be equipped with any suitable number of doors.

[0058] Each of the two doors 8 of the refrigerated sales cabinet 2 can be equipped with a respective door opening sensor 18 which can be formed as touch or proximity sensor and can be configured to sense, while the respective door is in a closed position if a hand of a customer touches the door opening sensor 18 or if a hand of a customer is moved close to the door opening sensor 18 or slides over the same, and to transmit a door opening signal indicative of such touch or such movement to a control unit 20, particularly via a microcontroller 20.

[0059] Each of the two doors 8 can be provided with a microcontroller 20 which can be arranged at or embedded within a door frame 12.

[0060] Furthermore, a control unit 22 is provided which is configured to drive the door operation motor in response to such door opening signal such that the door operation motor moves the door 8 from its closed to its opened position. The control unit 22 can be arranged at or embedded within the cabinet frame or the cabinet body 4. In the embodiments shown in the Figures, the control

unit 22 is arranged at a ceiling/roof portion of the cabinet body 4.

[0061] As can be seen in Fig. 1, the door opening sensor 18 is arranged at a middle vertical portion of the lateral inner portion 16 of the right door 8. A corresponding door opening sensor (not shown) is arranged at a middle vertical portion of the lateral inner portion 16 of the left door 8.

[0062] The door opening sensors 18 are particularly formed as touch or proximity sensors on or within a glass pane 10 of the doors 8, and are configured to change their conductivity or capacitance in response to a touch or proximity of a person. For example, if a person touches or moves close to a door opening sensor 18, then the conductivity and/or capacitance values of the door opening sensor 18 change, compared to a situation where no person touches the door opening sensor 18 or is close to the same. The door opening sensors can particularly be formed as touch screen type of glass or as a proximity glass. Both doors 8 respectively comprise a glass pane 10 which can be configured as double or triple glass pane and a door frame 12 enclosing the glass pane 10. In particular the doors 8 do not need to have a handle.

[0063] In Figs. 2 and 3 it can well be seen that the right door 8 is also equipped with a door obstruction detection sensor 24, and a corresponding door obstruction detection sensor (not shown) can also be provided at the handle of the door 8.

[0064] The door obstruction detection sensor or detector 24 is particularly formed as proximity sensor configured to sense, while the door 8 is in its open position, if an object, particularly a person or a body part is positioned in the way of the closing movement of the door 8, and to transmit a door closing signal indicative that no object is in the way to the control unit 22, particularly via the microcontroller 20. The control unit 22 is configured to drive the door operation motor in response to such door closing signal, such that the door operation motor moves the door 8 from its opened to its closed position.

[0065] The door obstruction detection sensor 24 is arranged at the lateral outer portion 16 of the door 8 and extends at least partially over the height of the glass pane 10, particularly over the full height of the glass pane 10 of the door 8, to ensure detection of any object, particularly no person, nobody part, no per or anything is present in between the door and the cabinet, at any length. The door obstruction detection sensor 24 can be formed as a sensor on or within the glass pane 10 of the door 8 and can be configured to change its conductivity or capacitance in response to proximity of a person. Particularly, the door obstruction sensor 24 can be formed as proximity glass.

[0066] The door obstruction detection sensor 24 can be further configured to transmit, while the door 8 is in its opened position, a door obstruction signal indicative that an object, particularly a person or a body part, is positioned in the way of the closing movement of the door 8. The control unit 22 can be configured to maintain the door 8 in its open position as long as it receives the door

obstruction signal from the door obstruction detection sensor 24.

[0067] As a further safety measure, the door obstruction detector 24 can be further configured to sense, during a closing movement of the door 8, if an object, particularly a person or a body part is positioned in the way of the closing movement of a door 8, and to transmit a door opening or door stopping signal indicative that an object is in the way. The control unit 22 can be configured to drive the door operation motor to stop the closing movement of the door 8 and to open the door 8 again if it receives a door obstruction signal from the door obstruction detection sensor 24 during a closing moving of the door 8.

[0068] In order to improve efficiency, the door obstruction detection sensor 24 can further be configured to sense continuously or at intervals, while the door 8 is in its opened position, if an object, particularly a person or a body part is positioned in the way of the closing movement of the door 8, and to transmit a door closing signal indicative that no object is in the way and/or a door obstruction signal indicative that an object is in the way.

[0069] The control unit 22 can be configured to transmit an alarm signal indicative of an excess door opening time if it receives door obstruction signals from the door obstruction detection sensor 24 over a predetermined period of time.

[0070] The door opening, door closing and door obstruction signals can be transmitted from the sensors 18, 24 via their respective microcontroller 20 to the control unit 22 in wireless or wired fashion.

[0071] In order to further improve efficiency of the refrigerated sales cabinet 2, the control unit 22 can be configured to drive the at least one evaporator fan of an evaporator arranged within the refrigerated sales cabinet 2 to run with adapted rotational speed, after receipt of the door opening signal. In one embodiment, the control unit 22 can be configured to drive at least one evaporator fan of the evaporator to run with reduced speed or to stop operation, after receiving a door opening signal, in order to further improve the energy efficiency of the refrigerated sales cabinet 2. In another embodiment, the control unit 22 is configured to drive at least one evaporator fan of the evaporator to run with increased speed, after receiving a door opening signal, in order to create a strong air curtain and avoid too much infiltration.

[0072] The control unit 22 can be further configured to drive the at least one evaporator fan of the evaporator to run with normal operational speed again, after receipt of the door closing signal.

[0073] Particularly, the door obstruction detection sensor 24 can be configured to sense, while the door 8 is in its opened position, in which the door 8 is pivoted out of the vertical front plane of the refrigerated sales cabinet 2, if an object, particularly a person or a body part is positioned between the lateral outer portion 16 of the door 8, where the door obstruction detection sensor 24 is arranged and the vertical front plane of the refrigerated

sales cabinet 2, and to transmit a door closing signal indicative that no object is in the way, to the control unit 22.

[0074] In Fig. 1 a customer moves to the refrigerated sales cabinet 2 and moves his hand close to/slides his hand over the door opening sensor 18, in case the door opening sensor is formed as a proximity sensor, or touches the door opening sensor 18 in case the door opening sensor 18 is formed as touch sensor. The change in conductivity or capacitance is detected by the door opening sensor 18, and the door opening sensor 18 transmits, particularly via its microcontroller 20, a door opening signal indicative of such movement or such touch to the control unit 22. The control unit 22 drives the door operation motor in response to such door opening signal such that the door operation motor moves the door 8 from its closed to its opened position, as can be seen in Fig. 2.

[0075] The customer can then access the goods within the refrigerated sales space and take out goods as desired. While the customer is standing in the way of the closing movement of the door 8, as depicted in Fig. 2, the door obstruction detection sensor 24 will transmit a door obstruction signal indicative that an object, particularly the customer is positioned in the way of the closing movement of the door 8, and the control unit 22 controls the door operation motor such that the door 8 will stay in its opened position as long as it receives such door obstruction signals from the door obstruction detection sensor 24, as can well be understood when viewing Fig. 2.

[0076] After taking out the desired goods from the refrigerated sales space, the customer will then move away from the refrigerated sales space 2 and the door obstruction detection sensor will sense that no object, particularly no customer is positioned in the way of the closing movement of the door 8 anymore. Consequently, it will transmit a door closing signal indicative that no object is in the way, to the control unit 22. The control unit 22 will then drive the door operation motor in response to such door closing signal such that the door operation motor moves the door 8 from its opened position (Fig. 3) to its closed position (Fig. 1).

[0077] After receiving a door opening signal, the control unit 22 can control the evaporator fan of an evaporator arranged within the refrigerated sales cabinet 2 to run with reduced speed or to stop operation. After receipt of the door closing signal, it can drive such evaporator fan to run with normal operational speed again.

[0078] The sensing if an object, particularly a person or a body part is positioned in the way of the closing movement of the door 8 can be done continuously or at intervals.

[0079] In Fig. 4 it can be seen that the door opening sensor 18 is formed as a rectangular portion on or within the glass pane 10 at a position where normally a handle would be placed, namely at the lateral outer portion 16 at a position that each customer can easily reach.

[0080] The microcontroller 20 is schematically depicted beside the door frame 12, but can well be integrated

within the frame.

[0081] The control unit 22 is typically arranged at a ceiling/roof portion of the cabinet body 4. The control unit 22 can be part of the cabinet controller, or an independent one.

[0082] In Fig. 5 it can well be seen that the door obstruction detection sensor 24 extends over the full height of the glass pane 10 of the door 8 at a lateral portion 16 of the door. With this embodiment, it is ensured that also small objects, particularly small customers or children, will reliably be detected by the door obstruction detection sensor 24.

[0083] In the embodiment of Fig. 6, the door opening sensor 18 is formed as part of the door obstruction detection sensor 24. The door obstruction detection sensor 24 is formed at the lateral outer portion 16 of the door 8 and extends over the full height of the glass pane 10 thereof. Its vertical middle portion also forms the door opening sensor 18.

[0084] While the invention has been described with reference to exemplary embodiments, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted for elements thereof without departing from the scope of the claims. In addition many modifications may be made to adopt a particular situation or material to the teachings of the invention without departing from the scope of the claims. Therefore, it is intended that the invention not be limited to the particular embodiment disclosed, but that the invention includes all embodiments falling within the scope of the claims.

List of reference numerals:

[0085]

2	refrigerated sales cabinet
4	cabinet body
6	refrigerated sales space
8	hinged door
10	glass pane
12	door frame
14	lateral outer portion close to the hinges
16	lateral inner portion
18	door opening sensor
20	microcontroller
22	control unit
24	door obstruction detection sensor

Claims

1. Refrigerated sales cabinet (2) comprising a door (8);
a door operation motor configured to move the door (8) between a closed position and an opened position;
a control unit (22);

- a door opening sensor (18), particularly a touch or proximity sensor configured to sense, if a customer touches the door opening sensor (18) or if a customer moves close to the door opening sensor (18), and to transmit a door opening signal indicative of such touch or such movement to the control unit (22); and wherein the control unit (22) is configured to drive the door operation motor in response to such door opening signal and to open the door; and/or a door obstruction detection sensor (24), particularly a proximity sensor configured to sense, while the door (8) is in its opened position, if an object is positioned in the way of the closing movement of the door (8), and to transmit a door closing signal indicative that no object is in the way to the control unit (22); and wherein the control unit (22) is configured to drive the door operation motor in response to such door closing signal and to close the door.
2. Refrigerated sales cabinet (2) of claim 1, wherein the door opening sensor (18) is formed as a sensor on or within a glass pane (10) of the door (8); and/or wherein the door opening sensor (18) is configured to change its conductivity or capacitance in response to a touch or proximity of a person; and/or wherein the door opening sensor (18) is formed as touch screen type of glass or as a proximity glass.
 3. Refrigerated sales cabinet (2) of claim 1 or 2, wherein the door obstruction detection sensor (24) is formed as a sensor on or within a glass pane (10) of the door (8); and/or wherein the door obstruction detection sensor (24) is configured to change its conductivity or capacitance in response to proximity of a person; and/or wherein the door obstruction detection sensor (24) is formed as a proximity glass.
 4. Refrigerated sales cabinet (2) of any of the preceding claims, wherein the door obstruction detection sensor (24) is further configured to transmit, while the door (8) is in an open position, a door obstruction signal indicative that an object, particularly a person or a body part, is positioned in the way of the closing movement of the door (8).
 5. Refrigerated sales cabinet (2) of any of the preceding claims, wherein the door obstruction detection sensor (24) is further configured to sense, during a closing movement of the door (8), if an object, particularly a person or a body part is positioned in the way of the closing movement of the door (8), and to transmit a door opening or a door stopping signal indicative that an object is in the way; and wherein the control unit (22) is configured to drive the door operation motor to stop the closing movement of the door (8) and/or to open the door (8) again if it receives a door obstruction signal from the door obstruction detection sensor (24) during a closing movement of the door (8).
 6. Refrigerated sales cabinet (2) of claim 4 or 5, wherein the door obstruction detection sensor (24) is configured to sense continuously or at intervals, while the door (8) is in an open position, if an object, particularly a person or a body part is positioned in the way of the closing movement of the door (8), and to transmit, continuously or at intervals, a door closing signal indicative that no object is in the way and/or a door obstruction signal indicative that an object is in the way; and/or wherein the control unit (22) is configured to transmit an alarm signal indicative of an excess door opening time if it receives door obstruction signals from the door obstruction detection sensor (24) over a predetermined period of time.
 7. Refrigerated sales cabinet (2) of any of the preceding claims, further comprising a door frame (12) surrounding the glass pane (10); and wherein a microcontroller (20) is arranged at or embedded within the door frame (12), the microcontroller (20) being configured to transmit at least one of the door opening signal, the door closing signal, and the door obstruction signal to the control unit (22) in a wired or wireless fashion.
 8. Refrigerated sales cabinet (2) of any of the preceding claims, wherein the control unit (22) is configured to drive at least one evaporator fan of an evaporator arranged within the refrigerated sales cabinet (2) to run with adapted rotational speed, particularly increased or reduced speed or to stop operation, after receipt of the door opening signal; and/or wherein the control unit (22) is configured to drive at least one evaporator fan of an evaporator arranged within the refrigerated sales cabinet (2) to run with normal operational speed again, after receipt of the door closing signal.
 9. Refrigerated sales cabinet (2) of any of the preceding claims, wherein the door (8) is formed as a hinged/pivoting door having a lateral outer portion (14) close to the hinges and a lateral inner portion (16) opposite the lateral outer portion (14); wherein the hinged door is moveable between a closed position in which the door (8) closes the front of the refrigerated sales space of the refrigerated sales cabinet (2) and lies in a vertical front plane of

the refrigerated sales cabinet (2), and an open position in which the hinged door is pivoted out of such vertical front plane and allows access to the refrigerated sales space of the refrigerated sales cabinet (2).

10. Refrigerated sales cabinet (2) of claim 9, wherein the door opening sensor (18) is arranged at a middle vertical portion of the hinged door, particularly at a middle vertical portion of the lateral inner portion (16) of the hinged door; and/or wherein the door obstruction detection sensor (24) is arranged at the lateral inner portion (16) of the hinged door, and particularly extends at least partially over the height of the glass pane (10) of the hinged door; and/or wherein the door opening sensor (18) is formed as part of the door obstruction detection sensor (24).
11. Refrigerated sales cabinet (2) of claim 9 or 10, wherein the door obstruction detection sensor (24), particularly a proximity sensor is configured to sense, while the hinged door is in an open position, if an object, particularly a person or a body part is positioned between the lateral inner portion (16) of the hinged door, where the door obstruction detection sensor (24) is arranged, and the vertical front plane of the refrigerated sales cabinet (2), and to transmit a door closing signal indicative that no object is in the way.
12. Refrigerated sales cabinet (2) of any of claims 1 to 8, wherein the door (8) is formed as a sliding door having a lateral outer portion close to a side wall of the refrigerated sales cabinet (2) and a lateral inner portion opposite the lateral outer portion; wherein the sliding door is moveable between a closed position in which the sliding door closes the front of the refrigerated sales space of the refrigerated sales cabinet (2) and in which its lateral inner portion abuts against a door frame post, a cabinet side wall or an adjacent door (8), and an opened position in which the sliding door is slid to the side and in which its lateral inner portion is spaced apart from the respective door frame post, the respective cabinet side wall or the respective adjacent door (8), thereby allowing access to the refrigerated sales space of the refrigerated sales cabinet (2).
13. Refrigerated sales cabinet (2) of claim 12, wherein the door opening sensor (18) is arranged at a middle vertical portion of the sliding door, particularly at a middle vertical portion of the lateral inner portion of the sliding door; and/or wherein the door obstruction detection sensor (24) is arranged at the lateral inner portion of the sliding door, and particularly extends at least partially over the height of the glass pane (10) of the sliding door;

and/or

wherein the door opening sensor (18) is formed as part of the door obstruction detection sensor (24).

14. Refrigerated sales cabinet (2) of claim 12 or 13, wherein the door obstruction detection sensor (24), particularly a proximity sensor is configured to sense, while the sliding door is in an open position an object, particularly a person or a body part is positioned between the lateral inner portion of the sliding door, where the door obstruction detection sensor (24) is arranged, and the respective door frame post, the respective cabinet side wall or the respective adjacent door (8).
15. Refrigerated sales cabinet (2) of any of the preceding claims, further comprising a cabinet frame; wherein the control unit (22) is arranged at or embedded within the cabinet frame; wherein the control unit (22) is formed as part of the cabinet controller; and/or further comprising a display and/or a projector configured to display the door status; and/or wherein the control unit (22) and/or the microcontroller (20) is configured to cause the display and/or projector to display the door status.

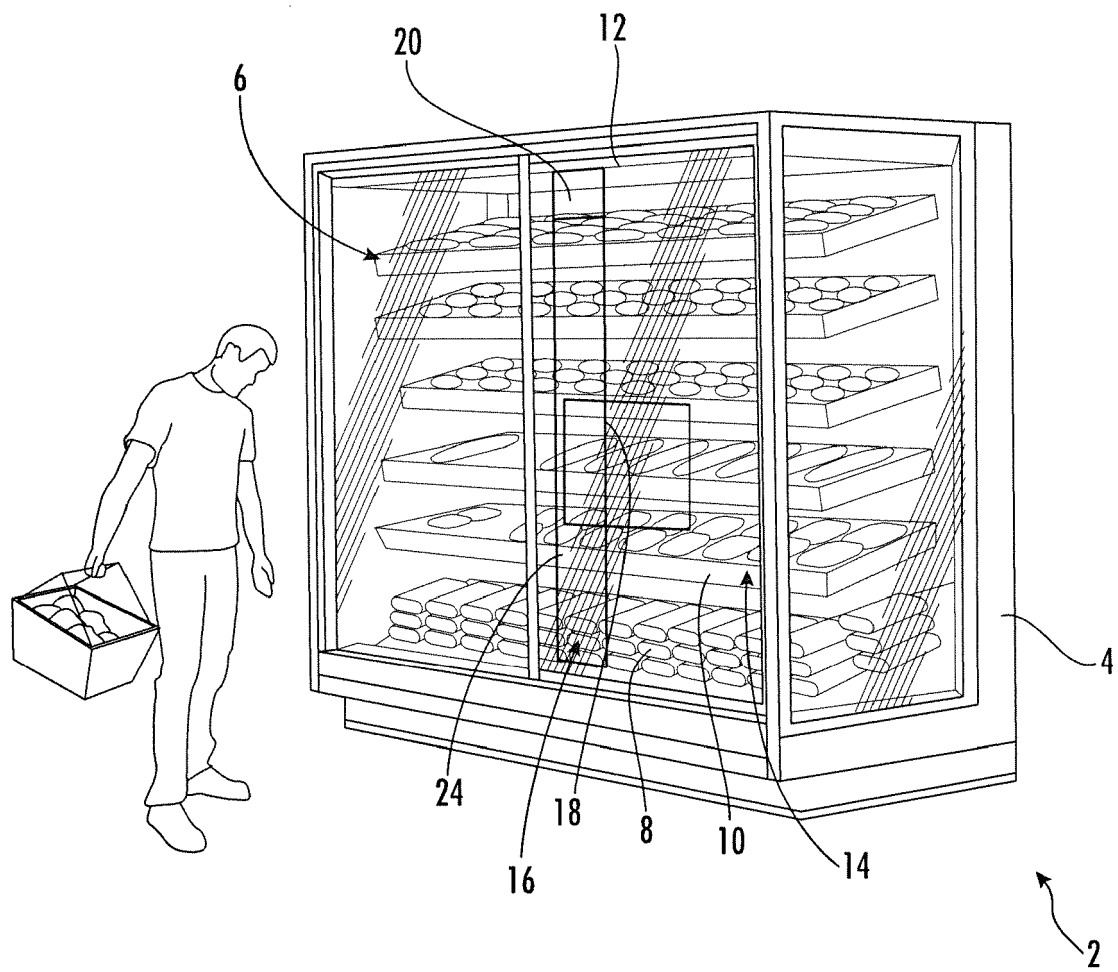
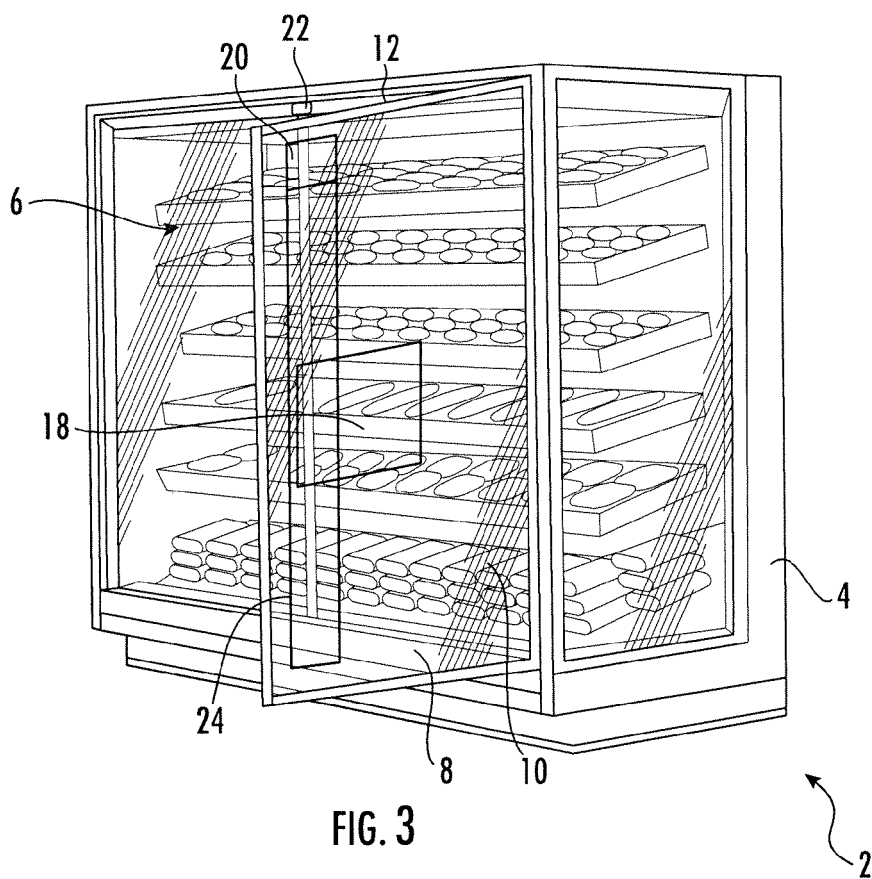
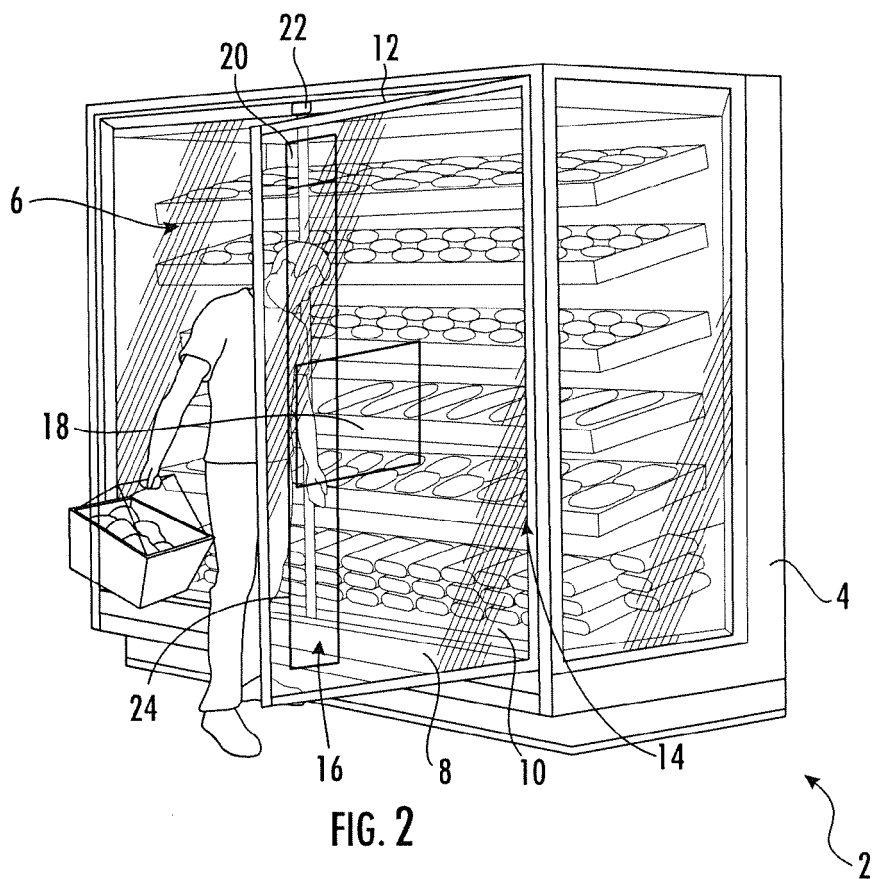


FIG. 1



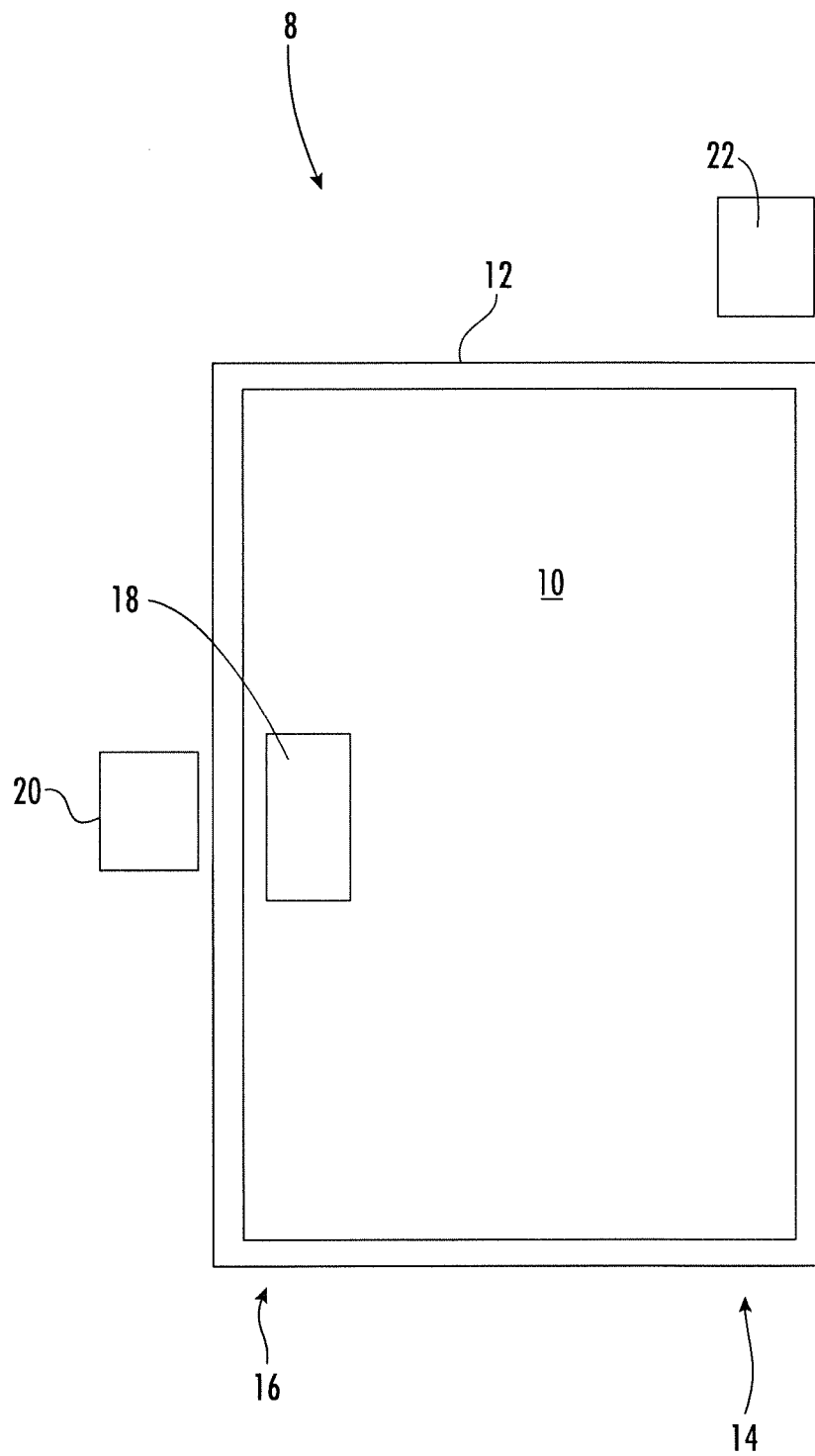


FIG. 4

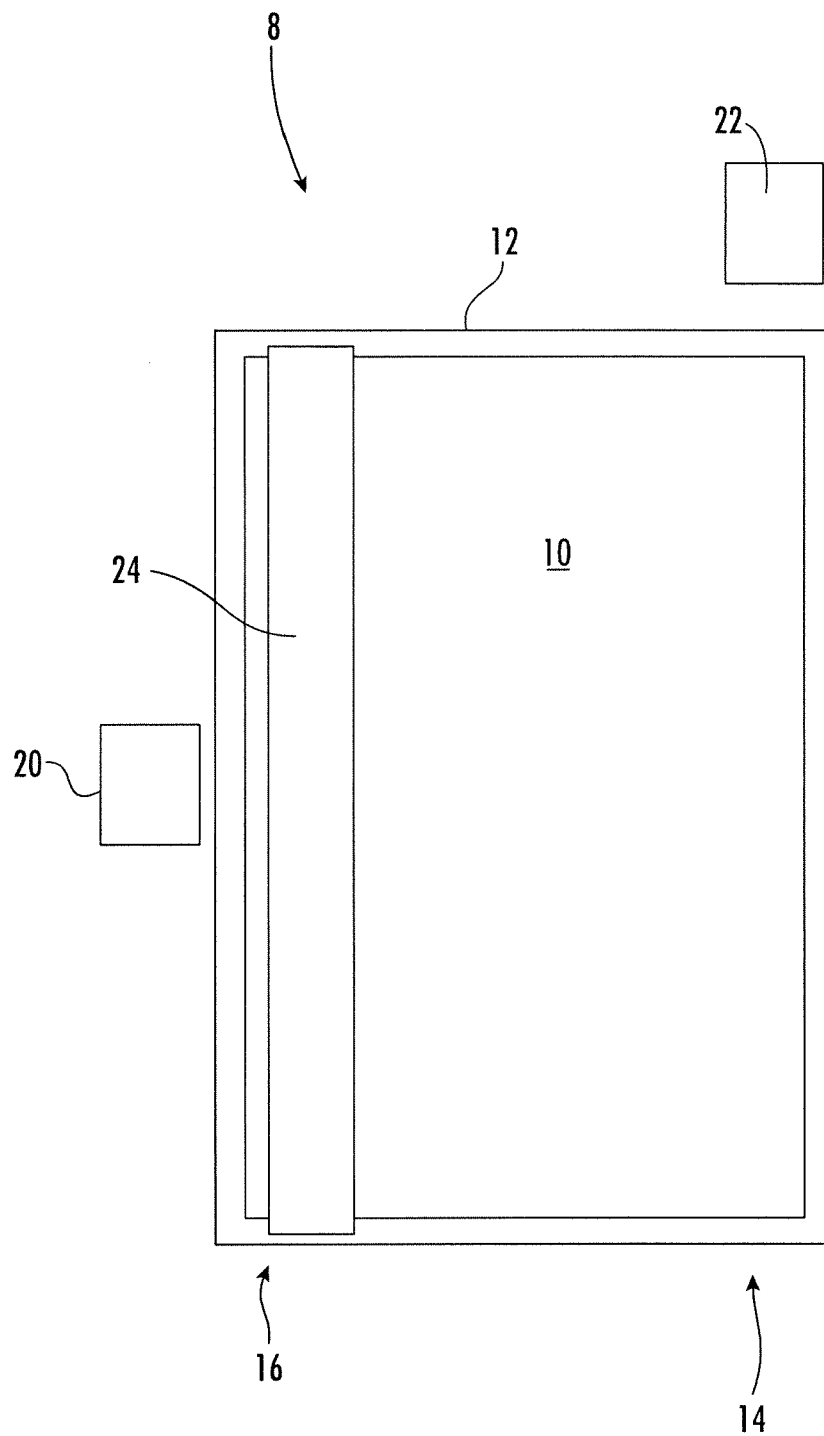


FIG. 5

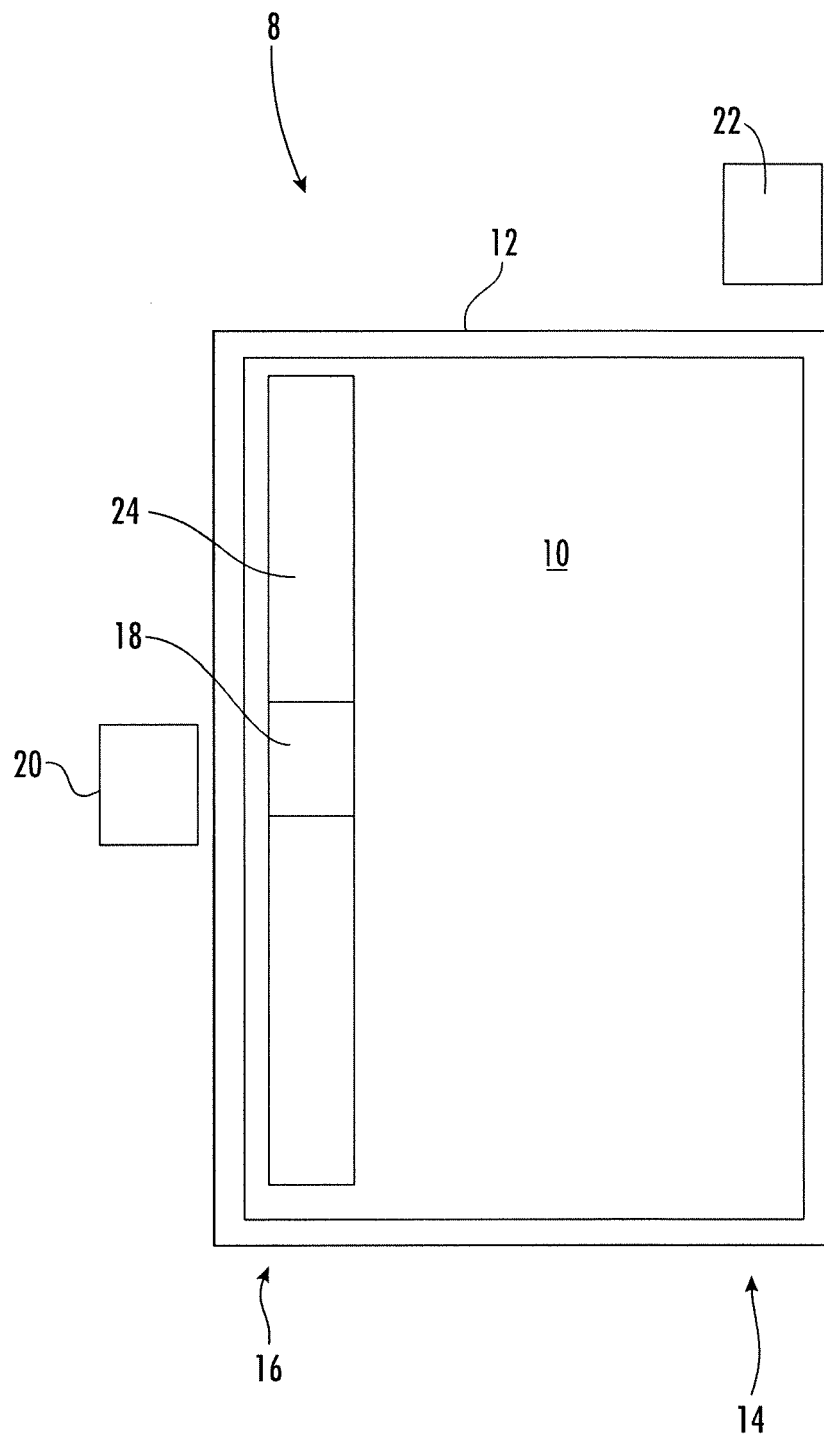


FIG. 6



EUROPEAN SEARCH REPORT

 Application Number
 EP 19 15 3068

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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	US 2014/311173 A1 (NILLES DIETMAR [DE] ET AL) 23 October 2014 (2014-10-23)	1,2,4-6, 9-15	INV. A47F3/04
Y	* paragraph [0028]; figures 1-5 *	8	A47F3/00
X	EP 2 525 177 A1 (IND SCAFFALATURE ARREDAMENTI ISA S R L [IT]) 21 November 2012 (2012-11-21)	1,4-6, 9-11,15	
Y	* figure 1 *	8	
X	CN 203 633 872 U (QINGDAO DASHANG ELECTRICAL APPLIANCES CO LTD) 11 June 2014 (2014-06-11)	1,4-6, 12-15	
Y	* figure 1 *	8	
X	US 2017/095092 A1 (WIND III ANTHONY G [US]) 6 April 2017 (2017-04-06)	1,4-6, 9-11,15	
Y	* figures 3-5 *	8	
X	DE 10 2011 103300 A1 (COOLBACK GMBH) 29 November 2012 (2012-11-29)	1,4-6, 9-11,15	
Y	* figures 1-7 *	3,7,8	TECHNICAL FIELDS SEARCHED (IPC)
Y	WO 2004/016897 A2 (DU PONT [US]; ANDERSON CHRISTOPHER [US] ET AL.) 26 February 2004 (2004-02-26)	3,7	A47F F25D E05G E05F
A	US 2014/144083 A1 (ARTWOHL PAUL J [US] ET AL) 29 May 2014 (2014-05-29)	15	
Y	* figures 1, 8 *		
Y	EP 2 210 530 A2 (REGAL BELOIT CORP [US]) 28 July 2010 (2010-07-28)	8	
	* paragraph [0022]; figures 1, 2 *		
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		4 September 2019	Crespo Vallejo, D
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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 EPO FORM 1503 03.82 (P04C01)



Application Number

EP 19 15 3068

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

**LACK OF UNITY OF INVENTION
SHEET B**

Application Number

EP 19 15 3068

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-7, 9-15

Refrigerated sales cabinet comprising a door opening sensor and/or a door obstruction detection sensor formed as a sensor on or within a glass pane of one or more doors.

2. claim: 8

Refrigerated sales cabinet wherein the rotation speed of the evaporator fan is adapted to the state of the door(s).

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 19 15 3068

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2014311173 A1	23-10-2014	BR 112014016866 A2 CN 104114064 A DE 102012202392 A1 EP 2814360 A1 ES 2701784 T3 JP 6290102 B2 JP 2015513059 A JP 2018066556 A KR 20140125413 A US 2014311173 A1 WO 2013120941 A1 ZA 201405427 B	13-06-2017 22-10-2014 22-08-2013 24-12-2014 25-02-2019 07-03-2018 30-04-2015 26-04-2018 28-10-2014 23-10-2014 22-08-2013 23-12-2015
EP 2525177 A1	21-11-2012	EP 2525177 A1 US 2012291471 A1	21-11-2012 22-11-2012
CN 203633872 U	11-06-2014	NONE	
US 2017095092 A1	06-04-2017	GB 2544182 A US 2017095092 A1	10-05-2017 06-04-2017
DE 102011103300 A1	29-11-2012	NONE	
WO 2004016897 A2	26-02-2004	AU 2003256893 A1 CN 1675446 A EP 1527249 A2 JP 2005534612 A US 2004185195 A1 US 2005233125 A1 WO 2004016897 A2	03-03-2004 28-09-2005 04-05-2005 17-11-2005 23-09-2004 20-10-2005 26-02-2004
US 2014144083 A1	29-05-2014	US 2014144083 A1 US 2015216326 A1 US 2015335174 A1	29-05-2014 06-08-2015 26-11-2015
EP 2210530 A2	28-07-2010	CN 101828830 A EP 2210530 A2 US 2010189571 A1	15-09-2010 28-07-2010 29-07-2010

EPO FORM P0459

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