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(54) REFRIGERATED DISPLAY CABINET FOLDABLE BAFFLES

(57) A refrigerated display cabinet (20) includes a cabinet body (22), a refrigerated space (34) arranged within an interior of the cabinet body, and a door (40) operably coupled to the cabinet body to selectively seal the refrigerated space. The door is movable between a closed position and an open position. A baffle (60) is operably coupled to the door and is movable between an extended configuration. When the door is in the open position, the baffle is in the extended configuration.

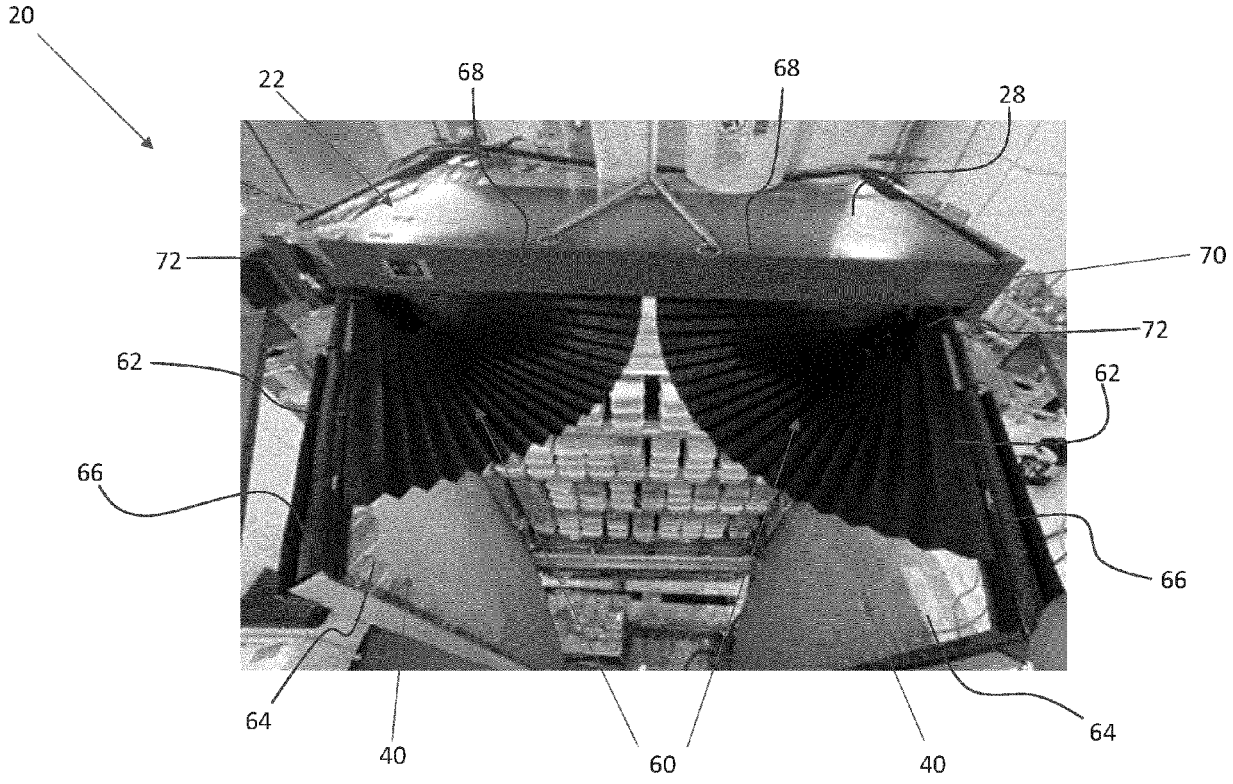

FIG. 4

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Description

[0001] The present invention relates generally to refrigerated display cabinets, and more specifically to a mechanism for maintaining a temperature within the refrigerated display cabinet when a door of the cabinet is opened.

[0002] In practice, retail stores such as supermarkets used refrigerated display cabinets for displaying and presenting food and beverages to a consumer while maintaining the temperature of the products below a predefined threshold. With respect to refrigerated display cabinets that have doors, whenever a consumer opens a door to access the goods, the ambient air infiltrates into the conditioned interior of the cabinet. As a result, additional energy is required to return the interior of the cabinet to below the predefined threshold.

[0003] According to an aspect of the invention, there is provided a refrigerated display cabinet including a cabinet body, a refrigerated space arranged within an interior of the cabinet body, a door operably coupled to the cabinet body to selectively seal the refrigerated space, the door being movable between a closed position and an open position; and a baffle operably coupled to the door and movable between an extended configuration, wherein when the door is in the open position, the baffle is in the extended configuration and is configured to block a flow of air relative to the refrigerated space.

[0004] The door may be rotatable about an axis between the closed position and the open position.

[0005] The baffle may be arranged adjacent to an upper end of the refrigerated space.

[0006] The baffle may be arranged adjacent to a lower end of the refrigerated space.

[0007] The baffle has a first end and a second end, the first end of the baffle being affixed to the door, and the second end of the baffle being affixed to the cabinet body.

[0008] The second end of the baffle may be mounted to a portion of the cabinet body in overlapping arrangement with the door when the door is in the closed position.

[0009] The cabinet body may include a header and the second end of the baffle is mounted at an underside of the header.

[0010] The baffle may have resilient properties.

[0011] The baffle may include at least one fold.

[0012] The baffle may include an accordion-like configuration.

[0013] The baffle may comprise a plurality of layers of material.

[0014] The baffle may be formed from a material that is impervious to air.

[0015] According to another aspect of the invention, there is provided a method of stabilizing a temperature within a refrigerated display cabinet includes opening a door of the refrigerated display cabinet and blocking a flow of air relative to a refrigerated space of the refrigerated display cabinet.

[0016] Blocking the flow of air relative to the refrigerated space may comprise blocking a flow of ambient air into the refrigerated space.

[0017] Blocking the flow of air relative to the refrigerated space may comprise blocking a flow of conditioned air out of the refrigerated space.

[0018] Blocking the flow of air relative to the refrigerated space may comprise extending a baffle operably coupled to the door.

[0019] Extending the baffle operably coupled to the door may comprise unfolding the baffle.

[0020] Extending the baffle operably coupled to the door may comprise telescoping a plurality of pieces of the baffle relative to one another.

[0021] The method may comprise closing the door and collapsing the baffle at at least one fold of the baffle.

[0022] According to another aspect of the invention, there is provided a method of stabilizing a temperature within a refrigerated display cabinet includes opening a door of the refrigerated display cabinet and blocking a vertical flow of air relative to a refrigerated space of the refrigerated display cabinet.

[0023] Blocking the vertical flow of air relative to the refrigerated space may comprise blocking a flow of ambient air into the refrigerated space.

[0024] Blocking the vertical flow of air relative to the refrigerated space may comprise blocking a flow of conditioned air out of the refrigerated space.

[0025] Blocking the vertical flow of air relative to the refrigerated space may comprise extending a baffle operably coupled to the door.

[0026] Extending the baffle operably coupled to the door may comprise unfolding the baffle.

[0027] Extending the baffle operably coupled to the door may comprise telescoping a plurality of pieces of the baffle relative to one another.

[0028] The method may comprise closing the door and collapsing the baffle at at least one fold of the baffle.

[0029] The following descriptions should be considered by way of example only. With reference to the accompanying drawings, like elements are numbered alike:

FIG. 1 is a perspective view of an exemplary refrigerated display cabinet;

FIG. 2 is a side view of an exemplary refrigerated display cabinet;

FIG. 3 is a side view of an exemplary refrigerated display cabinet and the air temperature distribution surrounding the cabinet in response to opening of the doors of the refrigerated display cabinet;

FIG. 4 is a top perspective view of an exemplary refrigerated display cabinet including a plurality of baffles;

FIG. 5 is a bottom perspective view of an exemplary baffle; and

FIG. 6 is a plan view of an exemplary baffle in an extended configuration.

[0030] A detailed description of one or more embodiments of the disclosed apparatus and method are presented herein by way of exemplification and not limitation with reference to the Figures.

[0031] With reference now to FIGS. 1 and 2, an exemplary refrigerated display cabinet 20 is illustrated. As shown, the cabinet 20 includes a cabinet body 22 having a bottom 24, a rear wall 26, a ceiling or roof 28, and side walls 30, 32. A refrigerated space 34 for displaying goods is located between the bottom 24, rear wall 26, ceiling 28, and side walls 30, 32. Arranged at a front side 36 of the cabinet body 22 is at least one door 40. In the illustrated, non-limiting embodiment, the cabinet body 22 includes two doors 40, a left door and a right door, respectively. However, it should be understood that the cabinet body 22 may have any number of doors 40 including a single door, three doors, or four or more doors, for example. Further, although the doors 40 are illustrated as being at least partially transparent, embodiments where the doors 40 and therefore the contents of the refrigerated space are not visible at an exterior of the refrigerated display cabinet 20 are also contemplated herein.

[0032] The at least one door 40 is movable between a closed position (FIG. 1) in which the door 40 seals or at least partially seals the front side 36 of the cabinet body 22, and an open position, in which the front side 36 of the cabinet body is open and in fluid communication with the surrounding atmosphere. As shown, the doors 40 are configured to pivot or rotate about a respective axis X relative to the cabinet body 22 to transform between the closed position and the open position. The doors 40 can be operated manually, such as via one or more handles 42 for example, or alternatively or additionally, may be operated automatically, such as via a door motor (not shown), for example.

[0033] The refrigerated space 34 typically includes a plurality of shelves 44 for supporting the goods displayed therein. As best shown in FIG. 2, each shelf 44 may be supported at a rear end by a backwall panel 46. An air channel 48 formed between the backwall panel 46 and the rear wall 26 of the cabinet body 22 and between the backwall panel 46 and the ceiling 28 of the cabinet body 22 defines a cooled air space. In an embodiment, the backwall 46 includes a plurality of distribution holes or perforations 50 that allow cooled air to pass from the backwall air channel 48 into the refrigerated space 34.

[0034] A heat exchanger 52 for cooling the air being provided to the shelves 44 may also be arranged within the backwall air channel 48, such as between the backwall panel 46 and the rear wall 26 of the cabinet body 22. As shown, a fan 54 is positioned immediately upstream of the heat exchanger 52 at an aft end of a return cavity 56, between the bottom most shelf 44 and the bottom 24 of the cabinet body 22. The fan 54 drives air from the return cavity 56 through the heat exchanger 52, thereby causing all of the air to be cooled while flowing into the air channel 48. While a portion of the cold air flows through the backwall holes 50, another portion of the cold air continues to flow upward to the portion of the air channel 48 arranged adjacent to the ceiling 28. A redirection feature or a Discharge Air Grille (DAG) 58 may be arranged at the ceiling 28. When the air flow contacts the redirection feature or the DAG 58, the flow direction of the air is changed, such as by about 90 degrees, for example, such that the redirected cooled air is directed towards the lower shelves 44. It should be understood that the refrigerated display cabinet 20 illustrated and described herein is intended as an example only, and that the refrigerated display cabinet 20 may have one or more doors 40 movable to access an internal refrigerated space 34.

[0035] With reference now to FIG. 3, when a door 40 of the cabinet 20 is opened, such as when a user accesses the goods within the refrigerated space 34, a flow of conditioned air rushes from the refrigerated space 34 out of the cabinet 20. This cool air typically flows or spills outwardly to the ambient atmosphere near the bottom of the refrigerated space 34 and the lower end of the door 40. At the same time, a flow of ambient air typically flows or infiltrates into the interior of refrigerated space 34 of the cabinet 20 via the upper end of the door 40 and refrigerated space 34. A representation of the distribution of the air temperature at 1 sec, 2 sec, and 3 sec after the door opened as illustrated in FIG. 3, clearly shows the aforementioned dynamics of ambient air infiltration into the refrigerated space and the cold air spillage into the ambient.

[0036] With reference now to FIGS. 4 and 5, in an embodiment, to reduce or minimize the flow of warmer ambient air into the refrigerated space 34 and/or to restrict the flow of refrigerated air out of the refrigerated space 34, a baffle 60 is arranged between the door 40 and a portion of the cabinet body 22. When the door 40 is opened, the baffle 60 is transformed from a collapsed or folded configuration to an extended configuration. In the extended configuration, the baffle 60 is configured to form a shield that blocks or impedes the surrounding airflow into or out of the refrigerated space 34.

[0037] In the illustrated, non-limiting embodiment, a first end 62 of the baffle 60 is mounted to an interior surface 64 of the door 40, such as at or near an upper end 66 of the door 40. In embodiments where the door 40 has a glass panel, the first end 62 may of the baffle 60 may be mounted to one or both of the glass panel and the frame of the door 40 supporting the glass panel. As shown, the second, opposite end 68 of the baffle 60 is mounted to an adjacent portion of the cabinet body 22, such as to a surface of a header 70 for example. The door 40, when closed, may be in overlapping arrangement with the portion of the header 70 to which the baffle 60 is mounted such that the first end 62 and the second end 68 of the baffle 60 are generally arranged within a horizontal plane. However, the second end 68 of the baf-

fle 60 may be mounted to another portion of the cabinet 20 and/or the baffle 60 may be mounted with another orientation.

[0038] Although the baffle 60 is illustrated and described herein as being mounted adjacent to an upper end 66 of the door 40, it should be understood that the baffle 60 may be alternatively or additionally mounted between an interior surface 64 of the door 40, such as near a lower end of the door 40, and an adjacent surface of the cabinet body 22.

[0039] The baffle 60 may have any suitable shape. For example, the baffle 60 may be generally rectangular, or alternatively, may be at least partially circular in shape. As shown, a side or edge 72 of the baffle 60 is generally arranged within the corner formed between the cabinet body 22 and the door 40 in the open position. In an embodiment, the baffle 60 extends over a substantial entirety of the width of the door 40. However, in other embodiments, the baffle 60 may extend over only a portion of the width of the door 40. In embodiments where the second end 68 of the baffle is mounted to a front surface of the header 70 such that the baffle 60 is arranged directly between the cabinet body 22 and the closed door 40, the thickness of the baffle 60 when collapsed must be small enough such that the door 40 is still able to form a seal with the cabinet body 22 when the door 40 is closed.

[0040] The baffle 60 may be formed from any material that is impervious to an airflow. In an embodiment, the baffle 60 has resilient properties. For example, the baffle 60 is configured to stretch to the extended configuration when the door 40 is open and is configured to collapse onto itself when the door 40 is closed. By using a baffle 60 that is configured to collapse onto itself, the baffle 60 will not sag (at least not substantially) relative to the door 40 to block visibility through the closed door 40. It should be appreciated that normal wear and tear may cause the baffle 60 to sag over time. In an embodiment, the resilience necessary to effectively transform the baffle 60 between the extended configuration and the collapsed configuration is achieved by forming at least one fold in the material of the baffle 60. Accordingly, when collapsed, the material of the baffle is folded onto itself via the one or more folds, and when the door is opened, the material of the baffle is unfolded. In the illustrated, non-limiting embodiment, the baffle 60 has an accordion-like configuration including a plurality of substantially identical folds. The baffle 60 may be formed from a single layer of material, or alternatively, may include a plurality of layers of material, such as an overlapping first layer and second layer for example. In embodiments including a plurality of layers, the baffle 60 may have a honeycomb or diamond like shape, similar to that used in cellular blinds. However, it should be understood that the baffle 60 may have any suitable configuration.

[0041] In another embodiment, as shown in FIG. 6, the baffle 60 includes a plurality of pieces 80 formed from a rigid or semi-rigid material. As shown, the plurality of pieces 80 are configured to telescope relative to one another, such as about an axis Y for example, to form a shield between the door 40 and the cabinet 20. In such embodiments, the second end 68 of the baffle 60 may be mounted at an underside of the header 70 of the cabinet body 22.

[0042] A refrigerated display cabinet 20 having a baffle 60 as described herein block the flow of air at the top or bottom of the door 40 when opened. Accordingly, inclusion of at least one baffle 60 will minimize the ambient air infiltration into the cold refrigerated space 34 of the cabinet 20, and the refrigerated cold air from spilling outside of the refrigerated space 34 into the ambient atmosphere thereby reducing the cabinet air curtain disturbance. This will not only improve the temperature stability of the goods within the refrigerated space 34, but will also reduce the energy consumption of the cabinet 20.

[0043] The term "about" is intended to include the degree of error associated with measurement of the particular quantity based upon the equipment available at the time of filing the application.

[0044] The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the present invention. As used herein, the singular forms "a", "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms "comprises" and/or "comprising," when used in this specification, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, element components, and/or groups thereof.

[0045] While the present invention has been described with reference to an exemplary embodiment or 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 present invention as defined by the claims. Therefore, it is intended that the present invention not be limited to the particular embodiment disclosed as the best mode contemplated for carrying out this present invention, but that the present invention will include all embodiments falling within the scope of the claims.

Claims

1. A refrigerated display cabinet (20) comprising:

a cabinet body (22);
a refrigerated space (34) arranged within an interior of the cabinet body;
a door (40) operably coupled to the cabinet body to selectively seal the refrigerated space, the door being movable between a closed position and an open position; and
a baffle (60) operably coupled to the door and

movable between an extended configuration, wherein when the door is in the open position, the baffle is in the extended configuration and is configured to block a flow of air relative to the refrigerated space.

2. The refrigerated display cabinet of claim 1, wherein the door (40) is rotatable about an axis (X) between the closed position and the open position.

3. The refrigerated display cabinet of claim 1 or claim 2, wherein the baffle (60) is arranged adjacent to an upper end of the refrigerated space (34); or
wherein the baffle (60) is arranged adj acent to a lower end of the refrigerated space (34).

4. The refrigerated display cabinet of any preceding claim, wherein the baffle (60) has a first end (62) and a second end (68), the first end of the baffle being affixed to the door (40), and the second end of the baffle being affixed to the cabinet body (22).

5. The refrigerated display cabinet of claim 4, wherein the second end (68) of the baffle (60) is mounted to a portion of the cabinet body (22) in overlapping arrangement with the door (40) when the door is in the closed position;
or
wherein the cabinet body (22) includes a header (70) and the second end (68) of the baffle (60) is mounted at an underside of the header.

6. The refrigerated display cabinet of any preceding claim, wherein the baffle (60) has resilient properties.

7. The refrigerated display cabinet of claim 6, wherein the baffle (60) includes at least one fold; preferably wherein the baffle (60) includes an accordion-like configuration.

8. The refrigerated display cabinet of any of claims 1 to 6, wherein the baffle (60) comprises a plurality of layers (80) of material.

9. The refrigerated display cabinet of any preceding claim, wherein the baffle (60) is formed from a material that is impervious to air.

10. A method of stabilizing a temperature within a refrigerated display cabinet (20), the method comprising:

opening a door (40) of the refrigerated display cabinet (20); and
blocking a flow of air relative to a refrigerated space (34) of the refrigerated display cabinet.

11. The method of claim 10, wherein blocking the flow of air relative to the refrigerated space (34) comprises blocking a flow of ambient air into the refrigerated space.

12. The method of claim 10 or claim 11, wherein blocking the flow of air relative to the refrigerated space (34) comprises blocking a flow of conditioned air out of the refrigerated space.

13. The method of any of claims 10 to 12, wherein blocking the flow of air relative to the refrigerated space (34) comprises extending a baffle (60) operably coupled to the door (40).

14. The method of claim 13, wherein extending the baffle (60) operably coupled to the door (40) comprises unfolding the baffle;
or
wherein extending the baffle (60) operably coupled to the door (40) comprises telescoping a plurality of pieces (80) of the baffle relative to one another.

15. The method of claim 13 or claim 14, comprising

closing the door (40); and
collapsing the baffle (60) at at least one fold of the baffle.

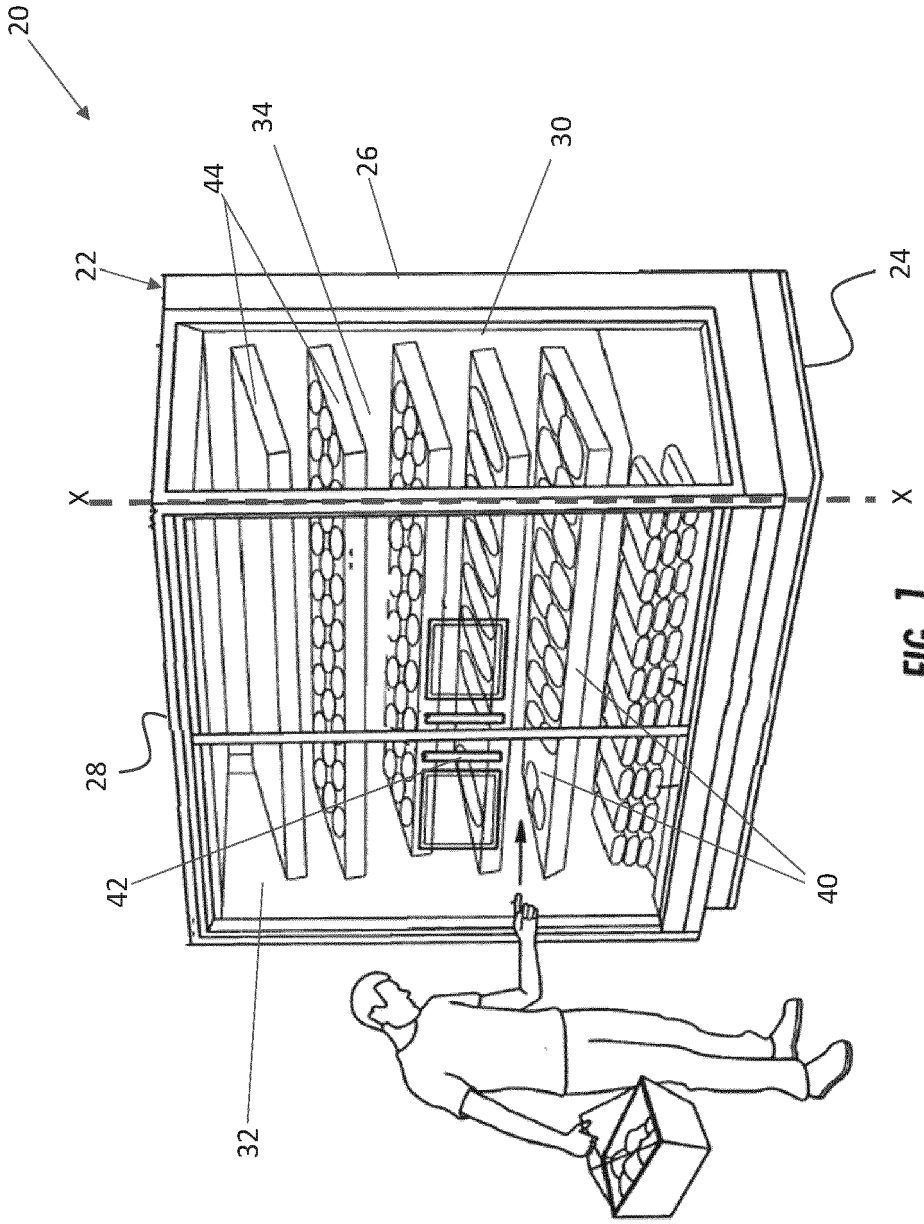

FIG. 1

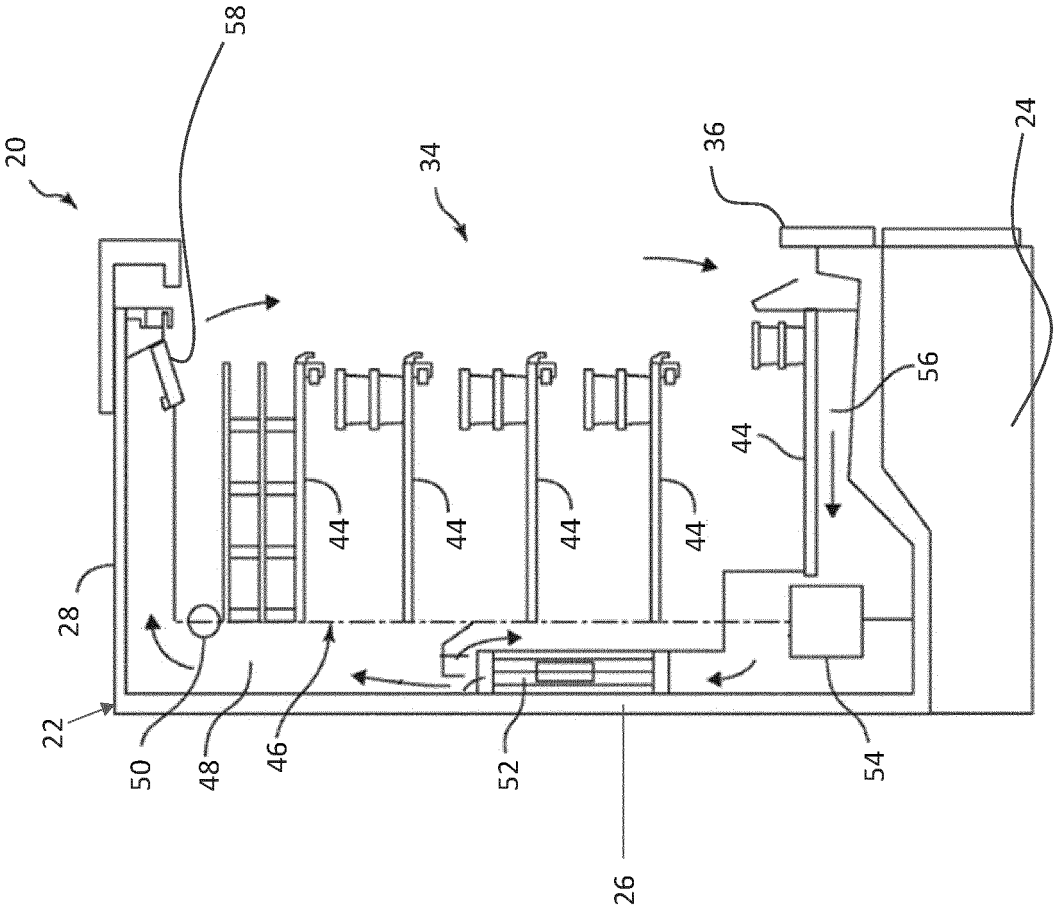

FIG. 2

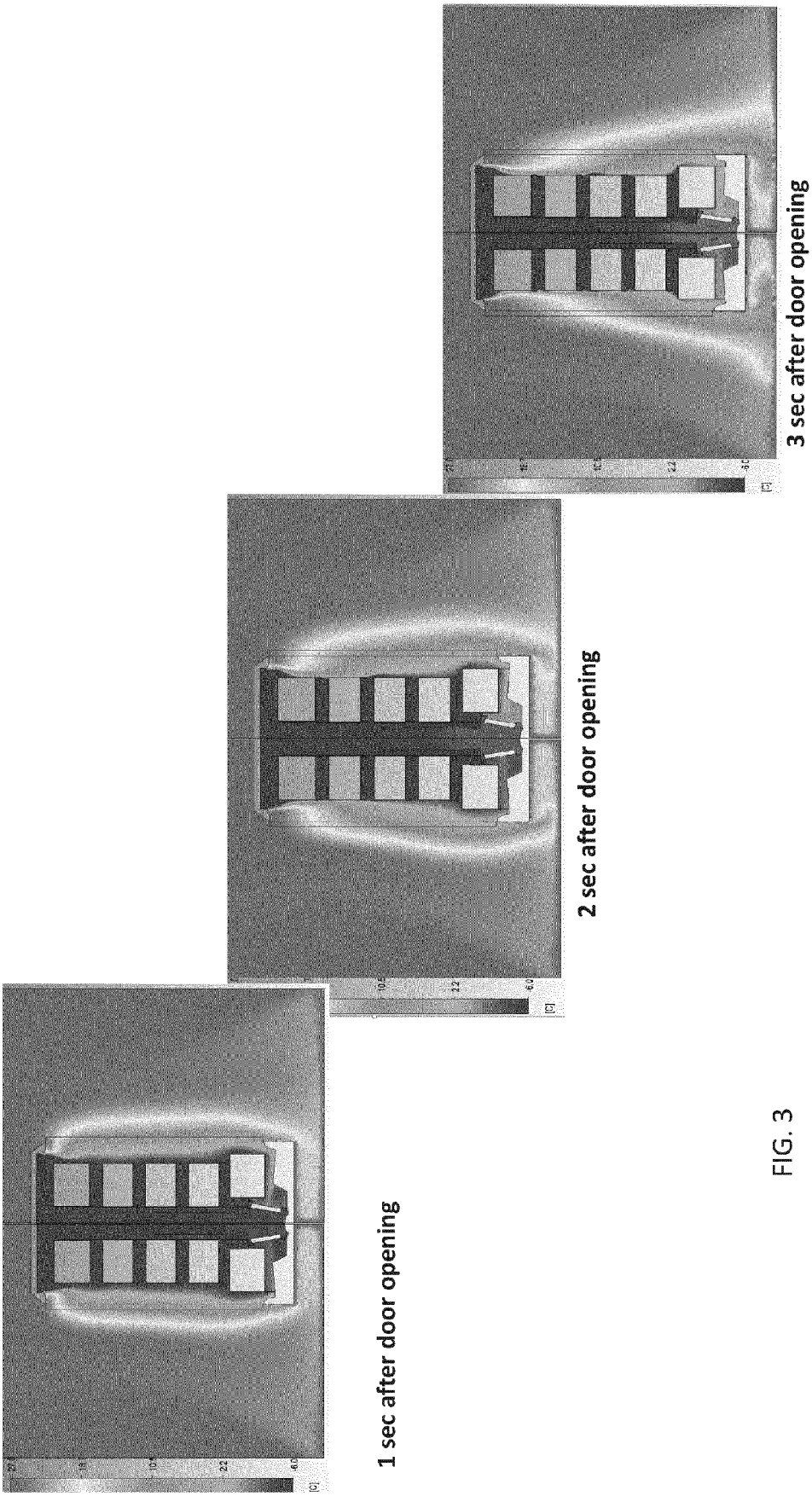
1 sec after door opening
2 sec after door opening
3 sec after door opening

FIG. 3

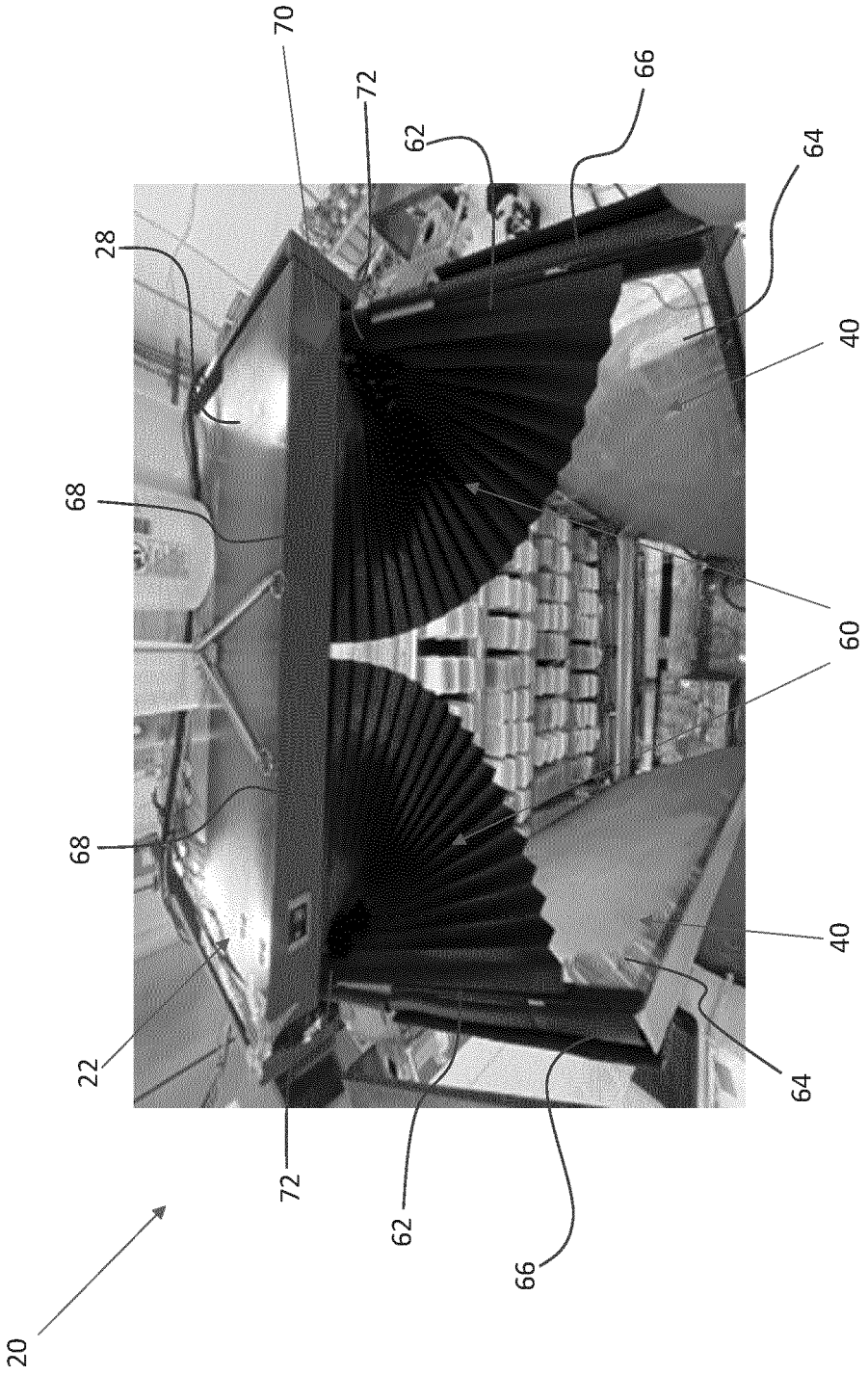

FIG. 4

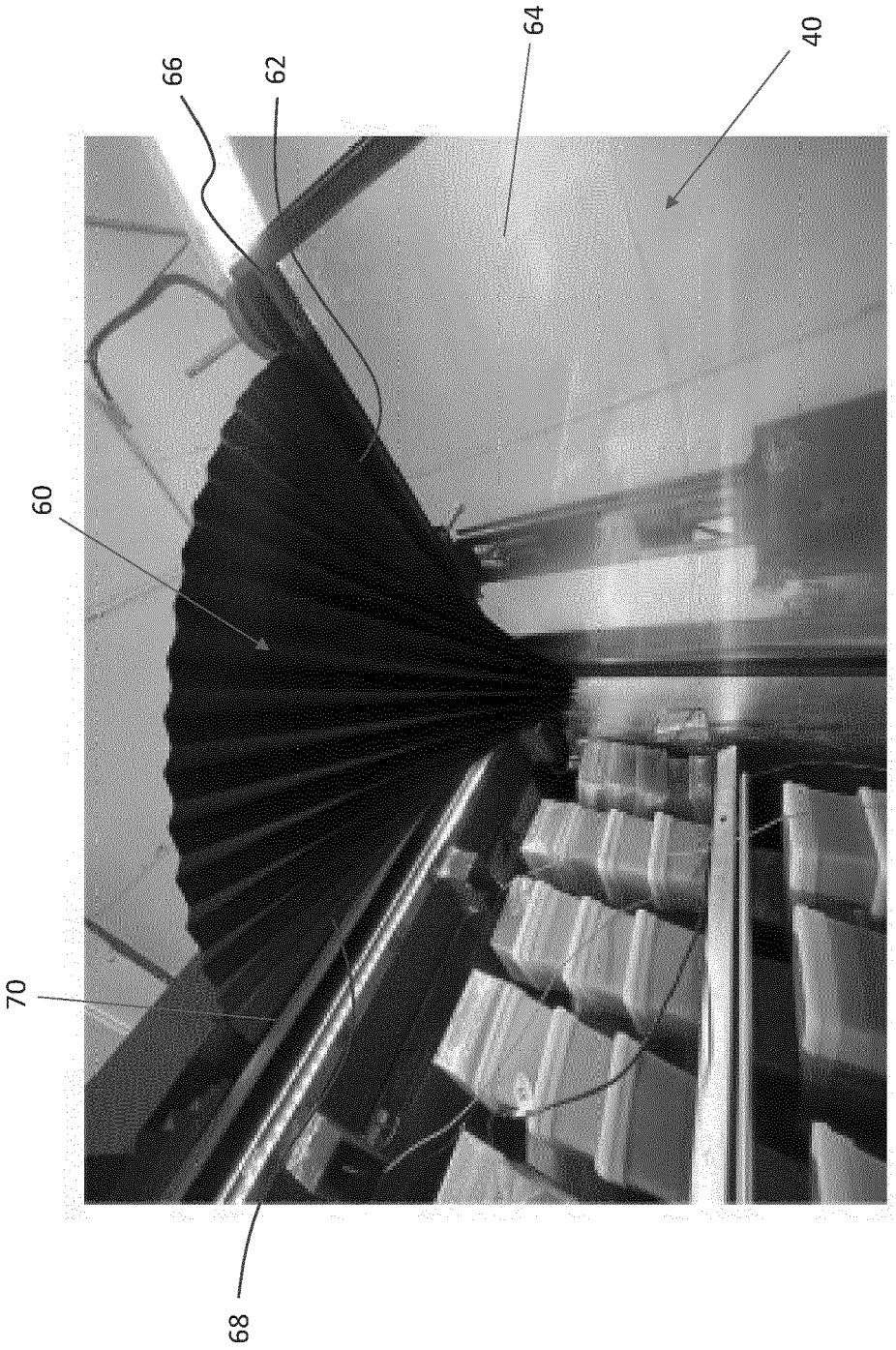

FIG. 5

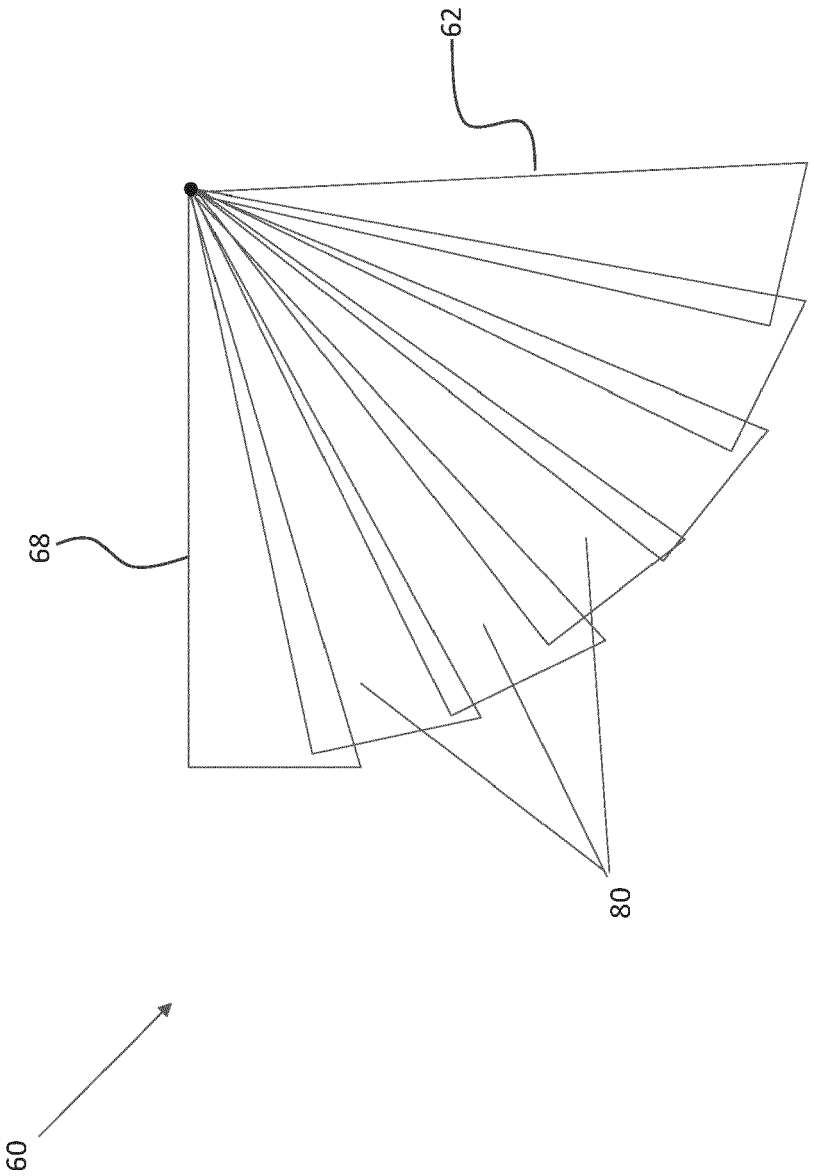

FIG. 6

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EUROPEAN SEARCH REPORT

Application Number
EP 22 21 0951

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	KR 1998 0043703 U (DAEWOO ELECTRONICS CO LTD [KR]) 25 September 1998 (1998-09-25) * abstract; figures 1-4 *	1-15	INV. A47F3/04 F25D23/02
X	KR 2011 0134568 A (WINIAMANDO INC [KR]) 15 December 2011 (2011-12-15) * abstract; figures 1-4 *	1,4-7, 9-15	
A	US 4 537 040 A (IBRAHIM FAYEZ F [US]) 27 August 1985 (1985-08-27) * column 1 - column 11; figures 1-11 *	1-9	

TECHNICAL FIELDS SEARCHED (IPC)

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	14 April 2023	Kohler, Pierre

CATEGORY OF CITED DOCUMENTS

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14-04-2023

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KR 19980043703 U	25-09-1998	NONE	
KR 20110134568 A	15-12-2011	NONE	
US 4537040 A	27-08-1985	NONE	

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