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(54) **A REFRIGERATED DISPLAY CASE**

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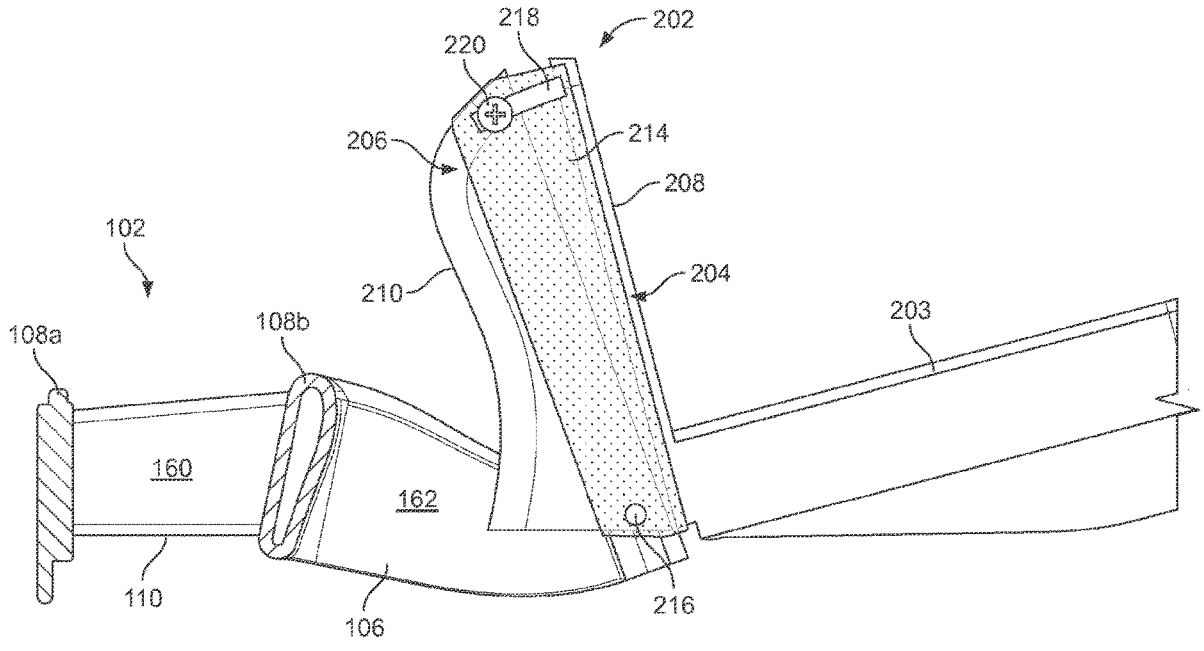
(57) **ABSTRACT**

A riser plate for a shelf of a refrigerated display case and kits of parts allows an angle between an outer guiding surface of a riser plate and an inner retaining surface to be adjusted.



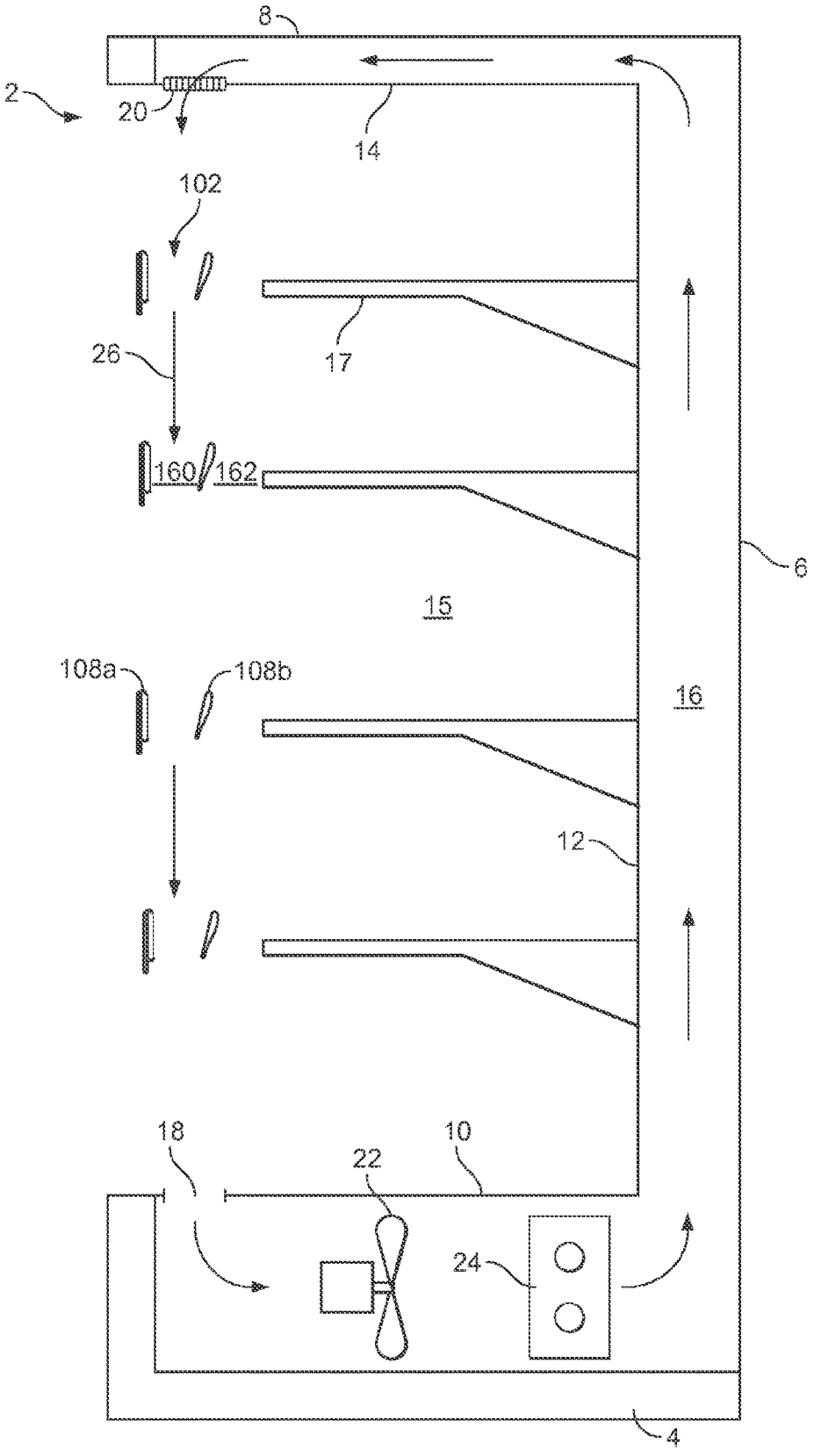


FIG. 1

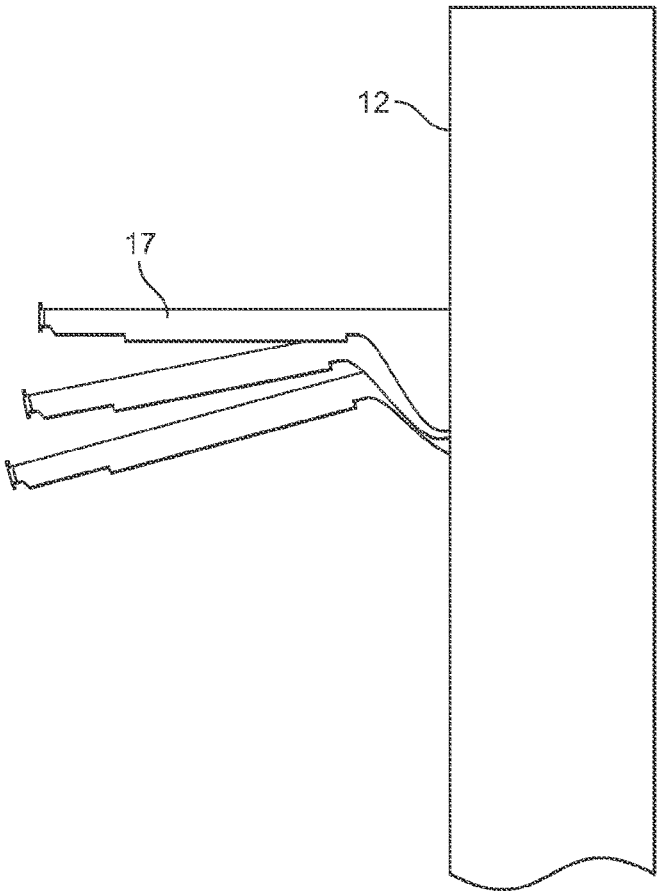


FIG. 2

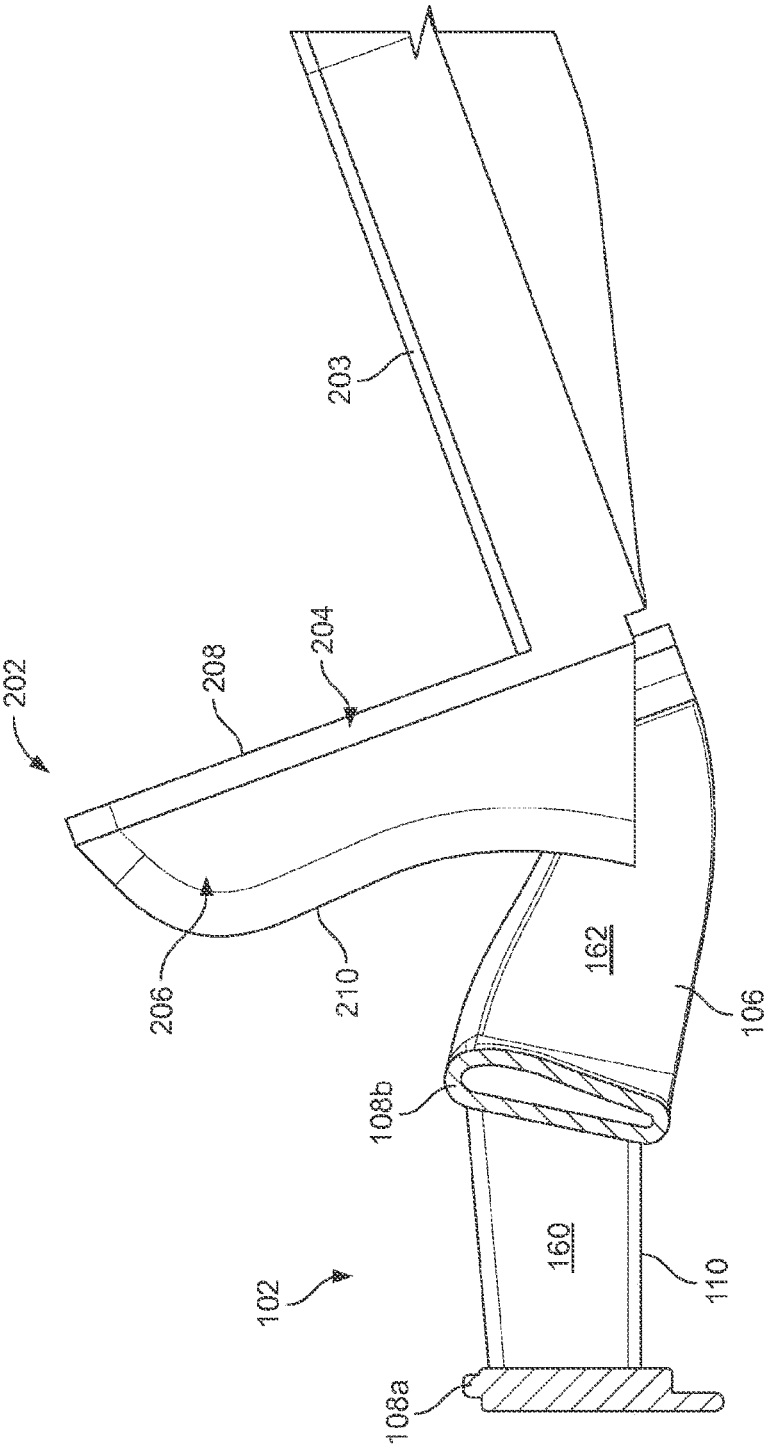


FIG. 3

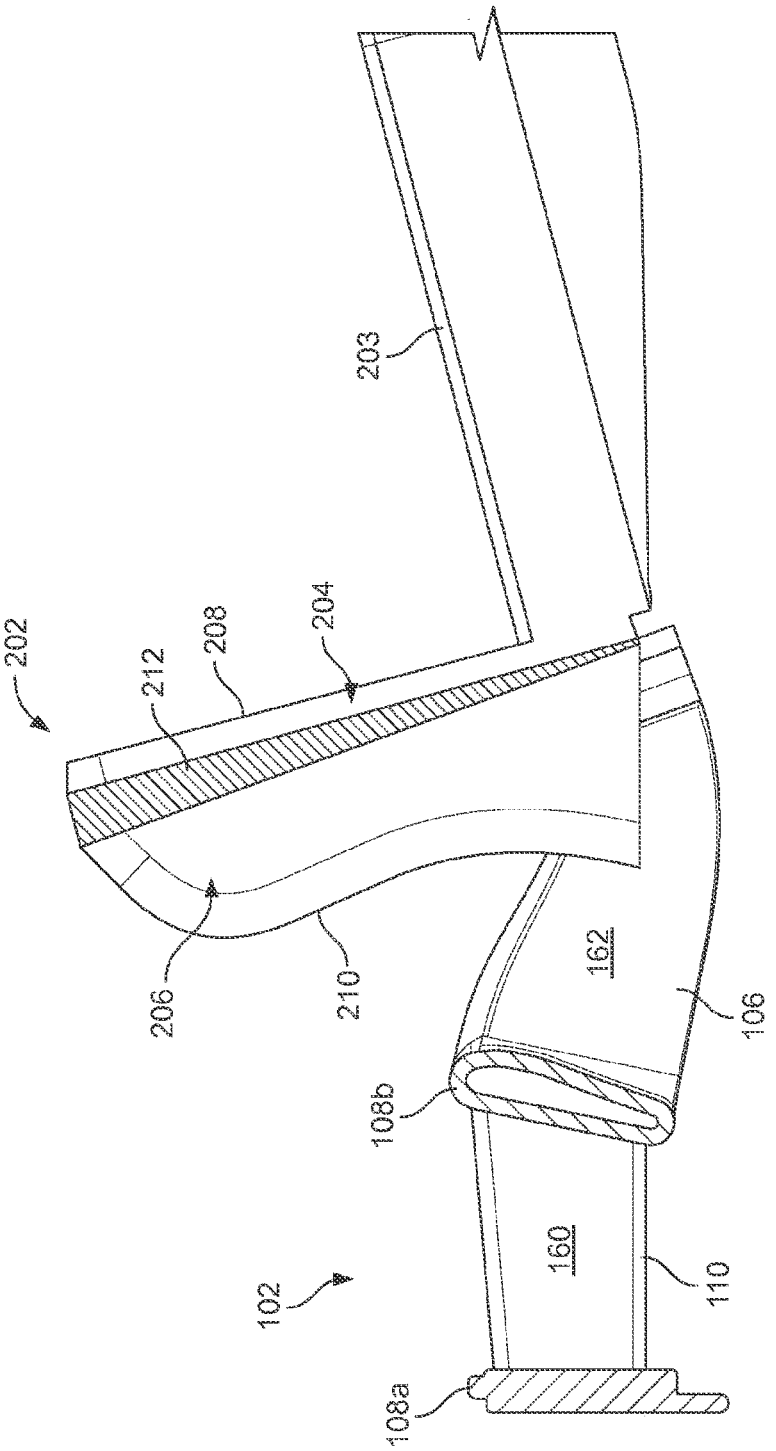


FIG. 4

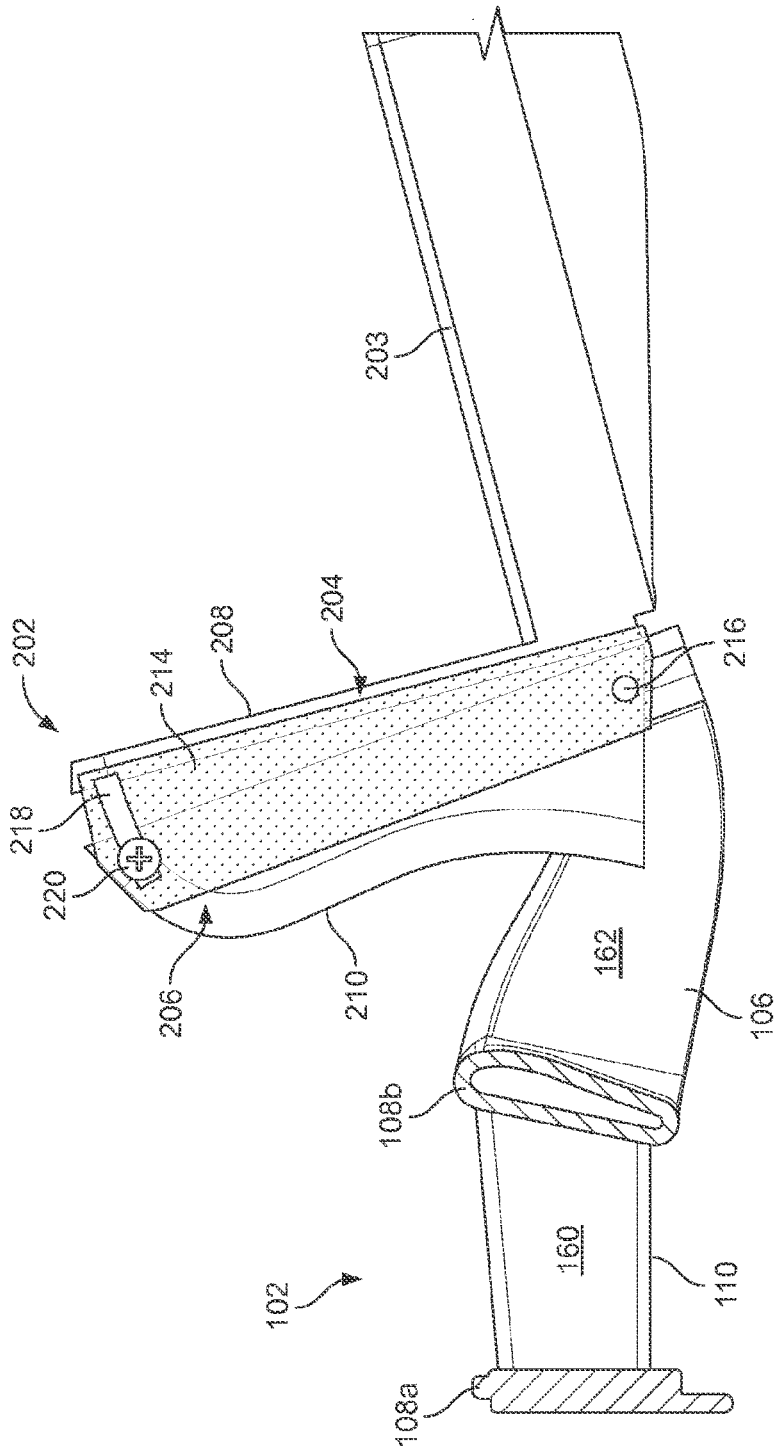

203
202
214
208
204
216
218
220
206
210
162
106
108b
160
110
102
108a

FIG. 5

A REFRIGERATED DISPLAY CASE

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This U.S. patent application claims priority under 35 U.S.C. § 371 to Patent Cooperation Treaty Application No. PCT/EP2019/072014, filed on Aug. 16, 2019, which claims the benefit of earlier-filed Great Britain Application No. GB1813547.5, filed on Aug. 20, 2018. The disclosures of these prior applications are considered part of the disclosure of this application and are hereby incorporated by reference in their entireties.

FIELD

[0002] The invention relates to a refrigerated display case comprising a riser plate.

BACKGROUND

[0003] This section provides background information related to the present disclosure and is not necessarily prior art.

[0004] The display of chilled or frozen items is commonplace in many retail environments, most notably in supermarkets. Such items are often displayed in refrigerated display cases having hinged or sliding doors, or having an open front. Refrigerated display cases utilize an air curtain which is cooled to below ambient temperature and propelled downward, across the front of the display case (either over the open front or behind the refrigerator doors).

[0005] The energy consumed by such refrigerated display cases presents a significant contribution to the overall energy consumption of the supermarket. It is therefore desirable to improve the efficiency of refrigerated display cases.

[0006] It has previously been proposed to provide an open refrigerated display case in which each shelf of a display area is provided with a flow control device which stabilizes flow in the air curtain. Such a flow control device is disclosed in GB2527628B.

SUMMARY

[0007] This section provides a general summary of the disclosure, and is not a comprehensive disclosure of its full scope or all of its features.

[0008] The invention seeks to provide developments relating to the use of flow control devices.

[0009] According to an aspect of the disclosure there is provided a refrigerated display case comprising: a refrigerated display area; an air outlet and an air inlet opening into the display area and spaced from one another; a duct fluidically coupling the air inlet to the air outlet, the duct being configured to direct air flow out of the air outlet across the display area and toward the air inlet to form an air curtain across the display area; wherein the display area comprises at least one shelf, the at least one shelf having a shelf plate which is inclined relative to horizontal for supporting products and a riser plate which projects upwards from the shelf plate to retain the products on the shelf plate; wherein the at least one shelf further comprises a flow control device which projects in front of the shelf and is configured to receive and guide the air curtain as it passes across the display area; wherein the riser plate comprises an inner retaining surface and an outer guiding surface; wherein at least a portion of the outer guiding surface diverges along its length in a downward direction from the inner retaining surface.

[0010] The flow control device may comprise a stabilizing beam which extends transversely across the display area and located within the air curtain; wherein a slot is formed between an inner surface of the stabilizing beam and the outer guiding surface of the riser plate.

[0011] The outer guiding surface may diverge from the inner retaining surface such that an angle of at least a portion of the outer guiding surface corresponds to an angle of a chord line of the stabilizing beam. Where the outer guiding surface is curved, its angle may be taken as an average over the outer guiding surface or a portion thereof.

[0012] A portion of the outer guiding surface may correspond to a portion of the inner surface of the stabilizing beam to define a parallel sided passageway through the slot.

[0013] The stabilizing beam may be an inner stabilizing beam and the flow control device may further comprise a second outer stabilizing beam arranged outwardly from the inner stabilizing beam to thereby form an outer slot between the inner and outer stabilizing beams.

[0014] The outer guiding surface may be profiled along its length.

[0015] The riser plate may comprise an inner plate component which forms the inner retaining surface and an outer fairing component which forms the outer guiding surface and is connected to the inner plate component.

[0016] The outer fairing component may be replaceable in order to allow the outer guiding surface to be changed for different incline angles of the shelf plate.

[0017] The outer fairing component may be connectable to the inner plate component via an intermediate component.

[0018] The intermediate component may be an angled wedge or a bracket which creates a wedge-shaped space between the outer fairing component and the inner plate component.

[0019] The outer fairing component may be hingedly connected to the inner plate component in order to allow an angle between the outer guiding surface and the inner retaining surface to be adjusted.

[0020] According to another aspect of the disclosure there is provided a riser plate for a shelf of a refrigerated display case, wherein the riser plate comprises: an inner retaining surface which projects upwards from a shelf plate of the shelf to retain products on the shelf plate when it is inclined relative to horizontal; and an outer guiding surface; wherein at least a portion of the outer guiding surface diverges along its length in a downward direction from the inner retaining surface.

[0021] The outer guiding surface may be profiled along its length.

[0022] The riser plate may comprise an inner plate component which forms the inner retaining surface and an outer fairing component which forms the outer guiding surface and is connected to the inner plate component.

[0023] The outer fairing component may be connectable to the inner plate component via an intermediate component.

[0024] The intermediate component may be an angled wedge.

[0025] According to an aspect of the disclosure there is provided a kit of parts comprising a riser plate as described above and a flow control device.

[0026] The flow control device may comprise a stabilizing beam which extends transversely across the display area and

located within the air curtain; wherein a slot is formed between an inner surface of the stabilizing beam and the outer guiding surface of the riser plate.

[0027] The outer guiding surface may diverge from the inner retaining surface at an angle which corresponds to an angle of a chord line of the stabilizing beam.

[0028] A portion of the outer guiding surface may correspond to a portion of the inner surface of the stabilizing beam to define a parallel sided passageway through the slot.

[0029] The stabilizing beam may be an inner stabilizing beam and the flow control device may further comprise a second outer stabilizing beam arranged outwardly from the inner stabilizing beam to thereby form an outer slot between the inner and outer stabilizing beams.

[0030] The kit of parts may comprise a plurality of riser plates configured for different incline angles of the shelf plate.

[0031] The kit of parts may comprise a plurality of outer fairing components configured for different incline angles of the shelf plate.

[0032] The kit of parts may comprise a plurality of intermediate components configured for different incline angles of the shelf plate.

[0033] According to an aspect of the disclosure there is provided a method of modifying a shelf of a refrigerated display case comprising: attaching a riser plate as described above to the shelf.

[0034] The method may further comprise changing the angle of the shelf from a first angle to a second angle and replacing the riser plate with a different riser plate configured for the second angle.

[0035] The method may further comprise changing the angle of the shelf from a first angle to a second angle and replacing the outer fairing component of the riser plate with a different outer fairing component configured for the second angle.

[0036] The method may further comprise changing the angle of the shelf from a first angle to a second angle and replacing the intermediate component of the riser plate between the inner plate component and the outer fairing component with a different intermediate component configured for the second angle.

[0037] According to an aspect of the disclosure there is provided a riser plate for a shelf of a refrigerated display case, wherein the riser plate comprises: an inner plate component which forms an inner retaining surface configured to project upwards from a shelf plate of the shelf to retain products on the shelf plate when it is inclined relative to horizontal; and an outer fairing component which forms an outer guiding surface; wherein at least a portion of the outer guiding surface diverges along its length in a downward direction from the inner retaining surface; wherein the outer fairing component is hingedly connected to the inner plate component in order to allow an angle between the outer guiding surface and the inner retaining surface to be adjusted.

[0038] According to an aspect of the disclosure there is provided a kit of parts comprising a riser plate as described above and a flow control device.

[0039] According to an aspect of the disclosure there is provided a kit of parts for forming a riser plate for a shelf of a refrigerated display case, wherein the kit of parts comprises: an inner plate component which forms an inner retaining surface of the riser plate that is configured to project upwards from a shelf plate of the shelf to retain products on the shelf plate; and a plurality of outer fairing components interchangeably connectable with the inner plate component and each configured to form an outer guiding surface of the riser plate which diverges along at least a portion of its length from the inner retaining surface in a downward direction; wherein the plurality of outer fairing components are each configured to provide a different angle between the outer guiding surface and the inner retaining surface.

[0040] According to an aspect of the disclosure there is provided a kit of parts for forming a riser plate for a shelf of a refrigerated display case, wherein the kit of parts comprises: an inner plate component which forms an inner retaining surface of the riser plate that is configured to project upwards from a shelf plate of the shelf to retain products on the shelf plate when it is inclined relative to horizontal; and an outer fairing component configured to form an outer guiding surface of the riser plate which diverges along at least a portion of its length from the inner retaining surface in a downward direction; wherein the outer fairing component is connectable to the inner plate component via an intermediate component, the kit of parts comprising a plurality of intermediate components which are interchangeable and are each configured to provide a different angle between the outer guiding surface and the inner retaining surface.

[0041] Each of the plurality of intermediate components may be an angled wedge or a bracket which creates a wedge-shaped space between the outer fairing component and the inner plate component.

[0042] According to an aspect of the disclosure there is provided a kit of parts comprising: a plurality of riser plates interchangeably connectable to a shelf of a refrigerated display case, each of the riser plates comprising: an inner retaining surface configured to project upwards from a shelf plate of the shelf to retain products on the shelf plate; and an outer guiding surface; wherein at least a portion of the outer guiding surface diverges along its length in a downward direction from the inner retaining surface; wherein the plurality of riser plates are each configured to provide a different angle between the outer guiding surface and the inner retaining surface.

[0043] The kits of parts may further comprises a flow control device.

[0044] The flow control device may comprise a stabilizing beam configured to extend transversely across a display area of the refrigerated display case and located within an air curtain; wherein a slot is formed between an inner surface of the stabilizing beam and the outer guiding surface of the riser plate.

[0045] The angle between the outer guiding surface and the inner retaining surface may be selected so that an angle of at least a portion of the outer guiding surface corresponds to an angle of a chord line of the stabilizing beam.

[0046] A portion of the outer guiding surface may correspond to a portion of the inner surface of the stabilizing beam to define a parallel sided passageway through the slot.

[0047] The stabilizing beam may be an inner stabilizing beam and the flow control device may further comprise a second outer stabilizing beam arranged outwardly from the inner stabilizing beam to thereby form an outer slot between the inner and outer stabilizing beams.

[0048] The plurality of riser plates, the plurality of outer fairing components or the plurality of intermediate components may be configured for different incline angles of the shelf plate.

[0049] According to an aspect of the disclosure there is provided a refrigerated display case comprising: a refrigerated display area; an air outlet and an air inlet opening into the display area and spaced from one another; a duct fluidically coupling the air inlet to the air outlet, the duct being configured to direct air flow out of the air outlet across the display area and toward the air inlet to form an air curtain across the display area; wherein the display area comprises at least one shelf, the at least one shelf having a shelf plate which is inclined relative to horizontal for supporting products; a riser plate and a flow control device provided from the kits of parts described above; wherein the riser plate projects upwards from the shelf plate to retain the products on the shelf plate and the flow control device projects in front of the shelf and is configured to receive and guide the air curtain as it passes across the display area.

[0050] According to an aspect of the disclosure there is provided a method of modifying a shelf of a refrigerated display case comprising: changing the angle of the shelf from a first angle to a second angle; and replacing or reconfiguring a riser plate attached to the shelf so as to change an angle between an inner retaining surface which projects upwards from a shelf plate of the shelf to retain products on the shelf plate and an outer guiding surface of the riser plate which diverges along at least a portion of its length from the inner retaining surface in a downward direction.

[0051] Reconfiguring the riser plate may comprise interchanging the outer fairing component of the riser plate with another of the plurality of outer fairing components which is configured for the second angle.

[0052] Reconfiguring the riser plate may comprise interchanging the intermediate component of the riser plate with another of the plurality of intermediate components which is configured for the second angle.

[0053] Replacing the riser plate may comprise interchanging the riser plate with another of the plurality of riser plates which is configured for the second angle.

[0054] Reconfiguring the riser plate may comprise adjusting the angle between the outer guiding surface and the inner retaining surface via the hinged connection.

DRAWINGS

[0055] For a better understanding of the invention, and to show more clearly how it may be carried into effect, reference will now be made, by way of example, to the accompanying drawings, in which:

[0056] FIG. **1** is a side cross-sectional view of an open refrigerated display case (ORDC) comprising a flow control device;

[0057] FIG. **2** is a side cross-sectional view of a pivotable shelf for an ORDC;

[0058] FIG. **3** is a side view of a shelf having a riser plate and a flow control device in accordance with an embodiment of the invention;

[0059] FIG. **4** is a side view of a shelf having a riser plate with an intermediate component and a flow control device in accordance with another embodiment of the invention; and

[0060] FIG. **5** is a side view of a shelf having a riser plate with an intermediate component and a flow control device in accordance with another embodiment of the invention.

DETAILED DESCRIPTION

[0061] FIG. **1** shows an ORDC **2**. The ORDC **2** comprises a cabinet portion formed by a lower wall **4**, a back wall **6**, an upper wall **8**, and left and right side walls (not shown). A lower panel **10**, a back panel **12** and an upper panel **14** are disposed within the cabinet portion.

[0062] The lower, back and upper panels **10**, **12**, **14** form a display area **15** which is provided with a plurality of shelves **17** (four are shown) on which items may be displayed. The shelves **17** are affixed to the back panel **12**.

[0063] As shown, the lower, back and upper panels **10**, **12**, **14** are spaced from the respective lower, back and upper walls **4**, **6**, **8** to form a duct **16**. An intake grille **18** is provided at the lower panel **10** to form an inlet to the duct **16**. Similarly, a discharge grille **20** is provided at the upper panel **14** to form an outlet from the duct **16**. The intake grille **18** and the discharge grille **20** are thus fluidically coupled to one another by the duct **16**. The intake grille **18** and the discharge grille **20** are spaced from the back panel **12** toward the front of the cabinet portion and ahead of the shelves **17**.

[0064] A fan **22** and a heat exchanger **24** are located within the duct **16** adjacent to the intake grille **18** and thus are disposed between the lower wall **4** and the lower panel **10**. The fan **22** draws air into the duct **16** via the intake grille **18** which then passes through the heat exchanger **24** where it is cooled to well below the ambient temperature.

[0065] After passing through the heat exchanger **24**, the air continues through the duct **16** between the back wall **6** and the back panel **12**. The back panel **12** is perforated allowing air to pass from the duct **16** into the display area **15** where it cools items located on the shelves **17** and on the lower panel **10**.

[0066] The remaining air flows through the duct **16** to the discharge grille **20**. The air is ejected from the discharge grille **20** and descends over the open front of the display area **15** to form an air curtain **26**. The air curtain **26** passes from the discharge grille **20** to the intake grille **18**, where it is drawn in by the fan **22** and re-circulated through the duct **16**. The air curtain **26** thus forms a non-physical barrier which separates the display area **15** from the ambient air surrounding the ORDC **2**.

[0067] As shown, a flow control device **102** is attached to each of the shelves (although, in other arrangements, only some of the shelves may be provided with flow control devices **102**).

[0068] The flow control device **102** comprises a pair of elongate elements in the form of stabilizing beams **108***a*, **108***b*. The beams **108***a*, **108***b* are spaced apart from one another such that upper edges and lower edges of the beams **108***a*, **108***b* run parallel to one another. The beams **108***a*, **108***b* are, however, angled relative to one another so that a gap between the beams **108***a*, **108***b* tapers, with the upper edges of the beams **108***a*, **108***b* being further apart than the lower edges.

[0069] The outer beam **108***a* may be arranged substantially vertically (i.e. with its upper and lower edges aligned in a vertical plane) and the inner beam **108***b* may be angled so as to form a tapering gap between the beams **108***a*, **108***b*.

[0070] The device **102** may further comprise a product information strip which may clip over the upper and lower

edges of the outer beam **108***a*. The product information strip has a channel for receiving tickets which display information regarding products, such as the product's price.

[0071] As shown in FIG. **1**, in use, the beams **108***a*, **108***b* define a first, outer slot **160** between the outer and inner beams **108***a*, **108***b* and a second, inner slot **162** between the inner beam **108***b* and the outer surface of the shelf.

[0072] The first slot **160** tapers from an inlet at an upper end to an outlet at a lower end. The inlet has a greater width than the outlet and a convergent throat is disposed between the inlet and the outlet.

[0073] The beams **108***a*, **108***b* are positioned such that the air curtain **26** passes through the outer and inner slots **160**, **162**. The beams **108***a*, **108***b* act to control and stabilize the air curtain so as to maximize the air which is returned to the intake grille **18** and prevent air from spilling out of the ORDC **2**.

[0074] As shown in FIG. **2**, the shelf **17** may be mounted to the back panel **12** of the ORDC **2** in several different angular positions (shown as 0°, 5° and 10°). The shelf **17** may therefore be arranged such that it is inclined with respect to horizontal (i.e. sloping downwards from the rear of the shelf to the front). Such inclined orientations may be beneficial for displaying certain types of product since they provide better visibility and access to products located towards the rear of the shelf.

[0075] In other examples, the shelf **17** may have a fixed incline and not be repositionable in different angular positions.

[0076] Where the shelf **17** is inclined, a riser plate **202** may be affixed to the shelf **17** to prevent products from sliding off the front of the shelf **17**, as shown in FIG. **3**. The riser plate **202** generally forms an upstand which projects upwards from the surface of a shelf plate **203** of the shelf **17** on which products are disposed.

[0077] As shown, the riser plate **202** comprises an inner plate component **204** and an outer fairing component **206** which is connected to the inner plate component **204**.

[0078] The inner plate component **204** defines an inner retaining surface **208** of the riser plate **202** which retains the products on the shelf plate **203**. Specifically, the inner retaining surface **208** is arranged such that it is perpendicular to the shelf plate **203**.

[0079] The outer fairing component **206** defines an outer guiding surface **210**. The outer guiding surface **210** is arranged to guide air passing through the inner slot **162**. In particular, the outer guiding surface **210** diverges from the inner retaining surface **208** over at least part of its length (e.g. over at least its lowermost portion) in a downwards direction (i.e. the lower end of the diverging portion is further from the inner retaining surface **208** than the upper end). The horizontal separation between the inner retaining surface **208** and the outer guiding surface **210** thus increases over this portion of the riser plate **202**. At least the divergent portion of the outer guiding surface **210** acts to guide (i.e. steer or redirect) the air passing through the inner slot **162**. In the example shown, the outer guiding surface **210** is profiled (i.e. curved or contoured) to provide a smooth transition or change of direction along its length.

[0080] In the example shown, the lowermost portion of the outer guiding surface **210** is angled such that it runs substantially parallel with at least a portion of an inner surface of the inner beam **108***b*. The inner beam **108***b* and the outer guiding surface **210** thus define a substantially parallel sided passageway through the inner slot **162**.

[0081] The inner beam **108***b* may define a chord line which extends between the leading edge and trailing edge of the stabilizing beam. The inner beam **108***b* may be arranged such that its chord line extends at an angle of around 1.5 to 16.5 degrees (in particular 4 to 14 degrees or in particular approximately 9 degrees) to a line or plane defined between the front edge of its associated shelf **17** and the front edge of the subsequent or below shelf **17**. Generally, the subsequent shelf is the next shelf away from the air outlet in the prevailing flow direction of the air curtain **26**. For the lowermost shelf (or the lowermost shelf fitted with a flow control device **102**), the angle may be defined with respect to a line or plane formed between the front edge of the shelf and the air inlet **18**. Further, if there is stock which overhangs the flow path, then the angle may be defined with respect to a line or plane formed between the front edge of the shelf and the front edge of the stock. It is noted that a positive angle denotes that the trailing edge is further from the shelf than the leading edge. The angle of the lowermost portion of the outer guiding surface **210** may therefore substantially correspond to the angle of the chord line of the inner beam **108***b*.

[0082] It has been shown that the use of the riser plate **202** described previously in conjunction with the flow control device **102** can provide a reduction of up to 22% saving in convective heat flux.

[0083] It will be appreciated that the angle of the inner plate component **204** will change with the angle of the shelf **17**. Accordingly, to maintain a consistent position of the outer guiding surface **210**, the outer fairing component **206** may be replaced by a different outer fairing component which allows for the change in angle of the inner plate component **204**. Alternatively, as shown in FIG. **4**, an intermediate component **212** may be located between the inner plate component **204** and the outer fairing component **206** to counteract the change in angle of the inner plate component. In this example, the shelf **17** has been adjusted from an incline of 10° to an incline of 5° and so the intermediate component **212** is in the form of a 5° wedge. It will be appreciated that various different intermediate components **212** or outer fairing components **206** may be provided to allow for different inclines of the shelf **17**. It may also be desirable to adjust the angle of the outer guiding surface **210** based on the configuration of adjacent shelves and so the outer fairing component **206** may also be replaced or modified using an intermediate component **212** for this reason.

[0084] In other examples, the outer fairing component **206** or at least the outer guiding surface **210** may be pivotable with respect to the inner plate component **204** to enable the angle to be changed. For example, as shown in FIG. **5**, a bracket plate **214** may be provided at one or both sides of the riser plate **202** between the inner plate component **204** and the outer fairing component **206**. The bracket plate **214** is connected to the inner plate component **204** and the outer fairing component **206** is hingedly connected to the bracket plate **214** by pin **216** (although this arrangement may be reversed). The bracket plate **214** comprises an arcuate slot **218** which is spaced from the pin **216** towards an upper end of the bracket plate **214**. A screw **220** passes through the slot and engages with the outer fairing component **206**. The screw **220** is slidable along the slot **218** in order to change

the angle of the outer fairing component **206** and can then be tightened in order to engage the bracket plate **214** and prevent further movement of the outer fairing component **206**.

[0085] In other arrangements, the slot **218** may be replaced by a plurality of discrete holes. Further, the pin **216** may be slidable within a slot to allow the outer fairing component **206** to move up and down relative to the inner plate component **204** and the slot **218** may comprise a plurality of indexing recesses which receive a pin located in the slot **218** (instead of the screw **220**) to allow the outer fairing component **206** to be lifted and rotated to move between the indexing recesses without requiring any tools. Alternatively, the outer fairing component **206** may be hingedly connected to the top of the inner plate component **204** and a mechanism may be provided, such as a lead screw, for adjusting a distance between a lower end of the outer fairing component **206** and the inner plate component **204**. It will be appreciated in the arrangements described above, the inner plate component **204** and the outer fairing component **206** are separate by a wedge-shaped space, rather than by the wedge-shaped intermediate component **212**.

[0086] As shown in FIG. **3**, the stabilizing beams **108***a*, **108***b* of the flow control device **102** are supported by a pair of brackets **106** (only one is visible in FIG. **3**) which are used to attach the device **102** to the shelf. The beams **108***a*, **108***b* are connected by a pair of spacers **110** (again, only one is visible in FIG. **3**). The spacers **110** may be provided towards the lateral ends of the beams **108***a*, **108***b*. A central spacer may also be provided at the center of the beams **108***a*, **108***b*, midway along their lengths. The riser plate **202**, particularly the outer fairing component **206**, may be configured to allow the brackets **106** to attach to the shelf **17**. For example, the outer fairing component **206** may comprise slots which are received over the brackets **106**. In other examples, the brackets **106** may be connected to the riser plate **202** (e.g. to the outer fairing component **206**) or may be integrally formed with the riser plate **202**.

[0087] It will be appreciated that the outer fairing component **206** may be connected to the inner plate component **204** in any known manner.

[0088] Although the riser plate **202** has been described as having an inner plate component **204** and an outer fairing component **206** which are formed as separate elements, they may instead be integrated as a single component. Accordingly, where the angle of the shelf **17** is changed or it is desired to change the angle of the outer guiding surface **210**, the riser plate **202** may be replaced as a whole by a different riser plate **202**.

[0089] Further, the outer guiding surface **210** need not be profiled in the manner shown in the FIG. **3** and may instead form a planar surface which diverges from the inner retaining surface **208** along its length.

[0090] Although the riser plate **202** of the invention has been described with reference to an exemplary flow control device, it will be appreciated that it may be used with any form of flow control device. In particular, the flow control device may have only a single beam.

[0091] Although the flow control device **102** has been described as having brackets which are configured to place the stabilizing beams **108***a*, **108***b* in the desired positions for the angle of the shelf **17**, it will be appreciated that the flow control device **102** may be connected to the shelf via an extension mechanism which is configured to guide the flow control device to move in translation and rotation to counteract arcuate movement of the shelf, in accordance with the teachings of GB1802575.9.

[0092] Although the invention has been described with reference to an open refrigerated display case, it may also be utilized on closed refrigerated display cases with doors.

[0093] The invention is not limited to the embodiments described herein, and may be modified or adapted without departing from the scope of the present invention.

1. A riser plate for a shelf of a refrigerated display case, wherein the riser plate comprises:

an inner plate component which forms an inner retaining surface configured to project upwards from a shelf plate of the shelf to retain products on the shelf plate when it is inclined relative to horizontal; and

an outer fairing component which forms an outer guiding surface;

wherein at least a portion of the outer guiding surface diverges along its length in a downward direction from the inner retaining surface;

wherein the outer fairing component is hingedly connected to the inner plate component in order to allow an angle between the outer guiding surface and the inner retaining surface to be adjusted.

2. A kit of parts comprising a riser plate as claimed in claim **1** and a flow control device.

3. A kit of parts for forming a riser plate for a shelf of a refrigerated display case, wherein the kit of parts comprises:

an inner plate component which forms an inner retaining surface of the riser plate that is configured to project upwards from a shelf plate of the shelf to retain products on the shelf plate; and

a plurality of outer fairing components interchangeably connectable with the inner plate component and each configured to form an outer guiding surface of the riser plate which diverges along at least a portion of its length from the inner retaining surface in a downward direction;

wherein the plurality of outer fairing components are each configured to provide a different angle between the outer guiding surface and the inner retaining surface.

4. A kit of parts for forming a riser plate for a shelf of a refrigerated display case, wherein the kit of parts comprises:

an inner plate component which forms an inner retaining surface of the riser plate that is configured to project upwards from a shelf plate of the shelf to retain products on the shelf plate when it is inclined relative to horizontal; and

an outer fairing component configured to form an outer guiding surface of the riser plate which diverges along at least a portion of its length from the inner retaining surface in a downward direction;

wherein the outer fairing component is connectable to the inner plate component via an intermediate component, the kit of parts comprising a plurality of intermediate components which are interchangeable and are each configured to provide a different angle between the outer guiding surface and the inner retaining surface.

5. A kit of parts as claimed in claim **4**, wherein each of the plurality of intermediate components is an angled wedge or a bracket which creates a wedge-shaped space between the outer fairing component and the inner plate component.

6. A kit of parts comprising:
a plurality of riser plates interchangeably connectable to a shelf of a refrigerated display case, each of the riser plates comprising:
an inner retaining surface configured to project upwards from a shelf plate of the shelf to retain products on the shelf plate; and
an outer guiding surface;
wherein at least a portion of the outer guiding surface diverges along its length in a downward direction from the inner retaining surface;
wherein the plurality of riser plates are each configured to provide a different angle between the outer guiding surface and the inner retaining surface.

7. A kit of parts as claimed in claim 3, further comprising a flow control device.

8. A kit of parts as claimed in claim 2, wherein the flow control device comprises a stabilizing beam configured to extend transversely across a display area of the refrigerated display case and located within an air curtain; wherein a slot is formed between an inner surface of the stabilizing beam and the outer guiding surface of the riser plate.

9. A kit of parts as claimed in claim 8, wherein the angle between the outer guiding surface and the inner retaining surface is selected so that an angle of at least a portion of the outer guiding surface corresponds to an angle of a chord line of the stabilizing beam.

10. A kit of parts as claimed in claim 8, wherein a portion of the outer guiding surface corresponds to a portion of the inner surface of the stabilizing beam to define a parallel sided passageway through the slot.

11. A kit of parts as claimed in claim 8, wherein the stabilizing beam is an inner stabilizing beam and the flow control device further comprises a second outer stabilizing beam arranged outwardly from the inner stabilizing beam to thereby form an outer slot between the inner and outer stabilizing beams.

12. A refrigerated display case comprising:
a refrigerated display area;
an air outlet and an air inlet opening into the display area and spaced from one another;
a duct fluidically coupling the air inlet to the air outlet, the duct being configured to direct air flow out of the air outlet across the display area and toward the air inlet to form an air curtain across the display area;
wherein the display area comprises at least one shelf, the at least one shelf having a shelf plate which is inclined relative to horizontal for supporting products;
a riser plate and a flow control device provided from the kit of parts of claim 2;
wherein the riser plate projects upwards from the shelf plate to retain the products on the shelf plate and the flow control device projects in front of the shelf and is configured to receive and guide the air curtain as it passes across the display area.

13. A method of modifying a shelf of a refrigerated display case comprising:
changing the angle of the shelf from a first angle to a second angle; and
replacing or reconfiguring a riser plate attached to the shelf so as to change an angle between an inner retaining surface which projects upwards from a shelf plate of the shelf to retain products on the shelf plate and an outer guiding surface of the riser plate which diverges along at least a portion of its length from the inner retaining surface in a downward direction.

14. A method as claimed in claim 13, wherein:
the riser plate is provided from a kit of parts for forming a riser plate for a shelf of a refrigerated display case, wherein the kit of parts comprises:
an inner plate component which forms an inner retaining surface of the riser plate that is configured to project upward from a shelf plate of the shelf to retain products on the shelf plate; and
a plurality of outer fairing components interchangeably connectable with the inner plate component and each configured to form an outer guiding surface of the riser plate which diverges along at least a portion of its length from the inner retaining surface in a downward direction;
wherein the plurality of outer fairing components are each configured to provide a different angle between the outer guiding surface and the inner retaining surface, and
reconfiguring the riser plate comprises interchanging the outer fairing component of the riser plate with another of the plurality of outer fairing components which is configured for the second angle.

15. A method as claimed in claim 13, wherein:
the riser plate is provided from a kit of parts for forming a riser plate for a shelf of a refrigerated display case, wherein the kit of parts comprises:
an inner plate component which forms an inner retaining surface of the riser plate that is configured to project upwards from a shelf plate of the shelf to retain products on the shelf plate when it is inclined relative to horizontal; and
an outer fairing component configured to form an outer guiding surface of the riser plate which diverges along at least a portion of its length from the inner retaining surface in a downward direction;
wherein the outer fairing component is connectable to the inner plate component via an intermediate component, the kit of parts comprising a plurality of intermediate components which are interchangeable and are each configured to provide a different angle between the outer guiding surface and the inner retaining surface, and
reconfiguring the riser plate comprises interchanging the intermediate component of the riser plate with another of the plurality of intermediate components which is configured for the second angle.

16. A method as claimed in claim 13, wherein:
the riser plate is provided from a kit of parts comprising:
a plurality of riser plates interchangeably connectable to a shelf of a refrigerated display case, each of the riser plates comprising:
an inner retaining surface configured to project upwards from a shelf plate of the shelf to retain products on the shelf plate; and
an outer guiding surface;
wherein at least a portion of the outer guiding surface diverges along its length in a downward direction from the inner retaining surface;
wherein the plurality of riser plates are each configured to provide a different angle between the outer guiding surface and the inner retaining surface, and

replacing the riser plate comprises interchanging the riser plate with another of the plurality of riser plates which is configured for the second angle.

17. A method as claimed in claim **13**, wherein:

the riser plate comprises:

an inner plate component which forms an inner retaining surface configured to protect upwards from a shelf plate of the shelf to retain products on the shelf plate when it is inclined relative to horizontal; and

an outer fairing component which forms an outer guiding surface;

wherein at least a portion of the outer guiding surface diverges along its length in a downward direction from the inner retaining surface;

wherein the outer fairing component is hingedly connected to the inner plate component in order to allow an angle between the outer guiding surface and the inner retaining surface to be adjusted, and

reconfiguring the riser plate comprises adjusting the angle between the outer guiding surface and the inner retaining surface via the hinged connection.

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