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(54) **Ambient air curtain with floor air inlet**

(57) A refrigerated merchandiser that includes a case defining a product display area. The case includes a base supported by a support surface that includes a primary inlet and a secondary inlet disposed outside of the primary inlet that receives air from adjacent the support surface. A canopy disposed substantially above the product display area includes a primary outlet and a secondary outlet. A primary air passageway fluidly connects the primary inlet with the primary outlet and defines a primary air curtain that flows across an open face portion of the case. A secondary air passageway fluidly connects the secondary inlet with the secondary outlet and defines a secondary air curtain that flows across the open face portion outside of the primary air curtain. An evaporator is located in the primary air passageway to refrigerate the primary air curtain.

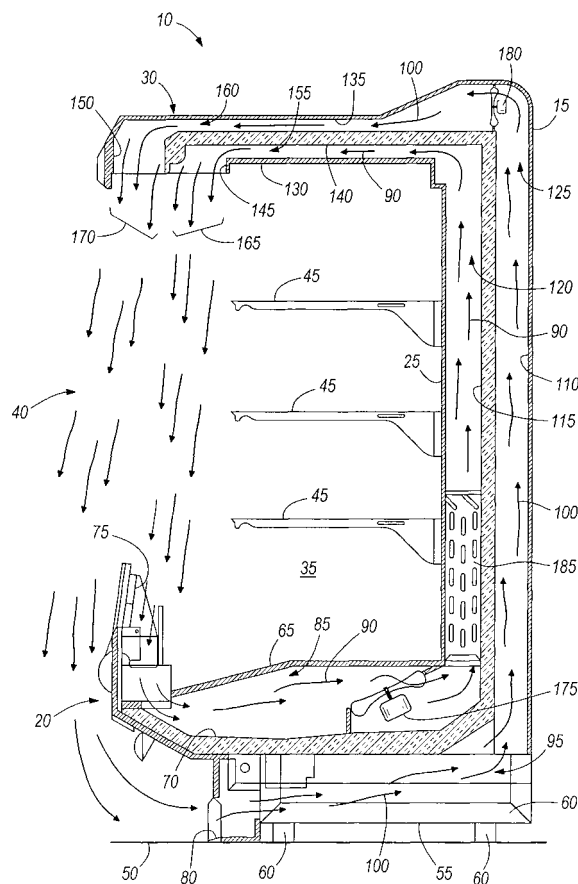


FIG. 2

Description

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This patent application claims priority to U.S. Provisional Application No. 60/698,395, filed on July 12, 2005, the entire contents of which are incorporated by reference herein.

BACKGROUND

[0002] The present invention relates to a refrigerated merchandiser that includes a primary air passageway and a secondary air passageway. More particularly, the present invention relates to a refrigerated merchandiser that includes a primary air passageway fluidly connecting a primary inlet adjacent a product display area and a primary outlet in a canopy, and a secondary air passageway fluidly connecting a secondary inlet adjacent a support surface and a secondary outlet in the canopy.

[0003] In conventional practice, supermarkets and convenience stores are equipped with refrigerated merchandisers having open display portions for presenting fresh food or beverages in a product display area to customers while maintaining the fresh food and beverages (i.e., food product) in a refrigerated environment or product display area. Typically, refrigerated merchandisers include a curtain of cool, refrigerated air that passes downward across the open face portion of the merchandiser to form a flowing boundary of air between the product display area and the rest of the store. The air curtain is generated by an airflow through a passageway of the refrigerated merchandiser that is discharged from an outlet in a canopy of the merchandiser, and is cooled by one or more evaporators disposed in the passageway. The air curtain keeps refrigerated air within the product display area to cool the food product and protects the product display area from ambient air in the surrounding store. Ambient conditions surrounding the refrigerated merchandiser increase cooling requirements of the merchandiser and can undesirably increase the temperature of the food product in the product display area.

[0004] Some refrigerated merchandisers incorporate multiple air curtains to limit entrainment of ambient air in a single air curtain refrigerated merchandiser and to maintain the product display area at desired temperatures. Turbulence exists at the boundary between a single relatively high velocity air curtain and the generally inactive ambient air lying in front of the display case. The turbulence causes some ambient air to undesirably entrain into the air curtain.

[0005] Refrigerated merchandisers with two or more adjacent, parallel, but independently generated, air curtains include an outer air curtain that has a slightly higher temperature than the inner air curtain, so as to protect the colder, inner air curtain from the impact of ambient air surrounding the merchandiser. The inner air curtain is refrigerated by an evaporator. Typically, the outer air

curtain is formed from relatively warm, moisture-laden air adjacent the top of the refrigerated merchandiser. The warm, moisture-laden air is directed into an inlet adjacent an upper portion of the refrigerated merchandiser and discharges the through a second outlet in the canopy. Many refrigerated merchandisers do not include an evaporator to cool air flowing through the second passageway.

[0006] These multiple air curtain refrigerated merchandisers are designed to limit problems of entrainment of ambient air into the colder, inner air curtain. However, such designs do not completely eliminate the intrusion of ambient air into the refrigerated air curtain.

SUMMARY

[0007] In one embodiment, the invention provides a refrigerated merchandiser that includes a case defining a product display area. The case includes a base disposed below the product display area and supported by a support surface, and a canopy disposed substantially above the product display area. The base includes a primary inlet adjacent the product display area and a secondary inlet disposed outside of the primary inlet that receives air substantially adjacent the support surface. The canopy includes a primary outlet adjacent the product display area and a secondary outlet disposed outside of the primary outlet. A primary air passageway fluidly connects the primary inlet with the primary outlet and directs a primary airflow out of the primary outlet and across an open face portion of the case to define a primary air curtain adjacent the product display area. A secondary air passageway fluidly connects the secondary inlet with the secondary outlet and directs a secondary airflow out of the secondary outlet and across the open face portion to define a secondary air curtain outside of the primary air curtain. An evaporator is disposed in the primary air passageway to refrigerate the primary air flow.

[0008] In another embodiment the invention provides a method of operating a refrigerated merchandiser including a case having a base and a canopy. The method includes drawing air adjacent a product display area into a primary inlet of the base, moving a primary airflow from the primary inlet, through a primary air passageway of the case, and to a primary outlet of the canopy adjacent the product display area, discharging the primary airflow through the primary outlet, and generating a primary air curtain adjacent a product display area with the primary airflow discharged through the primary outlet. The method also includes drawing air adjacent the support surface into a secondary inlet of the base disposed outside of the primary inlet, moving a secondary airflow from the secondary inlet, through a secondary air passageway of the case, and to a secondary outlet of the canopy disposed outside of the primary outlet, discharging the secondary airflow through the secondary outlet, and generating a secondary air curtain outside of the primary air curtain with the secondary airflow through the secondary outlet.

[0009] Other aspects of the invention will become apparent by consideration of the detailed description and accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] Fig. 1 is a perspective view of a refrigerated merchandiser embodying the present invention.

[0011] Fig. 2 is a cross-sectional side view of the refrigerated merchandiser of Fig. 1, exposing a primary air passageway defining a primary air curtain and a secondary air passageway defining a secondary air curtain.

[0012] Fig. 3 is a cross-sectional side view similar to Fig. 2, illustrating a forward louver adjacent a secondary air passageway of a refrigerated merchandiser according to another embodiment of the invention.

[0013] Fig. 4 is a cross-sectional side view similar to Fig. 2, illustrating a reverse louver adjacent a secondary air passageway of a refrigerated merchandiser according to another embodiment of the invention.

DETAILED DESCRIPTION

[0014] Before any embodiments of the invention are explained in detail, it is to be understood that the invention is not limited in its application to the details of construction and the arrangement of components set forth in the following description or illustrated in the following drawings. The invention is capable of other embodiments and of being practiced or of being carried out in various ways. Also, it is to be understood that the phraseology and terminology used herein is for the purpose of description and should not be regarded as limiting. The use of "including," "comprising," or "having" and variations thereof herein is meant to encompass the items listed thereafter and equivalents thereof as well as additional items. Unless specified or limited otherwise, the terms "mounted," "connected," "supported," and "coupled" and variations thereof are used broadly and encompass both direct and indirect mountings, connections, supports, and couplings. Further, "connected" and "coupled" are not restricted to physical or mechanical connections or couplings.

[0015] Fig. 1 shows a refrigerated merchandiser 10 that may be located in a supermarket or a convenience store (not shown) for presenting fresh food, beverages, and other food products (not shown) to customers. The refrigerated merchandiser 10 includes a case 15 having a base 20, a first interior rear wall 25, and a canopy 30. The area partially enclosed by the base 20, the first interior rear wall 25, and the canopy 30 defines a product display area 35 having an open face portion 40 that allows customer access to the food products stored in the case 15. The illustrated embodiment shows the open face portion 40 disposed vertically within the refrigerated merchandiser 10. Other embodiments may include a horizontal case or coffin-style case defining a product display area having an open face portion adjacent a top of the

case and disposed substantially horizontal within the refrigerated merchandiser 10. One or more shelves 45 are disposed within the product display area 35 to support the food products.

[0016] The base 20 is disposed substantially below the product display area 35 and is supported by a floor or support surface 50 of the supermarket. Specifically, as shown in Fig. 2, a frame 55 disposed within the base 20 supports the case 15 on the support surface 50. The frame 55 includes horizontal and vertical support members 60 to provide structural support for the case 15 on the support surface 50. The horizontal and vertical support members 60 are spaced apart from each other along the length of the base 20 providing clearance between adjacent support members 60.

[0017] Fig. 2 illustrates the refrigerated merchandiser 10 in greater detail. The base 20 includes a first bottom wall 65, a second bottom wall 70, a primary inlet 75, and a secondary inlet 80. The first bottom wall 65 defines a lower portion of the product display area 35 and is configured to support a portion of the food products. The illustrated second bottom wall 70 is an insulated wall disposed below the first bottom wall 65. Other embodiments may include the second bottom wall 70 without insulation.

[0018] The first bottom wall 65 and the second bottom wall 70 define a primary lower flue 85 to conduct a primary airflow 90 substantially horizontally through the base 20. The primary inlet 75 is in fluid communication with the primary lower flue 85 and is disposed adjacent the open face portion 40 of the product display area 35. The primary inlet 75 is positioned to receive surrounding air in a substantially vertical direction and to direct the surrounding air into the primary lower flue 85.

[0019] The second bottom wall 70 and the support surface 50 define a secondary lower flue 95 to conduct a secondary airflow 100 substantially horizontally through the base 20 below the primary airflow 90. The secondary inlet 80 is in fluid communication with the secondary lower flue 95 and is disposed adjacent the support surface 50. The secondary inlet 80 is positioned to receive surrounding air in a substantially horizontal direction from adjacent the support surface 50 and to direct the surrounding air into the secondary lower flue 95. A grill or other cover 105 is disposed over the secondary inlet 80 to at least partially conceal portions of the frame 55 and to assist with directing surrounding air into the secondary lower flue 95.

[0020] The first interior rear wall 25 defines a rear portion of the product display area 35. The case 15 further includes an exterior rear wall 110 and a second interior rear wall 115 disposed between the first interior rear wall 25 and the exterior rear wall 110. A primary rear flue 120 is defined by the first interior rear wall 25 and the second interior rear wall 115. The primary rear flue 120 is in fluid communication with the primary lower flue 85 to direct the primary airflow 90 in a substantially vertical direction. In some embodiments, the first interior rear wall 25 may include apertures (not shown) to fluidly couple the prima-

ry rear flue 120 with the product display area 35 and allow at least some of the primary airflow 90 in the primary rear flue 120 to enter the product display area 35.

[0021] The second interior rear wall 115 is an insulated wall configured to buffer the primary airflow 90 from the secondary airflow 100. Other embodiments may include the second interior rear wall 115 without insulation.

[0022] The exterior rear wall 110 and the second interior rear wall 115 define a secondary rear flue 125. The secondary rear flue 125 is in fluid communication with the secondary lower flue 95 direct the secondary airflow 100 in a substantially vertical direction.

[0023] The canopy 30 includes a first interior top wall 130, an exterior top wall 135, and a second interior top wall 140 disposed between the first interior top wall 130 and the exterior top wall 135. The first interior top wall 130 defines a portion of the product display area 35 and includes a primary outlet 145 and a secondary outlet 150. The primary outlet 145 is disposed adjacent the product display area 35 and the secondary outlet 150 is located outward from the primary outlet 145 adjacent an end of the canopy 30. The first interior top wall 130 and the second interior top wall 140 define a primary upper flue 155 that is fluidly connected with and adjacent the primary rear flue 120. The primary upper flue 155 couples with the primary outlet 145 to direct the primary airflow 90 in a substantially horizontal direction toward the primary outlet 145.

[0024] The second interior top wall 140 is an insulated wall configured to buffer the primary upper flue 155 from the secondary upper flue 160. Other embodiments may include the second interior top wall 140 without insulation.

[0025] The exterior top wall 135 and the second interior top wall 140 define a secondary upper flue 160 that is fluidly connected with and adjacent the secondary rear flue 125. The secondary upper flue 160 couples with the secondary outlet 150 to direct the secondary airflow 100 in a substantially horizontal direction toward the secondary outlet 150.

[0026] The primary lower flue 85, the primary rear flue 120, and the primary upper flue 155 define a primary air passageway. The primary air passageway is configured to direct the primary airflow 90 from the primary inlet 75 to the primary outlet 145, and to discharge the primary airflow 90 from the primary outlet 145 in the form of a primary air curtain 165. In the illustrated embodiment, the primary air curtain 165 is directed downwardly across the open face portion 40 adjacent the product display area 35 to cool the food products. Other embodiments may include a horizontal case or coffin-style case defining a product display area having an open face portion adjacent a top of the case. In these embodiments, the primary air curtain 165 is directed substantially horizontally across the horizontally-disposed open face portion.

[0027] The secondary lower flue 95, the secondary rear flue 125, and the secondary upper flue 160 define a secondary air passageway. The secondary air passageway is configured to direct the secondary airflow 100

from the secondary inlet 80 to the secondary outlet 150, and to discharge the secondary airflow 100 from the secondary outlet 150 in the form of a secondary air curtain 170. The secondary air curtain 170 is located adjacent and outside of the primary air curtain 165 to assist in forming a barrier between ambient air surrounding the case and the product display area 35. The secondary air curtain 170 is warmer than the primary air curtain 165 and cooler than the surrounding ambient air. In the illustrated embodiment, the secondary air curtain 170 is directed downward across the open face portion outside of the primary air curtain 165 to buffer the primary air curtain 165 from the relatively warm ambient air surrounding the case 15. In embodiments that include a case having a horizontal open face portion the secondary air curtain 170 is directed substantially horizontally across the horizontal open face portion.

[0028] The primary and secondary air curtains 165, 170 cooperate to define a dual air curtain that is configured to move across the open face portion 40. Portions of the dual air curtain may be drawn into one or both of the primary and secondary inlets for recirculation. The dual air curtain, among other things, helps to maintain the air temperature in the product display area within a standard temperature range. For example, for medium temperature cases the temperature range is 32 to 41 degrees Fahrenheit as determined by the Food and Drug Administration ("FDA") Food Code.

[0029] The refrigerated merchandiser 10 also includes some components of a refrigeration system (not entirely shown) therein. At least one fan 175 is located within the primary lower flue 85 toward the rear of the case 15 to generate the primary airflow 90 through the primary air passageway. The fan 175 draws air into the primary air passageway from the primary inlet 75 and forces the air through the remaining portions of the primary air passageway. The illustrated embodiment shows one fan 175 positioned in the primary lower flue 85 to generate the primary airflow. Other embodiments may include more than one fan 175 to generate the primary airflow 90 through the primary air passageway. In still other embodiments the fan 175 may be located in the primary rear flue 120 or in the primary upper flue 155.

[0030] A second fan 180 is disposed in the secondary air passageway to generate the secondary airflow 100. The illustrated embodiment shows the fan 180 positioned within the secondary rear flue 125 adjacent a rear upper portion of the case 15. The fan 180 draws air into the secondary air passageway through the secondary inlet 80 from adjacent the support surface 50 and forces air through the secondary outlet 150. The illustrated embodiment shows one fan 180 positioned in the secondary air passageway. Other embodiments may include more than one fan 180 to generate the secondary airflow 100 through the secondary air passageway. Still other embodiments may include one or more fans 180 extending across the length of the case 15 located in the secondary rear flue 125, in the secondary lower flue 95, or other

positions within the case 15 that generate the secondary airflow 100.

[0031] An evaporator 185 is located within the primary rear flue 120 and downstream of the fan 175 to refrigerate the primary airflow 90. The evaporator 185 is configured to receive a saturated refrigerant that has passed through an expansion valve (not shown). As is known in the art, the saturated refrigerant is evaporated as it passes through the evaporator 185 as a result of absorbing heat from the primary airflow 90 passing over the evaporator 185. The absorption of heat by the refrigerant allows the temperature of the primary airflow 90 to decrease as it passes over the evaporator 185. The heated or gaseous refrigerant then exits the evaporator 185 and is pumped back to remotely located compressor(s) (not shown) for reprocessing into the refrigeration system. In other embodiments, the evaporator 185 may be located in the primary lower flue 85 upstream of the fan 175 to refrigerate the primary airflow 90. In still other embodiments, more than one evaporator 185 may be located in the primary air passageway to refrigerate the primary airflow 90.

[0032] Figs. 3 and 4 show embodiments of the refrigerated merchandiser 10 including a louver 190 positioned adjacent the secondary outlet 150 to direct the secondary air curtain 170 across the open face portion 40. The louver 190 includes a plurality of substantially parallel, elongated fins and a unitary body as described in Hussmann's U.S. Patent Application No. 11/059,617, filed on February 16, 2005 (Entitled AIR LOUVER FOR A REFRIGERATED DISPLAY CASE). The louver 190 is positioned within the case 15 such that the secondary airflow 100 through the louver 190 is directed substantially orthogonal to the direction of the secondary airflow through the secondary upper flue 160. The louver 190 includes channels 195 that define an inlet profile to facilitate the change in direction of the secondary airflow 100. In other embodiments, one or more louvers 190 may be located adjacent the primary outlet 145 and the secondary outlet 150 to direct the primary and secondary air curtains 165, 170 across the open face portion 40. In still other embodiments, the louver 190 may be positioned adjacent the primary outlet 145 without a second louver 190 adjacent the secondary outlet 150.

[0033] Fig. 3 shows one embodiment of the refrigerated merchandiser 10 that includes the louver 190 positioned in a forward direction extending across the secondary outlet 150. The channels 195 generally increase in length and decrease in width in the direction of flow of the secondary airflow 100 through the secondary upper flue 160. This configuration of the channels 195 from an inner portion of the secondary outlet 150 adjacent the primary outlet 145 to an outer portion of the secondary outlet 150 adjacent the end of the canopy 30 causes a portion of the secondary air curtain 170 adjacent the primary air curtain 165 to be slower than a portion of the secondary air curtain 170 adjacent the end of the canopy 30. In other words, the forward louver 190 defines an

increasing variable flow rate of a cross-section of the secondary air curtain 170 taken from adjacent the primary air curtain 165 toward the end of the canopy 30 (i.e., outward direction away from the product display area 35).

The increasing variable flow rate provides a substantially uniform and relatively low-temperature flow of air to buffer the primary air curtain 165 and maintains a relatively cool dual air curtain across a substantial portion of the open face portion 40. In embodiments including the louver 190 disposed adjacent the primary outlet 145, the forward louver 190 facilitates a substantially uniform low-temperature primary air curtain 165 to cool the product display area.

[0034] Fig. 4 illustrates another embodiment of the refrigerated merchandiser 10 that includes the louver 190 positioned in a reverse direction extending across the secondary outlet 150. The channels 195 of the reverse louver 190 generally decrease in length and increase in width in the direction of flow of the secondary airflow 100 through the secondary upper flue 160. The decreasing length of the channels 195 across the secondary outlet 150 causes an inner portion of the secondary air curtain 170 adjacent the primary air curtain 165 to be faster than an outer portion of the secondary air curtain 170 adjacent the end of the canopy 30, defining a decreasing variable flow rate of a cross-section of the secondary air curtain 170 in the outward direction away from the product display area 35. The decreasing variable flow rate provides a substantially uniform flow of air across the open face portion 40 to buffer the primary air curtain 165 and maintains a relatively cool dual air curtain across a substantial portion of the open face portion 40.

[0035] Referring back to Fig. 2, the illustrated refrigerated merchandiser 10 includes the case 15 without the louver 190 located adjacent the primary and secondary outlets 145, 150. The primary and secondary air curtains 165, 170 are directed across the open face portion 40 without a substantially variable flow rate profile as described with regard to Figs. 3 and 4. The largely unchanging airflow velocity profiles of the primary and secondary air curtains 165, 170 respectively cool the product display area 35 and buffer the primary air curtain 165 from warm ambient air surrounding the refrigerated merchandiser 10.

[0036] Activation of the first and second fans 175, 180 draws air into the respective primary and secondary air passageways. With regard to the primary air passageway, air is drawn into the primary lower flue 85 through the primary inlet 75. The primary air curtain 165 is directed generally toward the primary inlet 75, and a substantial portion of the primary air curtain 170 is received by the primary inlet 75 to be recycled through the case 15. Recycling the primary air curtain 165 recirculates cool air to effectively cool the product display area 35. The primary airflow 90 generated by the first fan 175 is cooled by the evaporator 190 and discharges from the primary outlet 145 and flows across the open face portion 40, cooling the product display area 35 and maintaining the food

products at FDA-recommended temperatures.

[0037] The secondary inlet 80 draws relatively cool, dry air from adjacent the support surface 50 into the secondary air passageway. The secondary air curtain 170 is directed across the open face portion 40 outside of the primary air curtain 170 and flows generally toward the secondary inlet 80. The secondary inlet 80 receives at least a portion of the secondary air curtain 170 that is recycled through the case 15. The secondary airflow 100 flows through the secondary air passageway with the assistance of the second fan 180 and discharges through the secondary outlet 150 outside of the primary outlet 145. The cool, dry secondary air curtain 170 provides an effective buffer for the primary air curtain 165 without substantially decreasing the cooling effect of the primary air curtain 165. Drawing cool, dry air into the secondary air passageway and discharging the cool, dry air from the secondary outlet 150 effectively maintains a temperature of the secondary air curtain 170 that is warmer than the primary air curtain 165, but cooler than ambient air surrounding the refrigerated merchandiser 10.

[0038] Thus, the invention provides, among other things, a refrigerated merchandiser that includes a primary air curtain defined by a primary airflow that receives air from adjacent a product display area and a secondary air curtain defined by a secondary airflow receiving air from adjacent a support surface. Various features and advantages of the invention are set forth in the following claims.

Claims

1. A refrigerated merchandiser comprising:

a case defining a product display area including an open face portion, the case including

a base disposed below the product display area and supported by a support surface, the base having a primary inlet adjacent the product display area and a secondary inlet disposed outside of the primary inlet, the secondary inlet configured to receive air substantially adjacent the support surface, a canopy disposed substantially above the product display area, the canopy having a primary outlet adjacent the product display area and a secondary outlet disposed outside of the primary outlet, a primary air passageway fluidly connecting the primary inlet with the primary outlet, the primary air passageway configured to direct a primary airflow out of the primary outlet and across the open face portion to define a primary air curtain adjacent the product display area, a secondary air passageway fluidly con-

necting the secondary inlet with the secondary outlet, the secondary air passageway configured to direct a secondary airflow out of the secondary outlet and across the open face portion to define a secondary air curtain outside of the primary air curtain; and an evaporator disposed in the primary air passageway to refrigerate the primary air flow.

2. The refrigerated merchandiser of claim 1, further comprising a primary fan disposed within the primary air passageway and configured to generate the primary airflow, and a secondary fan disposed within the secondary air passageway and configured to generate the secondary airflow.
3. The refrigerated merchandiser of claim 1, further comprising a louver attached to the secondary outlet.
4. The refrigerated merchandiser of claim 1, further comprising a first louver attached to the primary outlet, and a second louver attached to the secondary outlet.
5. The refrigerated merchandiser of claim 1, wherein the primary inlet is configured to receive a substantial portion of the primary air curtain, and wherein the secondary inlet is configured to receive a substantial portion of the secondary air curtain.
6. The refrigerated merchandiser of claim 1, wherein the case further includes an insulated wall disposed along at least a portion of the primary air passageway and at least a portion of the secondary air passageway.
7. The refrigerated merchandiser of claim 1, wherein a portion of the secondary air passageway is defined by the support surface.
8. The refrigerated merchandiser of claim 1, wherein the primary inlet is configured to receive air in a substantially vertical direction, and wherein the secondary inlet is configured to receive air in a substantially horizontal direction.
9. The refrigerated merchandiser of claim 1, wherein the primary air curtain is directed along a first flow path, and wherein the secondary air curtain is directed along a second flow path that is substantially parallel to the first flow path.
10. The refrigerated merchandiser of claim 1, wherein the secondary airflow is warmer than the primary airflow and cooler than ambient air surrounding the refrigerated merchandiser.

11. The refrigerated merchandiser of claim 1, wherein the base includes a substantially vertical panel extending upwardly from the support surface, and wherein the secondary inlet is disposed on the vertical panel. 5
12. A method of operating a refrigerated merchandiser including a case having a base and a canopy, the method comprising: 10
- drawing air adjacent a product display area into a primary inlet of the base;
- moving a primary airflow from the primary inlet, through a primary air passageway of the case, and to a primary outlet of the canopy adjacent the product display area; 15
- discharging the primary airflow through the primary outlet;
- generating a primary air curtain adjacent a product display area with the primary airflow discharged through the primary outlet; 20
- drawing air adjacent the support surface into a secondary inlet of the base disposed outside of the primary inlet;
- moving a secondary airflow from the secondary inlet, through a secondary air passageway of the case, and to a secondary outlet of the canopy disposed outside of the primary outlet; 25
- discharging the secondary airflow through the secondary outlet; and 30
- generating a secondary air curtain outside of the primary air curtain with the secondary airflow through the secondary outlet.
13. The method of claim 12, further comprising refrigerating the primary airflow. 35
14. The method of claim 13, further comprising positioning the secondary outlet adjacent an end of the canopy and providing a secondary air curtain that is warmer than the primary air curtain. 40
15. The method of claim 12, wherein drawing air into the primary inlet includes drawing a substantial portion of the primary air curtain. 45
16. The method of claim 12, wherein drawing air into the secondary inlet includes drawing a substantial portion of the secondary air curtain. 50
17. The method of claim 12, further comprising separating at least a portion of the primary air passageway from at least a portion of the secondary air passageway with an insulated wall. 55
18. The method of claim 18, wherein separating at least a portion of the primary air passageway includes separating substantially the entire primary air passageway from the secondary air passageway with an insulated wall.
19. The method of claim 12, further comprising defining a portion of the secondary air passageway with the support surface.
20. The method of claim 12, wherein drawing air into the primary inlet includes drawing air in a substantially vertical direction, and wherein drawing air into the secondary inlet includes drawing air in a substantially horizontal direction.

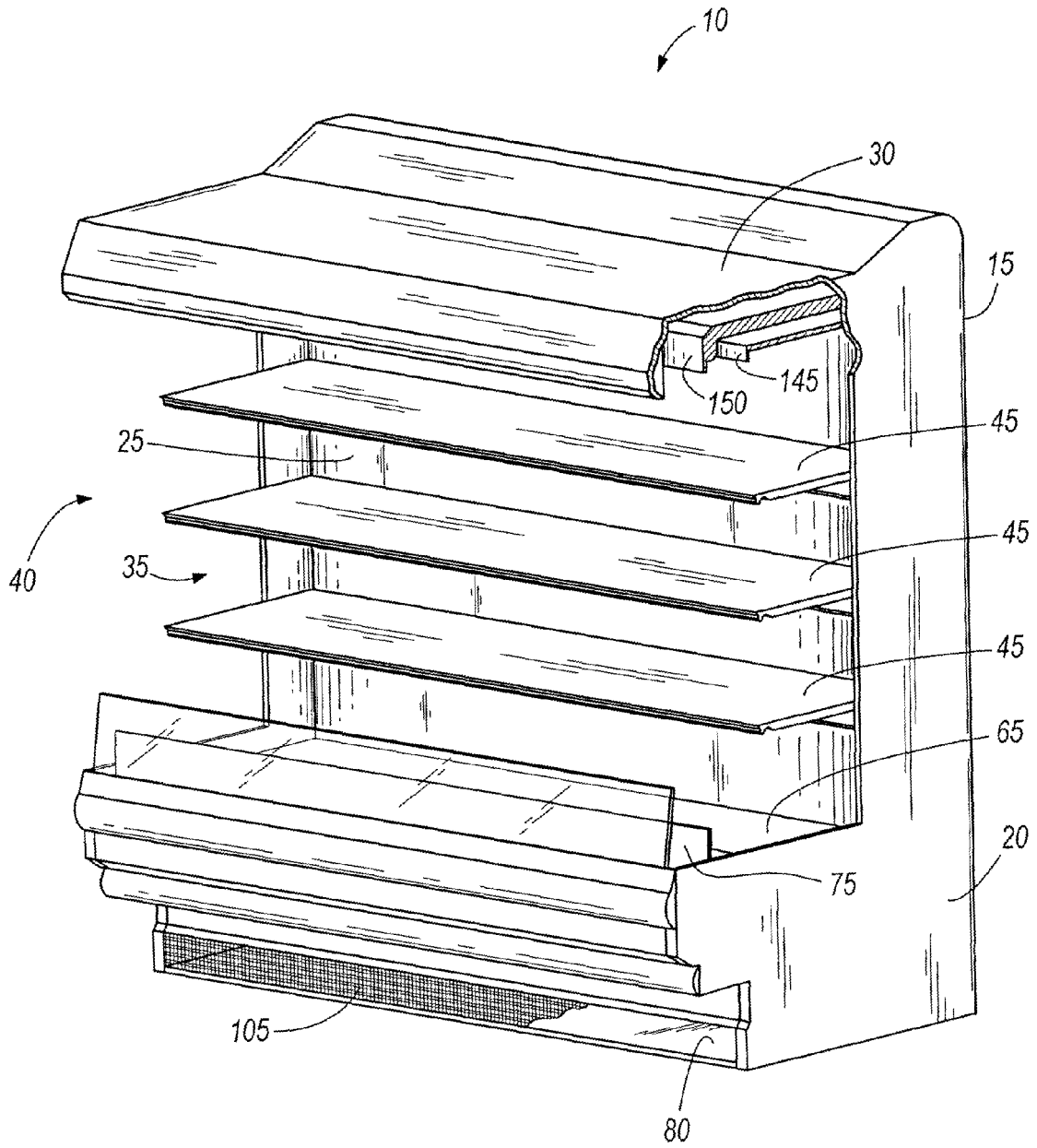


FIG. 1

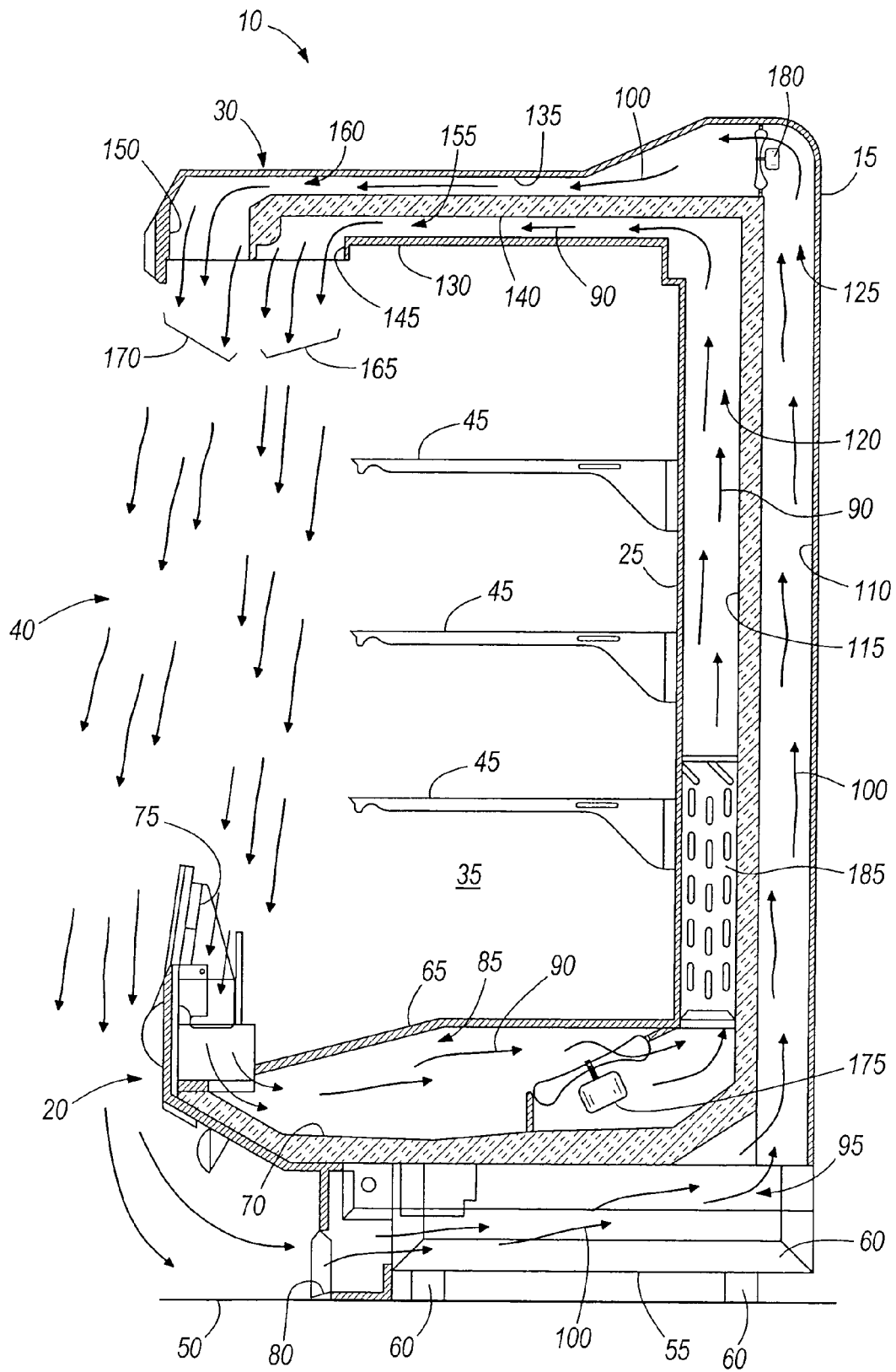


FIG. 2

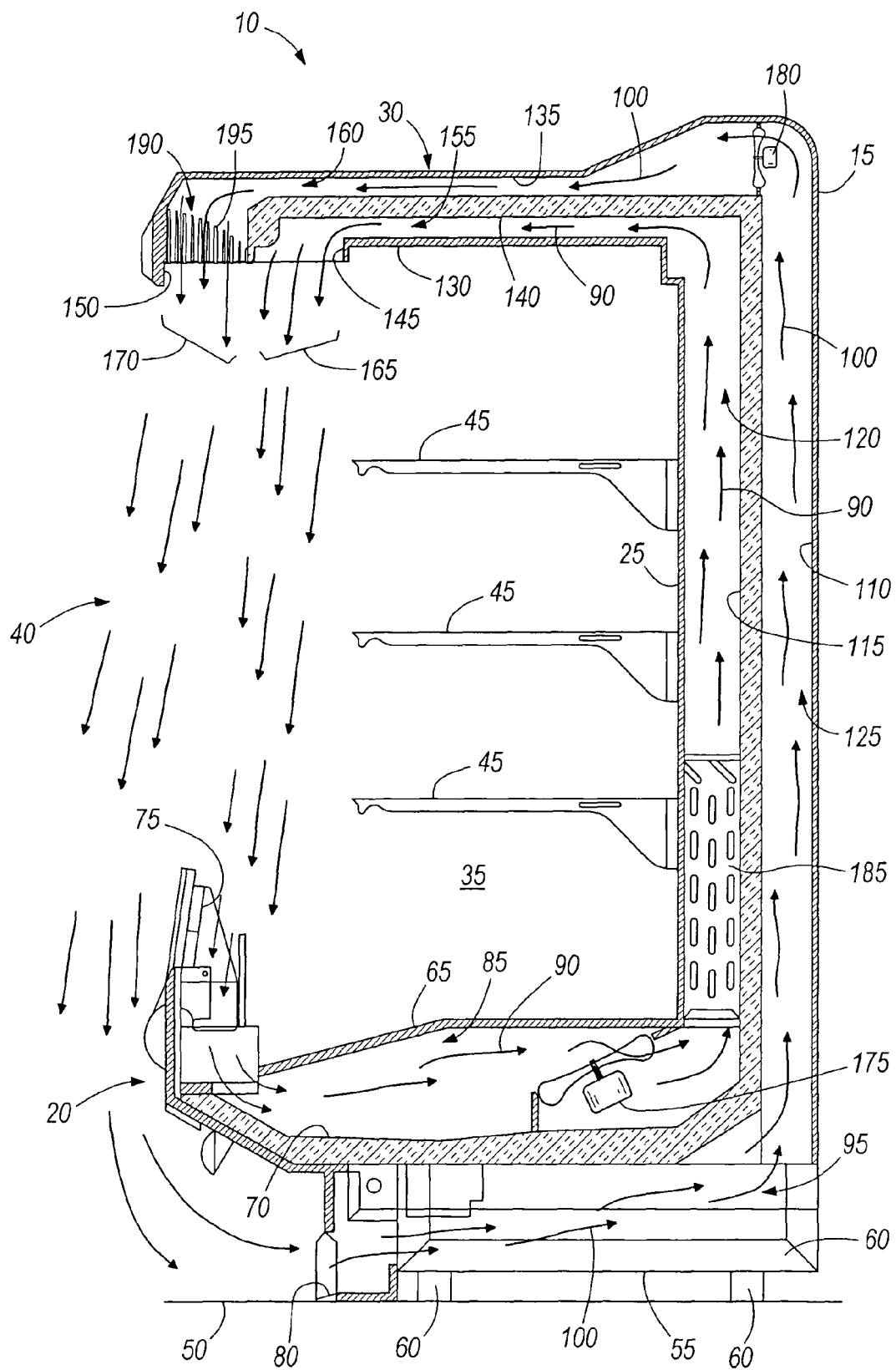


FIG. 3

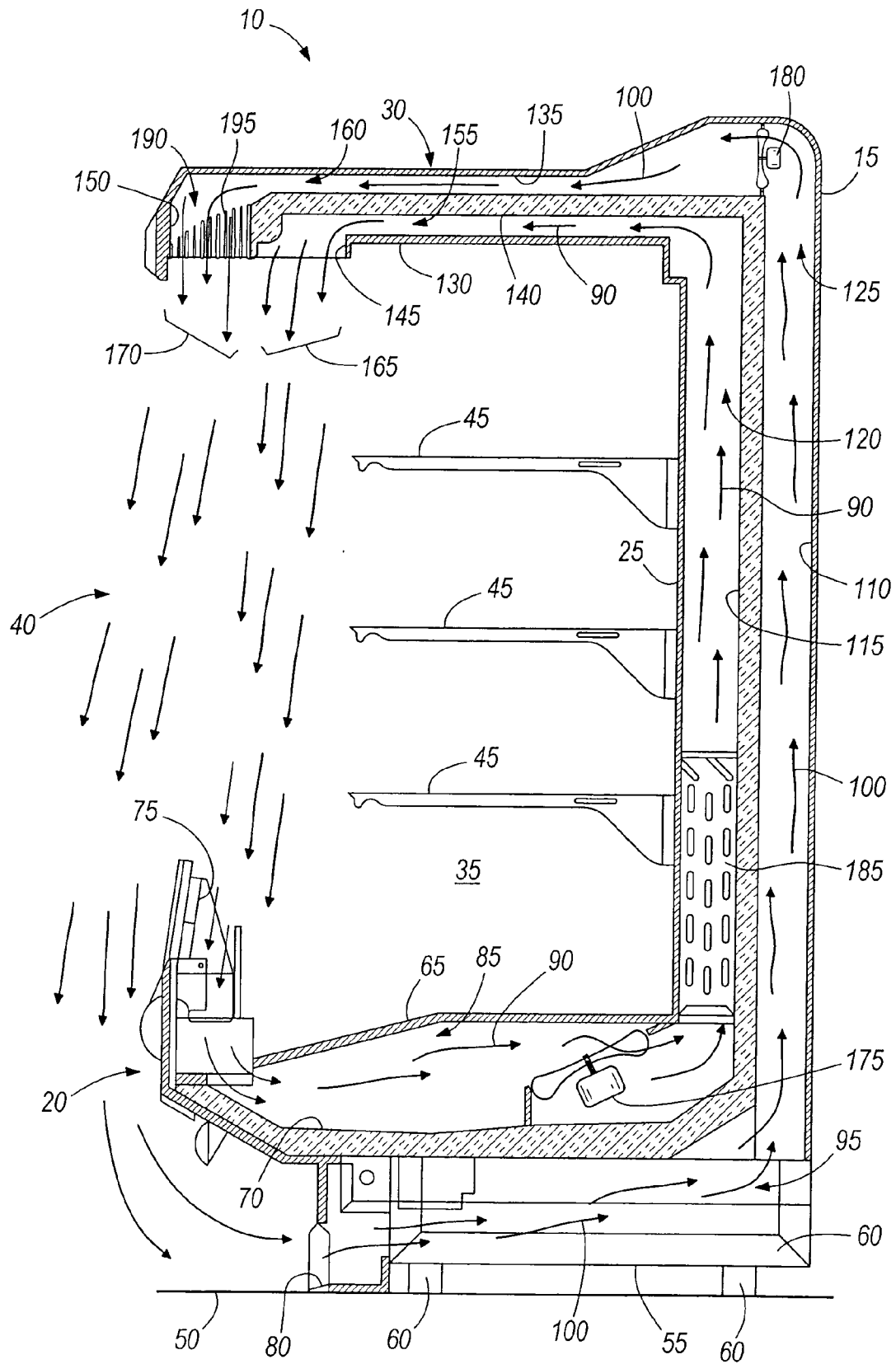


FIG. 4



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 10 October 2006	Examiner Cardan, Cosmin
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)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 06 25 3468

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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