

March 28, 1939.

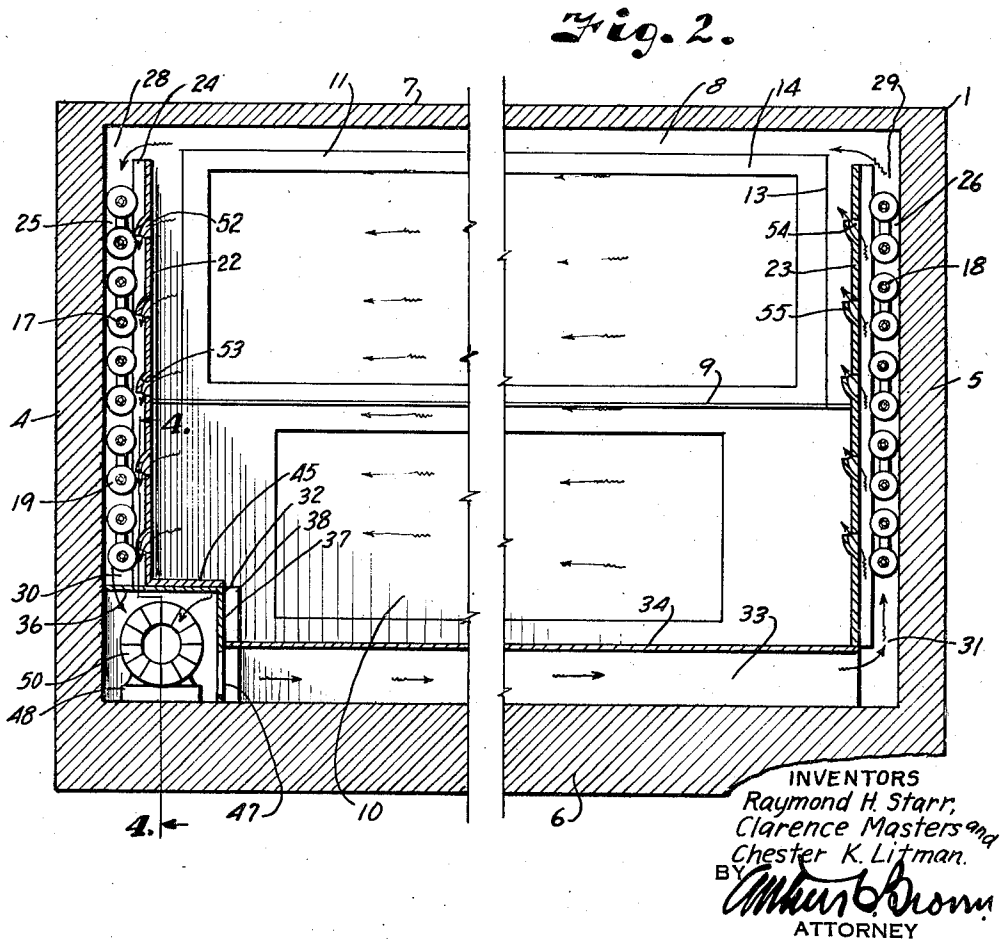
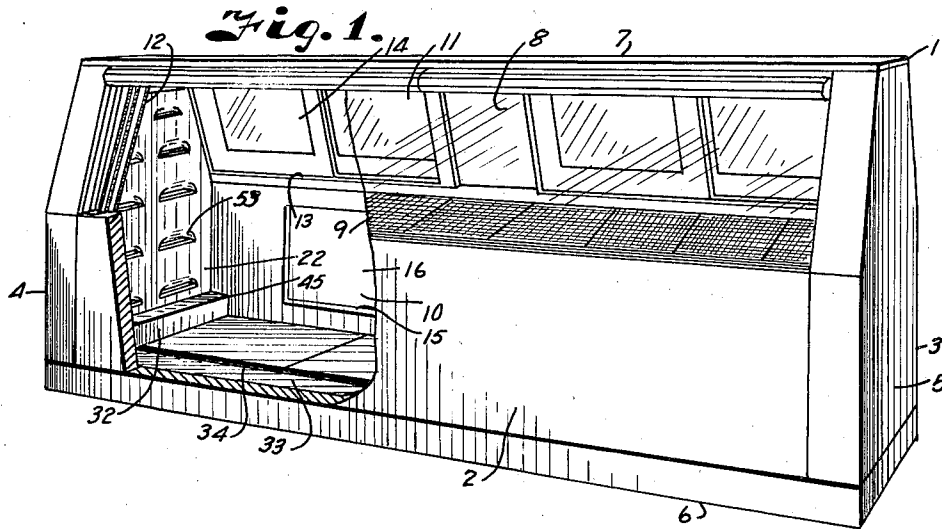
R. H. STARR ET AL

2,152,291

REFRIGERATED CASE

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2 Sheets-Sheet 1



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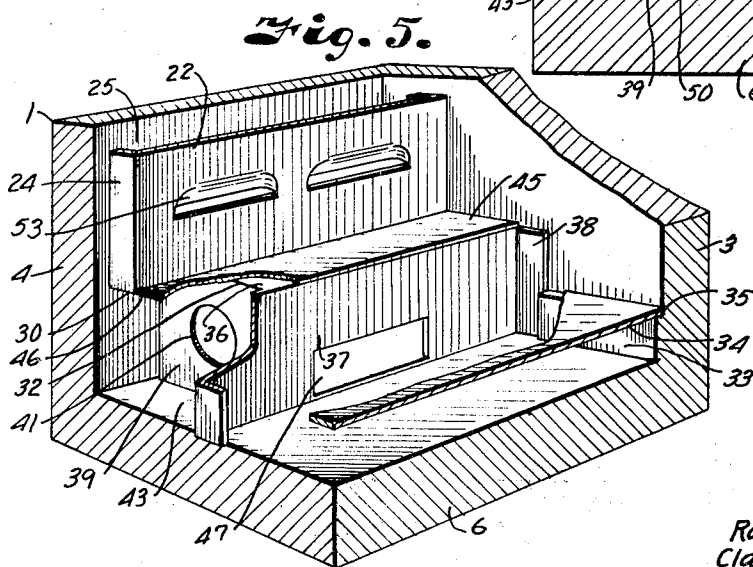
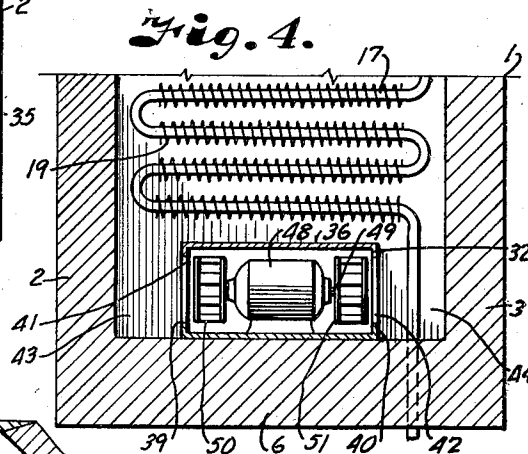
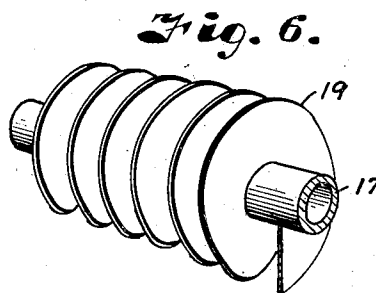
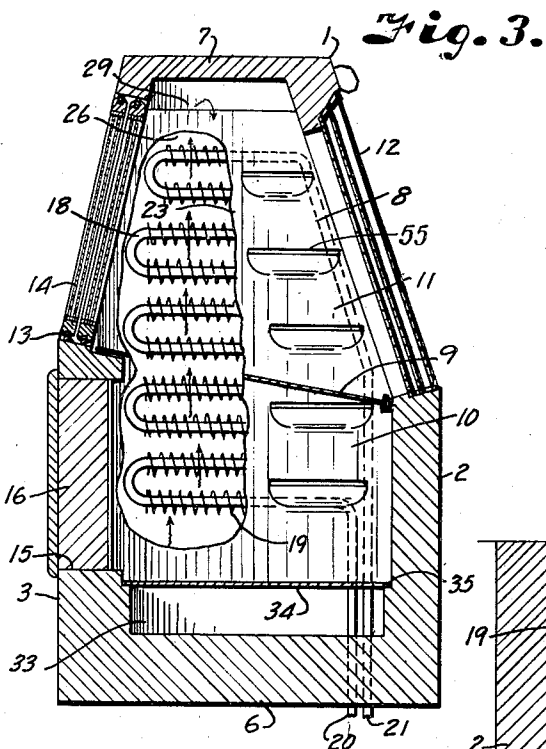
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2 Sheets-Sheet 2



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REFRIGERATED CASE

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5 Claims. (Cl. 62—89.5)

This invention relates to display cases, particularly to those equipped with refrigeration for the storage and display of perishable merchandise, and has for its principal objects to provide for substantially uniform temperatures in all parts of the display compartment; to provide for uniform movement of chilled air throughout the interior of the display case; to provide mechanical means for effecting forced circulation of air from one end of the display case to the other; and to effect inlet of air at one end of the refrigerated compartment in divided streams of progressively decreasing temperatures from the bottom toward the top throughout the height of the display case, thereby effecting transverse circulation of air from the top to the bottom of the refrigerated space.

Other important objects of the invention are to provide a display case with refrigerating elements located and constructed so that they do not interfere with merchandise on display; and to provide refrigerating elements which occupy a minimum of display or storage space.

In accomplishing these and other objects of the invention, as hereinafter pointed out, we have provided improved details of structure, the preferred form of which is illustrated in the accompanying drawings, wherein:

Fig. 1 is a perspective view of a display case equipped with a refrigerating and circulatory system embodying the features of the present invention, a part of the front wall of the case being broken away to better illustrate the louvers through which air is circulated from the interior of the case to an element carried at the end of the case.

Fig. 2 is a longitudinal vertical section through the case, particularly illustrating the air circulatory system and the location of the cooling elements.

Fig. 3 is a vertical cross-section through the display case, with a part of the cooling element housing broken away to better illustrate the arrangement of cooling coils.

Fig. 4 is a detail section on the line 4—4 of Fig. 2.

Fig. 5 is a detail perspective view of the fan housing and illustrating its connections with the adjacent cooling element housing and the air transfer duct, wherethrough air is moved from one end of the display case to the other.

Fig. 6 is a fragmentary perspective view of a portion of one of the cooling elements, particularly illustrating the fins thereon.

Referring more in detail to the drawings:

1 designates a display case including insulated front and rear walls 2—3, end walls 4—5, a bottom 6, and a counter top 7 to form a refrigerated compartment 8 adapted to contain perishable merchandise or the like. In the illustrated instance the compartment 8 is divided by a reticulated shelf 9, located at a point about midway the height of the display case, into a lower storage space 10 and an upper display space 11. The front wall 2 inclines inwardly above the level of the shelf 9, toward the counter top 7, and is provided with a plurality of transparent panels 12 through which merchandise is displayed to the view of a customer. The wall 3 also slopes toward the counter top above the shelf, and is provided with a series of door openings 13 normally closed by doors 14. Access to the storage space is attained through door openings 15 that are provided in the rear wall and which are closed by doors 16. The display case structure thus far described is conventional and specifically forms no part of the present invention.

Located in each end of the display case, in juxtaposition with the inner faces of the end walls 4 and 5, are air cooling elements 17 and 18, each including a coil arranged in horizontally positioned hairpin loops conforming in length to the shape of the end walls and having spirally wound fins 19 for increasing the conductive surfaces in contact with air circulated thereover. A suitable refrigerant is supplied to the coils through inlet pipes 20 connected with their lower ends and, after circulation through the coils, is returned through pipes 21 that are connected with the upper ends of the coils.

Located in covering relation with the coils are shield-like housing plates 22 and 23 respectively, which conform in shape to the transverse section of the compartment 8 and have side flanges 24 respectively engaging the inner faces of the front and rear walls for support thereof in spaced relation with the inner surfaces of the end walls to form vertical air passages 25 and 26. The shield-like housings terminate short of the top and bottom of the display case to provide upper inlet and outlet openings 28—29 and lower openings 30—31. The openings 28 and 29 communicate directly with the interior of the display space, while the openings 30 communicate with a fan housing 32, which in turn communicates with the opening 31 through a horizontal duct 33 that is formed by a plate 34 extending horizontally of the display case in spaced relation with the bottom 6, and which has its side edges supported on shoulders 35 formed on the

inner faces of the front and rear walls, as clearly shown in Fig. 3.

The fan housing includes a horizontal top or cover 36 that engages under the lower edge of the shield-like housing 22, and is supported by a vertical plate 37 that rests upon the bottom 6, as best shown in Fig. 5. The plate 37 extends completely across the width of the storage space and is provided with lateral flanges 38 engaging the front and rear walls of the case. The cover 36 is of shorter length than the plate 37, and connected to the ends thereof and with the plate 35 are end plates 39 and 40 having openings 41 and 42 that communicate with chambers 43 and 44 that are formed between the end plates and the front and rear walls of the housing, as shown in Fig. 4. The lower edge of the shield-like housing 22 has a laterally extending flange 45, seated upon the top of the fan housing and of length to extend completely across the display case to close the top of the chambers 43 and 44 with the exception of the spaces directly below the housing 22 which form openings 46 having connection with the air inlets of the fan housing. The plate 37 forming the front of the fan housing is provided between the end plates 39 and 40 with an outlet opening 47 communicating directly with the inlet end of the duct 33, as best shown in Fig. 2. Located within the fan housing is a motor 48, having an armature shaft 49 projecting from the ends thereof, to carry impellers 50 and 51 preferably of the sirocco type. The shield-like housing 22 is provided with a series of vertically spaced openings 52 that are covered by inwardly projecting louvers 53 extending inwardly and downwardly, as shown in Fig. 2, to direct air over the coils and toward the inlets to the fan housing. The shield-like housing 23 is provided with similarly spaced openings 54 covered by upwardly directed louvers 55 projecting into the compartment 8 for giving slight upward movement of the air streams that are discharged through the respective openings, so as to maintain the streams for substantially horizontal travel across the length of the case for passage through the openings 52.

In operating a display case constructed and assembled as described, the merchandise to be displayed is placed within the display space and the merchandise to be stored is placed in the storage space. A refrigerant is supplied to the cooling elements through the respective inlet pipes 20 for circulation upwardly through the coils and is returned to the source of supply through the outlet pipes 21. After starting the fan motor, air is drawn by the impellers from the interior of the case through the upper openings 28 and through the louvered openings 52 for circulation over the coils of the cooling element 17, so that the air is cooled before it is drawn through the openings 46 into the chambers 43 and 44, and thence through the inlet openings 41 and 42 of the fan housing. The initially cooled air is then discharged by the impellers through the outlet 47 of the fan housing into and through the duct 33 to the openings 31 leading to the vertical passageway 26, the air being discharged under sufficient pressure so that it circulates upwardly around the coils of the cooling element 18. As the air moves upwardly around the coils, portions thereof are discharged through the louvered openings 54 to move in the direction of the inlet openings in the opposite end of the case. As the air moves upwardly over the coils, the temperature thereof is gradually reduced, so that the air streams discharged through the openings 54 pro-

gressively vary in temperature, the coldest stream being discharged through the upper opening and the warmest through the lower opening. This discharge of air at different levels and temperatures, sets up secondary or transverse currents since there is the natural tendency for the warmer air to rise and the cooler air to fall so that the air in all parts of the display and storage spaces is in constant motion to maintain substantially uniform effective temperatures surrounding the merchandise contained therein. The air is thus kept in constant circulation and is maintained at the required temperature incidental to its contact with the cooling elements during portions of its cycle of circulation.

From the foregoing it is obvious that we have provided a refrigerating apparatus for a display case and the like wherein the air takes up heat from the merchandise and carries it into direct heat exchange relation with the cooling elements so that the refrigeration is more effective and can be operated at less cost. The air circulation system also obviates the usual difficulties encountered because of moisture condensation, obscurement of the merchandise, and occupation of useful space in the refrigerated compartment.

What we claim and desire to secure by Letters Patent is:

1. In a compartment to be refrigerated, means forming vertical passageways at opposite locations in the compartment and having air inlet and outlet openings respectively, a refrigerating element in each of the passageways, a duct connecting the lower ends of the passageways, and means connected with said duct for effecting circulation of air from the compartment and through one of said passageways for movement through said duct to the other of said passageways for discharge into the compartment.

2. In a compartment to be refrigerated, shield-like housings forming air passageways in the respective ends of the compartment, refrigerating elements supported in said passageways, a duct extending along the bottom of the compartment and having connection with said passageways, and a fan connected with said duct for circulating air from one of said passageways through the other to be refrigerated by said refrigerating elements and for circulation through the compartment.

3. In a compartment to be refrigerated, shield-like housings forming vertical passageways at the ends of the compartment and having air inlet and outlet openings respectively, a refrigerating element in at least one of the passageways, a duct connecting the passageways, and means connected with said duct for effecting circulation of air from the compartment and through one of said passageways for movement through said duct to the other passageway for discharge into the compartment.

4. In a case having a compartment to be refrigerated, shield-like housings forming vertical passageways at the ends of the compartment and having air inlet and outlet openings respectively, a refrigerating element in each of the passageways, a duct connecting the lower ends of the passageways, and means connected with said duct for effecting circulation of air from the compartment and through one of said passageways for movement through said duct to the other passageway for discharge into the compartment.

5. In a compartment to be refrigerated, means forming vertical passageways at opposite locations in the compartment and an interconnecting

passageway at the bottom ends of the vertical passageways, a refrigerating element in at least one of said passageways, one of said vertical passageways having a series of vertically spaced air inlets from the compartment and the other a series of air outlets to the compartment, and means connected with said passageways for effecting circulation of air from the compartment through one of the vertical passageways and

through the connecting passageway for return to the compartment through the other vertical passageway, said air being drawn in and discharged through said inlets and outlets at the respective elevations thereof.

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