Oct. 7, 1969 L. F. BARROERO 3,471,210

REFRIGERATOR DISPLAY CASE

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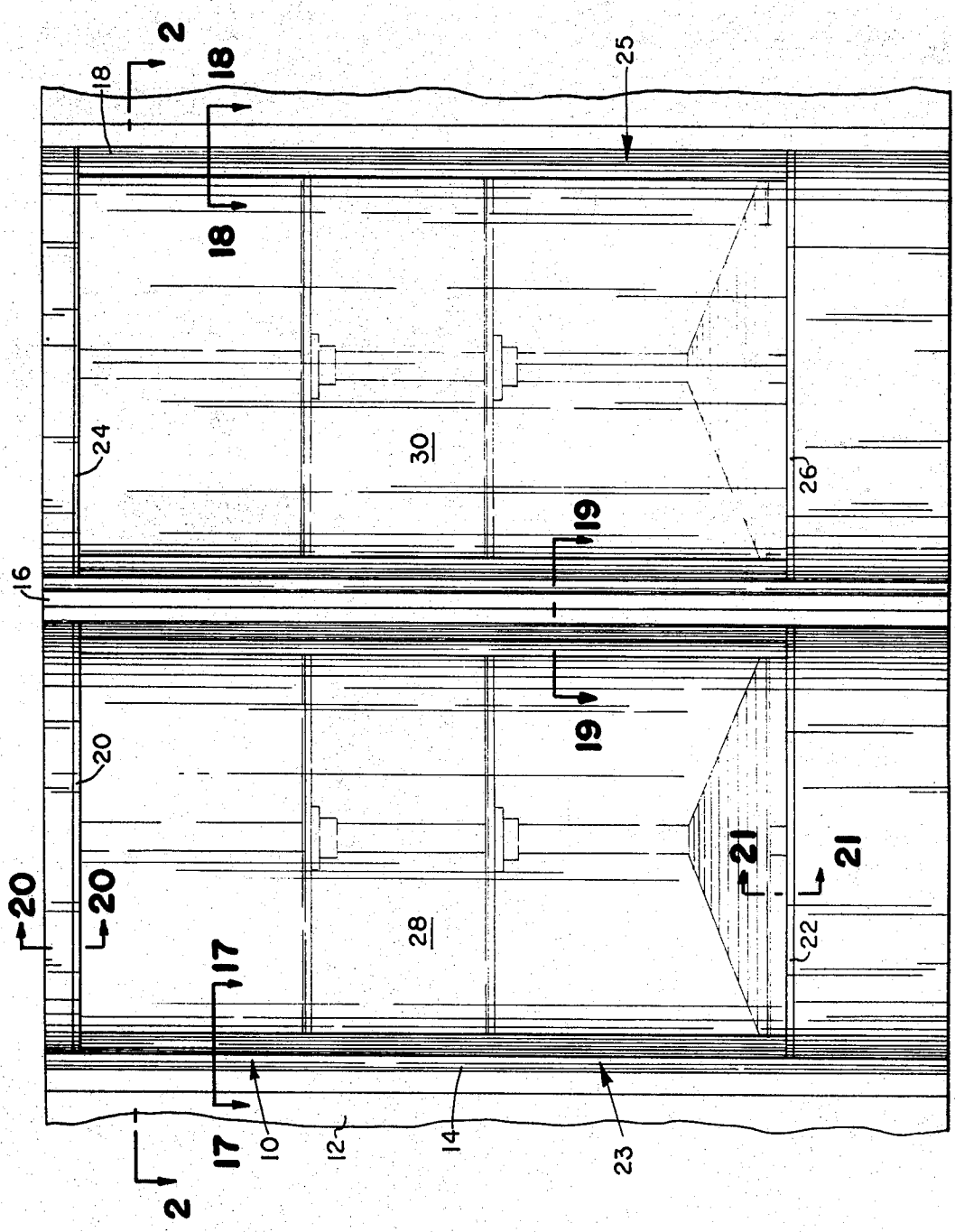


FIG_1

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Oct. 7, 1969 L. F. BARROERO 3,471,210

REFRIGERATOR DISPLAY CASE

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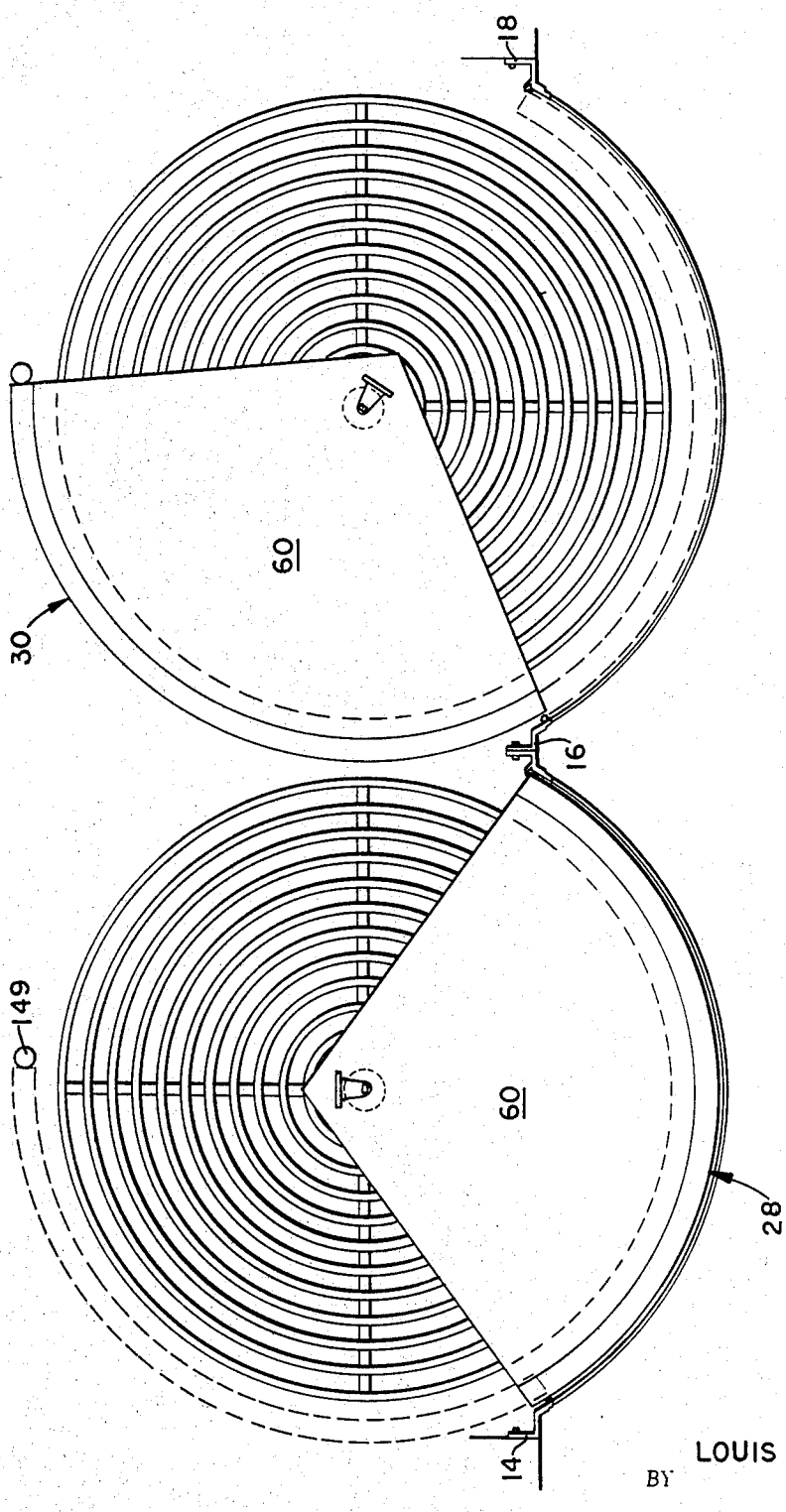


FIG_2

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Oct. 7, 1969 L. F. BARROERO 3,471,210

REFRIGERATOR DISPLAY CASE

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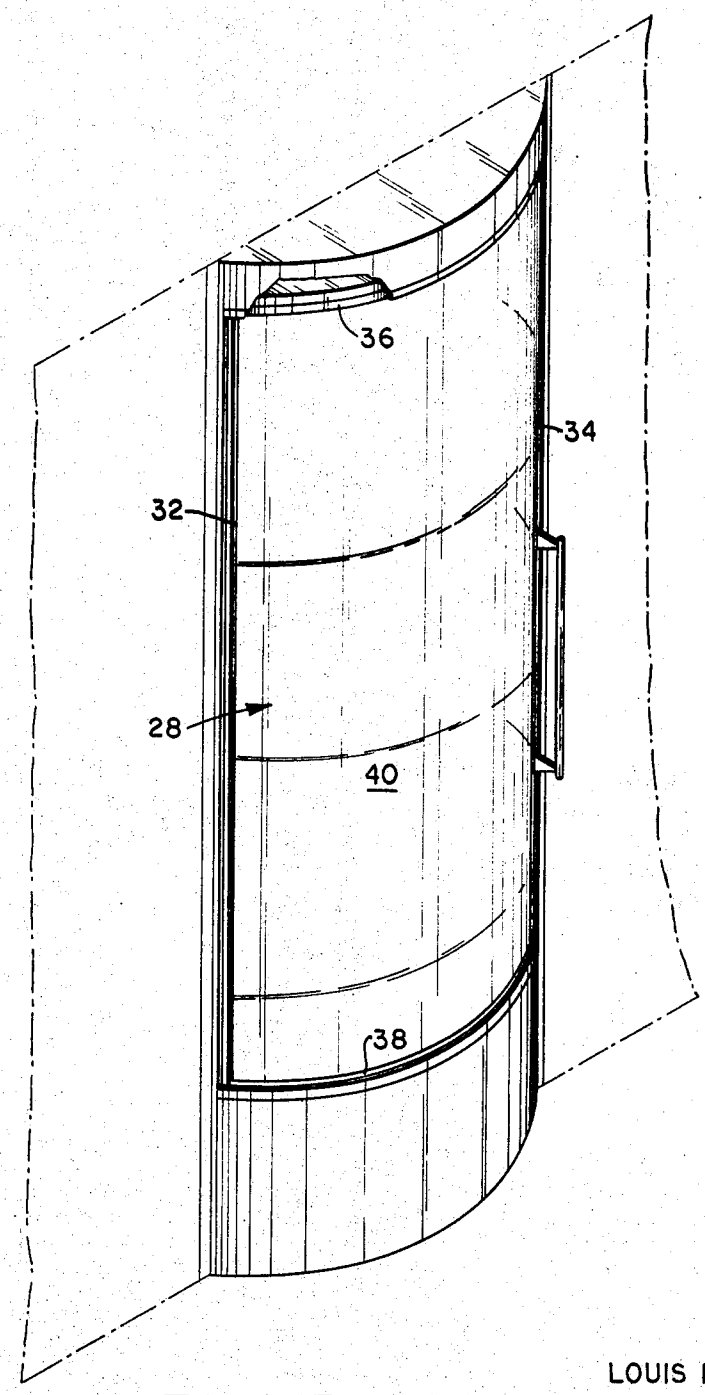


FIG_3

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Oct. 7, 1969 L. F. BARROERO 3,471,210

REFRIGERATOR DISPLAY CASE

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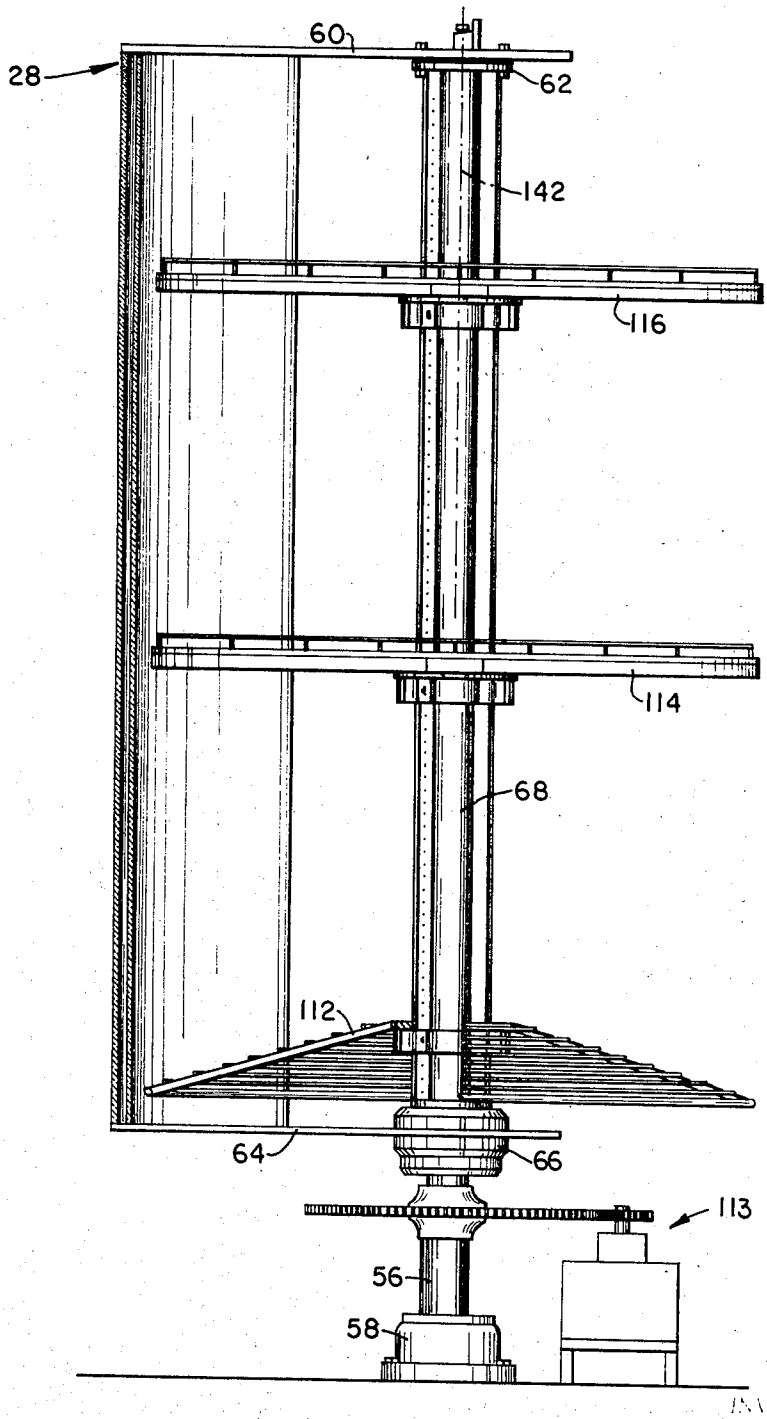


FIG_4

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Oct. 7, 1969 L. F. BARROERO 3,471,210

REFRIGERATOR DISPLAY CASE

Filed March 4, 1968 11 Sheets-Sheet 5

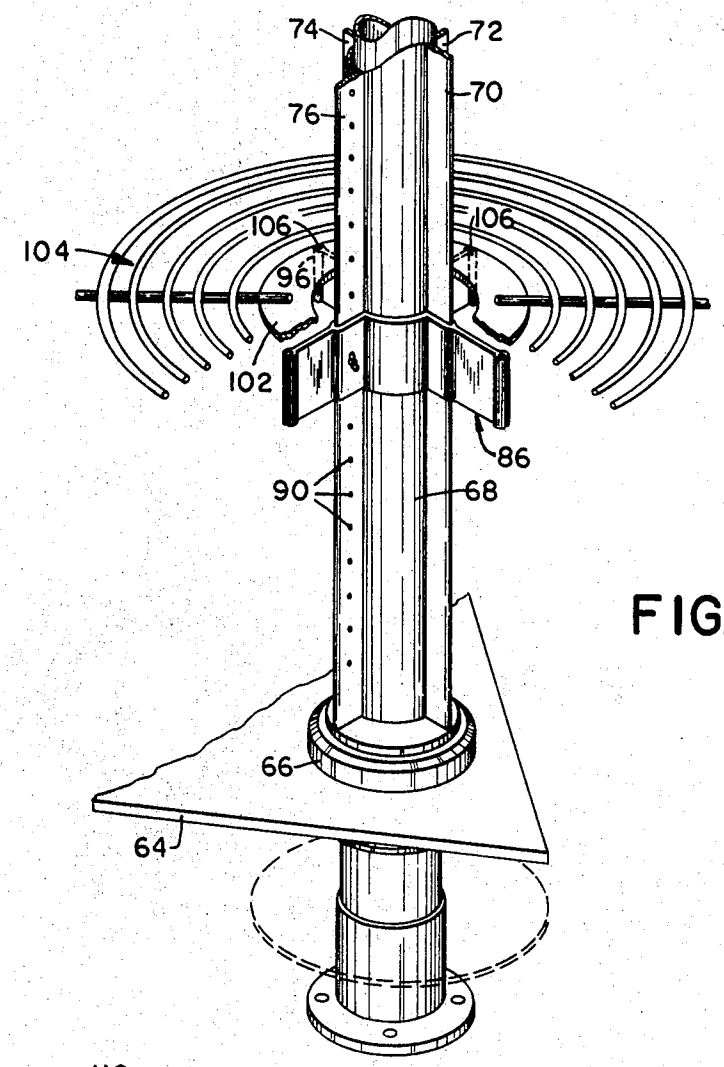


FIG_5

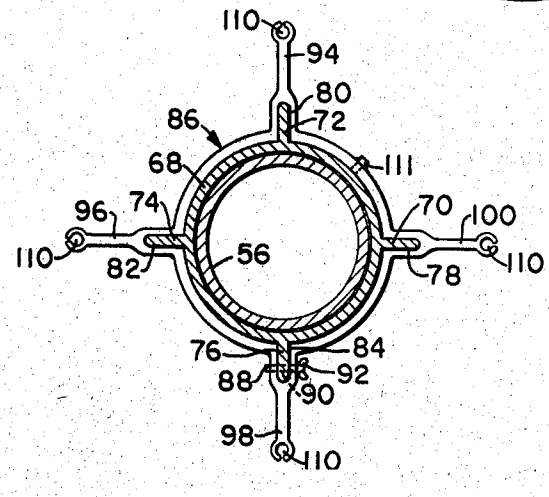


FIG_6

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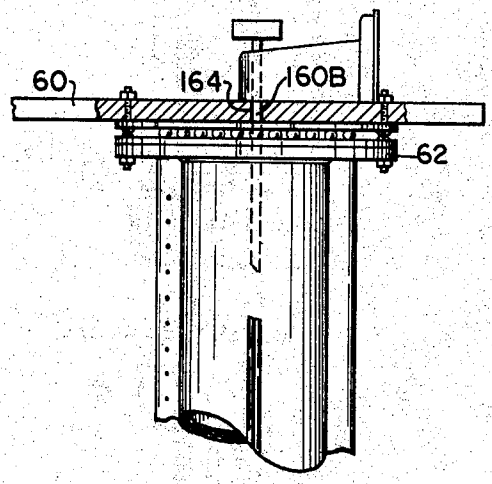
Mellin, Moore & Weissenberger

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REFRIGERATOR DISPLAY CASE

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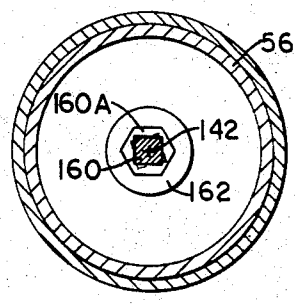


FIG_9

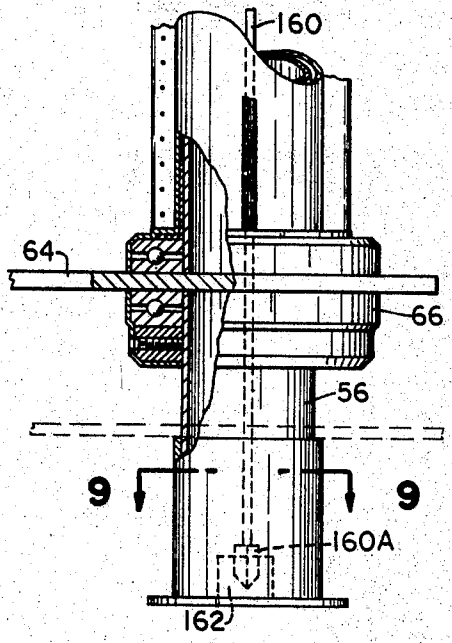


FIG_7

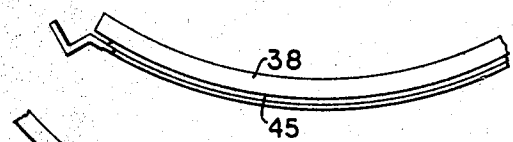


FIG_8A

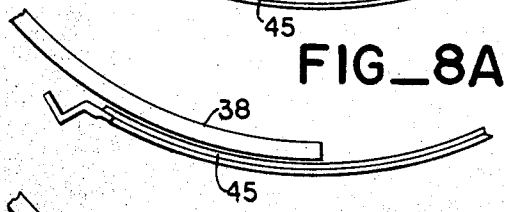


FIG_8B

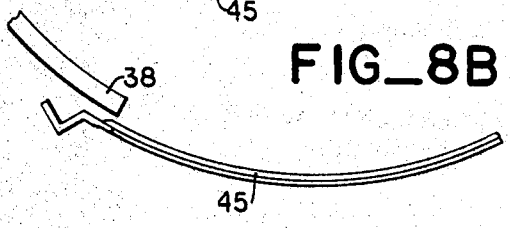


FIG_8C

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Oct. 7, 1969 L. F. BARROERO 3,471,210

REFRIGERATOR DISPLAY CASE

Filed March 4, 1968 11 Sheets-Sheet 7

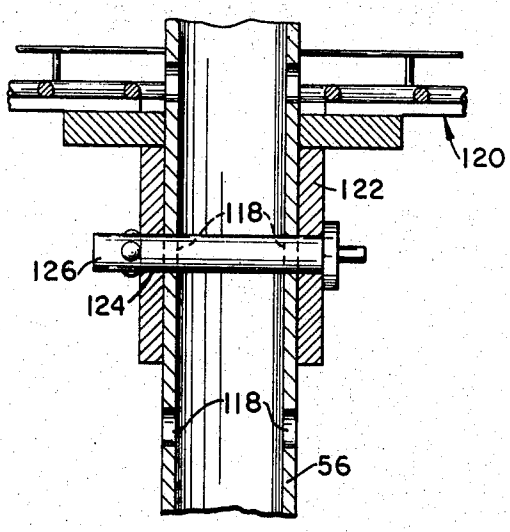


FIG_15

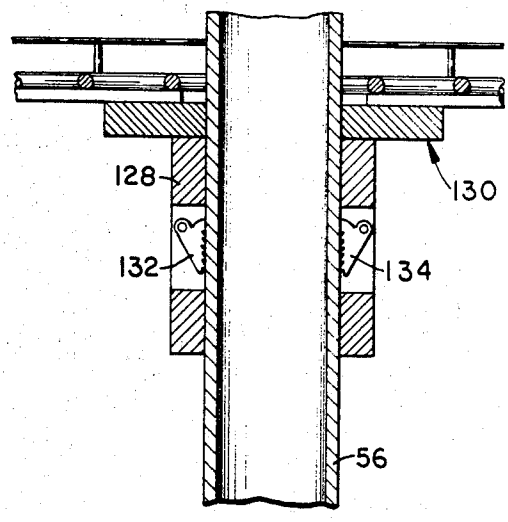


FIG_16

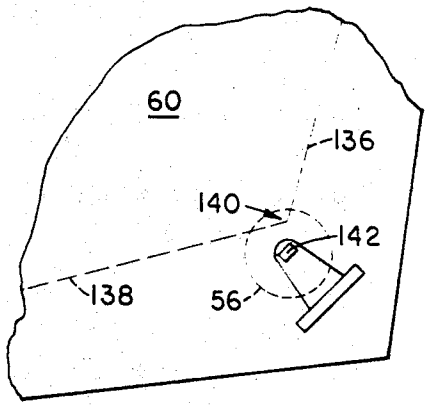


FIG_11

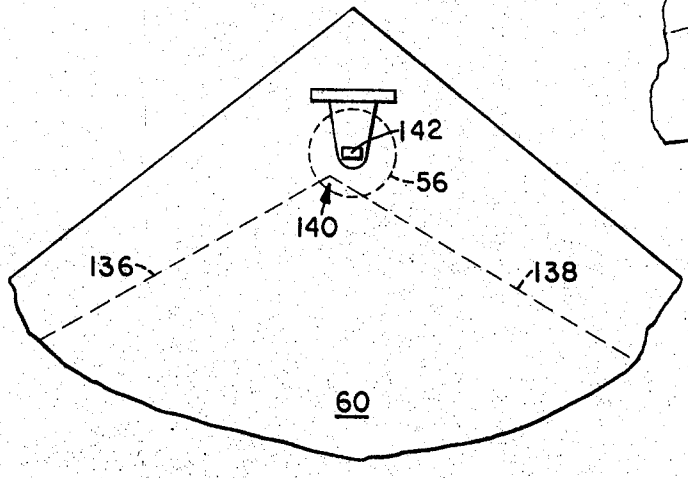


FIG_10

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Oct. 7, 1969 L. F. BARROERO 3,471,210

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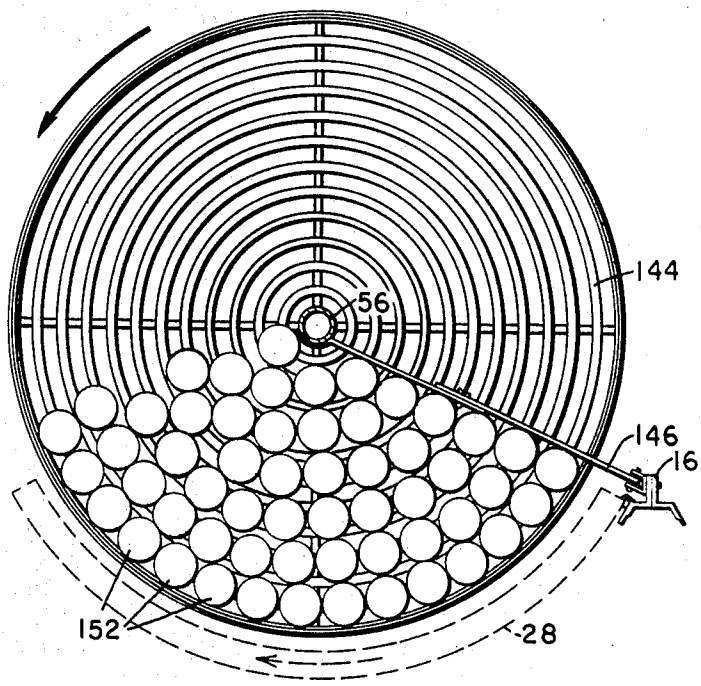


FIG_12

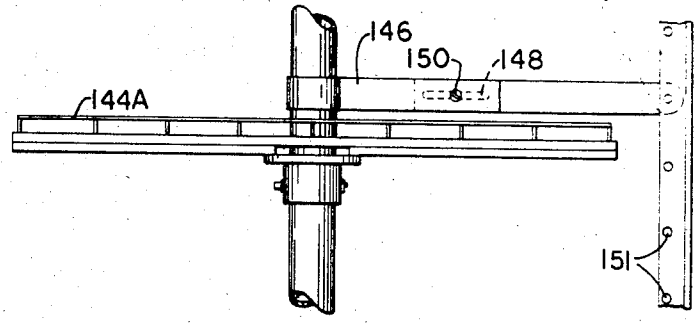


FIG_13

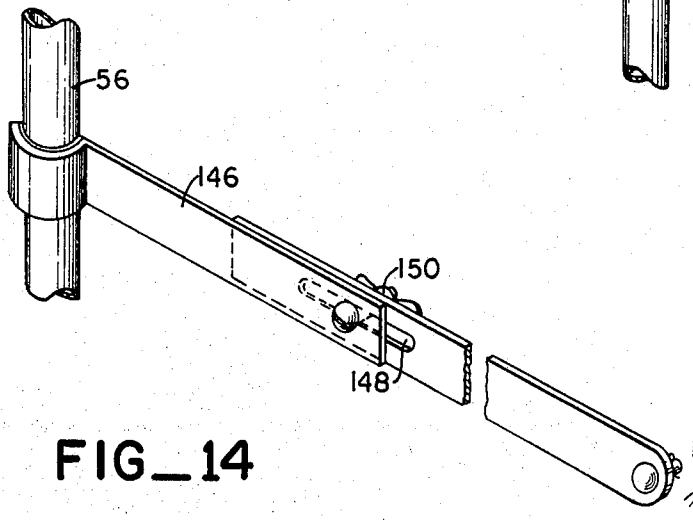


FIG_14

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REFRIGERATOR DISPLAY CASE

Filed March 4, 1968 11 Sheets-Sheet 9

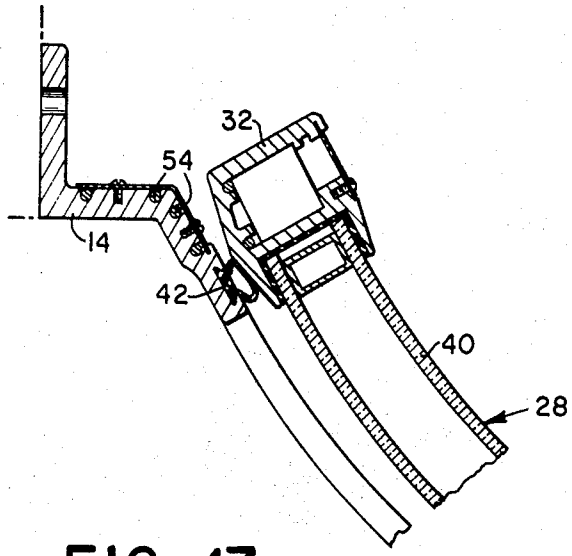


FIG_17

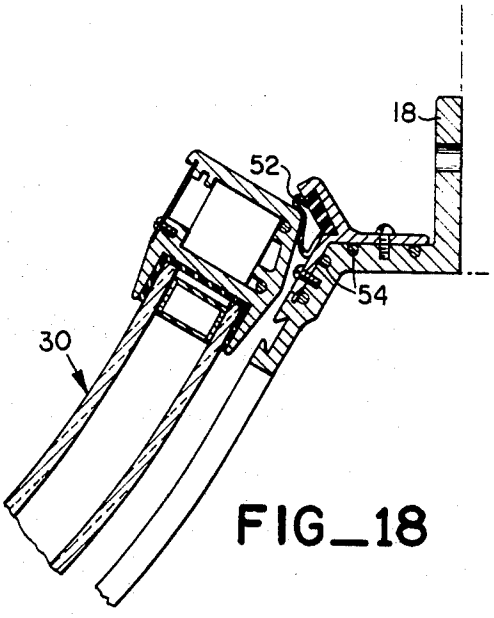


FIG_18

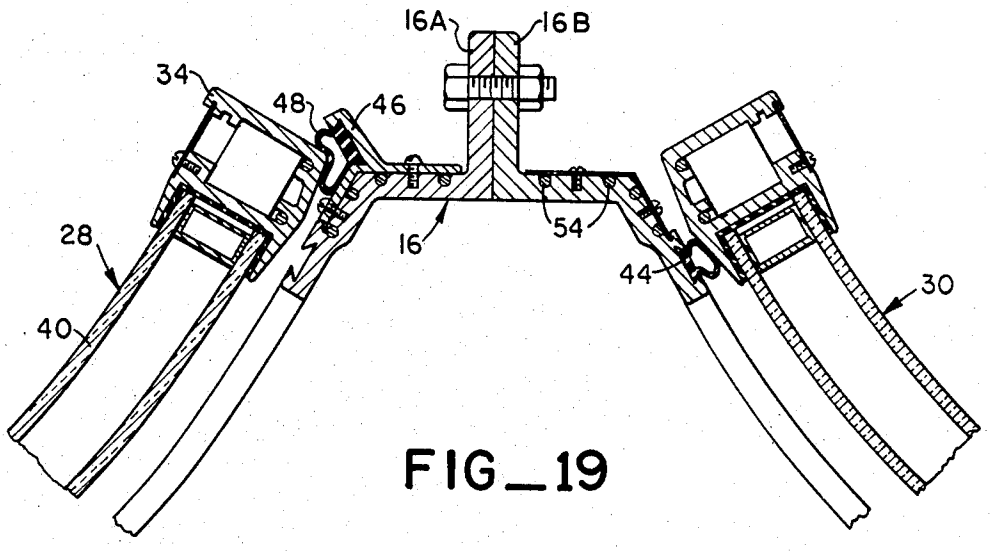


FIG_19

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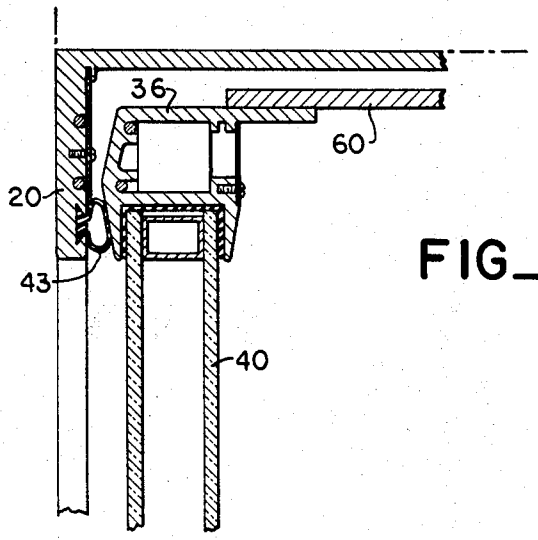


FIG_20

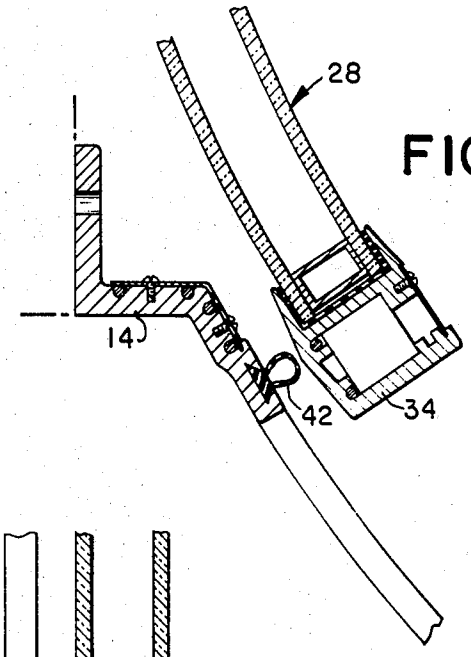
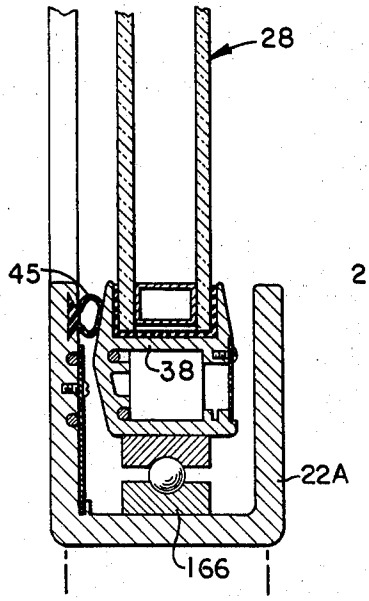


FIG_22

FIG_23



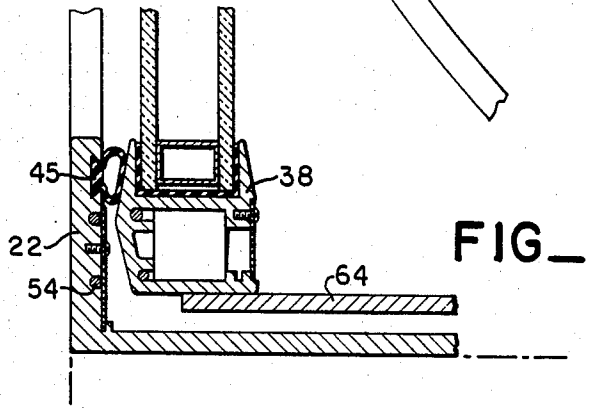


FIG_21

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REFRIGERATOR DISPLAY CASE

Filed March 4, 1968 11 Sheets-Sheet 11

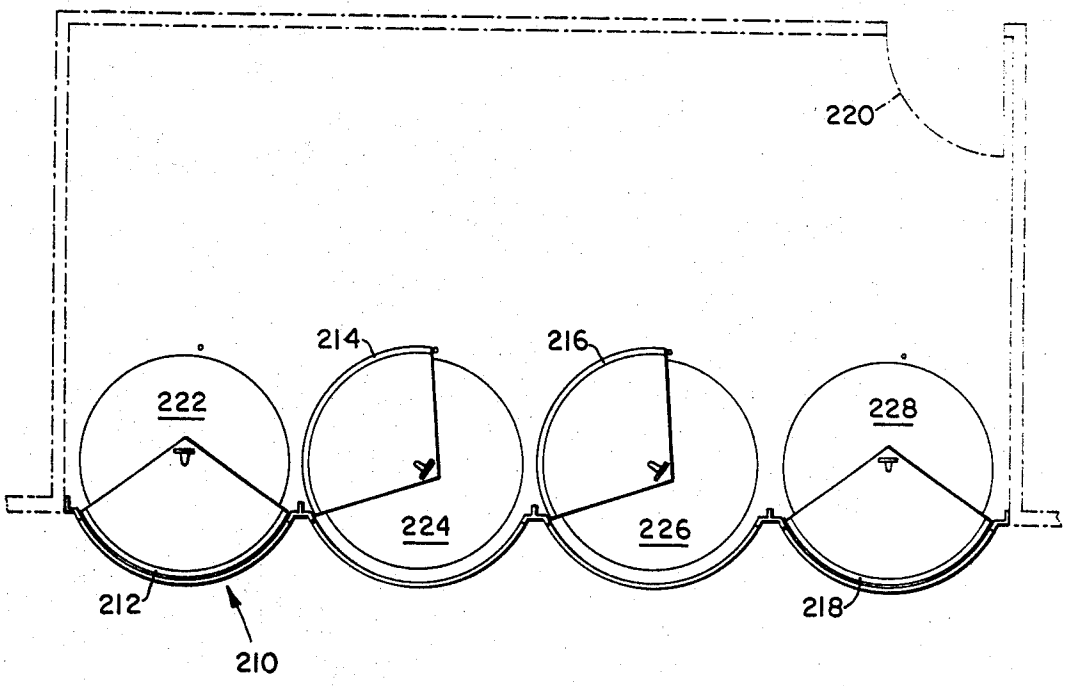


FIG_24

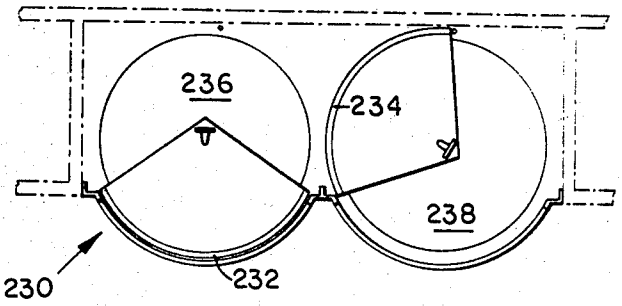


FIG_25

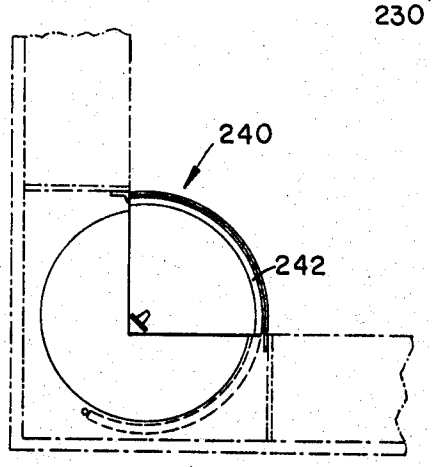


FIG_26

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United States Patent Office

3,471,210

Patented Oct. 7, 1969

3,471,210

REFRIGERATOR DISPLAY CASE

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Filed Mar. 4, 1968, Ser. No. 710,121
Int. Cl. A47f 3/00; F25d 23/02
U.S. Cl. 312—329 10 Claims

ABSTRACT OF THE DISCLOSURE

A refrigerator display case having a case frame, an upright post disposed within the case frame, and a semicylindrical door pivotably attached to the post and supported relative thereto by means of a pair of arms fixed near the top and bottom of the door, respectively, the door being pivotal from a closed position to a position substantially within the case frame.

Background of the invention

This invention relates to refrigerators, and more particularly to a refrigerator having a door which opens to a position substantially within the body of the refrigerator.

As is well known, the conventional type of freezer or refrigerator used in supermarkets is of the open type. That is to say, it is generally of elongated configuration with a large permanently open top or front and a number of shelves therein on which items are placed. While this type of unit is relatively convenient for use in that there are no doors to open and close to allow access to the items, it has been found that the cost of operating such a unit is quite high, obviously due to the fact that heat is continually allowed to enter the unit through the open top or front. While, of course, a conventional door-type refrigerator could be substituted for such an open type to overcome the high operating cost thereof, other problems arise from such a substitution. The door-type refrigerators generally have a door which opens outward of the refrigerator body. In a supermarket or smaller market, where utilization of space is extremely important, this can create serious problems of congestion and inconvenience in the aisle adjacent the refrigerator, and also make necessary a wide aisle space adjacent the door. It would thus be advantageous to provide a refrigerator having a door which is capable of closing the refrigerator to keep heat from traveling thereinto, the door meanwhile being capable of movement to a position substantially within the refrigerator body.

Display cases, whether of the refrigerator or non-refrigerator type, which provide such movement of a door thereon are known. See, for example, Morrison (2,994,572), Waddell (946,626), Ressinger (2,362,095), McCosh (1,791,736), Finn (1,326,718), and Romsos (1,134,908). However, these devices have certain drawbacks which should be pointed out. Morrison, Romsos and McCosh each provide a door which is itself slidable in rollers or grooves to a position substantially within the case body. Thus, either a relatively complicated roller structure (Morrison) is required, or close tolerances of such grooves is necessary to provide smooth and proper movement of the door (Romsos and McCosh). Waddell and Ressinger each provide means adjacent the ends of the doors therein to support the respective doors. But it will be seen that these support means are not particularly sturdy, and are not adapted for use where the doors therein are to be pivoted about an axis substantially perpendicular to the ground. Finn provides an upright post to support the doors therein. While a sturdy means of support is disclosed, this device provides a pair of doors and a relatively complicated operating structure.

It is an object of this invention to provide a display case having a single door which is adapted to close the case and adapted to be moved to a position substantially within the case body, meanwhile being quite simple in design and operation.

It is a further object of the invention to provide a display case of such type which is extremely sturdy and smooth in operation when the door is pivoted about an axis substantially perpendicular to the ground, with no close tolerances required and virtually no possibility of binding.

It is a still further object of the invention to provide a display case of such type having automatic door closing means cooperating therewith.

Summary of the invention

Broadly stated, the case for displaying items comprises a case body within which the items are disposed and defining an opening allowing access to the items. A door is configured to close the opening and form with the case body a substantially airtight case when the opening is so closed. A substantially upright post is mounted within the case and to the case body. An arm is pivotally mounted to the post and fixed to the door, whereby the door is pivotally mounted to the post, the door being pivotable to a first position to substantially close the opening and to a second position substantially within the case body allowing access through the opening to the items contained therein. Means are included for supporting the door in its first and second positions and when being moved therebetween. Further included are means for biasing the door in its first position and resiliently urging the door toward its first position.

Brief description of the drawings

These and other objects will become apparent from a study of the accompanying specification and drawings, in which:

FIG. 1 is a front elevation of the device;

FIG. 2 is a view taken along the line 2—2 of FIG. 1;

FIG. 3 is a perspective view of the device showing the door thereof;

FIG. 4 is a side elevation of the device with portions removed;

FIG. 5 is a perspective view of the post of the device and structure mounted thereon, with portions removed;

FIG. 6 is a sectional view taken along the line 6—6 of FIG. 4;

FIG. 7 is a side elevation with a portion removed, of the post portion of the device and structure mounted thereon;

FIG. 8A is a plan view of a door and surrounding framework of the device with the door in a closed position;

FIG. 8B is a view similar to FIG. 8A but with the door in an intermediate position;

FIG. 8C is a view similar to FIGS. 8A and 8B but with the door in an open position;

FIG. 9 is a sectional view taken along the line 9—9 of FIG. 7;

FIG. 10 is a fragmentary plan view of an arm of the device, showing the offset of the post around which the arm is pivoted, the arm being shown in its position when the door is closed;

FIG. 11 is a view similar to FIG. 10 but with the arm shown in its position when the door is open;

FIG. 12 is a plan view of a shelf of the device, shown in cooperation with a strap extending across the face thereof;

FIG. 13 is a side elevation of the structure of FIG. 12.

FIG. 14 is a perspective view of the strap and post of FIGS. 12 and 13;

FIG. 15 is a sectional view showing the mounting of another embodiment of shelf structure on the post;

FIG. 16 is a sectional view of yet another embodiment of shelf structure mounted on the post;

FIG. 17 is a sectional view taken along the line **17—17** of FIG. 1;

FIG. 18 is a sectional view taken along the line **18—18** of FIG. 1;

FIG. 19 is a sectional view taken along the line **19—19** of FIG. 1;

FIG. 20 is a sectional view taken along the line **20—20** of FIG. 1;

FIG. 21 is a sectional view taken along the line **21—21** of FIG. 1;

FIG. 22 is a view similar to that of FIG. 17 but with the door open;

FIG. 23 is a sectional view of alternative support structure for the bottom portion of a door of the device;

FIG. 24 is a plan view of the device shown as a walk-in refrigerator unit;

FIG. 25 is a plan view of the device shown as a reach-in refrigerator unit;

FIG. 26 is a plan view of the device shown as a refrigerator unit positioned in the corner of a room.

Description of the preferred embodiments

A refrigerator display case **10**, mounted in a wall **12**, is shown in FIG. 1. The display case **10** includes upright frame members **14**, **16** and **18**. A curved frame member **20** interconnects frame members **14**, **16** at the tops thereof, and a curved frame member **22** interconnects frame members **14**, **16** at the bottom thereof. The frame members **14**, **16**, **20**, **22** form a first case frame **23** defining an opening. The case frame **23** is part of a case body which includes the rearward portion of the refrigerator. Similarly, a curved frame member **24** interconnects frame members **16**, **18** at the tops thereof, and a curved frame member **26** interconnects frame members **16**, **18** at the bottoms thereof. The frame members **16**, **18**, **24**, **26** form a second case frame **25** defining an opening. The case frame **23** and case frame **25** form part of a case body which includes the rearward, upper and lower portions of the refrigerator display case **10**.

Cooperating with these openings are doors **28**, **30** which are of substantially semi-cylindrical configuration. The frame members and members which make up the doors are shown in detail in FIGS. 17–21 and FIG. 3.

As will be seen in these figures, frame members **14** and **18** are extrusions, and frame member **16** is made up of a pair of frame member extrusions **16A** and **16B** bolted together. Door **28** is made up of upright extrusions **32**, **34**, curved top and bottom extrusions **36**, **38**, and a glass portion **40** of double thickness. Door **30** is of similar construction. Frame member **14** has mounted along its length a sealing strip **42**, to cooperate with extrusion **32**, and frame member **16B** has a similar sealing strip **44** mounted along its length to cooperate with the corresponding extrusion of door **30**. Frame member **16A** has fixed thereto a bracket **46** which holds a longitudinal sealing strip **48** which cooperates with extrusion **34**, and frame member **18** has fixed thereto a bracket **50** which holds a longitudinal sealing strip **52** which cooperates with the corresponding extrusion of door **30**. Frame member **20** has mounted along its length a sealing strip **43** to cooperate with top extrusion **36**, and frame member **22** has mounted along its length a sealing strip **45** to cooperate with bottom extrusion **38**. Heater cables (as **54**) are mounted in the extrusions where required. The mounting of the doors **28**, **30** so that such cooperation takes place will now be described in detail.

The support means for such a door **28** relative to the frame is best shown in FIG. 4. Shown therein is a substantially upright post **56** mounted in a suitable support bearing **58** which in turn is mounted to the floor. An arm **60** is pivotally mounted to the post **56** at the upper

end thereof by means of a bearing **62**. A second arm **64** is pivotally mounted to the post **56** adjacent the lower end thereof by means of a bearing **66**. Arms **60** and **64** each extend from the post **56** and are fixed to upper and lower portions of the door **28** respectively. The bearings **62** and **66** are limited in their travel along the length of post **56**, and so act to hold the door **28** in proper position along the length of the post **56**. The door **28** is pivotally mounted to the post **56**, about the longitudinal axis **142** of the post **56**, the arms **60**, **64** determining the path of travel of the door **28**.

Fitted over the post **56** is a longitudinal shelf tube **68** (FIGS. 5 and 6) having four radial flanges **70**, **72**, **74**, **76** extending therefrom, each running the length of the shelf tube **68**. Adapted to slidably fit over the shelf tube **68**, and having slots **78**, **80**, **82**, **84** therewithin to receive the flanges **70**, **72**, **74**, **76** respectively, is a shelf bracket **86**. The shelf bracket **86** has therein an aperture **88** adjacent slot **84** which is registrable with any one of a plurality of apertures **90** along flange **76** as shelf bracket **86** is slid up or down along shelf tube **68**. Shelf bracket **86** may be locked in position relative to the shelf tube by disposing a locking pin **92** through the aperture **88** and through any one of the opertures **90**. Shelf bracket **86** has arms **94**, **96**, **98**, **100** extending therefrom, upon which rests an annular plate **102** of a shelf **104**. The annular plate **102** is fixed to the shelf bracket **86** by means of screws **106** which pass through apertures **108** in the annular plate **102** and thread into receiving apertures **110** in the arms **94**, **96**, **98**, **100**. In this way the shelf **104** is mounted relative to the post **56**, and yet can be adjusted along the length of the post **56** by removing locking pin **92**, moving the shelf **104** up or down, and replacing locking pin **92**. A set screw **111** may be provided as a locking means in addition to the locking pin **92**. It will be seen, of course, that other shelves **112**, **114**, **116** (FIG. 4) may be mounted in a similar manner.

Drive means **113**, as an electric motor, may be provided to slowly rotate post **56** (through a gear reduction). Bearings **62**, **66** allow rotation of the post **56** relative to the arms **60**, **64** and door **28**. Shelf tube **68** rotates with post **56**, as do shelf bracket **86** and shelf **104**, and items placed on shelf **104**.

Other means for mounting shelves on post **56** are shown in FIGS. 15 and 16. In FIG. 15, post **56** has a plurality of apertures **118** therethrough, and a shelf **120** is mounted on a sleeve **122** disposed about post **56**. Sleeve **122** has an aperture **124** therethrough which is registrable with one of the apertures **118**. The position of shelf **120** along post **56** may be set by moving the shelf **120** until aperture **124** in registry with one of the apertures **118**, and placing a pin **126** through these apertures.

In FIG. 16, a sleeve **128**, similar to sleeve **120**, is disposed about post **56**, and on the sleeve **128** is mounted a shelf **130**. However, instead of providing apertures in the sleeve **128** and post **56**, a pair of grippers **132**, **134** are pivotally fixed to the sleeve **128** and are adapted to be wedged into and against the post **56** under the weight of the shelf **130**. Teeth are provided on grippers **132**, **134** to aid in such gripping, whereby the position of the shelf **130** along the post **56** may be set.

As stated previously, door **28** is of substantially semi-cylindrical configuration. In FIGS. 9 and 10, dotted lines **136**, **138** are lines which run from the edges of the door **28** to the longitudinal axis **140** of that cylinder. It is to be noted that the longitudinal axis **140** of the cylinder is parallel to but spaced from the longitudinal axis **142** of the post **56** about which the arms **60**, **64** and door **28** are pivotal. The spacing of the longitudinal axes **140**, **142** is of extreme importance and results in the door **28** following a path as best shown in FIGS. 8A, 8B and 8C as it is opened and closed.

As shown in FIG. 8A, the bottom extrusion **38** which is part of door **28** is sealingly disposed against sealing strip **45** when door **28** is in its closed position. Similarly, top

extrusion **36** is sealingly disposed against sealing strip **43**, upright extrusion **32** is sealingly disposed against sealing strip **42**, and upright extrusion **34** is sealingly disposed against sealing strip **48** when door **28** is in its closed position (FIGS. 17, 19–21). As door **28** is opened (FIG. 7B), it moves rearwardly to the case frame **23** and into the case body, and, because of the offset of the longitudinal axes **140, 142** described above, moves away from the sealing strips **43, 45, 42, 48**. FIG. 8C shows the door **28** in completely open position. In such state, door **28** is disposed substantially within the case body and has moved even further away from sealing strips **43, 45, 42, 48** (see also FIG. 22). The fact that the door **28** moves to a position substantially within the case body of the device means that it is almost completely out of the way, i.e., it need not be opened into the aisle of, for example, a store, blocking the way for customers. The fact that the door **28** moves away from the sealing strips **43, 45, 42, 48** means that, while an effective seal is achieved when the door **28** is closed, there is little or no friction between the door **28** and those seals as the door **28** is opened, resulting in little wear on the sealing strips and easy movement of the door from its closed to its open position and back again. Stop means **149** (FIG. 2) are included to limit the travel of door **28** from its closed position to its open position.

As mentioned previously, drive means **113** (FIG. 4) are provided to slowly rotate post **56**. Referring to FIGS. 12–14, a shelf **144** may be mounted on the post **56** by any of the means previously described. That shelf **144** will rotate with such rotating post **56**. An additional device, shown in FIGS. 12–14, may be used with advantage in cooperation with such a shelf **144**.

Mounted to frame member **16** is a strap **146** which extends therefrom across the top face of shelf **144** to adjacent the post **56**. The strap **146** may with advantage be variable in length (by means of slot **148** and bolt and wingnut **150**). A rail **144A** is fixed about the edge of shelf **144**. It will be seen that with items **152** placed on the shelf **144** and the shelf **144A** being rotated in the direction indicated by arrow A, strap **146** and rail **144A** will cooperate to hold the items **152** relative to the case frame. That is, the items **152** become wedged in between the strap **146** and rail **144A**, which limits the movement of the items **152** even though the shelf **144** rotates. The face of the shelf **144** may be provided with rollers to insure that items **152** thereon are not worn or damaged.

The advantages of such structure are numerous. First, it will be seen that items **152** will always be served up from the rear portion of shelf **144** to the front portion thereof adjacent door **28**. This insures that a customer can always easily and conveniently reach items **152**. Secondly, if the device is of the type that the items **152** are loaded into the rear thereof and not through door **28**, the structure insures that the items **152** not recently loaded will be sold first, since they are the items most adjacent door **28**.

It will be seen, of course, that a plurality of shelves, and straps cooperating therewith, could be provided along post **56**.

As shown in FIGS. 12 and 13, strap **146** is pivotally mounted to frame member **16** so that it can be moved upward and away from the face of shelf **144** if desired. Also a plurality of mounting points **151** for the strap **146** are provided so that it can be positioned to cooperate with shelf **144** no matter where that shelf **144** is positioned along post **56**.

As best shown in FIGS. 6 and 8, an elongated torque rod **160** is longitudinally disposed in the post **56**. One end of the torque rod **160** is anchored relative to the case body by means of hexagonal end portion **160A** of torque rod **160** which fits into a hexagonal receiving aperture in a block **162** fixed relative to the case body. The other end of the torque rod **160** is anchored relative to the arm **60** by fitting a portion **160B** of square cross section into a square aperture **164** in arm **60**. The torque rod **160** serves to bias the door **28** in a closed position and resiliently urge the door **28** to a closed position by producing a turning moment on the door **28** about the longitudinal axis **140** of the post **56**. FIG. 9 shows this twisting of the torque rod **160** to a certain degree.

FIG. 23 shows a second means of supporting the bottom portion of door **28**. Instead of arm **64** interconnecting the door **28** and the post **56**, arm **64** is eliminated. A frame member **22A**, which is channel-like in cross section, is substituted therefor, and has disposed therein a plurality of roller means **166** which act to support the door **28** as it is moved from its closed to its open position and back again.

FIGS. 24–26 show various installments of the refrigerator display case. FIG. 24 shows a refrigerator display case **210** having four doors **212, 214, 216, 218** thereon allowing access to items within the case **210**. A door **220** is included in the case body so that the shelves **222, 224, 226, 228** may be loaded by a person passing through the door **220**. FIG. 25 shows a smaller refrigerator display case **230** having doors **232, 234** which allow access to items within the case **230**. However, in this embodiment, no door is provided in the use of the case body, the loading of shelves **236, 238** taking place through doors **232, 234**. FIG. 26 shows the refrigerator case **240** as it would be used in a home. The case **240** is disposed in the corner of a room and has a single non-transparent door **242**.

As will be seen from a study of these figures, significant advantages result from applicant's structure. It will be noted that each door, when it is opened, moves to a position substantially within the case body of the device. This results in a substantial saving of space, since doors need not be opened into aisles. Meanwhile, low operating costs are maintained since proper seals are effected by the doors when they are closed.

Various means may be provided for operating the doors of the device. For example, a foot pedal could be provided adjacent the case to open a door and provide access to the items therein. Release of the foot pedal would allow the torque rod mentioned previously to urge the door closed. Light-sensitive means could be included adjacent the door for detecting a light beam source having its beam directed at the light-sensitive means. Preventing the light beam from reaching the light-sensitive means could act to open the door. Such prevention could take place when a person reaches for the door, i.e., his hand blocks the light beam. Either of these door-opening means could be tied in with post- and shelf-rotating means so that the opening of the door stops such rotation. Either of these door-opening means could be combined with means which automatically close the door after a certain time that the door has remained open.

Obviously, the invention can be carried out in many different ways, and the embodiments shown and described are merely illustrative.

I claim:

1. A case for displaying items comprising:

(a) a case body within which the items are disposed and defining an opening allowing access to the items;

(b) a door configured to close the opening and form with the case body a case when the opening is so closed;

(c) a substantially upright post mounted within the case and held relative to the case body;

(d) an arm pivotally mounted to the post and limited in its travel along the post, said arm being fixed to the door, whereby the door is pivotally mounted to the post, the door being pivotable to a first position to substantially close the opening and to a second position substantially within the case body allowing access through the opening to the items;

(e) means for supporting the door in its first and second positions and when being moved therebetween.

(f) roller means positioned within a trackway fixed to

the case body and disposed to support the lower edge of the door, the limitation of the arm's travel on the post and the roller means cooperating to support said door;

(g) said arm being pivotable about an axis parallel to but spaced from the axis of said case body, and said trackway describing an arc of a circle centered on said pivot axis of said arm.

2. The device of claim 1, in which said trackway and lower door edge are positioned in a channel, said channel having gasket means therein extending longitudinally thereof on one side of said channel; said channel being curved coaxially with said case body and being of sufficient width to permit said lower door frame edge to move crosswise of said channel from a position in engagement with said gasket in the closed position of said door to a position out of engagement therewith in the open position of said door.

3. A case for displaying items comprising:

(a) a case body within which the items are disposed and defining an opening allowing access to the items;

(b) a door configured to close the opening and form with the case body a case when the opening is so closed;

(c) a substantially upright post mounted within the case and held relative to the case body;

(d) a pair of arms pivotally mounted to the post and limited in their travel along the post, said arms being fixed to the door to support said door by virtue of said limitation of their travel, whereby the door is pivotally mounted to the post, the door being pivotable to a first position to substantially close the opening and to a second position substantially within the case body allowing access through the opening to the items;

(e) means for supporting the door in its first and second positions and when being moved therebetween;

(f) said door being substantially semi-cylindrical in configuration and being pivotally movable relative to the post about a line defined by the longitudinal axis of the post parallel to the longitudinal axis of the cylinder so that the door substantially seats in the opening when in its first position and unseats from the opening and is spaced from the case frame to an increasing degree as said door is moved from its first to its second position.

4. A case according to claim 3 wherein are included a plurality of shelves each disposed about the substantially upright post, said shelves being spaced along and removably mounted to the substantially upright post and adapted to hold items thereon.

5. A case according to claim 4 wherein are included means for rotating the post about its longitudinal axis independent of the pivotal movement of the door thereabout, whereby the shelves and items thereon are rotated with the post.

6. A case according to claim 5 wherein are included means for limiting the movement of the items with the shelves and holding them relative to the case body.

7. In a case having a case body, an upright post fixed thereto, and a door pivotally mounted to the post and movable to open and closed positions relative to the case body, means for biasing the door in a closed position and resiliently urging the door to a closed position comprising an elongated torque rod longitudinally disposed in the post and having one end anchored relative to the case body and the other end anchored relative to the door, whereby a turning movement about the longitudinal axis of the post is imposed on the door.

8. A case according to claim 7 wherein are included light-sensitive means adjacent the door for detecting a light beam, a light beam source adjacent the door and having its beam directed at the light-sensitive means, and means for moving the door from its closed to its open position when the light beam is prevented from reaching the light-sensitive means.

9. A case for displaying items comprising:

(a) a case body defining an opening therein;

(b) a door configured to close the opening and form with the case body a case when the opening is so closed, the door being movable to a first position to substantially close the opening and to a second position to allow access through the opening;

(c) a substantially upright post mounted within the case and to the case body;

(d) at least one shelf disposed about the post and removably mounted thereto and adapted to hold items thereon;

(e) means for rotating the post about its longitudinal axis, whereby the shelf and items thereon are rotated with the post;

(f) rail means fixed to the shelf about the periphery thereof to aid in keeping items on the shelf; and

(g) a strap extending across the face of the shelf and being fixed to the case body and extending to adjacent the post, the rail means and strap acting to limit the movement of the items with the shelf and hold them relative to the case body.

10. A display case, comprising:

(a) a body having a generally cylindrical surface, a door opening in its generally cylindrical surface;

(b) a curved door adapted to close off said door opening; and

(c) means for opening said door by arcuately moving it about an axis parallel to but spaced from the axis of curvature of said generally cylindrical surface, so that the pivoting movement of the door about said spaced axis causes increasing spacing of the door from said surface as the door opens.

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