

[54] **DOOR AND DOOR MOUNTING FRAME**

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[51] Int. Cl. **E06b 7/00**

[58] Field of Search.....49/70, 501, 504, 386, 382;
16/180

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[57] **ABSTRACT**

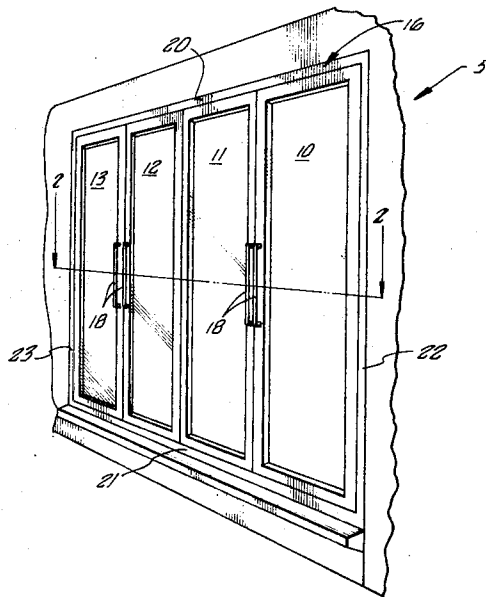
A refrigerated cabinet door and door mounting frame structure for mounting a plurality of electrically heated refrigerator doors with each door having selectable left or right hinging.

[56] **References Cited**

9 Claims, 8 Drawing Figures

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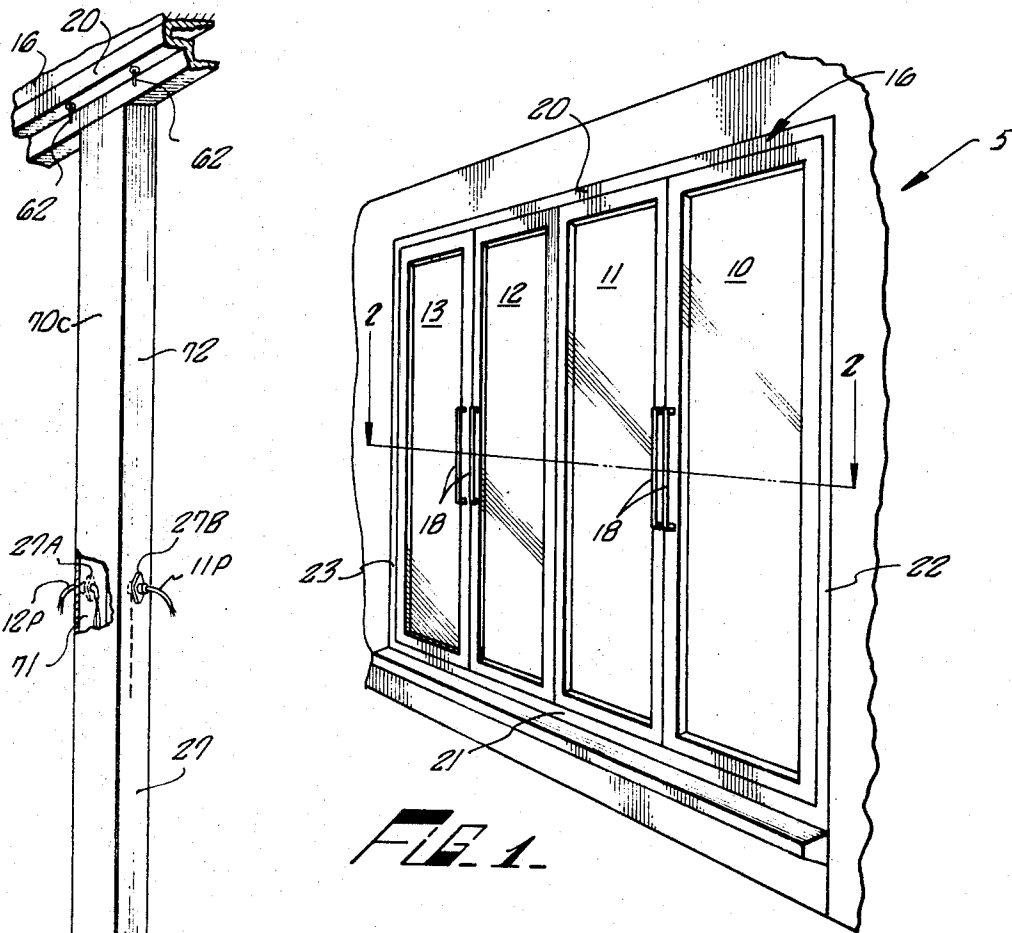


FIG. 1.

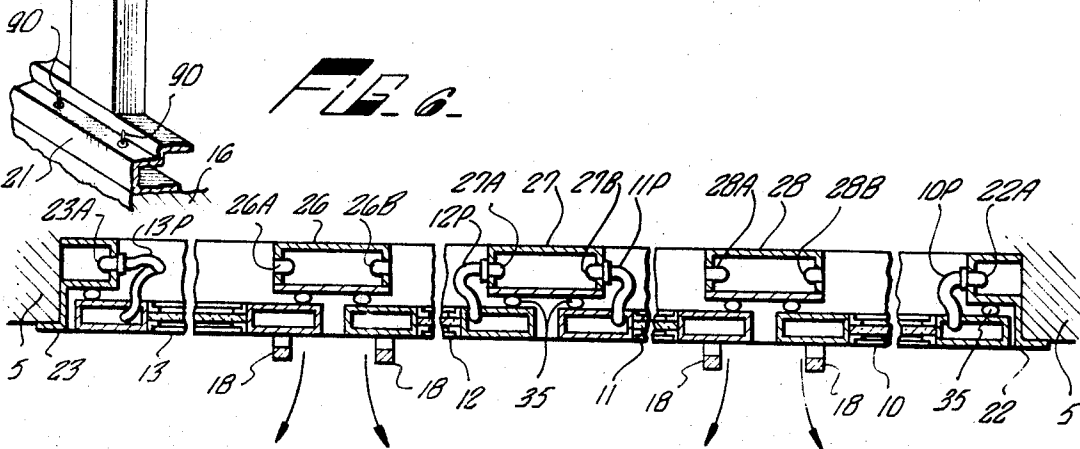


FIG. 2.

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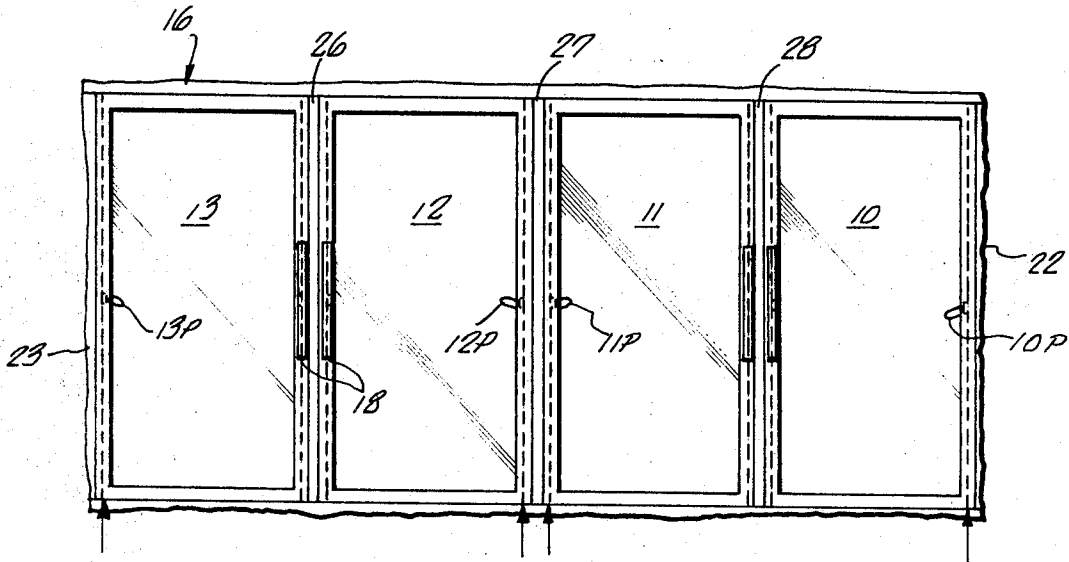


FIG. 3

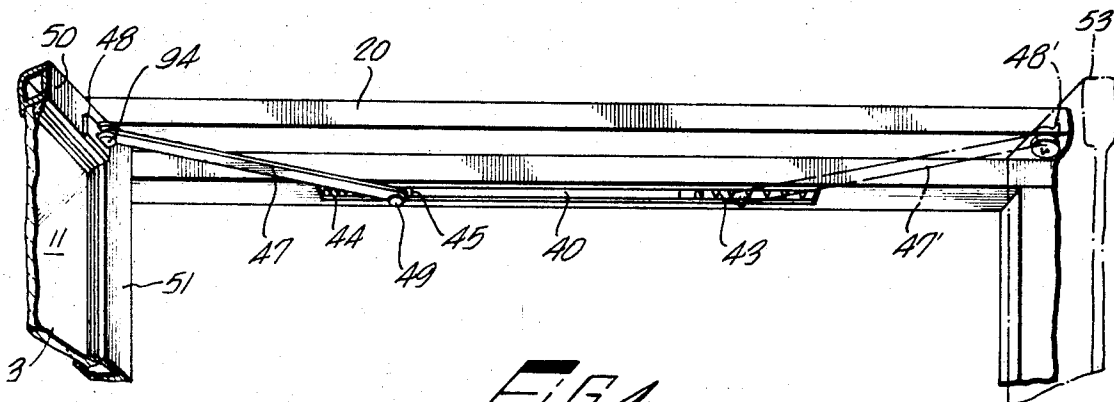


FIG. 4

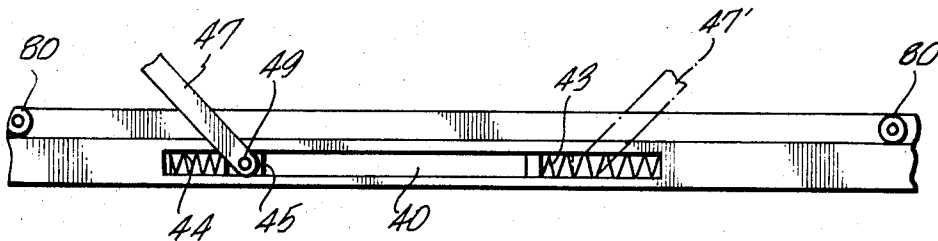


FIG. 5

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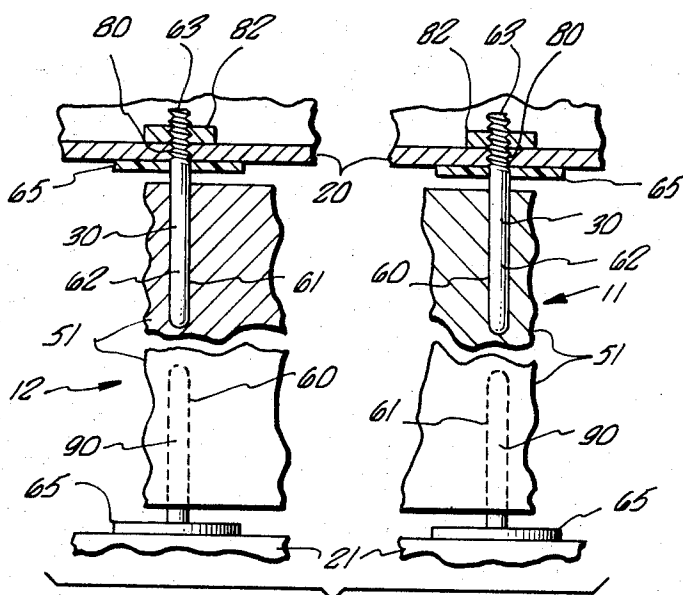


FIG. 1

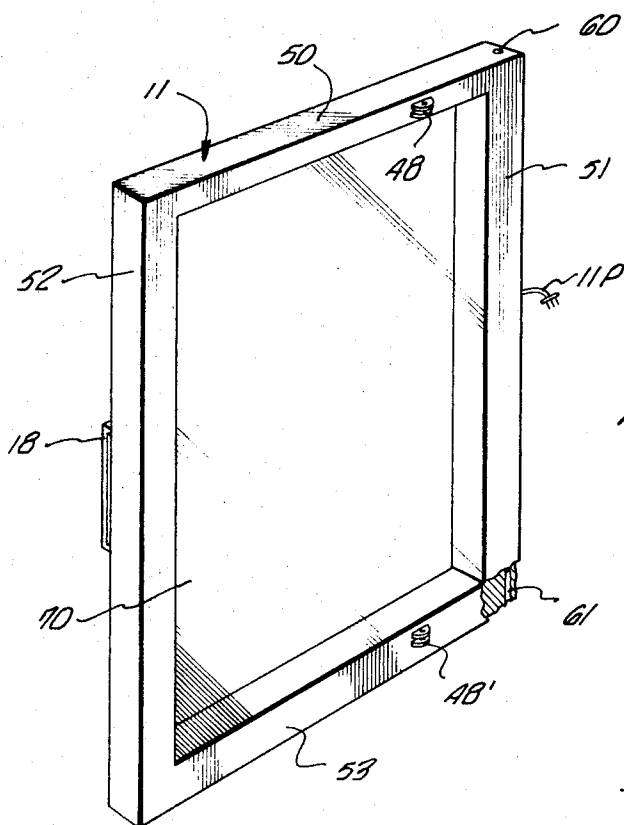


FIG 8

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DOOR AND DOOR MOUNTING FRAME

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to commercial upright refrigerated cabinets, and more particularly to refrigerated cabinet door and door mounting frame structures.

2. Description of the Prior Art

Low temperature commercial refrigerated cabinets are usually provided with a door mounting frame within which one or more doors are pivotally mounted in side by side relationship. To enhance the display characteristics of the refrigerator or freezer compartment, each door is typically fabricated from a multi-pane glass panel which is mounted within a metal supporting frame.

To prevent condensate such as frost from forming either on the metal support frame or the glass, it is known to provide electrical resistance heater wires in the glass panel supporting frame. For extreme low temperature operation, it is also known to coat the surface of one of the panes of the glass panel with a thin film of optically transparent conductive coating material. The coating is connected to electrical power lines via metallic conductive strip lead positioned on the glass. The resultant heating of the glass by the electric passing through the conductive coating effectively prevents frosting of the glass surfaces, thus permitting the displayed foods to be seen clearly at all times.

For heating of either the door supporting frame and/or glass, it is necessary to provide means to connect each door to a source of electrical power. For such a purpose, it is known to provide an electrical outlet on the door mounting frame, which outlet coacts with a door mounted plug connector to provide power to the door.

In addition to providing access to electric power, the door mounting frame and each door should coact in other respects to fulfill various required functions. For example, a means must be provided to pivotally articulate each door from the door mounting frame. Further, the door and frame should coact to prevent a door from swinging open further than a desired predetermined amount.

Because of the many required interactions between the doors and the door mounting frame, it has heretofore been necessary for purchasers of such doors to carefully specify the desired particular pattern of hinging of the doors, that is, which doors in a single or multi-door array are required to have a hinged right swing and which are required to have a hinged left swing. The manufacturer thereafter custom fabricates the doors and the door mounting frame in accordance with the pattern designated by the purchaser.

This requirement is subject to several severe disadvantages. First, it inhibits the ready utilization of mass assembly techniques for the fabrication of the doors and door mounting frames. This is so, since the hinging pattern requirements necessitate customized fabrication in many cases. Second, the ultimate consumer is prevented from readily modifying the multi-door hinging pattern to meet changing requirements as during store remodeling operations.

SUMMARY OF THE INVENTION

In accordance with the present invention, a refrigerated cabinet door and door mounting frame structure is disclosed which obviates the above deficiencies of the prior art and provides a structure capable of mounting any number of doors in accordance with any desired hinge swing pattern. The hinging pattern may be readily modified by the ultimate consumer to meet his changing requirements, while the initial manufacture may be effected in accordance with mass production techniques.

Briefly described, a door mounting frame structure is provided which includes upper and lower elongated horizontal door mounting frame members interconnected by left and right elongated vertical mounting frame members. For frames adapted to mount a plurality of doors in side by side relationship, one or more vertical mullions interconnecting the horizontal frame members between the left and right vertical frame members, are provided. The mullions divide the frame into a plurality of individual door frame sections.

Means are provided for selectively pivotally mounting each door from either the right or left hand side of each individual door frame section for hinge right or left operation. Each door is provided with an electrical connector means for connecting the door to an external source of power. Each left and right vertical mounting frame member is provided with an electrical outlet. Each vertical mullion is provided with at least two such electrical outlets. By this structure, each door's electrical connector means may be connected to a frame mounted electrical outlet, regardless of the door hinging pattern adopted. The door and mounting frame are provided with bi-symmetrically operating door stop means which coact to prevent a door opening beyond a predetermined mount in either hinge left or hinge right articulated operation.

Still other features and attendant advantages of the present invention will become apparent to those skilled in the art from a reading of the following detailed description of an embodiment constructed in accordance therewith, taken in conjunction with the accompanying drawings and wherein:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a multi-door refrigerator or freezer cabinet;

FIG. 2 is an enlarged cross-sectional view taken through lines 2—2 of FIG. 1;

FIG. 3 is a face view of the refrigerator or freezer cabinet shown in FIG. 1 illustrating the manner of effecting electrical connection between the doors and the door mounting frame;

FIG. 4 is a perspective view of the top of an exemplary door frame section illustrating the bisymmetrical door stop mechanism;

FIG. 5 is a plane view of the door frame section of FIG. 4;

FIG. 6 is a perspective view, partially broken away, of an exemplary mullion construction;

FIG. 7 is a partial cross-sectional view showing the manner of hinging the doors to the frame members in greater detail;

FIG. 8 is a perspective view, partially broken away, of an exemplary refrigerator or freezer cabinet door.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, there is shown in FIG. 1 a refrigerated cabinet 5 which includes a door mounting frame 16 within which are mounted doors 10, 11, 12 and 13. Frame 16 is constructed of upper and lower horizontal elongated members 20 and 21, left and right vertical elongated members 23 and 22 interconnecting top and bottom members 20 and 21, respectively. Referring more particularly to FIGS. 2 and 6, also interconnecting top and bottom members 20 and 21 are a plurality of vertical elongated mullions 26, 27, and 28. The peripheral frame members and mullions thus described define a plurality of individual door mounting frame sections within which the doors 10, 11, 12, and 13 are pivotally mounted in a manner to be more particularly described hereinafter. Handles 18 are fixed to the doors as shown, so that they may be open and closed.

As described above, it is desired to provide a door and door mounting frame structure capable of enabling the doors to be hung in any desired hinging pattern. More particularly, while in FIG. 1 the doors are shown mounted in a configuration wherein door 10 is hung right hinge, door 11 hung left hinge, door 12 hung right hinge, and door 13 hung left hinge, it is desired to be able to readily change the hinging pattern so that the plurality of doors may be hung in accordance with any desired arbitrary hinging pattern.

Referring now briefly to FIG. 8, an exemplary refrigerated cabinet door 11 is illustrated. Door 11 includes four rectangularly related frame members 50, 51, 52, and 53. Mounted within the frame thus described is a multi-pane glass unit 70 which is typically fabricated from two or more panes of sheet glass. For low temperature operation, it is well known in the art to provide resistance heater cables running through the length of the frame members 50, 51, 52, and 53. When electric current is applied to the resistance elements, the heat generated heats the frame members (typically fabricated from a lightweight metal extrusion, such as aluminum), thus preventing the condensation of moisture thereon. It is also well known in the art, for extreme low temperature operation, to coat one or more of the glass panels of multi-pane unit 70 with a thin, optically transparent resistive coating. Current is then passed through the coating, heating the glass and preventing the condensation of moisture thereon to maintain the glass in a clear, optically transparent condition. The internal structures for providing the heater cables and the electrical contacts to the conductive thin film are well known in the art and need not be described in detail.

To provide current to the resistance heater cables and/or resistive optically transparent thin film, it is necessary to provide electric power to the door. In accordance with the present invention, an electrical connector plug, 11P, is provided for this purpose. Plug 11P is adapted to engage electrical outlets positioned on the door mounting frame, as will hereinafter be described, and is preferably positioned at approximately the center of frame member 51.

As shown, the door frame is provided with a pair of aligned hinge pin mounting grooves 60 and 61. In a manner to be hereinafter described, the hinge pin mounting grooves are adapted to receive hinge pins de-

pending from the door mounting frame 16 to enable pivotal mounting of the door on the frame. It will thus be seen that connector plug 11P is positioned on the side of the door 11 which is adapted to be pivotally mounted to the door mounting frame.

Referring now to FIG. 2, a cross-sectional view of the multi-door mounting frame is illustrated. As shown, vertical mullions 26, 27 and 28, and vertical elongated left and right side members 23 and 22, divide the overall door mounting frame into four individual mounting frame sections within which the doors 10, 11, 12 and 13 are mounted. Left vertical elongated mounting frame member 23 is provided with an electrical outlet 23A. The outlet is preferably centrally positioned between the upper and lower frame members 20 and 21, FIG. 1, and is adapted to receive a corresponding door mounted electrical connector plug 13P, as shown. In like manner, the right elongated vertical frame member 22 is provided with an electrical connector 22A, adapted to receive door mounted connector plug 10P.

Each vertical elongated mullion, 26, 27 and 28, is provided with at least two electrical outlets, 26A, 26B, 27A, 27B, and 28A and 28B, respectively. Each mullion electrical outlet is adapted to receive a door mounted connector plug when a door is hinged adjacent thereto. The above described mounting frame electrical outlet configuration enables connection of electrical power to each door irrespective of whether a given door is hung in a hinged left or a hinged right configuration within its individual mounting frame section. The frame mounted electrical outlets 23A, 26A, 26B, 27A, 27B, 28A, 28B, and 22A, are suitably connected to an external source of electrical power as by being connected to ordinary 120 volt A.C. power lines. The manner in which such a connection may be effected is well-known in the art and need not be described in detail.

Shown in FIG. 3 is a front plane view of the four-door panel illustrated in FIG. 1. Each door is pivotally attached to the door mounting frame 16 at the locations indicated by the arrows. The pattern of connecting the door mounted electrical connector plugs 10P, 11P, 12P and 13P to the frame-mounted outlets is also indicated. As shown, vertical mullion 27 has electrical connectors 11P and 12P from doors 11 and 12, respectively, connected thereto, whereas mullions 26 and 28 are free from electrical connections since no doors are hinged adjacent thereto. Doors 10 and 13, being hinged adjacent to verticle end members 22 and 23, respectively, are connected electrically to the outlets positioned on these end frame members. It is also clear from an analysis of FIGS. 2 and 3 that doors 10 to 13 may be hinged in any desired pattern since there will always be an adjacent frame mounted electrical outlet available for supplying power to each door.

Referring now to FIG. 6, a prospective detail view of exemplary mullion 27, including portions of the upper and lower elongated frame members 20 and 21, is illustrated. As shown, the mullion has a front face 70 and rearward extending, opposed sides 71 and 72. The mullion face 70c is adapted, in a manner well-known in the art, to engage door mounted gaskets 35, FIG. 2, to provide a sealing engagement of the cabinet with the cabinet doors with the doors in the closed position.

Electrical outlets 27A and 27B are positioned on sides 71 and 72, respectively. As shown in FIG. 6, outlets 27A and 27B receive electrical connectors 12P and 11P, respectively, from doors 11 and 12. Positioned adjacent mullion 27 on upper elongated frame members 20, are a pair of mutually spaced door hinge pins 62. Positioned on the lower elongated door mounting frame member 21 are a pair of mutually spaced hinge pins 90. Hinge pins 62 are vertically aligned with hinge pins 90 and are adapted to receive and pivotally mount doors 11 and 12, respectively.

Referring now to FIG. 7, the manner of mounting the doors 11 and 12 on the hinge pins 62 and 90 is illustrated. As shown, upper frame member 20 is provided with a pair of apertures 80. Upper hinge pins 62 are inserted through the apertures. Hinge pins 62 each have a relatively smooth shaft portion 30, a threaded portion 63, and an integral washer 65. After insertion through an aperture 80, each hinge pin is fixedly secured to the member 20 as by a nut 82. Each hinge pin 62 is adapted to enter a corresponding hinge pin receiving groove 60 or 61 formed within each door, FIG. 8, to provide pivotal support therefor. In like manners, lower hinge pins 90 are positioned in the lower frame member 21, via aligned apertures in the lower frame member, to engage the corresponding opposed hinge pin receiving groove at the other end of each door.

By this technique, each door may be pivotally mounted to the door mounting frame. It should be noted that other means of hinging a door may be adopted in accordance with the present invention. For example, it is well known to utilize special hinging mechanisms which are capable of torquing a door to urge it toward the closed position. These mechanisms may readily be adapted for use in the present invention, as they typically can be inserted in the frame member apertures, above described, in a manner similar to that described in connection with hinge pins 62 and 90.

As seen in FIGS. 6 and 7, the upper and lower elongated door mounting frame members are each provided with two mutually spaced apertures adjacent each mullion, with each aperture being adapted to receive a door hinging pin in the manner described. The upper and lower apertures are, of course, aligned. Both the upper and lower elongated mounting frame members 20 and 21 are also provided with a hinge pin aperture adjacent the vertical end frame members 22 and 23, respectively. When it is desired to hinge a door adjacent either a vertical end frame member or a mullion, it is only necessary to insert and secure upper and lower hinge pins in the upper and lower frame members 20 and 21 to effect pivotal mounting of the door. By this technique, each door may be selectively mounted in its respective door mounting frame section to have either a hinge right or a hinge left configuration. Since the doors are symmetrical about their horizontal center line, when changing from one hinging orientation to the other, it is only necessary to remove the upper and lower hinging pins, rotate the door 180° in the plane of the door, and reinsert the hinging pins and door on the opposite side of each door frame mounting section.

Referring now to FIGS. 4 and 5, the bisymmetrical door stop construction of the present invention is shown. To prevent the doors from opening greater than a predetermined angle, an elongated door stop arm 47

is secured to door frame member 50 via bracket 48. Bracket 48 is secured to the door and has a pair of parallel ears which are adapted to engage an end of door stop arm 47. The end of arm 47 thus engaged is preferably provided with an aperture adapted to be aligned with apertures positioned in the ears of mounting bracket 48. A pin 94 may be inserted through the aligned configuration to provide a pivotal support for the end of door stop arm 47 attached to the door. The other end of door stop arm 47 is pivotally attached to a slide stop block 45, as by a screw 49. Slide stop block 45 is adapted to translate within a longitudinal raceway 40 formed within upper support member 20. As will be apparent from a review of FIGS. 4 and 5, the position of slide stop block 45 within raceway 40 varies as a function of the pivoted position of exemplary door 11. As the door is opened to the full open position desired, the slide stop block reaches the terminal portion of allowed travel within the raceway 40, thus preventing further opening of the door. A pair of springs 43 and 44 are positioned within the raceway on either side of the slide stop-block to prevent slamming of the door and to urge the door towards its normally closed position.

If it is desired to hinge door 11 from the right instead of the left end of its door frame section, the door, as described above, is rotated 180° in its plane. To enable connection of the arm to the door, the door is provided with a second bracket 48' symmetrically located on the side 53 opposite side 50.

As will be appreciated from the above discussion, the door and door mounting frame construction of the present invention provides a complete bisymmetrical structure whereby any given door in either a one or multi-door array, may be mounted within a generalized mounting frame structure with selective hinging, in each case, from either the left or the right hand side of each individual door mounting frame section. All the required interactions between the door and the door mounting frame are achieved in either door hinging position. It will be appreciated that many modifications and changes from the preferred embodiment may be effective without the departing from the spirit and scope of the invention. For example, it is clearly not necessary to locate the door mounted plugs and the frame mounted electrical outlets at the midpoint between the upper and lower horizontal door mounting frame members. That is, if the door mounted plug were positioned a predetermined amount above or below the door horizontal center line, the frame mounted electrical outlets could obviously also be spaced corresponding predetermined amounts from the frame horizontal center line to maintain the bisymmetrical symmetry of the structure.

I claim:

1. A refrigerated cabinet door and door mounting frame structure for mounting an array of electrically heated refrigerated cabinet doors with each door having separately selectable left or right hinging, comprising:

upper and lower elongated horizontal door mounting frame members;

first and second mutually spaced elongated vertical mounting frame members interconnecting said upper and lower members to define a door mounting frame;

at least one elongated vertical mullion interconnecting said horizontal frame members intermediate said first and second vertical frame members, said mullion dividing the door mounting frame into a plurality of individual door mounting frame sections;

a plurality of refrigerated cabinet doors, each door having an electrical connector means for connection to an external source of power;

means cooperating with said door mounting frame and doors for selectively pivotally mounting said doors in said frame sections, one each hinged with a separately selectable hinge axis in either left or right hand sides of each door mounting frame section;

a plurality of frame mounted electrical outlets, at least one each positioned on the first and second vertical mounting frame members, at least two each positioned on each mullion, each frame mounted electrical connector being adapted to engage a corresponding door electrical connector means when a door is hinged with its hinge axis adjacent thereto, said frame mounted electrical outlets being connectable to a source of external power, whereby electrical energy is supplied to each of said plurality of doors irrespective of their individual hinging orientations and whereby each door may be removed and reversed at will without changing the hinging orientation of any of the other doors.

2. The refrigerated cabinet door and door mounting frame structure of claim 1 further comprising:

a plurality of door stop means, one each connected between each door and its related door mounting frame section for limiting the opening of each door to a predetermined limit in both door hinging orientations.

3. The refrigerated cabinet door and door mounting frame structure of claim 2 wherein each of said doors comprises:

four rectangularly related door frame member defining a door frame;

a glass panel mounted within said door frame;

one of said door frame members having first and second aligned hinge pin mounting grooves formed at opposite ends thereof, symmetrically about the horizontal center line of said door.

4. The refrigerated cabinet door and door mounting frame structure of claim 3 wherein said upper and lower elongated horizontal door mounting frame members have a plurality of aligned hinge pin receiving apertures formed therein, each horizontal member having two such apertures for each individual door frame section, one such aperture being positioned adjacent each vertical mounting frame member and mullion.

5. The refrigerated cabinet door and door mounting frame structure of claim 4 further comprising a plurality of elongated hinge pins, two for each door mounting frame section, each such hinge pin having a first portion comprising a shaft member adapted to be selectively inserted in rotatable relationship into one of said hinge pin mounting grooves, and a second portion adapted to selectively project through one of said hinge pin receiving apertures, said second portion including means for securing said hinge pin to said frame

member, whereby two such hinge pins may be selectively positioned on the upper and lower door mounting frame members in either the left or right hand side of each door frame section to selectively pivotally mount a corresponding door in either a hinge left or hinge right configuration.

6. The refrigerated cabinet door and door mounting frame structure of claim 2, wherein each of said door stop means comprises:

a pair of door stop arm mounting brackets positioned on said door symmetrically about the door horizontal center line;

an elongated door stop arm;

means for pivotally mounting one end of said arm selectively to one of said mounting brackets as a function of the door hinging direction;

a longitudinal raceway of predetermined length symmetrically formed in one of said horizontal door mounting frame members and positioned within the corresponding individual door mounting's frame section;

a stop block positioned within said raceway and being slidable along the lengthwise dimension thereof;

means for pivotally mounting the other end of said door stop arm to said stop block, whereby as said door is opened the stop block will be translated along said raceway, preventing further opening of said door when said stop block reaches the end of the raceway.

7. The refrigerated cabinet door and door mounting structure of claim 6 wherein said door stop means further comprises:

first and second springs positioned on opposed sides of said stop block within said raceway, said springs, respectively, preventing said door from slamming while closing and urging said door towards a closed position when open.

8. The refrigerated cabinet door and door mounting frame structure of claim 1, wherein there are a plurality of elongated mutually spaced vertical mullions interconnecting said horizontal frame members intermediate said first and second vertical frame members, each mullion having at least two electrical outlets adapted to electrically engage a corresponding door electrical connector means, said plurality of mullions dividing said door mounting frame into N individual door frame sections, where N = the number of vertical mullions.

9. A door and door mounting frame structure for mounting an electrically heated refrigerated cabinet door with selectable left or right articulation, comprising:

upper and lower elongated horizontal door mounting frame members;

left and right elongated vertical mounting frame members interconnecting said upper and lower elongated frame members to define a door mounting frame;

a refrigerated cabinet door having electrical connector means for connecting an external source of electrical power to said door;

means cooperating with said door mounting frame and door for selectively pivotally hinging said door in said frame in either a hinge left or hinge right configuration;

first and second frame mounted electrical outlets
positioned respectively on the left and right frame
members, each adapted to electrically engage said
door electrical connector means when said door is
hinged with a hinge axis adjacent a respective ver- 5
tical frame member, said electrical outlets being
connectable to a source of external power
whereby electrical power is transmitted to said
door when mounted adjacent either of said vertical
frame members; 10
a pair of door stop arm mounting brackets positioned
on said door symmetrically about the door's
horizontal center line;
an elongated door stop arm;
means for pivotally mounting one end of said arm 15

selectively to one of said mounting brackets;
a longitudinal raceway of predetermined length,
formed in one of said horizontal door mounting
frame members;
a stop block positioned within said raceway and
being slidable along the lengthwise dimension
thereof; and
means for pivotally mounting the other end of said
door stop arm to said stop block, whereby as said
door is opened the stop block will be translated
along said raceway being stopped and thus
preventing further opening of said door when it
reaches the end of the raceway.

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