United States Patent

[11] 3,629,972

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[45] Patented **Dec. 28, 1971**
[73] Assignee **Ardco, Inc. Chicago, Ill.**

[54] **REFRIGERATOR DOOR CONSTRUCTION**
12 Claims, 18 Drawing Figs.

[52] **U.S. Cl.** **49/70,** 49/382, 49/386
[51] **Int. Cl.** **E06b 7/12**
[50] **Field of Search** 49/70, 386, 382; 16/73, 82

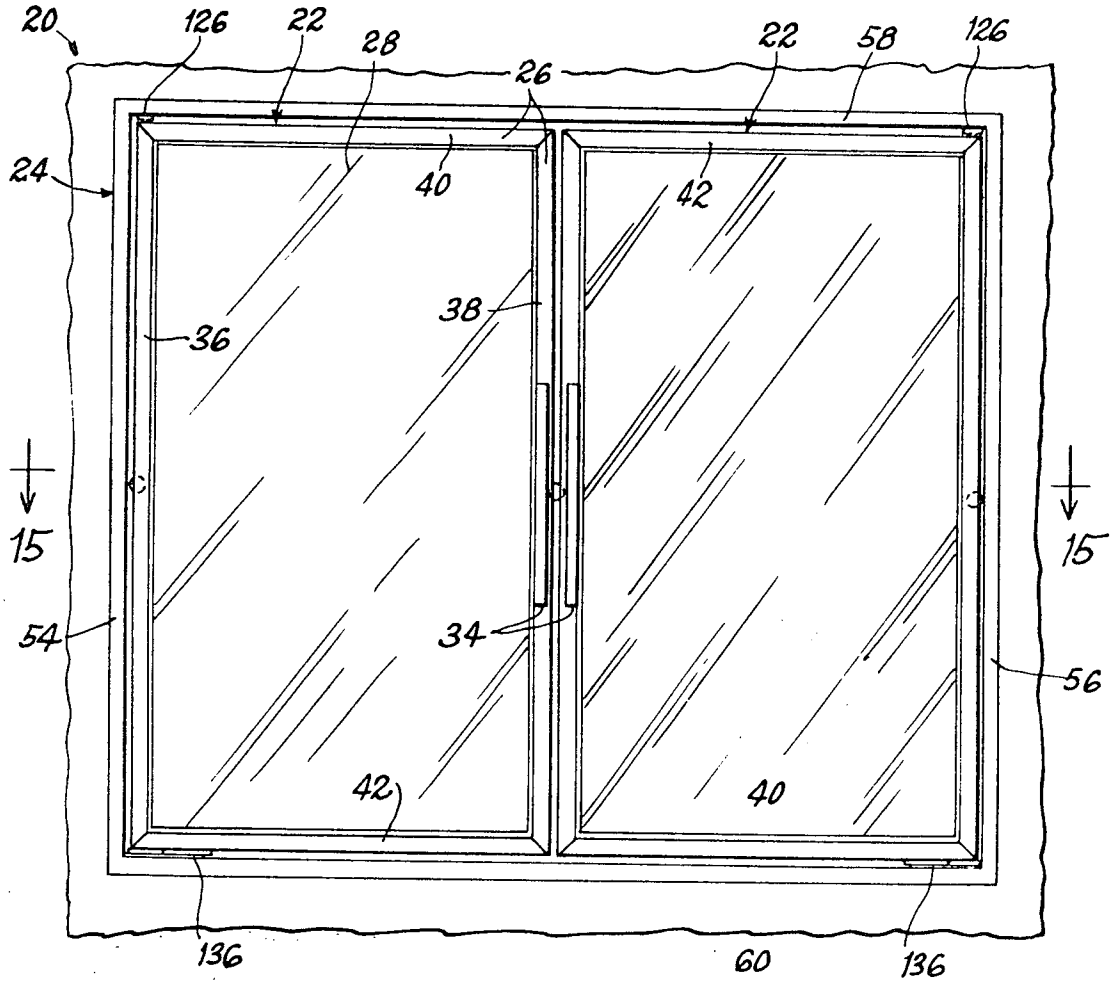
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ABSTRACT: One or more glass panel refrigerator doors are swingably mounted in a mounting frame. Each door is mounted so that it can be reversed between left- and right-hand swing. This is accomplished by providing upper and lower hinge pins rotatably mounted in the door, the pins having noncircular elements projecting from the door. A torsion spring is mounted in the door and is connected between one of the hinge pins and an adjusting member for regulating the initial stress in the spring. The noncircular elements of the hinge pins are engageable with socket members on the mounting frame. The socket members have noncircular openings and are movable between left- and right-hand positions on the mounting frame. Each door is reversed by removing the door, moving the socket elements to the opposite positions, inverting the door, and reinserting it into the frame. Each adjusting member is hidden when the door is closed, but is accessible when the door is open through a rearwardly facing recess formed in the door along the hinge axis. The recess is also employed to receive the connecting cord for the door heater. The cord is fitted with a plug which is positioned just behind the recess. To provide for reversal of the door, receptacles capable of accommodating left- or right-hand doors are mounted on the mounting frame to receive the plug in the left- and right-hand positions of the door.

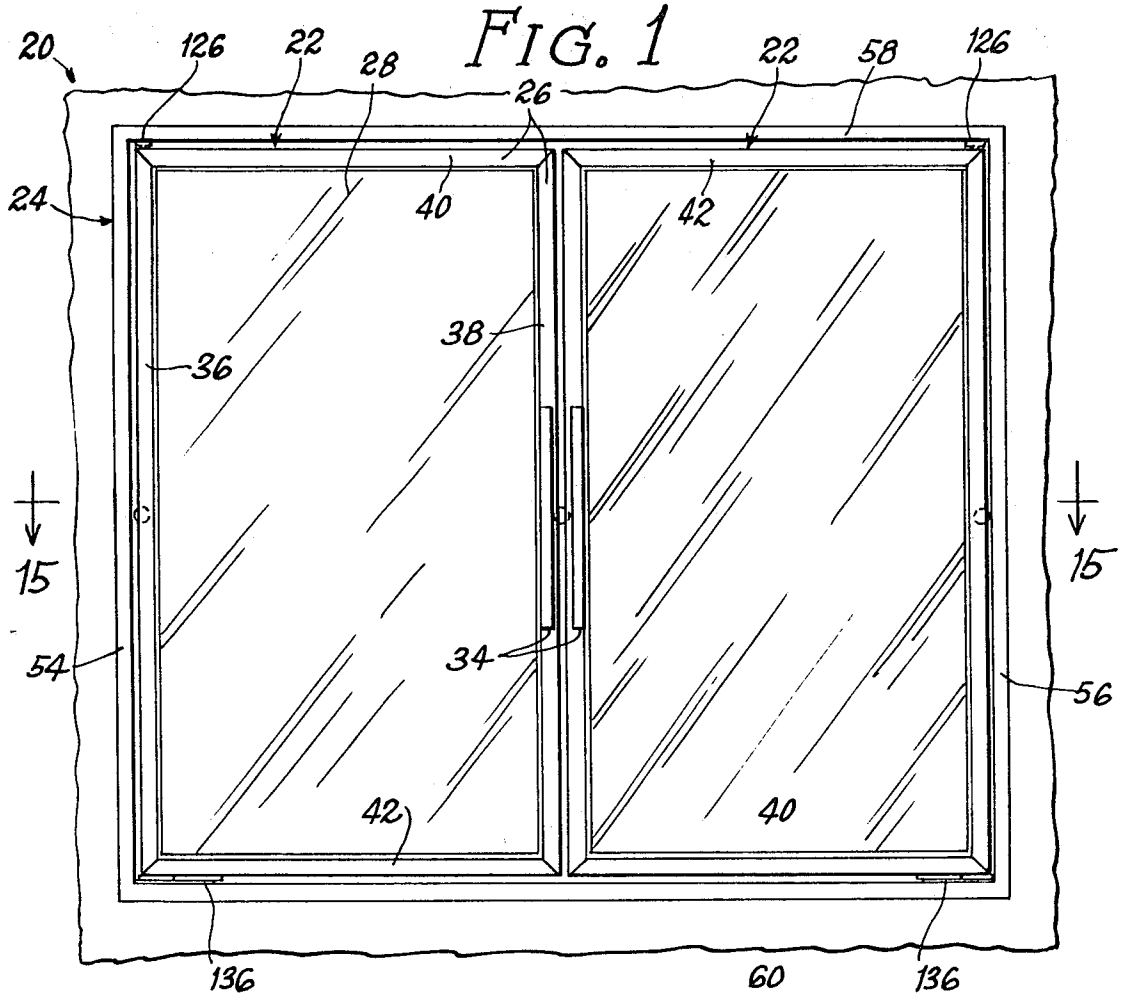


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SHEET 1 OF 7

FIG. 1



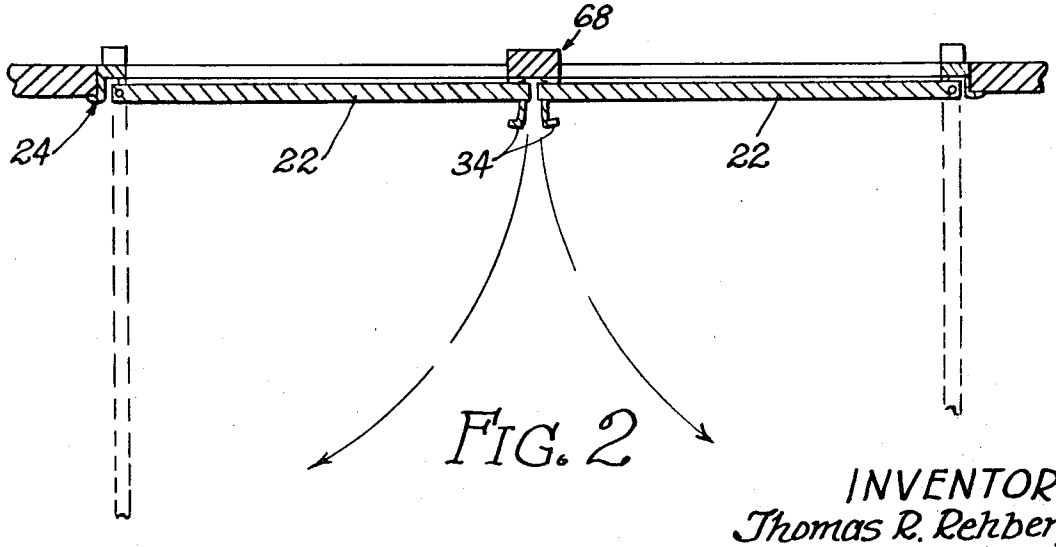


FIG. 2

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Francis M. Niekrasz
by Burmeister, Palmatier
and Hamby Attys

FIG. 3

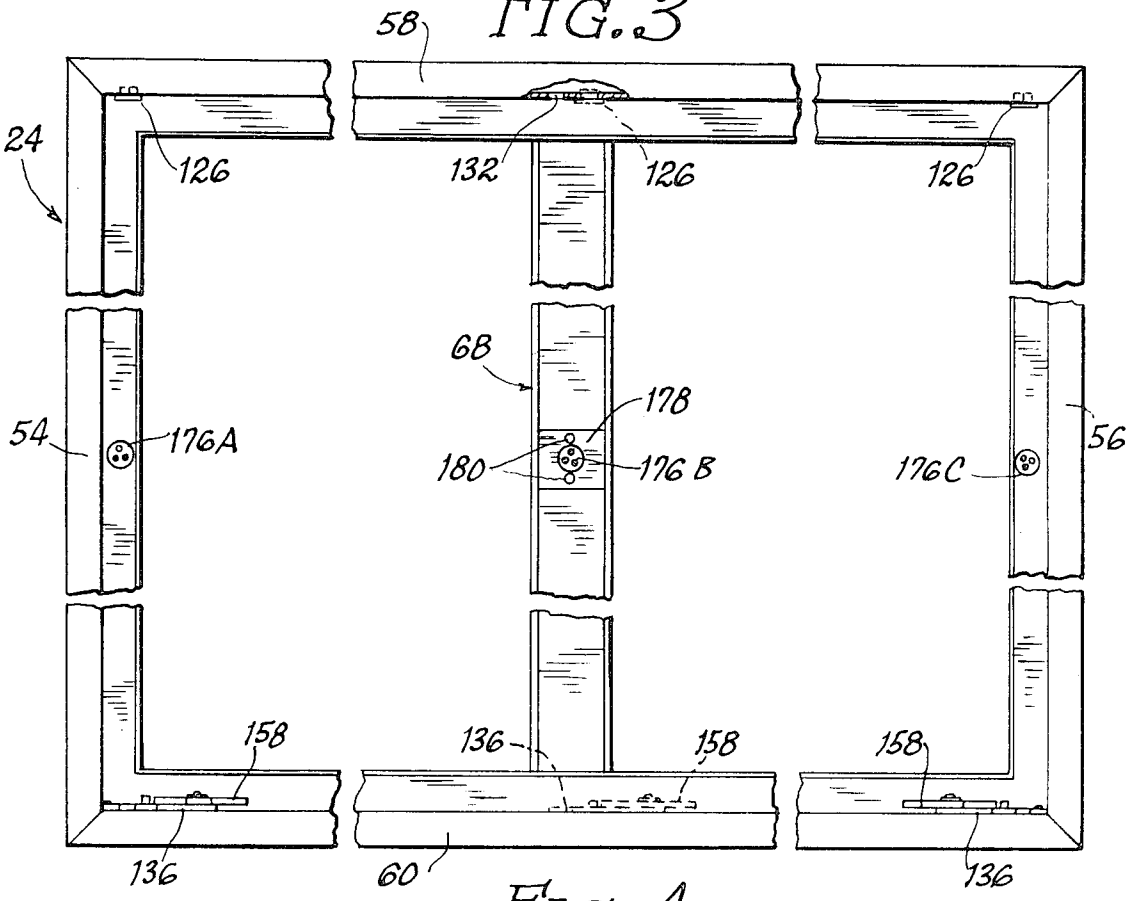

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FIG. 4

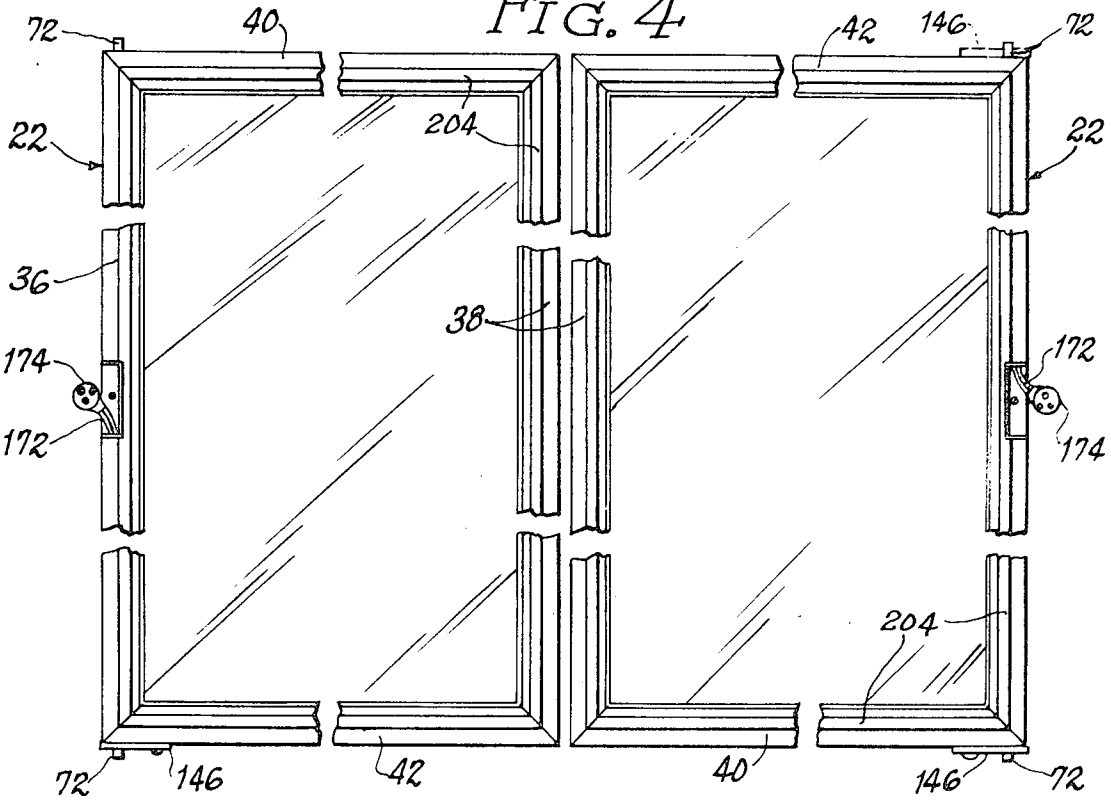

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FIG. 5

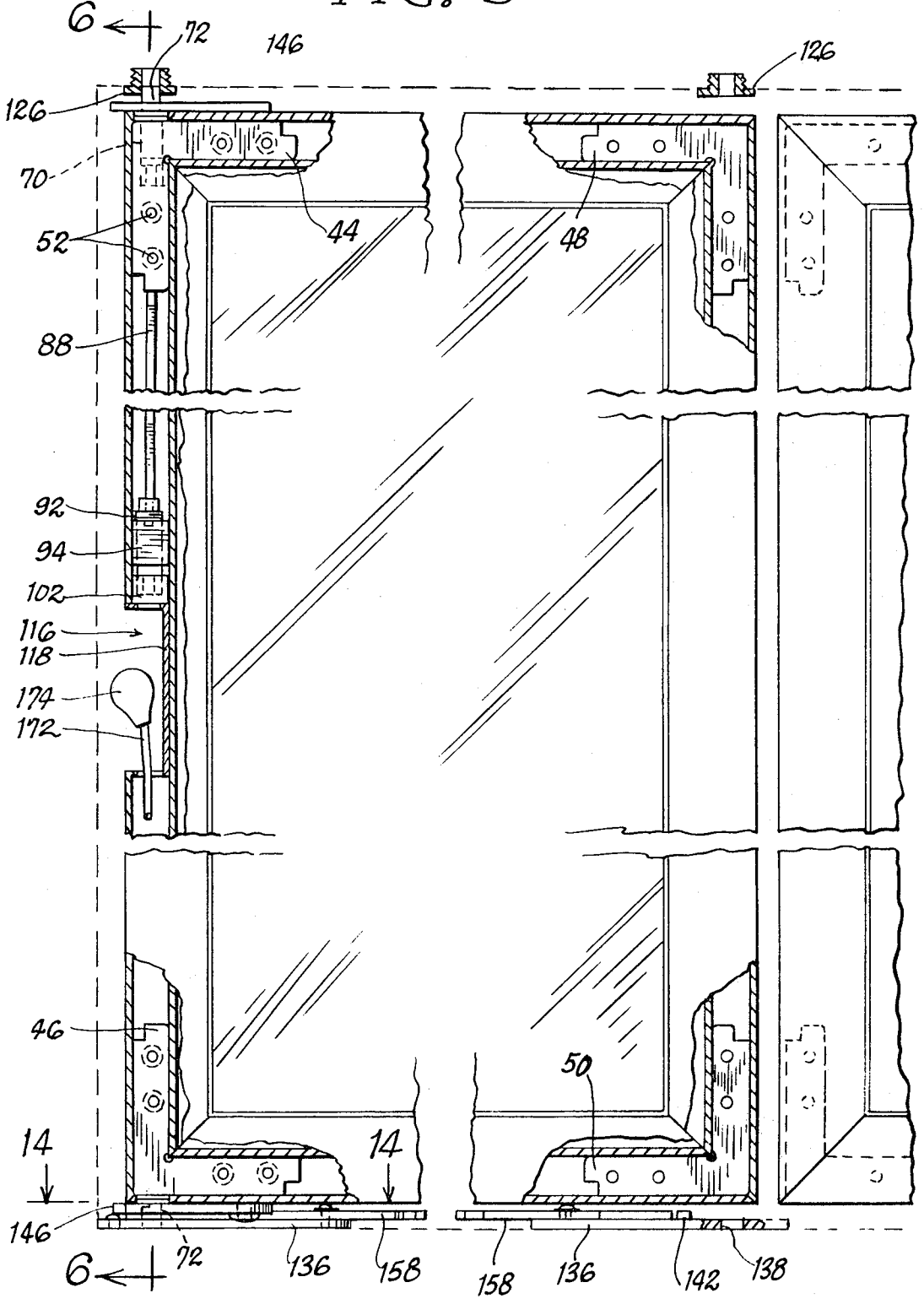

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FIG. 6

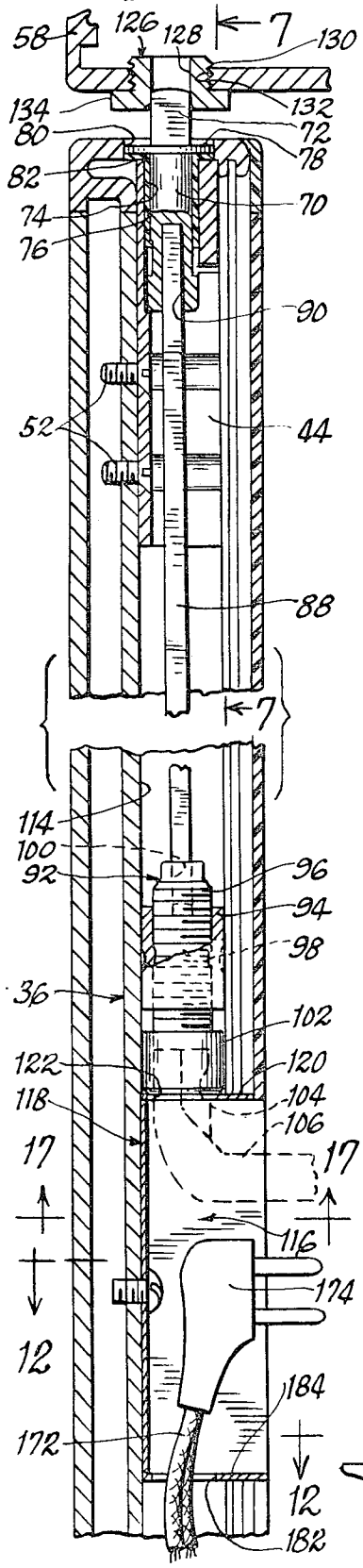


FIG. 7

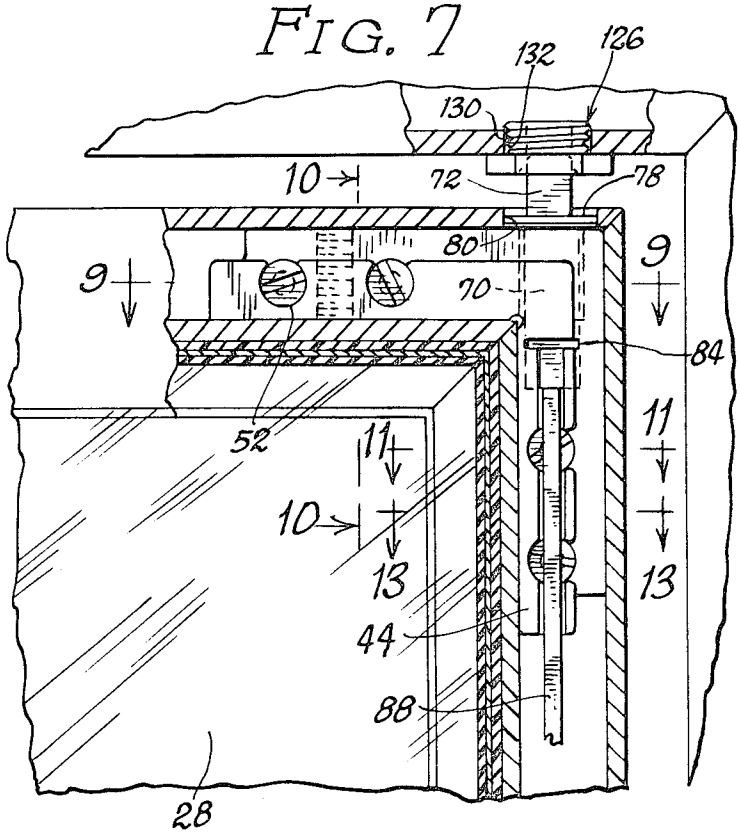


FIG. 8

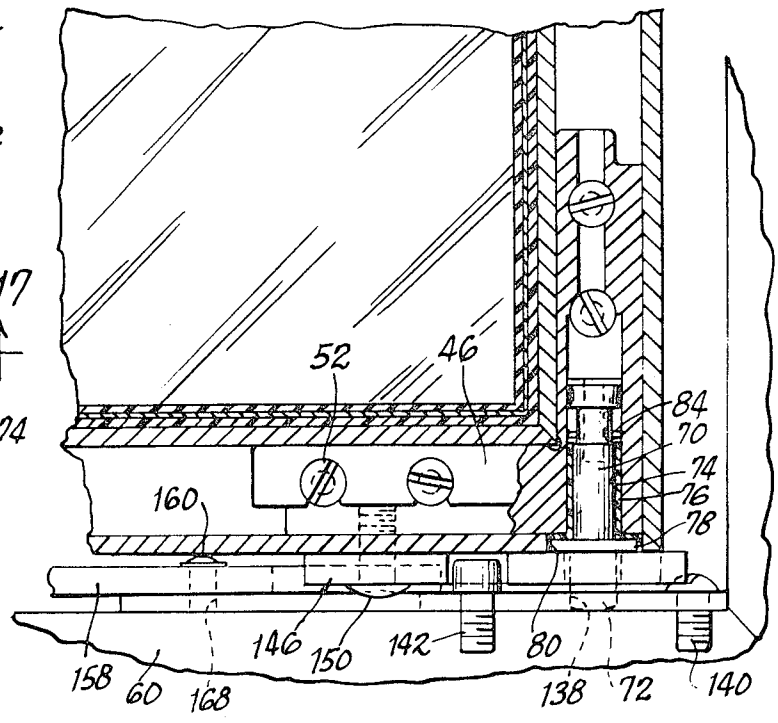


FIG. 9

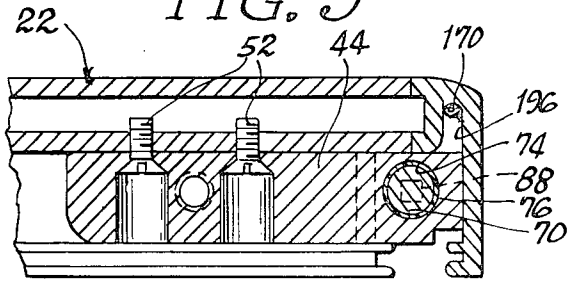


FIG. 10

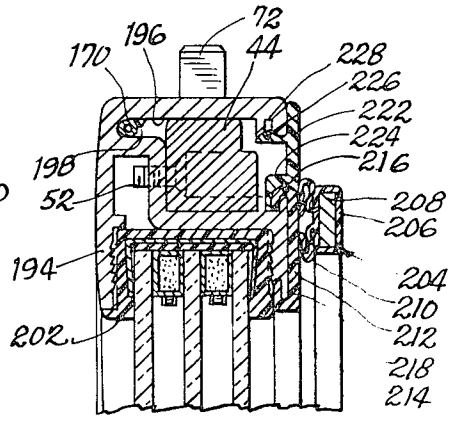


FIG. 11

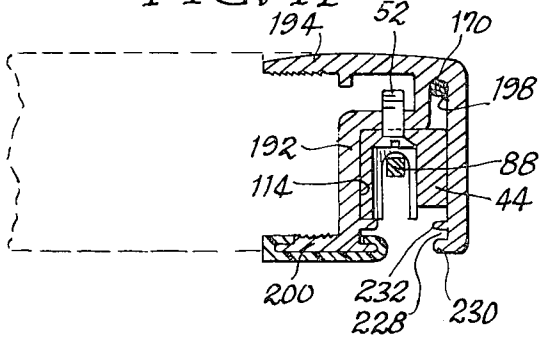


FIG. 12

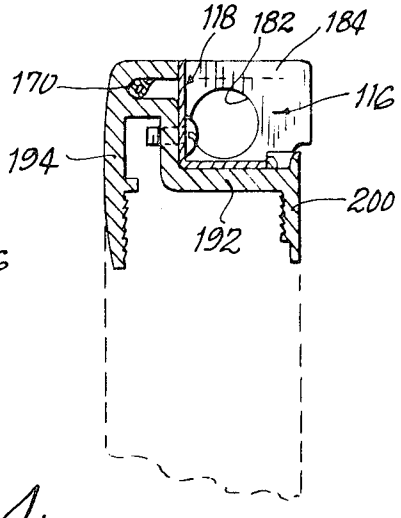


FIG. 13

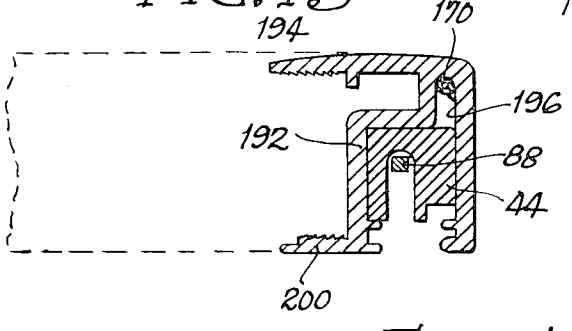
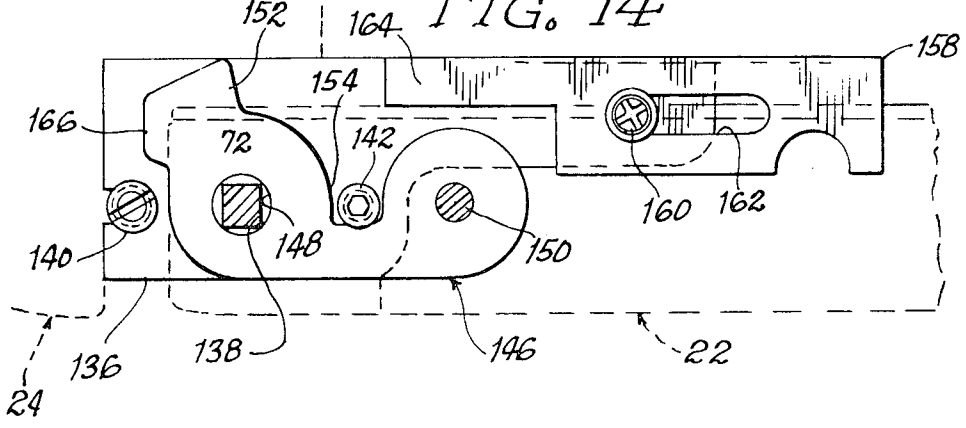


FIG. 14



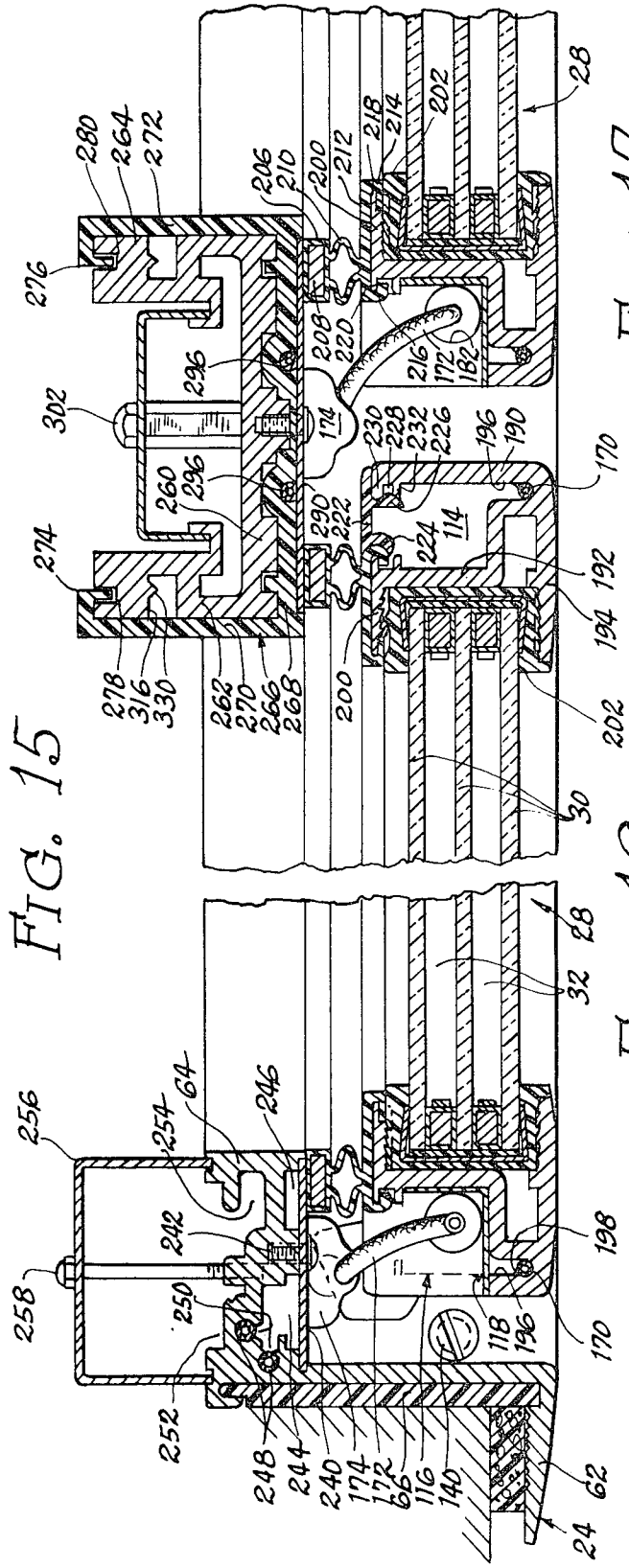


FIG. 15

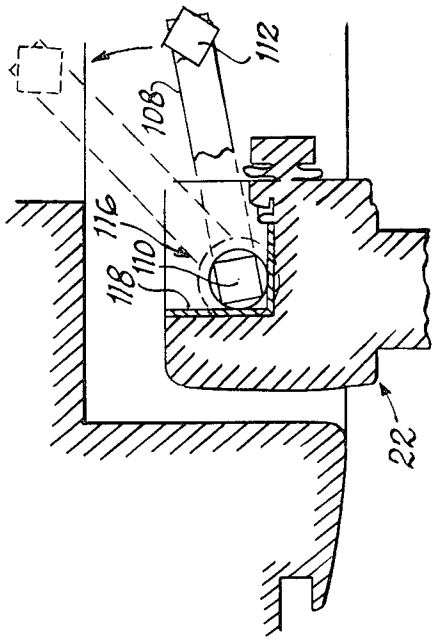


FIG. 17

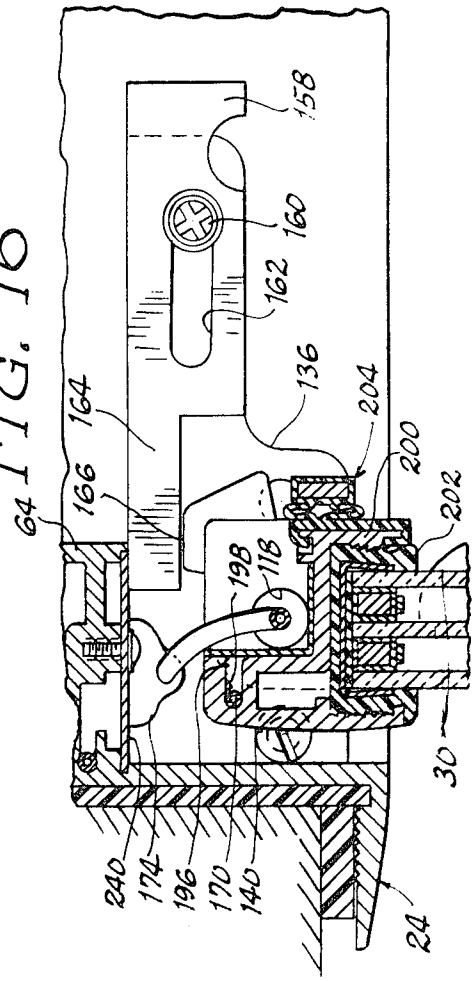
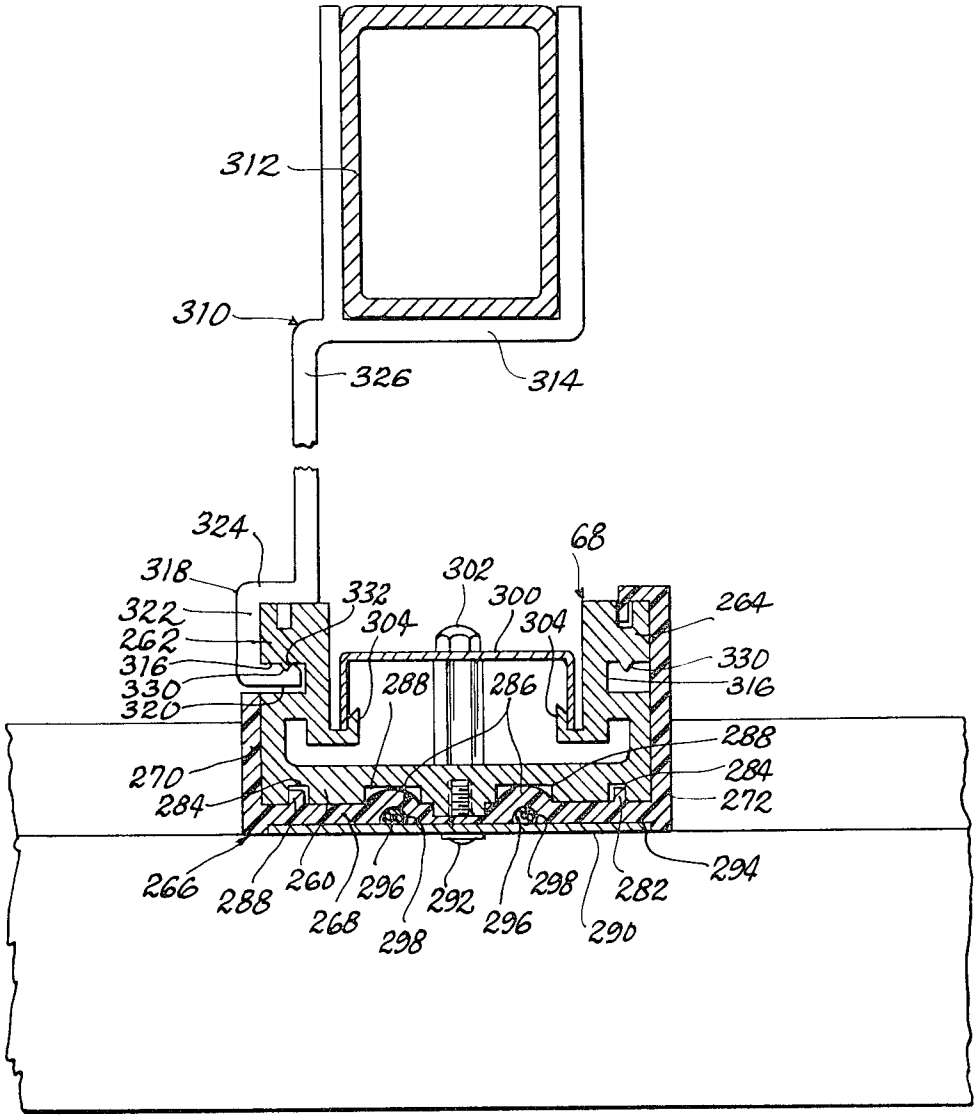


FIG. 16

FIG. 18


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REFRIGERATOR DOOR CONSTRUCTION

This invention relates to commercial refrigerator doors of the general type disclosed in U.S. Pat. No. 2,987,782, issued June 13, 1961, and also U.S. Pat. No. 3,131,421, issued May 5, 1964.

Commercial refrigerator doors of this type generally utilize glass panels mounted in metal frames. One or more such doors are swingably secured to a mounted frame, also generally made of metal.

Such glass panel refrigerator doors are generally employed in connection with refrigerated display facilities in supermarkets or other stores. The doors may be employed on self-contained refrigerator cabinets, or in connection with walk-in coolers or other built-in refrigerated display facilities. Such doors will find many other applications.

Shelves or the like are generally provided behind the glass panel refrigerator doors to hold merchandise which is to be displayed for sale. The customer selects the merchandise by looking through the glass panel of the door, opening the door, and removing the merchandise from the refrigerator. A closure spring is generally provided in connection with each door to close the door when it is released by the customer.

Such glass panel refrigerator doors are employed in connection with both normal-temperature and low-temperature refrigerators. Normal-temperature refrigerators are adapted to hold dairy products and other merchandise which is to be kept at a temperature a little above the freezing point. Low-temperature refrigerators are employed to hold frozen foods which are to be kept at a temperature well below the freezing point.

Such glass panel refrigerator doors generally utilize insulated glass comprising a plurality of panes with dead air spaces therebetween. The metal frames are generally equipped with internal electrically energized heaters to prevent the condensation of moisture, or the formation of frost on the frames. In many cases, the glass is also electrically heated. This is generally done by causing an electrical current to flow along a transparent conductive coating on one of the inaccessible surfaces of the multipane insulated glass.

It has been the practice to supply glass panel refrigerator doors with either left- or right-hand swing in accordance with the requirements of the customer. This has made it necessary to manufacture both left- and right-hand doors. Moreover, it has been necessary to make the door mounting frames especially to order, to meet the requirements of the customer for left- or right-hand doors. It has sometimes happened that one or more doors prove to have the wrong swing when installed in the field, but it has not been economically feasible to remedy any such problem.

One of the objects of the present invention is to provide a new and improved glass panel refrigerator door which is reversible in that it can be used for either left- or right-hand swing. With this construction, all of the doors are the same, so that it is no longer necessary to manufacture both left- and right-hand doors.

A further object is to provide a new and improved door construction which makes it possible to reverse the doors in the field, so that any door can be changed between left- and right-hand swing, or vice versa. This construction makes it easy to remedy any problem which develops in the field, if one or more doors prove to have the wrong swing.

Another object is to provide a new and improved reversible door having an internal spring for closing the door, together with a convenient mechanism for adjusting the initial stress in the spring.

It is a further object to provide such a new and improved reversible door in which the mechanism for adjusting the spring is readily accessible with the door in either its left- or right-hand position, and in which the adjusting mechanism is hidden from view when the door is closed.

Another object is to provide a new and improved reversible door having a connecting electrical cord which is hidden from view when the door is closed, such cord being provided to energize the heaters in the door.

A further object is to provide a new and improved door construction having means for snapping a bracket into place on any of the vertical mullions or other supporting members of the door mounting frame, the bracket being usable to stabilize a shelf-supporting post.

Thus, the door construction of the present invention preferably comprises one or more doors which are swingable in a mounting frame. Each door has first hinge elements, adapted to mate with second hinge elements on the mounting frame. A closure spring is mounted in the door and is connected to one of the first hinge elements. The door is normally reversed by removing it from the frame, moving the second hinge elements between left- and right-hand positions, or vice versa, inserting the door, and remounting it in the frame. Alternatively, it is possible to provide duplicate hinge elements on the frame in left- and right-hand mounting positions. The first and second hinge elements comprise interlocking male and female members which can be interchanged between the door and the frame. However, it is preferred to provide the male elements on the door and the female elements on the frame. Thus, the hinge elements on the door preferably comprise rotatable hinge pins with square or other noncircular members projecting from the door at both the upper and lower ends. The hinge elements on the frame preferably comprise socket members with corresponding noncircular openings. The hinge elements are preferably arranged so that the door can be lifted sufficiently to disengage the hinge elements so that the door can be removed from the frame.

The door preferably has an electrical cord for energizing the heaters in the door. The cord is fitted with a plug or other connector which is engageable with left- and right-hand receptacles on the door frame. One of the receptacles is preferably reversible to facilitate reversal of the door in the field.

The cord is preferably concealed in a recess formed in the door, so that the cord is hidden when the door is in its closed position. The cord and the recess are preferably at the center of the door between its upper and lower ends, and along the hinge axis of the door.

The door is preferably provided with an adjusting member which is accessible through the recess in the door. Such adjusting member is employed to establish the initial stress in the closure spring. The adjusting member is hidden when the door is closed and is always centrally located, regardless of door swing.

Further objects, advantages and features of the present invention will appear from the following description, taken with the accompanying drawings, in which:

FIG. 1 is a front elevation of a set of glass panel refrigerator doors, to be described as an illustrative embodiment of the present invention. FIG. 2 is a diagrammatic horizontal section of the doors.

FIG. 3 is a front elevation of the mounting frame, with the doors removed.

FIG. 4 is a rear elevation of the doors, detached from the mounting frame.

FIG. 5 is a fragmentary front elevation of the doors, with certain parts broken away and shown in section.

FIG. 6 is a fragmentary vertical section taken through one of the doors along the hinge axis, generally as indicated by the line 6—6 in FIG. 5.

FIG. 7 is a fragmentary vertical section taken through the upper hinge mechanism from the rear, generally along the line 7—7 in FIG. 6.

FIG. 8 is a fragmentary vertical section similar to FIG. 7 but taken through the lower hinge mechanism.

FIG. 9 is a fragmentary horizontal section, taken along the line 9—9 in FIG. 7.

FIG. 10 is a fragmentary vertical section taken along the line 10—10 in FIG. 7.

FIG. 11 is a fragmentary horizontal section taken along the line 11—11 in FIG. 7.

FIG. 12 is a fragmentary horizontal section taken along the line 12—12 in FIG. 6.

FIG. 13 is a fragmentary horizontal section taken along the line 13—13 in FIG. 7.

FIG. 14 is a fragmentary horizontal section taken along the line 14—14 in FIG. 8.

FIG. 15 is a fragmentary horizontal section taken along the line 15—15 in FIG. 1.

FIG. 16 is a fragmentary horizontal section corresponding to a portion of FIG. 15 but showing the door blocked open by the hold-open device.

FIG. 17 is a fragmentary diagrammatic horizontal section taken along the line 17—17 in FIG. 6.

FIG. 18 is a fragmentary horizontal section corresponding to a portion of FIG. 15 but showing a shelf-post bracket in place on the mullion.

It will be seen that FIG. 1 illustrates a refrigerator door construction 20, comprising a set of refrigerator doors 22, supported in a mounting frame 24. In commercial practice, door sets are supplied with any desired number of doors mounted in a single frame, from one door to a large number, such as 10, for example. The illustrated door construction 20 comprises two doors 22. This makes it possible to disclose one door mounted for left-hand swing and the other mounted for right-hand swing. As will appear in greater detail presently, either of the doors 22 can be reversed, so that both of them can be mounted for either left-hand or right-hand swing.

Each of the illustrated doors 22 comprises a metal doorframe 26 in which a glass panel 28 is mounted. As shown to best advantage in FIG. 15, each glass panel 28 is preferably of the insulated type, comprising a plurality of parallel panes 30 with dead air spaces 32 therebetween. While the spaces 32 are generally filled with dry air, they can be filled with an inert gas, such as nitrogen, for example.

As shown in FIG. 1, each of the doors 22 is provided with a handle 34 which is used by the customer to open the door. The handle is mounted midway between the upper and lower ends of the door and is made sufficiently long to serve equally well in the left- and right-hand positions of the door.

Each door frame 26 comprises a hinge side vertical member 36, a handle side vertical member 38 and two horizontal members 40 and 42. All four members 36–42 are preferably made from aluminum or other extrusions, so that all of them have the same cross section, shown, for example, in FIG. 10. The four members 36–42 are suitably joined together to form the rectangular doorframe 26, as by means of corner brackets 44, 46, 48 and 50, secured to the frame members 36–42 by means of screws 52 or other fasteners as shown in FIG. 5.

The mounting frame 24 is illustrated as comprising two vertical side members 54 and 56, an upper horizontal member 58, and a lower horizontal member 60. All four members 54–60 are preferably cut from extrusions made of aluminum or some other material, so that all of the members have the same cross section. As shown in FIG. 25 such cross section is generally Z-shaped. Thus, each of the members 54–60 is illustrated as comprising a front flange 62, a rear flange 64 and a web 66 extending therebetween.

At the division between each adjacent pair of doors, a mullion or metal members 68 is connected vertically between the horizontal members 58 and 60, as shown to best advantage in FIGS. 2 and 3. One such mullion is employed in illustrated construction. The mullion is located behind the space between the two doors 22.

Hinge elements are provided on each of the doors 22 and also on the mounting frame 24. Such hinge elements are arranged so that either door can be reversed between left- and right-hand positions. Moreover, the hinge elements cooperate with a closure spring in each door so that the door is resiliently urged to its closed position.

The hinge elements involve interlocking male and female elements adapted to transmit the closing torque developed by the closure springs. While the male elements could be provided on either the door or the mounting frame, it is preferred to mount them on the door. Thus, each of the illustrated doors 22 is fitted with upper and lower hinge pins 70 which can be the same and are illustrated as such, as shown in FIGS. 6–8. The hinge pins 70 are formed with outwardly projecting end portions 72 which are preferably noncircular in cross section. As illustrated, the end portions are square, but they could be of any other suitable noncircular shape.

The illustrated hinge pins 70 are rotatably mounted on the door 22. As shown, the hinge pins 70 are rotatably received in bores 74 formed in the corner brackets 44 and 46. It is desirable to provide antifriction bushings 76 between the hinge pins 70 and the bores 74. The bushings 76 can be made of nylon or some other suitable antifriction material.

The weight of the door 22 produces end thrust on the lower hinge pin 70. To take up such end thrust, each hinge pin 70 is formed with an outwardly projecting shoulder or flange 78 which is received in a circular recess or counterbore 80, formed in each of the corner blocks 44 and 46. Each of the illustrated antifriction bushings 76 has an outwardly projecting flange 82 which is interposed between the shoulder 78 and the corresponding corner bracket 44 or 46.

Each hinge pin 70 is suitably retained in the door. Thus, as shown in FIGS. 7 and 8, a retaining clip 84 is provided on each of the hinge pins 70.

Each door 22 is provided with a return spring 88 which is connected to one of the hinge pins 70. The return spring 88 is mounted within the door where it is hidden from view.

As shown to best advantage in FIGS. 6 and 7, the return spring 88 is preferably in the form of a torsion rod connected between the door and the inner end of one of the hinge pins 70. The torsion rod 88 could be of various shapes but is illustrated as being square in cross section to provide for the transmission of torque. One end of the illustrated torsion rod 88 is received in a square socket or opening 90 formed in the corresponding hinge pin 70. The other end of the torsion rod 88 is adjustably anchored to the door 22, to provide for adjustment of the initial stress, developed in the torsion rod when the door is closed.

As shown in FIG. 6, the adjustable anchor for the torsion rod 88 is provided by a rotatable adjusting member in the form of a bushing 92 which is adjustably retained within a stationary block 94. The illustrated bushing 92 has an externally threaded portion 96 which is received within the block 94, corresponding internal threads being formed within the block. To anchor the bushing 92 within the block 94, the block is distorted to produce a force fit between the internal and external threads. As shown, the block 94 has one or more portions 98 which are punched or crushed inwardly.

One end of the adjusting bushing 92 is formed with a socket 100 which is square and of a size to receive the end of the torsion rod 88. The other end of the bushing 92 is adapted to be engaged by an adjusting tool. As shown, the bushing 92 is formed with an enlarged head 102 having a socket 104 therein, adapted to receive an adjusting wrench 106. As shown, the socket 104 and the wrench 106 are square in cross section. As will be seen in FIG. 17, the wrench 106 has a handle portion 108 and two end portions 110 and 112, bent at right angles to the handle portion. The end portion 112 is twisted relative to the handle 108 so that one end of the wrench can always be engaged with the square socket 104.

The block 94 is nonrotatably received in a channel 114 formed in the vertical member 36 of the door 22. The block 94 is preferably rectangular in cross section to prevent it from turning in the channel 114.

As clearly shown in FIG. 6, the vertical member 36 of the door is formed with a rearwardly facing recess 116, to provide for access to the adjusting member 92. The wrench 106 is inserted through the recess 116 when the wrench is engaged with the square socket 104 in the adjusting member 92. To retain the adjusting member 92 and the block 94 within the channel 114 in the door, a cover member 118 is preferably secured to the vertical member 36 of the door, within the recess 116. The cover member 118 has an end wall 120 to retain the head 102 of the adjusting member 92. The end wall 120 is formed with an opening 122 to afford access to the square socket 104.

The recess 116 is preferably formed centrally in the vertical member 36 of the door 22. In this way, the recess affords the same access to the adjusting member 92, whether the door is mounted in its left- or right-hand position. However, the adjusting member 92 is in the upper portion of the door when it is in one position, while being in the lower portion of the door when it is in the other position.

Socket elements are provided on the mounting frame 24 to receive the noncircular end portions 72 of the hinge pins 70. Such socket elements could be the same at both the upper and lower ends of each door, but in this instance the upper and lower socket elements are different in construction. As shown to advantage in FIGS. 6 and 7, each of the upper socket elements is in the form of a bushing 126, having noncircular opening 128 therein. Each of the openings 128 is square, as illustrated, to conform to the square shape of the end portions 72 on the hinge pins 70.

The bushings 126 are suitably secured to the upper horizontal member 58 of the mounting frame 24. As shown, each bushing 126 has an externally threaded portion 130 which is adapted to be screwed into one of a series of internally threaded openings 132 in the upper horizontal member 58 of the frame 24. Each bushing 126 has a flange or head 134 which may be noncircular to receive a suitable wrench.

To provide for reversal of the doors 22, it is preferred to provide left- and right-hand openings 132 for each of the bushings 126. Thus, it will be observed from FIG. 3 that there are four openings 132 for the two bushings 126. In the case of the right-hand door the bushing 126 is shown in its right-hand position in full lines and in its left-hand position in broken lines. Alternatively, duplicate bushings 126 can be provided in the left- and right-hand positions for any or all of the doors 22. This construction is illustrated in FIG. 5, in which two bushings 126 are shown for the illustrated door.

It will be apparent that the bushing 126 transmits torque to the mounting frame 24 when the corresponding door is positioned so that torsion spring 88 is in the upper portion of the door, as shown in FIG. 5. When the door is reversed, the bushing merely supports the other or free hinge pin 70.

At the lower end of the door, each of the illustrated socket members takes the form of a plate 136 with a noncircular opening 138 therein, as shown to best advantage in FIG. 14. The illustrated plate 136 is secured to the lower horizontal member 60 of the mounting frame 24 by means of mounting screws 140 and 142. Suitable threaded openings are provided in the lower horizontal member 60 to receive the screws 140 and 142.

To provide for reversal of each door 22, each plate 136 can preferably be moved between left- and right-hand positions, as shown to best advantage in FIG. 3. It will be seen that the plate 136 for the right-hand door is shown in full lines in its right-hand position, and in broken lines in its left-hand position.

An alternative construction is to provide duplicate left- and right-hand plates 136 for any or all of the doors 22. This construction is shown in FIG. 5, in which one plate is in use, while the other is available for use when the door is reversed.

It will be seen from FIG. 8 that the square lower portion 72 of the lower hinge pin 70 extends through the square opening 138 in the plate 136 and rests upon the horizontal lower member 60 of the mounting frame 24. Any of the doors 22 can easily be removed from the mounting frame 24 by lifting the door sufficiently to disengage the square pin 72 from the opening or socket 138. Sufficient clearance is provided between the door 22 and the frame 24 to provide for such lifting movement. After the square pin 72 has been disengaged from the square opening 138, the lower portion of the door 22 is swung outwardly until it is clear of the mounting frame 24. The door 22 can then be moved downwardly to disengage the square pin 72 at the upper end of the door from the upper socket member 126.

When the door 22 has been removed, it can be reinserted in its original position. However, if the door is to be reversed, it is inverted before being reinserted. The upper socket member 126 and the lower mounting plate 136 are removed and relocated. As will be described in detail presently, the illustrated embodiment includes a stop plate which is moved from one end of the door to the other so that it is always mounted on the bottom of the door. The door is then reinserted in its new position.

Means are preferably provided to limit the opening movement of each door 22 to about 90°, so that any open door will not interfere with the opening of the adjacent door. As shown to best advantage in FIGS. 8 and 14, each door 22 is preferably provided with a stop plate 146, secured to one end of the door. In the illustrated embodiment, the stop plate 146 is always secured to the lower end of the door and is provided with a circular opening 148 adapted to receive the square projecting end 72 of the lower hinge pin 70. The square end 72 is freely rotatable in the opening 148. The 146 is suitably secured to the lower end of the door 22, as by means of a screw 150.

The movable stop plate 146 has an element which is adapted to abut against a stationary member on the mounting frame 24. As shown in FIG. 14, the abutting element on the stop plate 146 is in the form of an arm or projection 152, adapted to engage the head of the upwardly projecting screw 142 when the door has been swung to a fully open position. A slot or notch 154 is formed in the stop plate 146 to accommodate the screw 142 so that the door can be moved to its closed position without any interference between the screw 142 and the stop-plate 146.

When the door is opened and released, it is normally closed automatically by the closure spring 88. However, at times it may be desired to hold the door open, particularly when merchandise is to be loaded upon the shelves behind the door. Each door is preferably provided with a conveniently operable hold-open device, shown to best advantage in FIG. 14. Each device comprises a slidable latch member 158, adapted to cooperate with the stop plate 146. As shown, the latch member 158 is slidable along the upper surface of the mounting plate 136. The latch member 158 is mounted on the plate 136 by means of a screw 160 extending through a slot 162 in the latch member 158.

In FIG. 14, the latch member 158 is shown in its inactive position. When the door is swung open, the latch member 158 can be slid to the left into its active position, in which a finger 164 on the latch member 158 is moved behind a projecting member 166 on the stop plate 146. The latch member 158 is shown in its active position in FIG. 16. It will be seen that the door is blocked in an open position by the engagement between the latch member 158 and the stop plate 146. The rear edge of the latch plate 158 is backed up by a portion of the mounting frame 24.

The mounting screw 160 for the latching member 158 is adapted to be received in an internally threaded opening 168 in the mounting plate 136. When the mounting plate 136 is reversed from left to right, the screw 160 and the latching plate 158 are removed. In this way, the mounting plate 136 can be inverted. In the new position of the mounting plate 136, the latching member 158 is also inverted and is again secured to the mounting plate 136 by mounting the screw 160 in the opposite end of the threaded opening 168.

FIG. 5 illustrates an alternative construction in which both the mounting plate 136 and the latching member 158 are duplicated in the right- and left-hand positions. Generally, however, it is more advantageous to reverse the positions of the members 136 and 158, rather than duplicating them.

The stop plate 146 is preferably reversible between the opposite ends of the door 22. In FIG. 4, the stop plate 146 is shown on the right-hand door in full lines in its initial position, and in broken lines in its reversed position, at the opposite end of the door. The stop plate 146 is normally mounted on the bottom of the door to cooperate with the screw 142. Alternatively, the stop plate 146 can be duplicated at the opposite ends of the door, as illustrated in FIG. 5.

In accordance with the usual practice, each door 22 is provided with one or more internal heaters 170 (FIG. 10) to heat

the metal frame 26 of the door so as to prevent any condensation of moisture or formation of frost on the metal frame. In some cases, the glass panel 28 is also provided with an internal heater, which may take the form of a transparent, electrically conductive coating on one of the inaccessible surfaces of one of the glass panes 30. The door heater 170, as well as the heating element, if any, in the glass panel 28, is supplied with electrical energy by a flexible cord 172 (FIG. 6), adapted to extend between the door and a portion of the mounting frame 24. Preferably, a plug or some other electrical connector 174 is mounted on the free end of the electrical cord 172. Mating connectors are provided on the mounting frame 24 to receive the connector 174. To accommodate the reversal of the doors, the stationary connectors are provided in left- and right-hand positions for each door. As shown in FIG. 3, the connectors on the mounting frame 24 take the form of three similar receptacles 176A, B and C. It will be seen that the receptacle 176A is mounted on the left-hand vertical member 54 of the mounting frame 24. The receptacle 176B is mounted on the mullion 68. The receptacle 176C is the same as the receptacle 176A but is mounted on the right-hand vertical member 56 and is inverted. Thus, the receptacle 176A is adapted to receive the plug 174 of a door in its left-hand position, while the receptacle 176C is adapted to receive a plug for a door in its right-hand position.

The receptacle 176B must be capable of receiving the plug 174 on a door which is either left-handed or right-handed. Consequently, the receptacle 176B is made readily reversible. As shown in FIG. 3, the receptacle 176B is mounted on a plate 178 which is secured to the mullion 68 by a pair of screws 180 or other fasteners. It is an easy matter to reverse the receptacle 176B by removing the screws 180, reversing the plate 178, and replacing he screws 180.

It has already been indicated that the adjusting member 92 for the closure spring 88 is accessible through the recess 116 in the door 22. The recess 116 is also employed to receive and conceal the electrical cord 172 and the connector 174. As shown in FIGS. 4, 6 and 15, the cord 172 extends out of the door 22 through the recess 116. Virtually the entire exposed portion of the cord 172 is contained within the recess 116 when the door is in its closed position. Thus, the cord 172 is effectively hidden within the recess 116 when the door is closed. Most of the plug 174 is immediately behind the recess and is also effectively hidden when the door is closed. Moreover, the cord and the plug are not susceptible to snagging.

When the door is fully open, as shown in FIG. 16, a large part of the cord 172 is still within the recess 116 and that is hidden from the normal angle of view. Moreover, the plug 174 is substantially hidden to an observer at the usual viewpoint in front of the mounting frame 24. Only by moving into the opening vacated by the door can the cord 172 and plug 174 be seen.

It has previously been indicated that the cover member 118 is mounted in the recess 116. As shown in FIG. 6, the electrical cord 172 comes out of the door 22 through an opening 182 in an end wall 184 of the cover 118. It will be noted that the cord 172 extends generally along the hinge axis of the door 22. The opening 182 is substantially along the hinge axis. Thus, the cord 172 is subject to a minumum amount of movement when the door is opened. Accordingly, the cord can be made quite short so that it is easy to conceal.

It will be seen from FIGS. 15 and 16 that the recess 116 opens rearwardly and laterally. Both of the open sides of the recess are effectively concealed by the mounting frame 24, and also in some cases by the adjacent door.

It has been indicated that the metal frame 26 of each door 22 is formed with a channel 114. The supporting block 94 for the adjusting member 92 is mounted in this channel 114. Moreover, the electrical cord 172 extends along this channel and out of the door through the recess 116.

As shown in FIG. 15, the channel 114 is formed between flanges 190 and 192. The flange 190 forms the outside wall of the metal doorframe 26. The front wall of the doorframe is formed by another flange 194, generally at right angles to the flange 190. The flange 192 is generally Z-shaped and is concealed within the doorframe.

The narrow groove 196 is formed between the flanges 190 and 192 where they come together inside the doorframe. This groove 196 connects with the channel 114 and extends adjacent the rear side of the front flange 194 where it merges with the side flange 190. As shown in FIG. 16, the heater element 170 within the door 22 is preferably in the form of a cable which fits snugly into the groove 196. The heater cable 170 is installed by pushing it forwardly as far as possible into the groove 196. To retain the heater cable 170, the flange 190 is formed with a ridge 198 which projects into the groove 196. The location of the ridge 198 is such that the heater cable may be pushed past the ridge 198 into the most forwardly extremity of the groove 196. The ridge 198 is then behind the heater cable 170 so as to retain it in the groove against any possible dislodgement.

The glass panel 28 is adapted to be mounted between the front flange 194 and a rear flange 200, projecting inwardly from the flange 192. It will be seen that the joint between the glass panel 28 and the metal doorframe 26 is sealed by a molding strip 202 which is generally U-shaped in cross section and is wrapped around the edges of the glass panel. The molding strip 202 is confined between the flanges 194 and 200. Preferably, the molding strip 202 is made of vinyl plastic or some other soft resilient material.

As clearly shown in FIG. 15, each door 22 is provided with a gasket or sealing strip 204 which forms a seal with the mounting frame 24. The illustrated gasket 204 is of the magnetic type and is formed with a tubular sealing member 206 with a magnetic core 208. A flexible bellows portion 210 is connected between the sealing portion 206 and a base or mounting portion 212.

It will be evident that the mounting portion 210 of the gasket 204 covers the rear side of the flange 200.

The mounting portion 212 has edge portions or lips 214 and 216 which are wrapped around small projecting lips 218 and 220 at the opposite edges of the rear flange 200. The edge portions 214 and 216 are generally L-shaped in cross section. It will be seen that the edge portion 214 is retained between the lip 218 and a portion of the sealing strip 202 for the glass panel 28. It will be understood that the gasket 204 is made of vinyl plastic or some other soft resilient material.

The rear side of the channel 114 is closed by a molding strip 222 which also retains the edge portion 216 of the gasket 204. Thus, the molding strip 222 has a curved flange 224 adapted to engage and retain the L-shaped edge portion 216 of the gasket 204. The molding strip 222 has another flange 226 adapted to snap into a groove 228 between flanges 230 and 232 on the main side flange 196. The closure strip 222 is made of a suitable plastic or other soft resilient material so that it can be pushed into place during the assembly of the door. If the door ever requires any maintenance, the closure strip 222 can easily be pried off the door.

The mounting frame 24 is provided with magnetic armatures or members adapted to be attracted by the magnetized cores 208 in the magnetic gasket. As shown in FIG. 15, such magnetic armatures take the form of a series of metal plates 240 secured to the rear flanges 64 of the mounting frame 24. The plates 240 are suitably secured to the flanges 64 preferably by means of removable fasteners, such as the illustrated screws 242. The flanges 64 are generally made of aluminum which is a nonmagnetic material. However, the plates 240 are made of a magnetic material such as a magnetic form of stainless steel.

The rear flanges 64 of the mounting frame 24 are preferably formed with one or more channels which are closed by the plates 240. As shown, each of the flanges 64 has two such channels 244 and 246. One or both of these channels are preferably utilized to receive the electrical heaters for the mounting frame 24. Such heaters prevent the condensation of

moisture and the formation of frost upon the metal frame **24**. As shown, the heaters are in the form of two electrical heating cables **248** which are preferably pressed into grooves **250** formed in the walls of the channel **244**. As in the case of the groove **196** in the door **24**, the grooves **250** have constricted entrances so that the heater cables **248** will be retained in the grooves against any possible dislodgment. The heater cables **248** are sufficiently soft and flexible to be capable of being pressed through the constricted entrance portions of the grooves **250**. After the cables **248** are fully fitted in the grooves **250**, the cables spring outwardly into the grooves so that the cables will not become dislodged from the grooves accidentally.

The rear side of each flange **64** is also formed with one or more channels, two such channels **252** and **254** being illustrated. A cover **256** is preferably mounted on the rear side of each flange **64** to produce a raceway in which electrical wiring can be installed to energize the various heaters.

The illustrated cover **256** is channel shaped and is secured to the flange **64** by means of screw fasteners **258**.

As shown in FIGS. **15** and **18**, the mullion **68** is generally channel shaped. Thus, the mullion comprises a front flange **260** and a pair of side flanges **262** and **264**. The exposed portions of the mullion **68** are preferably covered by a molding strip or insulating member **266**, made of vinyl plastic or some other suitable material. The molding strip **266** is also channel shaped and thus comprises a front flange or web **268** and two side flanges **270** and **272**, adapted to cover the corresponding flanges **260**, **262** and **264** of the mullion **68**.

The rear edges of the flanges **270** and **272** are preferably formed with L-shaped lips **274** and **276** which extend into grooves **278** and **280** formed in the flanges **262** nd **264**. In this way, the molding strip **266** is anchored to the mullion **68**.

The front portion **268** of the molding strip **266** is preferably formed with rearwardly projecting ribs **282** which are received in locating grooves **284**. Additional curved ribs **286** project rearwardly from the front portion **268** of the molding strip **266** and are received in locating grooves **288**.

To provide a magnetic armature for the magnetic gaskets **204**, a metal strip **290** is mounted on the front of the mullion **68** by screws **292** or other suitable fasteners. The metal strip **290** is preferably made of magnetic stainless steel. It will be seen that the metal strip **290** is mounted against the front portion **268** of the cover strip **266**. A recess **294** is formed in the cover strip **266** to receive the metal plate **290**.

One or more electric heaters **296** are preferably provided to heat the mullion **68** so as to prevent the condensation of moisture or the formation of frost thereon. The heaters **296** are preferably in the form of heating cables mounted directly behind the metal strip **290**. As shown, the heaters **296** are mounted in grooves **298** formed in the molding strip or insulating member **266**. The grooves **298** are on the opposite side of the molding strip **266** from the curved ribs **286**. The clearance between the curved ribs **286** and the rectangular grooves **288** provides for compressive shifting movement of the ribs **286** when the heater cables **296** are pressed into the grooves **288** by the metal strip **290**.

A channel-shaped cover **300** is preferably mounted on the rear side of the mullion **68** by means of screws **302** or other suitable fasteners. The cover **300** provides a raceway for electrical wiring. Moreover, electrical lighting fixtures can be mounted on the cover **300** or directly on the mullion **68** if desired. The illustrated cover **300** engages L-shaped flanges **304** on the inside of the side flanges **262** and **266**.

It is preferred to employ the mullion **68** to hold a supporting bracket **310**. As shown in FIG. **18** the bracket **310** is used to stabilize a shelf-supporting post **312**. Thus, the bracket **310** has a U-shaped end member **314** adapted to embrace the post **312**.

The bracket **310** can be mounted on either of the side flanges **262** and **264** of the mullion **68**. As shown, the bracket **310** is mounted on the side flange **262**. It will be seen that each of the side flanges **262** and **264** has a groove or channel **316** which opens laterally. The bracket **310** has a U-shaped mounting portion **318** with front, side and rear legs **320**, **322** and **324**. An elongated arm **326** extends rearwardly between the leg **324** and the U-shaped member **314**.

It will be seen that the front leg **320** extends into the channel **316**. The intermediate leg **322** extends along the side of the flange **262**. The rear leg **324** extends along the rear side of the flange **262**.

Interlocking elements are formed on the mullion flange **262** and the bracket leg **320** to retain the leg in the channel **316**. As shown, the flange **262** is formed with a ridge or key **330**, adapted to interlock with a groove **332** in the rear leg **320** of the bracket. As shown, the ridge **330** and the groove **332** are V-shaped in cross section. It will be understood that the positions of the ridge and the groove can be interchanged, if desired.

The bracket **310** can easily be mounted on the mullion **68** by inserting the leg **320** into the channel **316** and rapping the side leg **322** with a hammer until the leg **320** deflects sufficiently to ride over the key **330**, which snaps into the groove **332**. The side and rear legs **322** and **324** are thus brought into full engagement with the side and rear surfaces of the flanges **262**. The bracket is securely retained on the flange **262**, but can be removed if desired.

It will be seen from FIG. **18** that a portion of the molding strip **266** is cut away or otherwise removed so as to expose the portion of the flange **262** on which the bracket **310** is to be mounted. The molding strip **266** can be scored to provide for easy removal of the desired portion of the molding strip.

It may be helpful to summarize certain of the features and advantages of the door construction illustrated in the drawings. It is readily possible for a workman in the field to reverse any of the doors **22** in the mounting frame **24** so that a right-hand door can be changed to a left-hand door and vice versa. For example, the right-hand door in FIG. **1** is mounted for swinging movement about a right-hand hinge axis. The procedure will be described for reversing the door so that it is swingable about a left-hand hinge axis.

First, the plug **174** is removed from the receptacle **176C**. Then, the door **22** is removed from the frame **24** by opening it partially and lifting the door so that the square hinge pin portion **72** at the lower end of the door is withdrawn from the square opening **138** in the mounting plate **136**. The lower end of the door is then moved outwardly so that the entire door can be moved downwardly to withdraw the upper square hinge pin portion **72** from the square opening **128** in the threaded bushing **126**.

The stop plate **146** is removed from the lower end of the door by removing the screw **150**. The stop plate **146** is transferred to the opposite end of the door and is clamped in place with the use of the screw **150**. Threaded openings for the screw are provided in both ends of the door.

The threaded bushing **126** is moved between its full line and broken line positions as shown in FIG. **3**. Thus, the bushing is unscrewed from its right-hand opening and screwed into its left-hand opening.

The mounting plate **136** is removed from the position shown in full lines in FIG. **3**. This is done by removing the screws **140** and **142**. The latch plate **158** is detached from the mounting plate **136** by removing the screw **160**. The mounting plate **136** is moved to its left-hand position, shown in broken lines in FIG. **3**. The mounting plate is inverted at its new location. To clamp the mounting plate **136** to the frame **24**, the screws **140** and **142** are turned into the threaded openings which are provided at the left-hand position of the plate. The latch plate **158** is also inverted and is mounted on the upper side of the plate **36** by inserting the screw **160**.

The door **22** is then inverted and is inserted into the frame **24**. This is done by inserting the upper square hinge pin portion **72** into the square opening **128** in the bushing **126**. The lower square hinge pin portion **72** is then inserted into the square opening **138** in the plate **136**.

Removing the door **22** relieves the tension or stress in the closure spring **88**. Consequently, it is necessary to reestablish the initial stress in the spring **88**. This is done with the door **22** in its open position. If desired, the latching slide **158** can be employed to hold the door in its open position. This is done by moving the slide **158** to the position shown in FIG. **16**. With the door open, one end of the wrench **108** is inserted into the square socket **104** in the adjusting member **92** as shown in FIG. **6**. The recess **116** affords access to the adjusting member **92**. The recess is near the center of the door so that the adjusting member is always conveniently accessible. To adjust the spring **88** the wrench **108** is turned in a direction to increase the stress developed in the spring. This develops an initial stress in the spring **88** so that it will hold the door shut with a definite force when the door is in its closed position.

The adjustment of the member **92** is maintained by the deformed block or nut **94**. While the adjusting member **92** can be turned in the block **94** with the aid of the wrench **108**, the resistance to turning movement is substantially greater than the maximum force developed in the return spring **88**. Thus, the spring **88** is incapable of changing the adjustment of the threaded member **92**. While the spring **88** is shown as a torsion rod, springs of other types can be employed.

The reinstallation of the door is completed by inserting the plug **174** into the receptacle **176B**. If necessary, the receptacle **176B** can be repositioned by removing the screws **180**, inverting the plate **178**, and reinstalling the screws.

In accordance with the present invention, all of the doors are the same in construction and all of them are capable of being mounted for either left- or right-hand swing. Left- and right-hand doors differ only in the position of the stop plate **146** which can readily be moved from one end of the door to the other. With this construction, the doors can be carried in stock and used for either left- or right-hand swing as needed.

To provide for reversal of the doors in the field, the mounting frames can be formed with left- and right-hand mounting holes for all of the bushings **126** and mounting plates **136**. If the need arises in the field, any door can then be reversed as to its direction of swing.

As shown in FIGS. **10** and **15**, the electrical heating cables **170** are securely retained in the grooves **196** by ridges **198** which provide a constricted entrance to each groove. Each heating cable is pressed into its groove and is deformed sufficiently to move past the constricting ridge **198**. The cable **170** then springs outwardly so that it is securely retained in the groove against any accidental dislodgement. The heating cables **248** in the mounting frame **24** are similarly retained in the grooves **250**, which also have constricted entrances. In addition to being securely retained, the heating cables are held in close contact with the metal frame members of the door and the mounting frame, so that the heat is efficiently transferred between the heating cables and the metal members. Thus, the metal frame members are heated with high efficiency, and the heat is dissipated from the cables so that local overheating is prevented.

The heating cables **296** in the mullion **68** are mounted directly behind the stainless steel armature plate **290** so that the heat developed by the cables is concentrated in the plate. This construction prevents condensation of moisture and formation of frost on the armature plate. The heater cables **296** are pressed into the grooves **298** in the molding strip **266** by the armature plate **290**. If the heater cables **296** ever need replacement, they can be made accessible simply by removing the plate **290**.

The bracket **310** can readily be installed on the mullion **68** by inserting the front leg **320** of the bracket into the channel **316** in the side of the mullion. The side leg **322** of the bracket is then rapped with a hammer until the leg **320** deflects sufficiently to move over the key **330** so that it will snap into the groove **332**.

In some cases, the reversible door can
comprising furnished without a mounting frame but with upper and lower mounting brackets or other elements, to provide for the mounting of the door with either left- or right-hand swing.

Various other modifications, alternative constructions and equivalents may be employed, as will be understood by those skilled in the art.

We claim:

1. A bracket mounting construction for refrigerators,
a refrigerator door mounting frame having a vertical member with rectangularly related side and rear surfaces,
said member having a laterally opening channel formed in said side surface,
a bracket having a generally U-shaped mounting portion disengageably mounted on said vertical member,
said U-shaped portion having first and second rectangularly related legs engageable with said side and rear surfaces,
said U-shaped portion having a third leg extending from said first leg into said channel,
and interlocking key elements on said vertical member and said third leg for retaining said U-shaped portion on said vertical member.

2. A bracket mounting construction according to claim **1**,
in which said key elements take the form of a forwardly projecting ridge formed on said vertical member in said channel,
and an interlocking groove formed in a rear side of said third lug.

3. A bracket mounting construction according to claim **1**,
in which said key elements are formed along the rear side of said third leg and the front side of said channel in said vertical member.

4. A refrigerator door construction,
comprising a mounting frame,
a door swingable in said frame,
and hinge means mounting said door in said frame for swinging movement about a hinge axis,
said hinge means including a torsion spring in said door for resiliently urging said door to a closed position,
said door including an adjusting member rotatably mounted therein and connected to said spring for adjusting the initial stress in said torsion spring,
and an anchoring member nonrotatably mounted in said door,
said anchoring member and said adjusting member having mating screw-threaded portions,
one of said portions being locally deformed to establish high frictional resistance to rotation of said adjusting member so that the stress in said spring will not change the position of said adjusting member.

5. A refrigerator door construction according to claim **33**,
in which said anchoring member is in the form of a nut with internal threads therein,
said adjusting member having external threads mating with said internal threads,
said nut being locally deformed inwardly to produce a force fit between said internal and external threads.

6. A refrigerator door as defined in claim **33**, in which said door has a vertical member with said hinge axis defined on said vertical member, said vertical member having a rearwardly facing recess substantially centrally thereof with said adjusting member being adjacent said recess and said recess affording access to said adjusting member.

7. A refrigerator door construction,
comprising a mounting frame,
a door swingable in said frame,
first and second hinge pins rotatably mounted in said door,
said pins having noncircular elements projecting from said door,
one of said elements projecting upwardly while the other element projects downwardly,
said door including a spring connected between one of said hinge pins and said door for resiliently urging said door to a closed position,
first and second socket elements having noncircular opening for receiving said noncircular elements of said pins,

said noncircular elements being nonrotatable in said noncircular openings,

means for selectively mounting said first and second socket elements in left- and right-hand positions on said mounting frame,

said door being reversible between left- and right-hand swing by reversing the positions of said socket elements and inverting said door,

a heater in said door,

a flexible cord connected to said heater and extending from said door,

and a first connector mounted on said cord,

said mounting frame having a left- of second connectors to mate with said first connector in left- and right-hand positions of said door,

said door being formed with rearwardly facing recess for receiving said cord when said door is in a closed position,

said recess being generally aligned with the hinge axis of said hinge pins,

whereby said cord is disposed in said recess when the door is in its closed position.

8. A door construction according to claim 7, further including an adjusting member rotatably mounted in said door adjacent said recess and connected to said torsion spring for adjusting the initial stress in said torsion spring.

9. A reversible refrigerator door construction comprising a mounting frame having vertical side members; a reversible door swingable about a hinge axis in said frame; hinge means cooperating with said frame and door for supporting said door for swinging movement in said frame; said hinge means being mountable on said frame to support said door in left- and right-hand positions affording opposite directions of swinging movement for the door; electrically responsive means in said door; a flexible cord connected to said electrically responsive means and having a free end extending from said door intermediate opposite ends thereof and adjacent said hinge axis, said cord having a first connector mounted on said free end; a pair of second connectors on said vertical side members mating respectively with said first connector in the left- and right-hand positions of said door, one of said second connectors being generally aligned with said first connector in the respective positions of said door.

10. A refrigerator door construction as defined in claim 9, further including a spring having one end connected to said hinge means; an adjusting member on the opposite end of said spring; means supporting said adjusting member in said door for access through said recess.

11. A refrigerator door construction,

comprising amounting frame,

a reversible door swingable in said frame in left- and right-hand directions,

hinge means mounting said door in said frame for swinging movement about a hinge axis, said door having a rearwardly facing recess adjacent said hinge axis substantially centrally between opposite ends thereof,

a heater in said door,

a flexible cord connected to said heater and extending from said door into said recess,

means on said frame vertically aligned with said recess with said door is in either position for receiving said cord to energize said heater,

said cord thereby being concealed within said recess when said door is closed.

12. A refrigerator door construction as defined in claim 11, further including a spring extending along said hinge axis and having one end connected to said hinge means; an adjusting member connected to the opposite end of said spring; and an anchor member supporting said adjusting member in said door with said recess affording access to said adjusting member.

* * * * *

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,629,972 Dated December 28, 1971

Inventor(s) Thomas R. Rehberg and Francis M. Niekrasz

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Col. 3, line 53, "FIG. 25" should be --FIG. 15--
Col. 5, line 14, after "having" insert --a--
Col. 6, line 16, "The 146" should read --The plate 146--
Col. 7, line 34, "he" should be --the--
Col. 8, line 5, "The" should be --A--
Col. 9, line 33, "nd" should be --and--
Col. 11, line 73, after "can" insert --be--
line 74, delete "comprising"
Col. 12, line 8, before "a" insert --comprising--
line 50, change "claim 33" to --claim 4--
line 57, change "claim 33" to --claim 4--

Col. 13, line 13, delete "left" and insert --pair--
Col. 14, line 14, "amounting" should be "a mounting"
line 24, change "with" (second occurence) to --when--

Signed and sealed this 11th day of July 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents

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