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CABINET WITH SELF-CLOSING DOORS

3 Sheets-Sheet 1



Fig. 3

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Fig. 4

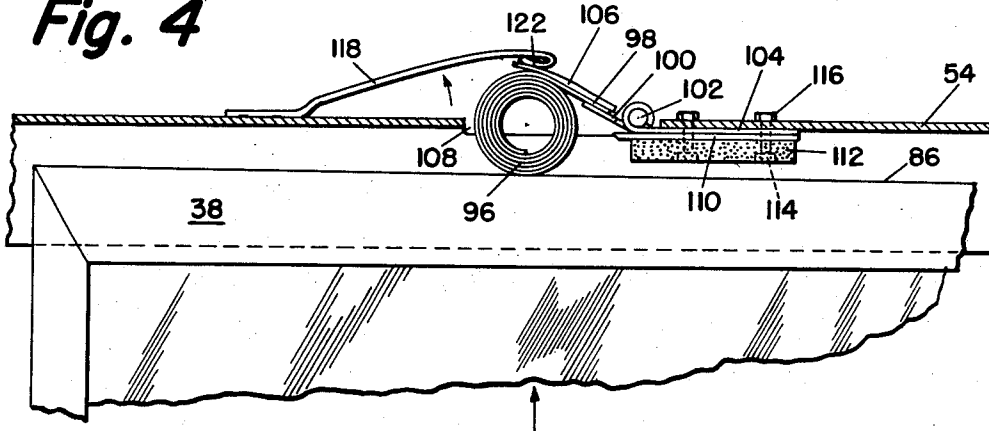


Fig. 5

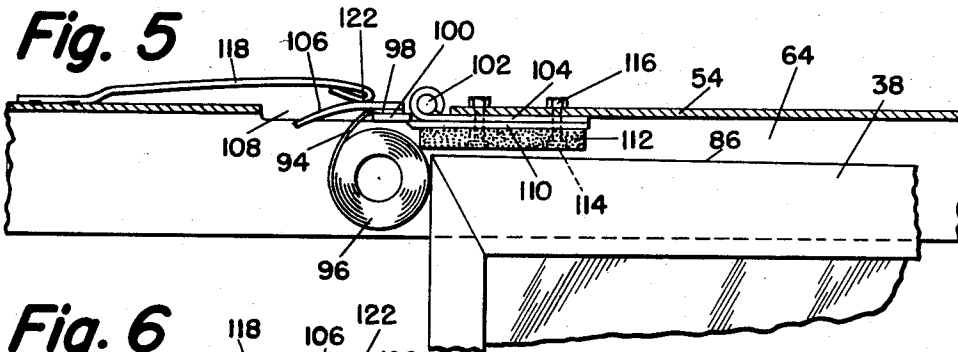


Fig. 6

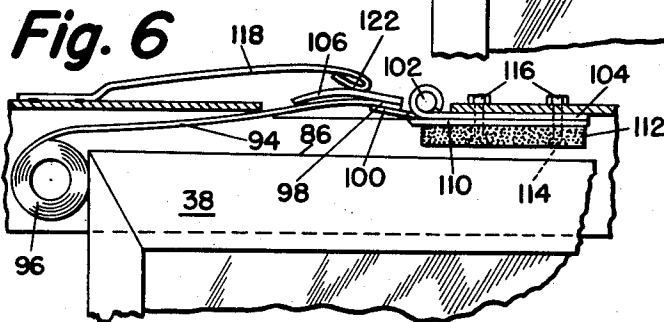


Fig. 7

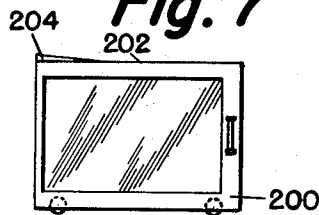


Fig. 8

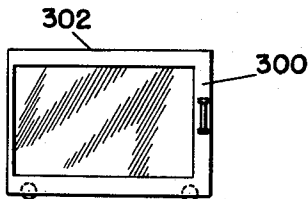
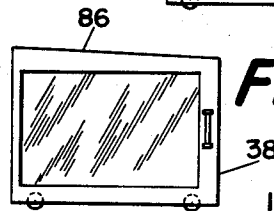


Fig. 9



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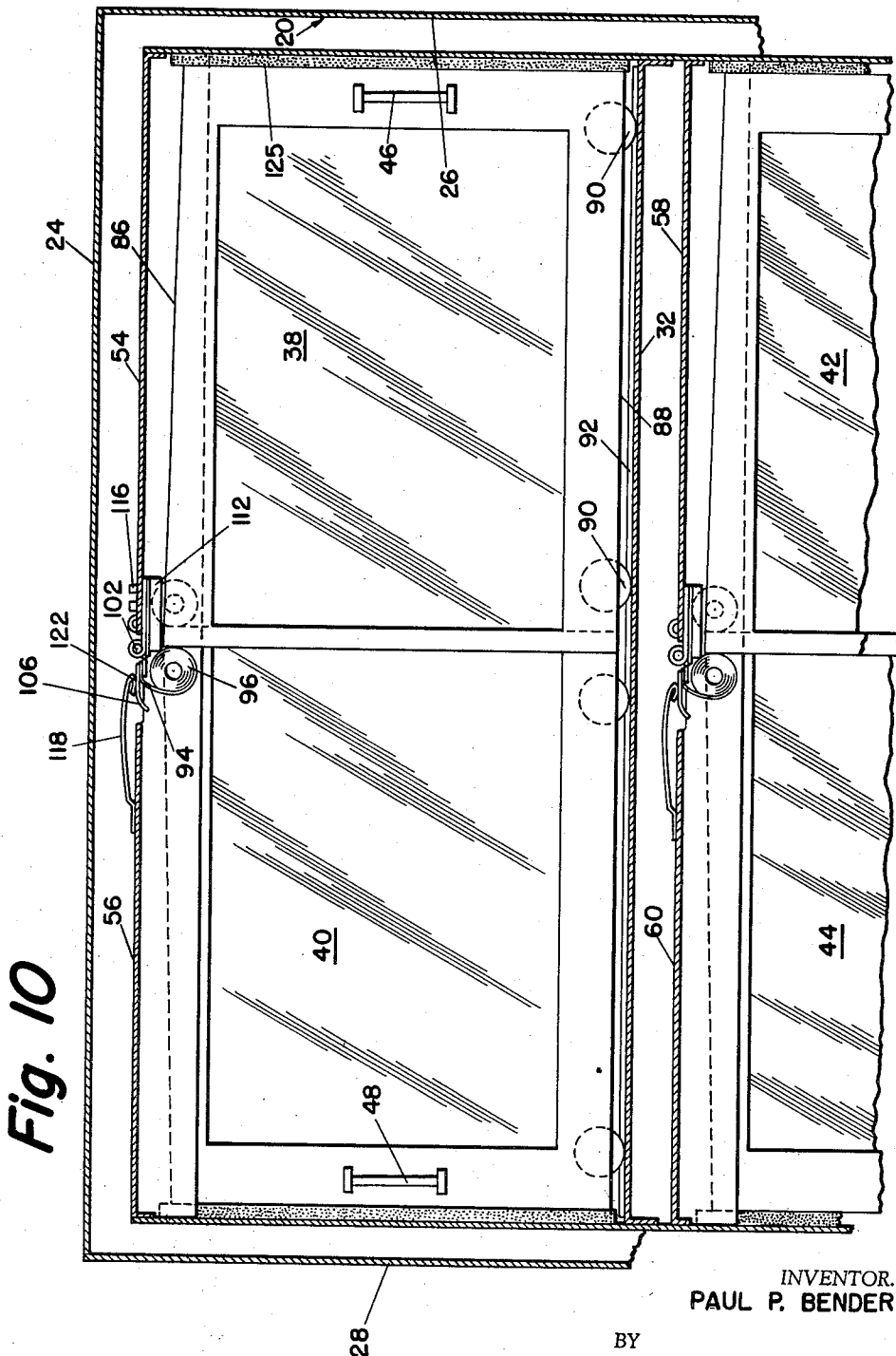
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3 Sheets-Sheet 3



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CABINET WITH SELF-CLOSING DOORS

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10 Claims. (Cl. 312—138)

This invention relates to a door construction for storage and display cabinets, and it particularly relates to a self-closing type of door construction.

Display cabinets having transparent windows or doors are used for many different purposes both in the home and in commercial installations. They are very frequently used in restaurants or food stores for displaying the foods in full view of the customer while yet maintaining such foods free from contamination by dust, dirt, insects and the like present in the atmosphere. These cabinets are also generally refrigerated. For best efficiency, the doors on these cabinets are usually of the sliding panel type, which makes it difficult to get into the cabinet to clean it. Furthermore, food crumbs and dust tend to accumulate in the grooves and tracks generally used for sliding doors. Consequently, it is highly desirable that these doors be removable so that the grooves and tracks may be cleaned. The removal of the doors also permits easier access into the cabinet itself so that all portions thereof may also be thoroughly cleaned.

Another problem inherent in the use of sliding doors or panels is the problem of keeping them closed at all times except when the food or other articles are being inserted or removed. Often the person using the cabinet will forget to slide the door back into closed position; at other times, both hands will be full so that he cannot close the door at that time and, thereafter, may forget to do so.

It is one object of the present invention to overcome the above and other difficulties by providing a removable sliding door construction wherein the doors automatically close when released.

Another object of the present invention is to provide a sliding door construction wherein the doors may be easily removed and inserted and when inserted will be in position for self-actuated closing.

Another object of the present invention is to provide a self-closing sliding door construction wherein the doors will return to closed position at an even and constant velocity, thereby eliminating any sudden and violent shock action which might cause breakage of the doors; especially when such doors include a transparent glass pane or the like.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings, wherein:

Fig. 1 is a front perspective view of a display cabinet embodying the present invention;

Fig. 2 is a view partly in elevation and partly in section, taken substantially on line 2—2 of Fig. 1, with parts broken away, and showing the sliding door arrangement;

Fig. 3 is a fragmentary, top perspective view of the channel member and self-closing arrangement for closing one of the sliding doors;

Fig. 4 is a fragmentary sectional view showing one of the doors being inserted into the upper track;

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Fig. 5 is a view similar to Fig. 4 but showing the door in closed position with the spring coil behind it;

Fig. 6 is a view similar to Figs. 4 and 5 but showing the inserted door in partially open position with the spring of the coil extended;

Fig. 7 is a side elevational view of a second form of door embodying the present invention;

Fig. 8 is a side elevational view of a third form of door embodying the present invention;

Fig. 9 is a view similar to Figs. 7 and 8, of the door shown in Figs. 1 to 6; the sloped inclination of the top edge being somewhat exaggerated for greater clarity; and

Fig. 10 is an enlarged front view, partly in section and partly in elevation, with parts broken away, of the front of the case illustrated in Fig. 1; here, too, the slope of the top edges of the doors being slightly exaggerated for greater clarity.

Referring now in greater detail to the figures of the drawings wherein similar reference characters refer to similar parts, there is shown a cabinet, generally designated 10, which comprises a base portion 12 in which is provided a refrigerated chamber closed by doors 14, a side portion provided with shelves 16, a water fountain 18 below the shelves 16 and a compressor unit 19 below the water fountain. The compressor 19 is operatively connected to refrigerator coils (not shown) in the chamber in the base portion, and these refrigerator coils supply cold air not only to the chamber in the base but are also associated with conduits which carry the cold air up to vents (not shown) in the interior of a food display case 20. Vents (not shown) are also provided in the food case to carry the warmed air down through corresponding ducts (not shown) back to the refrigerator coils whereby a cyclic system is effected.

The food display case 20 has an open front defined by a framework 22 which includes top frame member 24, side frame members 26 and 28 and counter portion 30 at the bottom. Extending across the open front at the center thereof is a bar 32, this bar being connected at one end to frame member 26 and at the other end to frame member 28.

Within the case 20 are provided a series of vertically spaced movable shelves 34 while at the bottom are provided a number of trays 36. The shelves 34 and trays 36 are shown for purposes of illustration; however, any arrangement of shelves, trays or other desirable supports may be used and the case may even be empty if desired.

The bar 32 divides the case into what is, in effect, two compartments with a pair of sliding glass doors or panels closing each compartment.

The doors for the upper compartment are indicated at 38 and 40 and the doors for the lower compartment are indicated at 42 and 44. Each door comprises a frame in which a glass pane is fixed and a handle is provided on the frame at one side, as at 46, 48, 50 and 52. Each door is slidable in an individual channel at its upper edge, such channels being shown at 54, 56, 58 and 60 respectively. (Note Fig. 2.)

The channels 54 and 56 are preferably formed from an integral strip having three spaced vertical walls 62, 64 and 66 with an inwardly turned flange on the bottom edge of each wall, as at 68, 70 and 72 respectively. The channels 58 and 60 are similarly formed by a strip having three vertical walls 74, 76 and 78 each of which has an inwardly extending bottom flange respectively indicated at 80, 82 and 84.

The positioning of the individual doors in their respective channels is an important feature of this invention and will be described in detail; however, since all the doors are similarly arranged and mounted, a description of one door assembly will serve as a description of

all. Consequently, the assembly of door 38 will be described as follows:

The door 38 is removable from the framework and is insertable by first inserting its upper edge 86 under the upper frame member 24 and into the channel 54. This is generally done with the door in about the center of the case rather than at the end. After the upper edge 86 has been properly inserted, the lower edge 88 is inserted into place with the grooved rollers 90 (to be hereafter more fully described) engaged with the corresponding rail 92 on the frame portion 32.

Positioned within the channel 54, as well as within each of the other channels, is a metal strip 94 which is resiliently biased into a coil 96. The strip 94 is usually constructed of stainless steel or high-carbon spring steel and is stressed incrementally along its length rather than cumulatively as in ordinary springs. Consequently, the strip 94 maintains a constant resistance to uncoiling throughout its entire deflection.

The strip 94 is secured at 98, as by adhesive, welding, soldering, bolting or the like, between a finger 100 hinged at 102 to a plate 104 and a finger 106 extending into a slot 108 is partially covered by the finger 100 but is of substantially greater length than the finger 106 so that even when the finger 106 is in fully extended horizontal position, a space will remain between its edge and the edge of the slot.

Positioned under the plate 104 is a plate 110 and below this plate 110 is provided a bumper bar 112 of preferably resilient material. The plates 104, 110 and bumper bar 112 are all held in assembled relationship and connected to the top wall of channel 54 by bolts 114 and nuts 116. A leaf spring 118 is connected by welding, rivets or the like to the top wall of channel 54. This spring bears against the finger 106, as at 122, urging the finger 106 into the slot 108.

The door 38, similarly to all the other doors 40, 42 and 44, is provided with a pair of slots 124 in each of which is journaled a grooved roller 90.

In operation, with the door 38 removed, the spring coil 96 occupies most of the width of channel 54 (as shown in Fig. 5). To insert the door 38, the upper edge 86 of the door is inserted under the frame member 24 and into channel 54 from below; the door generally being inserted midway of the length of the channel (as shown in Fig. 4). When this is done, the door edge 86 acts to lift the coil 96 against its bias into contact with finger 106. Finger 106 flexes through slot 108 while yet acting as a guard member to prevent binding of coil 96 in the slot 108 and to prevent damage to the somewhat delicate spring. The finger 106 under the tension of spring 118, also serves another purpose. During the last fractional portion of the closing movement and while the door is in closed position, because of the nature of the spring coil 96, any slight obstruction or jar would cause the door to slide back slightly against the force of the coil. This would be especially undesirable in the case of a refrigerated cabinet where the heat of the room would enter. However, the force of the spring 118 on the finger 106 acts as a counterforce to resist this opening movement until a positive opening force of sufficient extent is applied.

After the upper edge of the door has been inserted, the lower edge of the door is lifted over the bar 32 until the rollers 90 engage over the rail 92. The door 38 is then pushed to the right (as viewed in Figs. 4, 5 and 6) until the trailing edge of the door clears the coil 96. When this happens, the coil 96 moves down into position behind the trailing edge of the door (as shown in Fig. 5). Thereafter, whenever the door is pushed back into open position, it pushes back the spring coil 96 which uncoils the strip 94 (as shown in Fig. 6). When the door is then released, the spring strip 94 acts to automatically move the door back into closing position, in which position its forward edge contacts a resilient bump-

er strip 125. This closing movement of the door is effected gently and easily because of the heretofore explained constant tension of the spring strip 94.

When the door is removed in reverse fashion to the manner in which it was inserted, the bumper bar 112 prevents the spring coil 96 from bouncing back beyond its original position.

In the preferred embodiment of the invention, illustrated in Figs. 1 to 5, 9 and 10, the upper edge 86 of the door is slightly inclined from a high point at the trailing edge to a low point at the forward edge; this inclination being somewhat exaggerated in the drawings for greater clarity. One reason for this is to permit easy insertion of the door while yet permitting the trailing edge of the door to engage the coil 96 properly. In further explanation, the trailing edge of the door 38 should extend to a height above the center line of the coil so that, when the door is pushed back against the coil, it will push it back straight. If it were below the center line of the coil, there would be an inclined vector force which would tend to push the coil into the slot 108 and cause binding. On the other hand, there should be sufficient clearance to enable the door to be properly and easily inserted into the channel 54 without pushing the coil 96 too strongly against the finger 106. By providing the inclined edge 86 on the door, the door is inserted in such position that the lower central portion of the door first engages coil 96 and then as the door is initially pushed into its closed position, the coil rides gradually up on the cam-like inclined edge 86 until it falls down on the other side of the trailing edge of the door.

Another function provided by this tapered upper edge construction is that after the upper edge has been inserted, and while the lower edge is being inserted, the higher end of the door acts as a fulcrum to permit easier insertion of the opposite end of the door.

The above-described tapered upper edge construction of the door permits the door to be made without the very fine tolerances which would be necessary if the door were made perfectly rectangular and yet with the required height of the trailing edge together with the sufficient clearance necessary for easy insertion. In this manner, the expense and time of manufacture is considerably reduced.

Instead of making the upper edge of the door entirely inclined, as in Figs. 4 to 6, a door 200 may be used, as illustrated in Fig. 7, where the upper edge 202 is straight but a cam portion 204 is provided at the trailing edge. This door 200 functions similarly to door 38 except that instead of the upper edge 202 being entirely tapered, it can be made substantially straight while the cam portion 204 can either be made separately and then attached or made integral with the door frame in the first instance.

In Fig. 8 there is shown a door 300 which is similar to the other doors described except that it is has a perfectly straight upper edge 302. This edge 302 is somewhat more efficient than the others since, by this construction, the door can be inserted evenly at any position relative to the spring coil; however, the cost and difficulty of manufacture of this straight edge type of door is much greater than the others because of the fine tolerances required.

As illustrated, the doors 38 and 40 are provided for the upper portion of the display case and the doors 42 and 44 for the lower portion thereof. The doors 38 and 40 are arranged to close in opposite directions as are also doors 42 and 44. Therefore, the spring strip 94 of channel 54 is biased into its coil 96 in an opposite direction from the spring strip in channel 56 (as best indicated in Fig. 10) while the same is true of the corresponding spring strips in channels 58 and 60 where the strips are also biased into their respective coils from opposite directions.

Obviously many modifications and variations of the

present invention are possible in the light of the above teachings. It is, therefore, to be understood that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described.

What is claimed as the invention is:

1. In a self-closing door arrangement, a frame comprising upper and lower track means, said upper track means comprising a channel member having a front wall, a rear wall and a top wall, an aperture in said top wall intermediate its length, a finger hinged to said top wall at one side of said aperture, said finger being of smaller length than said aperture, a spring on said channel member resiliently urging said finger downwardly through said aperture, a spring strip resiliently mounted in said channel member and longitudinally biased into a coil underlying said finger, a door panel removably insertable into said frame between said upper and lower track means, said coil being positioned to be pushed radially upward against said finger by the upper edge of said door panel when said door panel is inserted into said channel member, and said coil being resiliently urged into a position wherein it abuts against the trailing edge of the door panel when said panel is moved away therefrom longitudinally of said channel member.

2. In a self-closing door arrangement, a frame comprising an upper channel member and a lower rail, said door panel having grooved rollers on its lower edge positioned to movably engage said rail, said upper channel member having a front wall, a rear wall and a top wall, an aperture in said top wall, intermediate its length, a finger hinged to said top wall at one side of said aperture, said finger being of smaller length than said aperture, a spring on said channel member resiliently urging said finger downwardly through said aperture, a spring strip resiliently mounted in said channel member and longitudinally biased into a coil underlying said finger, a door panel removably insertable into said frame between said upper and lower track means, said coil being positioned to be pushed radially upward when said door panel is inserted into said channel member, said coil being resiliently urged into a position wherein it abuts against the trailing edge of the door panel when said panel is moved away therefrom longitudinally of said channel member, and a flexible bumper bar underlying said top wall in a position to be engaged by said coil when said door panel is removed.

3. The arrangement of claim 1 wherein said door panel comprises a generally rectangular frame enclosing a transparent plate.

4. The arrangement of claim 1 wherein said door panel comprises a generally rectangular frame enclosing a transparent plate, the upper edge of said frame being tapered from one end to the other thereof.

5. The arrangement of claim 1 wherein said door panel comprises a generally rectangular frame enclosing a transparent plate, the upper edge of said frame being substantially straight and having a cam portion provided at one end thereof.

6. A track means for slidable doors comprising an elongated channel member, an aperture intermediate the ends of said channel member, a finger of smaller length than said aperture hinged to said channel member and spring-pressed into said aperture, a spring strip having one end connected to said channel member adjacent said finger and biased into a coil underlying said finger, and a bumper bar connected to said channel member below said finger in a position to be normally engaged by said coil when said coil is free from tension.

7. A self-closing door arrangement comprising a housing, an opening in said housing, a channel track on at least a portion of the inner periphery of said opening, said channel track being defined by a strip having two vertical walls integral therewith, the lower edges of said vertical walls defining the corresponding effective periphery of said opening, a door panel removably positioned in said opening with one edge thereof extending into said channel track beyond said effective periphery, a spring strip in said channel track, said spring strip being resiliently biased into a coil, said coil normally extending toward said effective periphery to a position downwardly of the position of said one edge of said door panel when said door panel is in said opening, said channel track having means thereon to permit said coil to be pressed radially back from said lower edges of said vertical walls when pressure is applied radially to said coil so that said one edge of said door panel acts to engage said coil and push it radially back from its normal position when said door panel is inserted into said opening in adjacency to said coil, and said coil acting to return to its normal position when said door panel is moved away from contact therewith.

8. The arrangement of claim 7 wherein said spring strip is incrementally stressed along its length to provide a constant linear tension thereon.

9. A self-closing door arrangement comprising a housing, a rectangular opening in said housing, track means on at least a portion of the periphery of said opening, said track means comprising an upper channel member defined by an upper strip having two vertical walls integral therewith, a guide element generally parallel to but spaced from said upper channel member, a rectangular door panel removably positioned in said opening and having one edge removably engaged in said channel member, and the opposite edge having guide means releasably engaged with said guide element, a spring strip in said channel member, said spring strip being resiliently biased into a coil, said coil being resiliently biased into a normal position within said channel member adjacent the lower edges of said vertical walls, said door panel being of such width that when it is positioned in said opening one edge thereof extends into said track means beyond the corresponding peripheral plane of said coil when said coil is in its normal position so that when said one edge is inserted in said track means adjacent said coil, said one edge engages said coil and pushes it radially back from its normal position, and said door panel having a length smaller than the distance between said coil and one end of said opening whereby, upon linear movement of said door panel toward said one end of said opening, said door panel is disengaged from said coil which thereupon moves back into its normal position.

10. The arrangement of claim 9 wherein said guide means comprises at least one grooved roller and said guide element comprises a rail, said roller being movably engaged with said rail when said door panel is positioned in said opening.

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