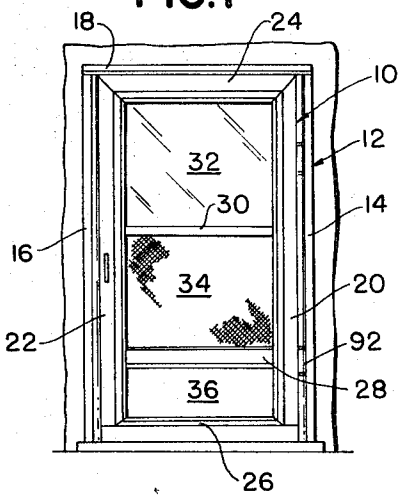
May 21, 1968 R. N. ANDERSON 3,383,799

DOOR STRUCTURE

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FIG. 1



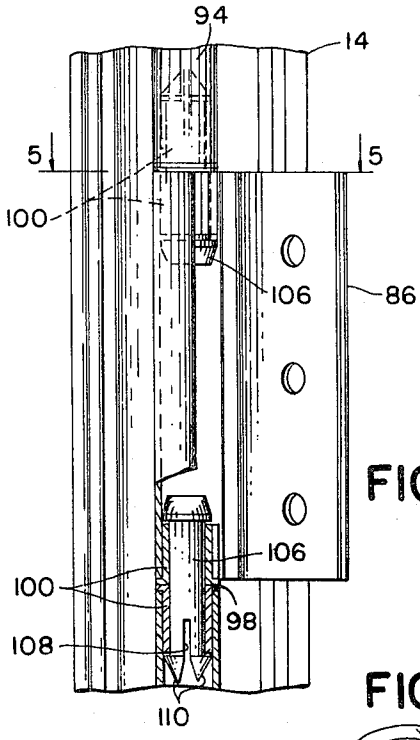


FIG. 3

FIG. 4

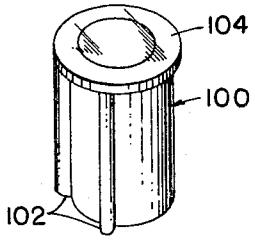
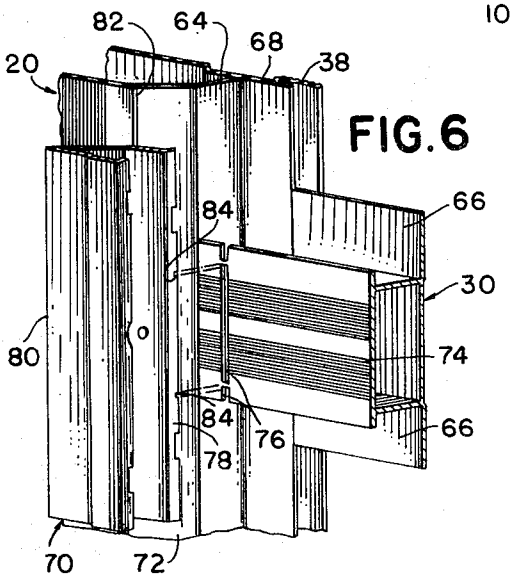


FIG. 6



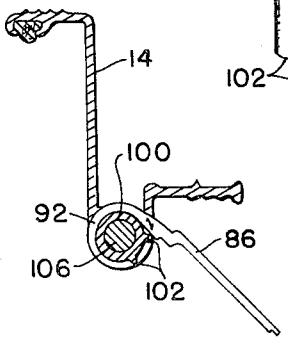


FIG. 5

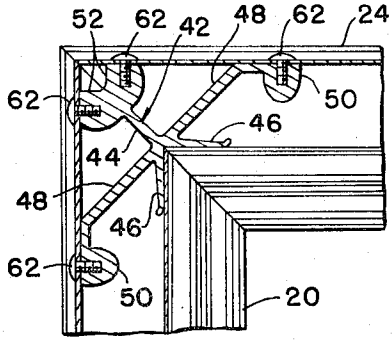


FIG. 7

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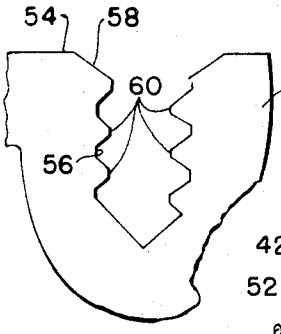


FIG. 9

FIG. 2

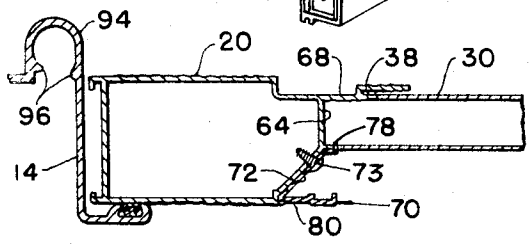


FIG. 8

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DOOR STRUCTURE

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8 Claims. (Cl. 49—397)

ABSTRACT OF THE DISCLOSURE

Door structure including a frame, a cross rail for insertion within the frame and securing strips operable to secure the cross bar to the frame at positions within the frame completely determined by the strips and a hinge assembly for the door structure including cylindrical portions adapted to be secured to each of a door and door frame with the cylindrical portions extending over less than three hundred sixty degrees and in axial alignment, a plastic insert positioned in the adjacent end of each of the cylindrical portions in engagement with each other at one end and including means for preventing axial and rotational movement thereof and a pin extending axially through the inserts having means engaged with the other ends of the inserts for preventing relative transverse movement of the hinge members.

An object of the invention is to provide an attractive mass produced door structure readily adaptable to accommodate different internal panel structures by means for securing a cross rail in the door structure in any vertical location without change of the cross rail or door frame whereby the parts inventory necessary for the manufacture of a line of similar doors is substantially reduced.

A still further object of the invention is to provide a hinge assembly for a storm door including a pair of cylindrical aligned hinge portions, inserts in the adjacent ends of the cylindrical aligned hinge portions, means for preventing axial movement and rotation of the inserts in the cylindrical hinge portions and a pin extending through the inserts and locked thereto at the ends of the inserts whereby the door may be more easily opened and closed and in which hinge noise and hinge surface erosion are substantially reduced.

Other objects and features of the invention will become apparent as the description proceeds, especially when taken in conjunction with the accompanying drawings, illustrating a preferred embodiment of the invention, wherein:

FIGURE 1 is a front view of a door structure according to the invention.

FIGURE 2 is an enlarged, partial sectional exploded view of the inside of the door structure shown in FIGURE 1.

FIGURE 3 is an enlarged partial sectional view of the hinge portion of the door structure shown in FIGURES 1 and 2.

FIGURE 4 is an enlarged perspective view of a hinge insert of the hinge structure of FIGURE 3.

FIGURE 5 is a sectional view of the hinge structure of FIGURE 3 taken along line 5—5 of FIGURE 3.

FIGURE 6 is an exploded perspective view of that portion of the door shown in circle 6 of FIGURE 2.

FIGURE 7 is an enlarged, sectional view of the door of FIGURES 1 and 2 taken in the plane of the door through one corner thereof.

FIGURE 8 is a sectional view taken along line 8—7 of FIGURE 2.

FIGURE 9 is an enlarged view of the portion of the corner bracket shown in circle 9 of FIGURE 2.

With particular reference to the figures of the drawings, one embodiment of the present invention will now be disclosed in detail.

As illustrated in FIGURE 1, the door 10 is hung on door frame 12 formed from generally Z-shaped side frame members 14 and 16 and top frame member 18. The door 10 includes side door members 20 and 22 and top and bottom door members 24 and 26 which are held together rigidly to form a rectilinear door frame structure. The door members 20–26 may be formed from hollow aluminum extrusions having a cross section as shown best in FIGURE 8. Cross rails 28 and 30 extend between the door members 20 and 22 to define door openings for suitable glass or screen panel members 32 and 34 which may be of conventional construction.

Kick panel 36 is fitted in grooves 38 in the side and bottom door members 20, 22 and 26. The top of the kick panel 36 is secured in a groove formed in cross rail 28, as illustrated in FIGURE 2. A U-shaped expander plate 40 is fitted over the bottom door member 26, as illustrated in FIGURE 2, and is adjustable relative thereto to assure that a close fit is maintained between the bottom of the door 10 and the door sill shown in FIGURE 1.

The mitered ends of the door members 20–26 are rigidly held together by means of extruded aluminum brackets 42, as best shown in FIGURES 2 and 7. Each bracket 42 includes a center portion 44 lying in the plane of the miter joint and having angular braces 46 at the inside end thereof for engagement with the inside of the door members. Lateral arms 48 extend to each side of the center portion 44 and carry mounting heads 50 at the outer or free ends thereof adjacent the outside walls of the door members. The outer end of center portion 44 of each bracket 42 carries mounting heads 52 arranged to engage the outer walls of the door members immediately adjacent the miter joint.

Each of the mounting heads 50 and 52 includes a flat mounting surface 54 and a mounting groove 56 formed herein with a V-shaped groove lead-in 58 at the edge of each groove. The groove side walls are provided with teeth 60 which extend the width of the respective mounting heads. The teeth 60 on one side of the groove are staggered from those on the other side thereof, as illustrated in FIGURE 9.

Mounting screws 62 extend through openings in the outer walls of the frame members and engage teeth 60 so as to hold such walls in intimate contact with the mounting faces 54. The angle between the planes defined by the mounting faces 54 on each side of the brackets 42 is slightly less than the angle of the mitered joint so that when the screws 62 are secured to the heads 50 and 52, the bracket is stressed and holds the door members tightly to form the desired joint.

The bracket 42 has a width sufficient to form a tight fit within the interior openings in the door members to assure that a rigid joint is formed therebetween. The use of door members and brackets as described achieves an extremely thin, yet rigid door frame structure capable of withstanding protracted usage without warping or being otherwise deformed.

In the assembly of the door 10 the door members 20–26 are first secured together as described. Kick panel 36 is inserted in grooves 38 and crossrail 28 is mounted between the door members 20 and 22 by screws 63 so as to hold the panel 36 in position.

The crossrail 30 is then placed in position between the flat inner faces 64 of door members 20 and 22 with the lateral flanges 66 thereof fitted against the door member flange or strip 68, as best illustrated in FIGURE 6, so that the rail 30 is tightly held to prevent axial movement thereof. The elongated V-shaped seating strips or

retainers 70 are then secured against the bevelled face 72 of door members 20 and 22 by means of screws 73. As illustrated in FIGURE 2, the strips 70 extend along the door members 20 and 22 from cross rail 28 to the top of the interior door opening. Face 74 of rail 30 is provided with a groove 76 at each end thereof adjacent the respective door member 20 and 22 so that when each strip 70 is secured to a door member by screws 73 with nose 80 thereof in the V-shaped groove 82 of the door member, the notched lip 78 thereof is tightly fitted within one of the grooves 76 to secure the rail 30 in the door and to prevent lateral movement thereof.

The position of rail 28 above bottom door member 26 is determined by the height of the kick panel 36 so that in some doors having a relatively small kick panel, the rail 28 is located adjacent the bottom door member 26 while in other doors having a larger kick panel the rail 28 is located further away from the bottom door member 26. Rail 28 is closely fitted between the side door members 20 and 22 so that it can be secured thereto by screws 64 at any desired position as determined by the height of the kick panel.

The position of cross rail 30 beneath the top door member 24 is determined solely by the location of the small grooves 84 in lip 78 of the strip 70 which enables such lip to engage the grooves 76 in face 74 of the cross rail. Since cross rail 30 may be fitted between door members 20 and 22 at any position between the cross rail 28 and top door member 24, it is possible to manufacture a complete line of doors wherein the cross rail 30 is positioned at different locations in the door frame assembly by utilizing a stock door frame as described and a number of sets of strips 70 having grooves 84 formed therein at the desired location points for the cross rail 30.

The rectilinear door assembly members 20–24 are manufactured as a stock item and the cross rail 30 may be positioned in the assembly at the last step of manufacture at the desired position by using an appropriate pair of strips 70 with grooves 84 located appropriately. This construction enables the manufacturer and retailer to reduce the stock inventory required to maintain the full line of doors since it is necessary only to maintain one type of door frame assembly and a number of types of strips 70 in stock. Only one assembly line is required to manufacture such a line of doors since the strips 70 are secured to the door at the last step of the assembly line and may be programed as desired.

The panel members 32 and 34 are held in the door 10 by guides which fit within the grooves defined by the strip 70 and the flange 68. In conventional doors of the type described herein, such grooves are formed as integral parts of the side door members and extend along the entire length thereof so as to be exposed for view on the inside of the door below the kick panel cross rail. In door construction as described the strips 70 extend only between the top door member 24 and the cross rail 28 and do not extend down to the kick panel. Thus, the kick panel portion of the door beneath rail 28 is neat and attractive in appearance and is not disrupted by conventional door panel member grooves.

The door 10 is secured to side frame member 12 by means of hinges as illustrated in FIGURES 2–5. Hinge plates 86 are secured to the door member 20 in the recessed portion of the outer edge thereof by mean of screws 90 and include projecting curled hinge portions 92 which, as shown best in FIGURE 5, are curled through an angle greater than one hundred eighty degrees. The side frame members 14 and 16 each include a U-shaped reverse bend hinge portion 94 with internal ridges 96 so that the interior angle thereof is greater than one hundred eighty degrees. The cross-section of portion 94, as shown in FIGURE 8, is similar to that of the curled portion 92 of hinge plate 86. Hinge portion 94 of frame member 14 is cut out at 98 to provide relieved areas for the curled portions 92 of hinge plate 86 to provide a neat appearance when the door is closed, as in FIGURE 1.

Cylindrical hinge inserts 100 may be formed from nylon or any other suitable plastic material and are provided with longitudinal ribs 102 extending along one side thereof and a flat hinge surface 104 at one end thereof. Inserts 100 which extend radially outwardly past the outer cylindrical surface thereof are seated in the ends of the curled portion 92 of hinge plates 86 and in the exposed ends of the hinge portions 94 of side frame 14 at either end of the cut out portions 98 thereof, as illustrated in FIGURE 3. The inserts have a tight fit in the interior openings of the portions 92 and 94 and are prevented from rotating therein by the ribs 102.

The door 10 is hung by positioning the hinge plates 86 in the cut out portions of frame member 14 and then inserting the nylon or other plastic hinge pins 106 through the aligned bores of adjacent hinge inserts 100, is illustrated. The leading ends of the hinge pins 106 are slotted at 108 so that the under-cut ends 110 may be bent inwardly to allow insertion of the pin through the hinge insert bores.

With the door hung as described, the door weight is supported solely by the flat hinge surfaces 104 of the nylon hinge insert 100 so as to reduce hinge friction and eliminate hinge noise. In conventional hinges having a metal-to-metal hinge contact, extended use of the hinge causes erosion to occur at such contact thereby limiting the useful life of the hinge. The hinge as described herein completely eliminates such erosion and thereby increases the useful life of the door assembly.

In addition the ribs 102 on the inserts 100 which prevent relative motion between the plastic inserts and the aluminum of the hinge plates and side frames, as set forth above, prevent the inserts from becoming impregnated with aluminum oxide which builds up between mill finish aluminum and most bearing materials. The buildup of aluminum oxide would result in excessive noise and abrasive action sufficient to destroy the bearing quality of the joint. In the hinge assembly disclosed relative motion takes place only between the flat hinge surface 104 of the plastic inserts and the hinge pins 106.

While one embodiment of the door structure of the invention has been described in detail, it will be understood that other embodiments and modifications thereof are contemplated. Thus several materials have the qualities necessary for the inserts 100 and hinge pins 106 besides the nylon from which they are constructed including other plastics and, for example, oil light bronze for the inserts and stainless steel for the pins. Also, the hinge plates 86 and hinge pins 106 may be injection molded as integral parts eliminating the bearing insert in the hinge plate and the hinge pins as separate components. It is the intention to include all embodiments and modifications as are defined by the appended claims within the scope of the invention.

What I claim as my invention is:

1. A prefabricated door structure comprising a door frame defining an interior door opening and including top and bottom frame members, and side frame members having uniformly spaced inner faces and a cross rail extending between said faces intermediate the top and bottom members of said frame, said inner faces including first and second face portions extending along the length of each of said side members, said first portions opposing each other and being oriented perpendicular to the plane of said door and said second portions opposing each other and extending from said first portions away from said opening and each other so as to form a uniform bevel on one side of said door, each side member also including a flange oriented parallel to said plane and projecting inwardly from the edge between said first portion and the other side of the door, said cross rail extending between said opposed first portions and being seated against said flange so as to prevent axial movement thereof, two

seating strips, each of said strips being secured to one of said second portions, and locating means carried on said strips at a predetermined location therealong for mechanical engagement with said rail so as to prevent sideways movement thereof whereby the position of said rail between the top and bottom of said door frame is determined solely by the position of said locating means on said strips.

2. A door structure as in claim 1 wherein said locating means includes a groove in each of said strips, said grooves being opposed across said opening, and said rail includes a cut-out portion at each end thereof whereby attachment of each strip to the respective second portion seats part of said strip adjacent the groove therein in the cut-out portion of said rail adjacent such strip.

3. A door structure as in claim 2 wherein a notch is formed along the outer edge of each of said second portions, said strips having a V-shaped cross section with the nose of the V seated in said notch, and means securing first sides of said strips to said second portions, the other sides of said strips covering such means from view, said grooves being formed in the outer edges of said first sides of said strips.

4. Structure as set forth in claim 1 and further including hinge structure secured to the door frame and door structure comprising two hinge members, two hinge inserts each having a central passage and a hinge surface at one end of said passage, each of said inserts being held by one of said members so that said passages are in alignment and said surfaces abut each other, and a hinge pin extending through said passages, said inserts being formed of a plastic material so as to reduce hinge noise and wear.

5. Structure as set forth in claim 4 wherein said central passages and said pins are circular in cross section, and said pin has a close fit within said passages and includes retaining means at each end thereof to prevent axial movement of the pin in an assembled position relative to said inserts, said retaining means comprises a head on one end of said pin and two under-cut locking portions on the other end of the pin separated by a diametral groove whereby during insertion of said pin through said insert passages the locking portions of said pin are bent inwardly so as to pass therethrough.

6. A prefabricated door structure comprising a door frame defining an interior door opening and including top and bottom frame members, and side frame members having uniformly spaced inner faces and a cross rail extending between said faces intermediate the top and bottom members of said frame, said inner faces including first and second face portions extending along the length of each of said members, said first portions opposing each other, each side member also including a flange projecting inwardly from the edge between said first portion and the side of the door opposite the second face portions, said cross rail extending between said opposed first portions and being seated against said flange so as to prevent axial movement thereof, at least one seating strip secured to one of said second portions, and locating means carried on said strip at a predetermined location therealong for mechanical engagement with said rail so as to prevent sideways movement thereof, whereby the position of said rail between the top and bottom of said door frame is determined solely by the position of said locating means on said strip.

7. A hinge unit comprising two hinge members having axially aligned cylindrical portions extending for less than three hundred sixty degrees, a generally cylindrical hinge insert in the adjacent ends of each of the cylindrical members having engaging ends, means for preventing axial movement of the inserts positioned within the adjacent ends of the cylindrical portions of the hinge members comprising radially extending flanges at the engaging ends of the inserts extending over the adjacent ends of the cylindrical portions of the hinge unit, means for preventing rotational movement of the inserts within the aligned adjacent ends of the cylindrical portions of the hinge structure comprising a pair of angularly spaced apart longitudinally extending ribs on the inserts engaged with similar longitudinally extending abutting surfaces on the cylindrical portions of the hinge unit, and pin means extending through the inserts and engaged therewith at the other ends thereof for preventing relative transverse movement of the cylindrical portions of the hinge unit.

8. Structure as set forth in claim 7 wherein the pin includes head portions at both ends and one end thereof is bifurcated.

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KENNETH DOWNEY, *Primary Examiner.*