May 5, 1964 B. W. MERRILL 3,131,754

FOLDING DOOR STRUCTURE

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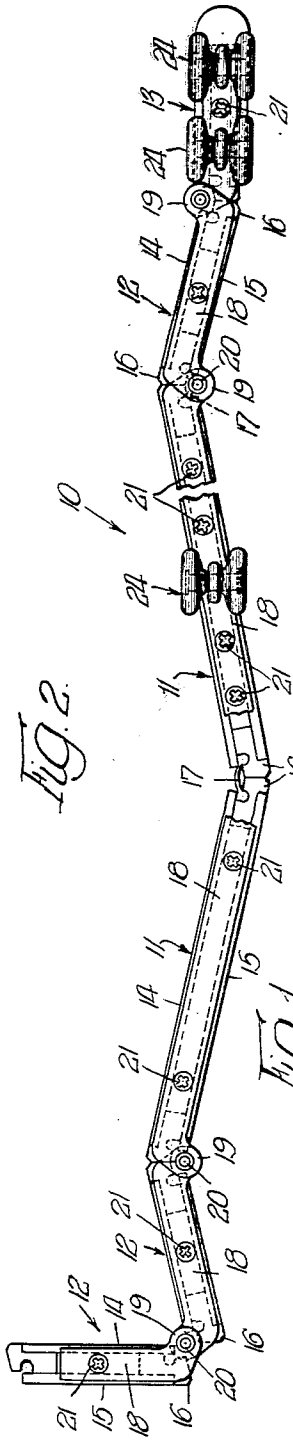


Fig. 2.

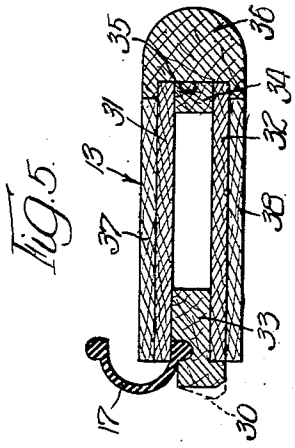


Fig. 5.

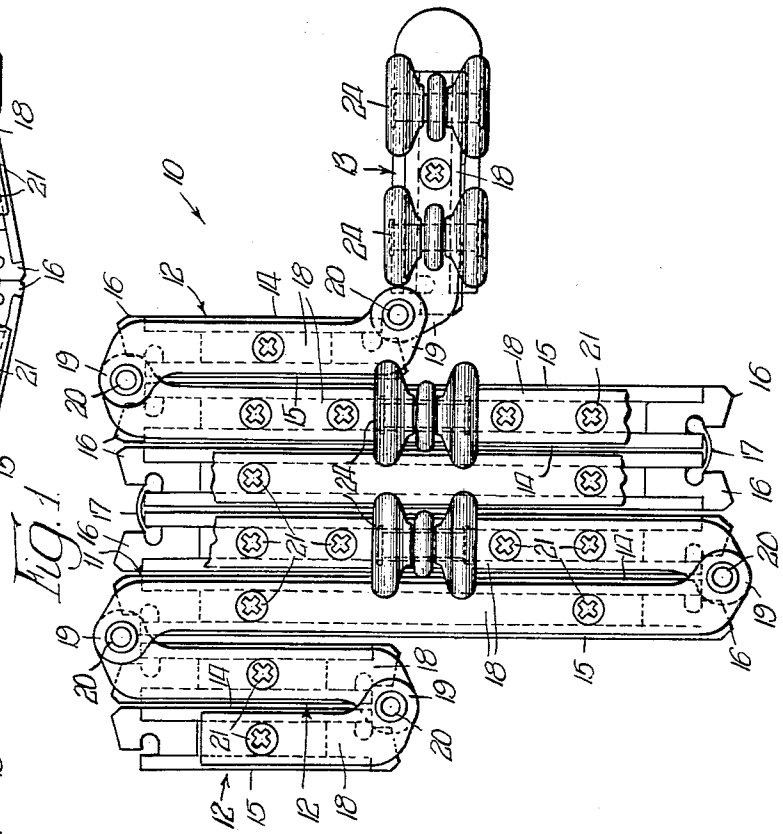


Fig. 1.

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Fig. 3

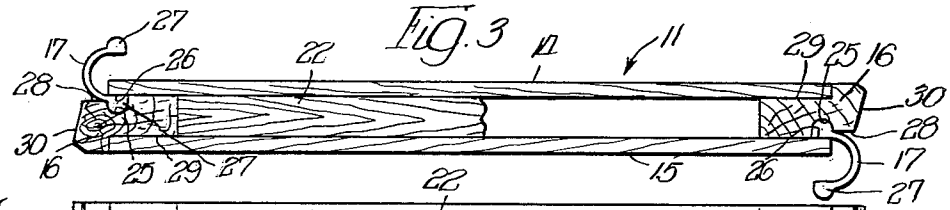


Fig. 4

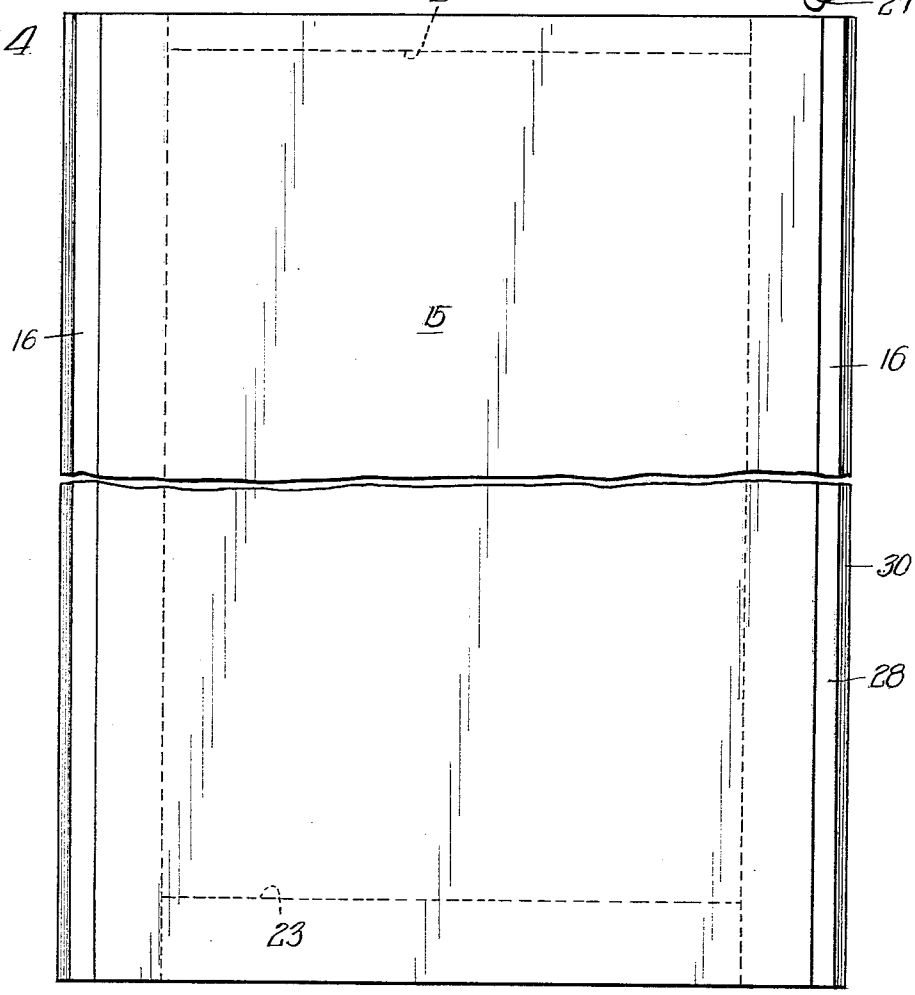
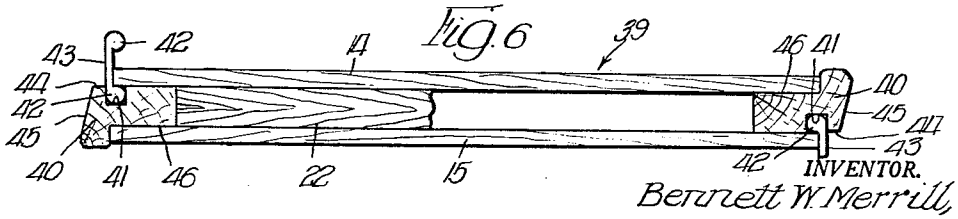


Fig. 6



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FOLDING DOOR STRUCTURE

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4 Claims. (Cl. 160—183)

The invention relates to a new and improved door structure and panel unit constructions forming a part thereof. More specifically, the invention is directed to new and improved coreless panel units incorporating therein unique hinge connection arrangements which not only contribute to the structural make-up of the panel units but also provide means for efficient hinge attachment thereto, the invention further being specifically directed to a new and improved door structure which is formed from a plurality of serially interconnected panel units.

It is an object of the present invention to provide a new and improved folding door structure formed from a plurality of uniquely constructed and interconnected panel units, the door structure and panel units forming a part thereof exhibiting improved lightweight and adequate strength characteristics and being adapted for economical manufacture.

A further object is to provide new and improved coreless panel units and hinge connection arrangements forming a part thereof, the hinge connection arrangements being of a design which adapts the same for use as main structural members of the panel units as distinguished from being merely accessories thereto.

Other objects not specifically set forth will become apparent from the following detailed description of the present invention made in conjunction with the accompanying drawings wherein:

FIG. 1 is a top plan view of the new and improved folding door structure of the present invention illustrating the same in its stacked condition, certain portions of the structure being broken away to better illustrate components thereof;

FIG. 2 is a fragmentary top plan view on reduced scale of the folding door structure of FIG. 1 illustrating the same in its extended condition;

FIG. 3 is a fragmentary top plan view of a full panel unit and attached hinge strips forming a part of the door structure as well as a part of the invention, this view illustrating the panel unit prior to its operative mounting in the door structure of FIGS. 1 and 2;

FIG. 4 is a fragmentary face view of the panel unit of FIG. 3 with the hinge strips removed;

FIG. 5 is a top plan view of the lead post panel unit of the door structure in its fabricated condition prior to operative mounting thereof as a part of the door structure; and

FIG. 6 is a view similar to FIG. 3 illustrating a modified form of panel unit incorporating therein the basic concepts of the invention.

The folding door structure of the present invention includes a plurality of serially interconnected, relatively foldable panel units each of which are of coreless construction. The panel units are formed from facings in the form of panel members which are at least substantially of the same height as the panel unit. The basically unique construction of each panel unit involves the combining of the facings or panel members in spaced apart relation through the use of hinge connection moulding strips or edgings received between the opposite vertical margins of the panel members and defining therewith hinge attachment means. With this arrangement, the hinge connection moulding strips actually constitute basic panel unit structural members and are not just accessories applied to a preformed panel unit.

FIGS. 1 and 2 illustrate an embodiment 10 of a folding door structure which is formed from a plurality of rigid, vertically elongated panels, the panels being of hollow construction and hinged together serially along their vertical edges by flexible hinge strips secured in specially formed recesses or grooves in vertical edge portions. As shown in FIG. 1, the panels are adapted to be folded or stacked in face-to-face relation or moved relative to one another toward co-planar relation in the open position of the door structure as shown in FIG. 2.

Generally, the door structure 10 includes a plurality of full panel units 11, half panel units 12 and a lead post panel unit 13. The endmost half panel unit 12 is adapted for use as a back post which in the position illustrated is arranged for fixed attachment to a wall or door opening surface. In this standard manner of mounting a folding door structure, the remaining panels and lead post are moved toward and away from the fixed endmost half panel unit 12.

Each full panel unit 11 and half panel unit 12 is formed basically from rigid facing panel members 14 and 15 having received therebetween a pair of spaced, parallel and relatively narrow vertically extending edgings or hinge connection moulding strips 16 which enclose the vertical side margins of the spaced panel members 14 and 15 and define therewith a hollow or coreless panel unit. As will be more specifically described, adjacent vertical edges of adjacent panel units are hingedly interconnected by a known type of vertically continuous flexible hinge strip 17. For operational rigidity and hinge strip protection, the top margin of each panel unit preferably has attached thereto a flat, rigid metallic hinge plate 18 which extends the full width of each panel unit and is provided with oppositely projecting hinge pin connection ears 19 for pivotal attachment by a pin 20 to an adjacent ear of an adjacent hinge plate. The top hinge plates 18 of the panel units are attached to the panel units by fasteners 21 of known type which extend through the hinge plates and are embedded and fixed in panel unit top end plug members 22 (see FIGS. 3 and 4). The panel units are also provided with bottom end plug members 23 (FIG. 4) with the panel units being completely hollow between the plug members. These plug members impart adequate rigidity to the panel unit construction for use thereof in the same manner as a known type of solid panel unit. The folding door assembly is completed by the attachment of any number of suitable trolley units 24 which are of known type and adapted for use for suspending the door structure in an overhead track (not shown) in the conventional manner.

FIGS. 3 and 4 illustrate the details of construction of each panel unit with particular reference to a full panel unit 11, it being understood that the half panel units 12 are of the same construction but are merely of less overall width. The facings or panel members 14 and 15 are formed from any suitable rigid material, such as 3 ply plywood of door skin type, and may be on the order of approximately ⅛ of an inch in thickness. Each hinge connection moulding strip 16 is block-like in cross section and includes an edge surface portion which projects from between the face panel members 14 and 15. A vertically continuous groove 25 is formed in a side face or surface of the moulding strip 16 and is located just inwardly of an adjacent edge portion of a face panel member such as the left hand edge portion of the panel member 14 as viewed in FIG. 3 and the right hand edge portion of the panel member 15 as also viewed in FIG. 3. The inner surface 26 of the overlying edge portion of a panel member 14 or 15 extends across a moulding strip groove 25 in at least substantially covering relation therewith and in cooperation therewith to form a pocket to receive therein an enlarged bead-like margin 27 of a hinge strip

17. An adjacent surface portion 28 of the moulding strip is offset or spaced inwardly from the plane of the inner surface 26 of the edge portion of a panel member to define a narrow entrance through which the center thin web-like flexible portion of the hinge strip 17 extends. Thus, the moulding strips 16 function not only to fixedly interconnect and space the panel members 14 and 15 to form a hollow or coreless construction but they also co-operatively define with an edge portion with one of the panel members a hinge strip locking pocket arrangement of unique and inexpensive design. In this regard, the specific provision of a well-defined groove 25 in which is received a bead 27 performs a hinge strip attachment function. Other hinge strip attachment means may be used. The hinge strips 17 illustrated in FIG. 3 are shaped during forming to assume the arcuate shape in their relaxed condition. This design provides for tensioning of the hinge strips when the door structure is extended or closed thus providing means to urge the panel units toward their stacked condition.

Each edge moulding 16 extends substantially inwardly of the edges of the panel members 14 and 15 for suitable attachment thereto, as by gluing or the like. This arrangement provides for vertical rigidity in the panel unit 11 and the top and bottom end plug members 22 and 23 as previously described add to this rigidity transversely of the panel unit. The opposite edge portion of each panel member 14 and 15 which does not cooperatively define with the moulding strip 16 a hinge strip connection arrangement, is received in a cut-away groove portion 29 formed in each moulding strip 16. With this feature it is unnecessary to finish the edges of the panel members 14 and 15 received in the attachment recesses 29 as the same are not noticeable in connection with general appearance of the door structure.

The moulding strips 16 along opposite edges of each panel unit 11 are reversed as illustrated with the grooves 25 thereof opening in opposite directions. As best illustrated in FIGS. 1 and 2, this arrangement of the moulding strips 16 provides for zigzag folding of the door structure. Further as shown best in FIG. 2, the moulding strips 16 function to prevent movement of adjacent panels into co-planar relation thus providing the door structure in its extended or closed position with "breaks" between panels to assure proper stacking folding of these panels relative to one another during opening of the door structure toward the stacked position shown in FIG. 1. To provide this function, the outer projecting edge surface portion 30 of each moulding strip 16 is beveled to form an inclined abutment surface, the inclination being directed outwardly from the juncture of the surface 30 with the offset surface 28 of the moulding strip. Door operation abutment of adjacent moulding strips 16 of adjacent panel units involving the surfaces 30 is illustrated in FIG. 2.

FIG. 5 illustrates the lead post structure 13. This structure includes face panel members 31 and 32 which along the rear vertical edge portions thereof receive therebetween and are attached to a moulding strip 33 which is of the type previously described. This moulding strip has the outer inclined surface portion 30 removed therefrom to maintain the lead post 13 in the same plane as the overhead door track during operation of the door structure. Opposite end vertical margins of the panel members 31 and 32 have received therebetween a vertical spacing strip 34 with this side margin structure being received in a vertical groove 35 formed in a nose strip member 36 which is rounded on the outer surface and is adapted for abutment with a suitable vertical door sealing area (not shown) in the closed position of the door. The lead post structure 13 is completed by the further provision of extra outer facing panels 37 and 38 if desired. The panels 37 and 38 may be used for special decorative treatment of the lead post 13 or may be relied upon to further increase the strength of the lead post

13 due to its operational requirements. Actually, the lead post 13 is basically formed from a half panel unit structure which supplies the face panel members 31 and 32, the half panel unit being cut down along the vertical edges as illustrated.

FIG. 6 illustrates a modification of edge moulding strip configuration and cooperative functioning with face panel members in attaching a hinge strip thereto. Like reference numerals are used in the illustration of the panel member 39 of FIG. 6 to identify elements thereof which conform exactly to those previously described with regard to the panel unit 11. The modified moulding strips 40 are each provided with a hinge locking groove 41 in which a bead-like margin 42 of a flexible hinge strip 43 is received. The adjacent edge portion of a panel member 14 or 15 associated with the groove 41 projects over the same in partial overlying relation. Thus the groove 41 is at least partially closed off by an overlying edge portion of a panel member. With this arrangement the thin web-like center portion of the hinge strip 43 extends directly outwardly of the groove 41 in flush engagement with the outer edge surface of the overlying panel member 14 or 15. To maintain this hinge strip directing arrangement, the surface portion 44 of the moulding strip 40 located immediately outwardly of the groove 41 is not offset and does lie in at least substantially the same plane as the inner overlying surface of the groove closing panel member.

The type of hinge strip 43 shown in FIG. 6 is formed to remain flat in its relaxed condition. This type of hinge strip is, in effect, pre-tensioned to urge the interconnected panel units toward face-to-face relation or stacked position. The hinge strips illustrated may be formed from any suitable material such as a vinyl plastic. Each moulding strip 40 may also be provided with an outer inclined abutment surface 45 similar in function as the inclined abutment surface 30 previously described. Conversely, the outer projecting portions of the moulding strips 16 and 40 may be uniformly rounded off if desired to thus reduce exposed surface finishing costs during the manufacture of the panel units.

Referring again specifically to the panel unit 39 of FIG. 6, opposite edges of the panel members 14 and 15 are received in groove-like recesses 46 formed in the moulding strips 40 and are suitably secured therein. With this arrangement the adjacent edge of each panel member 14 and 15 need not be finished as the same is not observable. Similarly, due to the projecting direction of the hinge strips 43, the adjacent edges of the panel members 14 and 15 need not be finished as the same are not observable.

Obviously certain modifications and variations of the invention as hereinbefore set forth may be made without departing from the spirit and scope thereof, and therefore only such limitations should be imposed as are indicated in the appended claims.

I claim:

1. In a folding door of the type composed of a plurality of rigid vertically elongated panels, which panels are of hollow construction and are hinged together serially along their vertical edges by flexible hinge strips having enlarged longitudinal bead-like formations along opposite side edges thereof secured in recesses in said vertical edges, and which panels are adapted to be either folded together face-to-face in the open position of the door or extended with respect to each other in the closed position of the door; the improvement comprising each panel having its vertical edge portions defined by a pair of spaced parallel and vertically extending panel facings, and a pair of relatively narrow vertically extending panel edgings which are laterally spaced apart from each other and are embraced between and secured to the opposite vertical side margins only of said panel facings, each of said edgings being provided in one of its side faces to which a side margin

of a panel facing is secured in overlapping relation with a vertically extending groove, which groove opens outwardly along said one side face and is at least partially covered by the overlapping marginal portion of the panel facing secured to that face of the edging, said groove being dimensioned to be filled solely by a bead-like formation of a flexible hinge strip, and said groove and the overlapping marginal portion of said panel facing together providing a partially closed pocket receiving therein one of the bead-like formations of the associated flexible hinge strip with the remainder of said hinge strip projecting freely outwardly between said one side face of said edging and the side margin of said panel facing.

2. The folding door of claim 1 wherein the panel edgings are identical in structure with the groove of one edging being at least partially covered by one panel facing and the groove of the other edging being at least partially covered by the other panel facing.

3. The folding door of claim 1 wherein the panel edgings are identical in structure with the groove of one edging being at least partially covered by one panel facing and the groove of the other edging being at least partially covered by the other panel facing, said panel edgings projecting outwardly beyond the side margins of said panel facings and including beveled end surfaces to provide controlled abutment between panel edgings of adjacent panels to limit movement of serially connected panels into co-planar relation in the closed position of said door.

4. The folding door of claim 1 wherein the panel edgings are identical in structure with the groove of one edging being at least partially covered by one panel facing and the groove of the other edging being at least partially covered by the other panel facing, said panel edgings projecting outwardly beyond the side margins of said panel facings and including beveled end surfaces to provide controlled abutment between panel edgings of adjacent panels to limit movement of serially connected panels into co-planar relation in the closed position of said door, said one side face of each panel edging outwardly of said groove being inwardly offset from the plane of the inner surface of the overlapping marginal portion of said panel facing to provide space for said hinge strip to project freely outwardly.

References Cited in the file of this patent

UNITED STATES PATENTS

2,458,537	Skelly	Jan. 11, 1949
2,507,965	Eichner	May 16, 1950
2,511,620	Clements	June 13, 1950
2,579,910	Dixon	Dec. 25, 1951
2,614,295	Een	Oct. 21, 1952
2,812,023	Laity et al.	Nov. 5, 1957
2,912,049	Kuyper	Nov. 10, 1959
3,040,806	Merrill et al.	June 26, 1962