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J. J. LAITY, SR., ET AL
FOLDABLE DOOR OR PARTITION

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2 Sheets-Sheet 1

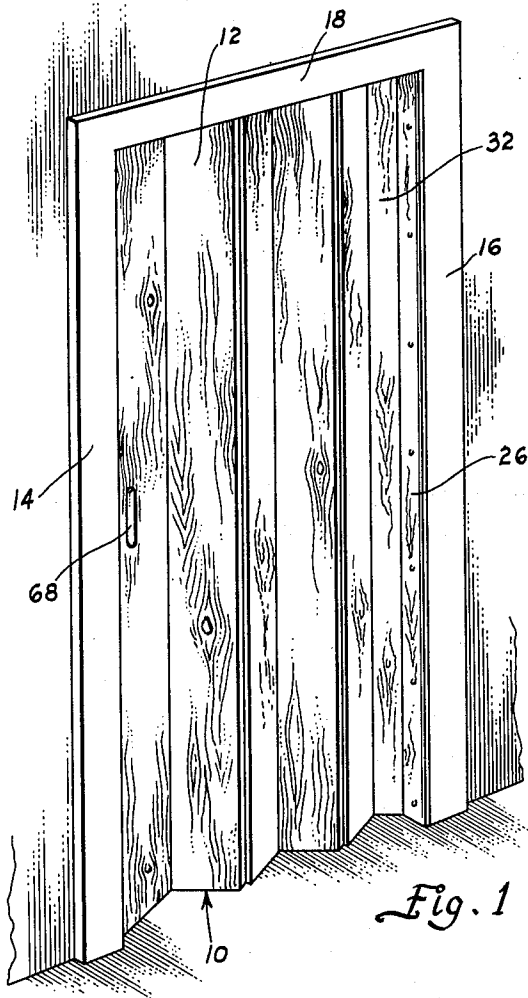


Fig. 1

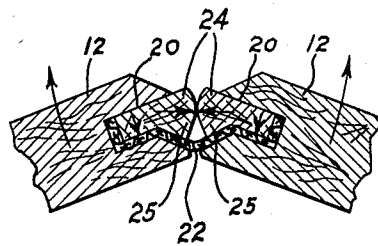


Fig. 2

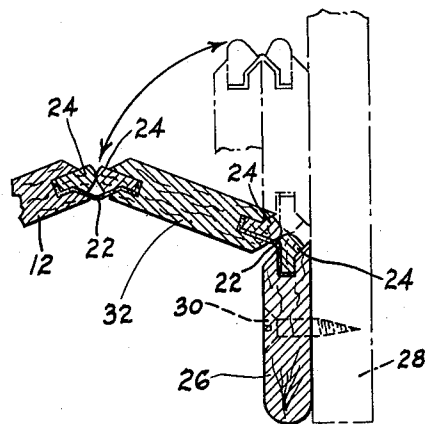


Fig. 3

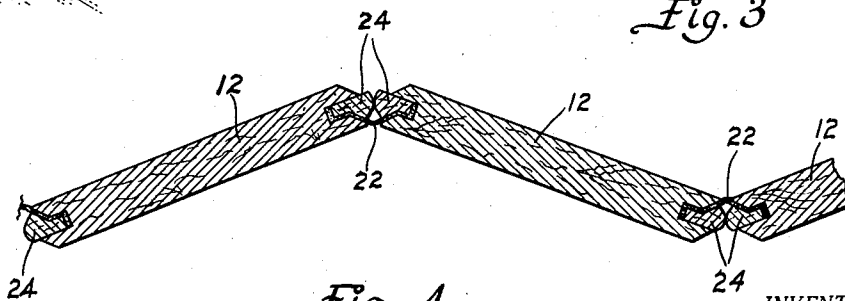


Fig. 4

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2 Sheets-Sheet 2

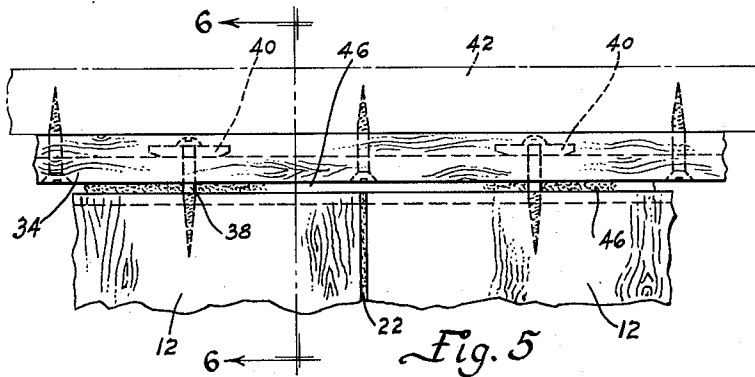


Fig. 5

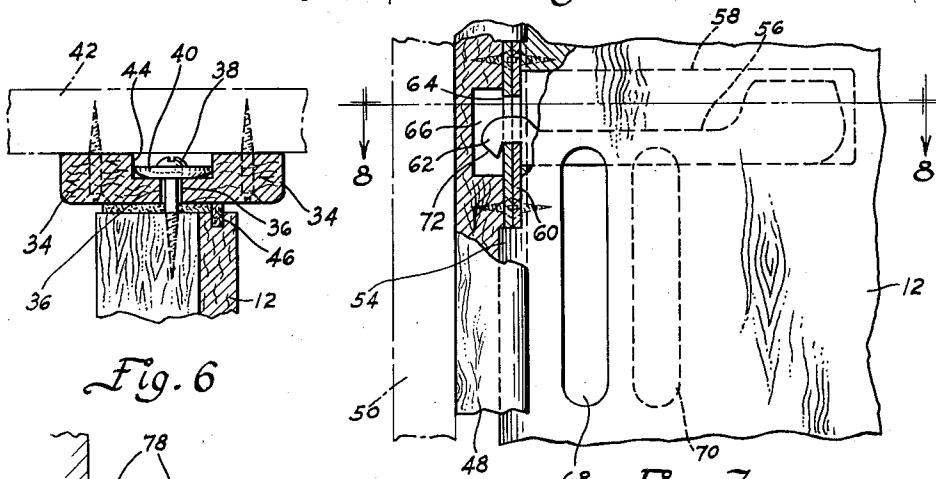


Fig. 6

Fig. 7

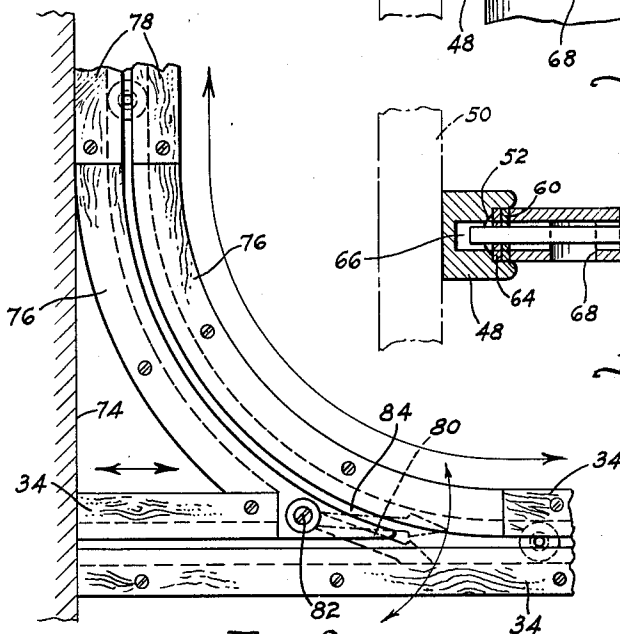


Fig. 9

Fig. 8

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1

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FOLDABLE DOOR OR PARTITION

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5 Claims. (Cl. 160—199)

This invention relates to improvements in a foldable door or partition construction designed to operate similarly to sliding doors or slidable partitions without requiring spaces within which the door or partition will be accommodated when the door or partition are moved to open position.

Sliding doors and partitions have a distinct advantage over hinge-supported doors and partitions in that, for example, when a hinge-supported door is used in one wall of a hallway and the door is open, the hallway is obstructed. If a sliding door is substituted for the hinge-supported door, no such obstruction results when the door is open. However, suitable space must be provided within which the door is to be slidably moved when the door is opened. Similar provisions must be made for slidable partitions used to divide a room area into more than one room, for example. Provision of such space within which the door or partition are to be slidably moved renders the cost of the installation of slidable doors and partitions usually considerably more than the corresponding cost of installing hinge-supporting doors and partitions.

In recent years, doors and partitions of a foldable nature have become popular, one type of such door or partition being sold under the trade-mark "Modern-Fold." This type of door has a foldably collapsible frame work of metal strips covered on opposite surfaces by a flexible fabric or composition sheet-like covering which, when the door or partition is in folded position, respectively are folded accordion-like. This type of door is supported by a track construction along the ceiling or header of a door frame and, usually, no track or support of any kind is provided along the lower edge of the door, whereby such door or partition is far from rigid when extended over the opening it is to cover. Furthermore, the cost of production and installation is substantial and, as a result, such door has met only with limited sales success.

A few attempts also have been made to provide foldable doors or partitions constructed from relatively narrow strips of material of various kinds which are elongated vertically and are hingedly connected by unsatisfactory means which permit substantial spaces between the strips when the door or partition are extended to closed position. Presumably providing a suitable hinge between the strips in this type of construction has constituted a problem which has thus far remained unsolved until the present invention was developed, particularly for purposes of providing a door or partition having no spaces between adjacent panels or strips when the same were extended to closed position.

It is the principal object of the present invention to provide a foldable door or partition comprising a plurality of flexibly connected, elongated, vertically extending panels which may be made from wood or any other suitable material, the flexible connecting means being novel and extending preferably the full vertical length of the panels, thereby affording substantially complete

2

obstruction to the passage of light, heat, and air, as well as being very substantially sound insulating.

Still another object of the invention is the provision of flexible, elongated connecting means which are relatively inexpensive to install and are cheap in cost compared to conventional hinges and the like and, in the preferred construction of said connecting means, the arrangement of certain elements is such that when adjacent panels are closed to the fullest contemplated extent and continued movement thereof in the same direction so as to attempt to separate the panels from each other results in the flexible connecting means being connected all the more firmly to the panels which they are flexibly connecting.

Still another improvement of the invention resides in the supporting means connected to the upper ends of certain of the panels of the foldable door or partition which are received within and supported by overhead track means readily connectable to the header of a door frame, a horizontal overhead beam, ceiling surface or the like, said connecting means being simple to install and yet fool-proof and capable of long life without adjustment or repair.

One more object of the invention is to provide a unique track arrangement whereby, particularly when the invention is adapted to partitions of substantial width when open to divide a room into more than one room and it is desired to open the space by folding the partition toward one wall of the room, the track means include a switch arrangement by which the folded door or partition may be moved around a curved section of track to dispose the folded door or partition adjacent a side wall of the room, whereby the same offers substantially less obstruction than conventional track installations which permit no such disposition of the folded door or partition.

Still other objects of the invention comprise various improvements in details such as latching mechanism, sealing strips, and door edge receiving strips which not only enhance the appearance of the doors and partitions embodying the invention but also improve the efficiency and utility thereof.

Other objects of the invention and details thereof, as well as details of the foregoing objects, are set forth in the following specification and illustrated in the drawings comprising a part thereof.

In the drawings:

Fig. 1 is a perspective view of an exemplary doorway in which a foldable door is shown in closed position, said door embodying the principles of the present invention.

Fig. 2 is a fragmentary transverse sectional view through portions of two adjacent panels of a door or partition embodying the principles of the present invention and showing details of the flexible connecting means for said panels as well as illustrating the directions of forces supplied to the connecting means when the panels are fully opened, this view being shown on a larger scale than in Fig. 1.

Fig. 3 is a transverse sectional view fragmentarily showing a portion of a wall or door jamb to which one end of a foldable door or partition is affixed, this view illustrating in full lines the relative positions of the panels when closing the door opening and, in broken lines, showing the position of said panels when in folded position which they occupy when the doorway is open.

Fig. 4 is a view similar to Fig. 3 but showing a transverse section through certain connected intermediate panels comprising a door or partition such as shown in Fig. 1 but shown on a larger scale than illustrated therein.

Fig. 5 is a view substantially on the scale of Fig. 4 but illustrating, fragmentarily, in vertical elevation, the

3

upper portion of certain panels of a door or partition embodying the present invention and also illustrating track means comprising part of the present invention.

Fig. 6 is a fragmentary vertical elevation taken on the line 6—6 of Fig. 5 and showing the track means and supporting mechanism for the door panels viewed at right angles to Fig. 5.

Fig. 7 is a fragmentary vertical elevation showing exemplary latching means for a movable end of a door or partition such as illustrated in the foregoing figures.

Fig. 8 is a fragmentary transverse sectional view taken on the line 8—8 of Fig. 7.

Fig. 9 is a bottom plan view of an exemplary track arrangement by which a door or partition intended to cover an opening of substantial width may be supported so as either to extend entirely from one wall to the opposite wall when the opening is closed, but also permit the folded door or partition to be moved in close juxtaposition to one of the side walls of the room when the opening is open, whereby a minimum obstruction is afforded by the folded door or partition.

In the present illustrations, and referring particularly to Fig. 1, it will be seen that the exemplary door 10 comprises a plurality of preferably relatively narrow, elongated panels 12 which are hingedly or flexibly connected together along the longitudinal edges thereof by means to be described in detail, for purposes of effectively closing the door opening defined by jambs 14 and 16 and the header at the upper ends thereof to which top molding strip 18 is affixed, it being understood that the jambs 14 and 16 also include the face moldings illustrated in this figure. In this illustration, it will be noted that the panels 12 have been shown to be formed of wood of appropriate width and thickness. Such illustration is not to be regarded as restrictive however since such panels may be formed of other suitable material such as composition, resin-bonded board, for example, of various kinds available on the market at present, or other suitable, relatively stiff and sheet-like material of either natural or synthetic origin which is capable of being adapted to the principles of the present invention as described hereinafter.

For purposes of forming doors to close conventional door-ways of household nature, as well as in offices and other public buildings, and also for forming what may be termed large doors or partitions to close openings or divide rooms either in homes, offices, churches, and other public or private types of buildings, it has been found that wooden boards of approximately three-quarters of one inch thickness and of the order of between five and eight inches width are highly convenient and suitable for purposes of economics, manufacturing and installation, adequate sound and heat insulation, and efficient operation. Even when such doors or partitions are intended to close openings of substantial height of the order of nine or ten feet, the weight of such doors or partitions is not too great to be supported readily by the supporting structure described in detail hereinafter.

In order that the panels 12 not only may be flexibly connected together satisfactorily from the standpoint of both structure and economy of cost, but also to insure maximum effectiveness in closing a given opening and also insulating against the passage of heat, sound, light, etc., the panel connecting arrangement now to be described, was developed. Details thereof are best shown in Fig. 2 wherein fragmentary transverse sectional portions of two adjacent panels 12 are flexibly connected together by said means. Opposite edges of each of said panels 12 are provided with inwardly extending grooves 20 for purposes of receiving opposite edges of an elongated strip of flexible material 22 which comprises an elongated hinge preferably extending longitudinally of the panels 12 for the full length thereof. One specific form of the material 22 which has been tested and used with complete satisfaction comprises a heavy grade of

4

duck webbing woven from cotton or the like and approximately one and one-half inches wide.

The flexible hinge strip 22 is held in the grooves 20 of the panels 12 by elongated clamping strips or members 24 which are of sufficient thickness not only to wedge the flexible strip 22 firmly into grooves 20 but the outer ends thereof are rounded as clearly shown in Fig. 2, said rounded ends projecting beyond the outer ends of grooves 20, whereby, when the panels 12 are moved in unfolding direction, as indicated by the arrows adjacent the fragmentary ends of said panels in Fig. 2, the outer ends of clamping members 24 will abut each other when a predetermined amount of unfolding has occurred, thereby stopping further movement of the panels. By causing the panels to cease unfolding movement prior to the same being disposed in a common plane, folding of the panels will be facilitated when it is desired to remove the door or partition from the space across which it extends.

It also will be noted from Fig. 2 that each of the clamping members or strips 24 are provided with a lateral rib 25 which engages the strip 22 especially when the panels 12 have reached the limit of unfolding movement as indicated in Fig. 2. Any further attempt to move the panels 12 relatively in unfolding direction results in the flexible strip 22 tending to rotate the clamping members 24 about the abutting fulcrum lines on the outermost surfaces of said members in the direction of the arrows shown on the inner ends of said clamping members, resulting in a pinching or clamping action of the inner ends of the clamping members 24 upon the innermost portions of flexible strip 22 within the grooves 20. Such movement also tends to force the clamping members 24 further into the grooves 20 and results in still additional clamping of the flexible strip 22 between the clamping member 24 and the grooves 20.

Preferably, the clamping members 24 and flexible strip 22 are assembled with the use of suitable adhesive or cement so as to effect a firm union of these elements with the panels 12. Further, not only do the outer ends of the elongated clamping members 24 project beyond the grooves 22 but certain of the walls of the grooves are so arranged as to accommodate the outwardly flared nature of the outermost portions of the clamping members 24 clearly illustrated in Fig. 2. This arrangement also facilitates assembly, as well as providing the lateral rib 25 referred to above, and also permits flat folding of adjacent panels.

It will be seen that the strip 22 completely closes any space which may occur between the adjacent edges of adjoining panels 12 during all relative positions of the panels when either fully unfolded or fully folded and all positions therebetween.

Particularly when the panels 12 comprise a door used for closing a door opening of a hall closet, bedroom, or the like for example, one end of the hingedly connected paneled door includes a narrower end panel 26 which is fastened to one of the doorway facings or jambs 28, by any suitable means such as screws 30. One edge of the end panel 26 is connected to a relatively narrow hinge panel 32 by a strip 22 and clamping strips 24 which are similar to those by which the panels 12 of the main portion of the door 10 are connected. Such provision of the panels 26 and 32 renders operative the supporting means for the various panels of the door, as described hereinafter. In practice, it has been found that the panels 26 and 32 are substantially about half the width of the panels 12.

A typical transverse sectional view of adjoining panels 12 and the manner in which they are flexibly connected by the hinge means described hereinabove is illustrated in Fig. 4. This view also represents the preferred angle between adjoining panels when extended to fully open or unfolded position and in which position there is a continuous appearance of wood at one side of each joint.

Exemplary supporting means for the folding door or

5

partition described hereinabove are shown in Figs. 5 and 6 which are views taken at right angles to each other. A pair of elongated L-shaped track bars 34, which may be made of wood or any other suitable material such as solid or hollow metal of suitable composition are mounted in horizontal opposition to each other as shown in cross-section in Fig. 6. Opposed edges 36 are spaced apart to provide a slot therebetween which receives connecting members such as screws 38 by which supporting discs 40 are attached to the upper ends of certain of the flexibly connected panels 12 and by which the door or partition is supported, depending-like, by track members 34. Track members 34 may be attached to any suitable supporting surface such as a horizontal header of a doorway or a ceiling 42.

Preferably, the supporting members or discs 40 are made from suitable materials such as sheet metal from which suitable cup-like members may be stamped. Certain synthetic resins are suitable, one example of which is polytetrafluoroethylene, sold under the trade name "Teflon." This material has an extremely low coefficient of friction and is capable of very long life. Sheet material of the order of one quarter inch in thickness is suitable for purposes of forming the discs 40 therefrom and the extremely simple nature of the means for connecting the same to panels 12 minimizes construction costs. Further, the space between the surfaces 44 of track members 34 preferably is only slightly greater than the diameter of the discs 40, whereby said discs engage one or the other of the surfaces 44 during the folding and unfolding movement of the panels 12 and thereby maintains the screws 38 centered in the slot between surfaces 44 of the track members and also effectively positions the panels 12 as desired relative to the trackway during such movements of the panels. If desired, for purposes particularly of effecting even greater insulation of all kinds, the upper ends of the panels 12 may be longitudinally grooved to receive a sealing strip 46 which may be of felt or any other suitable material, the upper surface of which slidably engages the lower horizontal surfaces of the track members 34 while the panels 12 are being moved as described above.

While the flexible hinge or connecting strips 22 will permit the panels 12 to remain in any fully or semi-opened position, as well as fully closed, it is nevertheless desirable usually to provide a finish strip 48 which is connected by screws or the like to one of the doorway facings or jambs 50 as shown in Figs. 7 and 8. The strip 48 preferably is provided with a longitudinal groove 52 which receives a preferably rounded outer edge 54 of the outermost panel 12, the groove 52 receiving the edge 54 of said panel when the door is fully closed or the foldable partition is fully extended across a room for example. Also, simple but effective latch means are provided which are illustrated in these figures, the same comprising an elongated keeper 56. Said keeper may be positioned in an elongated, horizontal mortise 58 formed in the outer panel 12, the outer end of said mortise being finished by a face plate 60 which is secured thereto by conventional screws. The hook 62 of keeper 56 extends through an opening in face plate 60 and the hook also projects through a similar opening in face plate 64 which is fixed to finish strip 48 by screws and covers the outer end of mortise 66 formed in said finish strip.

For purposes of operating latch keeper 56, and also simultaneously providing handle means for operating the door or partition to move the same in folding or unfolding direction, a pair of grooves 68 and 70 are formed in the outer panel 12 respectively from opposite surfaces thereof and staggered relative to each other as shown in Figs. 7 and 8. These grooves intersect the mortise 58 so as to permit the lower edge of latch keeper 56 to be exposed in the upper ends of the grooves 68 and 70, whereby the latch hook 62 may be moved upwardly by inserting a finger in the upper ends of slots 68 or 70 so as to permit

6

opening or folding movement of the door or partition. A cam surface 72 may be formed on the outer end of hook 62 in order to effect automatic engagement of said hook with the inner surface of keeper 56 when the door or partition is to be latched against the finish strip 48 or its equivalent.

When a door or partition is formed from wooden board-like strips of the exemplary dimensions set forth hereinabove and the panels are moved to fully stacked or folded positions against one side of a door jamb or wall of a room, about 15% of the width of the door or room opening will be occupied by the folded assembly of panels. Where for example an opening of substantial width such as when a relatively wide room is to be partitioned in half for example by such an assembly of panels, it may be that when such a partition is fully folded, the folded assembly or stack of panels will constitute an objectionable projection into the room. To prevent such objection from occurring, the present invention also includes a simple but highly effective track arrangement shown in exemplary manner in Fig. 9 which represents a bottom plan view thereof attached for example to the ceiling of a room. It will be seen in said figure that an exemplary side wall 74 of a room is illustrated. The straight sections of track 34, which extend transversely across the room to be divided by the partition are shown as extending up to the wall 74 in the lower portion of Fig. 9. Particularly when the partition is to be extended entirely across the room and the opposite ends of the partition are to engage the opposite walls of the room, said straight sections of the track are used for purposes of supporting the partition. However, when the partition is to be folded and in order to not have the folded assembly of panels present any substantial obstruction into the room as would result when using the straight sections of track 34, the invention contemplates the use of curved sections of track 76 which merge with the straight sections 34 as shown in Fig. 9, at one end, and the other end of the curved sections terminate in adjacent and parallel relationship with wall 74, it being understood that the outer ends of said curved sections, which actually terminate in additional straight sections 78 that may be of any desired length, sufficient to accommodate the entire folded assembly of partition panels 12. To control the positioning of the partition panels while being folded and unfolded, as desired, relative to sections 34 of the track or what may be termed storage track sections 76 and 78, a switch frog 80 is pivotally connected to one of the track members by a screw or bolt 82 extending through one end of the frog 80. When the frog 80 is positioned in the uppermost position as viewed in Fig. 9, the partition will move to the left along straight sections 34 of the track, while when the frog is in the lowermost position as viewed in Fig. 9, the folded partition will move along curved track sections 76 and onto storage straight track sections 78. The frog readily may be manipulated by any slender object such as a curtain pole, pointer, or the like by extending the same through slot 84 between the track sections.

The panels of the doors or partitions embodying the present invention may be formed from a relatively wide range of woods, including such cabinet woods as oak, maple and mahogany, and also pine and cypress. These latter woods are advantageous in that they are lighter in weight than the others. Not only are solid boards of these woods highly satisfactory when finished naturally, but veneers of cheaper base woods overlaid with cabinet wood veneers are suitable. Further, a wood that is even lighter in weight than any of the foregoing is obeche, this being from Africa, and known in the trade as "Litewood." It is approximately only half as heavy as mahogany, yet it has good rigidity and is attractive when finished naturally.

If desired, suitable finishing material, sheet-like and decorative, for example, such as fabrics, resins and the like, may be affixed to one or both outer surfaces of the

panels. Opposite surfaces of said panels may be finished differently to harmonize with the decorating scheme of the rooms on opposite sides of a foldable partition, for example. Further, finishing sheets or strips of sound-absorbing fabrics or other material may be affixed to one or both surfaces of each panel of the door or partition to further enhance the inherent sound-absorbing properties thereof. Minimizing of the transmission of sound also is afforded by the flexibility of the connecting strips 22 which results in damping the sound between adjacent panels.

It will be seen from the foregoing that the present invention not only provides a simple and economical foldable door or partition structure but also unique supporting structure including effective track means which are adapted to supporting a door or partition readily while fully extended or while completely folded as when the door or room opening is to be open. The door or partition is composed of a plurality of flexibly connected elongated panels, the connecting means comprising preferably flexible strips extending substantially the full length of the panels. This feature of the connecting means, coupled with the stiffness of the panels and the zigzag or accordion-like relationship of the panels, even when fully extended, results in a very rigid door or partition which is capable of sustaining substantial jarring and leaning force applied transversely to the plane of the doorway or other opening closed by the door or partition. Further, doors and partitions embodying the invention may be manufactured by simple wood working machines and require few preparatory and assembly operations, whereby the overall manufacturing cost, as well as the simplified nature of the required installation, results in a door or partition structure which is relatively low in cost compared to competing foldable structures, yet it is highly effective in providing substantial insulation against the transmission of heat, light, sound and air.

While the invention has been shown and illustrated in its several preferred embodiments, and has included certain details, it should be understood that the invention is not to be limited to the precise details herein illustrated and described since the same may be carried out in other ways falling within the scope of the invention as claimed.

We claim:

1. A foldable door or partition to be supported by suitable track means at one end thereof and comprising a plurality of rigid and elongated panels positioned with the opposite elongated edges of each juxtapositioned to the edges of adjacent panels, said opposite edges thereof having longitudinal grooves extending inwardly from said edges between the opposite outer surfaces of said panels, a flexible strip extending between adjacent panels and opposite edges of said strip being disposed respectively in the grooves of said adjacent panels to connect said panels flexibly together for folding and unfolding movement relative to each other to permit the same to be extended accordion-like across an opening to be closed thereby, and elongated members extending into said grooves and engaging said flexible strip therein to dispose said strip against the inner wall and one side wall of said groove and thereby connect said strip to said panels, the outer edge of said elongated members projecting beyond the outer edges of said grooves and engageable with

each other when the panels are unfolded to restrict such unfolding of adjacent panels to a relatively wide angle less than 180°.

2. The foldable door or partition set forth in claim 1 further characterized by said elongated members projecting beyond the outer ends of said grooves in said panels and having fulcrum portions extending linearly thereof and said fulcrum portions on adjacent members being in opposition to each other and positioned to abut each other when the panels are unfolded relative to each other to extend said door or partition, said fulcrum portions upon further pivotal movement after abutting each other operating to tend to move said elongated members into clamping engagement against portions of said flexible strip within said grooves.

3. A pair of substantially rigid panels each having at least one straight edge, said edges having longitudinal grooves extending inwardly from said edges between the outer surfaces of said panels, a flexible strip having the opposite edges thereof inserted respectively in said grooves, whereby said strip extends between said panels to flexibly connect the same, and securing means for said flexible strip comprising elongated clamping members fitted respectively into said grooves against the portions of said strip positioned therein against the inner ends and one side of each groove and the outermost edges of said clamping members projecting beyond said grooves and arranged to abut each other when said panels are pivotally moved apart a predetermined amount less than 180°, thereby serving as a stopping means for such pivotal movement.

4. The panel assembly set forth in claim 3 further characterized by the outermost edges of said clamping members having lateral ribs extending longitudinally therealong and engaging said flexible strip to hold it laterally away from the abutting portions of said members when in abutment, whereby further attempted pivoting apart of said panels causes said flexible strip to tend to rotate said clamping members about said line of abutment and urge the portions of said members within said grooves to be moved toward one wall of each groove and in clamping direction against said flexible strip.

5. The pair of rigid panels according to claim 4 further characterized by one side wall of each groove in said panels being bevelled outwardly and the side of each clamping member having a lateral rib thereon being complementary in shape to said bevelled side of each groove, said flexible strip being clamped between said complementary surfaces and thereby disposing said strip adjacent the outer surface of the panel nearest said bevelled side of the groove therein to permit substantially flat folding of said panels against each other.

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