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Viol et al.

[11] **3,708,009**

[45] **Jan. 2, 1973**

[54] FOLDING DOOR ARRANGEMENT

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[21] Appl. No.: **33,173**

Related U.S. Application Data

[60] Division of Ser. No. 657,970, Aug. 2, 1967, Pat. No. 3,476,630, and a continuation of Ser. No. 773,610, Nov. 5, 1968, abandoned.

[30] **Foreign Application Priority Data**

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Jan. 17, 1967 Germany ..... L 55509

[52] **U.S. Cl.** ..... **160/84 V**
[51] **Int. Cl.** **E06b 3/94**
[58] **Field of Search** ..... 160/84 LTM, 84 LTV, 231, 231R

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[57] **ABSTRACT**

A folding door arrangement of the accordian door type in which the cover is made up of relatively wide and relatively narrow wooden panels so that each fold of the cover is defined by a pair of relatively wide panels spaced apart by a relatively narrow panel, with the panels of each fold being connected together by articulating tapes applied to the outwardly facing surfaces of same, with such outwardly facing surfaces being covered by wood grained bearing veneer arranged so that in both the opened and closed positions of the door, an attractive, substantially continuous wood grained aesthetic effect is presented by the door side surfaces. The edges of the respective relatively wide panels at the inside of each fold are articulated to adjacent corresponding edges of adjacent relatively wide panels by similar tapes that are secured to carrier bars in turn supported by a lazy tong type extensible frame that is connected between the fixed immovable posts of the door.

6 Claims, 9 Drawing Figures

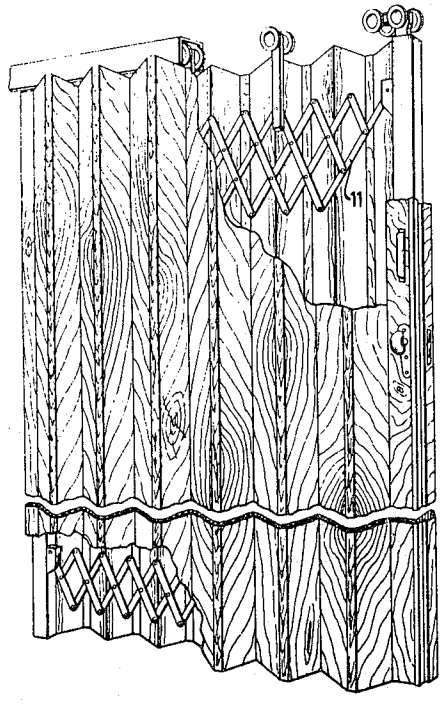


FIG.1

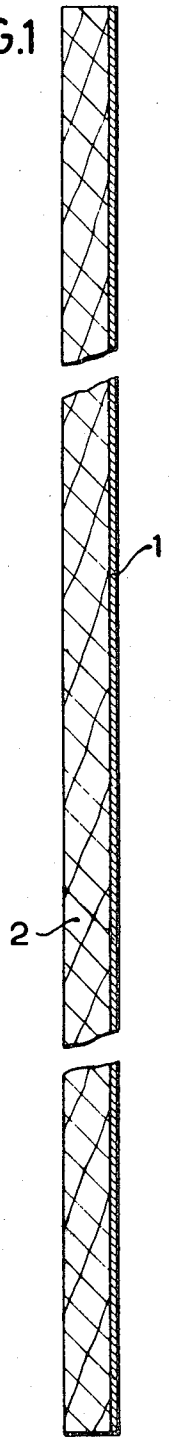


FIG.2

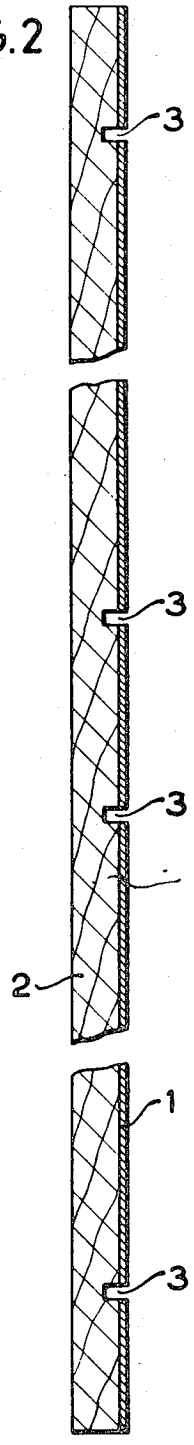
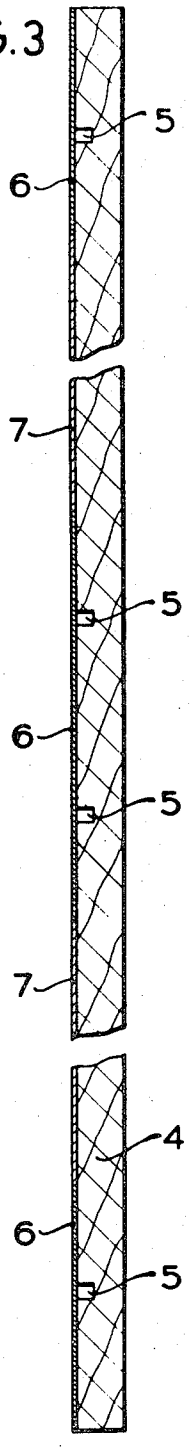


FIG.3



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FIG.4

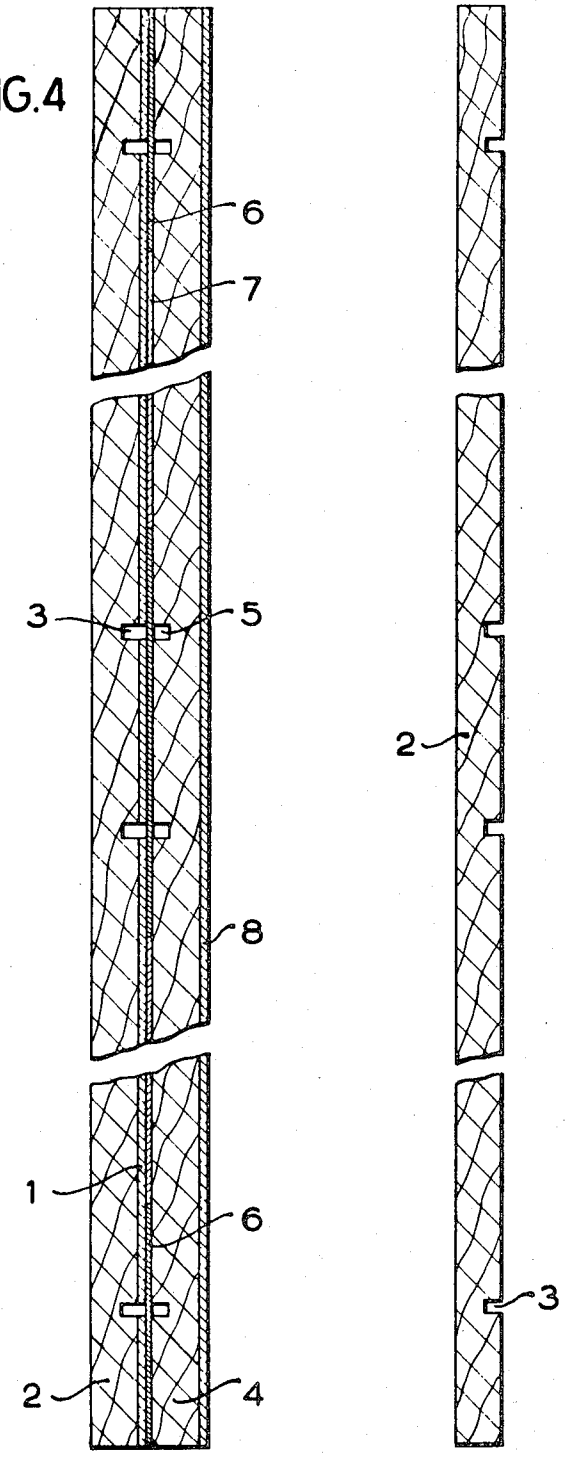
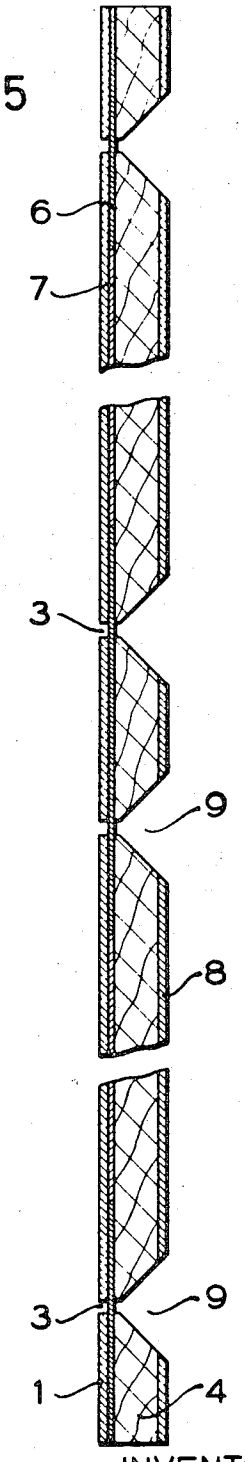


FIG.5



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FIG.6

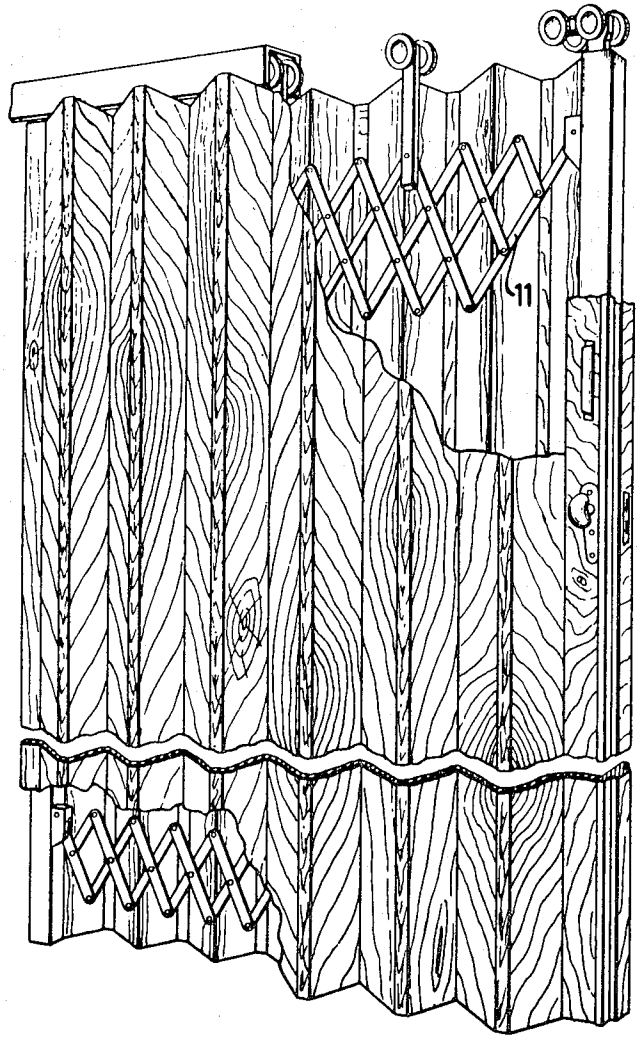
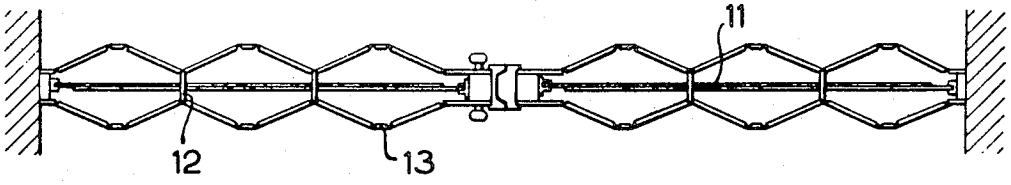


FIG.7



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FIG. 9

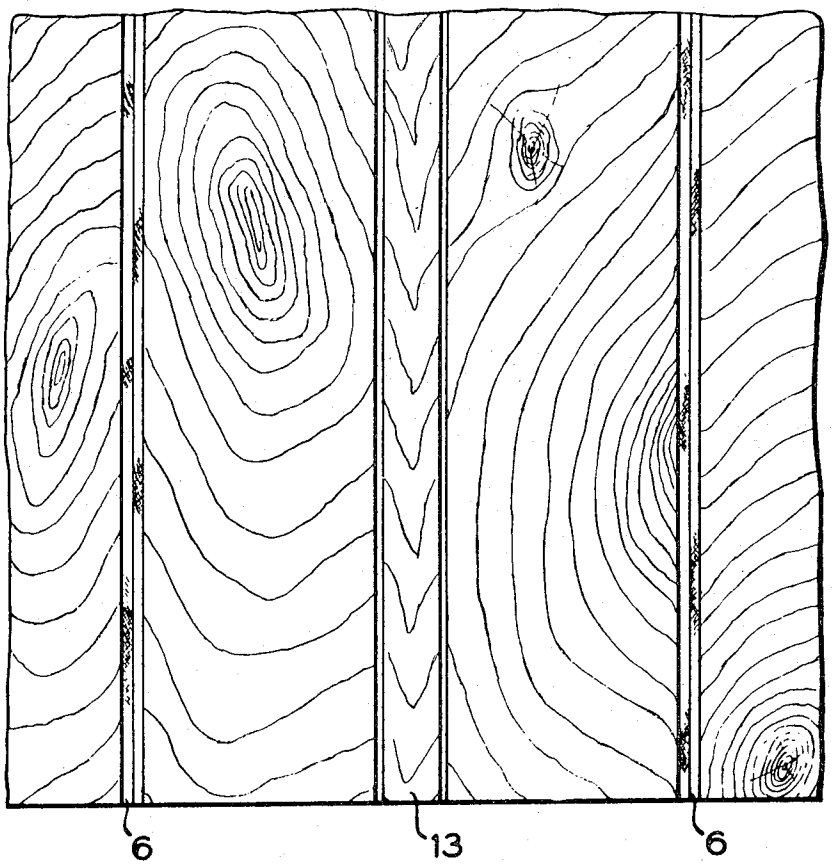
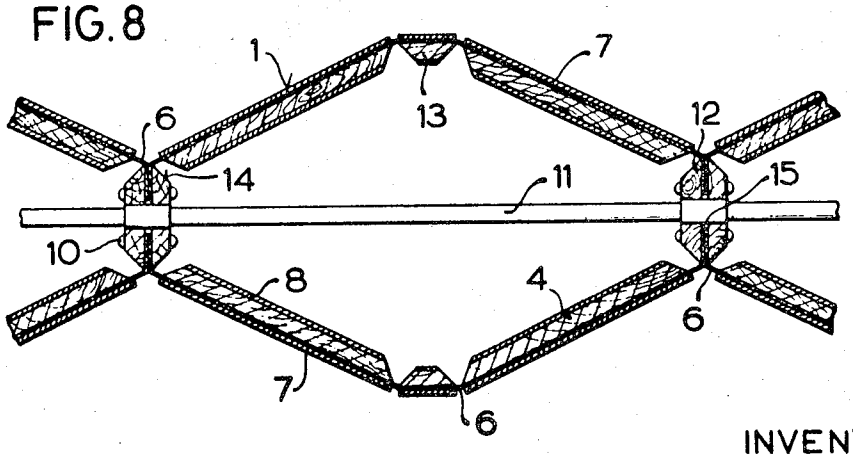


FIG. 8



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FOLDING DOOR ARRANGEMENT

This application is a division of our co-pending application Ser. No. 657,970, filed Aug. 2, 1967, now U.S. Pat. No. 3,476,630. This application is also a continuation of application Ser. No. 773,610, filed Nov. 5, 1968 and now abandoned.

The invention relates to a folding door of the accordion door type of preferably multi layer foldable wooden lamellae construction in which the individual lamella are interconnected by articulated tapes with said tapes being covered by a covering veneer or the like.

Folding doors of the type to which the invention relates comprise vertically arranged, stiff lamella parts formed from wood and interconnected by hinges, hinged tapes or articulated tapes, so that during the opening and closing of the door the lamella parts can be moved in an accordion-like manner.

The mass production of such wooden lamella connected with each other by articulation is extremely difficult because accordion type doors known from prior art have lamellae of varying width, depending on the width of the room. The width of the lamellae thereby is always a fraction of the width of the room. Another disadvantage of the lamella made in line with the width of the room is that the opposing side edges of the lamellae always diverge.

These disadvantages are avoided by the door according to the invention. According to the invention the lamellae are mass-produced at uniform width, whereby at different room widths the lamellae in the door are placed at different angles to each other. Instead of the hitherto open anterior bisecting edges, intermediate rods are glued in parallel to the operating direction of the door, which are in the same plane as the lamella surfaces.

As a rule the hinges, hinge tapes or articulated tapes are placed on the inside of the wooden lamellae, resulting in the disadvantage that when the door is folded the opposing side edges of adjacent wooden lamellae become visible; this looks bad and makes it necessary to cover these edge surfaces likewise with veneer.

In order to obtain a better optical overall impression, it is proposed to arrange the articulated tapes on the outside of the wooden lamellae and to cover them with covering veneer. Thereby, the covering veneer is applied in strips to the individual wooden lamellae, so that a recess remains between the covering veneers of the two adjacent wooden lamellae which is flush with a corresponding recess located behind the articulated tape between both wooden lamella, whereby the mobility of the articulated tape is maintained as the door is moved.

It has been discovered that a sufficiently precise application of the covering veneer strips to the lamellae is practically unfeasible in mass production. It is impossible to glue the cut veneer to the plywood with the precision of a fraction of an inch and to obtain that way a relatively wide and straight recess. During the compression resulting from the gluing, the veneer may shift, making the desired precise execution of same at the recesses at the folding points, by which the optical overall appearance and the operation of the door are influenced decisively, unattainable.

The aforementioned difficulties are to be obviated by the invention.

This problem has been solved by employing as part of the manufacturing technique the removable fastening of a covering veneer on its finished surface side to a carrier plate, for example by gluing it on very lightly, by cutting into the cover veneer from the bottom at predetermined intervals, first, longitudinally extending grooves, by cutting into the surface of a lamella panel second grooves extending in accordance with the first grooves, by fastening to the surface of the lamella panel articulated tapes covering the second grooves, by placing the carrier plate with the cover veneer upon the lamella panel so that the grooves match, and by gluing the cover veneer to the lamella panel, by cutting the lamella panel along its inner side, in a wedge-like manner, and in alignment with and as far into same preferably as the second grooves, and by removing the carrier panel from the covering veneer.

In the lamella panels the articulated tapes are applied only after cutting the grooves so that they cannot be damaged by the cutting tools. The cover veneer also is held firmly, after the application of the grooves, on the carrier plate until it is glued to the lamella panel. This fully maintains the straight and uniform course of the grooves and of the grain of the wood over the entire front surface of the door without any shifting.

Another advantage of the method consists in that the panel first used as carrier panel can be used in the further course of the production as a pre-grooved lamella panel. This renders the method even more economical.

In order to obtain a smooth front surface as support surface for the cover veneer, it is possible to apply compensating veneer strips between the articulated strips or a milling may be applied to the plywood at the depth somewhat less than the thickness of the articulated tapes. The fastening of the articulated tapes or strips, of the compensating veneer strips and of the cover veneer on the lamella panels can be accomplished by gluing.

According to a further development of the invention a folding door with side covers made of the lamella elements made according to the invention has been created, characterized in that intermittent bars are arranged between the lamella elements whose anterior surfaces are in one plane with the anterior edges of the basic bodies of the lamellae, in other words, they are neither recessed nor projecting, and that the lamella elements and the intermediate bars are connected by articulated strips veneered below the cover veneer and forming one unit with the material of the basic lamella bodies and of the covering veneers.

In this embodiment the opposing side edges of adjacent lamella elements, located on the outside when the folding door is folded, are corners without separately projecting or recessed edges, because the frontal surfaces of the lamella elements are covered up by the intermediate bars. The lamella elements and the intermediate bars are covered by wooden veneers. Due to the fact that the front surfaces are close together and continuous in one plane that is the front surfaces of the basic lamella bodies and of the intermediate rods or bars the folding door then shows a decorative pattern of the wood graining, as it is neither discontinuous nor shifted. Only with this design is it possible to show a continuous wood pattern with the natural veneer design, the like of which no wooden folding door could

show anywhere in the world. For the production it is favorable that the after-veneering of the longitudinal opposing edges of the lamella elements that are directed outwardly by the folding of the door is eliminated. The articulated strips may be colored according to the color of the lamella elements. It is possible to use simple fabric or plastic tapes or such tapes reinforced by inserts as material for the articulated strips.

According to a further development of the invention the design may be such that the lamella opposed edges that are located on the inside in folded position of said lamella elements are connected to carrier rods or bars fastened at the extensible supporting skeleton of the accordion door, whereby the articulating strip connecting two opposing lamella edges is inserted and fastened in a vertical slot in the carrier bar, so that with the door fully extended the front surfaces of the lamella elements and of the intermediate bars form a smooth surface that is intersected only by narrow slots at the joints between the lamella elements. This embodiment offers the advantage that with the telescoped or folded lamella position, the outer surfaces of the intermediate bars are disposed in close adjacency and are coplanar on either side of the door, so that in even the telescoped or folded door package each side of the same shows a smooth decorative wood pattern in one plane. This embodiment further more offers the advantage that even in the folded position of the door package hollow spaces remain between the individual lamella elements into which soundproofing inserts may be installed, for example.

Embodiments of the invention which show additional features of said invention are shown in the drawing.

FIG. 1 shows in a sectional view a cover veneer fastened to a carrier plate 2 for the front sides of wooden lamellae 1 intended for a folding door.

FIG. 2 shows in a sectional view the carrier plate 2 with cover veneer 1 according to FIG. 1, with the grooves 3 cut in.

FIG. 3 shows in a sectional view a lamella panel 4 with cut-in grooves 5 and articulated tapes 6 glued on and overlapping the grooves 5, along with a compensating veneer 7.

FIG. 4 shows in a sectional view the assembly of the cover veneer 1, the carrier plate 2 with the lamella panel 4 and

FIG. 5 shows the lifting of the carrier panel 2 from the cover veneer 1 now solidly glued to the cover veneer 1 and the wedge-like cutting out 9 of the lamella panel 4 from the rear.

FIG. 6 shows a perspective view of a door design where the wooden lamellae produced according to the method of application Ser. No. 657,970 are used.

FIG. 7 shows a longitudinal section through the door according to FIG. 6.

FIG. 8 shows an enlarged partial presentation from FIG. 7 and FIG. 9 shows a lateral view of the presentation according to FIG. 8.

The various steps of the method of our said application are shown consecutively in FIGS.. 1 to 5 to provide a full understanding of the nature of the present invention. All lamellae of a cover for a folding door or of a major folding door section, wooden lamellae in the embodiment, are worked out of a wide plywood panel or plate only at the end of the production, said plywood plate being designated as lamella panel 4.

The cover veneer 1 with the proper dimensions to be applied to the exterior surface of the lamella panel first has its outer surface removably glued to the lower side of a stable carrier plate or panel 2 (FIG. 1). The grooves 3 which are spaced to define the joints between the articulated sections of the cover, and extend vertically in the operative position of the door are cut into the cover veneer 1 glued to the carrier and into the carrier panel 2 from the bottom, whereby the cover veneer is separated into cover veneer strips which remain glued to the carrier panel 2.

Grooves 5 are placed into the front side of the lamella panel 4. The grooves 5 are placed at the same intervals from each other as the grooves 3 of the carrier plate and also coincide as to width with the grooves 3. The front surface of the lamella panel is then so glued with the articulated strips 6, textile strips for example, that the grooves 5 of the lamella panel are covered on both sides with sufficient overlapping. In order to obtain a smooth front surface compensating veneer strips 7 are glued between the articulated tapes 6 on the lamella panel.

To a lamella panel so prepared the carrier plate 2 with the cover veneer 1 is now glued, whereby the grooves 3 and 5 are placed matchingly on each other and the cover veneer is glued firmly to the front surfaces of the articulated tapes 6 and the compensating veneer strips 7 (FIG. 4). At the same time the rear side of the lamella panel is glued to the blind veneer 8 during this operation.

Now that the cover veneer 1 is firmly glued to the lamella plate, the carrier plate 2 is removed from the covering veneer 1 (FIG. 5). The carrier panel 2 thereby released becomes a support during the further course of operation the lamella panel. The lamella panel 4 is cut wedge-like as at 9 precisely in alignment with the grooves 3, so far that each wedge cut 9 reaches the superimposed groove 3 at its bottom. The wedge-like design of the notches 9 establishes the mutual mobility of the lamella strips so that after the assembly into the folding door they can be displaced bellows-like and can pivot thereby (see FIG. 8).

FIGS. 6 and 9 show an accordion or double shell folding door with a lazy-tong type extensible supporting skeleton 11 located therein and placed in a vertical plane, said skeleton being covered on both sides with one outer shell or cover each. The supporting skeleton 11 extends between the conventional fixed and movable door posts shown in FIG. 6.

Each outer shell is connected via vertically extending carrier bars 12 made of wood, with the skeleton 11. Two basic wooden lamella bodies 4 making up the respective covers are placed between two carrier bars 12 each on either side of the door. Between the longitudinal opposed side edge surfaces located on the outside in closing position of the basic lamella bodies one intermediate narrow lamella body or panel in the form of wooden bar 13 is arranged extending parallel to the anterior edges of the lamellae 4. Two basic lamella bodies 4 form one individual fold or lamella element of the door, together with an intermediate bar 13. Near their outer and inner longitudinal edges the lamella bodies are coated on their front side with flexible articulated

tapes 6. On the outside the articulated tapes are applied over the intermediate bars 13 from one basic body to another one and glued on. In the inner fold areas the articulated tapes connect the basic bodies to the carrier bars 12. Bars 12 have on their outwardly extending edges the surfaces 14 that slant toward each other. The front edge of each bar 12 formed by the slanted surfaces 14 is slit open to define a slot 15. The laterally projecting articulated tapes 6 of the adjacent lamella elements are placed into said slot 15 and connected to the carrier rod by gluing, pasting or nailing. 10 identifies a wire pin.

Bodies 4 and bars 13 when incorporated in the cover as indicated in FIGS. 6–9 in effect define same into relatively wide and relatively narrow slats that are separated by relatively narrow recesses between such slats in any position of the door.

A compensating veneer 7 is pasted between the articulated tapes on the front surface of each basic body 4 and the smooth front surfaces of the basic bodies so formed and the intermediate bars that are covered with the articulated tapes are covered in turn by covering veneers 1, as described in connection with the showing of FIGS. 1–5. The adjacent longitudinal surfaces of the basic bodies and of the intermediate rods 13 are undercut as a result of the formation of the previously described notches. The inner surfaces of the basic bodies 4 and the intermediate bars 12 are coated with veneers likewise.

It will be noted that the slats of each cover are arranged to define individual folds in the cover in which each fold comprises three slats including a center slat and side slats on either side of the center slat (see FIG. 8).

As the folding door is folded together, smooth corners form on the outer fold defining edges of the lamella elements, which edges are formed by articulated tapes 6, resulting in a neat appearance.

We claim:

1. In an accordion-type folding door including a foldable cover on either side of the door with the covers each supported by an extensible and contractible frame and defining an inner surface facing the corresponding surface of the other cover and an outwardly facing surface defining the outer surface of the door, the improvement wherein:

said covers comprise a plurality of slats,

said slats of each cover defining vertically extending side edges and being arranged to define individual folds of the cover in which each fold comprises three slats including a center slat and side slats on either side of the center slat,

means for hinging adjacent of said side edges of said side slats of each fold to the corresponding side edges of the center slat adjacent same,

means for hinging the other edges of the side slats of each fold to said frame,

said slats each comprising a panel having one side surface thereof on the outer surface side of the respective covers and the other side surface thereof on the inner surface side of the respective covers,

said means for hinging said side slat side edges to said center slat edges comprising an articulating tape extending substantially the height of the respective panel and bonded to said one side surface of the respective panels forming said side and said slats,

said means for hinging said other edges of said side slats to said frame comprising an articulating tape extending substantially the height of the respective panels and bonded to said one side surface of the respective panel forming said side slats, and means for securing the last mentioned tapes to said frame,

each of said panels including a cover veneer bonded to same over said tapes and overlying said one side of said panels,

said cover veneer of each of said panels defining vertically extending side edges that are substantially aligned with the side edges of said panels,

said hinging means disposing the respective panels joined together thereby in closely spaced relation,

said slats at the inner surface of the respective covers along their side edges being formed such that adjacent slat side edges at the inner surface of the respective covers define v-shaped grooves in the unfolded position of the door,

said cover veneers defining said outwardly facing surface of said cover,

whereby said outwardly facing surfaces of said covers present a substantially continuous decorative appearance running the length of the door in the folded and unfolded positions thereof, and said slat side edges are substantially covered by said tapes, whereby said decorative appearance dominates the external aesthetic effect presented by said covers.

2. The door of claim 1 further comprising means for filling in said one side surface of said panels defining said side slats to the level formed by said tapes bonded thereto.

3. The door of claim 2, wherein said filling in means comprises a plurality of compensating veneers of substantially the same thickness as said tapes, each of said compensating veneers being of a width that is substantially the same as the width of the spaces between the tapes.

4. The door of claim 1 wherein said means for securing said tape to said frame comprises a pair of inwardly extending carrier bars secured to said tape, means for securing said carrier bars together, and means for securing said carrier bars to said frame.

5. The door of claim 4 wherein said carrier bars of sad foldable cover on one side are also connected to a foldable cover on the other side of said door.

6. The door of claim 1 wherein each of said cover veneers has a decorative wood grain pattern on its outer surface.

* * * * *