Jan. 16, 1968 B. W. SCHWINDT 3,363,387

DOOR CONSTRUCTION

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FIG. 1

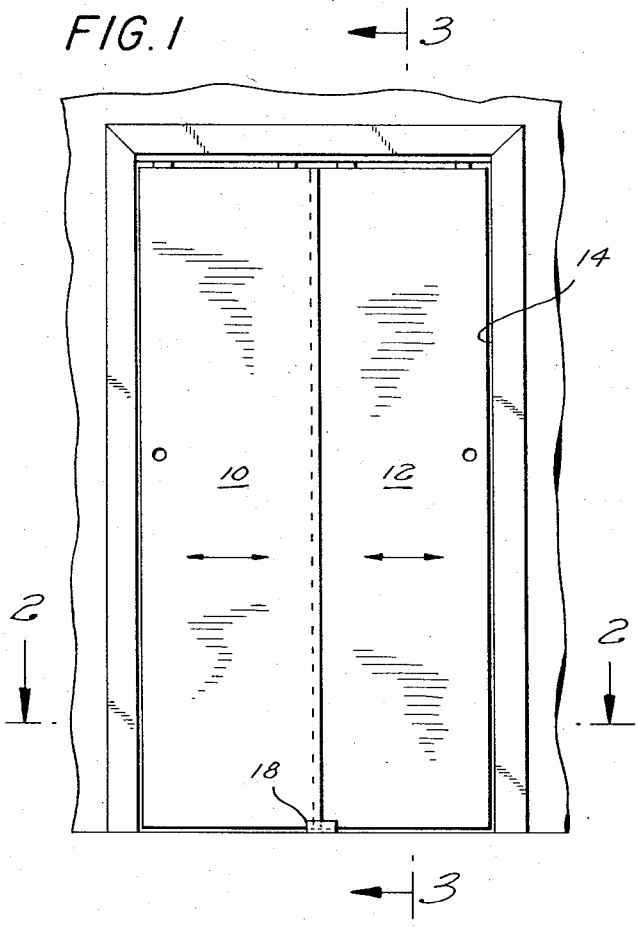
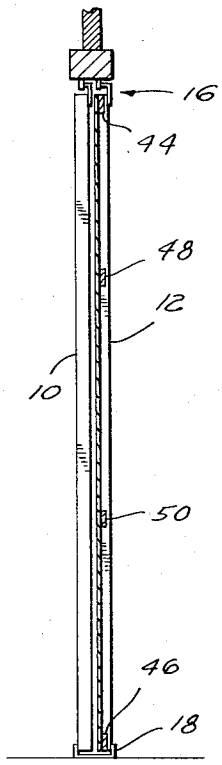


FIG. 3



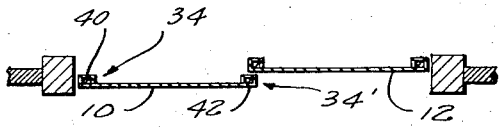


FIG. 2

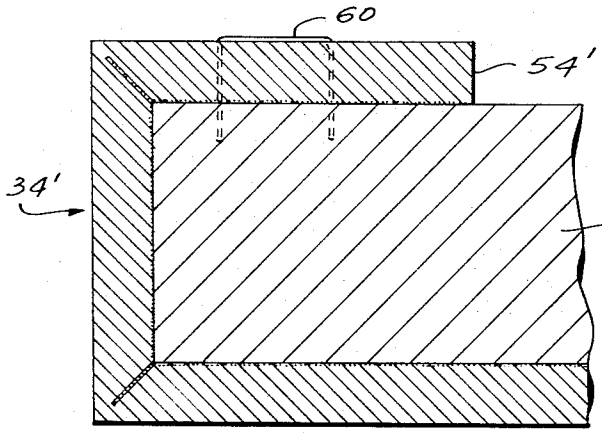


FIG. 7

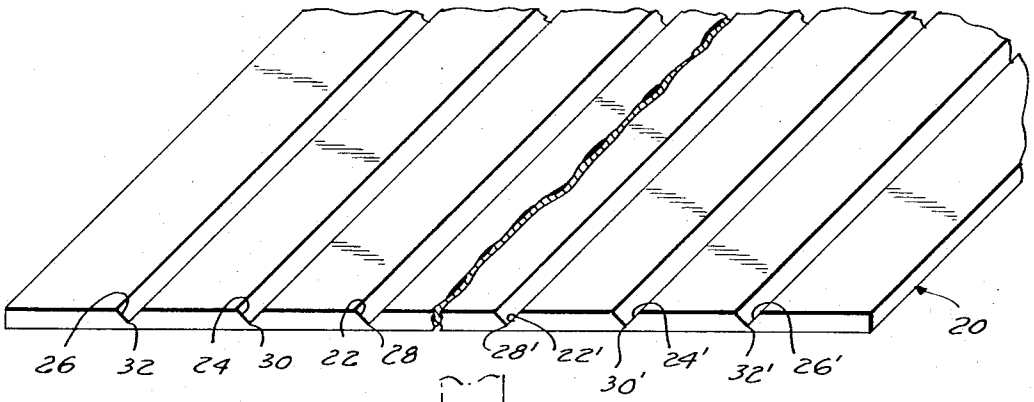
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DOOR CONSTRUCTION

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FIG. 4



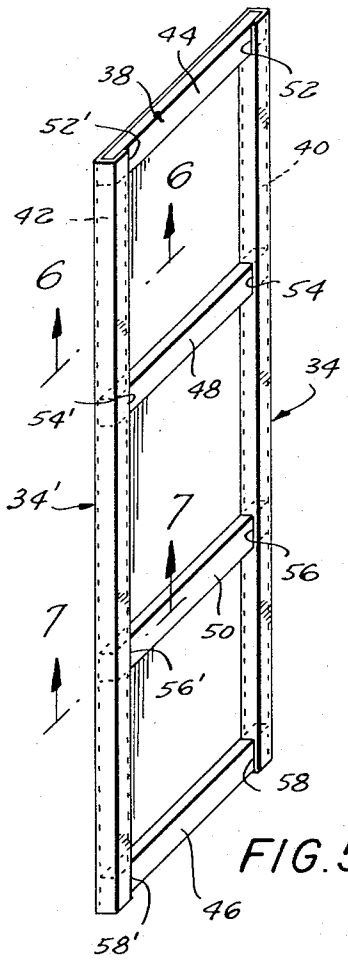
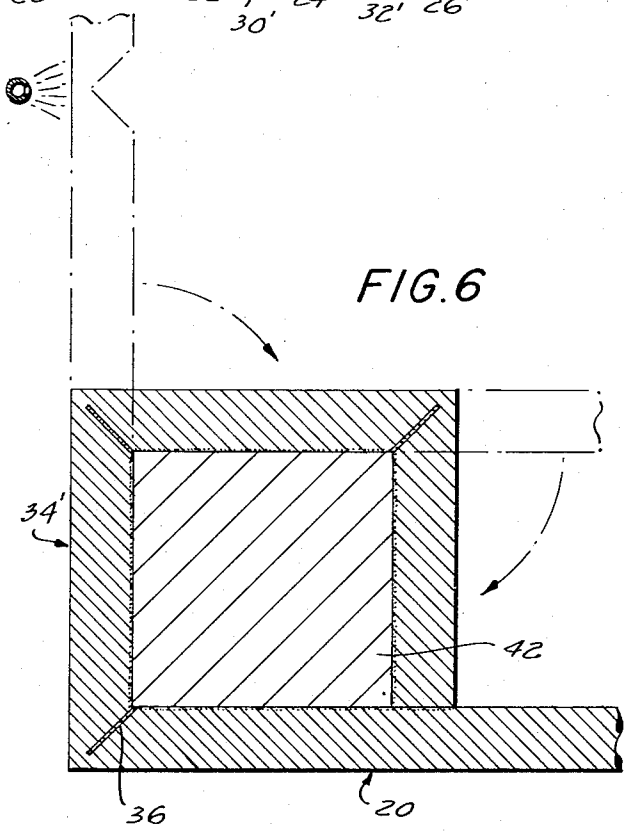


FIG. 5

FIG. 6



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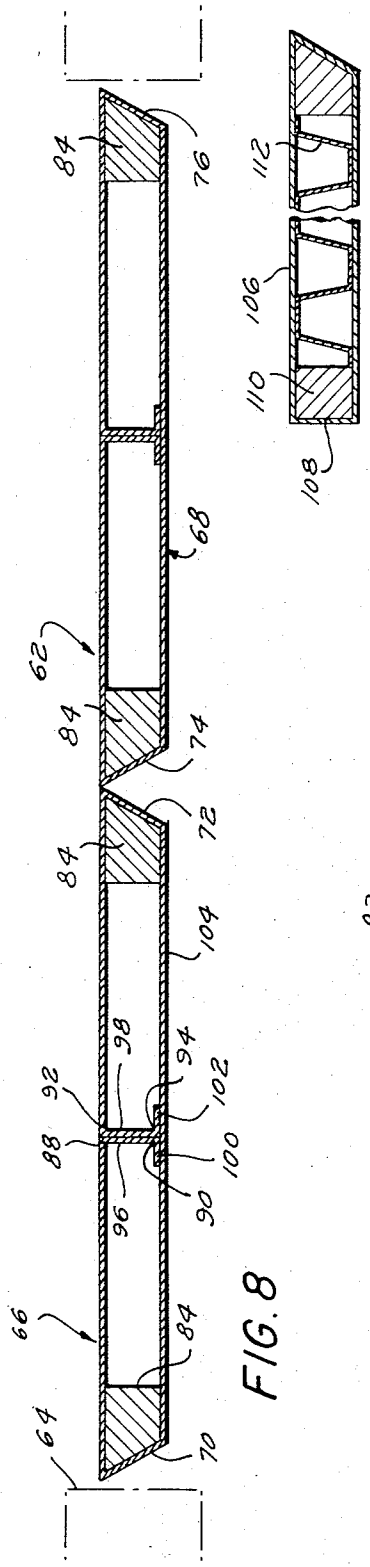


FIG. 8

FIG. 10

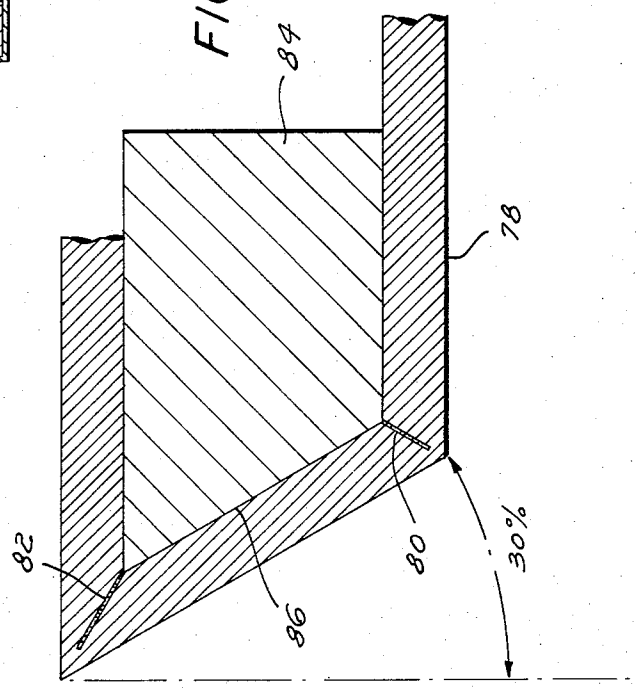


FIG. 9

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DOOR CONSTRUCTION

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ABSTRACT OF THE DISCLOSURE

A low-cost simplified door construction comprised essentially of a panel in sheet form provided with a network of V-shaped grooves. The sheet is bent about the base of the V of each groove following an application of an adhesive to adhere the opposed faces of the grooves together. Supplemental stiffening members may be interposed along the sides of the door. The sheet is formed to provide a front panel and a rear panel means for defining a substantially hollow door construction. Internally disposed stiffening means may also be provided interiorly of the panels for rigidifying the door construction.

The present invention relates generally to a simiplified and low-cost door construction and, more particularly, to a panelized door construction which effectively utilizes the inherent structural strength of the panel materials, and at the same time, relies upon a minimum number of supplemental parts and members for completing the construction.

Today, doors assume many forms of construction, each having a number of common factors which contribute to the recognized exceptionally high costs of door construction. Among these are the relatively large number of members contributing to the appearance and structural strength of the door. Incident to this is the large amount of handling and labor required to assemble the parts. In addition, certain types of doors inevitably result in large amount of waste materials and labor included in which is the typical sliding closet door or bifold door as well as others with which the discerning eye never does view the rear or back of the door. With the ever-increasing cost of living, materials and labor, simplified constructions and techniques are in demand to prevent doors from becoming prohibitively high in price or, for that matter, advantageously contribute to a reduction in the cost.

A typical door manufactured today will inevitably possess dissimilar materials along the vertically extending edges. In this connection, it will be visibly apparent that two surface sheets of hardboard or plywood are glued to a woodened frame. The door edges will, therefore, include different colors, different density materials and, at the same time, be subject to damage all of which affect appearance, finishing and general utility. An imbalanced construction of this type will be conducive to warpage. The exposed edges of these doors must be clear lumber and, of necessity, expensive lumber. When special sized and types of doors are specified, the attendant costs are significantly increased.

It is, therefore, a principal object of this invention to provide an improved door construction and method of manufacture whereby a minimum number of parts are employed, each individually inexpensive and of simple construction while being readily assembled efficiently by low-cost techniques and with a minimum expenditure of labor.

Another object is to provide a door construction of this type in which a single fiber panel or hardboard may be provided with longitudinally extending grooves extending across a major part of the thickness of the board whereupon the board may be bent about the base of the groove whereby adhesively secured stiffening or rigidifying structure is permissable along the longitudinally extending side edges; and, where necessary, supplemental framework or stiffening members may be readily and economically incorporated into this basic structure without materially affecting the cost of the structure or its assembly.

A further object is to provide a balanced door construction which will minimize, if not eliminate, warpage and at the same time produce a more uniform and inexpensive production in which the exterior faces of the door may be of similar materials and in which the lumber frame is concealed and can, under these circumstances, be very low grade.

These objects are effectively attained by a door construction and method of manufacture which employs as the basic unit of structure a panel of fiberboard or hardboard or a veneered product in sheet form. This board is provided with a network or series of V-shaped grooves extending across a major part of the thickness of the board. The number of grooves is dictated by the type of structure desired along each of the sides of the door. In any event, the board is bent about the base of the V of each groove following an application of suitable glue or adhesive to adhere the opposed faces of the grooves together and the internal faces of the stiffening structure thus produced along the sides of the door to associated supplemental stiffening members, rails or braces. Where desired or necessary, the exterior face of the base of the grooves may be treated by an application of moisture, water or similar liquid to condition the internal fibers to permit the board to be readily bent without materially rupturing or breaking the board at this location during the bending operation.

Other objects and advantages will become apparent from the following detailed description which is to be taken in conjunction with the accompanying drawings and in which :

FIG. 1 is a side elevational view of the front of a typical pair of sliding closet doors incorporating the teachings of the present invention;

FIG. 2 is a cross-sectional view taken along the line 2—2 of FIG. 1;

FIG. 3 is a longitudinal sectional view taken along the line 3—3 of FIG. 1;

FIG. 4 is an enlarged fragmentary perspective view of a board from which a door of this invention is constructed showing the network of V-shaped grooves about the base of which the board is bent to form a panelized network which, in turn, provides the requisite amount of stiffening for the door;

FIG. 5 is a perspective view looking at the rear of a door of this invention showing typical supplemental framework including vertically extending stiffeners and cross rails which supplement the stiffening or rigidifying of the door construction;

FIG. 6 is an enlarged fragmentary sectional view taken along the line 6—6 of FIG. 5 showing in phantom the manner in which the board of FIG. 4 is bent about a stiffener;

FIG. 7 is another fragmentary cross-sectional view taken along the line 7—7 of FIG. 5;

FIG. 8 is a top plan view of another embodiment of door of this invention in which a bifold door is formed with beveled vertical side edges adapted to extend between walls which themselves are similarly beveled or provided with squared openings as shown;

FIG. 9 is an enlarged sectional view showing the detail of fold or bending of the board in providing the beveled side edges of the door of FIG. 8; and

FIG. 10 is a cross-sectional view of a hollow core flush door incorporating the teachings of this invention.

In the exemplary embodiment of FIGS. 1 to 7, a sliding door is illustrated comprised of the usual pair of relatively

sliding doors 10 and 12 disposed between the generally squared door opening 14. These doors may be conveniently suspended on roller mechanisms 16 in the usual fashion and guided at the bottom by nylon or other suitable guides 18.

According to this invention, the construction of a door will include as the primary unit a rectangular sheet 20 whether it be the illustrated sliding closet, bifold door or overhead garage door or any other door adapted to be fabricated in accordance with the herein disclosed teachings. The sheet 20 may be fiberboard, hardboard, a veneered product included in which is Masonite and plywood. The sheet 20 may be initially trimmed to the desired dimensions or during the fabrication process to be described, trimmed and cut during the assembly of the door. In any event, the sheet 20, for purposes of the illustrated embodiment being discussed, will be formed with a series of spaced V-shaped grooves 22, 24 and 26 along the vertically extending side edges. These grooves will not extend across the entire thickness of the sheet 20 whereby the respective bases 28, 30 and 32 of each groove will be spaced from the opposed face of the sheet to thereby provide an integral hinged portion of reduced thickness. In the illustrated exemplary embodiment, the opposed and corresponding V-shaped notches will be identified with like numerals bearing primes. As will be evident, the formation of the V-shaped notches in this manner facilitates the formation of stiffening structures 34 and 34' along the opposed vertically extending side edges of the sheet 20.

Towards this end, the sheet 20 is bent about the respective bases of the grooves in the manner depicted by FIG. 6 to place the opposed faces of the grooves approximate one another. Where desired or necessary, the respective bases of the V-shaped grooves may be suitably pre-treated to facilitate this bending or hinged action. This treatment may partake of a water or moistening application or the like whereby the material from which the sheet 20 is fabricated is suitably rendered pliable such that it will bend without rupturing or at least without rupturing to a material extent. Thus, the stiffening structures 34 and 34' will assume a substantially rectangular or even square tubular configuration in section. This stiffening structure is maintained and retained through the employment of a layer 36 of suitable adhesive or glue interposed between the opposed faces of the V-shaped notches prior to the bending operation.

Where desired or necessary, the stiffening structures 34 and 34' and the rigidity of the doors in general may be supplemented by framework 38. In the illustrated exemplary embodiment, this framework may be conveniently pre-assembled and will include vertically extending rails 40 and 42, a top cross member 44, a bottom cross member 46 and a pair of intermediate cross-members 48 and 50. As will be apparent where the framework 38 is incorporated in the door structure, the sheet 20 will be required to be suitably notched at 52, 54, 56 and 58 prior to the bending operation to accommodate the horizontally extending cross members. Primes are supplied to the corresponding notches on the opposed stiffening structures 34'. With the employment of stiffening framework 38, the internal faces of the sheet 20 that make up the stiffening structures 34 or 34', as the case may be, are upon bending placed into engagement or in close proximity with the associated vertically extending rail 40 or 42, respectively. The layer of adhesive 36 may, under these circumstances, be extended to the internal faces of the reinforcing structure to firmly interconnect through this layer of adhesive the exterior of the vertical rail and reinforcing structure provided by the sheet 20. In addition, this interconnection may be supplemented by the use of a number of strategically located nails, screws or, as shown, staples 60 (FIG. 7).

Thus, it will be apparent that this invention takes advantage of the inherent strength of the sheet material 20 which is obtainable in stock sizes to form a rigid and structurally sound door construction, a minimum number of parts are obviously employed and relatively simple and efficient fabrication and assembly techniques need only be executed.

Referring now to the embodiment of this invention of FIGS. 8 and 9 wherein a bifold door 62 is illustrated extending across a square door opening 64. The bifold door may be composed of a pair of relatively pivotal doors 66 and 68 which could assume the form of construction of doors 10 and 12. On the other hand, doors 66 and 68 preferably are provided with beveled ends 70, 72, 74 and 76. Under these circumstances, the door opening 64 may be formed with correspondingly beveled parts. In manufacturing either of the doors 66 or 68, the sheet 78 from which the door is fabricated is provided with V-shaped grooves such as 80 and 82 having an included angle which will upon bending of the sheet about the base of the grooves provide the desired bevel. Where employed, the vertically extending stiffening rails 84 may be provided with a correspondingly beveled side 86 to accommodate the bevel formed in the sheet 78. The vertically extending terminal end of the side edges of the sheet 78 may simply be wrapped around the stiffening rails in a manner proposed in the embodiment of FIGS. 1 to 7 or may be extended centrally of the door where the sheet ends are suitably notched and glued to provide the illustrated rigidifying or stiffening structure. In this connection, the opposed ends of the sheet 78 may be provided with similar and complementary notches to form the substantial right angle corners 88, 90, 92 and 94. Of course, the corners will have a suitable application of the selected glue or adhesive which may also be interposed between the abutting panels 96 and 98 and interposed between the extreme end panels 100 and 102 and the rear of the front face 104 of the sheet 78.

In FIG. 10, a further embodiment of this invention is illustrated in which a hollow core flush door is again fabricated from a single piece of hardboard 106. As in the previous embodiments, the four corners of the door are rabbeted and bent and ultimately joined at 108 about a wood filler frame 110. This particular embodiment advantageously employs a honeycombed core 112 which may be of standard construction or any other type of equivalent core material.

Thus, the several aforenoted objects and advantages are most effectively attained. Although several preferred embodiments of the invention have been disclosed and described in detail herein, it should be understood that this invention is in no sense limited thereby and its scope is to be determined by that of the appended claims.

I claim:

1. A low-cost simplified door construction comprising a door: said door having front and rear faces, top and bottom edges, and side edges; a panel formed of fibrous sheet material extending across and defining one of said faces; and at least one of said edges being defined by an integral lateral extension of said sheet, said extension and panel having a juncture therebetween, the juncture being defined by a V-slot in the sheet, the base of the slot being defined by an integral hinged portion of the sheet, the diverging faces of the slot being brought together proximal one another by bending about the base of the V, an adhesive interposed between the proximal diverging faces, whereby the integral extension operates to supply structural rigidity to the panel, panel means forming an integral part of said sheet cooperating in defining the other of said faces and being integral with the lateral extension while defining therewith another of said junctures, and means for interconnecting the panels at the other of said side edges to thereby form a substantially hollow door.

2. The invention in accordance with claim 1 wherein the included angle defined by the integral extension and panel is less than 90°.

3. The invention in accordance with claim 1 wherein the included angle at one juncture is less than 90° and the included angle at the other of the junctures is more than 90°.

4. The invention in accordance with claim 1 wherein a rail of lumber is disposed in the tubular structure to strengthen the door along side edges and means for securing the rail to the parts, extension and panel.

5. The invention in accordance with claim 4 wherein substantially all opposed faces of the rail, parts, extension and panel are adhesively secured to one another.

6. The invention in accordance with claim 1 wherein both of said side edges includes one of said integral extensions and juncture.

7. The invention in accordance with claim 1 wherein means are provided intermediate said panel and panel means for rigidifying the door between the side edges.

8. The invention in accordance with claim 1 wherein a core material is interposed between the panel and panel means for rigidifying the door between the side edges.

9. A low-cost simplified door construction comprising a door; said door having front and rear faces, top and bottom edges and side edges; a panel formed of sheet material extending across and defining one of said faces; both of said side edges being defined by an integral lateral extension of said sheet, said each of the extensions and panel having a juncture therebetween, each juncture being defined by a V-slot in the sheet, the base of the slot being defined by an integral hinged portion of the sheet, the diverging faces of the slot being brought together proximal one another by bending about the base of the V, an adhesive interposed between the proximal diverging faces, whereby the integral extension operates to supply structural rigidity to the panel, the included angle at one juncture at one side edge being less than 90° and the included angle at the other of junctures at such side edge being more than 90°; at least one other panel means forming an integral part of said sheet cooperates in defining the other of said faces and is integral with each of the lateral extensions and defines therewith another pair of said junctures to thereby provide a substantially hollow door, means intermediate said panel and panel means for rigidifying the door between the side edges; and two panels cooperate in forming the other of said faces and are in abutting relation intermediate the side edges of said door, and cooperate at this location in defining rigidifying structure for the door at this location.

10. A low-cost simplified door construction comprising a door; said door having front and rear faces, top and bottom edges and side edges; a panel formed of sheet material extending across and defining one of said faces; both of said side edges being defined by an integral lateral extension of said sheet, said each of the extensions and panel having a juncture therebetween, each juncture being defined by a V-slot in the sheet, the base of the slot being defined by an integral hinged portion of the sheet, the diverging faces of the slot being brought together proximal one another by bending about the base of the V, an adhesive interposed between the proximal diverging faces, whereby the integral extension operates to supply structural rigidity to the panel; at least one other panel forming an integral part of said sheet cooperates in defining the other of said faces and is integral with each of the lateral extensions and defines therewith another pair of said junctures; each of said lateral extensions having a first integral part extending laterally therefrom and defines therewith another of said junctures; each of said lateral extensions having a second integral part extending laterally from said first part and defines therewith another of said junctures such that said parts cooperate in defining a tubular structure with the extension and panel at each of the side edges.

11. The invention in accordance with claim 10 wherein a rail is disposed in each of the tubular structures to strengthen the door at such locations, and means for securing the rail to the associated parts, extension and panel.

12. The invention in accordance with claim 11 wherein substantially all opposed faces of the rails, parts, extensions and panel are adhesively secured to one another.

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KENNETH DOWNEY, *Primary Examiner.*