

July 25, 1961

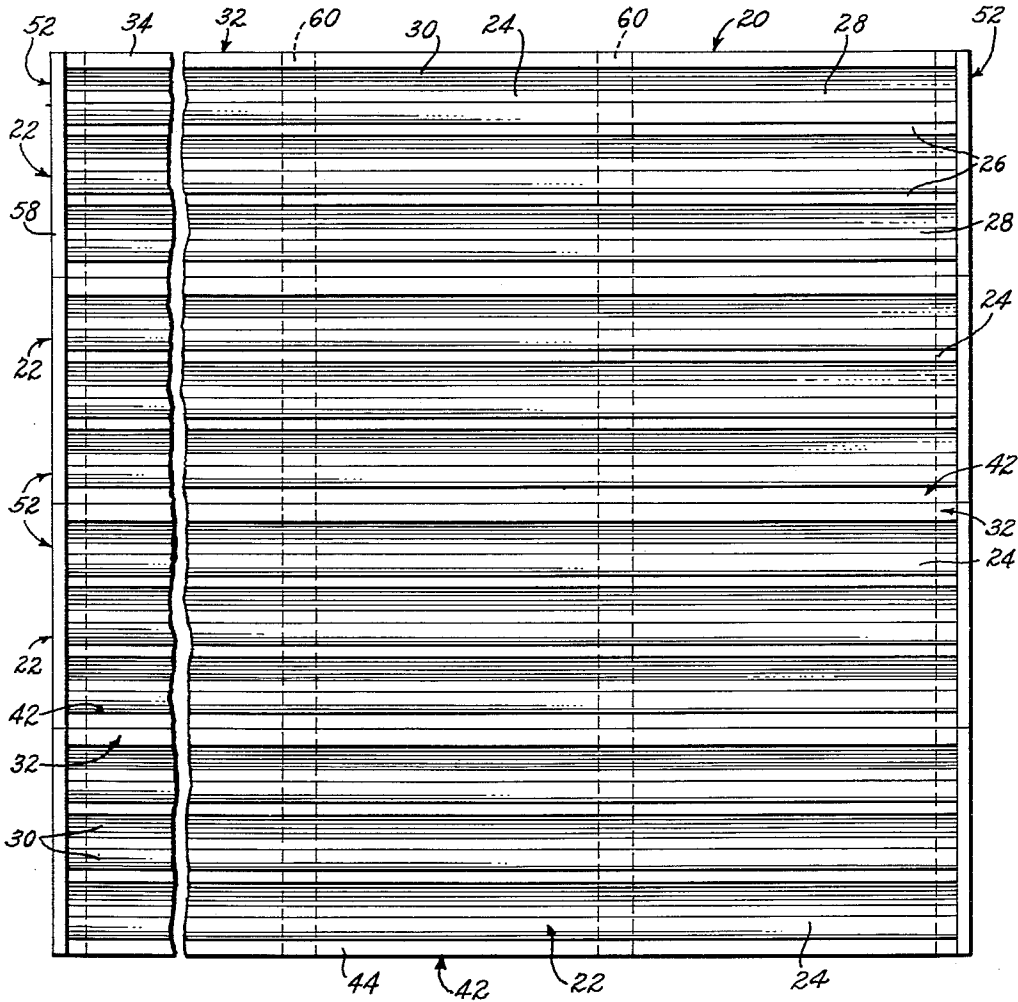
G. H. RICH
GARAGE DOORS

2,993,572

Filed Aug. 24, 1959

6 Sheets-Sheet 1

Fig. 1.



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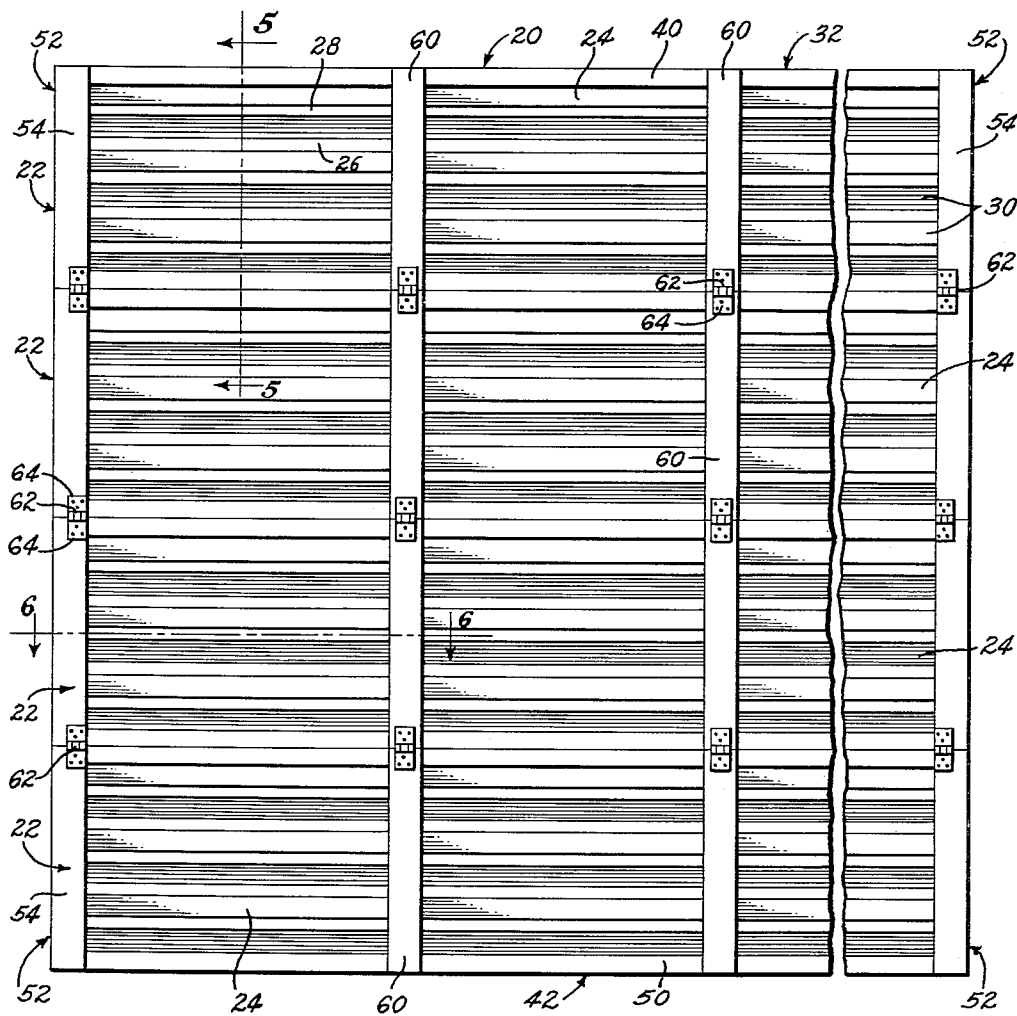
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Fig. 2.



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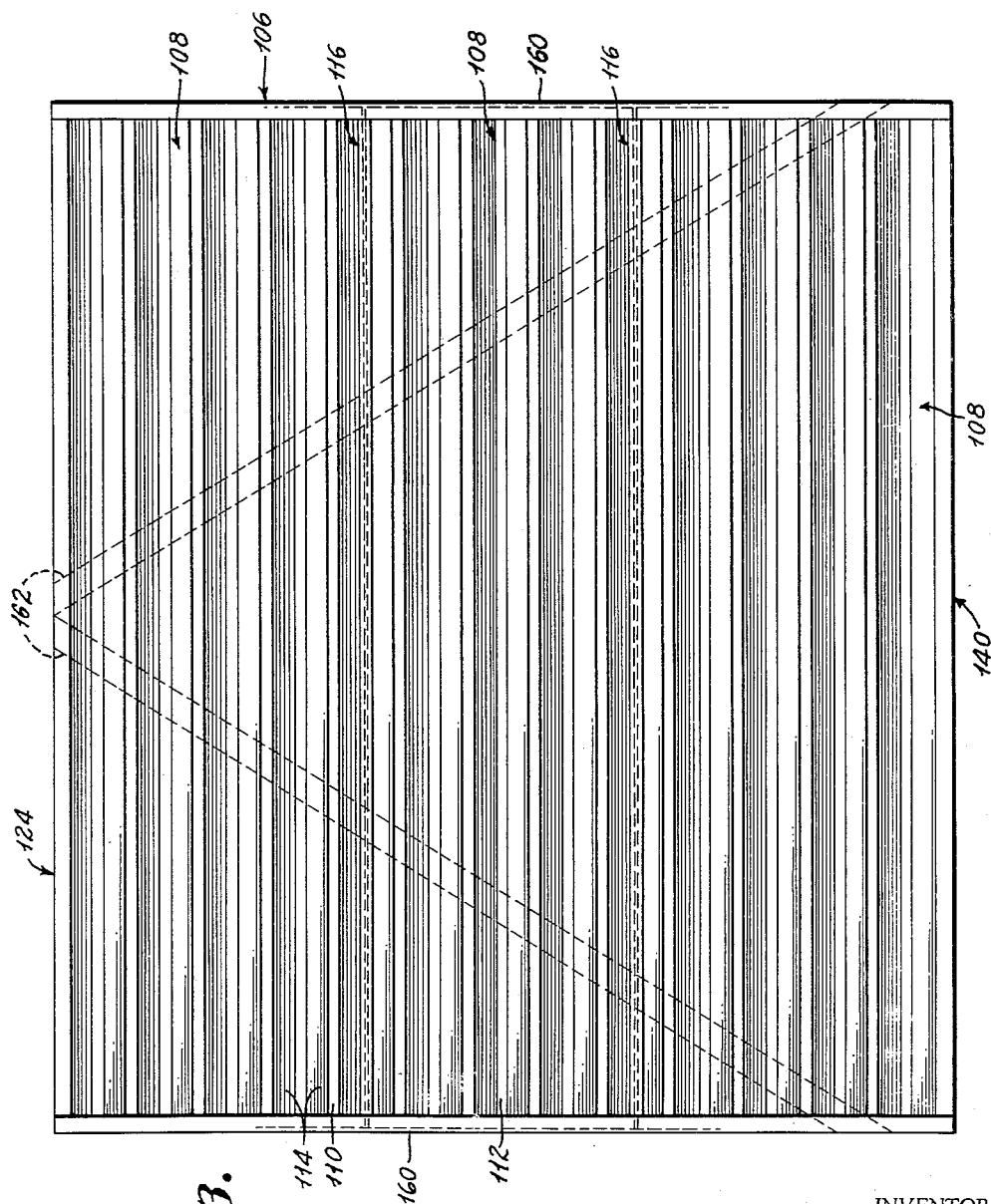


Fig. 3.

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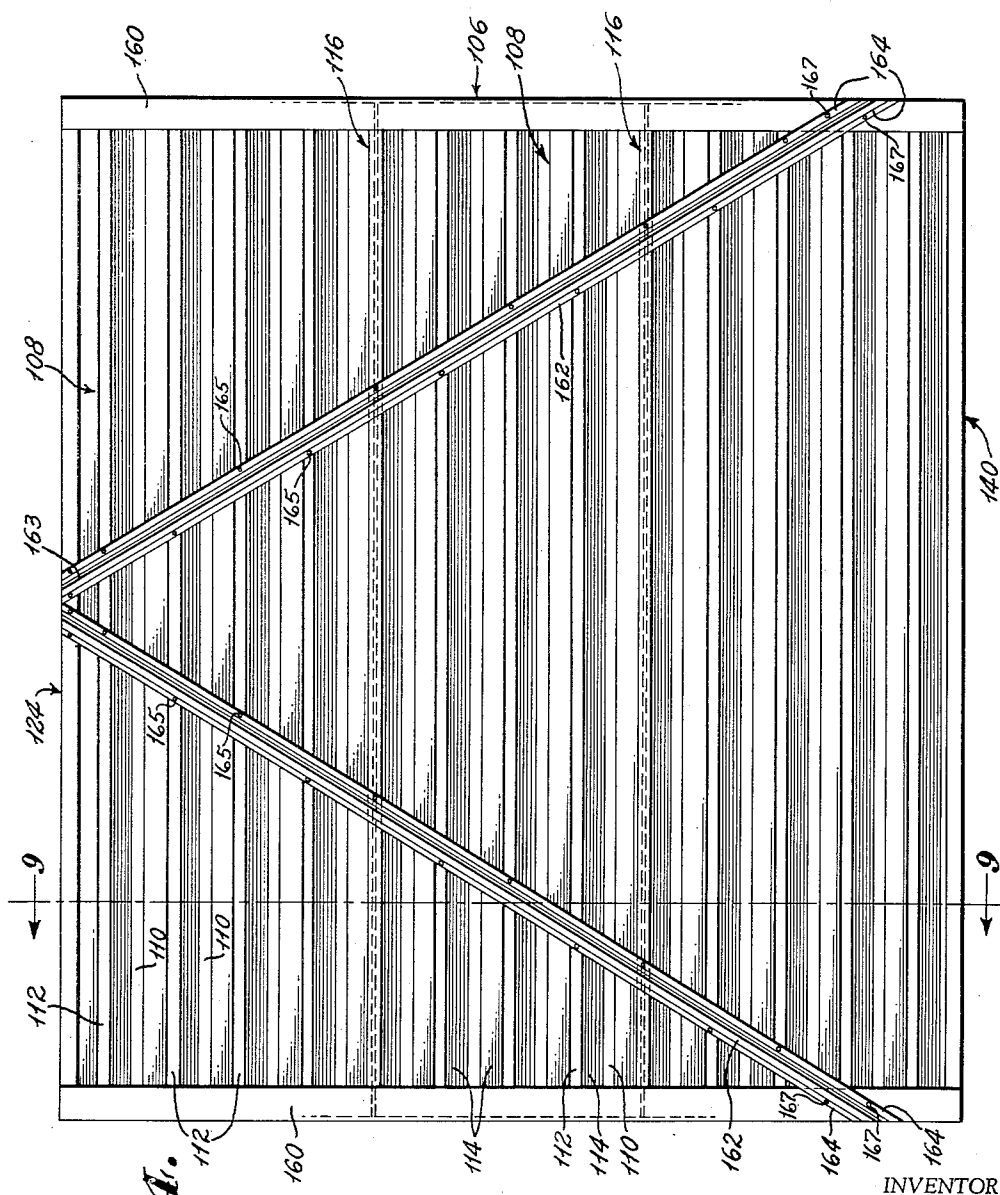
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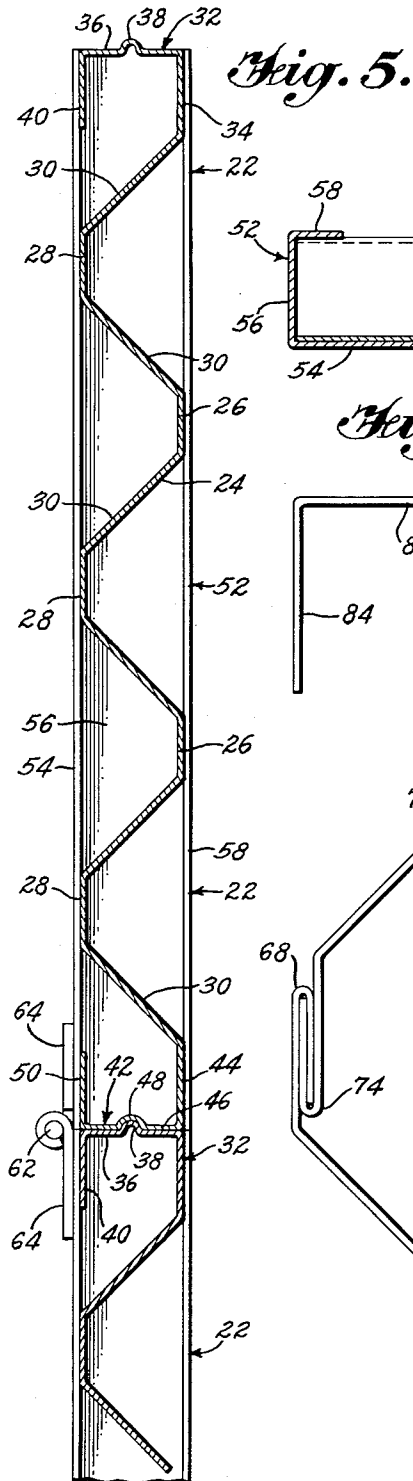


Fig. 6.

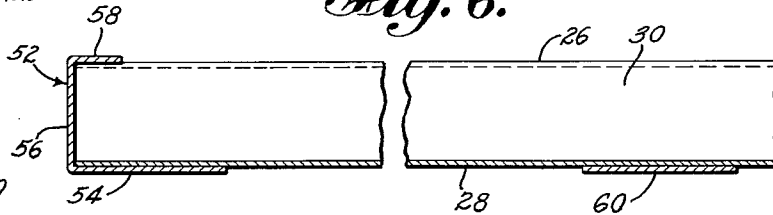


Fig. 7.

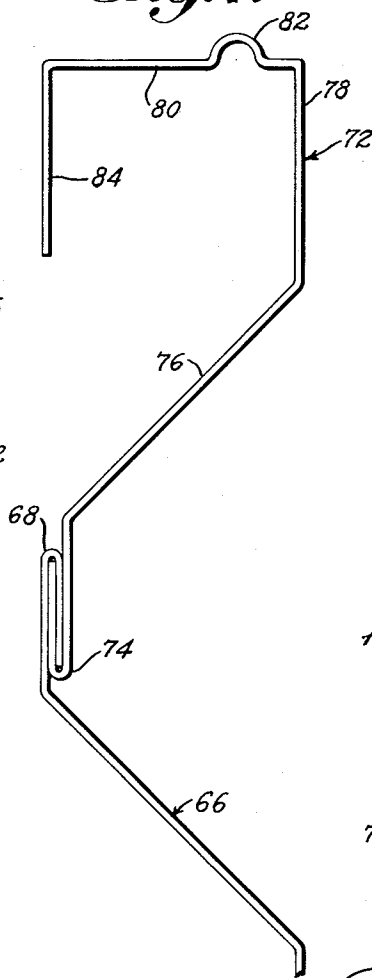
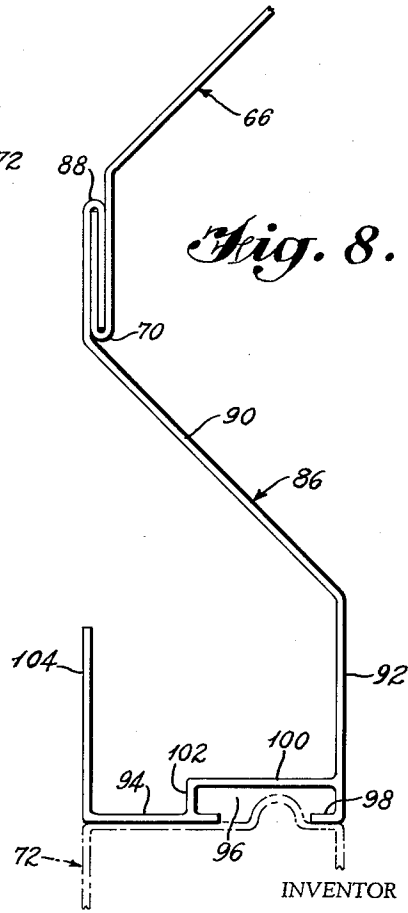


Fig. 8.



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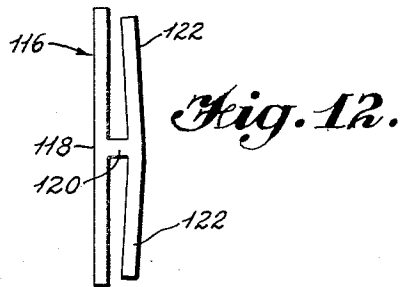
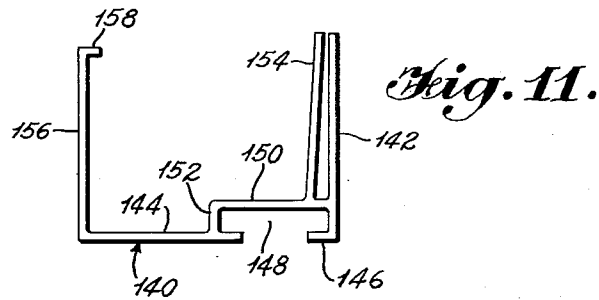
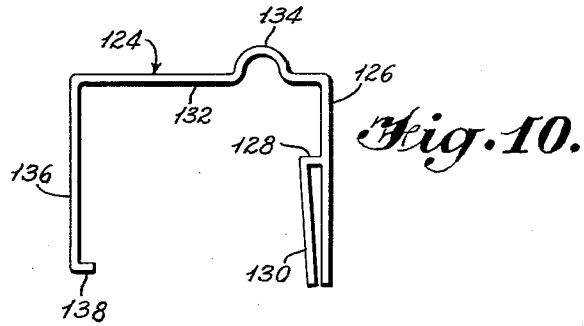
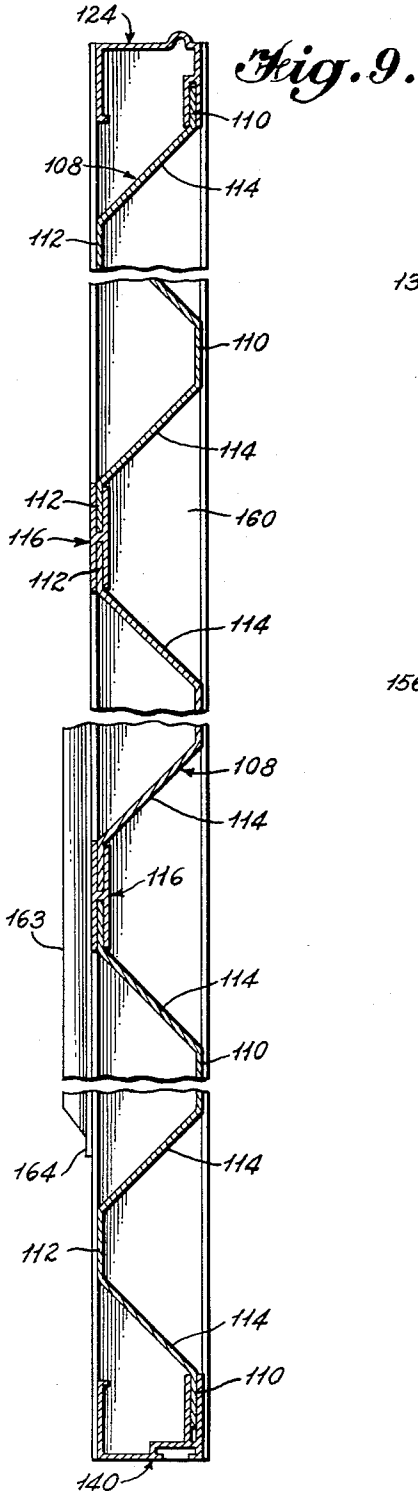
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6 Sheets-Sheet 6



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2,993,572 GARAGE DOORS

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Filed Aug. 24, 1959, Ser. No. 837,318
1 Claim. (Cl. 189—34)

This invention relates to doors and particularly to rigid and foldable doors suitable as garage doors. In the production of doors where a high strength, high load carrying capacity and high wind resistance are required, it has been the general practice to employ heavy, bulky structures frequently utilizing trusses. While this type of construction provides the desired strength, the cost of the doors is relatively high and the weight makes opening or folding of the door difficult. In addition to this, the top, bottom and side edge portions of these doors have included complicated structures requiring heavy fastening to the central panel sections. As a result of this heavy complicated construction, these doors generally had to be assembled prior to shipment to the consumer, since assembling could not readily be accomplished by him. Where heavy construction has been avoided, the panels have frequently been subject to twisting, warping and sagging at the center of the door.

It has now been found that these problems and disadvantages can be largely eliminated by the novel construction of the present invention. According to the invention a door is provided having one or more lightweight, strong panel portions extending across the full width of the door, and formed of spaced webs connected in a generally corrugated fashion. Reinforcing members extend transversely of the webs. Top, bottom and side edge channel sections are provided having light weight, strong design and means for easy, firm connection to the panel portions. The top and bottom of the panel portions have interlocking weather guard arrangements to make the door resistant to penetration by wind or rain. The individual panel portions are assembled from novel shaped members in a simple manner capable of being performed by the consumer. The doors are provided either in a rigid or articulated form as may be desired in the particular case. High strength is provided without heavy construction and the nature of the various parts is such as to permit economical manufacture. The door may be made either from metal or plastic, or from a combination of the two materials.

Accordingly, it is a primary object of the invention to provide a door having great strength combined with light weight.

A further object of the invention is to provide a door having light weight and sufficient strength to resist warping, twisting and center sagging.

A further object of the invention is to provide a door having one or more panel portions of corrugated design extending across the full width of the door.

A further object of the invention is to provide a door having one or more panel portions and top, bottom and side edge sections designed for an ease of assembly which permits the door to be shipped with the parts disassembled for assembly by the consumer.

A further object of the invention is to provide a door with one or more panel portions of corrugated shape including oblique webs of great width extending between adjacent front webs and back webs to provide a strong structure.

A further object of the invention is to provide a door having mating weather guards formed in the top and bottom channel sections to render the assembled door resistant to wind and rain.

These and further objects and advantages of the invention will become more apparent upon reference to the

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following specification and claim and appended drawings wherein:

FIGURE 1 is a front elevation view of a folding or articulated door constructed according to the invention;

FIGURE 2 is a rear elevation view of the folding door illustrated in FIGURE 1;

FIGURE 3 is a front elevation view of a rigid door constructed according to the invention;

FIGURE 4 is a rear elevation view of the rigid door illustrated in FIGURE 3;

FIGURE 5 is a fragmentary horizontal section taken along the line 5—5 in FIGURE 2;

FIGURE 6 is a fragmentary horizontal section taken along the line 6—6 of FIGURE 2;

FIGURE 7 is a fragmentary elevation view of an alternative embodiment of a door panel portion and top channel for use both in the folding door shown in FIGURE 1 and the rigid door shown in FIGURE 3.

FIGURE 8 is a fragmentary elevation view of a door panel portion and bottom channel forming a lower portion of the door section partially illustrated in FIGURE 7 and for use both in the folding door of FIGURE 1 and the rigid door of FIGURE 3;

FIGURE 9 is a vertical section taken along the line 9—9 in FIGURE 4;

FIGURE 10 is a detailed elevation view of the top channel shown in FIGURE 9;

FIGURE 11 is a detailed elevation view of the bottom channel shown in FIGURE 9; and

FIGURE 12 is a detailed elevation view of the double-clamp connector shown in FIGURE 9.

The folding door illustrated in FIGURES 1 and 2 is indicated generally by the numeral 20 and includes a plurality of horizontal door sections 22 connected together by hinges. While four door sections are shown in FIGURE 1, other numbers of sections may be used such as 2, 3, 5 or more.

Each door section 22 includes a panel portion 24 having a generally corrugated shape and including a plurality of spaced parallel front webs 26, a plurality of spaced parallel back webs 28 and a plurality of oblique webs 30 extending between and connecting adjacent edges of the front webs 26 and the back webs 28. The width of the oblique webs 30 is preferably greater than the width of the front webs 26 or the back webs 28. Front webs 26 are preferably of the same width as back webs 28. It is desirable to avoid wide front or back webs since it has been found that this provides a greater strength.

A top channel is integrally formed at the upper end of each door section 22 and is generally indicated by the numeral 32. The top channel includes a vertical front plate 34 formed integrally with oblique web 30, a horizontal top plate 36 having a semi-cylindrical ridge 38 extending integrally upwardly therefrom, and a depending vertical back plate 40. A bottom channel is formed at the lower portion of each door section 22 and is generally indicated by the numeral 42. The bottom channel includes a vertical front plate 44 formed integrally with oblique web 30, a horizontal bottom plate 46 with a semi-cylindrical groove 48 formed therein, and a vertical back plate 50.

In the embodiment shown in FIGURE 5, the panel portion 24, the top channel 32 and bottom channel 42 are integral and may be formed either of an appropriate metal such as aluminum, stainless steel or copper, or may be formed of a plastic material such as fiber reinforced plastic.

Vertical end channels are secured to each end of each door section 22 as shown best in FIGURE 6. The end channels are generally designated by the numeral 52 and include a back plate 54, an end plate 56, and a front plate 58. The vertical channel 52 is secured to the panel por-

tion 24 by welding, bolting or riveting in the case of metal doors, and by adhesive, bolting or heat bonding in the case of plastic doors.

In order to further strengthen each door section 22, a plurality of vertically-extending horizontally-spaced rectangular reinforcement plates 60 are secured to the rear of the door section 22 and extend from the top channel 32 to the bottom channel 42.

The door sections 22 are foldably interconnected by hinges 62 having hinge plates 64 secured to the back plates 54 of end channels 52 and to the reinforcement plates 60. As seen in FIGURE 5, the ridge 38 of each top channel 32 mates with the groove 48 of each bottom channel 42 to form a barrier against the penetration of wind and rain through the door.

While the door section shown in FIGURE 5 has the top and bottom channels formed integrally therewith, it is also possible to use separate channels as shown in FIGURES 7 and 8. Referring to these figures, the panel portion generally designated 66 is of the same corrugated shape as the panel portion 24 illustrated in FIGURE 5. The panel portion 66 has its upper end bent back upon itself to form a U-shaped hook portion 68 and has its lower end bent back upon itself to form a U-shaped hook portion 70. The top channel generally designated 72 includes a U-shaped lower hook portion 74, an oblique web 76, a vertical front plate 78, a horizontal top plate 80 with a semi-cylindrical ridge 82 formed therein, and a depending vertical back plate 84.

In FIGURE 8, a bottom channel 86 is shown which includes a U-shaped upper hook portion 88, an oblique web 90, a vertical front plate 92, and a bottom plate 94 with a rectangular groove 96 formed therein. The groove 96 is formed in a particular manner to permit rubber stripping to be inserted therein if desired. This groove consists of the bottom plate 94, a bottom flange 98 extending perpendicularly from vertical front plate 92, groove bottom plate 100 and groove side 102. Secured to the rear of the bottom plate 94 is the vertical back plate 104.

The U-shaped portions 68, 70, 74 and 88 are dimensioned to provide a tight friction fit when these portions are interlocked as shown in FIGURES 7 and 8, and this is all the securement which is necessary, in most instances, although bolts, rivets or welding may be used for additional fastening if desired. In this embodiment, end channels and reinforcing plates are employed in the same manner as described in connection with FIGURE 5.

In the embodiment illustrated in FIGURES 7 and 8, the panel portion 66, the top channel 72 and bottom channel 86 may all be formed of metals such as those previously described or of plastic. Also, the top and bottom channels may be formed of metal and the panel portions 66 formed of plastic. Colored plastics may be employed to provide a colorful, opaque center panel portion with a metal frame therearound. The folding door illustrated in FIGURES 1 and 2 may also be formed employing the top and bottom channels illustrated in FIGURES 10 and 11, hereinafter described.

Referring to FIGURES 3 and 4 there is shown a rigid door constructed according to the invention and generally designated by the numeral 106. This rigid door includes a plurality of panel portions 108 having a generally corrugated shape, similar to those previously described. As seen in FIGURE 9, the panels include vertical front webs 110, vertical back webs 112 and oblique webs 114 extending between adjacent edges of front webs 110 and rear webs 112. Adjacent panel portions 108 are interconnected by double-clamp connectors 116, illustrated in detail in FIGURE 12. Each of these connectors includes a planar vertical plate 118 having a central perpendicular flange 120 extending perpendicularly from the center thereof. Clamping plates 122 extend from the end of flange 120 inwardly toward the ends of the vertical plate

118, the distance between the clamping plates 122 and the vertical plate 118 diminishing as the ends of the plates are approached. The double-clamp connectors 116 are formed of resilient metal and are dimensioned so that when the vertical back webs 110 of the panel portions 108 are slipped between the clamping plates 122 and the vertical plate 118, an easy, secure, tight, friction-fit is provided.

Attached to the top of the panel portion 108 is a top channel generally designated 124 which is best illustrated in FIGURE 10. This channel includes a front plate 126 with a flange 128 extending perpendicularly therefrom. A clamping plate 130 extends from the end of flange 128 inwardly towards the end of front plate 126 so that the distance between the clamping plate 130 and the front plate 126 diminishes as the end of the plates is approached. Secured to the top edge of front plate 126 is a top plate 132 having a semi-cylindrical ridge 134 formed therein, and a back plate 136 extending downwardly from the rear edge thereof. A flange 138 extends inwardly from the lower edge of back plate 136. The top channel 124 is formed of resilient metal such as an aluminum extrusion, so that when the front vertical web 110 at the upper end of the uppermost panel portion 108 is slipped between the clamping plate 130 and the front plate 126, an easy, secure, tight friction-fit is provided.

Forming the bottom of the rigid door is a bottom channel 140, shown in detail in FIGURE 11. This channel includes a vertical front plate 142, a bottom plate 144, and a flange 146 extending perpendicularly from the bottom edge of front plate 142. A rectangular-shaped groove 148 is formed by the bottom plate 144, the bottom flange 146, a groove bottom plate 150 extending perpendicularly from front plate 142, and a groove side 152. These members form a groove suitable for receiving and holding weather stripping such as rubber strip when desired. A clamping plate 154 extends from groove bottom 150 inwardly toward the upper edge of front plate 142, the distance between the clamping plate and the front plate diminishing as the end of the plates is approached. Extending upwardly from the rear edge of bottom plate 144 is a back plate 156 with a horizontal flange 158 formed at the uppermost edge thereof. The bottom channel 140 is also formed of a resilient material such as extruded aluminum, so that when the lowermost vertical web 110, as seen in FIGURE 9, is slipped between the clamping plate 154 and the front plate 142, an easy, tight friction-fit is obtained.

Along the vertical side edges of the door 106, vertical end channels 160 are provided to strengthen the door and form a smooth frame end. These vertical end channels have U-shapes similar to the end channels designated 52 in FIGURE 6 and may be secured to the panel portions by a suitable means such as welding, bolting or riveting.

In order to further strengthen the rigid door 106, diagonal braces 162 extend diagonally across the rear of the door in a V-shape. These braces 162 have a center portion 163 of V-shaped cross section with flanges 164 extending outwardly from the ends thereof. While the braces 162 are shown in a V-shape, they may also cross one another in the middle of the door to form the shape of an X.

The flanges 164 are fastened to each of the back webs of the door shown in FIGURE 4 by a plurality of rivets 165. These rivets are staggered along opposite edges of the braces 162 but may be spaced on both sides of the braces at each back web if desired. Rivets 167 similarly secure the braces 162 to the top channel 124 and to the respective end channels 160.

It will be seen that the rigid door shown in FIGURES 3, 4 and 9 through 12 may be made of an extremely light weight in that it is possible to eliminate the central channel members used in the embodiment of the door shown in FIGURES 1 and 2. The double clamp connectors replace these channels and provide an extremely effective

and light attachment which facilitates rapid assembly by unskilled labor or by the consumer himself.

The top and bottom channels and panel portions disclosed in FIGURES 7 and 8 may also be employed in the construction of the rigid door illustrated in FIGURES 3 and 4. As in the case of the folding door, the entire door may be constructed of metal or of plastic, or the panel portions 108 may be formed of plastic, with the surrounding frame portions being constructed of metal.

As a further variation, the rigid door illustrated in FIGURES 3 and 4 may be formed of a single, integral door section having the shape of the section 22 illustrated in FIGURE 5, the door sections being together connected by vertical end channels 160 and braces 162.

Where the door is constructed entirely of metal and the panel portions are separate from the top and bottom channels, it has been found that the embodiment shown in FIGURES 7 and 8 is preferable wherein interlocking is effected by the U-shaped members 68, 70, 74 and 88. On the other hand, where the panel portions of the doors are constructed of plastic and the surrounding frame of metal, the constructions shown in FIGURES 9 to 12 have been found preferable, wherein the ends of the plastic panel sections are grasped by the resilient clamping members.

While the illustrated embodiments have shown the connection of the panel portions to the top and bottom channels by U-shaped interlocking hook portions and by clamping jaw devices, this connection may also be effected by overlapping portions of the panel portion and top and bottom channels and securing the overlapping portions with rivets.

It is thus seen that the invention provides a lightweight door having a panel portion of great strength and resistance to distortion in corrugated form with spaced front and back webs and wide oblique webs extending diagonally therebetween, to form a three-dimensionally buttressed structure. The panel portions extend in unbroken sweeping lines continuously from one end of the door to the other, achieving an effect of strength and beauty. The invention also provides a lightweight strong door composed of separate parts which may be packed and shipped with the parts disassembled and wherein the design permits relatively simple subsequent assembly of the door.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiments are therefore to

be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claim rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claim are therefore intended to be embraced therein.

This application is a continuation-in-part of co-pending application Serial No. 649,211 filed March 25, 1957, now abandoned.

What is claimed and desired to be secured by United States Letters Patent is:

A door comprising a plurality of interconnected panel portions of corrugated shape, each panel portion including a plurality of spaced vertical parallel exposed front and back webs, and a plurality of exposed oblique webs extending from said front webs diagonally through said panel portion to the adjacent back webs, the widths of said oblique webs being at least as great as the width of said front webs and at least as great as the width of said back webs, the width of said front webs being approximately equal to the width of said back webs, a top channel extending along the upper edge of each said panel portion and having a pair of downwardly extending clamping plates resiliently grasping the upper edge of a vertical web of said panel portion therebetween, a bottom channel extending along the lower edge of each said panel portion and having a pair of upwardly extending clamping plates resiliently grasping the lower edge of a vertical web of said panel portion therebetween, and an inwardly turned vertical end channel for each end of said panel portions, the spaced flanges of said end channels being secured to said front and back webs, and reinforcing braces having a V-shaped cross section and flat outwardly extending edge flanges extending across the rear surface of each panel portion, said reinforcing braces extending across substantially the entire width of said panel from said top channel to said bottom channel with said flat outwardly extending edge flanges in contact with and secured to said back webs.

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