Aug. 15, 1961 H. A. ETLING 2,996,161

METAL DOOR FRAME CONSTRUCTION

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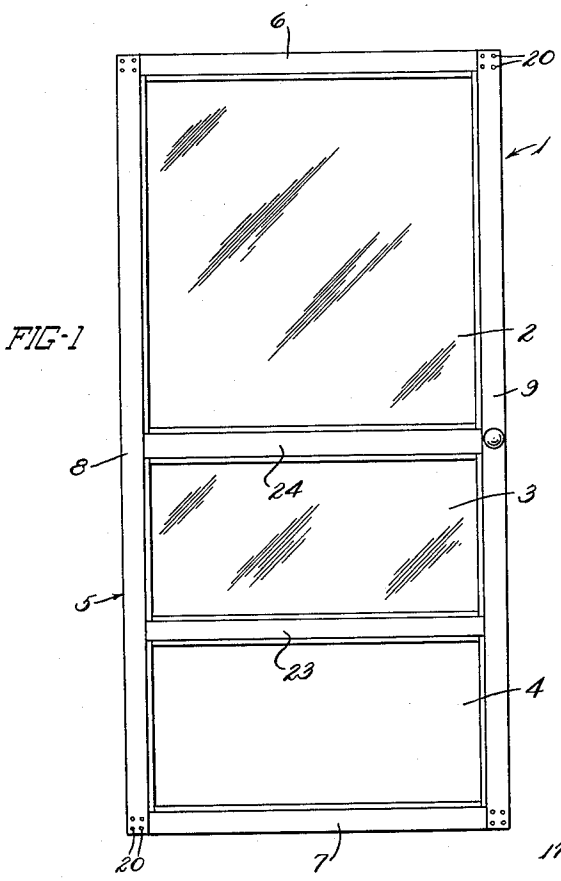


FIG-1

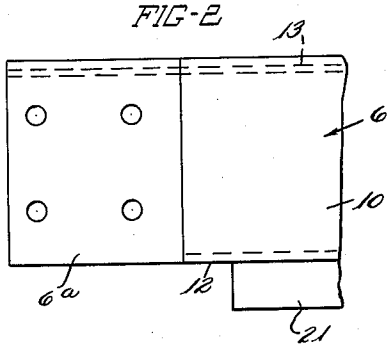


FIG-2

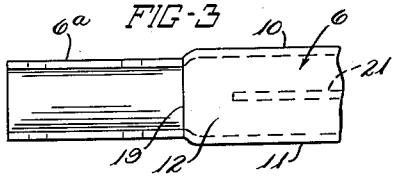


FIG-3

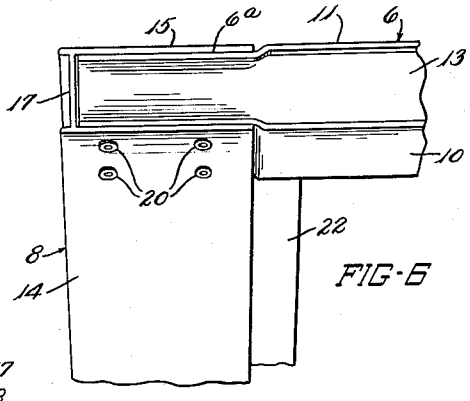


FIG-6

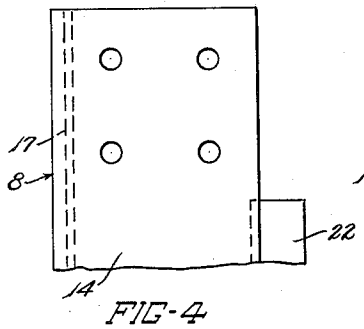


FIG-4

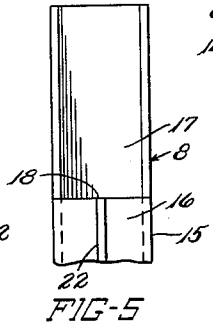


FIG-5

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METAL DOOR FRAME CONSTRUCTION

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FIG-7

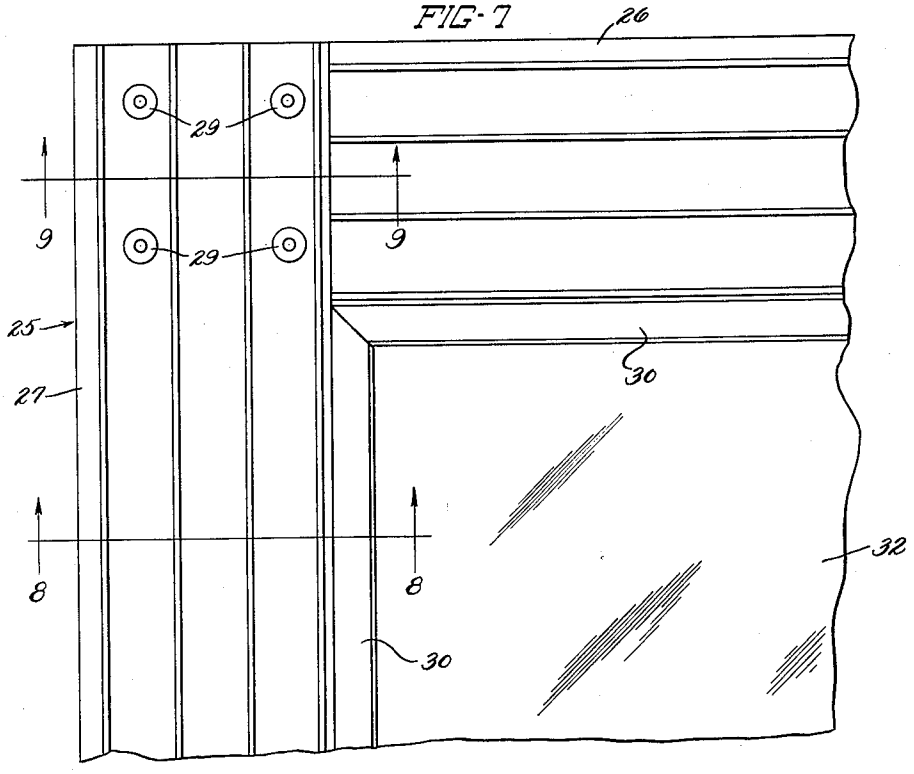
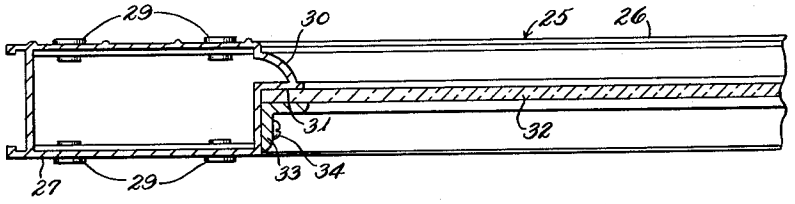


FIG-8



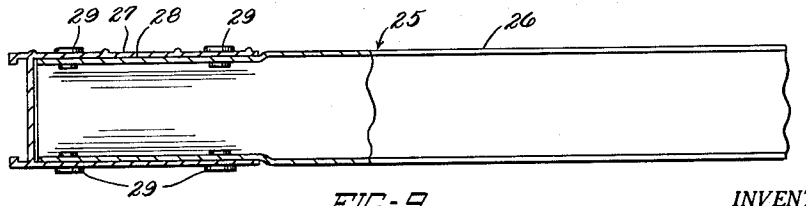


FIG-9

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METAL DOOR FRAME CONSTRUCTION

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5 Claims. (Cl. 189—46)

This invention relates to metal door frames, and especially to corner constructions for metal doors wherein the door frames are made from hollow metal side, top and bottom stiles of the same thickness, and usually of the same cross sectional contour.

At the present time, many different types of metal doors are produced in large quantities and such doors frequently are used as auxiliary or storm doors on building units. In all events, it is necessary that these doors have sturdy, substantial frames and that the doors hold their shapes over extended periods of rough use. Naturally the costs of the doors, or door frames are important in determining the practicality of the doors for many purposes and so the production of a sturdy, low cost door is very desirable. In general, these doors are made from extruded metal shapes, usually hollow, rectangular shape in section. Frequently components of the frames for the doors have been secured together by welding suitable re-enforcing or connector angles at the corners of the frame, or by gussets. Welding is a costly process and frequently leads to metal failures or breakage. Angles and gussets may work loose in use.

The present invention has as a general object the provision of an improved strength efficiently constructed door characterized by the provision of overlapped stile sections at the corners of the door.

A further object of the invention is to provide a corner in a metal door wherein the door is made from hollow metal stiles and where one stile section is of reduced thickness and is received within an opening provided in an inner wall of the other stile so that overlapped stile sections can be provided and be secured together at the corners of the door.

Another object of the invention is to cut away or otherwise remove a portion of the inner side wall on door stiles so that a reduced thickness end of another stile originally of equal thickness to the first stile can be telescoped into engagement with the first stile through the opening provided therein to be abutted against the remaining side wall of such first stile.

The foregoing and other objects and advantages of the invention will be made more apparent as the specification proceeds.

Reference now should be had to the accompanying drawings, wherein:

FIG. 1 is an elevation of a metal door embodying the principles of the invention;

FIG. 2 is an enlarged plan of a section of a stile of the door of FIG. 1;

FIG. 3 is a front elevation of the top stile shown in FIG. 2;

FIG. 4 is a fragmentary enlarged plan of the end portion of a side stile of the door of FIG. 1;

FIG. 5 is a front elevation of the stile section shown in FIG. 4;

FIG. 6 is an enlarged perspective view of a corner of the door of FIG. 1;

FIG. 7 is an enlarged elevation of the corner of a door embodying a modification of the door of the invention;

FIG. 8 is a fragmentary vertical section taken on line 8—8 of FIG. 7; and

FIG. 9 is a fragmentary vertical section taken on line 9—9 of the door of FIG. 7.

When referring to corresponding parts shown in the drawings and referred to in the specification, corresponding numerals are used to facilitate comparison therebetween.

When referring to doors in this specification, house doors, as well as commercial doors, garage doors, and the like, are all meant to be included within the scope of such term.

Broadly speaking, the present invention relates to a door comprising hollow metal side stiles, a metal top stile, and a hollow metal bottom stile, where all of the stiles have top and bottom walls and inner and outer side walls and usually are of rectangular shape and the same size in section. The side stiles are overlapped with the top and bottom stiles at the corners of the door, and one of the stiles at each corner of the door has an inner side wall thereon removed and the other of the stiles at such corner is of reduced thickness at the end thereof and is received within the other stile through the opening provided by the removed side wall therein, and rivet or equivalent means extend through and secure the overlapped ends of the stiles together at the corners of the door so that a sturdy, efficient but inexpensive door frame is provided.

Reference now is particularly directed to the details of the embodiment of the invention shown in the accompanying drawings, and a door 1 is indicated therein. The door 1 includes conventional panels, such as glass panels 2 and 3 and a kick panel 4 therein, which panels are secured in place in a conventional manner. The door 1 includes a frame indicated as a whole by the numeral 5 and made from a top stile 6, a bottom stile 7, and side stiles 8 and 9. All of these stiles 6 through 9 are made from metal and are of the same hollow, rectangular shape and size in section. The surfaces shown on the face of the door in FIG. 1 are considered to be the top walls thereof for describing the door parts so that a top wall 10 and a bottom wall 11 are provided on the top stile 6 which also has an inner side wall 12 and an outer side wall 13 provided thereon. Likewise, the side stile 8 has a top wall 14, a bottom wall 15, an inner side wall 16 and an outer side wall 17.

As an important feature of the invention, the end of the top stile 6 is formed of reduced thickness, as best indicated in FIG. 3 and as indicated at 6a. The end 6a is of such thickness as to be received snugly within the side stile 8 intermediate the top and bottom walls 14 and 15 thereof. So as to receive the top stile end 6a therein, an opening 18 is formed in the inner side wall 16 of the side stile 8 adjacent the end thereof. Such opening or aperture 18 is provided by removing a portion of the inner side wall from the stile usually by some cutting or punching operation. Preferably both the top and bottom walls 10 and 11 of the top stile 6 are forced inwardly of the stile equal distances so that the center axis of the top stile 6 will still align with the center axis of the side stile 8, or other member to which the top stile is to be engaged or secured. These center axes of the stiles define a center plane in the door.

FIG. 3 of the drawings also shows that an opening or cutout section 19 is also provided on the top stile 6 at the end thereof and such removal of a portion of a side wall of the stile weakens the stile so that it is easier to reduce the thickness of such top stile 6 at the end portion thereof. Furthermore, by removing a portion of the inner side wall of the top stile, this wall is thus prevented from bulging out from the vertical margins or plane determined by the edges of the top and bottom walls 10 and 11 of the stile so that there will be nothing protruding from the stile to prevent its insertion into the opening 18 provided in the side stile. Usually the opening 18

is of exactly the width of the top stile 6 at the end portion thereof. It should be noted that the top stile 6 is inserted into the side stile 8 until the end of the top stile abuts against the inner surface of the outer side wall 17 of the side stile. This aids in accurately and automatically setting the top stile and side stile at exactly a right angular relationship to each other and also reenforces the joint produced therebetween.

Conventional means, such as so-called blind rivets 20 or equivalent members, are used to extend through holes formed in the adjacent top walls 10 and 14 of the stiles at the corner of the door, as well as through the adjacent bottom walls 11 and 15, respectively, of the top stile 6 and side stile 8. If desired, in some instances, the rivet means could extend completely through the overlapped stile ends to secure them together.

A flange 21 usually is formed integrally with the top stile 6 and may terminate spaced from the reduced thickness end section 6a, while a similar flange 22 is provided on the side stile 8 and it extends to the opening 19 provided therein so that these flanges will not interfere with each other when the stiles are brought into engagement to form a corner on the door. The flanges 21 and 22 are used to aid in determining the position of the panels 2 through 4 of the door and other means (not shown) of any conventional construction can be used to secure these panels in position on the door and against the flanges 21 and 22.

Cross stiles 23 and 24 are also provided in the door 1 intermediate the top and bottom stiles 6 and 7. These cross stiles 23 and 24 may have reduced thickness end sections, if desired, and be received in openings provided in the inner side walls of the side stiles 8 and 9. If desired, conventional means can be used for securing the cross stiles 23 and 24 to the remainder of the door construction. The cross stiles then would be of conventional construction.

A modified type of a door corner construction, indicated as a whole at 25, is shown in FIG. 7 and this comprises another embodiment of the door frame means of the invention. The corner is formed by means of stiles 26 and 27 positioned at right angles to each other. The stile 26 is of the same thickness and shape as the stile 27 but with an end section 28 on the stile 26 being of reduced thickness and being received within an opening formed in the inner side wall of the stile 27. Rivets 29 are shown extending through the adjacent top and bottom surfaces of the stiles 26 and 27 to secure them in engagement. In this instance, each of the stiles 26 and 27 has a contoured flange 30 provided thereon that provides a shoulder 31 used for positioning an insert panel 32 in the corner 25 of a door. A conventional member, such as an angle 33, is secured to the stile 27 by cap screws 34 to fix the panel 32 in position. It will be seen in Fig. 7 that the adjacent ends of these flanges 30 can be beveled at complementary angles to insure the provision of a neat, tight fit between the stiles at the corner of the door.

It also is possible to secure the overlapped stile ends together by a cementing or bonding action. Thus commercial products, such as "Tygo-Weld," "36–B," and the Activator 41 therefore, made by U.S. Stoneware Company of Akron, Ohio, is a typical commercial cement used to bond metal-to-metal by the present invention. This adhesive is an alloyed epoxy base structural adhesive and equivalent materials may be used in lieu thereof. The top and bottom walls 10 and 11 of the top stile 6 would be immediately adjacent the inner surfaces of the top wall 14 of the bottom wall 15 of the side stile 8 and can be bonded thereto by a liquid sealing medium that solidifies in place for a bonding action. A safety rivet could be used at each corner to insure permanent and positive engaging action therebetween.

The rivets 29 may be blind rivets, or they may extend completely through the assembled frame unit.

From the foregoing, it will be seen that an improved style of corner construction and frames for doors is provided by the invention. The invention is particularly adapted for use with hollow metal door stiles made by extruding them to a desired contour and where the door members are of the same thickness and usually are of the same shape and size in section. The door construction can be readily formed and the components are easily assembled in proper relationship with each other and can be secured together by conventional means to form sturdy, but inexpensive and attractive door constructions that will hold their shape over a long period of use. Thus it is believed that the objects of the invention have been achieved.

While two complete embodiments of the invention have been disclosed herein, it will be appreciated that modification of these particular embodiments of the invention may be resorted to without departing from the scope of the invention as defined in the appended claims.

What is claimed is:

1. A door comprising hollow metal side stiles, a hollow metal top stile, a hollow metal bottom stile, all of said stiles having top and bottom walls and inner and outer side walls and being of generally rectangular shape and the same size in section, said side stiles being overlapped with the top and bottom stiles at the corners of the door, one of said stiles at each corner of the door having the inner side wall thereon removed and the other of said stiles at said corner being of reduced thickness only at the end thereof and being received within the other stile through the opening provided by the removed side wall therein, means securing the overlapped ends of said stiles together at the corners of the door, and means secured to laterally inner portions of said stiles to form a center portion for the door.

2. A door comprising hollow metal side stiles, a hollow metal top stile, a hollow metal bottom stile, all of said stiles having top and bottom walls and inner and outer side walls and being of generally hollow rectangular shape and the same size in section, said side stiles being overlapped with the top and bottom stiles at the corners of the door, one of said stiles at each corner of the door having the inner side wall thereon removed and the other of said stiles at each said corner being of reduced thickness only at the end thereof to be received within the one stile through the opening provided by the removed side wall therein, the said stile with a reduced thickness end being abutted against the inner surface of the outer side wall of the other of said stiles at the corner, and means securing the overlapped portions of the top walls and the bottom walls of said stiles together at the corners of the door, said stiles combining to form an interlocked door frame the components of which are of the same thickness.

3. A door comprising hollow metal side stiles, a hollow metal top stile, a hollow metal bottom stile, all of said stiles having top and bottom walls and inner and outer side walls and being of generally rectangular shape and the same size in section, said side stiles being overlapped with the top and bottom stiles at the corners of the door, both of said stiles at each corner of the door having the complete inner side walls thereon removed and one of said stiles at each said corner being of reduced thickness only at the end thereof and being of a thickness substantially equal to the distance between the inner surfaces of the top and bottom walls of the other said stile to be received within the other stile through the opening provided by the removed side wall therein, the said stile with a reduced thickness end being abutted against the inner surface of the outer side wall of the other of said stiles at the corner and having top and bottom walls lying immediately adjacent corresponding top and bottom walls of the other of said stiles, and means securing the stiles together at the corners of the door.

4. A door comprising hollow metal side stiles, a hollow metal top stile, a hollow metal bottom stile, all of said stiles having top and bottom walls and inner and outer side walls and being of generally rectangular shape and the same size in section, said side stiles being overlapped with the top and bottom stiles at the corners of the door, at least one of said stiles at each corner of the door having the complete inner side wall thereon removed and the other of said stiles at each said corner being of reduced thickness and of a size to be received within and slid directly into the other stile through the opening provided by the removed side wall therein, the said stile with a reduced thickness end being abutted against the inner surface of the outer side wall of the other of said stiles at the corner and having top and bottom walls lying immediately adjacent corresponding top and bottom walls of the other of said stiles, and rivet and bonding means securing the overlapped ends and adjacent surfaces of the top and bottom walls of the stiles together at the corners of the door.

5. In a metal door, a corner formed from a pair of hollow metal stiles of equal thickness and of generally rectangular shape in section, one of said stiles overlapping the other of said stiles, the end of one stile being of reduced thickness only at the end thereof for snug engagement with the inner surfaces of opposed walls and the outer side wall of the other of said stiles, the other of said stiles having an opening formed by removal of an entire section of the inner side wall thereof of the width of a stile for receiving the reduced thickness stile end therein to form a corner from uniformly thick metal stiles, and means securing portions of the overlapped stiles together, the outer side walls of said stiles being continuous to complete the corner construction.

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