Aug. 19, 1958 C. A. FRICK 2,847,726

SLIDING DOOR CONSTRUCTION

Filed Jan. 10, 1956 3 Sheets-Sheet 1

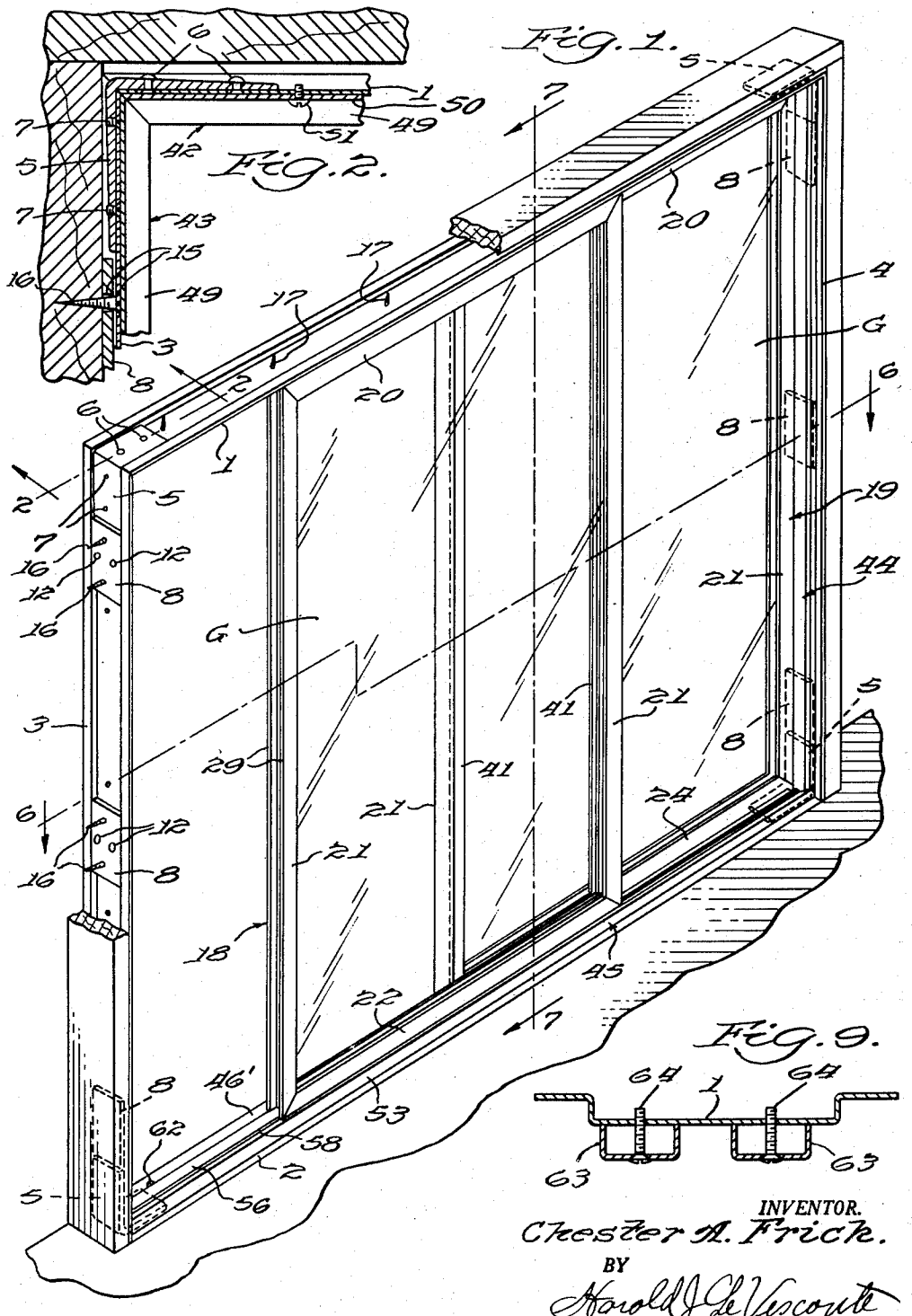


Fig. 1.

Fig. 2.

Fig. 9.

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SLIDING DOOR CONSTRUCTION

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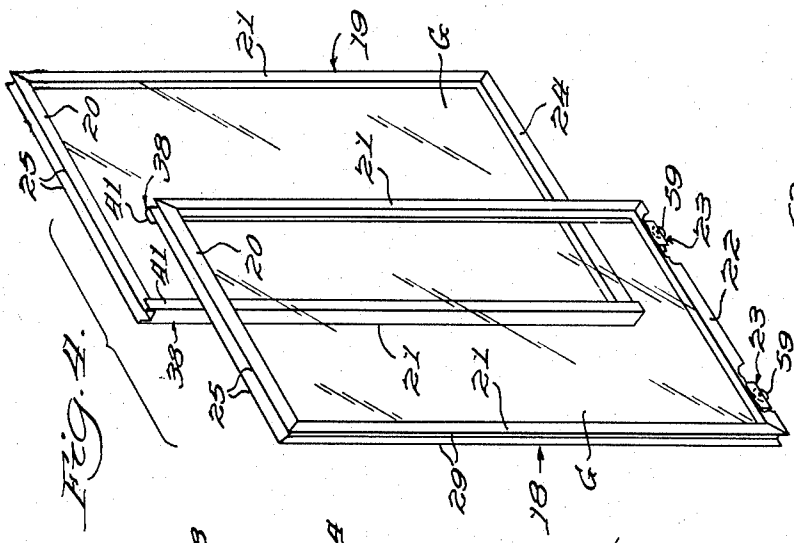


Fig. 4.

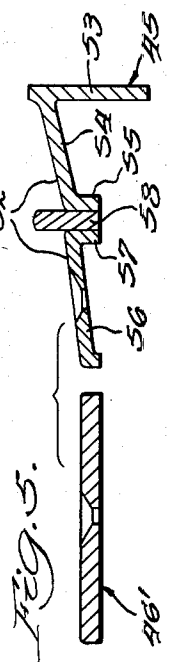


Fig. 5.

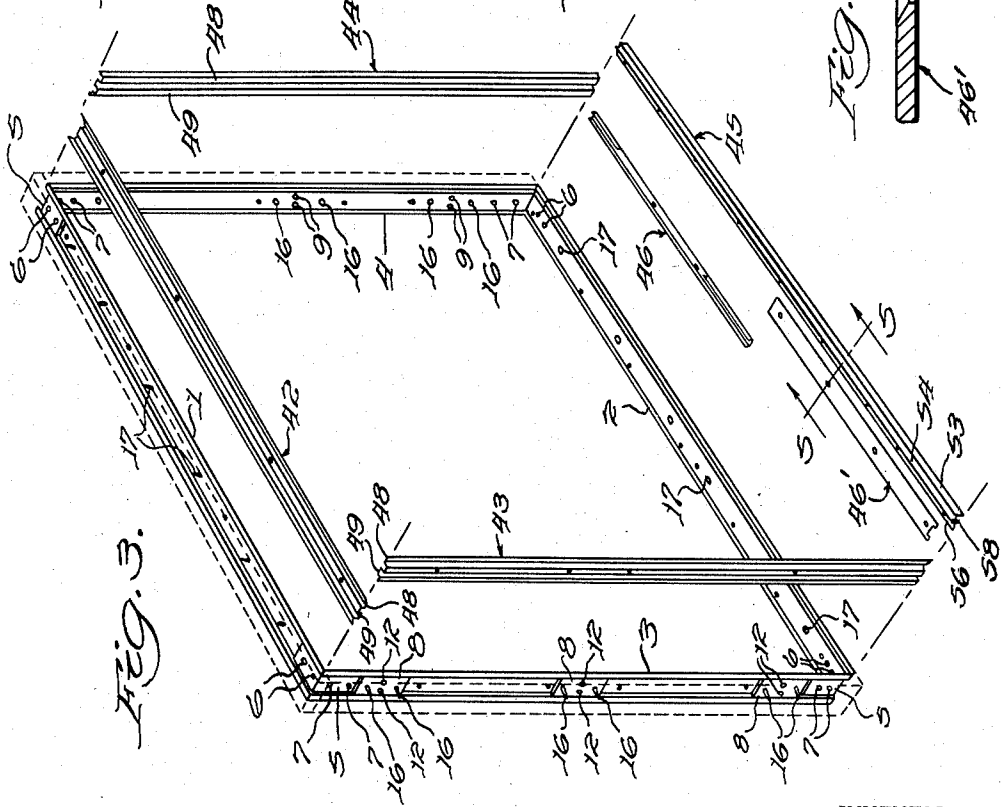


Fig. 3.

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SLIDING DOOR CONSTRUCTION

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Fig. 6.

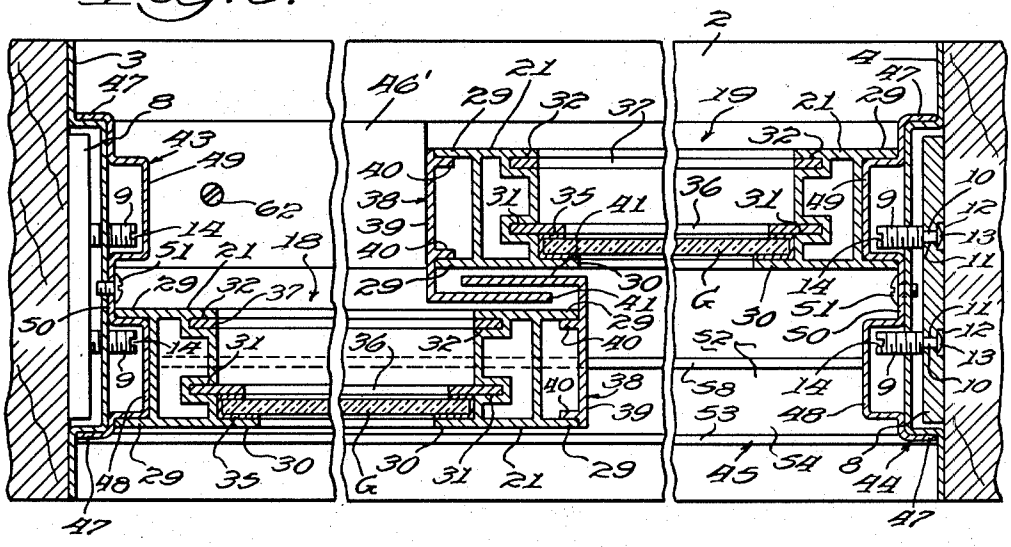


Fig. 7.

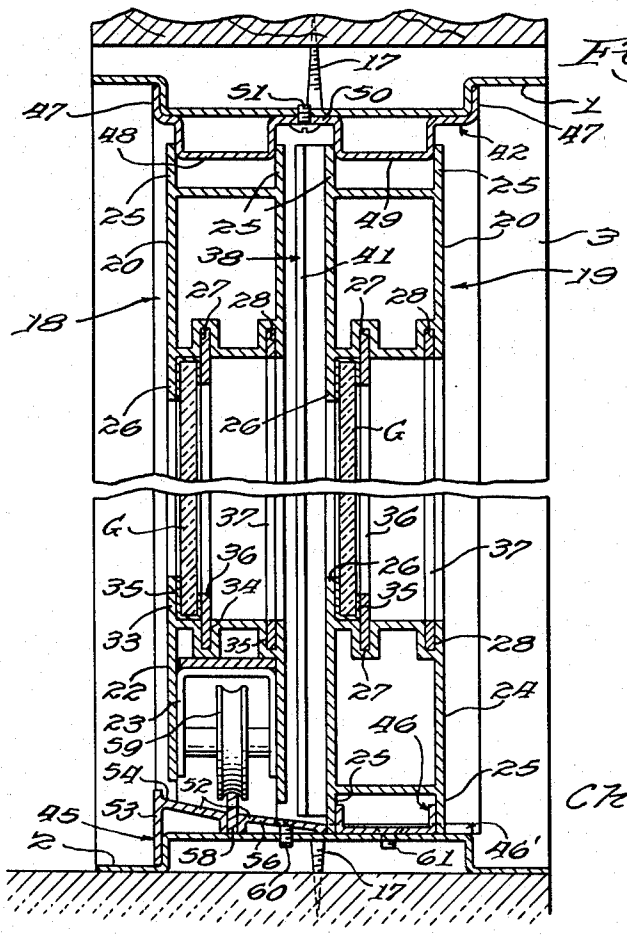
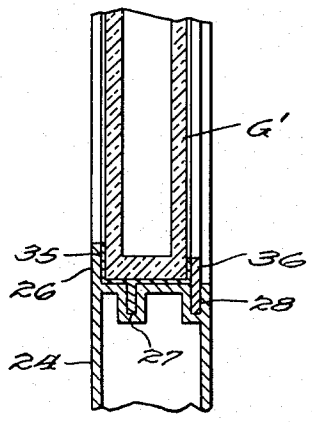


Fig. 8.



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SLIDING DOOR CONSTRUCTION

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Application January 10, 1956, Serial No. 558,215

3 Claims. (Cl. 20—19)

This invention relates to door construction and more particularly to an improved form of sliding door and frame therefor of the type used in dwellings. The door construction involves a primary metal frame and a secondary frame including door supporting and guiding means together with a novel construction of door components including a metal frame in which the glass is supported.

Door constructions including sliding glass door components currently in use are such as must be installed completely while the house or apartment is being framed and before the interior is closed in and plastered. The exposed surfaces of the metal usually have a brushed or other satin type finish and generally are formed of aluminum. Incident to the workmen bringing material into the structure during construction activities subsequent to installation of the door these surfaces are often marred or scratched and such surface injuries are difficult to restore. Further, the frame of such doors is apt to be shifted out of the essential square configuration by the studdings to which the door is attached due to warpage and the like of the house frame during building with the result that the actual fitting of the doors requires excessive field work to achieve the desired fit with the attendant free running characteristics that are essential.

Having these considerations in mind, it is an object of the present invention to provide a sliding door construction comprising a primary frame including means for achieving the required squareness when it is installed in the building as an incident to framing the building and having a concealed surface which does not require to be guarded against scratching, a secondary frame mountable on the primary frame and serving to support and guide the door components as well as to cover the surface of the primary frame, and at least one stationary door and at least one sliding door mounted on and guided by the secondary frame component.

Another object of the invention is to provide a sliding door construction in which the door components may be installed at the time the building is being "glassed in" after interior finishing has been completed with resultant avoidance of the possible damage to the finish thereof by building operations.

A further object of the invention is to provide a sliding door construction in which adjusting means are provided for insuring squareness thereof prior to the installation of the door components.

Still another object of the invention is to provide a sliding door and frame construction in which the frame and doors are conveniently formed from extruded and rolled metal strips whereby door and frame assemblies may be conveniently manufactured by shops supplied with the said metal strips and whereby the actual manufacture of door and frame can be carried on with a minimum of special tooling and be supplied both in stock sizes and in special sizes to order for particular installations.

A still further object of the invention is to provide a sliding door construction including incorporated means whereby the frame of the door can be adjusted relative to the building opening in which it is installed to achieve squareness of the frame despite possible departures from squareness of the building members comprising that opening.

Still another object of the invention is to provide a sliding door construction including means whereby the means for attaching it in the building are concealed from view with resultant neat appearance of the finished assembly.

With the foregoing objects in view, together with such additional objects and advantages as may subsequently appear, the invention resides in the parts, and in the construction, combination and arrangement of parts disclosed, by way of example, in the following specification of a presently preferred embodiment of the invention; reference being had to the accompanying drawings which form a part of said specification and in which drawings:

Fig. 1 is a perspective side elevation of a sliding door construction embodying the invention; with portions of the building structure forming the opening in which it is installed being shown for better understanding of the mounting of the invention in the opening,

Fig. 2 is an enlarged, fragmentary, sectional view taken on the line **2—2** of Fig. 1 showing a typical corner construction,

Fig. 3 is an exploded view of the primary frame structure and of the secondary frame members used in connection therewith,

Fig. 4 is a perspective view of the door components used with the frame shown in Fig. 3,

Fig. 5 is an enlarged transverse sectional view of the door supporting rail and the filler strip; the view being taken on the line **5—5** of Fig. 3,

Fig. 6 is an enlarged scale, transverse, sectional view taken on the staggered line **6—6** of Fig. 1; with the door in closed position and with intermediate portions omitted to conserve space on the drawing,

Fig. 7 is an enlarged scale, sectional view taken on the vertical line **7—7** of Fig. 1 with the door in partly open position and with an intermediate portion omitted to conserve drawing space,

Fig. 8 is a fragmentary section through one of the door frame elements showing the mode of installing insulating glass panes therein, and

Fig. 9 is a transverse sectional view showing a modified form of secondary frame construction.

Referring to the drawings, the primary frame comprises a top member **1**, a bottom member **2** and two side members **3** and **4**. The said primary frame members are formed from heavy sheet metal rolled into a shallow rectangular channel with laterally extending flanges at each side, the form being generally known as a "hat" section. The members are disposed with the channel thereof to the outside of the frame and the width of the members is at least equal to the width of the building structural members surrounding the opening in which the door assembly is installed. At each corner the members are connected to each other by angle members **5**; the angle members having the legs thereof disposed in the channel portions of the members and preferably being attached to the top and bottom members by rivets **6** and to the upper and lower ends of the side members by screws **7** extending from the exposed inner face of the primary frame and threadedly engaging threaded holes in the corner angles. By this provision, the primary frame members can be fabricated from preformed lengths of the "hat" section material in the shop and have the angles attached to the ends of the top and bottom members so that in installa-

tion in the opening, the side members may be readily connected to the top and bottom members with the use of a screw driver only. Each side member carries three positioning blocks **8** disposed in the channel thereof and adjacent each corner angle and at the midlength of the side member and being of less thickness than the depth of the channel. The blocks **8** are each supported by a pair of screws **9, 9** threaded through the side member and disposed in a line transverse to the length of the side member. Each screw is provided with a reduced diameter shank **10** loosely engaging a hole **11** in the block; said hole terminating in a counterbore **12** in the outer face of the block in which the shank is peened over to provide a head **13** within the counterbore. The opposite end of the screw is provided with a slot **14** for engagement by a screw driver. Above and below each pair of screws the side members and their respective blocks are provided with registering holes **15** through which screws **16** extend to secure the side members to the studdings at each side of the door opening. Since the framing of door openings is sometimes accompanied by studdings which are not truly vertical and since the successful installation of a sliding door construction requires that the door frame be absolutely square, the blocks **18** can be adjusted outwardly by the adjusting screws to the extent necessary to hold the side members in a vertical position and at right angles to the bottom members; the mounting screws **16** then serving to hold the side members tightly in the position determined by the adjustment of the blocks. Similar screws **17** serve to secure the top and bottom members to adjacent building members. To relieve the door frame of any load from the building, the plate member forming the top of the door opening is commonly spaced slightly above the top member of the primary frame and thus with side members of equal length and adjusted to right angle positions with respect to the bottom member, the top member completes the necessary exactly square configuration of the primary frame. The side flanges of the "hat" sections of the primary frame members at the top and sides may extend beyond the faces of the studding and plate to serve as a plaster stop if the door is to be surrounded with a molding or if no molding is to be used they may stop at the edge of the studding and the plaster or other inner and outer coating can be faired or "bullnosed" to the edge of the flanges. This is mentioned by way of showing the adaptability of the primary frame to various forms of wall construction. The primary frame is installed as an incident to framing the building so that the later installation of the doors can readily be accomplished when the plastering and other rough work on the interior of the house is completed.

In the illustrated embodiment of the invention there is shown a sliding door **18** and a fixed door **19**. The doors comprise identical top rails **20** and identical side rails **21**. The bottom rail **22** of the sliding door is formed to accommodate roller supporting means **23** and the bottom rail **24** of the fixed door is formed to engage a securing means to which reference will later be made. All of the rails are formed of lengths of hollow metal extrusions of special forms which will now be described in detail.

The top rails **20** comprise a generally rectangular hollow form having flanges **25, 25** extending as continuations of the sides on the upper edge thereof to form a channel in which a guide rail means to be presently described is received. The lower edge thereof at the side forming in inner face of the door has a depending flange **26** and the inner face of the rail is provided with a first longitudinal groove **27** spaced from the flange slightly wider than the thickness of plate glass. The inner face is also provided with a second longitudinal groove **28** spaced from the flange **26** slightly more than the thickness of insulating or air spaced glass.

The side rails **21** are generally of the same configuration as the top rails and are of the same thickness as the top rails but the depth of the hollow interior is preferably less than the top rails. They include spaced outwardly extending flanges **29, 29**, an inwardly extending glass stop flange **30** and grooves **31** and **32** which are in longitudinal alignment, respectively, with the grooves **27** and **28** of the top rails.

The bottom rail **22** of the sliding door is of the same thickness as the side and top rails and has the same glass engaging means as the said side and top rails including the glass stop flange **33** and grooves **34** and **35** aligned with the corresponding grooves of the other rails. The lower side is open to permit the insertion and mounting of the roller supporting means **23**.

The bottom rail **24** of the fixed door is identical with the top rails and therefor the various elements thereof are identified with the same numerals as the corresponding elements of the top rails.

The doors are formed of their respective rails and the rails may be joined at the corners in any manner desired as by welding or by screws and appropriate corner brackets contained within the interior of the doors to the greatest possible extent. When the members have been united to form the door, the glass G is inserted in the recess formed by the inner faces of the united rails and the glass stop flanges with a suitable sealing compound **35** and is secured in place by metal strips **36** inserted in the appropriate grooves. If plate glass is used the exposed groove is filled by a suitable filler strip **37** and if the thicker insulating type of glass G' is used, the locking strip **36** is inserted in the outermost groove (see Fig. 8).

The assembly of the doors is completed by the installation of the weather strips **38** in the meeting edges thereof. The weatherstrips are identical in form and comprise a right angle strip having a leg **39** extending across the outer edge of the side member and having inwardly extending flanges **40, 40** forming a drive fit between the flanges **29, 29**. The leg **41** extends parallel to the side face of the side rail with enough space to permit the entry of the leg **41** of the other weatherstrip member (see Fig. 6). These weatherstrips as well as other joints between the doors and the frame are preferably fitted with yielding weatherstrip elements to provide suitable air seals, but in the interest of more clearly showing the present invention, they have been omitted from the drawings.

The door assembly is completed by the installation of the secondary frame and the completed doors. The secondary frame comprises a top member **42** and side members **43** and **44** of identical form, a rail assembly **45** and a fixed door securing means **46**, and a filler strip **46'**. The top and side members are formed of sheet metal and include side flanges **47, 47** closely fitting over the sides of the rib portion of the corresponding primary frame members formed by the rectangular channel thereof and outwardly projecting, laterally spaced, rectangular ribs **48** and **49** engageable, respectively with the flanges **25, 25** and the flanges **29, 29** of the sliding door at the side thereof opposite the weatherstrip, and the top flanges **25, 25** of the fixed door and the flanges **29, 29** at the side thereof opposite the weatherstrip. The portion **50** of these members between the ribs **48** and **49** contacts the face of the corresponding primary frame members and screws **51** secure the secondary frame top and side members to the primary frame members concealing the screws which secure the primary frame in the opening.

The rail assembly **45** extends the full length of the bottom of the primary frame and comprises a threshold and rail. The threshold includes an inner member **52** having a vertical leg **53** extending along the vertical face of the U-shaped portion of the primary frame member and extending above the top of said U-shaped portion, and thence extends in a downwardly sloping leg

54 terminating in a downturned end portion 55 resting on the top of the primary frame. The threshold includes an outer member 56 having a downturned end portion 57 resting on the top of the U-shaped portion and thence extending in a continuation of the slope of the inner member 52 and terminating adjacent the plane of the inner face of the fixed door when installed. The rail 58 is interposed between the end portions 55 and 57 and is welded or otherwise secured thereto. It has at flat bottom edge resting on the U-shaped portion of the primary frame and a rounded upper edge engaged by the grooved rollers 59, 59 on the sliding door. Screws 60 secure the bottom rail assembly to the bottom primary frame member and said assembly also conceals the screws 17 which secure the bottom primary frame member.

The lower edge of the fixed door is held in position by engagement with a U-shaped member 46 having a length equal to the width of the fixed door and having a width closely fitting between the flanges 25, 25 of the bottom rail of the fixed door and secured to the primary frame by screws 61.

The space defined by the outer edge of the rail assembly and the end of the member 46 is filled by a metal filler strip 46' having a thickness equal to the outer end of the threshold and screws 62 secure the filler strip to the primary frame member.

Prior to the installation of the secondary frame and the doors, the primary frame is checked for squareness and any necessary adjustment of the blocks by the screws 9 is made. The secondary frame members are then installed and the doors are then installed by first engaging the flanges of the top rails with the appropriate ribs and lifted sufficiently to allow the lower edge of the door to clear the holding means or rail and then lowered into position.

The outer surface of the secondary frame members and of the door rails are finely finished and thus by the simple installation effected when the interior work on the building has been completed, there is no danger that the finish will be marred by building operations. Further, through the provision of adjusting means for the primary frame, the frame can be reset if necessary to insure that the doors will fit and operate properly when installed without the necessity of cut and try adjustment as has heretofore been frequently required.

Attention is especially directed to the fact that the entire door and frame construction is formed from a few shapes of sheet metal and extruded metal forms which can be furnished in long lengths to local door manufacturers to be made up to order into doors and frames of any desired sizes and for either of the two commonly used types of glass. Further, the exposed surfaces of the secondary frame members and door members may be given the desired finish with assurance that the finish is not liable to be marred by building construction operations. The manufacture of the primary frames consists only in the cutting of the frame components to the desired lengths and providing the necessary corner angle elements and adjusting blocks, none of which requires extensive special tooling. The manufacture of the doors is equally simple and free from the necessity of expensive tooling and the secondary frame requires only the cutting of the various members to the required lengths. The drilling for the screws attaching the secondary frame to the primary frame can be economically done on the job. This mode of procedure has the advantage of keeping inventory investment to a minimum since the added cost of manufacturing labor is applied at the point of sale of the finished product.

Alternatively, since many door and frame assemblies are of standard sizes, the various frame and door elements can be cut to the required sizes and be assembled by the dealer incident to filling orders. Lastly, the sets can include the finished doors and the frame elements.

Referring finally to Fig. 9, there is shown a modified form of secondary frame structure which may be used where economy in cost is desired at the expense of appearance of the finished structure. The secondary frame members attached to the bottom primary frame member are not changed but in place of the members 42, 43 and 44, pairs of U-shaped strips 63, 63 are attached to the side and top primary frame members by screws 64, 64 in the same spaced relation as the rib portions 48 and 49 of the first described embodiment of the secondary frame structure.

While an assembly comprising one fixed door and one sliding door has been shown by way of illustration of the principles of the invention as most generally employed, it will be appreciated that door assemblies may be made involving more than two door panels without departure of the feature of the use of primary and secondary frames or of the formation of the door panels from hollow extruded metal sections, or of the adaptation of those door forming sections for use selectively with either of the two types of glass panels commonly used for doors. Accordingly, it is appreciated that changes and modifications will suggest themselves to those skilled in the art in the light of the foregoing specification, and it will be understood that the invention embraces all such changes and modifications in the parts, and in the construction, combination and arrangement of parts as shall come within the purview of the appended claims.

I claim:

1. A primary frame for a sliding door construction adapted to be installed in a door opening in a building formed by vertically and horizontally disposed components of the building and serving as a mounting means for a secondary frame and a door slidingly mounted in said secondary frame; said primary frame comprising a top member, a bottom member, and two side members connected together at their ends to form a rectangle, and means for attaching said frame to the building components; said members being of identical cross section and each of said members comprising a strip of sheet metal formed to provide a shallow longitudinally extending channel with laterally extending, longitudinally coextensive flanges disposed one at each side of said channel; said members being disposed with the channels thereof on the exterior of said frame and adjacent to the building components to which the respective members are attached; each of said side members adjacent each end thereof and at least one intermediate point carrying devices adjustable to engage the adjacent building component and operable to position said side members in exact right angle relationship with said bottom and top members, each of said devices including a plate disposed in the channel of the primary frame member, a pair of screws threaded into the portion forming the bottom of the channel and having shank portions rotatably engaging said plate and shoulder portions adjacent to said shank portions effective to prevent movement of said plate axially of said shank portions, said screws being operable to move said plate into and out of said channel to engage the building component while the side member is maintained in an exact right angle relationship with the top and bottom members of said primary frame.

2. In a sliding door construction, a primary frame of rectangular configuration adapted for installation in a door opening in a building; said primary frame comprising top, bottom and side members of identical cross section; said members being formed of sheet metal and having a shallow, rectangular channel extending longitudinally thereof disposed on the exterior periphery of said primary frame with resultant formation of a shallow, relatively wide rib extending longitudinally of said members on the inner periphery of said frame, a secondary frame structure mounted on said rib portion of said primary frame structure comprising a combined threshold and door supporting rail extending longitudinally of the

rib portion of said bottom member of said primary frame and means for retaining the lower edge of a fixed door panel against movement mounted on said rib portion of said primary frame bottom member, and sheet metal secondary frame members of identical, cross sectional configuration mounted on the rib portions of the top and side members of said primary frame; each of said last named identical members being longitudinally coextensive with the primary frame members on which it is mounted and including shoulder portions engaging the corners of the rib portions of the respective primary frame members, a pair of longitudinally extending door engaging ribs disposed one each adjacent one of said shoulder portions and a run extending between said door engaging ribs disposed parallel to and closely adjacent to the face of said rib of the primary frame member, and means for separately, detachably securing said last named secondary frame members to their respective primary frame members.

3. In a sliding door construction, a primary frame of rectangular configuration adapted for installation in a door opening in a building; said primary frame comprising top, bottom and side members of identical cross section; said members being formed of sheet metal and having a shallow, rectangular channel extending longitudinally thereof disposed on the exterior periphery of said primary frame with resultant formation of a shallow, relatively wide rib extending longitudinally of said members on the inner periphery of said frame, a secondary frame structure mounted on said rib portion of said primary frame structure comprising a combined threshold and door supporting rail extending longitudinally of the rib

portion of said bottom member of said primary frame and means for retaining the lower edge of a fixed door panel against movement mounted on said rib portion of said primary frame bottom member, and door engaging means attached to the rib portions of said top and side primary frame members comprising pairs of parallel, rectangularly U-shaped metal strips longitudinally coextensive with the said primary frame members and attached to the said rib portions of the primary frame members with the open sides of said U-shaped strips adjacent the primary frame members and with remote sides of each pair thereof positioned adjacent the side edges of the primary frame member ribs; said U-shaped strips being received in complementary grooves in the corresponding sides of door panels mounted on and supported by the portions of said secondary frame structure mounted on the bottom primary frame member.

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