Feb. 24, 1959 T. W. HENDERSON 2,874,420

METAL DOOR FRAME

Filed Dec. 7, 1955 3 Sheets-Sheet 1

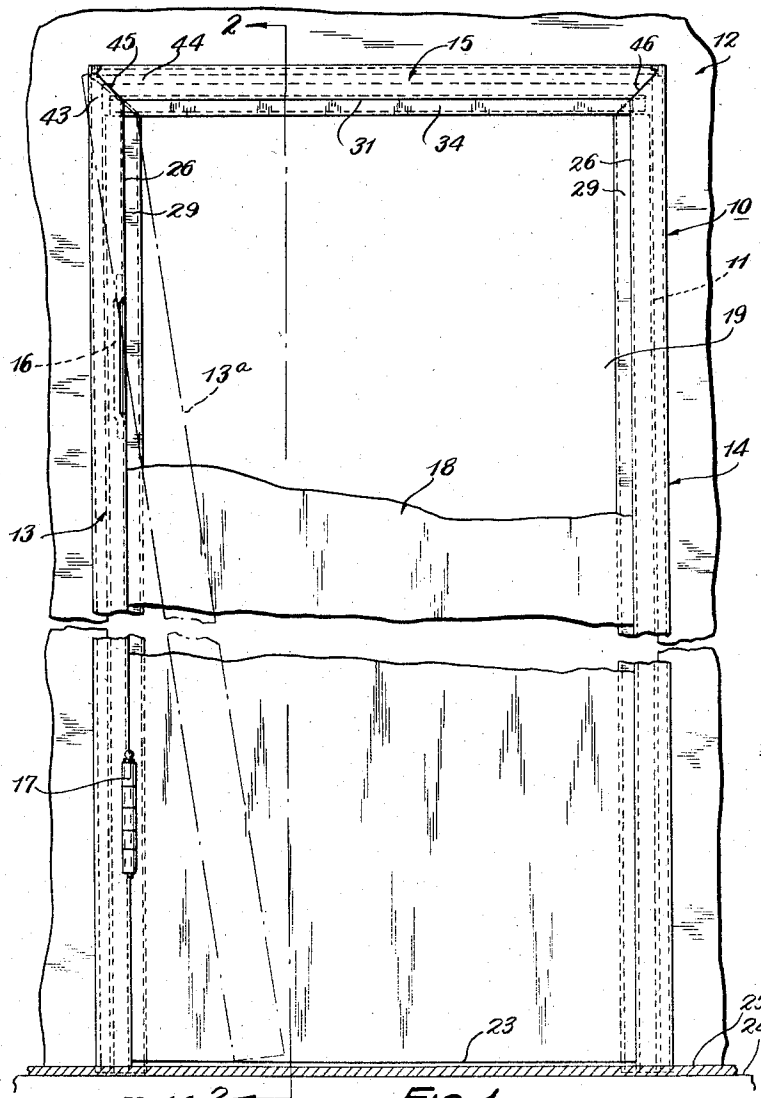


FIG. 1

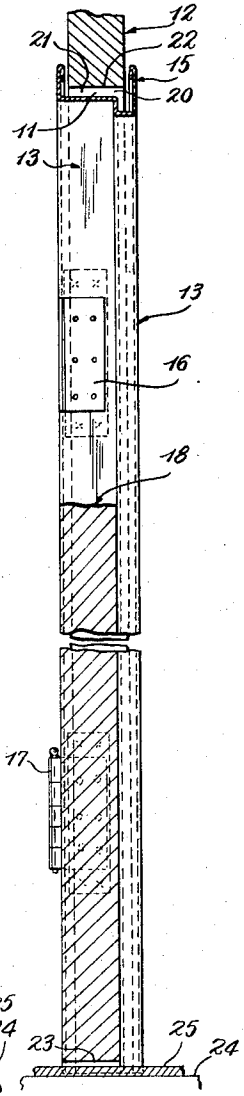


FIG. 2

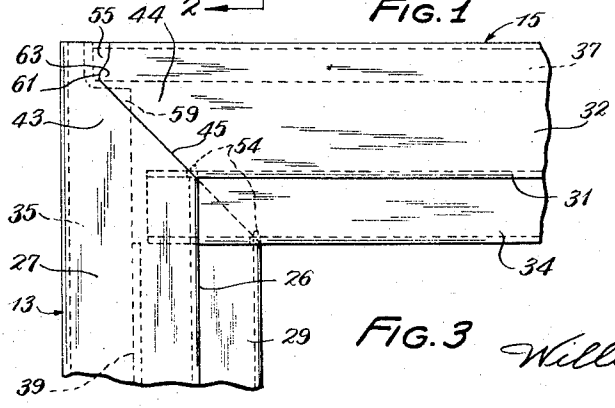


FIG. 3

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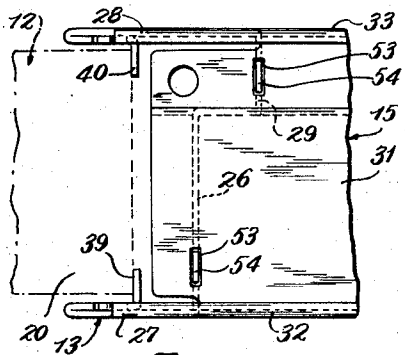


FIG. 4

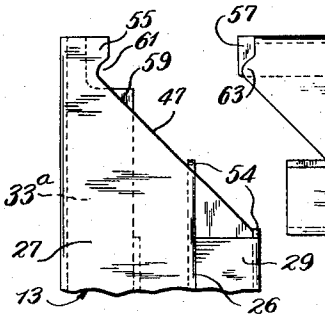


FIG. 5

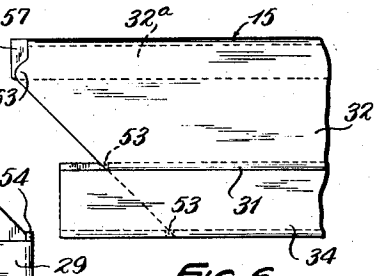


FIG. 6

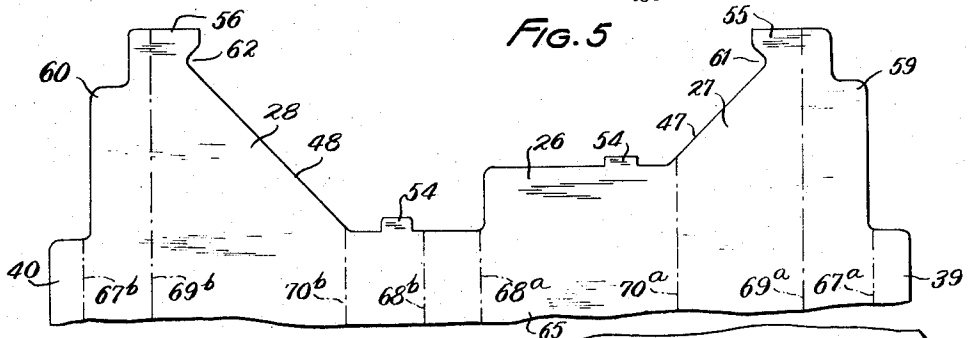


FIG. 9

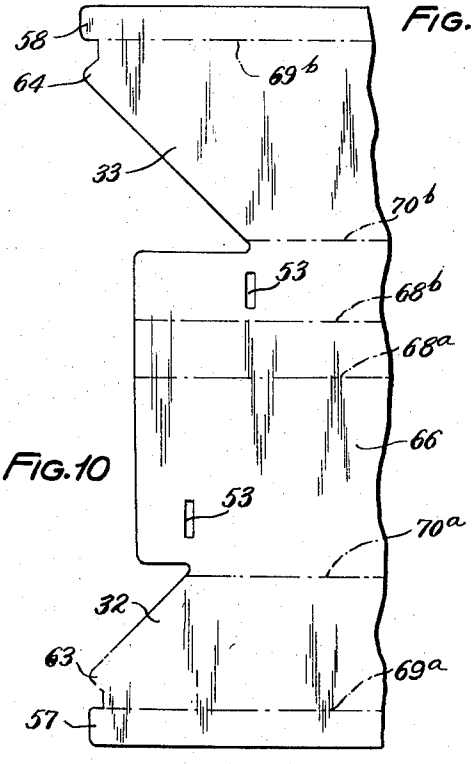


FIG. 10

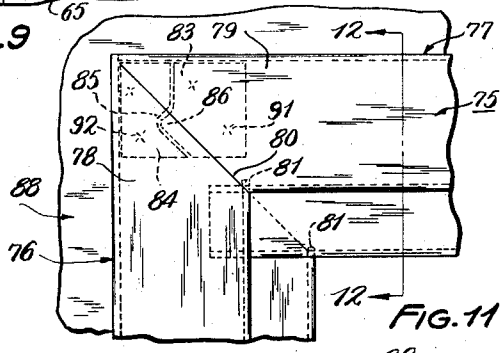


FIG. 11

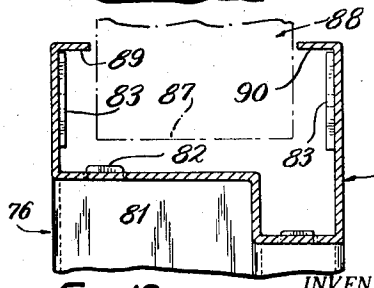


FIG. 12

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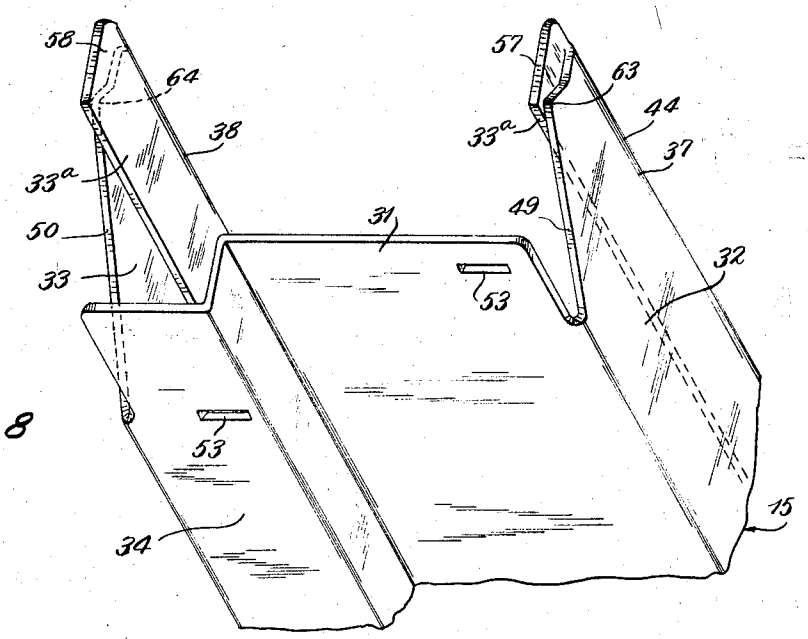


FIG. 8

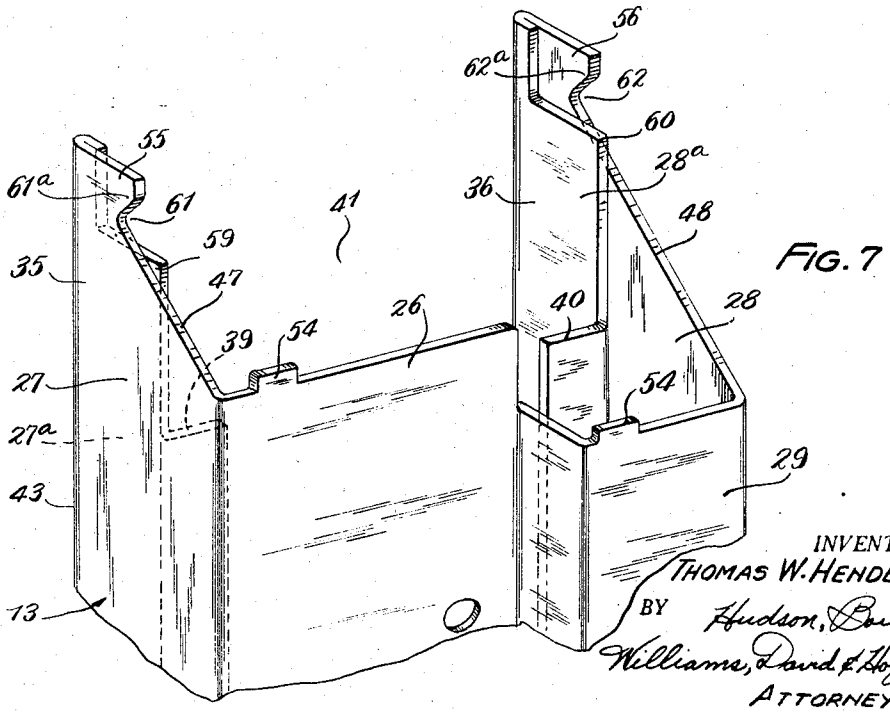


FIG. 7

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2,874,420

METAL DOOR FRAME

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Application December 7, 1955, Serial No. 551,562

2 Claims. (Cl. 20—11)

This invention relates to door frames and, as one of its objects, aims to provide a novel form of metal door frame comprising head and side rails which can be transported in a knock-down condition and can be readily assembled at the building site during the operation of installing the door frame in an opening of an existing wall.

Another object of this invention is to provide a novel door frame in which the head rail and side rails are all of a channel-shaped cross-section defined by connected web and flange portions, such that the frame formed by these rails will have a continuous channel recess along its outside perimeter into which portions of the wall extend, and such that the door frame will be vertically adjustable in the wall opening for locating the lower edge of the hinged door with relation to the surface of the floor or floor covering.

A further object is to provide a novel door frame of the character above indicated in which the pairs of cooperating rail ends have engageable connecting means thereon for connecting the adjacent ends such that, during the installation of the frame in the wall opening, one or both of the side rails will be swingable from a relatively inclined initial assembly position to a final assembly position in parallel relation to the other side rail, and in which the connecting means becomes effective for retaining the rails in their final assembly position without need for the bending of any locking projections or tabs, as is necessary in certain prior art constructions, and without need for access to the rear side of the rails for any purpose whatever.

Still another object is to provide a novel door frame of the kind referred to above in which the flanges of the pairs of cooperating rail ends have joint-forming portions thereon, preferably mitered joint-forming portions, and in which the connecting means comprises aligning and locking elements associated with the flanges and automatically rendered effective during the assembly operation for maintaining the joint-forming portions in a connected substantially co-planar edge-abutting relation.

It is likewise an object of this invention to provide a novel door frame in which stop projections carried by the flanges of the side rails and located in the channel recesses of the latter are adapted to be engaged by wall portions extending into such channel recesses.

Additionally this invention provides such a novel door frame in which the edges of the flanges of the head and side rails are of double-thickness metal and in which cooperating elements of the connecting means of the adjacent ends are defined by portions of the double-thickness edges.

Other objects and advantages of the invention will be apparent in the following detailed description and in

the accompanying sheets of drawings forming a part of this specification and in which:

Fig. 1 is a front elevation showing a metal door frame of the present invention installed in a wall opening,

Fig. 2 is a vertical section taken on section line 2—2 of Fig. 1,

Fig. 3 is a fragmentary front elevation of one of the corner portions of the door frame and showing the same on a larger scale,

Fig. 4 is a fragmentary top plan view of the corner portion shown in Fig. 3,

Fig. 5 and Fig. 6 are fragmentary front elevational views showing a pair of cooperating ends of a side rail and the head rail respectively with such ends in an adjacent, but disengaged, relation,

Fig. 7 is a perspective view of the upper end of one of the side rails and showing the same on a larger scale,

Fig. 8 is a perspective view of an end of the head rail and showing the same on a larger scale,

Fig. 9 is a fragmentary plan view in development form of one end of a sheet metal blank for one of the side rails,

Fig. 10 is a similar fragmentary plan view in development form of one end of a sheet metal blank for the head rail,

Fig. 11 is a fragmentary front elevation showing one corner of a metal door frame of a modified form, and

Fig. 12 is a transverse vertical section taken on section line 12—12 of Fig. 11.

The novel door frame 10 is shown in Figs. 1 and 2 in its installed position in an opening 11 of a wall 12. The door frame 10 comprises an existing pair of laterally spaced substantially parallel upright side rails 13 and 14, and a substantially horizontal head rail 15 connecting the upper ends of the side rails. The side rail 13 is here shown as being the hinge rail and carries hinge reinforcements 16 to which suitable hinges 17 can be secured for swingably mounting a door 18 in a doorway 19 defined by the frame 10. The rail 14 is here shown as being the lock-receiving rail.

The rails 13, 14 and 15 are all preformed metal frame members which can be readily produced in a shop or factory and can be conveniently transported in a knock-down condition to the building site for assembly in the opening 11 of the existing wall 12 in a manner to be explained hereinafter. The frame members 13, 14 and 15 are all of a channel-shaped cross-section such that when they are in their assembled relation they define a continuous channel recess 20 in the outer perimeter of the door frame 10. As shown in the drawings, portions of the wall 12 extend into the channel recess 20 when the frame is fully assembled in the wall opening 11.

The dimensional relationship between the frame 10 and the wall opening 11 is such that a clearance space 21 exists between the head rail 15 and the wall portion 22 which defines the horizontal top edge of the wall opening 11. The clearance space 21 permits vertical shifting of the door frame 10 in the wall opening 11 so as to locate the lower edge 23 of the door 18 at an elevation to clear the upper surface of the floor 24, or the surface of a floor covering 25 when such a covering is provided on the floor. The provision for this vertical shifting of the door frame 10 is of considerable practical importance because it adapts the lower edge of the door 18 to the thickness of the floor covering to be used, without need for removing the door from its hinges for remounting or for trimming of the lower edge of the door.

The frame members 13, 14 and 15 are made of sheet metal by bending suitable blanks to the desired channel-shaped form, as is further explained hereinafter. The side rails 13 and 14 are generally similar in that each comprises a web portion 26 and a pair of longitudinal side flanges 27 and 28 connected by such web portion. The web portion 26 forms the jamb portion of the side rail and preferably includes an integrally formed longitudinally extending door stop or batten strip projection 29.

The head rail 15 also comprises a web portion 31 and a pair of longitudinal side flanges 32 and 33 connected by such web portion. The web portion 31 preferably includes an integrally formed longitudinal door stop or batten strip projection 34. When the frame members 13, 14 and 15 are in their assembled relation shown in Figs. 1 and 2, the web portions 26 and 31 thereof define the doorway 19 with the integrally formed projections 29 and 34 lying in a common plane and defining a continuous door stop or batten ledge extending along the inner perimeter of the frame and engageable by edge portions of one side face of the door 18.

The pairs of side flanges 27 and 28 of the side rails 13 and 14, and the pair of side flanges 32 and 33 of the head rail 15 are of a width transversely of these frame members such that the above-mentioned continuous external channel recess 20 will be of a suitable depth, and such that these pairs of flanges will overlap portions of the wall 12 to a sufficient extent to result in a neat and finished appearance when the door frame has been installed in the wall opening 11. The side flanges 27 and 28 of the side rails 13 and 14 are reinforced by having their longitudinal edge portions 35 and 36 made of double-thickness metal. The side flanges 32 and 33 of the head rail 15 likewise have double-thickness longitudinal edge portions 37 and 38. These double-thickness edge portions are obtained by doubling the sheet metal, of which the frame members are made, upon itself and with the doubled portions pressed into a flattened or flat folded condition.

The door frame 10 is preferably provided with pairs of locating flanges 39 and 40 in the channel recesses 41 of the side rails 13 and 14 and which are engageable by the edge portions of the wall 12 (see Fig. 4) which extend into those channel recesses. The locating flanges 39 and 40 are preferably formed by inwardly deflected edge portions of the doubled-metal edges of these side rails.

The upper ends of the side rails 13 and 14 and the ends of the head rail 15 form pairs of cooperating ends 43 and 44 which, when brought into an engaged relation as explained hereinafter, define joints 45 and 46 between the side rails and the head rail and which joints include a parting line. These joints are preferably in the form of miter joints so as to facilitate the assembly of the frame members in the wall opening 11. Since the miter joints 45 and 46 are substantially the same only one of these joints, for example the joint 45, need be described. For the formation of the miter joint 45, the side flanges 27 and 28 of the side rail 13 and the side flanges 32 and 33 of the head rail 15 are mitered to a complemental angular relation represented by the mitered edges 47, 48 and 49, 50 of these side flanges.

The cooperating ends 43 and 44 defining the miter joint 45 are provided with engageable elements by which the head and side rails are connected with each other during assembling and are thereafter maintained with the mitered edges 47, 48 and 49, 50 of the side flanges in a co-planar and edge-abutting relation. These engageable elements comprise three sets of cooperating elements, namely, connecting elements, aligning elements and locking elements which will now be described.

The connecting elements of the cooperating pair of ends 43 and 44 are here shown as comprising slot and lug elements 53 and 54, the slot elements being a pair of spaced slots 53 provided in the web portion 31 of the head rail 15 and the lug elements being a pair of spaced lugs 54 formed as integral endwise extensions of the web

portion 26 of the side rail 13. The slots and lugs 53 and 54 are shaped and so located on the cooperating ends 43 and 44 that the lugs will engage in the slots for connecting these ends in a manner such that the head rail 15 will hold the side rails 13 and 14 in their laterally spaced relation and will permit the side rail 13 to be swung from an inclined initial assembly position 13^a, indicated in broken lines in Fig. 1, to its vertical final assembly position in parallel relation to the other side rail 14.

The aligning elements are here shown as comprising pairs of plate elements 55, 56 and 57, 58 carried by the cooperating ends 43 and 44 and formed by single-thickness portions of the double-thickness edges of the side flanges. The plate elements 55 and 56 are on one of the rails, in this instance the side rail 13, and the plate elements 57 and 58 are on the other of the cooperating rails, in this instance the head rail 15. As shown in Fig. 7, the plate elements 55 and 56 of the end 43 are relatively projecting integral end portions of the side flanges 27 and 28. The plate elements 57 and 58 of the end 44 are relatively projecting integral end portions of the flanges 32 and 33, as shown in Fig. 8, but are on the inwardly doubled flange portions 32^a and 33^a and are thus relatively inwardly offset from the plate elements 55 and 56.

When the cooperating ends 43 and 44 are in an engaged condition with the lugs 54 extending into the slots 53 and with the pairs of mitered edges 47, 48 and 49, 50 in an abutting relation, the aligning elements 55, 56 and 57, 58 lie face-to-face and extend in an overlapping relation to each other, as shown in Figs. 3 and 4. This face-to-face overlapping relation of the plate elements 47, 48 and 49, 50 maintains the flanges of the cooperating ends 43 and 44 in a flush or co-planar alignment.

An additional pair of aligning plate portions 59 and 60 is provided on the end 43 of the side rail 13 and are formed by projecting corner portions of the inner thickness portions 27^a and 28^a of the side flanges 27 and 28. The aligning elements 59 and 60 extend across the joint line 45 into the channel recess of the head rail 15 and lie against the inner faces of the side flanges 32 and 33.

The locking elements of the cooperating ends 43 and 44 are also carried by the pairs of side flanges 27, 28 and 32, 33 and comprise locking recesses 61 and 62 and locking projections 63 and 64 engageable in those recesses. The locking recesses are formed in the flanges 27 and 28 adjacent the ends thereof, and the locking projections 63 and 64 are formed on the ends of the flanges 32 and 33. As shown in Fig. 7, the locking recesses 61 and 62 are of a hook-like shape and the projections 63 and 64 are of a shape which is complemental to the hook-like shape of the recesses.

When relative swinging between the cooperating ends 43 and 44 occurs, about the engaged slots and lug elements 53 and 54 as a fulcrum point, and in a direction to cause relative closing movement between the pairs of mitered edges 47, 48 and 49, 50, the locking projections 63 and 64 will engage in the locking recesses 61 and 62. In thus engaging in the recesses 61 and 62, the locking projections ride over the flange portions 61^a and 62^a and snap into the recesses with a self-locking action to define a locked condition of the locking elements by which the cooperating ends 43 and 44 will be held against relative swinging in the reverse direction, and hence, the mitered edges will be maintained in a tightly closed condition which is desirable in the mitered joints 45 and 46.

The side and head rails 13, 14 and 15 are formed of sheet metal which is cut or blanked in a flat condition to the appropriate shape for these frame members. Figs. 9 and 10 show the development shapes of the end portions of a side rail blank 65 and a head rail blank 66. These side rail and head rail blanks 65 and 66 will produce corresponding channel-shaped frame members of the desired shape when the blanks are bent or folded along the indicated bend and fold lines thereof.

Thus, bending of the side rail blank 65 along the bend lines 67[a] and 67[b] forms the longitudinal stop flanges 39 and 40, and bending of the blank along the bend lines 68[a] and 68[b] produces the batten strip projection 29. Folding of the blank 65 along the fold lines 69[a] and 69[b] produces the double-thickness edges 35 and 36. Likewise, bending of the blank 65 along the bend lines 70[a] and 70[b] produces the channel-shaped cross-section with the side flanges 27 and 28 extending in a substantially parallel right-angle relation to the web portion 26.

Similarly designated fold and bend lines are shown on the head rail blank 66 of Fig. 10 but the bend lines 67[a] and 67[b] have been omitted therefrom inasmuch as the head rail 15 does not have any stop flanges in its channel recess.

The operation of assembling the frame members 13, 14 and 15 in the wall opening 11 to form the door frame 10, will now be described in greater detail. In this assembling operation the head rail 15 and one of the side rails, for example the side rail 14, are moved into the wall opening 11 of the existing wall 12 so that edge portions of the wall extend into the channel recesses of these members. These two frame members are then connected together in the right-angle relation shown in Fig. 1 by bringing the connecting means of the cooperating pair of adjacent ends into a fully engaged relation to form the joint 46. In some situations it may be feasible or desirable to connect the rails 14 and 15 in their right-angle relation before they are moved into place in the wall opening 11.

The other side rail, namely the side rail 13, is now moved into the wall opening 11 so as to first assume its relatively inclined initial assembly position 13[a] with the lugs 54 at least partially engaged in the slots 53. The side rail 13 is then swung to its upright parallel full-line position to complete the engagement of the connecting means of the cooperating pair of ends 43 and 44 in the manner already explained above for completing the joint 45.

Figs. 11 and 12 of the drawings show a door frame 75 which is generally similar to the door frame 10, but which represents a modified construction. The door frame 75 comprises similar frame members which include a side rail 76 and a head rail 77, and whose cooperating pair of ends 78 and 79 form the miter joint 80.

The connecting means connecting the pair of cooperating ends 78 and 79 comprises substantially the same sets of elements as are provided in the door frame 10, namely cooperating slot and lug connecting elements 81 and 82, aligning plate elements 83 and 84, and cooperating locking elements comprising a locking recess 85 and a locking projection 86. These cooperating elements accomplish functions similar to those explained above in the door frame 10 but the aligning elements 83 and 84 are differently formed.

In the door frame 75 the aligning plates 83 and 84 are formed by separate plate members or tabs which are welded against the inner faces of the side flanges of the head rail 77 and of the side rail 76. These aligning elements 83 and 84 project from the ends of the channel recesses of these frame members so that portions of the elements of one frame member extend into the channel recess of the other frame member and lie in a face-to-face relation against the inner surfaces of the side flnages of the latter, in a spanning relation to the parting line of the miter point 80 as shown in Fig. 11.

The locking recesses 85 are formed in the edges of the aligning plates 84, and the locking projections 86 are formed on the adjacent edges of the aligning plates 83. The door frame 75 is assembled in the opening 87 of the wall 88 in the same manner as has been explained above for the door frame 10 and, during the relative swinging of the side rail 76 to its vertical parallel position, the locking projections 86 snap into a self-locking position in the recesses 85 to retain the miter joint 80 in a closed condition.

The side flanges of the head and side rail members of the door frame 75 do not have the double-thickness edge portions of the door frame 10, but, as shown in Figs. 11 and 12, have inturned substantially right-angle longitudinal flanges 89 and 90 thereon. The aligning plate members 83 and 84 are secured to the side flanges of the frame members 76 and 77 by spot welds 91 and 92, with edge portions of these plate members lying against or adjacent to the inturned flanges 89 and 90.

From the accompanying drawings and the foregoing detailed description it will now be readily understood that this invention provides a novel form of metal door frame comprising preformed channel-shaped sheet metal members which can be readily produced in a shop or factory and can be conveniently transported in a knock-down condition to the building site where they can be quickly assembled into a wall opening of an existing wall to define a doorway. It will now also be understood that the novel connecting means provided on the pairs of cooperating ends of the frame members adapt these members for quick and easy assembly in the wall opening without need for any unusual skill or special tools, and without need for access to be had to the rear side of the frame members for the bending of locking projections or for any similar purpose. It will be further understood that the cooperating ends, by reason of the novel connecting, aligning and locking elements carried thereby, will form strong joints therebetween which have a tightly closed and smooth character so as to be neat and relatively unnoticeable. Additionally, it will be seen that the channel-shaped character of the frame members provides the door frame with a continuous channel recess in the external perimeter thereof for receiving edge portions of the wall and provide for vertical adjustment of the door frame in the wall opening for locating the lower edge of the door at an elevation to swing freely over the floor surface, or floor covering, without need for any dismounting of the door from its hinges or trimming of its lower edge.

While the novel door frame of the present invention is primarily intended for installation in a door opening of an existing wall and has been so described above, the component rails could, of course, be assembled into a door frame prior to the erection of the wall, and in which case, the wall would be built up to the door frame.

Although the novel door frame has been illustrated and described herein to a somewhat detailed extent, it will be understood of course that the invention is not to be regarded as being limited correspondingly in scope but includes all changes and modifications coming within the terms of the claims hereof.

Having thus described my invention, I claim:

1. A door frame comprising, a pair of side rails, and a head rail, said head and side rails each having a web portion and a pair of side flanges connected by said web portion, the flanges of said head and side rails having mitered portions of a complemental angular relation for forming miter joints between the ends of said head rail and the upper ends of said side rails, one end of each cooperating pair of said ends having a slot in the web portion thereof and the other end of said cooperating pair having a lug projection engageable in said slot for connecting the cooperating pair of ends, the side flanges of said head and side rails having flat-folded double-thickness edges and the ends of each cooperating pair of said ends having cooperating locking elements thereon comprising locking recesses and locking projections defined by certain cooperating single-thickness portions of said double-thickness edges, said locking projections when engaged in said locking recesses being effective to maintain said mitered portions in a substantially closed joint-forming relation, other single-thickness portions of said double-thickness edges forming aligning elements extending in a direction

transversely of said joints and lying alongside of the single-thickness portions carrying said locking elements for retaining the latter in an edge-aligned relation.

2. A door frame as defined in claim 1 and for use in an opening of an existing wall of a building, and wherein said side rails have channel recesses for receiving edge portions of the building wall and the flat-folded portions of said side rails have angularly deflected free edge portions forming locating flanges, said locating flanges projecting angularly from the side flanges of said side rails

and lying within said channel recesses and being engageable with said edge portions of said building wall.

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