

Nov. 24, 1959

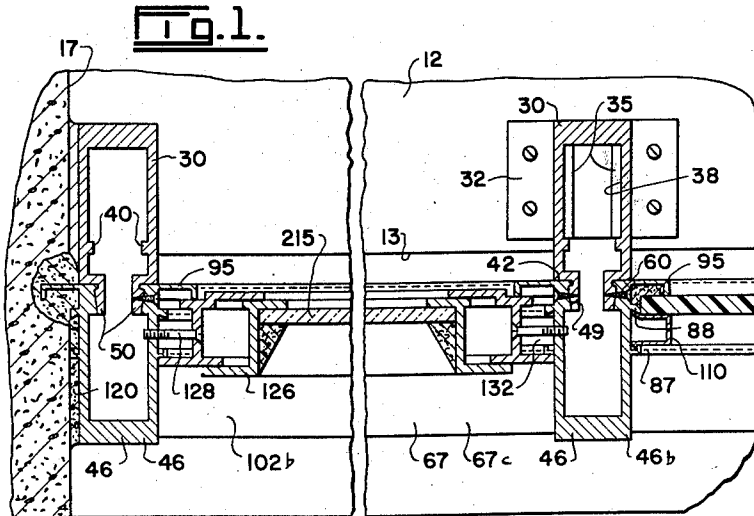
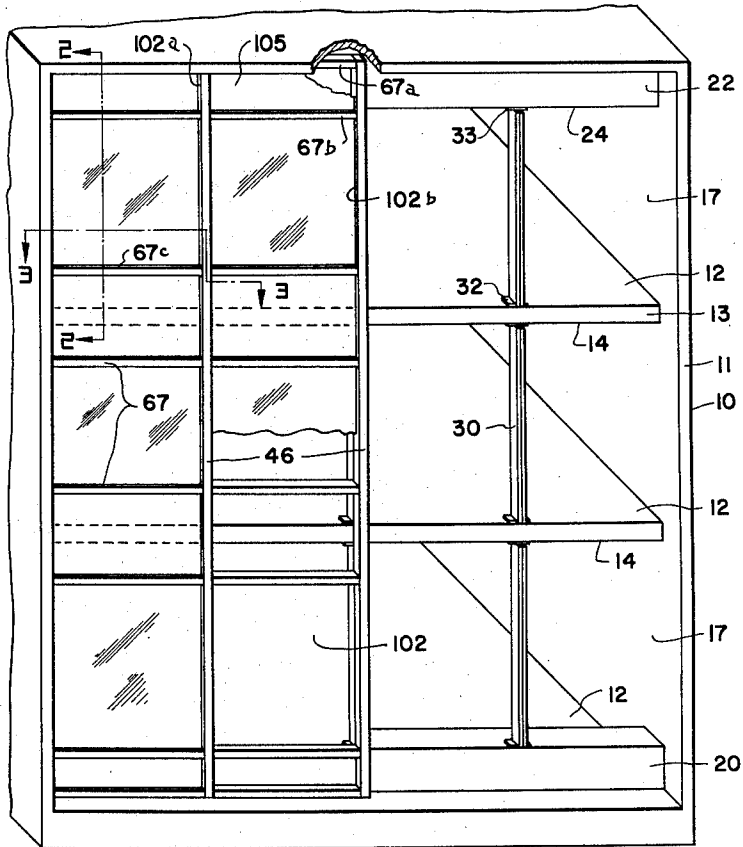
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2,914,145

CURTAIN WALL FRAMING

Filed April 26, 1955

5 Sheets-Sheet 1



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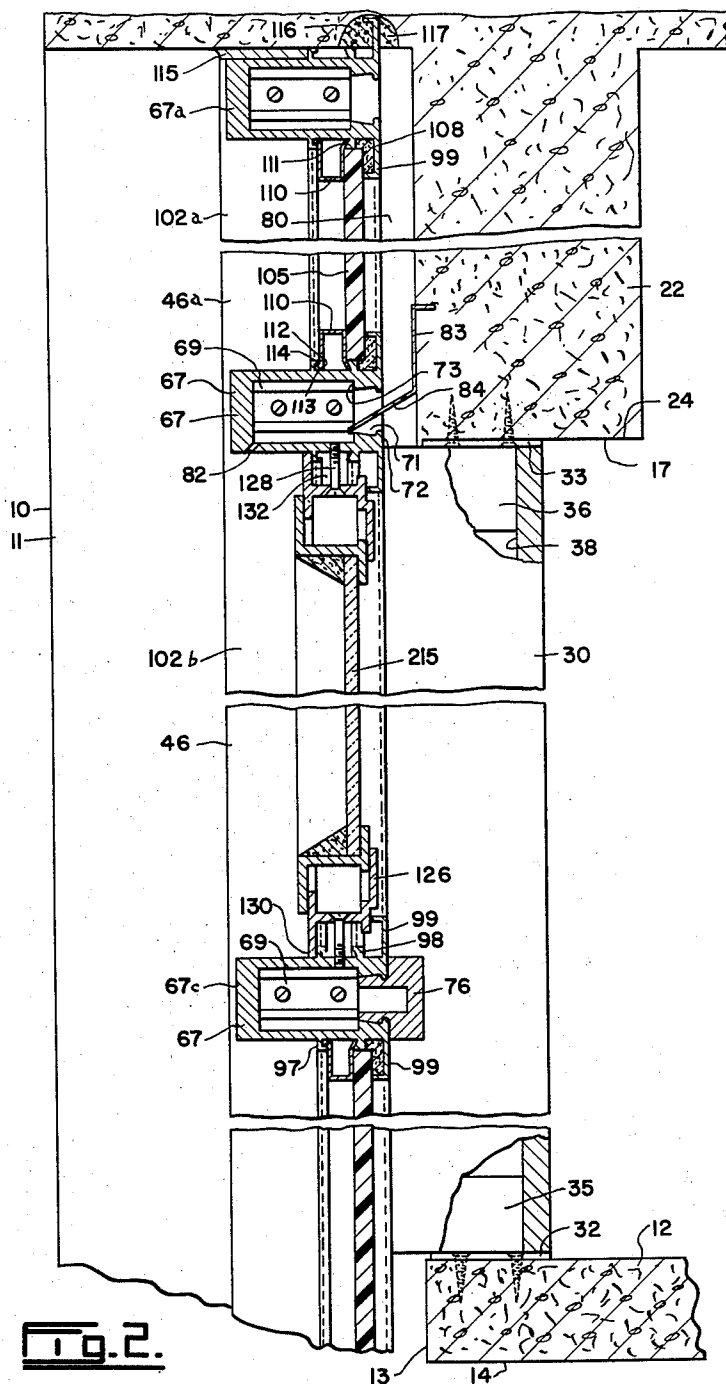
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5 Sheets-Sheet 2



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5 Sheets-Sheet 3

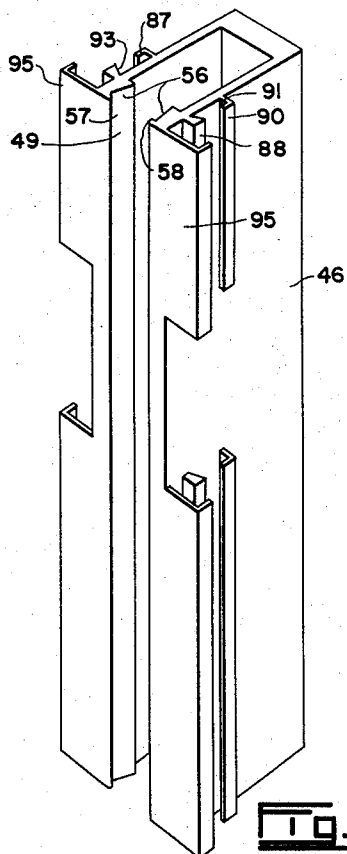


Fig. 4.

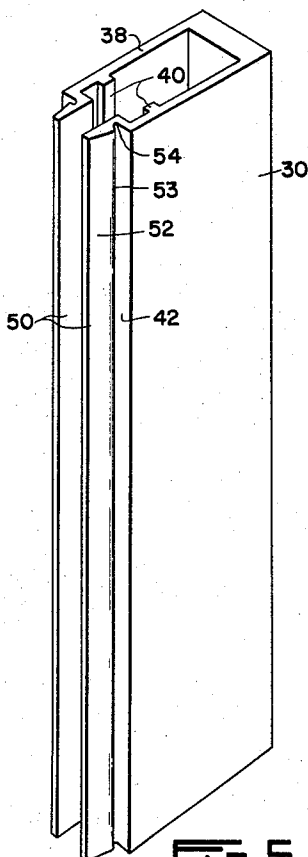


Fig. 5.

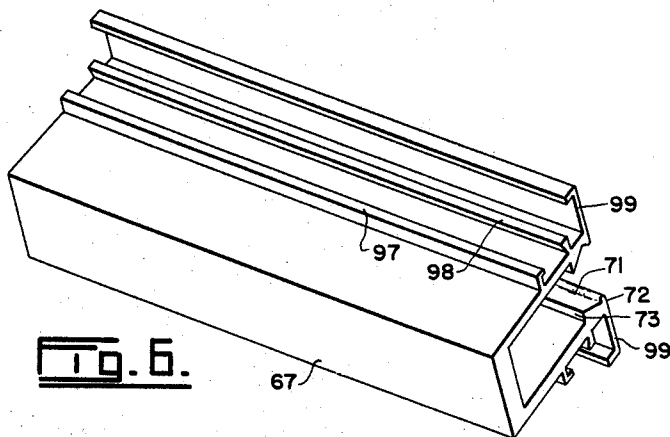


Fig. 6.

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5 Sheets-Sheet 4

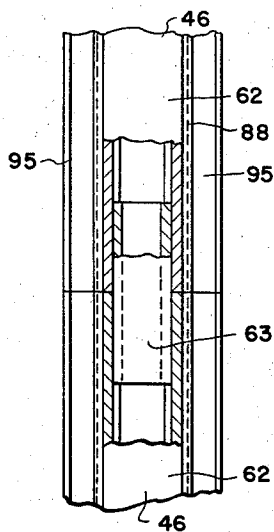


Fig. 7.

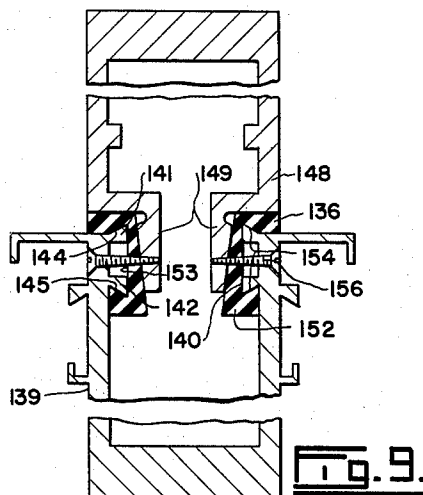


Fig. 9.

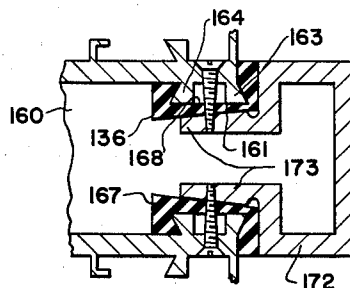


Fig. 10.

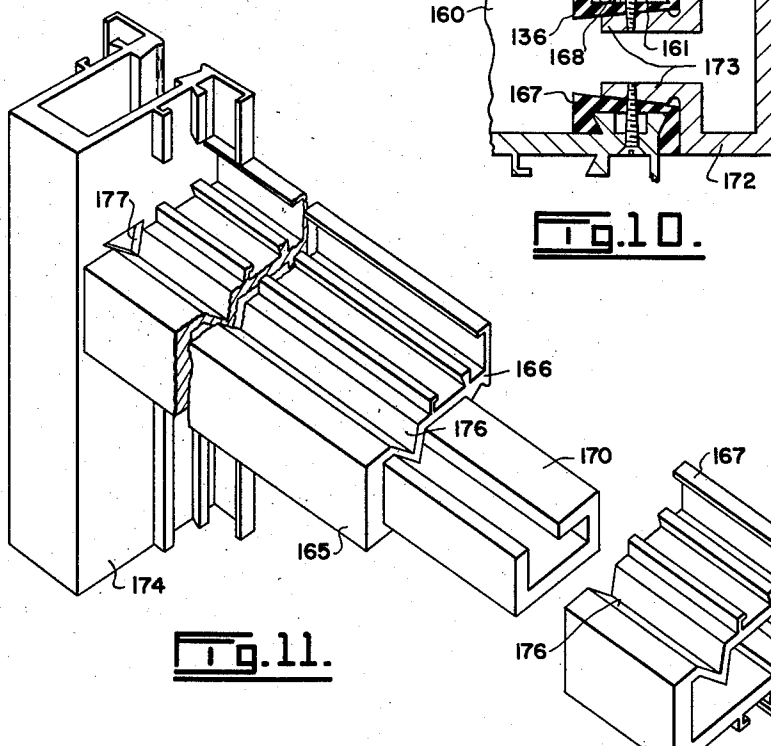


Fig. 11.

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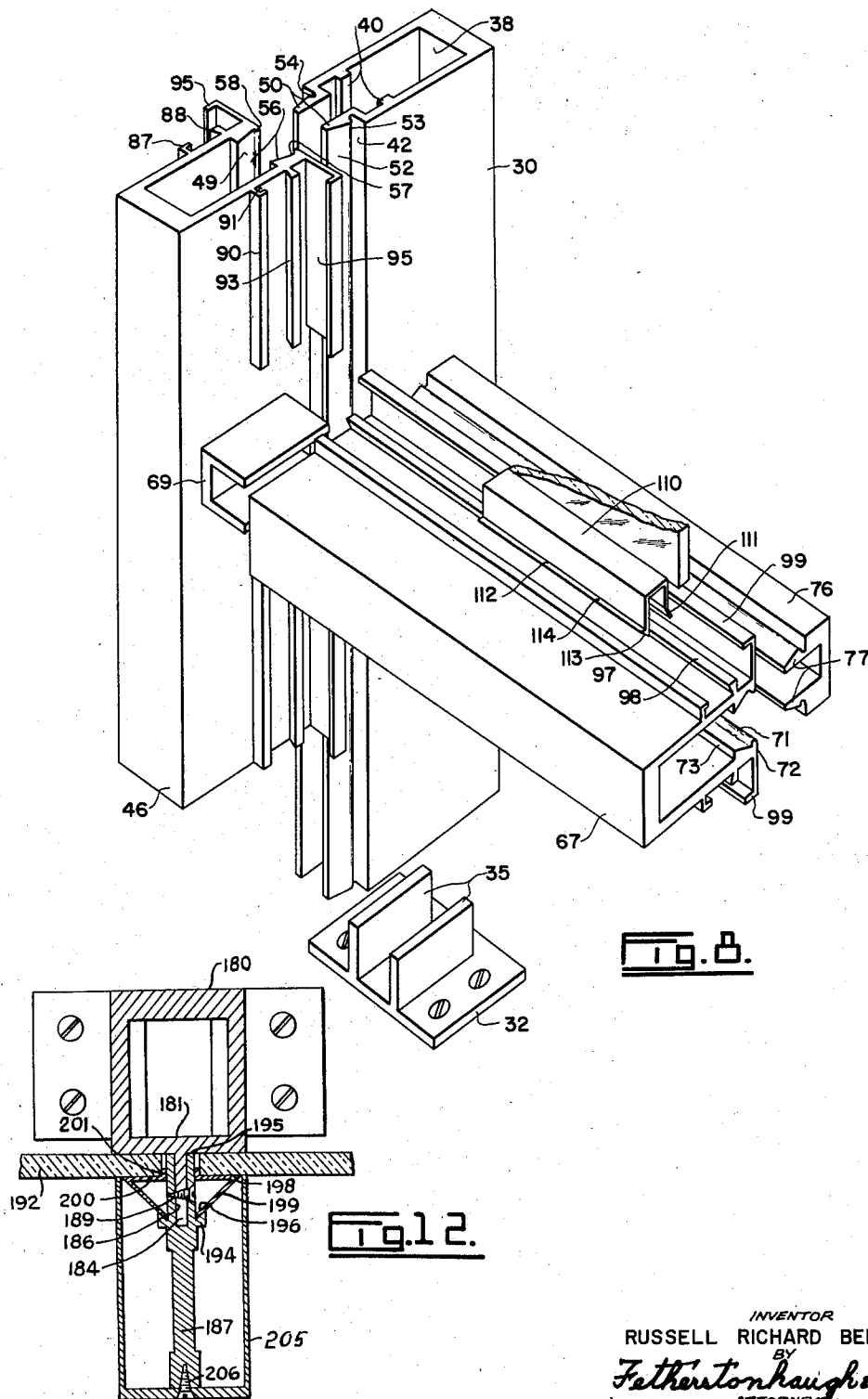
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5 Sheets-Sheet 5



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2,914,145

CURTAIN WALL FRAMING

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Application April 26, 1955, Serial No. 503,945

5 Claims. (Cl. 189—1)

This invention relates to improvements in curtain wall framing for building structures.

A curtain wall is a wall that closes or covers the side of a building structure but does not of itself bear any weight. The basic structure of the building may be any desired form and made of any convenient material. For example, the basic structure or framework of the building may be made of steel, concrete, or a combination of these. For the sake of convenience, this invention will be described in connection with a building made of reinforced concrete.

The basic structure or shell of the building, including the floors thereof, are erected in the usual manner. Openings are left in the sides of the structure above and below the floor levels thereof. These openings may extend completely from one floor to the next, or the building may have solid walls with openings therein between the floors. In the latter case, the solid wall may extend upwardly a predetermined distance from each floor and the opening may extend from the upper edge of this wall upwardly to the next floor, or the opening may extend upwardly from the upper edge of the solid wall at each floor to another portion of the solid wall which depends from the next floor or ceiling. This curtain wall may be readily applied to any of these various types of construction.

Prior to this invention, a contractor erecting a building structure had to set in bolts, anchors, and the like to which a curtain wall was later secured. These fixtures had to be accurately placed, and the design of the curtain wall was limited to them. The curtain wall framing of this invention eliminates this necessity. The building contractor may provide nailing grounds at the upper and lower portions of the openings, or these may be provided where desired before the framing is set into place.

The main object of the present invention is the provision of curtain wall framing that does not require special bolts, anchors, etc. in the basic building structure, and which is such that there is complete flexibility as far as adjustment in placing the various members thereof is concerned.

Another object is the provision of curtain wall framing which may be quickly and easily assembled on the job without any special tools for this purpose.

A further object is the provision of curtain wall framing which is free to expand vertically and laterally throughout the area covered thereby, and which does not have any exposed screws or bolts.

A further object is the provision of curtain wall framing including flashing means for directing moisture from inside the wall to the outside thereof.

Another object is the provision of a framing of the type described having inner and outer members and including means for preventing the conduction of heat therebetween.

Curtain wall framing according to this invention includes inner mullions to be placed in a building opening extending from the top to the bottom thereof at the side

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of the building in which the opening is located. These mullions are secured at their opposite ends by suitable means within the opening. It is preferable to provide a socket in each end of each mullion for slidably receiving suitable means projecting from bearing plates which, in turn, are secured to the top and bottom of the opening. This allows for expansion and contraction of the mullions.

An outer mullion is secured to each inner mullion and extends vertically outside the building side, said outer mullion being adapted to carry the elements forming a curtain wall for the building. The inner mullions of each floor are aligned with those of the other floors so that the outer mullions may extend from the top to the bottom of the building. For multi-floored buildings, it is preferable to make each outer mullion in at least two vertically-aligned sections slidably connected together by an expansion sleeve.

A plurality of horizontal transoms are slidably connected at their opposite ends to adjacent outer mullions. These transoms may be positioned at any desired points throughout the lengths of the outer mullions without regard to the floors of the building. They are absolutely independent of said floors. This makes it possible to erect a curtain wall of any desired design without having to worry about the spacing or position of the floors. The curtain wall between any two adjacent transoms may be solid, transparent or translucent, and any desired or convenient type of material may be used therefor. One way of connecting the transoms to the outer mullions is to provide seats on the side of the latter on to which the transoms slidably fit. These transoms may be formed with sockets in the ends thereof for receiving the seats. This sliding fit permits expansion and contraction of the transoms.

The inner and outer mullions and the transoms may be made of any desired material, but they are preferably formed of a light metal, such as aluminum alloy. These elements are preferably hollow in order to reduce the weight thereof and provide sockets at their ends. The elements may be formed of extruded metal of the desired cross sectional shape. Suitable non-heat conducting gaskets may be provided between the inner and outer mullions. Furthermore, suitable flashing may be used for directing condensed moisture from inside the curtain wall into the hollow horizontal transoms which are provided with holes in their lower surfaces outside the curtain wall to permit the water to drain away. Alternatively, the transoms may be constructed so as to catch rain water and direct it into the hollow outer mullions from which it is drained at the lower ends thereof in any desired manner.

Examples of this invention are illustrated in the accompanying drawings, in which:

Figure 1 is an elevation of the side or end of a building structure showing curtain wall framing in part thereof, and one form of curtain wall in part of the framing,

Figure 2 is a sectional view taken on the line 2—2 of Figure 1,

Figure 3 is a sectional view taken on the line 3—3 of Figure 1,

Figure 4 is a perspective view of an outer mullion,

Figure 5 is a perspective view of an inner mullion,

Figure 6 is a perspective view of one form of transom,

Figure 7 is a fragmentary elevation, partly in section, of two adjacent sections of an outer mullion,

Figure 8 is an exploded perspective of inner and outer mullions and a transom,

Figure 9 is an enlarged horizontal section through inner and outer mullions with insulation gaskets therebetween,

Figure 10 is an enlarged vertical section through a

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transom and plug or cover plate therefor with a gasket therebetween,

Figure 11 is an exploded perspective of an alternative form of transom connected to an outer mullion, and

Figure 12 is an enlarged horizontal section through alternative forms of inner and outer mullions.

Referring to Figure 1 of the drawings, 10 is a concrete building structure, concrete being used by way of example, comprising a shell 11 and three floors 12. As is usual in structures of this type, the edges 13 of these floors are set back from the side of the building or shell 11. The bottom of each floor forms a ceiling 14 for the space therebelow. There is an opening 17 between each floor and the ceiling thereabove at the side of the building structure. In this example, a solid wall 20 projects upwardly a short distance from the lowermost floor 12 at the building side. In this case, the opening 17 in which this invention is interested extends from the upper edge of this wall to the ceiling 14 thereabove. Similarly, another solid wall 22 extends downwardly a short distance from the top of the shell 11 towards the uppermost floor 12. Thus, the opening 17 extends from the lower edge of this wall to the floor.

Figure 1 illustrates the basic structure of the building at the right side thereof and the curtain wall framing at its left side.

Figure 2 illustrates curtain wall framing in the opening 17 between the upper solid wall 22 and the uppermost floor 12. The lower surface 24 of the solid wall is the equivalent of the ceiling for this opening, and may be referred to herein as the ceiling.

As all the inner and outer mullions are identical, the construction of one set thereof only will be referred to in detail.

An inner mullion 30 extends from the bottom to the top of opening 17 at the side of the building structure. This mullion may be secured in place in any convenient manner, but it is desirable to so mount it that it is able to expand and contract longitudinally thereof. This may be accomplished by means of lower and upper bearing plates 32 and 33 secured in any convenient manner to the bottom and top of the opening, and having means thereon slidably fitting into sockets in the ends of the mullion. In this example, the bearing plates 32 and 33 are provided respectively with upwardly and downwardly extending spaced flanges 35 and 36 which fit into the ends of the mullion.

The sockets may be formed in the inner mullion in any desired manner. However, it is preferable to make the mullion hollow as indicated at 38, in Figures 2 and 3. In this particular design, the mullion is rectangular in cross section and has opposed lugs 40 projecting inwardly from opposite walls thereof. These lugs help to define a socket within the mullion extending from end to end thereof into which the flanges 35 and 36 slidably and snugly fit, flanges 35 being clearly shown in Figures 3 and 8.

It will be noted that in Figures 2 and 3 the front edge 42 of the inner mullion 30 projects beyond or outwardly from the edge 13 of floor 12. The upper end of the mullion also projects outwardly from the lower surface 24 of the solid wall 22.

An outer mullion 46 is secured to and extends longitudinally of the inner mullion. As the outer mullion is positioned beyond the edges 13 of the building floors and beyond the outer faces of the walls 20 and 22, it can extend from the top to the bottom of the building structure. In practice, the inner mullions of the various floors are aligned vertically so that the outer mullion may be connected to several inner mullions. The outer mullion is preferably made in sections as will be hereinafter described.

The outer mullion 46 in this example is rectangular in cross section, and preferably is hollow, as shown.

The inner and outer mullions are designed so that they

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may be snapped together and then secured to each other in any desired manner. One of the mullions is provided with a restricted opening in one side or edge extending longitudinally thereof, while the other mullion has spaced prongs connected to one side or edge and extending longitudinally thereof, these prongs being shaped to fit into the restricted opening of the other mullion to hold them together. In this example, the outer mullion 46 is provided with a restricted opening 49 in its inner edge extending longitudinally thereof, and the inner mullion has spaced prongs 50 connected to its outer edge and extending longitudinally thereof. The outer surfaces 52 of the prongs 50 diverge from their outer ends towards the mullion to form shoulders 53 at their inner ends which create recesses 54 between themselves and the edge 42 of the mullion. The restricted opening 49 of the outer mullion is shaped to correspond with these prongs. Each side wall 56 of the opening diverges from the inner side towards the outer side of said opening to a recess 57 formed by a lug 58 projecting inwardly of the opening at the outer side thereof.

When the outer mullion is moved towards the inner mullion, the outer ends of prongs 50 enter the opening 49 and are pressed towards each other by lugs 58 which ride on the diverging surfaces 52 of the prongs. When the lugs clear shoulders 53, they enter the prong recesses 54, at which time the prongs snap back towards their normal free positions. This locks the mullions together while they are permanently secured together in any convenient manner. In this example, a plurality of screws 60 are screwed through the sides of the outer mullion near the edge thereof in which the opening 49 is located and into the prongs 50 of the inner mullion, as clearly shown in Figure 3.

As shown in Figure 7, the outer mullion 46 is preferably made in a plurality of aligned sections 62. These sections are slidably connected together in any convenient way, such as by means of expansion sleeves 63. These sleeves slidably fit into the adjacent ends of the mullion sections. Each sleeve may be secured to one mullion and slidable within the other.

Any desired number of horizontal transoms 67 extend between adjacent outer mullions 46. Each transom is preferably hollow, as shown in Figure 2, and in this example it is rectangular in cross section. In the form of the invention illustrated in Figures 2 to 10, each transom is slidably connected at its ends to the adjacent outer mullions in any desired manner. One way of doing this is to provide each mullion with a seat 69 for each transom. In this example each seat is in the form of a U-shaped bracket bolted, screwed or welded to the outer mullion. The transom is provided with a restricted opening 71 in its inner edge 72 extending longitudinally thereof. This opening is preferably shaped in cross section the same as the opening 49 of the outer mullion. In order to install a transom, it is only necessary to move it horizontally over the seat 69 at the opposite ends thereof, said seats passing through the opening 71 in the transom edge. Shoulders 73 are formed inside the transom at the side of the opening 71 thereof. The sides of each seat bracket 69 are of such size and are so spaced apart that they fit snugly within an end of the transom. The shoulders 73 prevent the transom from being moved horizontally off its seats, and yet it is free to expand and contract longitudinally of itself since it is not fixedly connected to the seats.

A plug or cover plate 76 is provided for some of the transoms in case it is desired to close up the openings 71 thereof after they are installed. One of these plugs or cover plates is shown at the bottom of Figure 2 and in Figure 8. Each plug 76 is preferably hollow and rectangular in cross section, as shown, and is substantially the same width as the thickness of the transom. The plug has prongs 77 projecting from the side thereof which are shaped the same as the prongs 50 of the inner mul-

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lions so that they snap into place within the restricted opening 71 of the transom. This provides a facing for the inner edge of the transom in places where said inner edge is exposed to view within the building.

Figure 2 illustrates three transoms, 67a, 67b and 67c spaced from each other and extending between outer mullions 46a and 46b, said latter mullions being shown in Figures 1 and 3. The transoms 67a and 67b are at the upper and lower edges of the outer surface of the solid wall 22 and carry a solid section of curtain wall therebetween. Transom 67c is spaced below transom 67b, and these carry a transparent or window section of the curtain wall. As it is always possible that there may be condensation of moisture behind the curtain wall, and particularly in the confined space 80 between wall 22 and the curtain wall, suitable means has been provided for directing the water from the inside to the outside of the curtain wall through the framing thereof. Some or all of the transoms 67 may be provided with openings in the lower surface thereof adjacent their outer edges. In this example, transom 67b is provided with a plurality of small opening outlets 82 in its lower wall near the outer edge thereof. Suitable flashing 83 is secured to the wall 22 and has an inclined portion 84 extending through the restricted opening 71 of the transom into the interior of the latter, see Figure 2. This directs any moisture into the interior of the transom, and it drains out through the openings 82 which are outside the curtain wall.

The framing described so far constitutes the main part of this invention. The shell 11 of the building with its floors are erected by a contractor. The side of the building structure is left open as shown in part of Figure 1. In order to install the curtain wall framing, the inner mullions 30 are positioned between the floors and ceilings, and these are aligned in spaced vertical rows extending from the bottom to the top of the building. Each of these mullions is mounted between the lower and upper bearing plates 32 and 33 as described above. These mullions provide the foundation for the entire curtain wall. The outer mullions 46 are attached to the inner mullions and secured thereto by screws 60. These mullions extend from the top to the bottom of the building structure, and they are independent of the floors and the short solid walls thereof. This makes it possible to provide a curtain wall of any desired design regardless of the construction of the building structure. The horizontal transoms are then moved into place on their seats carried by the outer mullions. The flashing 83 is provided where desired, and cover plates 76 are attached to the transoms requiring them. The inner mullions are free to expand and contract longitudinally thereof because of their sliding connection with the bearing plates. Each of these mullions is slightly shorter than the distance between the upper and lower bearing plates. It is preferable to provide an expansion sleeve 63 between sections of the outer mullion connected to different inner mullions. This allows the outer mullion sections to expand and contract with the inner mullions to which they are connected. As the horizontal transoms are slidably connected at their ends to the outer mullions, they are free to contract and expand longitudinally thereof. Each transom is cut a little shorter than the distance between the two outer mullions to which it is connected.

As previously stated, this framing is capable of carrying any kind of curtain wall constructed of any type or various types of material. In order to facilitate the mounting of the wall elements in the framing, the outer mullions and horizontal transoms may be formed with means for positioning these elements.

An examination of an outer mullion and a transom will show that their cross sectional shapes are identical. This does not have to be the case, but it is desirable to have them identical for ease of manufacture. These elements may be manufactured or extruded in given

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lengths, and then cut to whatever lengths are required for a particular building.

Each outer mullion 46 may be formed with pairs of spaced ribs 87 and 88 projecting outwardly from its opposite sides and extending the length thereof. Each rib 87 may have a small shoulder 90 at its outer edge extending towards rib 88 and forming between itself and the side of the mullion a recess 91. Each rib 88 may be formed in the same way, or as shown, it may be undercut along its inner surface to form a recess 93 therein. Each pair of ribs 87—88 is located nearer the inner edge of the mullion than the outer edge thereof, see Figure 4. The mullion may also have L-shaped flanges 95 projecting laterally from its opposite sides at the inner edge thereof.

By referring to Figure 6, it will be seen that each transom 67 is provided with pairs of ribs 97—98 and L-shaped flanges 99 similar in shape and size to the ribs 87—88 and flanges 95, respectively, of the outer mullion.

When the mullions and transoms are assembled to form the framing, openings 102 are formed between the outer mullions and transoms connected thereto. Referring again to Figure 2, an opening 102a is bounded by transoms 67a and 67b and the outer mullions 46a and 46b, while another opening 102b is bounded by transoms 67b and 67c, and outer mullions 46a and 46b.

The opening 102a is closed by a panel 105 formed of any desired material and of any convenient construction. In this example, the panel is in the form of a single thickness of material. Suitable sealing material 108 is inserted between the flanges 99 and ribs 98 of the upper and lower transoms. Similar material is placed between the flanges 95 and ribs 88 of the two side outer mullions. Panel 105 is then inserted so that it bears against the flanges of the two transoms and the mullions and extends between the ribs 88 and 98 thereof. Snap-in glazing beads 110 are positioned between the pairs of ribs of the transoms and outer mullions to hold the panel in position. By referring particularly to Figure 2, it will be seen that each glazing bead 110 is U-shaped in cross section and has a portion 111 at the outer edge of one side thereof bent to fit into the undercut of a rib 88 or 98, this undercut being shown at 93 in Figure 4, while the opposite side of the bead is provided with a latch 112 having a sloping outer surface 113 and a shoulder 114. The bead 110 is made out of springy material, such as an aluminum alloy, and in order to insert it into position, the bent portion 111 thereis moved into the undercut of the rib 88 or 98 and then the bead is pressed towards the transom or mullion upon which it is being mounted. The latch 112 slides past the shoulder 90 of the ribs 91 or 97 until said flange engages the shoulder 114 thereof securely to hold the bead in position. This bead, in turn, bears against the panel 105 to press it against the flange 95 or 99 of a transom or mullion.

When a transom is located at the top or bottom of the large opening in the building structure, the pairs or ribs and the flange on the outer side thereof may be removed, or special transoms may be made having the ribs and flange on one side only thereof. On the other hand, the flange 99 may be used as additional anchoring means for the entire curtain wall. Transoms 67a of Figure 2 is shown at the top of a building opening, and as ribs 97 and 98 bear against the top of the opening, a space 115 is left therebetween, and this may be filled with a suitable sealing material, as shown. If the upper flange 99 is left on the transom, it is necessary to cut a channel 116 in material forming the upper part of the building opening into which this flange may extend. Once the flange is in place, the channel may be filled with a suitable grouting or sealing material 117 which imbeds the flange. The same thing may be done if a transom is located at the bottom of the building opening.

In Figure 3, the outer mullion 46a is up against the

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side of the large building opening. Here again, the outer flange and ribs thereof may be omitted or, as shown, the space created by the ribs 97—98 may be filled with a sealing composition 120 and the flange 99 may be imbedded in the material of the building structure in the same manner as the flange 95 of transom 67a, as illustrated in Figure 3.

Referring again to Figure 2, the opening 102b between the transom 67b and 67c, and outer mullions 46a and 46b is closed by a glass panel 215. In this example, the glass panel is provided with a hollow metal frame 126 of well-known construction which is secured to the bounding transoms and mullions in any suitable way, such as by means of bolts 128. One side of the frame 126 bears against the flanges 95 and 99 of the transoms and mullions, while a portion 130 of this frame bears against the outer sides of ribs 87 and 97 of said transoms and mullions. If desired, the space 132 between the window frame and the flanges and transoms and mullions may be filled with a suitable sealing compound.

For cold and damp climates, it may be desirable to provide insulation means between the outer and inner mullions, and between the horizontal transoms and the cover plates 76 thereof. For this purpose, extruded gaskets 136 formed of rubber, plastic or other suitable material may be shaped to fit within the restricted openings of the outer mullions between the edges of said openings and the prongs and inner edge of the inner mullion.

Figure 9 illustrates an outer mullion 139 which is similar to the previously-described outer mullions, but is slightly different therefrom. This mullion has a restricted opening 140 in and extending the length of its inner edge. The opening is restricted by pairs of ribs 141 and 142 extending from the side of the mullion into said opening, said ribs running the length of the mullion. Each rib 141 is formed with a tapered shoulder 144 along its outer edge, while each rib 142 is also formed with a tapered shoulder 145 along its outer edge. An inner mullion 148 is provided on its outer edge with spaced prongs 149 extending the length thereof. These prongs may be exactly the same as those of the inner mullions 30. A gasket 152 formed of any suitable insulating material, such as rubber or resilient plastic material, is shaped to lie between each prong 149 and the adjacent side of the outer mullion 139. This gasket is formed with a pocket 153 in its outer surface extending the length thereof. This pocket has tapered sides 154 adapted to fit over and correspond with the sides 144 and 145 of the ribs 141—142. As the gasket is formed from a resilient insulating material, it fits over the ribs 141—142. Screws 156 extend through the sides of the outer mullion, the gaskets, and into the prongs 149. These gaskets prevent heat or cold travelling from one mullion to the other.

Figure 10 illustrates a horizontal transom 160 having a restricted opening 161 in and extending the length of its inner edge. This transom is preferably formed in the same shape as the outer mullion 139. It has spaced ribs 163—164 projecting from each of its sides into its restricted opening, said ribs being shaped the same as ribs 141—142 in order to receive an insulating gasket 167 which is formed with a pocket 168 adapted to fit over said ribs, as clearly shown in the drawing. A plug or cover plate 172 has spaced prongs 173 which are adapted to extend between the gaskets within the opening 161 of the transom. These prongs may be shaped the same as those of cap 76. The gaskets tend to prevent heat or cold traveling between the transom and the cover plate.

Gaskets 152 and 167 are preferably constructed by extrusion, and are formed of rubber, plastic or other suitable material which will act as insulation and is flexible enough to be fitted over the ribs of the outer mullion or the transom.

Figure 11 illustrates an alternative form of transom. A transom 165, similar to the previously-described transoms, is made in two identical sections 166 and 167.

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These sections are aligned and are slidably connected together at the centre of the transom by an expansion sleeve 170 which fits in to the adjacent ends of the sections. The outer end of section 166 is permanently connected to the side of an outer mullion 174. The outer end of transom section 167 is also permanently connected to an outer mullion, not shown. Both sections of the transom are provided with a drainage channel 176 in the upper surfaces thereof and extending longitudinally of the transom. Each of these channels extends to an opening 177 in the mullion to which the transom section is connected.

In tall buildings, it is necessary to catch the rain running down the side thereof at various levels in order to avoid the accumulation of a large quantity of water flowing down the wall towards the bottom of the building. The channels 176 of each transom 165 catches water running down the curtain wall at said transom and directs it through the opening 177 into the outer mullion. This water is removed from the lower end of the mullion in any convenient manner.

Figure 12 illustrates alternative forms of inner and outer mullions. A hollow inner mullion 180 is adapted to be mounted in the same manner as the previously-described mullions. This mullion has a wall 181 along its outer edge instead of the restricted opening of the other mullions. A tongue or prong 184 projects outwardly from this wall and extends longitudinally of the mullion. The tongue fits into a restricted opening or slot 186 formed in the adjacent edge of an outer mullion 187 and extending the length of the latter. This mullion may be hollow or, as shown, it may be solid. A plurality of screws 189 extend through the portions of the outer mullion on the opposite sides of its opening or slot 186 and through the prong 184 in said opening or slot.

Panels 192 formed of suitable material, such as glass, may be held against the wall 181 of the inner mullion on opposite sides of the outer mullion in any suitable manner. In this example, the outer mullion is provided with ribs 194 along its outer surface extending longitudinally thereof and spaced from the inner edge 195 of said mullion. Each of these ribs is undercut as at 196 to receive a spring clip 198. Each of these clips is formed with a portion 199 which extends beneath one of the ribs 194 and towards the panel 192. It also is formed with another portion 200 connected to portion 199 and lying substantially parallel with and against the panel. A shoulder 201 is formed on the free edge of the portion 200, said shoulder fitting between the adjacent edge of the panel and the side of the outer mullion adjacent the inner edge thereof.

If desired, a cover 205 which is U-shaped in cross section may enclose the outer mullion, in which case it is secured to the latter by screws 206 which extend into the outer edge of said mullion. This cover extends the length of the outer mullion, and its sides extend inwardly to the panels 192 on opposite sides of said mullion.

The cover 205 may be made the same length as each outer mullion section 187, and the latter usually extends the height of one floor of the building, though this is not absolutely necessary. The outer mullion sections are movably connected together in any desired manner in order to provide an outer mullion extending from the top to the bottom of the building. It would be a simple matter to fit the adjacent ends of two outer mullion sections into a sleeve so that said ends may move relative to each other.

Transoms similar to those already described may be used with the inner and outer mullions 180 and 187. The ends of the transoms may be connected to the sides of the cover 205 or to the sides of the outer mullion. In the latter case, the cover would be cut away where desired to accommodate the transoms.

As the curtain wall framing set out herein may be used for side and/or end walls of a building, it is to be under-

stood that the term "side" when used throughout this specification and in the appended claims with reference to a building, is intended to include the building ends as well as the sides thereof.

What I claim as my invention is:

1. Curtain wall framing, in combination with a building structure having openings in the side thereof, said openings being above each other between the different floors of the building, comprising inner mullions within each building opening extending from top to bottom thereof at the side of the building, said mullions being aligned in rows with one in each floor opening in each row, means at the opposite ends of each mullion for securing it in place within its opening, an outer mullion secured to each row of inner mullions throughout the lengths of the latter mullions and extending vertically outside the building side from the top to the bottom thereof, hollow horizontal transoms outside the building side connected at the ends thereof to the outer mullions, each transom having an opening in and extending longitudinally of its inner edge, flashing extending into each transom through the opening thereof, and at least one outlet in the lower wall of each transom near the outer edge thereof.

2. In curtain wall framing, the combination comprising a hollow inner mullion, a hollow outer mullion, a narrow slot in a side of one mullion extending the length thereof, spaced outwardly extending prongs connected to the mullion with the slot therein on opposite sides of said slot and extending the length of the mullion, a shoulder extending longitudinally of the outer surface of each prong, a restricted opening in a side of the other mullion extending the length of the latter, recesses in the mullion with the opening on opposite sides of and opening into the latter and extending the length thereof, the prongs of the one mullion fitting in the restricted opening of the other mullion with the prong shoulders fitting in the recesses, a hollow transom having a slot in and extending the length of one side thereof, a seat on a side of the outer mullion extending outwardly therefrom, said transom being adapted to be slipped sideways on the seat until the latter extends through the slotted end thereof into its interior, and a cap having prongs extending from a surface thereof and removably fitting in the transom slot, said cap being substantially the same length as the transom.

3. Curtain wall framing as claimed in claim 2 including insulating gaskets between the transom and the cap and between the former and the prongs of the cap.

4. In curtain wall framing, the combination comprising a hollow inner mullion, a hollow outer mullion, a narrow slot in a side of one mullion extending the length thereof, spaced outwardly extending prongs connected to the mullion with the slot therein on opposite sides of said slot

and extending the length of the mullion, a shoulder extending longitudinally of the outer surface of each prong, a restricted opening in a side of the other mullion extending the length of the latter, recesses in the mullion with the opening on opposite sides of and opening into the latter and extending the length thereof, the prongs of the one mullion fitting in the restricted opening of the other mullion with the prong shoulders fitting in the recesses, and a transom connected at one end to the outer mullion, said transom being formed in two aligned sections slidably held together by a connecting member.

5. In curtain wall framing, the combination comprising a hollow inner mullion, a hollow outer mullion, a narrow slot in a side of one mullion extending the length thereof, spaced outwardly extending prongs connected to the mullion with the slot therein on opposite sides of said slot and extending the length of the mullion, a shoulder extending longitudinally of the outer surface of each prong, a restricted opening in a side of the other mullion extending the length of the latter, recesses in the mullion with the opening on opposite sides of and opening into the latter and extending the length thereof, the prongs of the one mullion fitting in the restricted opening of the other mullion with the prong shoulders fitting in the recesses, and a horizontal transom connected at one end to the outer mullion, said transom having a drainage channel in its upper surface extending longitudinally thereof, and the outer mullion having an opening therein registering with the end of said channel.

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