

[54] CONSTRUCTION ELEMENT ASSEMBLY

[75] Inventors: **S. Eugene Hubbard; Lawrence F. Biebuyck**, both of Niles, Mich.

[73] Assignee: **American Metal Climax, Inc.**, New York, N.Y.

[22] Filed: **Apr. 3, 1970**

[21] Appl. No.: **25,457**

[52] U.S. Cl. **52/731**

[51] Int. Cl. **E04c 3/04**

[58] Field of Search 52/729, 730, 731, 732, 52/498, 476

[56] **References Cited**

UNITED STATES PATENTS

3,299,596	1/1967	Neal et al.	52/732 X
3,349,538	10/1967	Crossman	52/731
3,377,756	4/1968	Polhamus	52/731 X

Primary Examiner—Price C. Faw, Jr.
Attorney, Agent, or Firm—Mason, Kolehmainen, Rathburn & Wyss

[57] **ABSTRACT**

There is provided a new and improved entrance system for a building which permits a latitude of design by the architect. The system includes a door formed of butt joined vertical and side rails, the rails each having side pockets extending beyond spaced webs thereby forming glazing pockets. Longitudinal parts on the tubular structures of the rails define longitudinal screw splines. Twisting and shear stresses between the rails are reacted through a joint block of general T-shape having a body portion fitting within the glazing pocket of one rail and a tongue portion fitting within the tubular structure of the abutting rail. Screw fasteners extend through the joint block and the rails to secure the rails together. Hinges are readily fastened to the vertical rails of the door without cutting through heavy structural portions of the rail. Moreover, a system of push-pull hardware is provided for the doors. A graphic identification system permits the adaptation of the entrance structure for identifying signs and labels. Thus, the program permits wide latitude to the architect with regard to the combination of the elements into building entrances.

5 Claims, 45 Drawing Figures

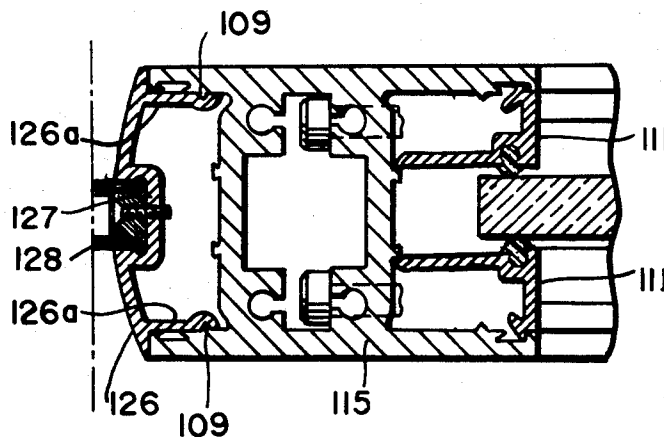


FIG. 2

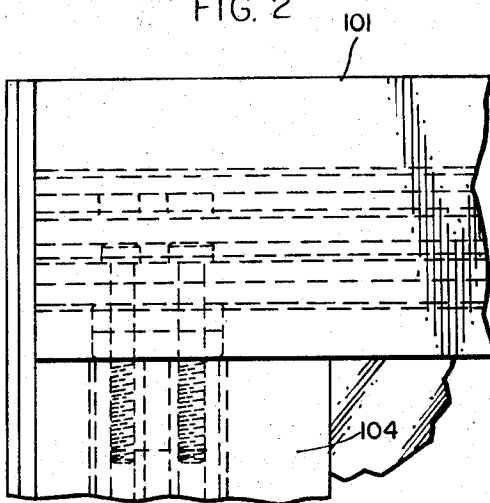


FIG. 3

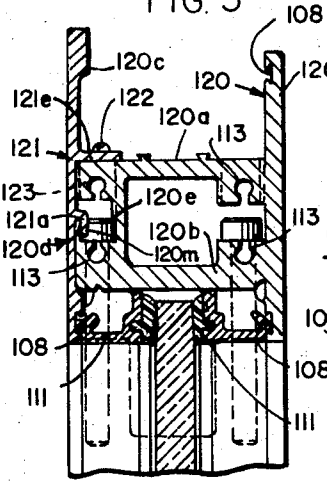


FIG. 1

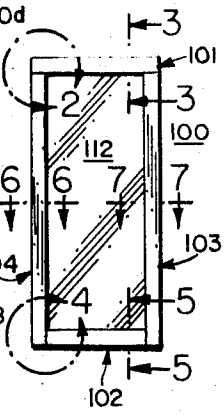


FIG. 6

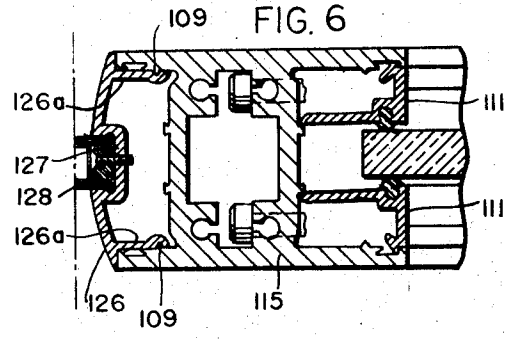


FIG. 7

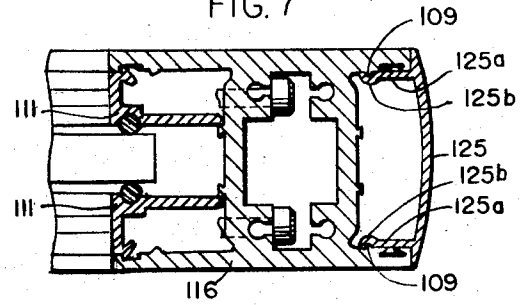


FIG. 4

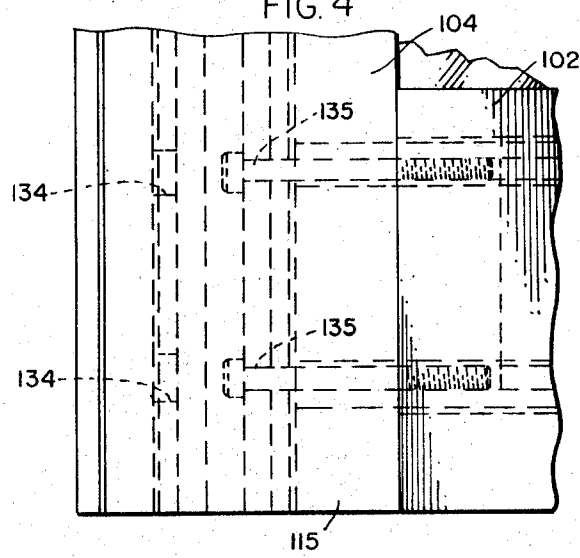
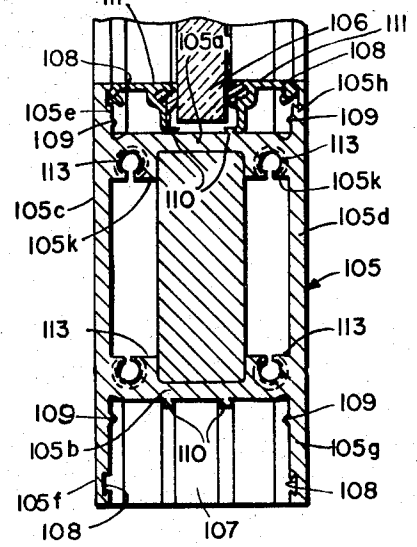


FIG. 5

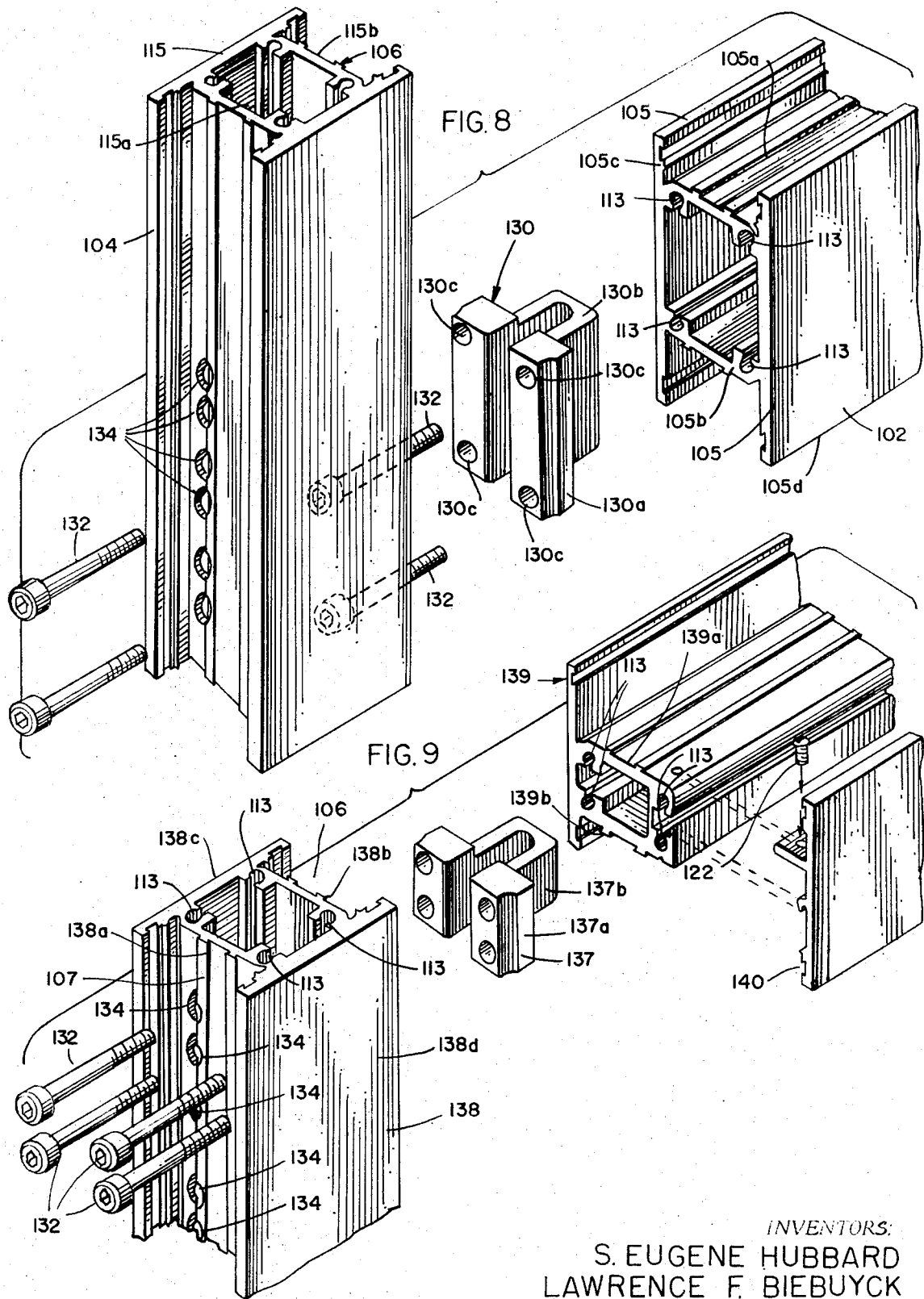


INVENTORS:

S. EUGENE HUBBARD
LAWRENCE F. BIEBUYCK

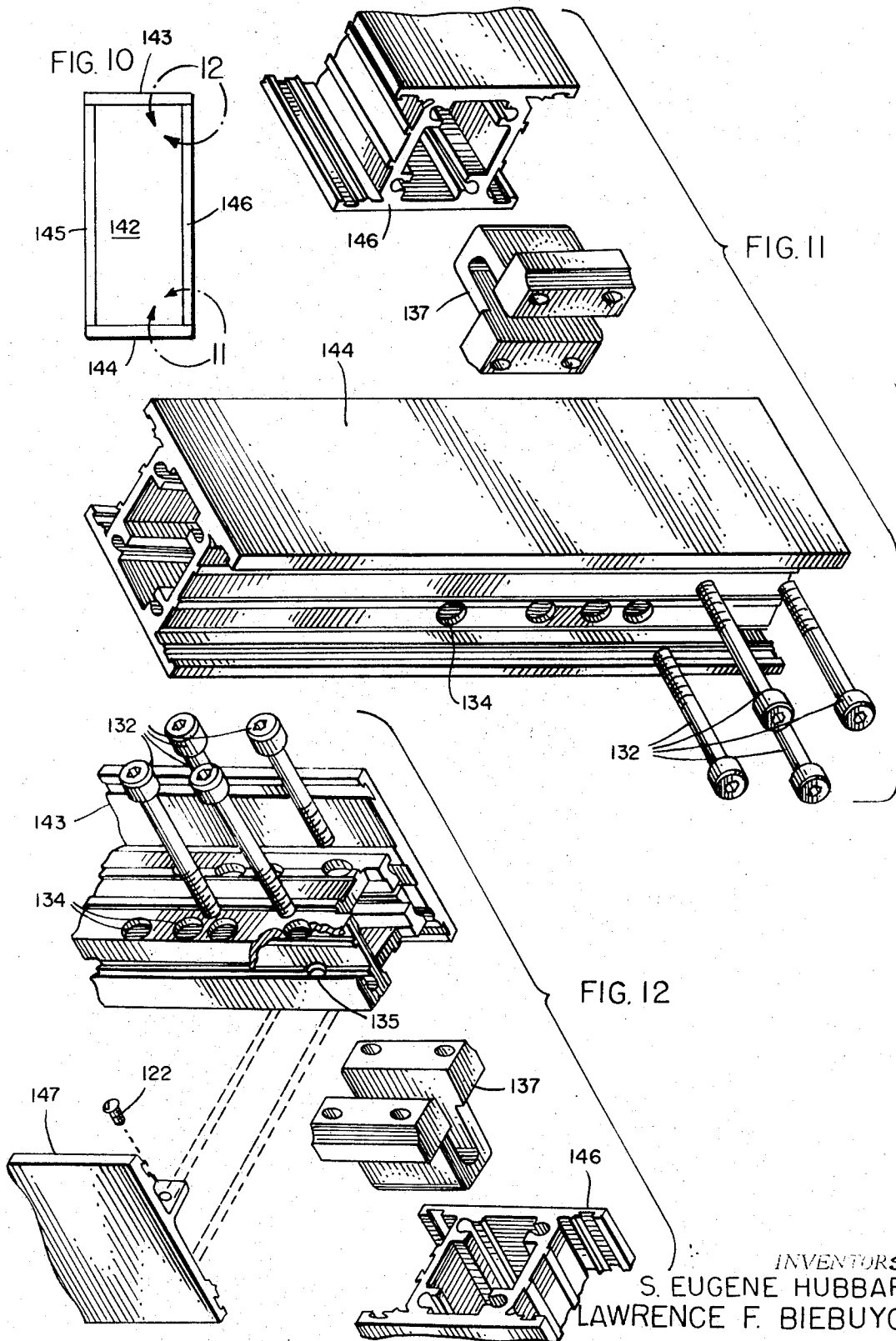
BY: *C. Magoy, Kolehmainen, Rathburn & Wyss*

ATT'YS



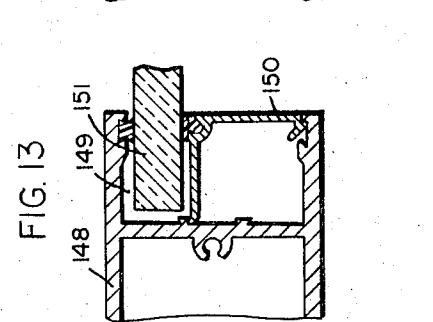
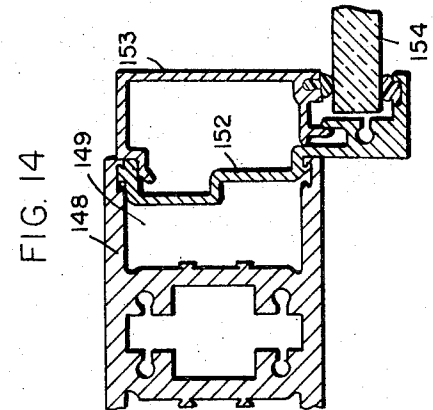
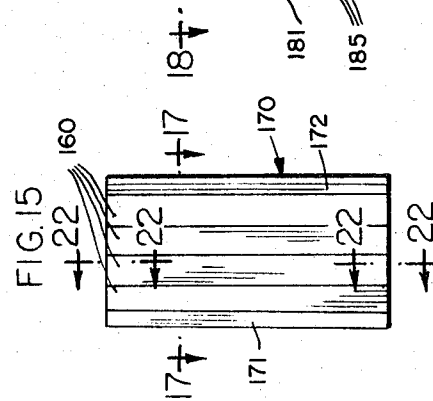
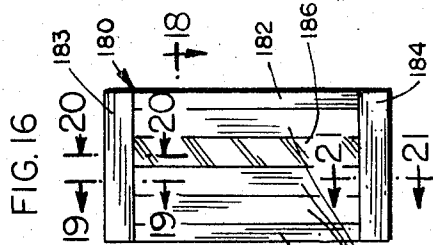
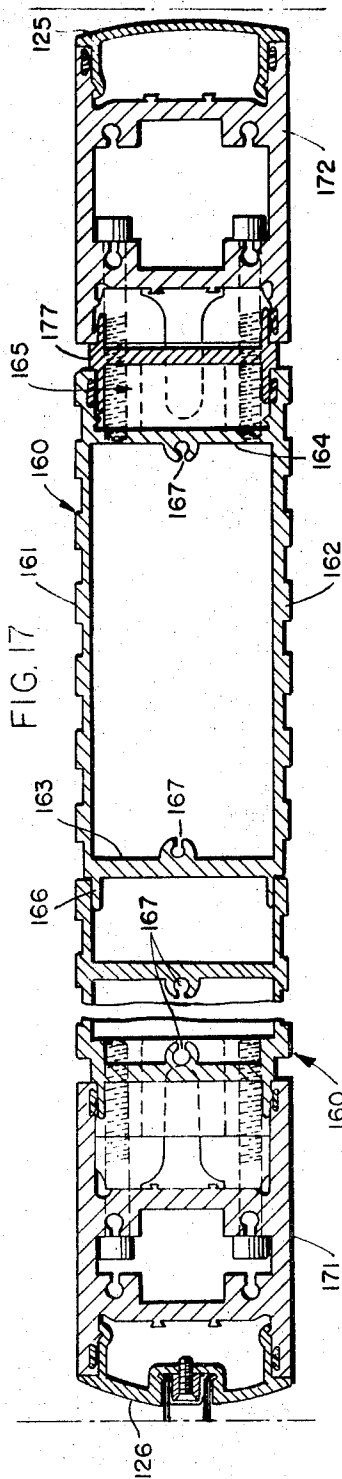
INVENTORS:
S. EUGENE HUBBARD
LAWRENCE F. BIEBUYCK

BY: *Massey, Kolehmainen, Rathbun & Wyss*
ATT'YS



INVENTORS:
S. EUGENE HUBBARD
LAWRENCE F. BIEBUYCK

BY: *Mazor, Kolehmainen, Prathburijolby*
ATT'YS



INVENTORS:

S. EUGENE HUBBARD
LAWRENCE F. BIEBUYCK

BY: *Wagon, Kolehmainen, Rathburn & Wyss*

ATT'YS

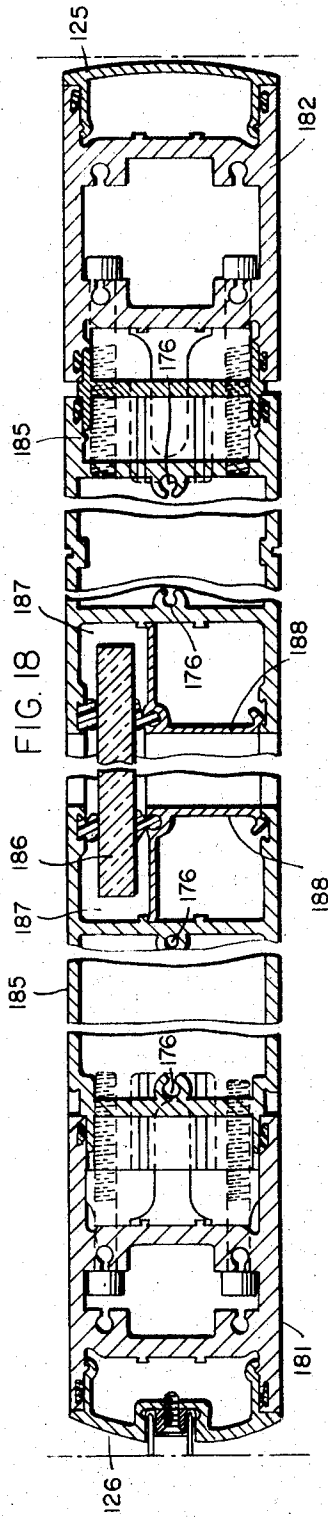


FIG. 22

FIG. 21

FIG. 20

FIG. 19

INVENTORS:
S. EUGENE HUBBARD
LAWRENCE F. BIEBUYCK
BY: *Mason, Kolehmainen, Rathbun & Wyss*
ATT'YS

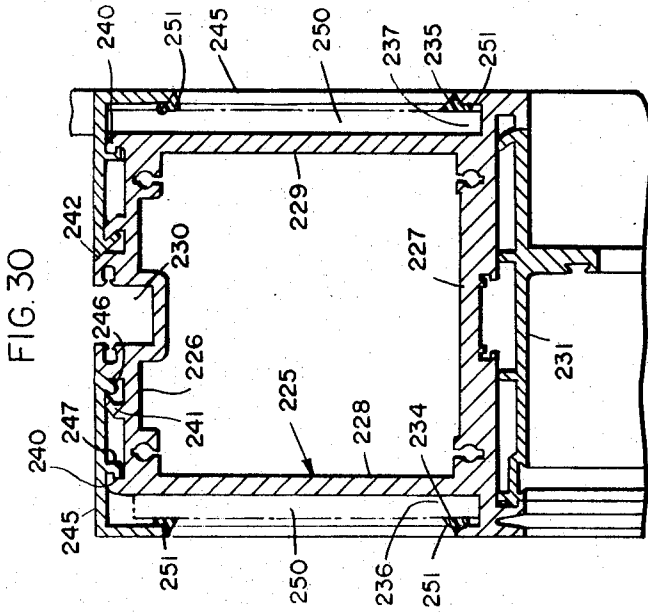


FIG. 30

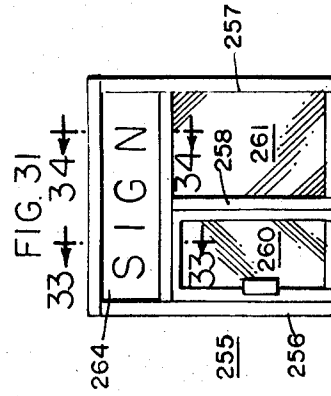


FIG. 31

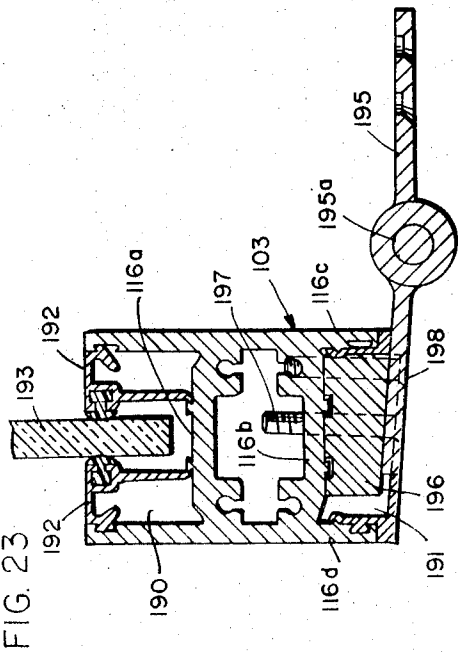


FIG. 23

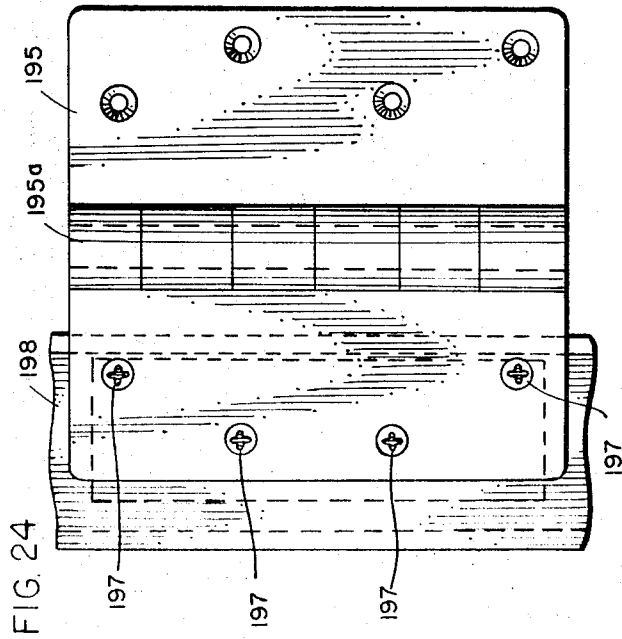


FIG. 24

INVENTORS:
 S. EUGENE HUBBARD
 LAWRENCE F. BIEBUYCK

BY: *Mason Kolchmainer, Rathbun & Wyss*
 ATT'YS

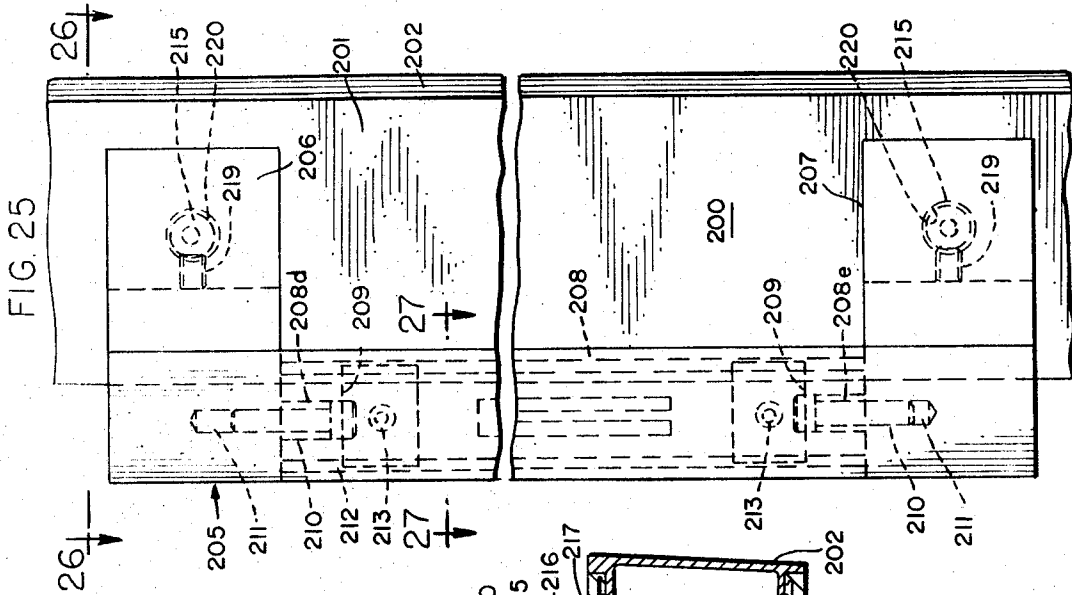


FIG. 25

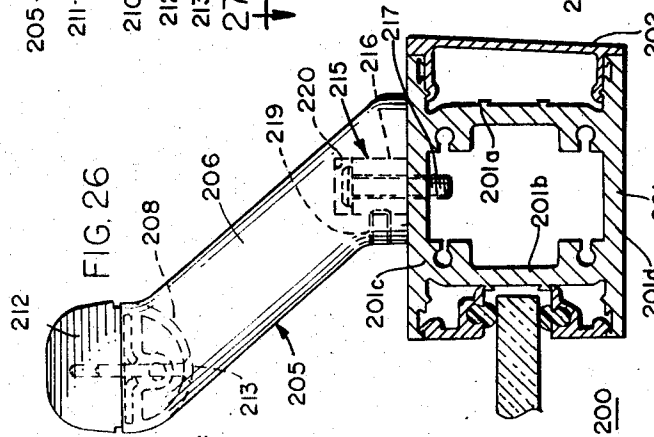


FIG. 26

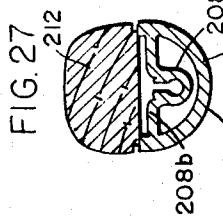


FIG. 27

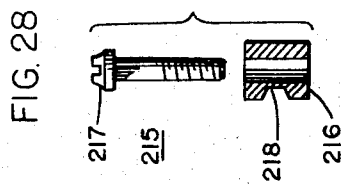


FIG. 28

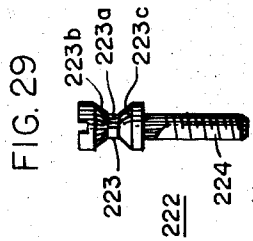


FIG. 29

INVENTORS:
 S. EUGENE HUBBARD
 LAWRENCE F. BIEBUYCK

BY: *Masoy, Kolehmainen, Rathbun & Wyss*
 ATT'YS

FIG. 34

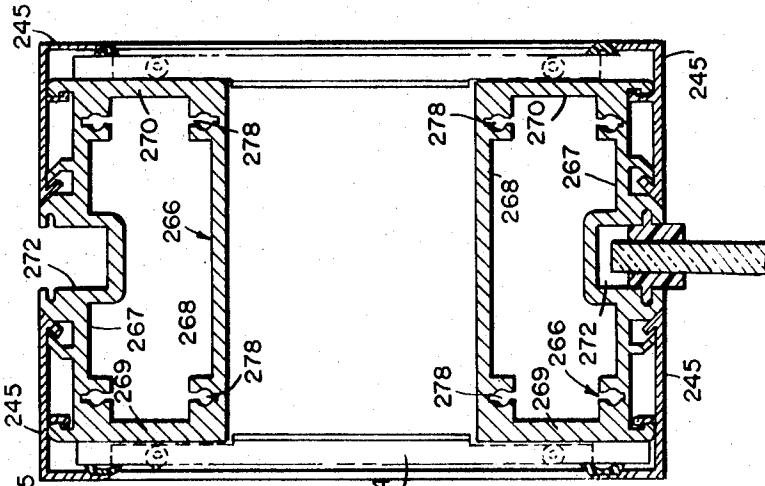


FIG. 33

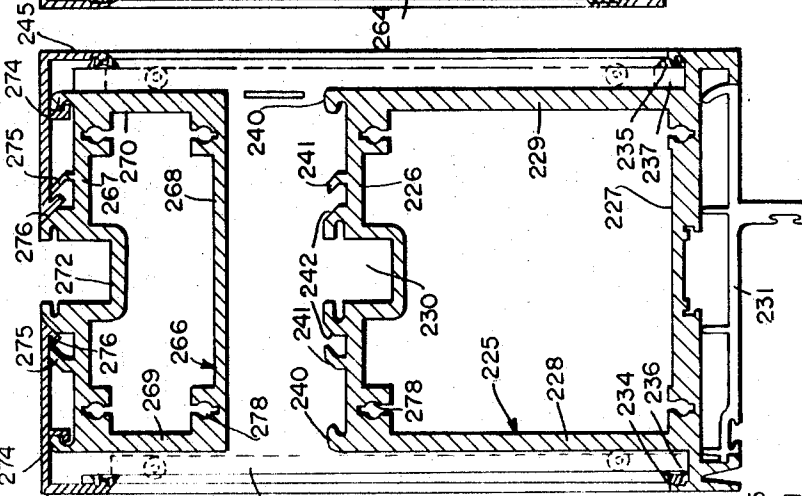
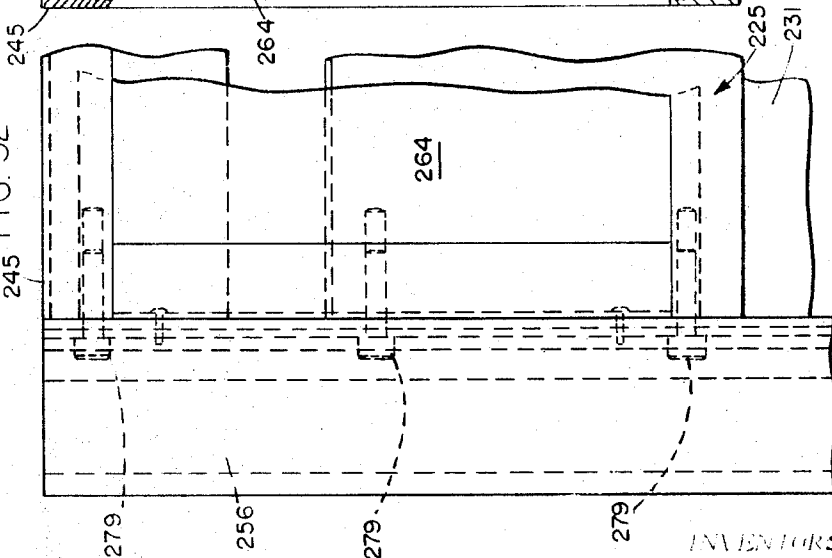
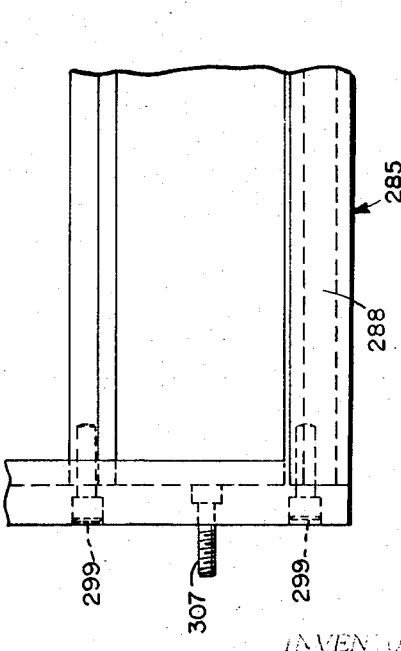
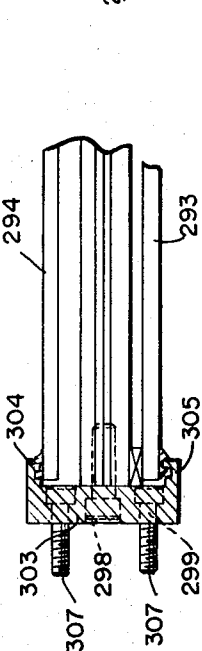
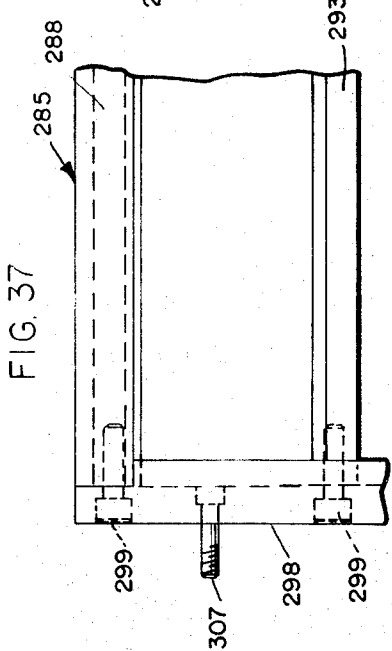
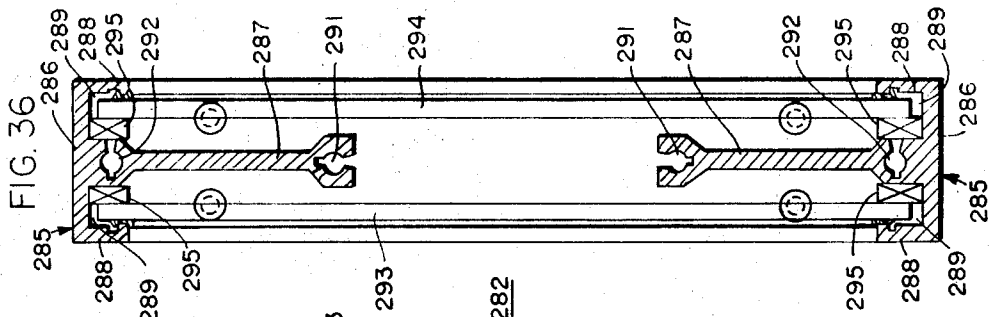
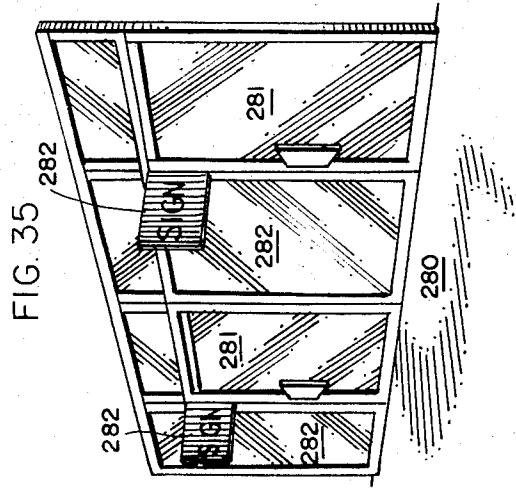
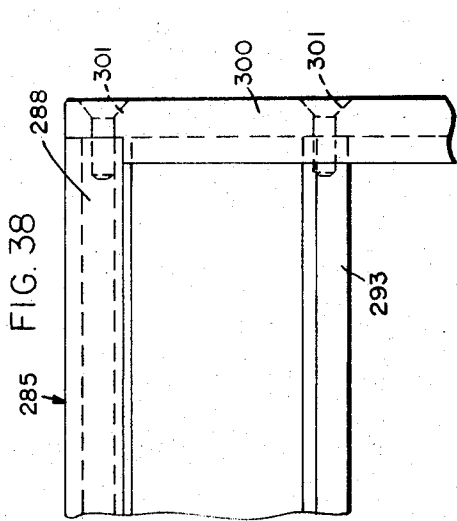


FIG. 32



INVENTORS:
S. EUGENE HUBBARD
LAWRENCE F. BIEBUYCK

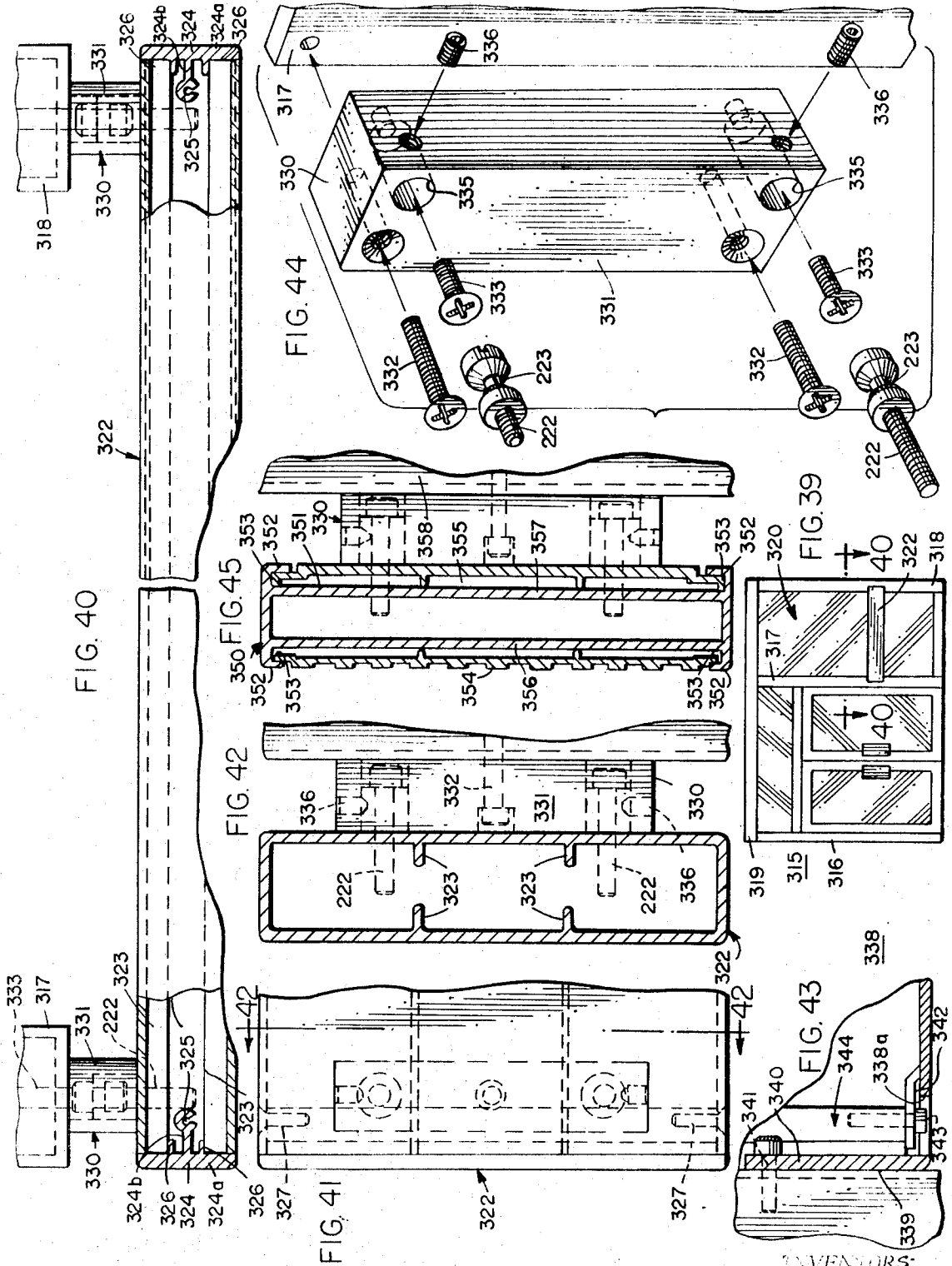
BY: *Mason, Kolehmainen, Rathbun & Wyss*
ATT'YS



INVENTORS:

S. EUGENE HUBBARD
LAWRENCE F. BIEBUYCK

BY: *Magoy, Kolehmainen, Rathbun & Wyss*
ATT'YS



INVENTORS:
S. EUGENE HUBBARD
LAWRENCE F. BIEBUYCK

BY: *Mason, Kolehmainen, Rathbun & Wyss*
ATT'YS

CONSTRUCTION ELEMENT ASSEMBLY

The present invention relates to an improved entrance structure, and more specifically to a coordinated system of doors, entrance frames, graphic identification, and hardware to provide an entrance arrangement having a wide latitude with regard to the combination and design in building entrances. The system is particularly adapted to be assembled from extruded aluminum construction elements.

Heretofore commercially available aluminum doors and entrances have generally been highly standardized, mass produced products which look and act very much like the doors made of other materials. Aluminum doors, particularly, are strong enough to withstand heavy traffic if the door is not abused. It has definite advantages in that it provides little obstruction to a clear view of the interior of the building from the street. Although it has somewhat marginal weathering properties, these may be of little importance if the doors are likely to be open a large part of the time. Many of these doors go into building facades that do not warrant, and do not get, the benefit of architectural design services. However, there are buildings such as schools, colleges, public auditoriums, recreation buildings, churches, and public buildings of all kinds wherein the ordinary commercial aluminum door is not satisfactory. These buildings are always architect-designed and their entrances are an integral part of their design compositions. The commercially available door does not give the monumental entrance the visual impact that it must have if it is to be part of the building design composition. Doors in these buildings get heavy traffic, and sometimes abusive traffic. They must be strong, and look strong.

To provide an entrance, doors must be mounted in frames. Historically, the frames have been developed at different times as completely independent products. As they stand commercially today, the doors of any manufacturer may be mounted in the frames of any other manufacturer without any loss of design impact. Door hardware has been another weakness of the commercial aluminum door as applied to monumental entrances

It has been recognized that commercial doors are often too light in appearance and too weak in structure for buildings of institutional character. Some manufacturers have responded by making a commercial door with wide stiles. Other manufacturers have brought out heavier walled portions of commercial doors, and have given them various labels such as "institutional" doors. These beefed up doors do look stronger, and may actually be stronger. But they offer the architect no design options over the conventional commercial door.

Accordingly, it would be advantageous if an entrance structure were offered specifically designed to set off the architecture of the building, and if the architect had options as to the character and proportion of the push-pull hardware. Moreover, it would be desirable for the architect in buildings of monumental character to have the option of designing his own doors to complement his building. Thus, it would be desirable to provide a system of elements which may be combined to provide custom doors and entrances for buildings.

Accordingly, one object of the present invention is to provide a new and improved entrance structure which has the above mentioned advantages.

A further object of the present invention is to provide a new and improved entrance structure which provides an architect with a latitude of design combinations.

Yet another object of the present invention is to provide a new and improved door.

Still another object of the present invention is to provide a new and improved door which may be custom designed with a wide latitude of design combinations.

Still another object of the present invention is to provide a new and improved door structure which is sturdy and rugged in construction.

Still another object of the present invention is to provide a new and improved entrance frame system for an entrance structure.

Still another object of the present invention is to provide a graphic identification system for use with an entrance system.

Still another object of the present invention is the provision of an improved door hardware system for an entrance structure.

In accordance with these and many other objects of the present invention, there is provided a new and improved entrance structure which permits wide latitude with regard to the combination of the components to the architect. An improved door system is provided wherein the door is formed of interconnected vertical and side rails. The rails are formed of a pair of spaced side faces and a pair of spaced transverse webs, the side faces including legs projecting outwardly of the webs to define pockets. The webs and portions of the faces therebetween form a tubular structure, and longitudinal parts at the corners of the tubular structure define longitudinal screw splines. The improved door includes a corner joint wherein the vertical and side rails are butt joined together by a joint block of generally T-shape having a body portion fitting within the pocket of one rail and having a tongue portion fitting within the tubular structure of the other rail. Thus, shear and twisting loads of the door are carried in the joint block. The butt fitted joint may be secured in any conventional manner as by screws. However, the joint corners may additionally be welded if desired.

In accordance with another feature of the present invention there is provided an improved frame system compatible with the door. A graphic identification system is provided with the entrance structure. Moreover, improved door hardware is provided for the entrance structure.

For a better understanding of the present invention reference may be had to the accompanying drawings wherein:

FIG. 1 is an elevational view of a new and improved door according to the present invention;

FIG. 2 is a detailed view of a corner joint structure of the door of FIG. 1, taken along detail 2 of FIG. 1;

FIG. 3 is a cross sectional view of the upper rail of the door of FIG. 1, taken along line 3—3 of FIG. 1;

FIG. 4 is a corner detail of the door of FIG. 1, taken along detail 4 of FIG. 1;

FIG. 5 is a cross sectional view of the lower rail of the door of FIG. 1, taken along line 5—5 of FIG. 1;

FIG. 6 is a cross sectional view of one vertical door stile, taken along line 6—6 of FIG. 1;

FIG. 7 is a cross sectional view of the other vertical stile of the door of FIG. 1, taken along line 7—7 of FIG. 1;

FIG. 8 is an exploded view of a lower corner joint wherein the vertical rail is through;

FIG. 9 is an exploded view of an upper corner joint wherein the vertical rail is through;

FIG. 10 is an elevational view of a typical door with through horizontal rails;

FIG. 11 is an exploded view of the lower corner detail 11 of FIG. 10, illustrating a typical through horizontal lower rail joint;

FIG. 12 is an exploded view of the upper corner joint 12 of FIG. 10, illustrating a typical through upper rail joint;

FIG. 13 is a cross sectional view of a typical door rail illustrating a different glazing arrangement wherein the glazing panel is offset from the center of the door;

FIG. 14 is a cross sectional view of a typical door rail illustrating a projected glass stop compatible with the present system;

FIGS. 15 and 16 represent two door structures composed in part of vertical panels illustrating the versatility of the present entrance system;

FIG. 17 is a cross sectional view of the door of FIG. 15, taken along line 17—17 thereof;

FIG. 18 is a cross sectional view of the door of FIG. 16, taken along line 18—18 thereof;

FIG. 19 illustrates a top rail assembly taken along line 19—19 of FIG. 16;

FIG. 20 represents a top rail assembly taken along line 20—20 of FIG. 16;

FIG. 21 illustrates a lower rail assembly taken along line 21—21 of FIG. 16;

FIG. 22 illustrates a horizontal rail structure wherein the planks go through and typically shown as 22—22 of FIG. 15;

FIGS. 23 and 24 are fragmentary views illustrating the connection of standard butt hinges to the stile of a door according to the present invention;

FIG. 25 is a fragmentary elevational view illustrating a standard pull handle attached to a door according to the present invention;

FIG. 26 is a fragmentary sectional view of the door of FIG. 25, taken along line 26—26 of FIG. 25;

FIG. 27 is a cross sectional view of the push handle taken along line 27—27 of FIG. 25;

FIG. 28 is an exploded view of a fastening stud according to the present invention;

FIG. 29 is an exploded view of another embodiment of a fastening stud according to the present invention;

FIG. 30 is a cross sectional view of a standard transom bar assembly incorporating graphic identification means for use with an entrance structure according to the present invention;

FIG. 31 is an elevational view of an entrance structure according to the present invention and illustrating the improved graphic identification system;

FIG. 32 is an enlarged detailed view of the graphic identification system of FIG. 31;

FIG. 33 is a cross sectional view of the graphic identification system of FIG. 31, taken along line 33—33 of FIG. 31

FIG. 34 is a cross sectional view of the graphic identification system of the entrance structure of FIG. 31, taken along line 34—34 of FIG. 31;

FIG. 35 illustrates an entrance structure according to yet another embodiment of the present invention and

illustrating an improved system of projected out signs;

FIG. 36 is a cross sectional view of a projected out sign of FIG. 35;

FIG. 37 is a fragmentary elevational view, illustrating a horizontal cross section, of the projected out sign of FIG. 35;

FIG. 38 is a fragmentary elevational view illustrating the end construction of the projected out sign of FIG. 35;

FIG. 39 is an illustration of yet another entrance structure according to the present invention and illustrating an improved safety rail system;

FIG. 40 is a plan view of the safety rail system of FIG. 39, taken along line 40—40 of FIG. 39;

FIG. 41 is a fragmentary elevational view illustrating an end construction of the safety rail of FIG. 40;

FIG. 42 is a cross sectional view of the safety rail of FIG. 41, taken along line 42—42 of FIG. 41;

FIG. 43 is a fragmentary detailed view illustrating the attachment of a safety rail between vertical mullions;

FIG. 44 is an exploded view of a typical stanchion assembly securing a safety rail to a vertical mullion; and

FIG. 45 is a cross sectional view of another embodiment of a safety rail wherein removable insert faces may be used with the safety rail.

Referring now to the drawings, and particularly to the embodiment of FIGS. 1 through 7, there is illustrated an improved door 100 according to the present invention. As therein illustrated, the door, for purposes of illustration, has a through upper rail assembly 101, a lower rail assembly 102, and two side rail assemblies 103 and 104. Glass or other suitable panel 112 is in the opening formed by the interconnected rail assemblies 101, 102, 103 and 104.

The rails make up the basic structure of the door, and are generally universal and interchangeable, capable of being used as verticals, horizontals, or intermediates. A typical construction element forming a rail assembly is illustrated in FIG. 5. As therein illustrated, a construction element 105 is formed by extrusion or other suitable means of suitable material such as aluminum. The extrusion element 105 has a generally tubular structure defined by spaced transverse webs 105a and 105b, and spaced interconnecting side faces 105c, 105d. The side faces include legs 105e, 105f, 105g and 105h projecting outwardly of the webs on both sides thereof to form pockets 106, 107. The interconnected webs and the portions of the side faces therebetween form a tubular structure to provide strength and rigidity to the construction elements. Longitudinal parts at the corners of the tubular structure define longitudinal screw splines 113 for use in the assembly. These screw splines 113 have flattened tops 105k to provide solid bearing for the heads of assembly screws. As indicated, the parts forming the screw splines 113 are filleted directed to the heavy side faces 105c, 105d, as well as to the webs 105a, 105b, serving to provide stiffness and transfer of stress at the joints between the rails and between the screws and side faces 105c, 105d. The webs 105a and 105b may be made thinner than the faces in order to conserve material and in recognition that they carry comparatively light loads and are not exposed to abuse. In the interest of universal use, the glazing pockets 106, 107 are provided on their inner surface with weathering pockets of glazing channels 108, and with longitudi-

nally extending inwardly projecting V-shaped ribs 109. Along the bottom of the bight portion of the pockets 106 and 107 are one or more longitudinally extending dove-tailed ribs 110. The glazing channels 108, and the ribs 109 and 110 cooperate to support a suitable glazing means as more fully described later. However, in the illustrated embodiment there is provided a pair of glass stops 111 for supporting a glass panel 112, FIG. 1, within the door. Thus, the basic rail extrusion used in the side rails and lower rail are all similar to that illustrated in FIG. 5, except for their availability with standard face widths, such as of 3, 4-½, and 6 inches. Rails of such various face widths are illustrated in FIG. 6, element 115, and in FIG. 7, element 116. Elements 115 and 116 are similar to construction element 105 except for the difference in the face length.

To provide for glazing of the door after assembly thereof, the upper rail (and intermediate rails if used) have a removable face. As herein illustrated, referring to FIG. 3, there is provided a construction element 120 including webs 120a and 120b and side portions 120c and 120d. One side portion 120c, however, includes a removable face 121 and a connecting portion 120e interconnecting the webs 120a and 120b and filleted to its adjacent screw splines 113. The lower projecting leg of the side face 120d is provided with a glazing channel 108; since the upper projecting leg of the removable face 121 will never be used to support glazing means, only the lower projecting end thereof is provided with the glazing channel. However, if the rail were to be used as an intermediate, then a glazing channel would be provided on both projecting legs of the removable face. To secure the removable face 121 to the construction element, there is provided an interlocking tongue 120m fitted within a groove 121a of the face and extending upwardly from the outer portion of the screw splines 113. Additionally, there is provided a longitudinally extending transverse flange 121e extending inwardly from the removable face 121 and seated against the upper one of the webs 120a, being secured in place by suitable screws 122. Advantageously the removable face 121 may be removed only when the door 100 is open, and presents an unbroken outward face with no weathering joints, eliminating the possibility of vandalism and tampering.

Any door system must of course be provided with stile caps. Typical stile caps are shown in FIGS. 6 and 7. Referring to FIG. 7, there is illustrated a stile cap 125 completely covering the edge of the rail 116, necessary in order to cover the open end of a through running horizontal rail, such as the upper rail 101. The stile cap 125 is provided with two projecting legs 125a having snap-lock detents 125b secured within the pocket of the element 116 over the ribs 109 thereof.

FIG. 6 illustrates a stile cap 126 secured to the glazing pocket of the element 115. The stile cap 126 is provided with the projecting legs 126a snapping over the ribs 109 on the construction element. The construction element 126 also covers the entire edge of the element 115 in like manner as the stile cap 125 covers the end cut of any through running horizontal rails. The stile cap 126 is provided with weathering pockets 127 for retaining suitable weather strip 128.

To transmit shear and torque loads between abutting vertical and horizontal rails there is provided a joint block used at each of the rail joints. Thus the joint blocks relieve the assembly screws of shear loads, leav-

ing them stressed essentially in tension. A different joint block is used for joints on rails having different face dimensions; however, all of the joint blocks in accordance with the illustrated embodiment may be machined from the same extrusions. A typical joint block is illustrated, for example, in FIG. 8 wherein there is illustrated a lower horizontal rail abutting against a through vertical, similar to that illustrated in FIGS. 1 and 4. Referring now to FIG. 8, there is illustrated a joint which may include a side rail assembly 104 extending through, and a lower rail assembly 102 abutting against the rail assembly 104. A joint block 130 according to the present invention interconnects the two rails. More specifically, the joint block 130 is formed in general T-shape, with the body portion 130a thereof dimensioned to closely fit within the glazing pocket 106 of the through running rail 104. A tongue portion 130b is dimensioned to closely fit between the screw splines 113 of the abutting rail assembly 102. Four screw fasteners or connectors 132 extend through the web of the through rail 115, through apertures 130c in the joint block 130, and into the respective screw splines 113 of the rail 105. More specifically, the outer web 115a of the rail 115 is provided with a plurality of spaced apertures 134 sufficiently large to pass the head of the screws 132, and aligned screw openings 135 are provided in the inner web 115b through the screw splines 113 of the element 115 to receive the shank of the screws 132. The aligned apertures 134 and 135 are shop formed so that by the selective use of the desired apertures, butting rails of different widths may be used. Thus it will be seen by a comparison with a typical upper joint having a through vertical that a joint block 137 of a shorter length may be used if a rail or narrower face abuts the through rail.

More specifically, there is illustrated a typical vertical rail 138 extending through, being abutted by a typical upper horizontal rail assembly 139. As heretofore described the rail assembly 139 has a removable face 140 snapped thereto and secured by suitable set-type screws 122. The through rail 138 is formed of outer and inner transverse webs 138a and 138b, and inner and outer side faces 138c and 138d. Thus, there is formed the pair of pockets 106 and 107 for glazing or other purposes. The joint block 137 includes the body portion 137a dimensioned to fit within the pocket 106 of the rail 138, and includes the tongue portion 137b dimensioned to fit between transverse webs 139a and 139b of the rail assembly 139. The plurality of screws 132 extend through selected ones of the larger apertures 134 in the outer web 138a, and the heads of the screws 132 seat on the flat surfaces of the screw splines 113, extending through the apertures 135 of the inner web 138b, and are secured within the screw splines 113 of the rail assembly 139.

As heretofore described, a similar construction is used with through horizontals as illustrated in FIGS. 10-12. More specifically, in FIG. 10 is illustrated a door 142 formed of upper and lower rails 143 and 144 and side rails 145 and 146. The horizontal rails 143 and 144 are through, and the vertical rails 145 and 146 butt against the through rails. A typical rail joint for a lower rail is illustrated in FIG. 11 wherein the same connector block 137 is used to carry the shear and torque loads between the rails 144 and 146. A typical upper connection is illustrated in FIG. 12 wherein there is provided the upper rail 143 having a removable face 147 in like

manner as heretofore described. The same joint block 137 carries the shear and torque load at this joint.

It will be seen that a door according to the present invention may be designed with through verticals, with through horizontals, or a combination of these. In addition, all of the members may be of any one of a number of different stock widths to provide different face widths to the door rails. Moreover, intermediate horizontals may be combined with doors of either type.

Further design latitude is afforded by the provision of a system of various glazing stops. A typical center glazed arrangement has heretofore been described. A typical offset arrangement is illustrated in FIG. 13, and a typical projected glass arrangement is illustrated in FIG. 14. Moreover, the glass stops may be the same surface texture and color as the rails themselves, or the glass stops may be a different or contrasting finish thus affording further design latitude with the structure.

Referring to FIG. 13 there is illustrated a door rail 148 having glazing pocket 149 and a single glass stop 150 providing for offsetting of a panel 151 relative to the center line of the door. FIG. 14 illustrates a projected glass on the door wherein the door rail 148 is provided with a pocket 149 supporting a set of interconnected glass stops 152 and 153 so that a panel 154 is projected beyond the side surfaces of the rail 148.

In addition to the design latitude afforded by a selection of rails and stops, there is provided planks for use with the system. The planks provide at one edge the details of the basic rails, and will accept glass or panels in the same manner as the rails. The opposite edge of the planks provides an interlock either with another plank or with a typical rail member. The walls of the planks may be thinner than the walls of the rails in order to save metal and weight and is permissible in view of the face that the planks are not needed as part of the basic door structure. Moreover, the planks are provided with various surface configurations and may include either a ribbed face arrangement, or a substantially plain arrangement with spaced grooves, or any other desired surface texture. The plank arrangements are best illustrated in the door embodiments of FIGS. 15 through 22.

Referring first to the embodiment of FIG. 15, there is illustrated a door arrangement wherein the planks on the surface of the door extend through, with neither the upper or lower rails showing. In this arrangement a different rail configuration for the upper and lower rails is used. In FIG. 16 there is illustrated an arrangement wherein the upper and lower rails of the door structure extend through, and the planks abut against the upper and lower rails.

Referring to the embodiment of FIGS. 15, 17 and 22, there is illustrated a typical plank 160 shown as of the rib design. As therein illustrated, the plank 160 includes a pair of spaced side faces 161 and 162, interconnected by transverse webs 163 and 164. The side faces 161 and 162 extend past the transverse webs so that at one edge there is formed a pocket 165 resembling the pockets 106 and 107 of the door rails, and which will accept glass and other panels in the same manner as the rails. The opposite edge of the plank 160 provides interlocking portions 166 which interlock into an adjacent pocket either with another plank 160 or with a typical rail members. Screw splines 167 are provided along the transverse webs intermediate their

length to facilitate assembly of the planks into the door.

Referring now to FIG. 15 there is illustrated an embodiment or design of a door 170 incorporating a plurality of planks 160. As therein illustrated, the door 170 includes a pair of spaced side rails 171 and 172 interconnected by special horizontal rails 173, FIG. 22. The horizontal rail 173 has a portion of its faces cut off in order to receive the through facing of the planks 160. More specifically, the horizontal rail 173 includes spaced side portions 174 and transverse webs 175 which together form a generally tubular structure. Screw splines 176 are filleted into the side portions and webs 174 and 175. The connection between the verticals and horizontals now may be made with a suitable joint block in like manner as heretofore described.

In the embodiment of FIG. 15, where planks 160 are used to produce full panel doors, it is necessary at some point in the assembly for the glazing edge of a plank to adjoin the glazing edge of either another plank or a rail member. For this purpose there is provided a reverser 177, FIG. 17, which reproduces the details of the plank interlocks in both directions, fitting into the recesses at the glazing edges of the planks and rails. The completed door is, of course, then finished off with suitable stile caps, such as stile caps 125 and 126.

It will be seen that in the embodiment of FIGS. 15, 17 and 22, the side faces 161 and 162 of the planks 160 extend through, from the top to the bottom. Thus the upper and lower portions of the transverse webs 163 and 164 will be coped out to fit over the horizontal rails 173. Screw fasteners 178 will pass through the inner web of the horizontal rails 173 into the screw splines 167 of each plank to secure the planks and rails together.

FIGS. 16, 18 and 19 to 21 illustrate an embodiment wherein the upper and lower rails extend through, and wherein a section of glazing is incorporated into the door. As therein illustrated there is provided a door 180 formed by a pair of side rails 181 and 182 and upper and lower horizontal rails 183 and 184. The door 180 is formed of a plurality of planks 185 and a panel 186 of glass or other suitable material. The planks 185 are similar to the planks 160 heretofore described, except as to the surface configuration or finish, each formed of side faces and transverse webs forming suitable glazing pockets 187. Suitable glass stops 188 are used in the pockets 187 containing the glazing panel.

It will be seen that a door design embodying a glass panel does not require the use of a reverser, such as was used in the embodiment of FIGS. 15, 17 and 22. The glass panel 186 may be assembled last, so that the planks 185 may be assembled from both the ends of the door side rails 181, 182 thus eliminating the need for the reverser. Moreover, it will be seen that in the illustrated embodiment wherein the horizontal members run through, the planks 185 are square cut and butted against the horizontal rails 183 and 184. The screw fasteners 178 extending through the inner web of the horizontal rails and into the screw splines 176 of the planks 185 secure the planks to the horizontal rails 183 and 184.

The doors of the present entrance system are designed to accept many of the standard hardware components. While the entrance system according to the present invention is largely an appearance design to

give the architect versatility in his design of the entrance structure from a stock series of extrusions, suitable hardware must be available to permit maximum latitude to the designer. Accordingly, the present series of doors according to the present invention will accept many suitable panic devices, door closures, door operators, hinges, pivots, push-pull hardware and the like to considerable advantage.

A typical butt mounted hinge is illustrated in FIGS. 23 and 24. Advantageously because of the stile caps, mounting of butt hinges on the door according to the present invention may be done without cutting away the structural flanges and webs of the door rails. Referring now to FIGS. 23 and 24, there is illustrated the door rail 103, identical to the door rail 103 heretofore described, and including transverse webs 116a, 116b and side faces 116c, 116d. As heretofore described, the webs and side faces combine to form opposed pockets 190 and 191. The pocket 190 carries suitable glass stops 192 for retaining a glass panel 193. A hinge 195 is screwed directly to the outside web 116b of the door stile through a spacer block 196. The spacer block is as long as the hinge and is secured to the door stile only by a plurality of hinge screws 197. The stile is not cut away, and the hinge is not weakened, and no hinge reinforcement is required. A stile cap 198 covering the pocket 191 is mortised to fit around the hinge 195 and the leg thereof adjacent to the hinge knuckle 195a is cut away for the length of the hinge 195.

In assembly the stile cap 198 is installed first, then the hinge and spacer are inserted into the mortise and screwed fast. The mounting of the butt hinges on the typical mullion frame is conventional and may be backed up with butt straps in a manner known in the industry.

As previously indicated the entrance structure according to the present invention will accept various commercial hardware including push-pull handles, bars and the like. Advantageously an improved push-pull handle and bar system is provided for the improved entrance structure. FIGS. 25 through 28 illustrate a typical attachment of a pull handle to the stile of a door. Referring now to the embodiment of FIGS. 25 through 28, there is illustrated a typical pull handle, offset from the edge of the door to provide easier access to the lock mechanism. As therein illustrated, there is fragmentarily illustrated a door 200 having a vertical stile or rail 201, similar to the rail 115 previously described, enclosed by a stile cap 202 at its open edge. As heretofore described, the rail 201 includes a pair of transverse webs 201a, 201b and a pair of side faces 201c, 201d, having legs extending beyond the webs 201a, 201b to define pockets for glazing and for retaining the stile cap.

In accordance with the present invention there is provided an improved pull handle assembly 205 including a pair of end stanchions 206, 207 interconnected by a transverse body 208. The body 208 is of generally D-shape having a somewhat semi-circular inner web 208a, FIG. 27, and a transverse flange 208b. Within the flange 208b is defined a generally U-shaped screw spline 208c. A portion of the web 208a and screw spline 208c is removed, as indicated at 209, FIG. 25, to permit insertion of screws 210 longitudinally through the remaining end portions 208d, 208e of the screw splines 208c to thread within aligned apertures 211 within the respective stanchions 206 and 207. A face

cap 212 of wood, metal or any other suitable material and design extends over the entire outer surface of the stanchions 206 and 207 and body portion 208 and is held in place by suitable screws 213 fastened through the body 208 and into the face cap 212.

Suitable stud assemblies 215 are provided for securing the handle assembly 205 to the stile cap 202. In the illustrated embodiment the stud assembly comprises a sleeve 216, FIG. 28, which is fastened to the rail by a suitable screw 217. The sleeve 216 preferably is provided with a recess 218 for receiving the end portion of a set screw 219. The edges of the stanchions 206 and 207 confronting the stile cap 202 are provided with suitable recesses 220 fitting over the stud assemblies 215.

In order to assemble the handles 205 to the rail 201, the stud assemblies 215 are first fastened to the rail 201. Thereafter the handle assembly 205 is set in place over the stud assemblies 215 and the set screws 219 are driven tight, locking the handle assembly to the stile cap.

It will be seen that in accordance with the present invention there is provided an improved system of push-pull hardware and bars wherein all of the fasteners are hidden from view, and a pleasing appearance is presented offering a maximum of design latitude to the architect. Advantageously the hidden fasteners on the hardware minimize tampering and vandalism of the entrance structure.

FIG. 29 illustrates another embodiment of a stud for use in the blind fastening of the push-pull handle assembly to a stile. More specifically, as illustrated in FIG. 29, there is illustrated a stud 222 having a head portion 223 and a shank portion 224. The head portion 223 is of somewhat spool-shape formed of a V-shaped circumferential groove provided with a root portion 223a and outwardly tapered side wall portions 223b and 223c.

In use the stud 222 is fastened to the stile of a door, in like manner as the stud assembly 215, and the groove formed by the root 223a forms a pocket for receiving the tip of a set screw. Thus door hardware may be securely locked in place by means of the stud 222 and a suitable set screw in like manner as in the embodiment of FIGS. 25 through 28.

In accordance with the present invention there is provided a graphic identification system the primary purpose of which is to provide means for the installation and support of identification and direction signs that are ordinarily used on buildings. These members are designed to be used in combination with, and to be architecturally compatible with, the members of the entrance system as heretofore described. This system includes a vertically expandible transom bar, a system of projecting sign panels, and a system of safety rails and matching insert rails along with the necessary stanchions, splice blocks and end caps.

Referring first to an identification system in the transom bar, there is provided a vertically expandible transom bar which allows the use of insert panels of various heights. The transom bar used in the entrance structure according to the present invention is most clearly illustrated in FIGS. 30 and 33 as member 225. As therein illustrated the transom member 225 is generally box-shape having upper and lower transverse webs 226 and 227 and side faces 228 and 229, and dimensioned not only from a structural view, but to accept various hid-

den door closers, operators and the like. The upper web 226 is provided with a glazing pocket 230 to provide for the installation of glass or other paneling where required. However, the lower web and surface of the transom 225 includes parts and projections for supporting a door stop member 231. Along the lower edges of the side faces 228 and 229 are upwardly projecting flanges 234 and 235 forming pockets 236 and 237 for retaining signs and the like. From the upper surface of the upper web 226 is a pair of upwardly and inwardly extending webs or toe portions 240 and 241, and the upper outer edge of the parts forming the glazing pockets 230 are chamfered, as at 242, to provide interlocking means for a panel stop 245. The panel stop 245 is of generally angular cross section having downwardly and outwardly extending webs or toe portions 246 and 247 adapted to interlock with the webs 240 and 241 and the chamber 242 thereby to secure a sign 250 or other identification against the transom bar 225. Suitable gaskets 251 resiliently support the sign 250 in place.

Where it is desired to provide a sign or identification of greater height than that afforded by the height of the standard commercial transom bar, an expansible member may be used in connection with the transom bar. Such an arrangement is illustrated in the embodiments of FIGS. 31 through 34. As therein illustrated there is shown an entrance structure 255, FIG. 31, including a plurality of vertical frame members or mullions 256, 257 and 258. A door 260 is positioned between the frames 256 and 258, while a fixed panel 261 of side light is positioned between the vertical frames 258 and 257. A sign 264 extends over the top of the door 260 and the side light 261.

Referring now particularly to FIGS. 33 and 34, an upper horizontal member 266 or rail extends between the vertical frames 256 and 257, and is provided with an upper surface similar to that heretofore described in connection with the transom bar 225. More specifically, the horizontal rail 266 includes transverse webs 267 and 168 interconnected by side faces 269 and 270. The web 267 has parts forming a glazing pocket 272 and includes parts or webs similar to those carried by the web 226 of the transom bar 225. More specifically, the transverse web 267 includes a pair of upwardly and inwardly extending toe or web portions 274 and 275, and the upper outer edge of the parts forming the pocket 272 are chamfered as at 276 so as to interlock with the panel stop 245 heretofore described. Both the transom bar 225 and the horizontal rails 266 are formed with screw splines 278 to provide for attachment to the vertical rails by suitable fasteners, such as screws 279, FIG. 32.

It will be seen that by the proper spacing apart of the transom bar 225 and the horizontal rail 266, any vertical dimension for the sign 264 may be provided. Moreover it will be observed that a horizontal rail 266 is used in connection with a transom bar 225, the glazing pocket 230 of the transom bar 225 is not used. In like manner, and as best illustrated in FIG. 34, it will be seen that when the sign extends over a fixed panel, the same horizontal rail 266 is used to support the edge of the glass in the fixed panel; in this instance the horizontal rail 266 is turned upside down so that its glazing pocket 272 extends downwardly to receive the fixed panel.

There is also provided a system of projecting sign panels as are commonly used with entrance structures of the type described in the present application. Such a system is best illustrated in FIGS. 35, 36, 37 and 38. As therein illustrated there is shown an entrance structure 280 including a plurality of doors 281 and a plurality of side lights or fixed panels 282. Associated with each of the doors is an outwardly projecting sign assembly 282.

Referring now to FIGS. 36, 37 and 38, each of the sign assemblies 282 is provided with identical upper and lower frame members 285, each of generally T-shape having a cross bar 286 and a longitudinal leg 287. The legs 287 of each of the frame members 285 extend inwardly toward each other. At the end of each cross bar is provided inwardly extending flanges 288 forming side pockets 289. Moreover each of the legs 287 has formed adjacent its ends suitable screw splines 291 and 292. Suitable signs 293 and 294 are supported with their edges within the sign pockets 289 and are properly spaced by means of shims 295. An inner end cap 298 is provided closing the inner end of the space between the cross bars 286 and is fastened to the cross bars 286 by suitable countersunk screws 299 threaded into the screw splines 291 and 292. An outer end cap 300, similar in cross section to the end cap 298, closes the outer end of the space between the cross bars 286. Suitable screws 301 counter-sunk through the outer end cap and extending into the screw splines 291 and 292 fasten the outer end cap 300 to the cross bars 286. Both the inner and outer end caps 298 and 300 are of similar cross section, and as best illustrated in FIG. 37, are of generally U-shape cross section having a bight portion 303 and a pair of inwardly extending legs 304 and 305 which enclose and secure the vertical edges of the signs 293 and 294. The sign assemblies 282 are fastened to suitable structure such as vertical mullions adjacent the doors 281 by a plurality of screw fasteners 307 extending through the bight portion 303 of the inner end cap 298.

There is also provided a basic safety rail extension for use with the entrance structure according to the present invention. This member is intended primarily to be mounted either on the face of, or between, vertical mullions, to prevent people from accidentally walking through floor to ceiling glass. It can, of course, have cut-out letters mounted on it for purposes of identification. The basic rail is accomplished in the system by a second rail into which various fillers may be inserted. These two rails have the same overall dimensions and the same internal dimensions, and because of this they are interchangeable and may be used in combination on the same job and with the same end caps and stan- chions.

It is likely that the safety rails will be used most often mounted on the faces of the vertical mullions. There are, however, three general manners in which the safety rails may be mounted, first the safety rail extends past the mullion, the safety rail terminates at the mullion, or the safety rail joins an additional rail at the mullion. Each of these conditions is accommodated with either the one piece rail or the rail with the fillers. In the case of rails joining at the mullion, it is possible to join the two types of rails one to the other.

The safety rail system is best illustrated in FIGS. 39 through 44. Referring first to FIG. 39, there is illustrated an entrance structure 315 formed of vertical

frames or mullions 316, 317 and 318 and including an upper horizontal frame 319. The frames 317, 318 and 319 define an opening closed by a fixed panel of glass 320 extending, in the illustrated embodiment, from the floor to the ceiling. A safety rail 322 is mounted on the vertical frames 317 and 318 to call attention to the glass.

Referring now to FIGS. 40, 41 and 42, the safety rail is essentially a rectangular tubular structure, conveniently formed of extruded aluminum or the like, and including inwardly projecting web portions 323. Suitable end caps 324 are provided, each of generally T-shape having an outer face portion 324a and an inwardly extending leg portion 324b terminating in a screw spline 325. Moreover each of the end caps 324 includes a pair of vertically extending webs 326 on its inner surface engageable with the web portions 323 of the safety rails 322 to position the end caps 324 onto the safety rails 322. Suitable countersunk screws 327 extend through the upper and lower web surfaces of the safety rail 322, and are secured within their respective ends of the screw splines 325 to secure the end caps 324 to the safety rail 322. It will be seen that the end caps 324 may be conveniently formed of extruded aluminum or other material, with the edges thereof coped away to fit flush against the ends of the safety rail 322.

In the illustrated embodiment the safety rail 322 is secured to the respective vertical frames 317 and 318 by suitable stanchion assemblies 330, best illustrated in FIG. 44. More specifically, there is provided a stanchion block 331, fastened to a mullion, such as mullion 317, by suitable screw fasteners 332 and 333. Moreover, the stud fasteners 222, heretofore described, are threaded into the inner side surface of the safety rail 322. The head portion 223 of the studs 222 fit within an aperture 335 in the stanchion block 331, and suitable set screws 336 secure the heads 223 to the stanchion block 331.

FIG. 43 illustrates an arrangement wherein a safety rail 338 may be secured between adjacent vertical mullions 339. Under such an arrangement the end caps 340 are first secured in place to the mullion 339 by suitable screws 341. Suitable coped recesses 338a are provided in the lower outer walls of the rail 338 so that the rail 338 may be slid down over the end caps. After assembly of the safety rail 338 on the end caps 340, the safety rail 338 is held in place by the usual screw in its upper surface and by a cam plate 342 on its lower edge. The cam plate 342 is fastened by a suitable fastener 343 into the screw spline 344 of the end cap 340. The safety rail 338 and the end cap 340 may otherwise have the identical cross section as the heretofore described embodiment of FIGS. 39 through 41.

FIG. 45 illustrates in cross section a safety rail structure 350 adapted to receive selected inserts. More specifically there is provided a generally tubular safety rail 351 having upwardly and downwardly extending flanges 352 forming pockets 353. A suitable face insert 354, 355 may be slid longitudinally between the confronting flanges 352 prior to the assembly of the end caps. It will be appreciated that the face inserts 354 and 355 may have any suitable design or identification. Moreover, the inner dimension between the vertical webs 356, 357 of the safety rail 351 is identical to the transverse distance between the web portions 323 so that the inwardly extending webs 326 of end caps di-

mentally fit between the web portions 356 and 357. A standard stanchion assembly 330 may be used to fasten the safety rail structure 350 to a mullion 358.

Although the present invention has been described by reference to several embodiments thereof, it will be apparent that numerous other modifications and embodiments will be devised by those skilled in the art which fall within the true spirit and scope of the present invention.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. A construction element assembly to be used in an entrance system of a building comprising:

- a pair of spaced webs,
- a pair of side faces interconnecting said webs to form a tubular structure, each of said side faces terminating in legs extending beyond each of the webs to form glazing pockets,
- and longitudinal parts at each of the corners filleted directly into the webs and the side faces to define longitudinal screw splines,
- each of said longitudinal screw splines including spaced engaging flanges to form a slot therebetween in order to receive the shank of a threaded connector, said flanges having flattened top surfaces along said slot to provide a stable surface for the heads of threaded connectors driven between said flanges.

2. A construction element assembly to be used in an entrance system of a building comprising:

- a pair of spaced webs,
- a pair of side faces interconnecting said webs to form a tubular structure, each of said side faces terminating in legs extending beyond each of the webs to form glazing pockets,
- and longitudinal parts at each of the corners filleted directly into the webs and the side faces to define longitudinal screw splines and
- a connecting portion spaced from a first side face interconnecting the webs to form a tubular structure with said first side face and said webs,
- the other side face being spaced apart from said connecting portion and readily attachable to said webs, said second side face extending beyond said webs to form said glazing pockets with the legs of said first side face.

3. A construction assembly to be used in an entrance system of a building comprising:

- a pair of spaced side rail assemblies;
- upper and lower horizontal rail assemblies extending past the ends of said side rail assemblies;
- each of said rail assemblies being formed of a pair of spaced webs, a pair of side faces connecting said webs to form a tubular structure, each of said side faces terminating in legs extending beyond each of the webs to form longitudinal glazing pockets, each of said legs having a longitudinal rib extending into said glazing pockets;
- means joining the respective ends of said side rail assemblies and said upper and lower horizontal rail assemblies; and
- capping means for projecting legs to enclose at least one of said glazing pockets, said capping means being secured in said one of said glazing pocket by means of projecting legs snapping over said longitudinal ribs on each of said legs of the side faces;

15

said capping means extending the length of a side rail assembly and extending over the end of said upper and lower horizontal assemblies.

4. A construction assembly as set forth in claim 3 wherein there are provided longitudinal parts along each of the corners formed by the webs and the side faces to define longitudinal screw splines, each of said longitudinal screw splines including spaced engaging flanges to form a slot therebetween in order to receive the shank of a thread connector, said flanges having flattened top surfaces along said slot to provide a stable surface for the heads of threaded connectors driven between said flanges, and wherein said means joining said side rail assemblies and said upper and lower horizontal rail assemblies includes fasteners extending transversely through the screw splines of said upper and lower horizontal rail assemblies longitudinally into the screw splines of said side rail assemblies.

5. A construction assembly to be used in an entrance system of a building comprising:
a pair of spaced side rail assemblies;
upper and lower horizontal rail assemblies extending past the ends of said side rail assemblies;

16

each of said rail assemblies being formed of a pair of spaced webs, a pair of side faces connecting said webs to form a tubular structure, each of said side faces terminating in legs extending beyond each of the webs to form longitudinal glazing pockets, each of said legs having a longitudinal rib extending into said glazing pockets;

longitudinal parts along said tubular structure defining longitudinal screw splines, each of said longitudinal screw splines including spaced engaging flanges to form a slot therebetween in order to receive the shank of a thread connector, said flanges having flattened top surfaces along said slot to provide a stable surface for the heads of threaded connectors driven between said flanges; and threaded fasteners joining said side rail assemblies and said upper and lower horizontal rail assemblies extending transversely through the screw splines of said upper and lower horizontal rail assemblies longitudinally into the screw splines of said side rail assemblies.

* * * * *

25

30

35

40

45

50

55

60

65