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Maxcy et al.

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[45] **Jan. 7, 1975**

[54] **ADJUSTABLE PICKET RAIL ASSEMBLY FOR STAIRWAYS**

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[73] Assignee: **W-T Industries, Inc.**, Baltimore, Md.

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[52] **U.S. Cl.** **256/22**, 256/24

[51] **Int. Cl.** **E04h 17/16**

[58] **Field of Search** 256/21, 22, 24, 59, 65, 256/66–70

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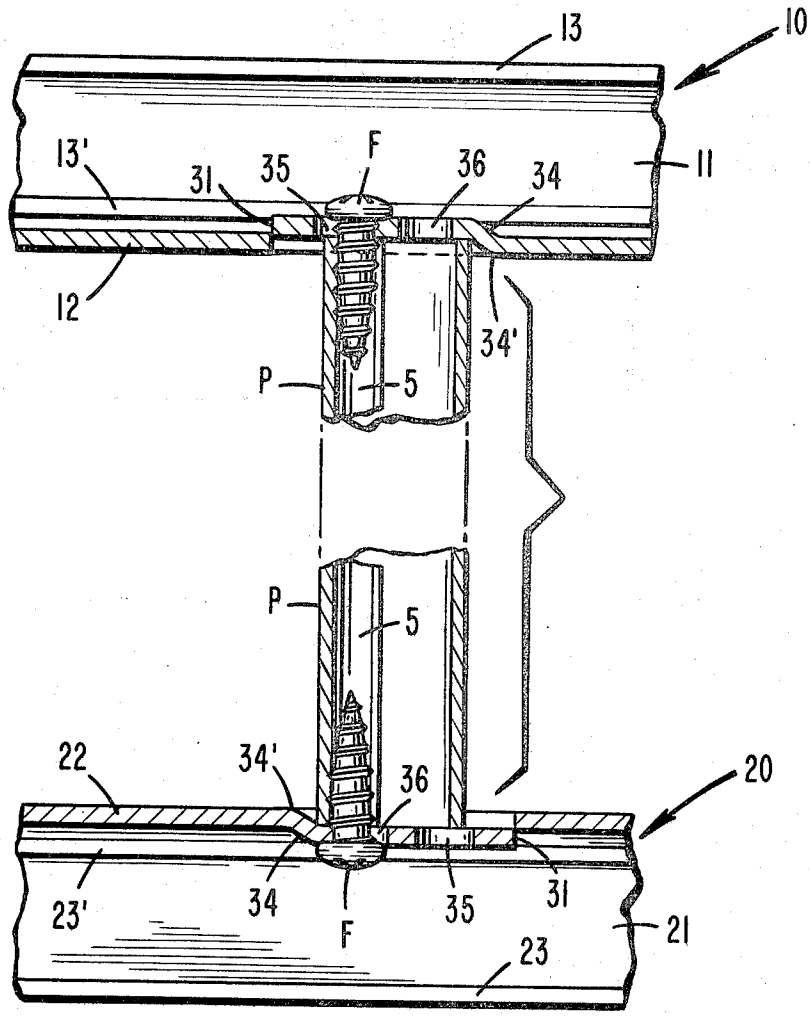
Primary Examiner—Dennis L. Taylor

Attorney, Agent, or Firm—Samuel Lebowitz

[57] **ABSTRACT**

The rapid and economical assembly of raked rails for stairways permitting the adjustment of the railing assembly to variable angles ranging from about 35° to 42°, to the horizontal. The top and bottom picket rails of the assembly are constituted of channel-shaped metal extrusions, the oppositely facing webs of which are broached to form spaced deformable tabs, each of which is provided with at least one opening. The opposite ends of hollow pickets of extruded metal, provided with at least one screw boss extending longitudinally on the interior thereof, are affixed to the vertically aligned tabs in said webs of the picket rails, with the free ends of the tabs extending in opposite directions. A rocking of the rails in opposite directions results in the deformation of the tabs within the confines of the picket rails to impart the desired adjustable angularity to the latter while the pickets remain vertical. The ends of picket rails are cut at an angle conforming to the desired rake angle and are fitted with fastening straps or splines which are mitered to the same angle for fastening to vertical newel posts at the terminals of the picket rails, which rigidifies the assembly at the desired rake angle.

15 Claims, 14 Drawing Figures



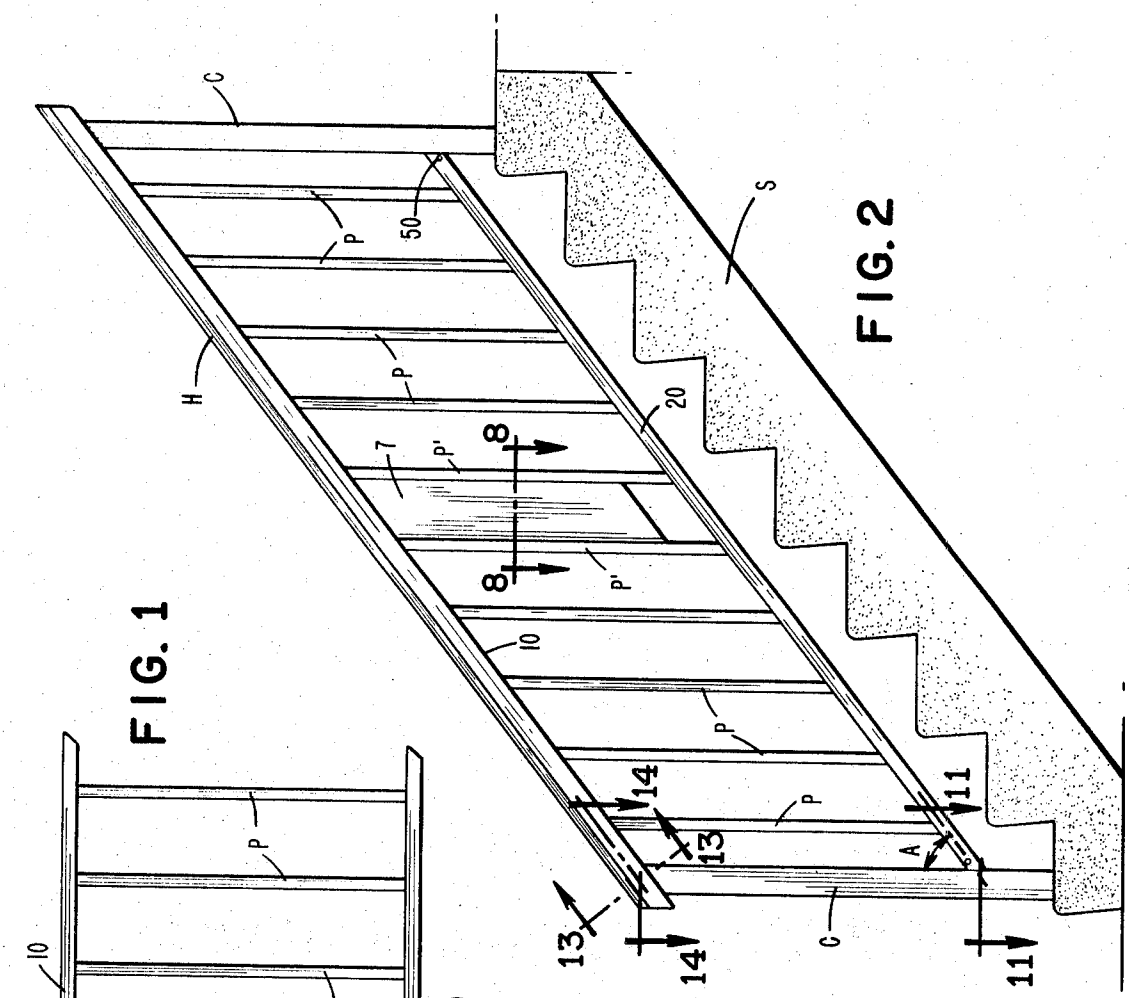


FIG. 2

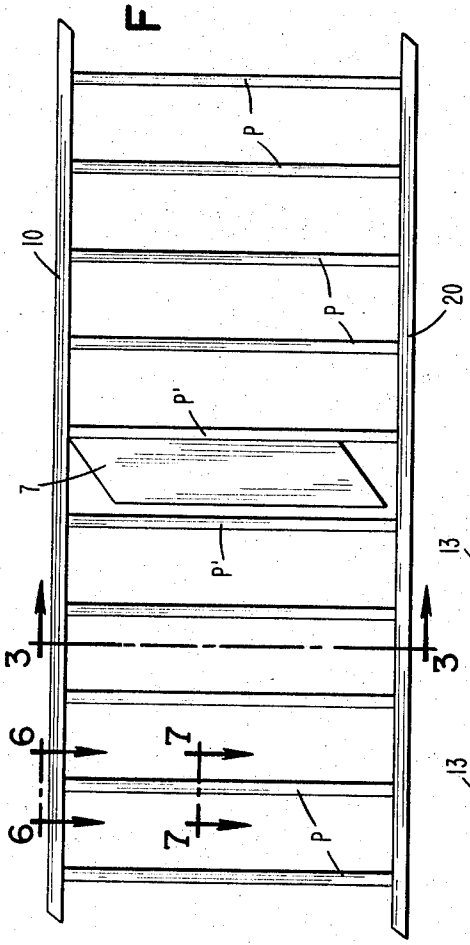


FIG. 1

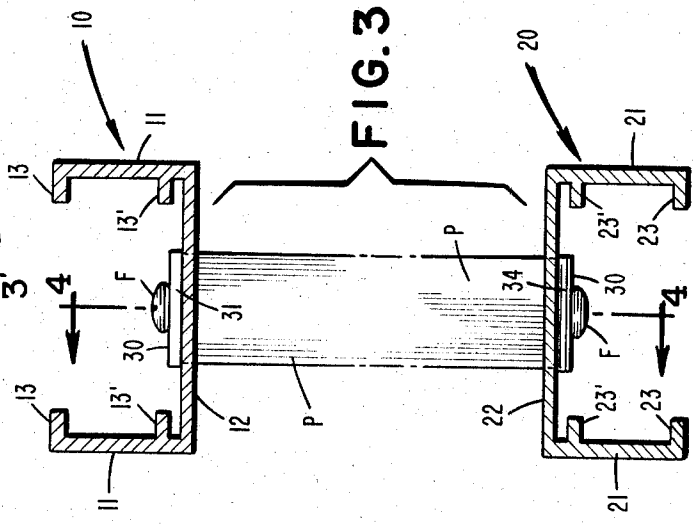


FIG. 3

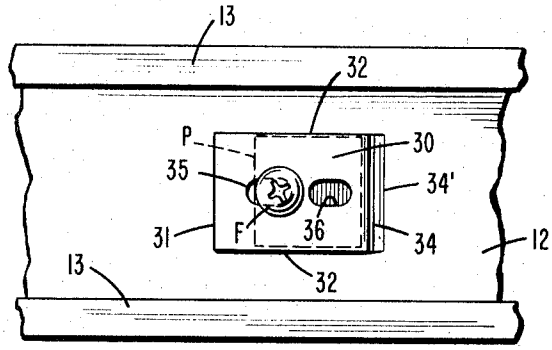


FIG. 6

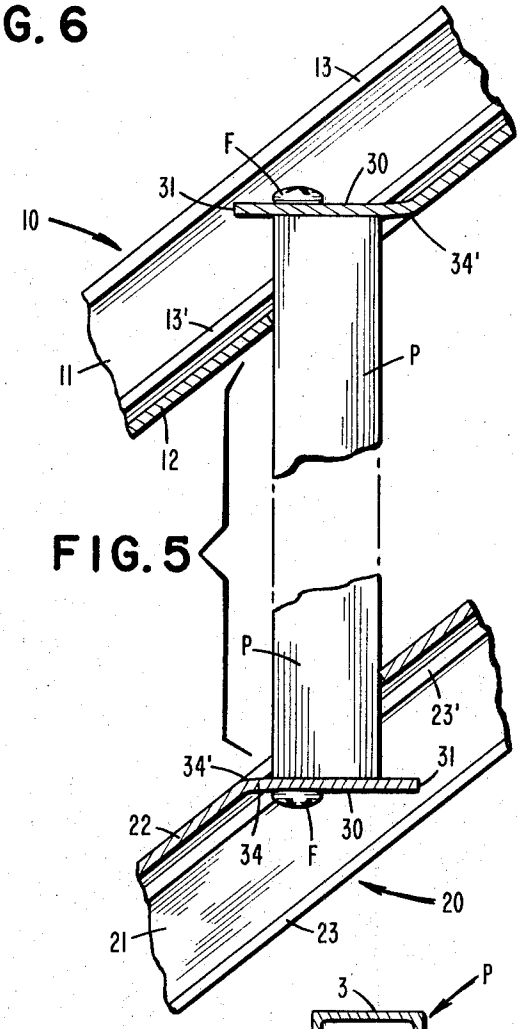


FIG. 5

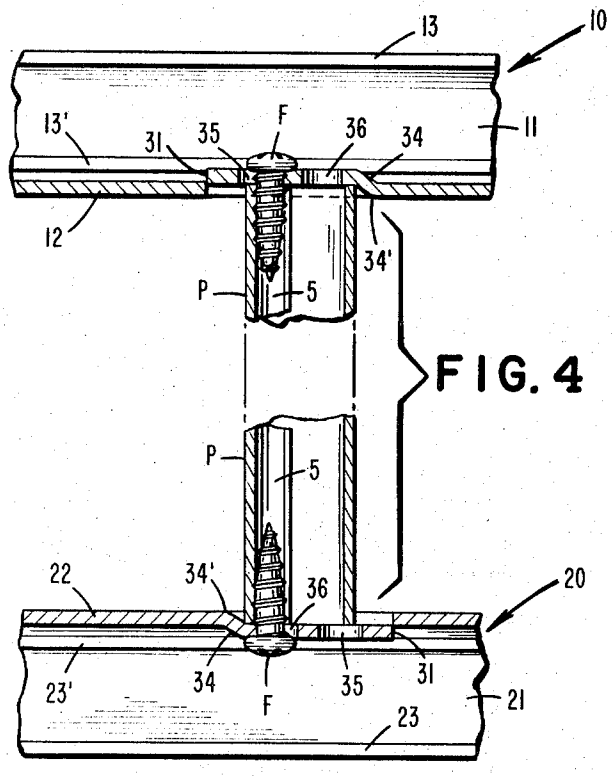


FIG. 4

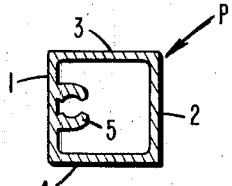


FIG. 7

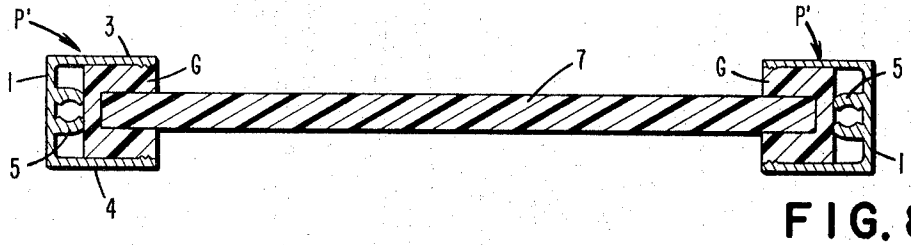


FIG. 8

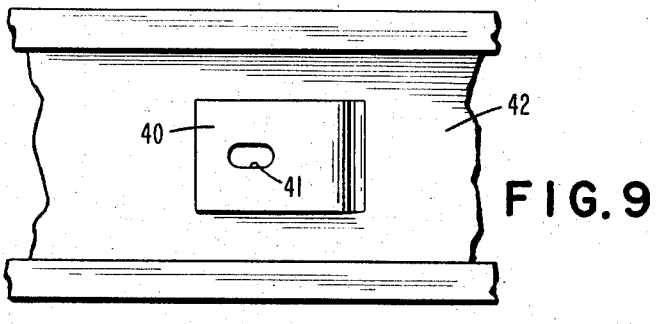


FIG. 9

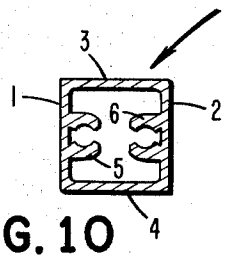


FIG. 10

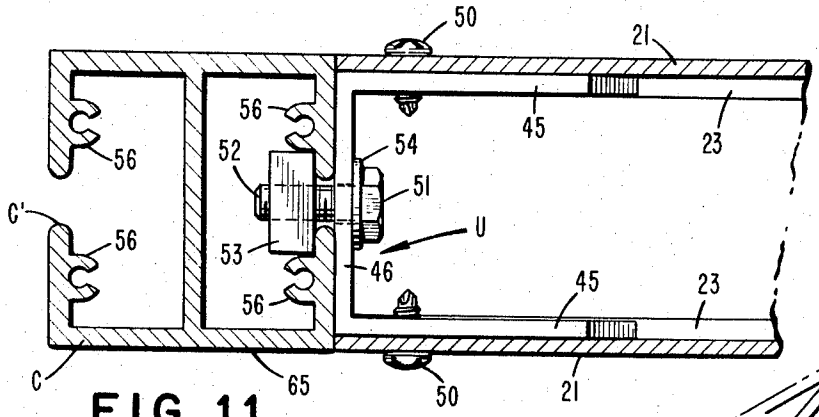


FIG. 11

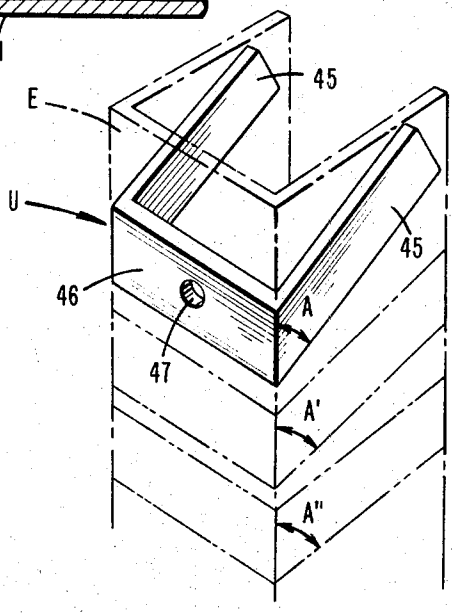


FIG. 12

FIG. 13

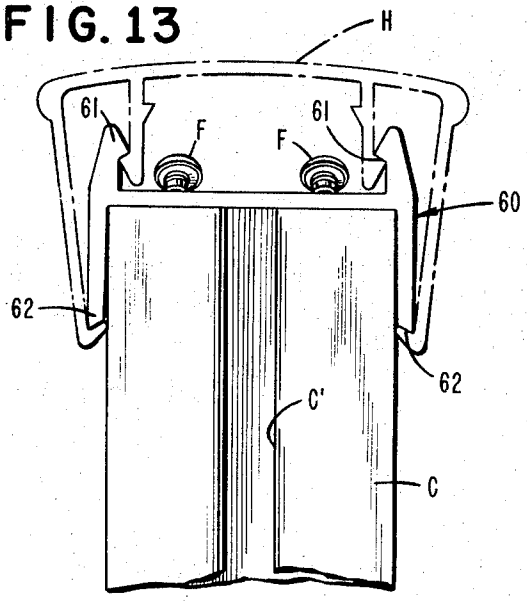
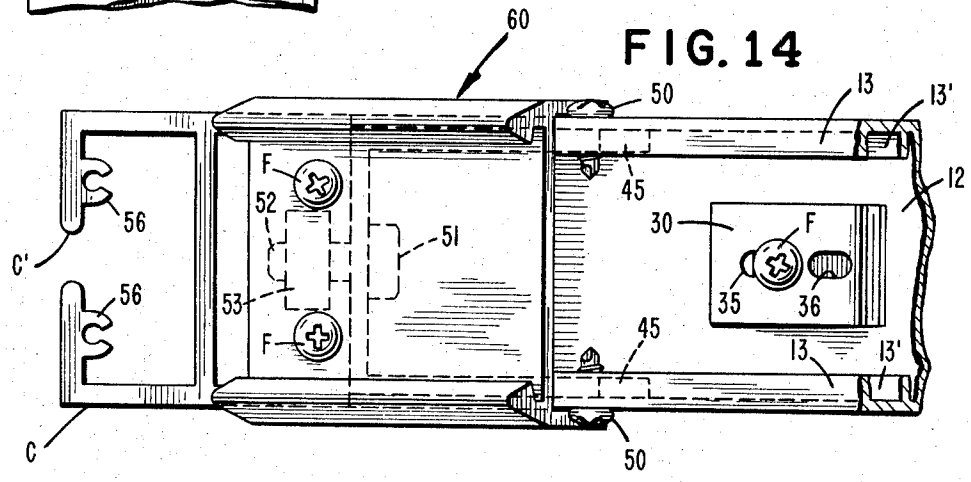


FIG. 14



ADJUSTABLE PICKET RAIL ASSEMBLY FOR STAIRWAYS

This invention relates to a rail assembly for stairways which may be assembled quickly and economically from extruded metal components, and which may be adapted to stairways of varying rake angles.

It is the object of the present invention to provide a rugged and reliable rail assembly for stairway which is composed essentially of standard prefabricated components, and which may be adapted to meet the needs of varying architectural and structural designs without entailing the costs of fabrication according to set specifications.

It is another object of the invention to provide a rail assembly for stairways which lends itself to variations in the utilization of its components, so that rails with conventional pickets may be interspersed with pickets which retain panels of colored or translucent plastic material to attain distinctive ornamental and artistic effects. Alternatively, the rail assembly may be formed entirely of conventional pickets or pickets framing plastic panels, to the exclusion of the other.

It is a further object of the invention to provide a rail assembly for stairways which may be fabricated by mass production procedures at the factory, preparatory to assembly procedures which may be executed at that point, or at the point of utilization immediately prior to the mounting thereof on the construction site. In the latter case, all of the advantages of shipping and packaging of knockdown constructional components are realized.

Other objects and purposes will appear from the detailed description of the invention following hereinafter, taken in conjunction with the accompanying drawings, wherein.

FIG. 1 is a front elevation of the preliminary assembly of the top and bottom picket rails and pickets extending therebetween;

FIG. 2 is a front elevation of the rail assembly in its substantially completed form, mounted on a stairway;

FIG. 3 is an enlarged vertical sectional view along line 3—3 of FIG. 1 with the mid-portion of the pickets indicated in dot-dash lines;

FIG. 4 is a vertical sectional view along ling 4—4 of FIG. 3;

FIG. 5 is a vertical sectional view with certain parts in section, showing the assembly of FIG. 4 following the racking of the assembly to the desired angle from that shown in FIG. 1 to that illustrated in FIG. 2;

FIG. 6 is a horizontal sectional view along line 6—6 of FIG. 1;

FIG. 7 is a horizontal sectional view along line 7—7 of FIG. 1, to illustrate a preferred embodiment of a picket construction;

FIG. 8 is a horizontal sectional view along line 8—8 of FIG. 2, to illustrate a portion of the railing having a panel of plastic material extending between a pair of adjacent hollow pickets;

FIG. 9 is a horizontal sectional view, similar to FIG. 6, showing a picket rail with the broached tabs therein provided with a single opening therein;

FIG. 10 is a horizontal sectional view of another embodiment of a hollow picket, as a variant of that shown in FIG. 7, which may be used with the picket rail shown in FIG. 9;

FIG. 11 is a sectional view along line 11—11 of FIG. 2;

FIG. 12 is an isometric view of the mounting straps at the ends of the picket rails for fastening the latter to the newel posts or columns mounted on the stairway;

FIG. 13 is a sectional view along line 13—13 of FIG. 2; and

FIG. 14 is sectional view along 14—14 of FIG. 2.

In the drawings is shown the basic rail assembly for a stairway S, which preferably is fabricated from lengths of extruded metal such as aluminum alloys. The top rail **10** is formed of a continuous extrusion of generally channeled-shaped cross-section, having the web **12** extending between the walls **11**, which walls are provided with inwardly facing flanges **13** at the free ends of the walls **11**, and flanges **13'** on the interior thereof in close proximity to the web **12**. The bottom picket rail **20** is preferably formed from the same continuous extrusion as rail **10**, and is comprised of the web **22** extending between walls **21** which terminate in inwardly directed flanges **23** at the ends of the walls and flanges **23'** adjacent to the web **22**. The flanges not only reenforce the rails but serve as guides for mounting straps or solid splines which serve to interconnect the rails with the supporting posts.

In the preferred embodiment of the invention, rectangular tabs **30** are broached from the web of the channeled extrusion, as clearly shown in FIGS. 4 to 6, which tabs are severed along two lateral edge **32** parallel to and equidistant from the longitudinal axis of the picket rail, and which are spanned by the transverse edge **31** slightly displaced from the plane of the web **12** by virtue of the inclined portion **34** at the end of the tab remote from the free end **31**, which permits the tab to be deformed along the axis **34'**, substantially perpendicular to the longitudinal axis of the rail.

Apertures or openings **35** and **36** are stamped in the tabs **30** at the same time that the boundaries of the tabs are broached, and preferably these openings are of oval shape to permit manufacturing and assembly tolerances when the pickets are integrated with the picket rails.

The bottom rail **20** is fabricated from the same continuous length of extrusion as the top rail, and the desired lengths of the top and bottom rails, for example, 5 or 6 feet, are assembled by disposing them in the relation shown in FIG. 1, with the webs facing each other, but with the tabs **30** extending in opposite directions. The webs are spaced from each other corresponding to the desired vertical spacing between them and the lengths of the hollow vertical pickets P adapted to extend therebetween, which, as shown in FIG. 7 is formed of a hollow extrustion of rectangular or square cross-section having the four faces **1**, **2**, **3** and **4** with the screw boss **5** cast integrally on the interior of one of the faces, for example, face **1**.

As shown in FIG. 4, the screw boss **5** is disposed in alignment with the aperture **35** which is adjacent to the free end **31** of the tab **30** while the screw boss **5** is adjacent to the aperture **36** in the tab of the lower rail which is remote from the free edge **31**. Screw fasteners F, for example size **10**, are passed through the apertures **35** and **36** and are driven into the screw boss **5** adjacent to the tabs **30**. Thus, the several pickets are fixed between the top and bottom rails, following which the top and bottom rails are rocked in opposite directions, for example, the top rail **10** to the left, and the bottom

rail 20 to the right, so that the parts assume the position shown in FIG. 5 wherein the tabs are deformed about the axes 34' to dispose them within the confines of the channels of the top and bottom rails which conceal the fasteners F as well as the opposite end of the pickets P.

The degree of the rocking movement may vary so that the angles assumed by the rails 10 and 20 may range from 35° to 42° to the horizontal, to render the angularity of the rail assembly adjustable so that it may be adapted to variations in the rake of the stairway on the construction site following the preliminary assembly of the railing at the factory or at the building site.

The invention permits the utilization of hollow pickets of different sections, and variations of the picket shown in FIG. 7, of square cross-section, may be utilized. The outlines of the deformable tabs may be modified accordingly. Of course, dimensions of the tabs vary with the cross-sectional dimensions of the pickets. Tabs or tongues having a length of 1.198 inches and a width of 0.770 inches have proven very practical in conjunction with pickets of ¾ inches square section.

FIG. 8 illustrates an assembly in which a screw boss 5 extends on the interior of an open-faced picket P' of the same external dimensions as the pickets P described above, so that, in effect, the picket is of channel-shape cross-section. Such a structure permits the interspersion of channel-shaped pickets P' amongst the closed perimetric pickets P and, as indicated in FIGS. 1 and 2, such an arrangement renders possible the insertion of a panel 7 of plastic material of approximately ¼ inches thickness, which may be set within gaskets G to secure the panels 7 between the pickets P', as shown in FIG. 8. The panels 7 may alternate with one or more plain pickets P or may be used to the exclusion of the latter.

FIGS. 9 and 10 illustrate a modified arrangement from that shown in the preceding embodiments. In this case, the tabs 40 are stamped with a single opening 41 and use is made of a picket P'' having the same external dimensions as the pickets P described above, but which is provided with an additional screw boss 6 on the interior of the picket, laterally displaced from the screw boss 5, which is cast integrally with the face 1. Thus, in the assembly of the picket rails and pickets in this construction, the fasteners F pass through the openings 41 into driving engagement with the screw boss 5, and the fasteners F in the bottom rail pass through the openings 41 in the tabs 40 for engagement with the screw boss 6.

As is the case in the previously described embodiments, the openings 41 in the tabs 40 may be punched out at the same time that the tabs are broached from the planes of the webs and preferably are of elondated form to allow for variations in alignment and assembly procedures.

Following the assembly of the top and bottom rails with the pickets extending therebetween, the rails are affixed to the newel posts or columns C at the top and bottom of the stairway, as shown in FIG. 2. As shown in FIG. 12, the U-shaped fastening straps U are cut from a continuous extrusion E with the lateral straps 45 cut at an angle A corresponding to the rake of the stairway. The U-shaped fastening strap U is fitted within each end of the rails by accommodating the lateral walls 45 within the channel of the picket rails between the internal flanges 13 and 13' in the top rail and 23 and 23' in the bottom rail. Self-tapping screws 50 serve to integrate the lateral straps 45 with the side wall 11 and 21 of the picket rails.

The web 46 extending between the lateral straps 45 is provided with a central aperture 47 for the reception of a bolt 52 extending through the opening and through longitudinal slot C' into the newel post C. The assembly is tightened to the post by means of nut 53 acting on the end of the bolt opposite the head 51 and washer 54. If desired, solid splines having inclined top faces corresponding to the rake angle may be affixed to the post C for supporting the ends of the picket rails, as described in application Ser. No. 371,384, filed July 19, 1973.

As indicated in FIG. 12, the angle A defining the angularity of the fastening straps 45 and the vertical edge corresponds to the rake angle of the rail assembly. Thus, if the stairway has an inclination of 35° to the horizontal, angle A is 55°. Should the inclinations to the horizontal plane be less, the angles A' and A'' may be varied, as indicated in FIG. 12, to accommodate the rail assembly to the decreasing inclinations of the stairway. Correspondingly, the walls 11 of the top rail, and 21 of the bottom rail, are mitered to the same degree as the rake angles of the attaching straps C, so that these abut closely the newel posts C, as indicated in FIG. 2.

Following the fixation of the terminals of the rail assembly to the newel posts C at the top and bottom of the stairway, the top rail may be finished in any desired way. As shown in FIGS. 13 and 14, the post clips 60 are affixed to longitudinally displaced points of the top rail 10 by engagement of screw fasteners F within the screw bosses 56 of the post C. Thereafter, a top hand rail H, of any desired section, is adapted to be snapped into engagement with the post clips, for example, at points 61 and 62 of the latter, to integrate the assembly and impart a finished appearance thereto.

Rail assemblies of extended length may be fabricated by extending the picket rails from the opposite sides of the posts or columns C, as shown in FIGS. 11 and 14. When the rails assume a change in direction, posts are employed which are provided with longitudinal slots C' in faces which are in planes at desired angles relative to the plane whereat the picket rails are joined to the posts. Thus, a post or column C having the longitudinal slot C' in the side 65 thereof would serve to mount and direct the rail assembly in a direction perpendicular to the assembly as shown.

We claim:

1. An adjustable rail assembly for a stairway comprising spaced upper and lower picket rails disposed at an angle to the horizontal with spaced hollow vertical pickets extending therebetween,

a. said picket rails being formed of channelled sections of extruded material with the respective central webs thereof facing each other,

b. a plurality of tabs stamped and broached from the central web of the upper rail spaced from each other and each readily deformable from the plane of said web along an axis substantially perpendicular to the longitudinal axis of the rail at a level higher than the cut at the free edge of the respective tab,

c. each of said tabs having an opening therein,

d. a plurality of tabs stamped and broached from the central web of the lower rail spaced from each other corresponding to the spacings of the tabs in

the upper rail, and in the opposite direction, and each readily deformable from the plane of said lower web along an axis substantially perpendicular to the longitudinal axis of the rail at a level lower than the cut at the free edge of the respective tab,

e. each of said last-mentioned tabs having an opening therein,

f. said spaced vertical pickets formed from predetermined lengths of hollow extruded material formed with an integral screw boss as an integral part of an interior wall surface and adapted for alignment with said openings.

g. self-engaging threaded screw fasteners extending through said openings in said tabs into penetrating threaded engagement with the screw boss at the ends of the hollow pickets adjacent to each tab, and

h. said tabs readily bent from the planes of the respective webs at angles corresponding substantially to the inclination of the stairway relative to the horizontal, to dispose said tabs and end portions of said pickets within said picket rails.

2. A rail as set forth in claim **1**, wherein the angularity of said tabs relative to the planes of the respective webs is adjustable between approximately 35° to 42° to adjust the rake of the rail assembly to that of the stairway on which it is adapted to be installed.

3. A rail assembly as set forth in claim **1**, wherein said hollow vertical pickets are of substantially rectangular section and with the integral screw boss on the interior thereof extending along the entire length thereof.

4. A rail assembly as set forth in claim **1**, wherein said tabs are of substantially rectangular outline, each of a length slightly greater than its width and the hollow vertical pickets are of substantially square cross-section having an external dimension nearly that of the width of said tabs.

5. A rail assembly as set forth in claim **1**, wherein the opening in each of the tabs in the upper and lower rails is of oval shape with its long axis coincident with the longitudinal axis of the rails, and the spaced vertical pickets are of square cross-section having a screw boss on the opposite sides of the interior thereof, one adapted for engagement with the fasteners extending through the openings in the tabs of the upper rail and the other adapted for engagement with the fasteners extending through the openings in the tabs in the lower rail.

6. A rail assembly as set forth in claim **1**, including a vertical post of polygonal cross-section at the overlying terminals of said picket rails, and means for affixing the ends of said picket rails to said vertical post.

7. A rail assembly as set forth in claim **6**, wherein said last-mentioned means comprises a U-shaped fastening strap seated within the ends of the channeled sections of said picket rails with the legs thereof affixed to the sides of the picket rail and the base thereof disposed in a vertical plane for abutting contact with a face of said vertical post.

8. A rail assembly as set forth in claim **7**, wherein said polygonal vertical post is provided with a longitudinal slot extending along the length thereof, to permit the passage of a bolt through an opening in the base of said fastening strap and through said slot for integrating the parts with a nut engaging the end of the bolt.

9. A rail assembly as set forth in claim **6**, wherein the ends of said picket rails are mitered at an angle corresponging to the rake of the stairway.

10. A rail assembly as set forth in claim **9**, including a retaining clip affixed to the junction of said vertical post and upper rail, and a hand rail engageable with said retaining clip for concealing the tabs, the upper end portions of said pickets and the screw fasteners interconnecting them.

11. An adjustable rail assembly for a stairway comprising spaced upper and lower picket rails disposed at an angle to the horizontal with spaced hollow vertical pickets extending therebetween,

a. said picket rails being formed of channeled sections of extruded material with the respective central webs thereof facing each other,

b. a plurality of tabs stamped and broached from the central web of the upper rail spaced from each other and each readily deformable from the plane of said web along a bending axis substantially perpendicular to the longitudinal axis of the rail at a level higher than the cut at the free edge of the respective tab,

c. a plurality of tabs stamped and broached from the central web of the lower rail spaced from each other corresponding to the spacings of the tabs in the upper rail and in the opposite direction, and each readily deformable from the plane of said lower web along a bending axis substantially perpendicular to the longitudinal axis of the rail at a level lower than the cut at the free edge of the respective tab,

d. each of said tabs in the upper and lower rails having a pair of openings therein displaced longitudinally from each other between the bending axis of each tab and the free end thereof, and constituting inner and outer openings relative to said bending axis.

e. said spaced vertical pickets formed from predetermined lengths of hollow extruded material formed with an integral screw boss as an integral part of an interior wall surface and adapted for alignment with said openings,

f. a self-engaging threaded screw fastener extending through one of the openings in each of the tabs of the upper rail in penetrating threaded engagement with the screw boss at the end of the hollow picket adjacent to the respective tab,

g. a self-engaging threaded screw fastener extending through the oppositely designated opening in each of the tabs of the lower rail in penetrating threaded engagement with the screw boss at the end of the hollow picket adjacent to the respective tab, and

h. said tabs being readily bent from the planes of the respective webs at angles substantially corresponding to the rake of the stairway relative to the horizontal, to dispose said tabs and end portions of said pickets within said picket rails.

12. A rail assembly as set forth in claim **11**, wherein said first-mentioned screw fastener extends through the outer opening in each tab in the upper rail, and the last-mentioned screw fastener extends through the inner opening in each tab in the lower rail.

13. A rail assembly as set forth in claim **12**, wherein the angularity of said tabs relative to the planes of the respective webs is adjustable between approximately

35° to 42° to adjust the rake of the rail assembly to that of the stairway on which it is adapted to be installed.

14. A rail assembly as set forth in claim **12,** wherein

a. said picket rails and hollow pickets are fabricated from an extrudable aluminum alloy,

b. said tabs are of substantially rectangular outline, each of a length, in the direction of the longitudinal axis of the rails, slightly greater than its width, and

c. said hollow vertical pickets are of square cross-section having an external dimension nearly that of the width of said tabs with the screw boss on the interior wall surface of the width of each picket adjacent to the outer edge of each tab of the upper rail.

15. A rail assembly as set forth in claim **14,** wherein said openings in said tabs in the upper and lower rails are of oval shape with the long axis thereof coincident with the longitudinal axes of said rails.

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