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PATENT SPECIFICATION
DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Railing Assembly

WE, IPATEX S. A., a Swiss Body Corporate, of 4 rue des Merbriers, Geneva, Switzerland, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a railing assembly, and although it is not so restricted, it will be described with reference to such an assembly for use in a balcony balustrade.

According to one aspect of the present invention, there are provided, in combination, railing assembly members adapted to be assembled together into a railing assembly, comprising a plurality of bars, at least one channel-shaped rail having inwardly bent side walls adapted to form thrust surfaces in the assembled-together state, and a plurality of openings in its base wall, each opening being adapted engagingly to receive a said bar, each said bar comprising a thin web each edge of which has two longitudinally extending flanges, the said flanges being arranged to bear against said thrust surfaces.

Preferably the said two flanges together form a dihedral shape.

In a preferred embodiment, peg means are provided for securing said bars and the or each rail together.

The peg means preferably comprises two pegs which, in the assembled together state, extend through the said web of each said bar and bear against the or each rail.

The two pegs may be integral with each other to form a substantially fork-shaped unitary structure.

Preferably the said flanges are arranged symmetrically with respect to the longitudinal and transverse centre planes of their respective bars.

There may be two rails provided which,

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in the assembled-together state, extend substantially in a parallel superposed relationship with each other and are interconnected at regular intervals with said bars.

Clamp means are preferably provided to clamp a panel to said rail(s), said clamp means comprising jaw members adapted to engage said panel and pivotally to engage a securing member secured to said rail(s), and the securing member preferably comprises a nut-and-bolt arrangement, said bolt having a hook-shaped head adapted to engage said jaw members.

Preferably one end of each said jaw member, on the surface thereof adapted to be nearest to said panel, is provided with longitudinal ribs, while the other end of said jaw member is formed with a hook-shaped head portion thereby forming an open longitudinal channel in which the head of said screw is adapted to be located.

Said channel may thus be formed on the same surface as the said ribs.

The said bars may be made of a light alloy.

According to another aspect of the present invention, there is provided a railing assembly comprising a plurality of bars and at least one channel-shaped rail as set forth above, each said opening having a said bar received therein, and said flanges bearing against said thrust surfaces, the bar and the or each rail being secured together.

In one preferred embodiment, said bars and the or each rail are secured together by welding an end portion of each said bar to said thrust surfaces on the or each rail.

The invention also includes a balustrade provided with a railing assembly as set forth above.

The invention will be illustrated, merely by way of example, in the accompanying drawings, in which:—

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Figure 1 is a perspective view of two rails and a bar about to be assembled into a railing assembly to form a balustrade according to the invention;

Figure 2 shows in cross-section the balustrade obtained with the elements in Figure 1;

Figure 3 is a cross-section of the bar used in Figures 1 and 2;

Figures 4a, 4b, 4c, 4d show, respectively, in cross-section, four alternative types of bars for use in the railing assembly in accordance with the present invention;

Figure 5 is a perspective view partially cut away, of a railing assembly including panels;

Figures 6 and 7 show in perspective and in cross-section respectively, partially cut away, a panel assembling device;

Figure 8 is a perspective detail view of an alternative embodiment of the assembly device of figures 6 and 7; and

Figure 9 shows in cross-section a sectional member usable for assembling panels that will not withstand powerful clamping forces.

Referring first to Figures 1 and 2, there is shown thereon an upper rail 51a and a lower rail 51b, both of which consist of identical light aluminium alloy sections and have a shallow channel-shape in cross-section.

The sections 51a, 51b additionally have a longitudinal plane of symmetry, and the sides 52 of the channel are formed with in-turned rims or flanges 53 the facing edges of which leave a longitudinal channel therebetween.

Each rail has a web 54 which corresponds to the base of the channel, the web 54 being formed with a plurality of uniformly spaced openings 55 therein, the contours of which match the cross-sectional contour of bars 56 which they are adapted to receive. The inner faces of flanges 53 form transversely extending thrust surfaces against which the end-sections of the bars 56 can abut, the bars 56 being arranged to be upright when assembled.

Each bar 56 consists of a solid thin web 57 each edge of which has two flanges 58 which together form a substantially dihedral shape. These identical flanges 58 are arranged symmetrically in relation to the longitudinal and transverse centre planes of the web 57. Since these planes are mutually perpendicular, the symmetry axis of each bar 56 will be the intersection line of the two planes.

When a balustrade according to the present invention is assembled, each bar 56 is secured to the lower rail, 51b as will be explained in greater detail hereinafter, with the aid of the prongs of a peg 59 which fit into holes 60 formed in the web 57 and which bear tangentially against that sur-

face of web 54 which faces the rail flanges 53 acting as thrust surfaces. This peg arrangement enables the simultaneous engagement of two pegs thereby reducing assembly time.

It will now be readily appreciated that it is possible to assemble a balustrade from two sets of elements, supplied respectively at the lengths required to form the rails 51a and 51b and the upright bars 56, the webs of bars 56 having been previously formed with holes 60 at a distance "1" from the ends of the bars equal to the distance separating the inner faces of flanges 53 from web 54.

The assembly operation consists of the steps of:

- engaging one end of each bar 56 with one of the openings 55 in the lower rail 51b until it abuts against the transverse thrust surfaces of flanges 53,
- driving the prongs of pegs 59 into the holes 60 by thrusting against the web 54, the operation being facilitated by the pointed ends of the prongs,
- engaging the free ends of the bars 56 with the corresponding openings 55 in the upper rail 51a,
- and assembling the bars 56 to rail 51a by a pegging process as described at (b).

The upper ends of the bars 56 can then be masked by a handrail 61 in the form of a thin resilient aluminium section of substantially channel shape each side wall of which is formed with, consecutively, an out-swept and an in-turned surface.

The handrail 61 may be engaged over the longitudinal upper rail 51a and is secured thereto by force-fitting it with comparatively light pressure over the rail 51a.

The lower ends of the bars 56 can also be masked by similarly engaging, over the lower longitudinal rail 51a, a lining 62 formed with resilient flanges which securely clip into the gap between ridges formed on the facing flanges 53 of the rails.

It is to be noted that despite the ease with which a peg 59 can be engaged with the web 57, the spacing "e" between the two prongs of the peg 59, which is arranged to be as large as possible, ensures a rigid engagement in the transverse direction. Further, good longitudinal mutual engagement between the pegs 59 and the web 54 is ensured by the full length "L" of each peg bearing against the rail web 54; moreover, the fact that each peg 59 is a force fit may result in advantageous elastic deformation of the web 57.

Thus, having regard for the manufacturing tolerances in such elements, it is possible with such an assembly to balance the varied loads which a balustrade bar and rail may be called upon to withstand.

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It is furthermore possible to form a railing assembly having oblique bars and longitudinal rails without particular difficulty, with the view to constructing a sloping staircase balustrade, if desired.

This can be accomplished by providing openings 55 of width somewhat greater than in the case described above; in this way, the opposite faces of a bar 56, engaged obliquely into such an opening 55 will bear against diagonally opposed lips of the opening, respectively. The holes 60 must also be of larger size so that the pegs 59 can be clamped between the web 57 and the upper lip of the corresponding opening 55.

It has been found that, notwithstanding the clearances, the elastic deformation of the web 57 which occurs on assembly ensures rigid engagement.

Alternatively, instead of the peg-and-hole method of securing, it would be possible, within the scope of the present invention, very economically to assemble straight or oblique bars to the rails by spot-welding the edges of the thrust flanges 53 to the end-sections of the bar flanges 58. Such securing points widely spaced from the bar centre plane would also permit rigid engagement.

Finally, the usually pleasing appearance of the bar 56 is to be noted, despite the fact that its shape is fairly similar to a conventional I-section.

As can be seen more clearly in Figure 3, the web 57 is formed with rounded flange edges 63 and with surfaces 65 and 66 which respectively have radii of curvature carefully chosen and which blend in with the substantially thinned down middle part 67 of the web 57. This results in pleasingly rounded shapes.

It should be noted in this connection that the sections can be contoured to suit the kind of lighting to which the balustrades are to be exposed. Figures 4a to 4d, show alternative embodiments for the shape of bar 56, and in each of these embodiments the bars 56 can be formed in addition with longitudinal ribs which lend themselves particularly well to the obtainment of shadow effects, if desired.

Moreover, the sloping staircase balustrades and the straight balustrades described above can readily be fitted with panels, and reference to Figure 5 shows bars 56 and panels 69 assembled to an upper handrail 51a and a lower rail 51b. The panels 69 can rapidly be assembled by their horizontal edges to the rails 51a, 51b by means of a device illustrated in Figure 6.

Figure 6 shows the upper edge of the panel 69 clamped between jaws formed on the end portions of two identical sections 70a and 70b. Washers 71a, 71b, made of the material known by the trade-name "Isobutyl" are preferably placed between the

jaws and the corresponding panel faces so as to absorb possible irregularities in the thickness of the panel, and possible deformation of the panel edges due to rough handling, or possible distortion due to changes of temperature.

The ends of sections 70a and 70b remote from said jaws are each formed with a substantially hook-shaped head 72 which is caused to bear against the rail web 54, when assembled by means of hook-bolts 73 provided at spaced intervals in the longitudinal channel formed in each section, each hook-bolt 73 having a shank 75 which passes through a hole extending through the web 54 and is secured to the latter by a nut 76.

It will be appreciated, therefore, that each section 70a, 70b acts as a lever having a pivotal point 74 through which the force is applied and a head 72 which is the fulcrum point (see Figure 7). For when the nut 76 is screwed home, a traction force *T* is exerted on the shank 75 which causes tightening forces *F*1 to be applied at 74, and these forces, through the reactions *R* against the heads 72, produce pivoting forces *F*2 tending to clamp the jaws against the edge of panel 69.

In addition, the hook-bolt 73, 75 acts as an element which simultaneously retains the sections 70a, 70b on web 54 and causes closure of their jaws.

It should be noted that the channels 74a in sections 70a, 70b have a generously dimensioned opening facing the side of the section to be clamped to the panel 69, so that when nut 76 is loosened the two sections 70 can be fitted without difficulty over the hook-bolts 73 while receiving the panel 69 between them.

In order to obtain a symmetrical assembly, such hook-bolt type fixing elements may be positioned with advantage in the plane of longitudinal symmetry of a rail.

Finally, it will readily be appreciated that embodying the jaw-closing means in the very same means used to secure the jaws to their support ensures a substantial saving in assembly time. Also noteworthy is the fact that the sections 70a, 70b can be made with advantage by such industrial processes as extrusion or drawing and be supplied in sections as an economical way of providing the assembling and clamping levers referred to precedingly. Further, the hook members with their shanks can be made cheaply by die-stamping or casting.

Obviously, the unit length of each section can be reduced commensurately with the size of the hook members; moreover, the pivot-channels formed in these members could be formed on the sides thereof remote from the clamping faces of the jaws. Such an arrangement is shown in Figure 8 which will not be described in detail, since

its action is very similar to that of Figures 6 and 7, and corresponding parts are given the same reference numerals, but are given a prime (').

- 5 Panels that will not withstand clamping forces could be assembled using the alternative cross-sectional shape shown in Figure 9. The sectional shape illustrated in Figure 9 comprises a U-shaped portion adapted to receive the panel 69, the latter being secured therein by any convenient filler material 77 such as putty.

- 10 The base of the "U" is formed with two flanges 78a and 78b forming part of the section and adapted to engage with the hooks 73 used in the securing system described above.

- 15 It will be appreciated, that the present invention affords a railing assembly construction which is easy to assemble and, in one preferred embodiment, easy to dismantle. Moreover, the use of a thin web 57 instead of thick tubular sections results in saving manufacturing costs.

25 **WHAT WE CLAIM IS:—**

1. In combination, railing assembly members adapted to be assembled together into a railing assembly, comprising a plurality of bars, at least one channel-shaped rail having inwardly bent side walls adapted to form thrust surfaces in the assembled-together state, and a plurality of openings in its base wall, each opening being adapted engagingly to receive a said bar, each said bar comprising a thin web each edge of which has two longitudinally extending flanges, the said flanges being arranged to bear against said thrust surfaces.

2. Railing assembly members as claimed in claim 1 wherein the said two flanges together form a dihedral shape.

3. Railing assembly members as claimed in claim 1 or claim 2 wherein peg means are provided for securing said bars and the or each rail together.

4. Railing assembly members as claimed in claim 3 wherein the peg means comprises two pegs which, in the assembled together state, extend through the said web of each said bar and bear against the or each rail.

5. Railing assembly members as claimed in claim 4 wherein the two pegs are integral with each other to form a substantially fork-shaped unitary structure.

6. Railing assembly members as claimed in any preceding claim wherein the said flanges are arranged symmetrically with respect to the longitudinal and transverse centre planes of their respective bars.

7. Railing assembly members as claimed

in any preceding claim wherein there are two rails provided which, in the assembled-together state, extend substantially in a parallel superposed relationship with each other and are interconnected at regular intervals with said bars.

8. Railing assembly members as claimed in any preceding claim wherein clamp means are provided to clamp a panel to said rail(s), said clamp means comprising jaw members adapted to engage said panel and pivotally to engage a securing member secured to said rail(s).

9. Railing assembly members as claimed in claim 8 wherein said securing member comprises a nut-and-bolt arrangement, said bolt having a hook-shaped head adapted to engage said jaw members.

10. Railing assembly members as claimed in claim 8 or claim 9 wherein one end of each said jaw member, on the surface thereof adapted to be nearest to said panel, is provided with longitudinal ribs, while the other end of the said jaw member is formed with a hook-shaped head portion thereby forming an open longitudinal channel in which the head of said screw is adapted to be located.

11. Railing assembly members as claimed in claim 10 wherein said channel is formed on the same surface as the said ribs.

12. Railing assembly members as claimed in any preceding claim wherein said bars are made of a light alloy.

13. Railing assembly members adapted to be assembled together into a railing assembly substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

14. A railing assembly comprising a plurality of bars and at least one channel-shaped rail as claimed in any preceding claim, each said opening having a said bar received therein, and said flanges bearing against said thrust surfaces, the bar and the or each rail being secured together.

15. A railing assembly as claimed in claim 14 wherein said bars and the or each rail are secured together by welding an end portion of each said bar to said thrust surfaces on the or each rail.

16. A balustrade provided with a railing assembly as claimed in claim 14 or 15.

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its action is very similar to that of Figures 6 and 7, and corresponding parts are given the same reference numerals, but are given a prime (').

5 Panels that will not withstand clamping forces could be assembled using the alternative cross-sectional shape shown in Figure 9. The sectional shape illustrated in Figure 9 comprises a U-shaped portion
10 adapted to receive the panel 69, the latter being secured therein by any convenient filler material 77 such as putty.

The base of the "U" is formed with two flanges 78a and 78b forming part of the section and adapted to engage with the hooks 73 used in the securing system described above.

It will be appreciated, that the present invention affords a railing assembly construction which is easy to assemble and, in one preferred embodiment, easy to dismantle. Moreover, the use of a thin web 57 instead of thick tubular sections results in saving manufacturing costs.

25 WHAT WE CLAIM IS:—

1. In combination, railing assembly members adapted to be assembled together into a railing assembly, comprising a plurality of bars, at least one channel-shaped rail having inwardly bent side walls adapted to form thrust surfaces in the assembled-together state, and a plurality of openings in its base wall, each opening being adapted engagingly to receive a said bar, each said bar comprising a thin web each edge of which has two longitudinally extending flanges, the said flanges being arranged to bear against said thrust surfaces.

2. Railing assembly members as claimed in claim 1 wherein the said two flanges together form a dihedral shape.

3. Railing assembly members as claimed in claim 1 or claim 2 wherein peg means are provided for securing said bars and the or each rail together.

4. Railing assembly members as claimed in claim 3 wherein the peg means comprises two pegs which, in the assembled together state, extend through the said web of each said bar and bear against the or each rail.

5. Railing assembly members as claimed in claim 4 wherein the two pegs are integral with each other to form a substantially fork-shaped unitary structure.

55 6. Railing assembly members as claimed in any preceding claim wherein the said flanges are arranged symmetrically with respect to the longitudinal and transverse centre planes of their respective bars.

60 7. Railing assembly members as claimed

in any preceding claim wherein there are two rails provided which, in the assembled-together state, extend substantially in a parallel superposed relationship with each other and are interconnected at regular 65 intervals with said bars.

8. Railing assembly members as claimed in any preceding claim wherein clamp means are provided to clamp a panel to said rail(s), said clamp means comprising jaw members adapted to engage said panel and pivotally to engage a securing member secured to said rail(s).

9. Railing assembly members as claimed in claim 8 wherein said securing member 75 comprises a nut-and-bolt arrangement, said bolt having a hook-shaped head adapted to engage said jaw members.

10. Railing assembly members as claimed in claim 8 or claim 9 wherein one end of 80 each said jaw member, on the surface thereof adapted to be nearest to said panel, is provided with longitudinal ribs, while the other end of the said jaw member is formed with a hook-shaped head portion thereby 85 forming an open longitudinal channel in which the head of said screw is adapted to be located.

11. Railing assembly members as claimed in claim 10 wherein said channel is formed 90 on the same surface as the said ribs.

12. Railing assembly members as claimed in any preceding claim wherein said bars are made of a light alloy.

13. Railing assembly members adapted 95 to be assembled together into a railing assembly substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

14. A railing assembly comprising a 100 plurality of bars and at least one channel-shaped rail as claimed in any preceding claim, each said opening having a said bar received therein, and said flanges bearing against said thrust surfaces, the bar and the 105 or each rail being secured together.

15. A railing assembly as claimed in claim 14 wherein said bars and the or each rail are secured together by welding an end portion of each said bar to said thrust sur- 110 faces on the or each rail.

16. A balustrade provided with a railing assembly as claimed in claim 14 or 15.

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