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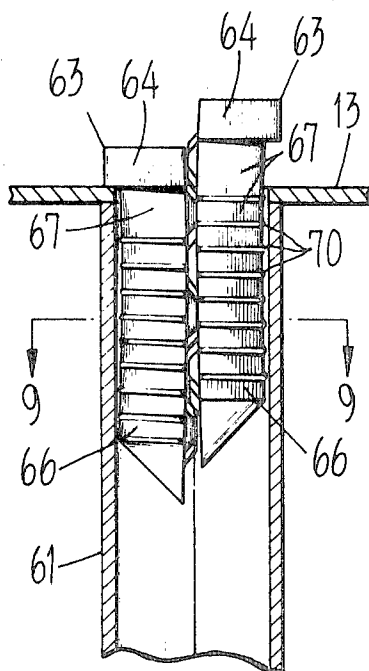
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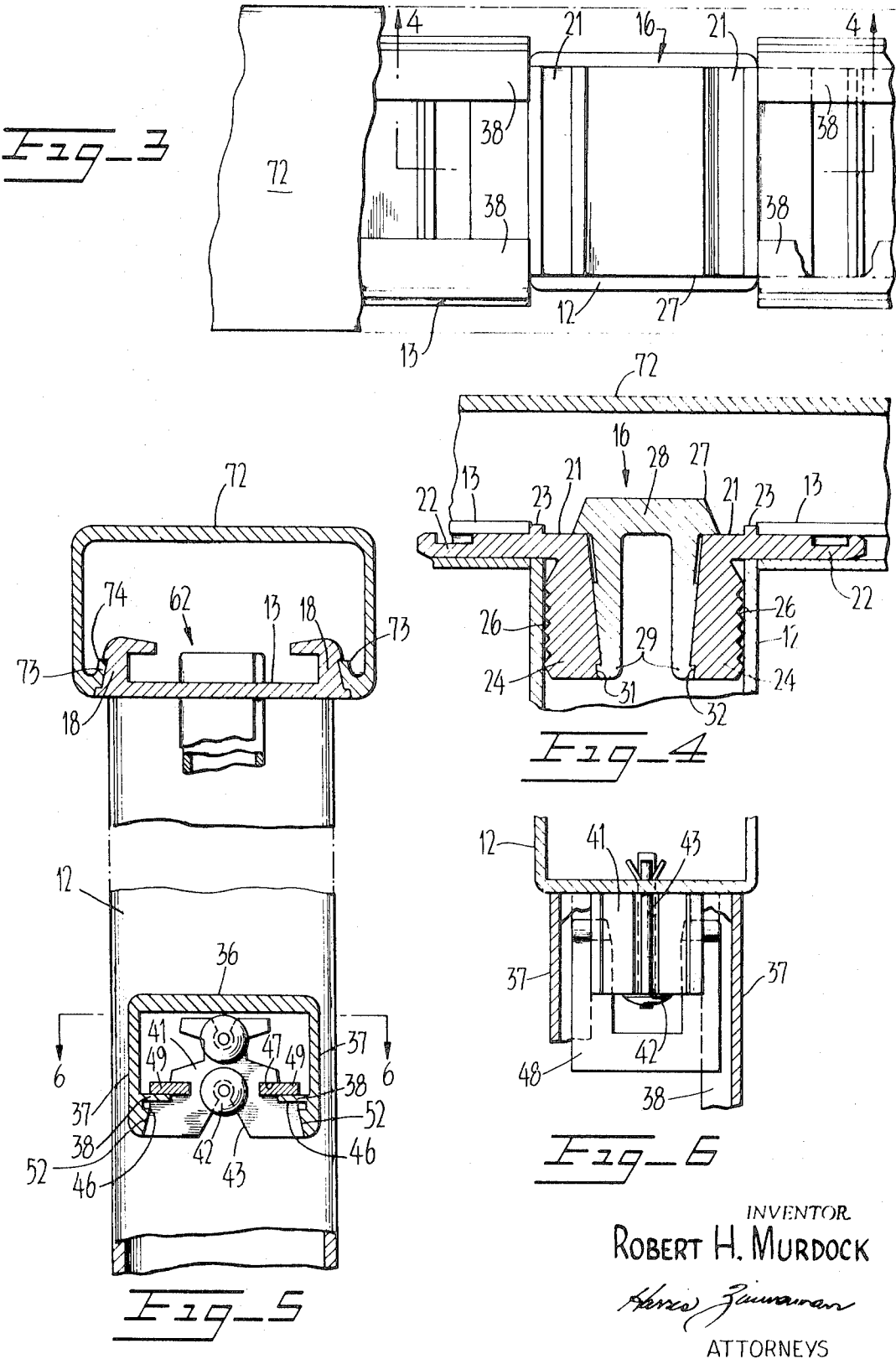
[54] **INTERLOCKING RAILING CONSTRUCTION**
9 Claims, 15 Drawing Figs.

[52] U.S. Cl. **287/189.36,**
 287/54 C, 287/126
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 117, 114, 111, 127, 20.92 E, 126, 54 A, 54 C;
 85/79; 256/22, 70

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ABSTRACT: An interlocking construction for metal railings is described which provides a rigid and tamperproof railing construction and yet which is quickly assemblable. The interlocking construction includes a wedge-and-hanger assembly for rigidly securing locking bars for an upper rail to railing posts. A connector is also provided for securing a bottom rail to the posts by a wedge arrangement which assures tight security of the bottom rail to the posts. Bars are arranged vertically between the upper and lower rails and are secured thereto by locking studs which rely upon a friction fit to assure tight security of the bars.





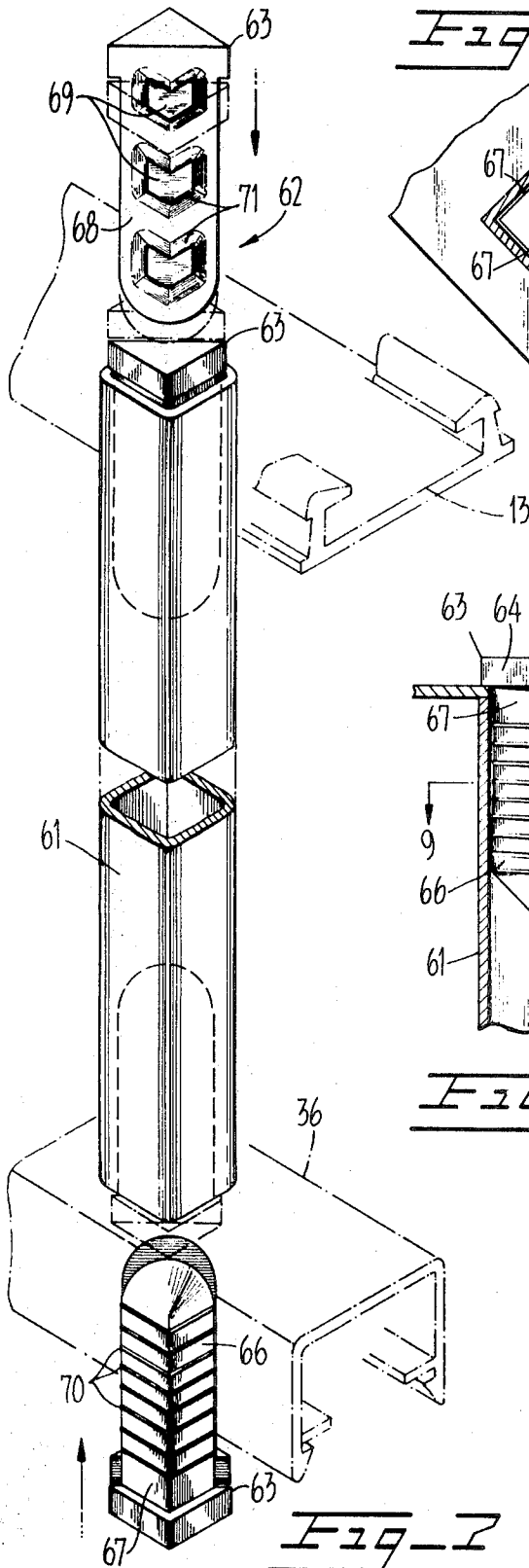


Fig-1

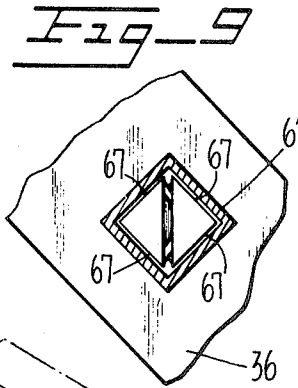


Fig-9

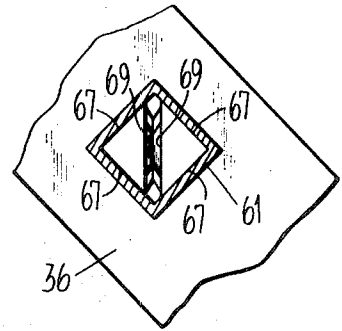


Fig-11

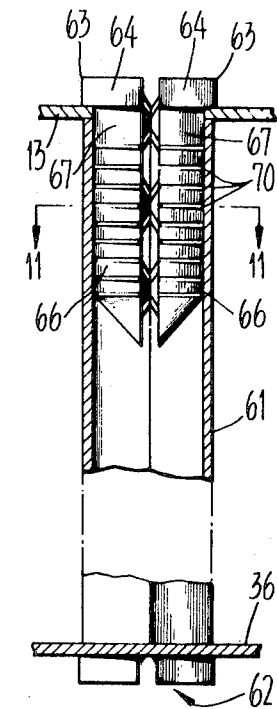
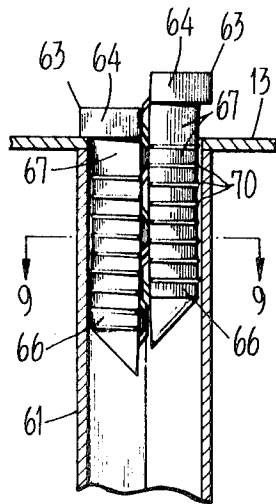


Fig-10

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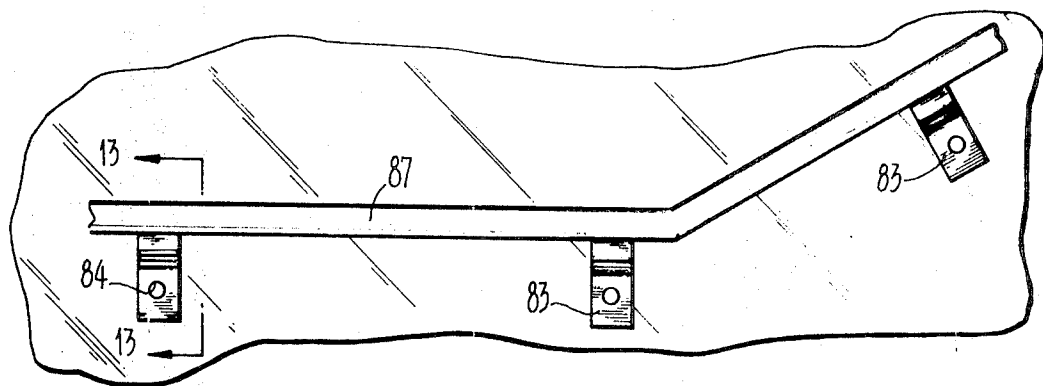


Fig. 12

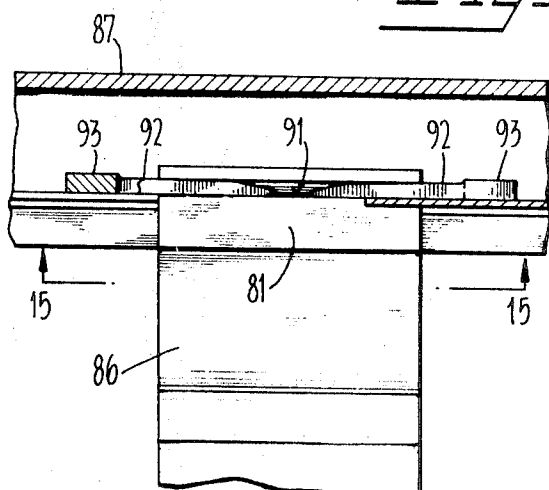


Fig. 14

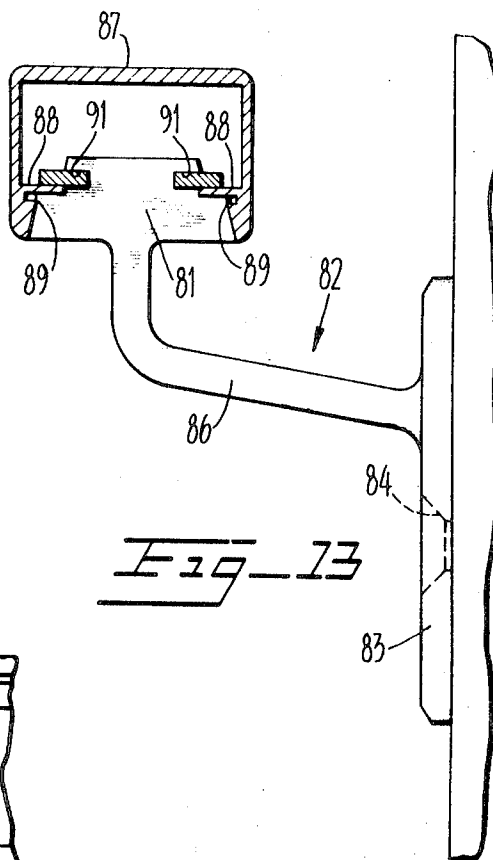


Fig. 13

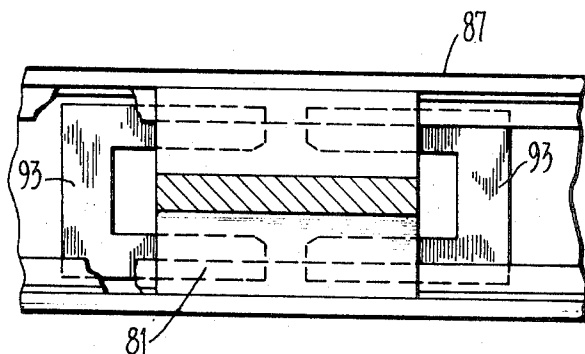


Fig. 15

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INTERLOCKING RAILING CONSTRUCTION

This application is a divisional application of application Ser. No. 644,505, filed Aug. 30, 1967, now U.S. Pat. No. 3,498,589.

BACKGROUND OF THE INVENTION

This invention relates to an interlocking construction for railings and the like, and more particularly to such a construction which is quickly and easily assemblable and which, when assembled, is a very rigid and tamperproof construction.

Metal railings such as tubular aluminum railings are appealing for use on balconies, stairs, etc., in public structures because of their beauty, simplicity in design, and minimum maintenance requirements. However, the cost and time involved in installing this type of railing has limited their acceptance. In this connection, it has been the general practice in the past to secure the various railing parts together by a time-consuming and expensive welding procedure to assure that the final structure is rigid. While bolts and screws have been tried, it has been found that after a period of time they become loose and the railing structure consequently loses its rigidity and becomes unsafe. Moreover, bolts and screws can be easily tampered with and the amount of tampering that takes place on railings mounted in a public place is surprising. Various other connecting arrangements have been used in an attempt to eliminate the necessity of welding. However, these prior connecting arrangements have not been completely satisfactory in that they do not provide a construction having the rigidity and tamperproofness of a welded construction.

SUMMARY OF THE INVENTION

The present invention is an interlocking construction for railings and the like which permits the railings to be quickly and simply assembled and yet which results in a very rigid railing construction which is tamperproof. In its basic aspects, the interlocking construction includes a wedge-and-hanger assembly for rigidly securing to the railing posts locking bars which are adapted to nonremovably retain a rail member in covering relation to the wedge-and-hanger assembly. The interlocking construction also includes easily assemblable locking devices for rigidly securing bottom rail members also to the posts and vertical bars between the upper and lower rail members.

BRIEF DESCRIPTION OF THE DRAWINGS

With reference to the drawings:

FIG. 1 is an elevation view of a railing structure constructed in accordance with the present invention;

FIG. 2 is an exploded and perspective partial view of a railing structure which includes the interlocking construction of the invention;

FIG. 3 is a partial, broken-away plan view of the construction showing the wedge-and-hanger assembly securing the locking bars to a post;

FIG. 4 is a partial sectional view of the railing structure taken on a plane indicated by the line 4—4 in FIG. 3 and depicting the wedge-and-hanger assembly;

FIG. 5 is a partial sectional view of railing structure taken on the planes indicated by the lines 5—5 in Figure 1;

FIG. 6 is a partial sectional view taken on a plane indicated by the line 6—6 in FIG. 5 and depicting the bottom connector locking device of the invention;

FIG. 7 is a perspective partial view, partly in phantom, of the railing structure depicting the locking device of the invention by which vertical bars are secured between the upper locking bars and the bottom rails;

FIG. 8 is a vertical section view of a portion of the railing structure showing the locking device of FIG. 7 in its assembling position, and FIG. 9 is a sectional view thereof taken on a plane indicated by the line 9—9 in FIG. 8;

FIG. 10 is a vertical section view of a railing structure showing the locking device of FIG. 7 in its locking position, and FIG. 11 is a sectional view thereof taken on the plane indicated by the line 11—11 in FIG. 10.

FIG. 12 is an elevation view of a wall handrail having an interlocking construction according to the invention;

FIG. 13 is a sectional view of the wall handrail of FIG. 12 taken on a plane indicated by the line 13—13 in FIG. 12 and depicting the interlocking construction of the invention;

FIG. 14 is a partial sectional view taken on a plane indicated by the line 14—14 of FIG. 13; and

FIG. 15 is a partial section view taken on a plane indicated by the line 15—15 of FIG. 14.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

A metal railing structure, generally referred to by the reference numeral 11, is depicted in FIG. 1. Railing 11 includes the interlocking construction of the invention, and it will be noted that the means by which the various parts are connected together is not visible, thereby giving the railing a clean and neat appearance.

In FIG. 2, a post 12 of railing 11 is illustrated with the various locking devices of the interlocking construction of the invention exploded therefrom to illustrate the manner in which they secure the other parts of the railing to the post. Post 12 is a rectangular hollow member and its upper end is open and adapted to have a pair of similar elongated locking bars 13 rigidly secured thereto by fastening connector means which is generally referred to by the reference numeral 16. Each locking bar 13 includes a base 17 having sides 18 upwardly projecting from the longitudinal edges thereof. The upper free edge of each side portion 18 terminates in an inwardly extending flange 19 which is spaced from, and generally parallel to, base 17. This construction of the locking bars adapts the ends of each for secureance to a hanger 21 of fastening connector means 16. More particularly the locking bar, base 17, side portions 18, and inwardly directed flanges 19 define a slot at the end of each locking bar into which a tongue 22 of each hanger 21 is adapted to fit. Each tongue 22 has width and thickness dimensions substantially the same as the interior dimensions of the slot in the end of the locking bars so that a press fit between the tongue and slot can be obtained. As will be more fully explained below, when the connector 16 is fully assembled to lock the locking bars 13 to post 12, a prying action occurs between the tongue 22 and the locking bars to provide a rigid, tight secureance. Because of this prying action, a sufficiently loose fit between the tongues and the slots can be provided so that only hand pressure need be used to press the hangers into the slots. It is to be noted that the upper surface of each tongue has laterally extending thereacross a projecting stop 23 to assure that the hanger is only inserted into the end of the locking bar the required distance.

The other end of each hanger 21 is adapted for insertion into the hollow end of post 12 with a side surface of the hanger adjacent such end frictionally engaging the interior surface of the post. More particularly, the forward end of tongue 22 of each hanger 21 terminates in a downwardly depending connector portion 24 which is adapted to fit into the hollow end of post 12 with its interior side surface 26 in engagement with the interior surface of one of the sidewalls of post 12. To assure a good frictional contact between connector portion 24 and the post, it will be noted that surface 26 of portion 24 has a relatively large area and is serrated with the serrations running transversely thereof.

After the tongues 22 of the hanger connectors are inserted into the slots of adjacent locking bars, the locking bars are secured to the post by inserting hanger connector portions 24 into the hollow open end of post 12 such that they engage the interior surfaces of opposed sidewalls thereof. Then a wedge member 27 is inserted between them to hold the surfaces 26 into tight frictional engagement with the interior surfaces of the post. Wedge 27 comprises a head 28 from which depends two opposed spring walls 29. From FIG. 4 it will be seen that the thickness of the hanger connector portions 24 increase in a direction away from tongue 22 such that when these portions are within the open end of post 12 with their surfaces 26 in engagement with the interior sidewalls of the post, they

present an inwardly tapering slot for the insertion of wedge 27. Opposed wedge walls 29 are somewhat resilient so that they can be forced into the slot defined by the hangers to provide a strong outward force against hanger connector portions 24 to maintain them in tight frictional engagement with the post sidewalls.

Interlocking shoulder-and-groove means are provided on wedge walls 29 and connector portions 24 to assure that once wedge 27 is forced home into position, it cannot be removed or tampered with. More particularly, the free end of each connector portion 24 has a notch groove 31 extending for the full length of the transverse edge of portion 24 at the end of the surface opposed to the friction surface 26. Complementary shoulder portions 32 project outwardly from the outer lower edge of each wedge wall 29. When wedge 27 is in position between hanger connectors 21, shoulders 32 lockingly engage within grooves 31 and prevent withdrawal of the wedge. It is to be noted that head 28 of wedge 27 extends outwardly beyond walls 29 to provide a shoulder 33 which will engage with the upper surfaces of hangers 21 when the wedge is in position.

As has been mentioned before, connector means 16 is so arranged that when wedge 27 is in the locking position, a prying action is caused which assures good securance of the hanger tongues 22 within the locking bar slots. More particularly, the included angle between face 26 of connector portion 24 and the inner face of tongue 21 of the hanger is greater than the desired angle between the post and the locking bars. For example, in the embodiment depicted it is desired that the locking bars be right-angularly related to the post 12, but the included angle between surface 26 and the lower surface of tongue 22 is greater than a right angle, e.g., 93°. This difference causes the tongue 12 to have a prying lever fit within the slot of the locking bars when such bars are brought into right-angle relationship with the post 12. It will be appreciated that a similar fastening connector with a hanger will be provided for securing the other end of each locking bar to adjacent posts. Thus, the fastening connectors for the adjacent posts will assure that the locking bars are held at a 90° or right-angle relationship to the post and thereby cause the prying action.

From the preceding description, the case by which the locking bars can be secured to the post should be readily apparent. It is only necessary to insert the tongues of the connectors into the slots of the locking bars, place the connector portions of the hangers in the top open end of the post and then drive the wedge 27 home. The resulting lock is very rigid and tamperproof. It has been found that before wedge 27 can be removed the head thereof must be cut.

In accordance with the invention, an easily assemblable device is also provided for locking the lower rail to the post 12 in a rigid and rattle-free manner. In this connection, with reference to FIGS. 2, 5, and 6, it will be seen that the bottom rail is an elongated, open-mouthed member 36 having a substantially U-shape cross section. Opposite sides 37 of the channel member have flanges 38 which extend inwardly thereof from adjacent the mouth.

Each post 12 has connector members 41 suitably secured thereto at the locations at which the bottom rails are to be attached such as by means of conventional exploding drive rivets. Each post 12 has connector members 41 suitably secured thereto such as by means of conventional exploding drive rivets 42 at the locations at which it is desired to attach the bottom rails. Rivets 42 extend through keyhole slots 43 in each connector 41 and through apertures in the sidewall of the post 12. Exploding drive rivets are particularly beneficial as securing means in that they will assure a rigid, nonloosening securance of the connectors.

Each connector 41 is adapted to be received within the open mouth of the bottom rail channel member 36 and has outwardly projecting shoulders 46 which abut against the inwardly directed flanges 38 of the channel member. A groove 47 on each of the opposite sides of the connector is spaced upwardly from the shoulder and located to be inwardly of the

flange 38 when the channel member is received within the connector with the flanges 38 resting upon the shoulders 46. These grooves are for the purpose of receiving a wedge means to rigidly lock the channel member to the connector. More particularly, a U-shaped wedge 48 is provided which has two spaced wedge bars 49. Each of the bars 49 is adapted to fit within one of the grooves and extend outward therefrom in overlying tight contacting relationship to the channel member flange 38 to therebeneath. That is, the spacing of groove 47 from shoulder 46 and the configuration of the wedge bars 49 is such that when the wedge bars 49 are forced into the grooves, they will hold the flanges 38 tight against the shoulders 46 to thereby rigidly secure the channel member to the connector. It is to be noted that the portion of the connector beneath the shoulders 46 engages with the sidewalls of the channel member to assure that the channel member is properly positioned on the connector when the wedge 48 is driven into position.

The above-described connector provides a very rigid securance of the bottom rail to the post. However from FIG. 6 it will be seen that insofar as the structure described to this point is concerned, bottom rail is removable from the post since it can be released from the connector by pulling wedge 48 from the grooves. In some railing installations this movability is desirable in that the bottom rail is the one most often damaged by people standing on the same, etc. It will be noted though that the bottom connector is completely hidden from view inside the bottom rail and tampering with it is consequently discouraged. In those instances in which a permanent installation of the bottom rail is desired, a snap filler plate 51 can be placed within the open mouth of the channel member to close the same and prevent access to the wedge 48. In this connection, it will be noted that sidewalls 37 of bottom rail 36 have shoulders 52 which extend inwardly of the channel for the length thereof adjacent its mouth. The inner surfaces of these projections taper inwardly from the edge of the sidewalls to thereby provide a groove between the termination of such projections and the flanges 38. The snap filler 51 includes upwardly directed side ribs 53 having an exterior surface configuration complementary to the inner surface configuration of the projections 52 and terminating in outwardly extending shoulders 54 adapted to lockingly engage with the channel member groove to thereby prevent removal of the snap filler.

The railing structure also includes FIG. bars 61 closing the area between each pair of posts 12 as shown in FIG. 1. These bars 61 are also secured between the top and bottom rails by a locking device of the invention to assure that the complete railing structure the hollow a very rigid, tamperproof construction. With reference to FIGS. 7 through 11, which are devoted to the locking device for the vertical bars, it will be seen that each vertical bar 61 is a hollow rectangular member whose ends are open and which is mounted vertically between the upper locking bar 13 and the bottom rail 36 (the latter two members being shown in phantom in FIG. 7). Locking bar 13 and bottom rail 36 are provided with a plurality of vertically aligned apertures which are spaced along the length of each and which are adapted to register with the hollow open ends of the vertical bars. The locking devices for these vertical bars, generally referred to by the reference numeral 62, cooperate with the apertures in the locking bar and bottom rail and with the hollow open ends of the vertical bars to provide the securance of the bars between such horizontal members. Since the locking devices for both the upper and lower ends of the vertical bars are identical, only the depicted upper one will be described in detail. Locking device 62 comprises a pair of locking studs 63, each one of which has a head portion 64 and a pin portion 66. The studs of has a pair are adapted to cooperate with one another in one "unexpanded" axial positioning of one relative to another as shown in FIG. 8 to permit their insertion together through an aperture in the locking bar and into the upper open end of bar 61. Then the pair of locking studs can be "expanded" by changing their relative

longitudinal positioning to the position shown in FIG. 10, thereby causing the pins to tightly grip the vertical bar to the horizontal locking bar. In more detail, it will be noted that the pin portion 66 of each locking stud has an exterior surface portion which is adapted to mate with a corresponding portion of the interior surface of the hollow open end of bar 61. That is, the longitudinal surface of each pin is defined by three faces, two of which, referred to by the reference numerals 67, are right-angularly related to mate with the interior surfaces of two of the right-angularly related walls making up the rectangular vertical bar 61. With this type of arrangement, it will be seen that when both pins of each pair are placed together with the third faces thereof, faces 68, in opposed relationship, the exterior surface of the composite construction is generally rectangular and conforms to the rectangular interior surface of the bar.

The faces 68 of each pair of locking studs have projections 69 which interfit with one another when the studs are in the first axial positioning with the pin faces 68 in opposed contacting relationship. With the projections interfitting, the pair of studs is easily insertable by hand through the aperture in the locking bar 13 and into the hollow open end of vertical bar 61. In the second axial positioning of the studs relative to one another, the respective projections 69 are in abutment and force the studs apart. The result is that the exterior surface portions of the pins are brought into tight frictional engagement with the complementary interior surface of the hollow end, thereby preventing withdrawal of the studs from such hollow end. To assure tight frictional fit of the pins 66 in the vertical bar, it will be noted that the faces 67 thereof are provided with transversely extending serrations 70. Also, for best results it is desirable that the pins 66 be of a slightly greater width at the upper and lower edges of the faces 67 than at the midplane thereof. This difference in width, discernable in FIG. 8, will cause the upper and lower edges of the pins to "dig into" the locking bar 13 and the vertical bar 61, respectively, to assure the tight fit.

The studs can be moved from the first axial positioning to the second by simply striking the upwardly extending stud with a hammer to thereby transversely align the heads of the studs. It will be noted that the stud heads 64 of each pair extend outwardly beyond the edges of the aperture in the locking bar when they are transversely aligned and overlie such locking bar to cause its securance to the vertical bar 61.

The projections 69 are designed to facilitate their above-described mating as well as movement of the pins between the first and second axial positionings. That is, with reference to FIG. 7 it will be seen that each of the projections has a generally herringbone tooth or chevron-shaped upper surface which is connected to the face 68 by ramp surfaces 71. The projections 69 are equally spaced apart with the distance between each being sufficient to permit the nesting of a similar projection on the other pin of each pair. The ramp portions 71, and the points of the chevrons nesting in the valley of the adjacent chevron of the other pin, facilitates movement of the projection 69 from the nesting position to the abutting position.

As has been brought out before, the interlocking construction of the invention makes the assembling of a railing structure a very simple and quick matter. The railing can be preassembled into sections which include the upper locking bar 13, bottom rail 36 and vertical bars 61. The locking device 61 described immediately above facilitates this preassembly. Bars 61 can be rigidly secured between the locking bar 13 and the bottom rail 36 by simply inserting a pair of locking studs into each end thereof when it is in position and striking the protruding stud with a hammer. The posts 12 have the bottom connector bodies 41 secured thereto at the appropriate positions and then are set in the desired spacial relationship at the location for the railing. To secure each railing section between the posts, the hangers 21 are inserted into the ends of the locking bars 13 and the sections are hung from the posts by inserting the hanger connector portions 24 into the open upper

end of such posts and resting the bottom rail flanges 38 on shoulders 46 of the bottom connector bodies 41. Then the upper wedge 27 and the bottom connector wedges 48 can be driven home to rigidly secure the railing sections between the posts. An upper railing member 72 can be simply snapped onto locking bar 13 in covering relationship to the wedge-and-hanger assemblies 16 and the vertical bar locking devices 62. In this connection, it will be noted that the upper rail is an elongated open-mouth channel member having inwardly projecting reentrant flanges 73 extending the length thereof adjacent the mouth. These flanges are complementary to longitudinal grooves 74 in the exterior surfaces of the side portions 18 of locking bar 13 and are adapted to fit within such grooves in a snapping, nonremovable engagement to thereby rigidly secure the rail member to the locking bar. The rail member 72 can be provided in sections of any desired length, it being preferred that such rail member sections extend over and cover the hanger-and-wedge assemblies 16 and the vertical bar locking devices 2.

The various locking devices cooperate to provide the resulting railing structure with a rigidity, rattle-freeness, and tamperproofness equal to that obtained by welding the various parts together. It will be appreciated however, that the individual locking devices need not necessarily be used together, since each provides a rigid securance of the members to which it relates. Moreover, each need not be used with the specific railing member with which they are described above. For example, as shown in FIGS. 12 through 15, the locking device used for securing the bottom rail to the posts can also be used advantageously to secure a handrailing for stairs and the like to wall brackets. More particularly in FIGS. 12 through 15 a connector body 81, generally similar to the connector body 41 of the previously described bottom connector, is an integral part of a wall bracket 82. Bracket 82 includes a plate portion 83 having a countersunk aperture 84 for the reception of bolt or screw to secure the bracket to a wall. An arm portion 86 extends outward and upwardly from plate 83 and terminates in connector 81. Handrail 87 is similar to the bottom rail 36 of the previously described railing structure in that it is an open-mouth channel member having inwardly directed flanges 88 adapted to rest upon shoulders 89 72 projecting second connector 81. Each side of connector the 81 is provided with a groove 91 adapted to receive the wedge bars 92 of wedges 93. Wedge bars 92 are arranged to overlie flanges 88 of rail 87 to cause the tight securance of such rail to the connector body 81 as previously described. It will be noted, that in this embodiment two wedges 93 are provided, one for each end of connector body 81, since the connector body 81 is not up against a member such as the post 12. The provision of these two wedges 83 will prevent longitudinal movement of the rail with respect to the connector. A snap-in filler such as the previously described bottom-rail filler 51 can be snapped into place within the mouth of the channel member to prevent tampering.

Because of the provision of the interlocking device of the instant invention the handrail is easily secured to the brackets and yet the resulting structure is rigid, rattle-free and tamperproof.

What is claimed is:

1. An interlocking construction for connecting a first member having a preferred hollow open end to a second member having an aperture adapted to register with said hollow open end, comprising a pair of locking studs each of which includes a head portion and a pin portion, a first exterior surface portion of each of said pins having a configuration mating with a corresponding portion of the interior surface of the hollow end portion of said first member, each of said surface portions of each of said pins being complementary to a different portion of the interior surface of said hollow end portion than the other, each of said pins having a face adapted to be opposed to a like face of the other pin when said pins are inserted through the aperture in said second member and said exterior surface portions of the pins are in mating relation to said in-

terior surface of said hollow end portions, said face of each of said pins having projections which in a first axial positioning of said studs with said pin faces in opposed substantially contacting relationship interfit with one another to permit said studs to be inserted through said second member aperture and into said first member hollow end portion, and which in a second axial positioning of said studs about one another forcing said studs apart and said exterior surface portions of said pins into tight frictional engagement with the complementary interior surface of said hollow end and with the portions of said second member defining the aperture therein.

2. A construction as defined in claim 1, in which said aperture has a configuration mating with and complementary to said first exterior surface portions of said pair of pins.

3. A construction as defined in claim 1, in which a first projection on each face is positioned adjacent said second member aperture and another projection on each stud is positioned in spaced relationship to said first projection and within said first member hollow end portion when said studs are in said second axial positioning.

4. A construction as set forth in claim 1, in which said first member is of hollow tubular configuration defining said hollow open end.

5. A construction as set forth in claim 1, in which said hollow open end has an internal polygonal cross section.

6. A construction as set forth in claim 5, in which said polygonal cross section constitutes a substantial square.

7. A construction as set forth in claim 5, in which said faces form an acute angle with at least some of the interior surface of said hollow end portions.

8. A construction as set forth in claim 1, in which said hollow end portion is of generally square cross-sectional configuration and each of said pin portions has a cross-sectional form of a right triangle.

9. A construction as set forth in claim 1, in which the width of said pin measured from the face thereof to the outermost surface thereof has a lesser dimension at a medial portion than at the ends.

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