March 3, 1970 R. H. MURDOCK 3,498,589

INTERLOCKING RAILING CONSTRUCTION

Filed Aug. 30, 1967 4 Sheets-Sheet 1

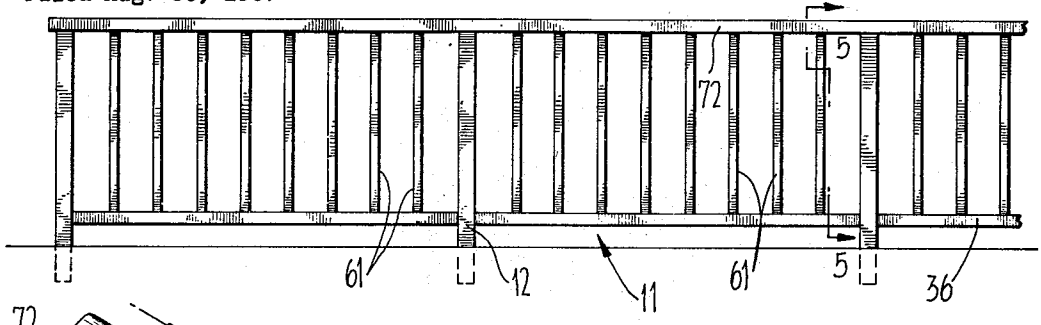


Fig. 1

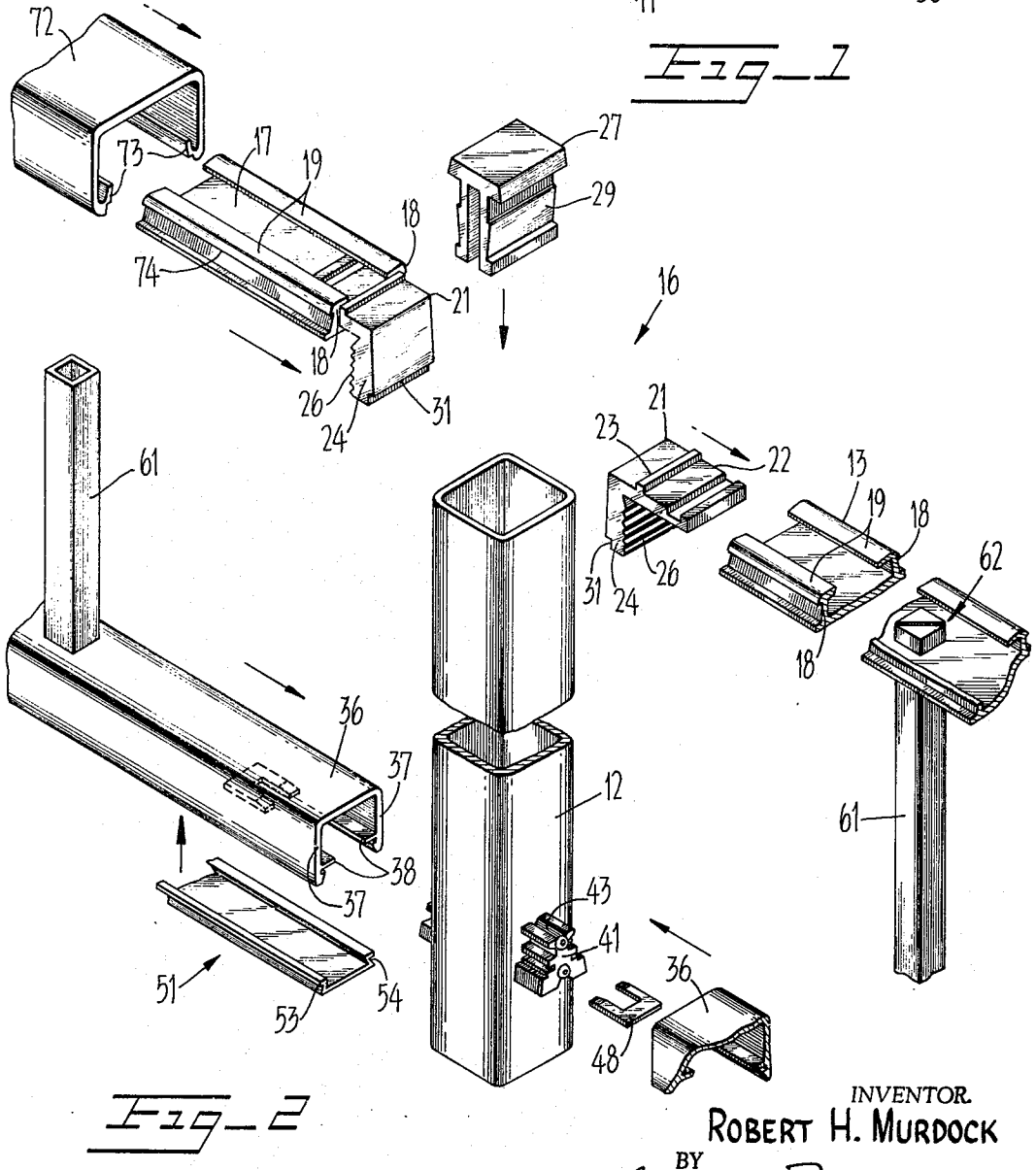


Fig. 2

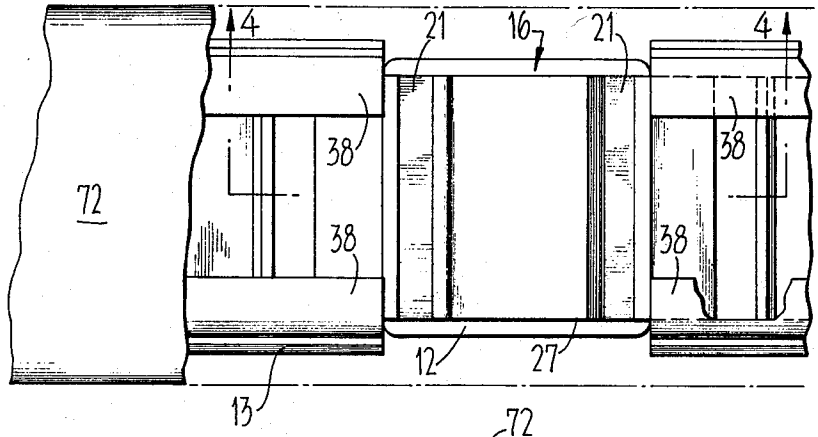
INVENTOR.
ROBERT H. MURDOCK
BY
Gardner & Zimmerman
ATTORNEYS

March 3, 1970 R. H. MURDOCK 3,498,589

INTERLOCKING RAILING CONSTRUCTION

Filed Aug. 30, 1967 4 Sheets-Sheet 2

Fig_3



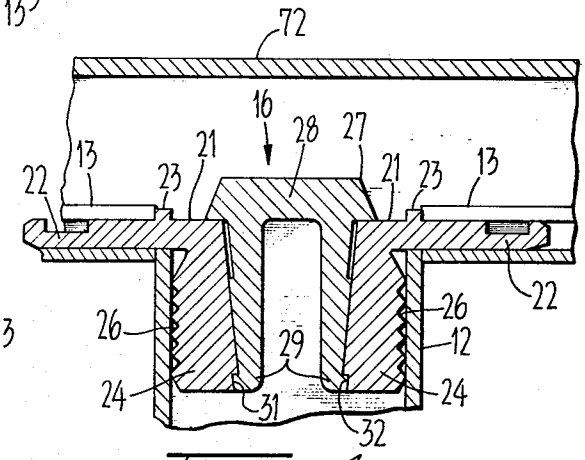


Fig_4

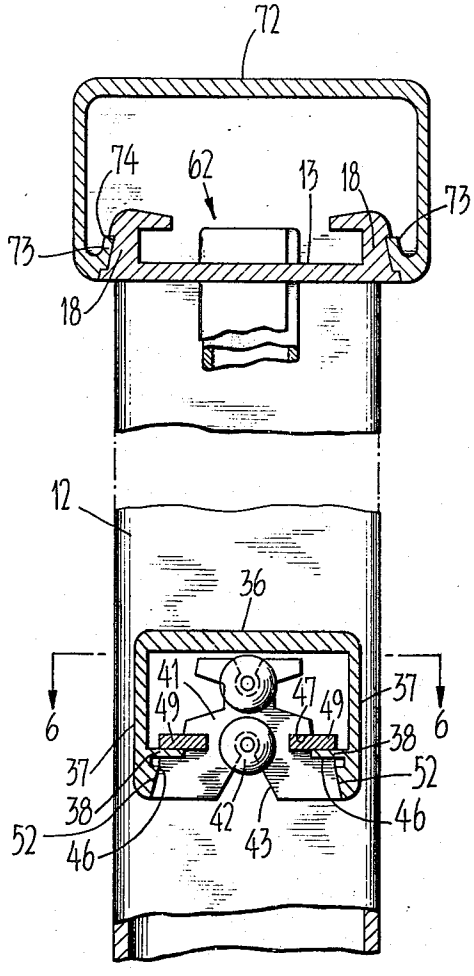


Fig_5

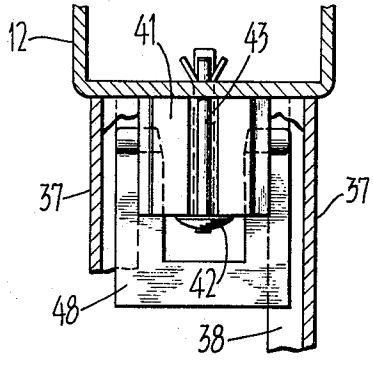


Fig_6

INVENTOR.
ROBERT H. MURDOCK
BY
Gardner & Zimmerman
ATTORNEYS

March 3, 1970 R. H. MURDOCK 3,498,589

INTERLOCKING RAILING CONSTRUCTION

Filed Aug. 30, 1967 4 Sheets-Sheet 3

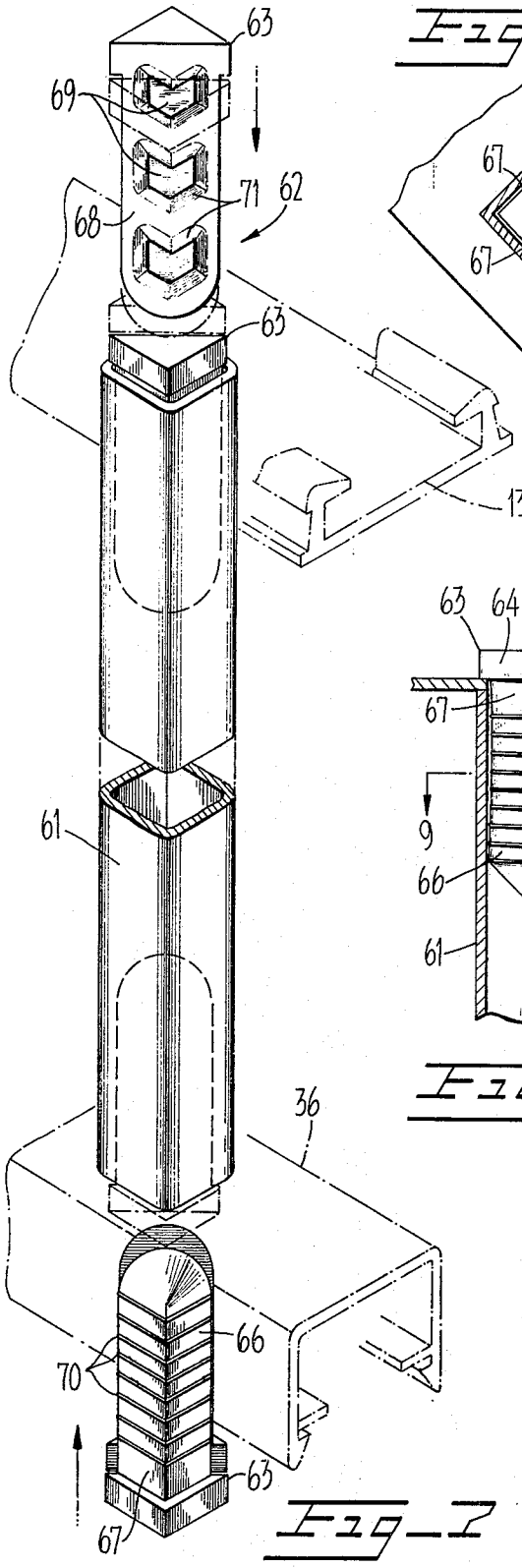


Fig. 7

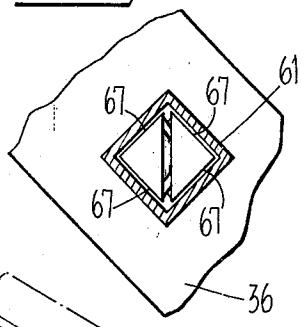


Fig. 9

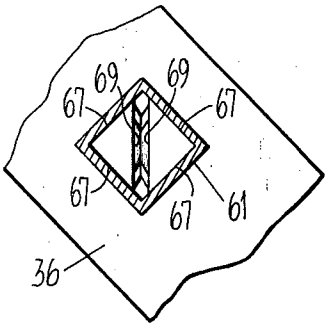


Fig. 11

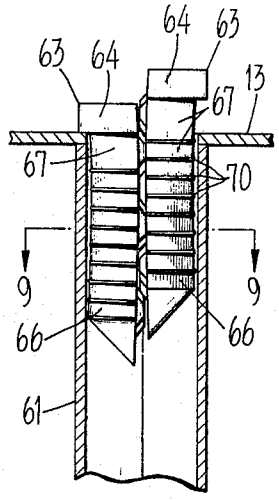


Fig. 8

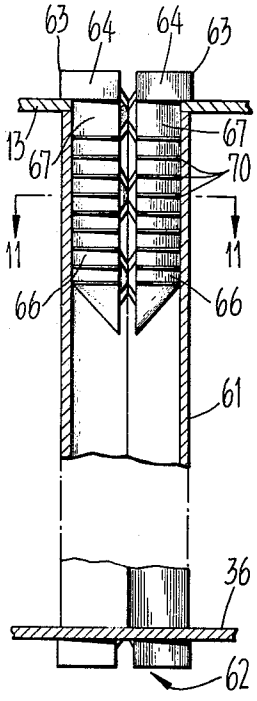


Fig. 10

INVENTOR.
ROBERT H. MURDOCK
BY
Gardner & Zimmerman
ATTORNEYS

March 3, 1970 R. H. MURDOCK 3,498,589

INTERLOCKING RAILING CONSTRUCTION

Filed Aug. 30, 1967 4 Sheets-Sheet 4

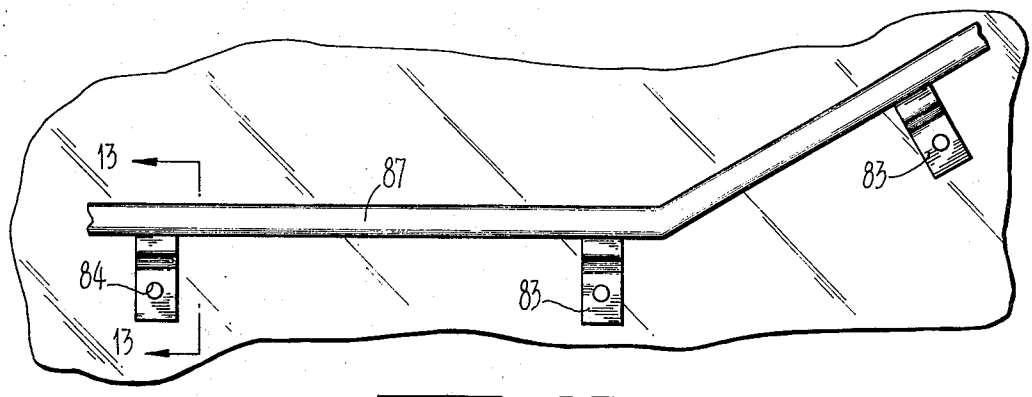


Fig_12

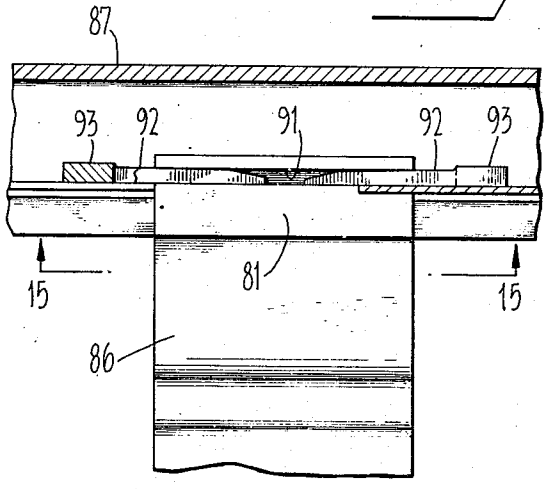


Fig_14

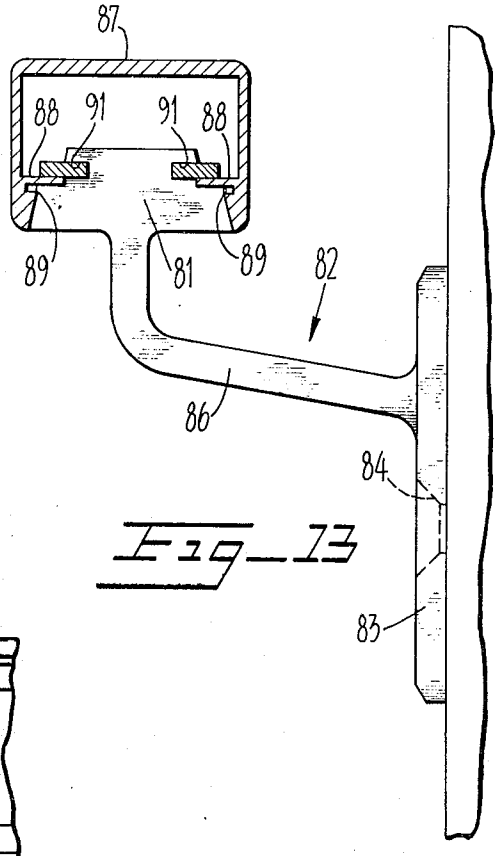


Fig_13

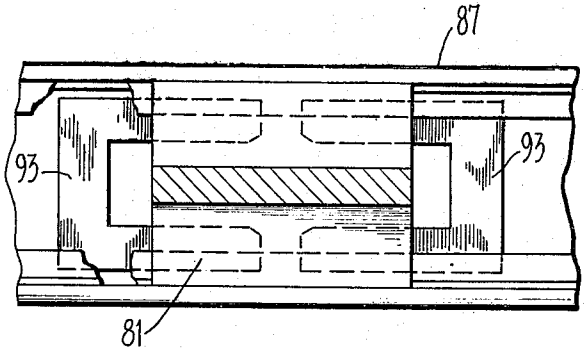


Fig_15

INVENTOR.
ROBERT H. MURDOCK
BY
Gardner & Zimmerman
ATTORNEYS

United States Patent Office

3,498,589
Patented Mar. 3, 1970

3,498,589

INTERLOCKING RAILING CONSTRUCTION

Robert H. Murdock, Oakland, Calif., assignor to Railtec Corporation, Berkeley, Calif., a corporation of California

Filed Aug. 30, 1967, Ser. No. 664,505
Int. Cl. E04h 17/14, 17/16
U.S. Cl. 256—70 4 Claims

ABSTRACT OF THE DISCLOSURE

An interlocking construction for metal railings is described which provides a rigid and tamper proof 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 securance 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 securance of the bars.

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 tamper-proof 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 tamper-proofness 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 tamper proof. 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 nonremoveably 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:

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

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

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

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

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

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

FIGURE 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;

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

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

FIGURE 12 is an elevation view of a wall hand rail having an interlocking construction according to the invention;

FIGURE 13 is a sectional view of the wall hand rail of FIGURE 12 taken on a plane indicated by the line **13—13** in FIGURE 12 and depicting the interlocking construction of the invention;

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

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

DESCRIPTION OF THE PREFERRED EMBODIMENTS

A metal railing structure, generally referred to by the reference numeral **11**, is depicted in FIGURE 1. Railing **11** includes the interlocking construction of the invention, and 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 FIGURE 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 securance 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 securance. 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 side walls 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 side walls 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 FIGURE 4 it will be seen that the thickness of the hanger connector portions 24 increases 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 side walls 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 side walls.

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 FIGURES 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 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 key hole slots 43 in each connector 41 and through apertures in the side wall of the post 12. Exploding drive rivets are particularly beneficial as securing means in that they will assure a rigid, non-loosening 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 side walls 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 FIGURE 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 removability 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 side walls **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 side walls 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 vertical bars **61** closing the area between each pair of posts **12** as shown in FIGURE 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 is a very rigid, tamperproof construction. With reference to FIGURES 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 FIGURE 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 each pair are adapted to cooperate with one another in one "unexpanded" axial positioning of one relative to another as shown in FIGURE 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 FIGURE 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** that at the midplane thereof. This difference in width, discernable in FIGURE 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 FIGURE 7 it will be seen that each of the projections has a generally herring bone 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 **62** described immediately above facilitates this preassembly. Bars **61** can be very 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 shoulder **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, non-removable engagement to thereby rigidly secure the rail

member to the locking bar. 8he 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 **62**.

The various locking devices cooperate to provide the resulting railing structure with a rigidity, rattle-freeness, and tamper-proofness 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 FIGURES 12 through 15, the locking device used for securing the bottom rail to the posts can also be used advantageously to secure a hand railing for stairs and the like to wall brackets. More particularly in FIGURES 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 a 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**. Hand rail **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** outwardly projecting from connector **81**. Each side of connector body **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. In an interlocking construction for railings and the like, an easily assemblable fastening connector for joining the ends of a pair of longitudinally aligned members to the hollow end of a third member disposed generally normal to said pair of members in a tamper proof and rattle free manner, comprising a pair of hangers each having a first portion adjacent one end secured to one of said pair of members and each having a second portion angularly related to said first portion for insertion into said hollow end of said third member with a side surface thereof frictionally engaging the interior surface of said hollow end; and a wedge having depending, opposed walls adapted to be driven into said hollow end of said third member between said second portions of said hangers when said hangers are in said hollow end to force said side surfaces into tight frictional engagement with the interior surface of said hollow end, said opposed wedge walls and said hangers having cooperating projecting shoulders and recess grooves adapted to lockingly engage when said wedge is positioned in said hollow end between said hangers to thereby hold said surfaces in tight frictional engagement and prevent withdrawal of said wedge.

2. The interlocking construction of claim **1** wherein each of said pair of members has at an end thereof a slot and said first portion of each of said hangers includes a tongue adapted to fit within one of said slots to provide said joining of said hangers to said pair of members.

3. The interlocking construction of claim **2** wherein said pair of members are to be anqularly joined to said third member and wherein said second portion of each of said hangers is angularly related to said tongue with an included angle therebetween greater than the angle at which each of said pair of members is to be related to said third member.

4. The interlocking construction of claim **1** wherein each of said pair of members comprises an elongated locking bar adapted at an end thereof for securance to the first portion of one of said hangers and each of which includes upwardly projecting side portions, and an elongated open mouthed channel rail member having inwardly projecting reentrant flanges adjacent the mouth thereof, said locking bar side portions and said reentrant flanges having cooperating shoulders and grooves adapted to lockingly engage in a nonremovable snapping fit to rigidly secure said rail member to said locking bar, said rail member being securable over said fastening connector to both of said locking bar members in covering relationship to said pair of hangers and said wedge.

References Cited

UNITED STATES PATENTS

474,813	5/1892	Clements	256—65
910,459	1/1909	Craig	256—65 X
2,905,446	9/1959	Blum	256—21 X
3,313,527	4/1967	Eriksson	256—21 X
3,315,943	4/1967	Van Den Brock	256—22

FOREIGN PATENTS

570,548	9/1958	Belgium.

DENNIS L. TAYLOR, Primary Examiner

U.S. Cl. X.R.

256—21