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Gross

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[54] **DECKING STRUCTURE WITH GUARD RAIL SUPPORT**

[76] Inventor: **Rudolph Leonard Gross,** 20 Valencia Crescent, Toronto, Ontario, Canada

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[51] **Int. Cl.** **E04c 5/18,** E04b 1/38

[58] **Field of Search** 52/601, 73, 699, 52/710, 704, 235, 714, 627, 27; 256/13.1

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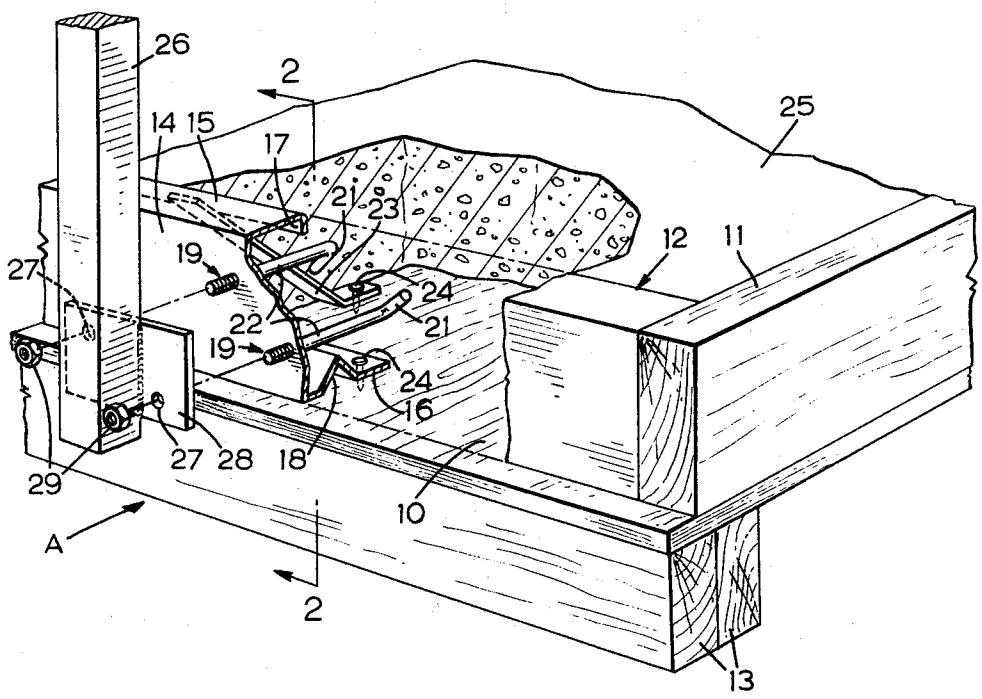
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Primary Examiner—Frank L. Abbott
Assistant Examiner—H. E. Raduazo
Attorney—J. A. Legris et al.

[57] **ABSTRACT**

In a balcony structure in which the front edge portion of a concrete body is clad with a channel-shaped metal frame, metal securement rods are disposed through the frame and are welded thereto with one end portion of each rod being embedded in the concrete body and a further end portion of each rod projecting from the frame and disposed outwardly of the concrete body. The rods are disposed with a predetermined spacing therebetween which spacing is identical to the spacing between apertures provided in upright members of a guard railing, the further end portions of the rods being disposed through these apertures and having nuts screw-threadedly mounted therein whereby securely to connect the guard railing to the rods. The lower limb portion of the frame has a portion which is of inverted V-shape in cross-section and which extends substantially longitudinally relative to the frame.

11 Claims, 3 Drawing Figures



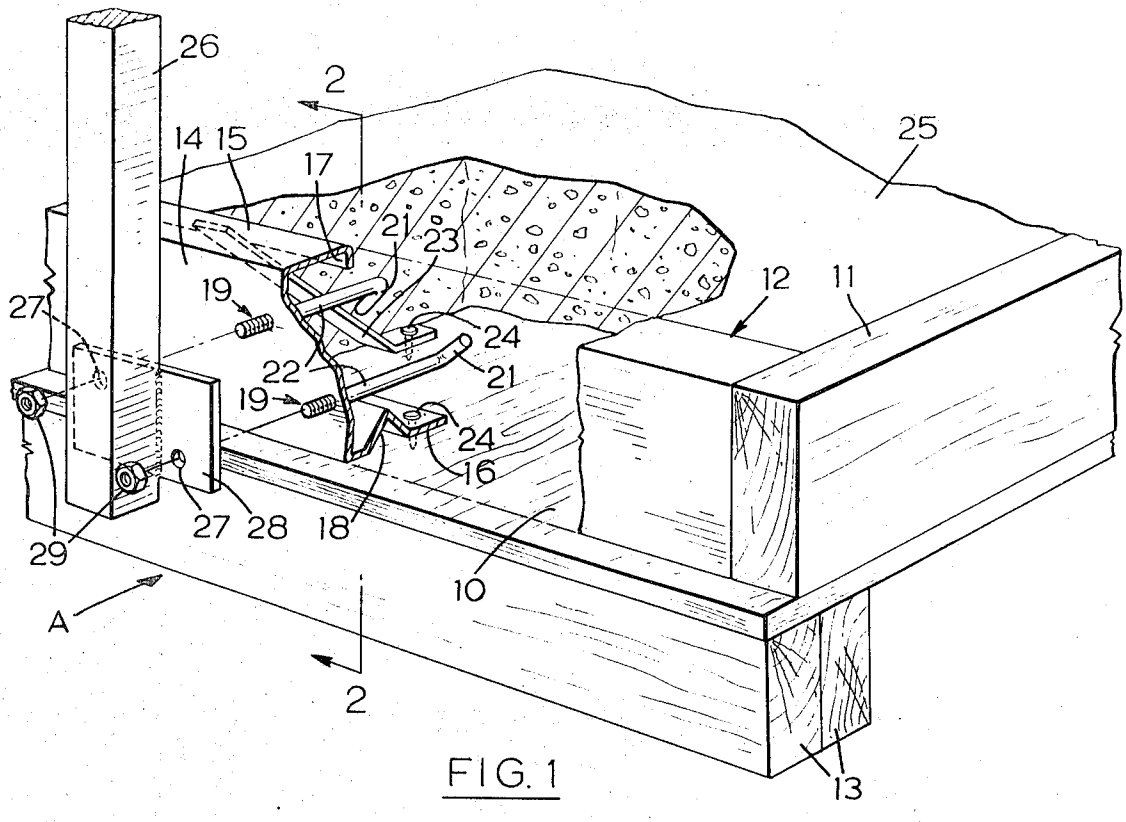


FIG. 1

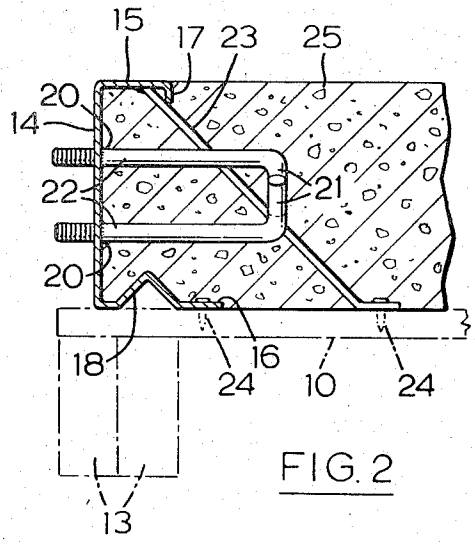


FIG. 2

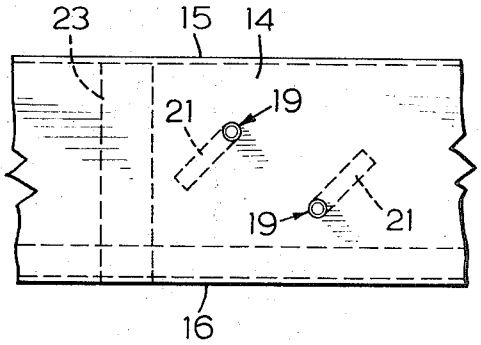


FIG. 3

INVENTOR.
RUDOLPH LEONARD GROSS
BY Maybee & Legris
ATTORNEYS

DECKING STRUCTURE WITH GUARD RAIL SUPPORT

This invention relates to a decking structure. A decking structure with which the present invention is concerned may be constituted by any substantially horizontal structure, and particularly any such structure which is incorporated in or associated with a building. Thus, such a structure may be constituted by a floor of a building or, for example, by a substantially horizontal patio particularly where the patio is of the type which is raised above the ground, although it is to be emphasized that the invention is also applicable to patios which are mounted on the ground.

The present invention is, however, particularly applicable in the case of such a structure which is in the form of a cantilevered balcony projecting from a high-rise building such as a high-rise apartment building, and the invention will accordingly be hereinafter described with specific reference to a structure of this type.

It has been conventional in the manufacture of cantilevered balconies in high-rise apartment buildings for the balconies, where they are of poured concrete construction, to be formed by appropriately positioning wooden form members, and then pouring the concrete into the space defined by the form members, the concrete being caused or allowed to set and the form members subsequently being removed. In the manufacture of such balconies a guard in the form of, for example, a metal railing is, for obvious reasons of safety, generally secured to the balcony along the edges thereof, or at least along the front edge thereof, the guard which may be in the form of spaced upright members interconnected by panels or by substantially horizontally disposed rails being secured to anchor bolts part of which project from the concrete with the remaining part embedded in the poured concrete thereby securely to connect the bolts to the balcony. It has hitherto been the conventional practice for these anchor bolts to be mounted in position by being disposed through holes which are drilled on site through the appropriate wooden form member or members prior to the pouring of the concrete. While this hithereto used manner of mounting the anchor bolts has in many respects been reasonably satisfactory, it suffers from the disadvantage that the drilling of the holes in the appropriate form member or members must be performed by skilled labour since this operation, together with the subsequent mounting of the anchor bolts in the holes requires great accuracy and care, the spacing between the anchor bolts and hence the spacing between the drilled holes requiring to be identical to the predetermined spacing between the apertures or other elements of the guard railing with which the anchor bolts must register in order satisfactorily to ensure secure connection of the guard railing to the anchor bolts. It is also to be noted that in this hitherto used manner of manufacturing such balconies there is the risk that the anchor bolts may be accidentally dislodged from their proper alignment prior to the setting of the concrete.

It is an object of the present invention to provide a decking structure, such as a cantilevered balcony in an apartment building, in which the above disadvantages and difficulties are substantially overcome or obviated.

In U.S. Pat. No. 3,372,523 which issued on Jan. 12, 1968 to W.H. Hall, Jr. and which is the most relevant prior art of which the inventor is aware, there is disclosed a structure comprising a metallic form **10** which

is provided with apertures through which fasteners **12** in the form of anchor bolts are disposed, a body of concrete **14** then being poured over the form **10** so that when the concrete **14** has set the portions of the fasteners **12** which are disposed above the form **10** and which are, of course, embedded in the body of concrete **14** are together with the form **10** securely connected to the concrete **14.** It will be noted, however, that the fasteners **12** disclosed by Hall, Jr., these fasteners **12** projecting downwardly from the body of concrete **14** which constitutes a ceiling structure, are intended to support individual hanging objects such as individual light fixtures, conduits and the like. Thus, although the fasteners **12** must, of course, be appropriately positioned in order to support the light fixtures or the like substantially at the desired positions, it will be noted that in the arrangement disclosed by Hall, Jr. the precise spacing between the fasteners **12** is not critical in view of the fact that, as hereinbefore stated, the arrangement is a ceiling structure provided with fasteners **12** for supporting individual light fixtures or the like, whereas the present invention is concerned with the wholly different technical field of decking structures, such as a cantilevered balcony in an apartment building, in which the means such as the anchor bolts for securing a guard in the form of, for example, a metal railing to the balcony must be spaced apart a distance which is identical to the predetermined spaced distance between the apertures or other elements of the guard with which the anchor bolts register in the mounting of the guard on the balcony. That in the arrangement disclosed by Hall, Jr. the spacing between the fasteners **12,** at least in the plane of the paper in FIG. **1** of the patent, is not critical and could not readily be varied to be identical to the predetermined spacing between the apertures or other registering elements of a guard is emphasized by the fact that the form **10** of Hall, Jr. is corrugated and the fasteners **12** may be disposed only in the troughs of the corrugations since the washers **24** bite into the sloping sides **32** and **34** of the corrugations in order to secure the fasteners **12** in place.

A decking structure according to the present invention comprises a guard provided with at least two spaced registering elements, a cementitious body at least a portion of the periphery of which is clad with a frame, and securement means fixedly disposed through the frame with one end portion of the securement means embedded within the cementitious body and with a further end portion of the securement means being furcated, said further end portion of the securement means projecting from the frame and being disposed outwardly of the cementitious body. The furcated parts of said further end portion of the securement means are positioned with a predetermined spacing therebetween which spacing is identical to the spacing between the registering elements of the guard, and the guard is securely connected to said furcated parts of said further end portion of the securement means with the registering elements of the guard in registration with said furcated parts of the further end portion of the securement means. The frame has a lower limb portion which clads a peripheral portion of the lower main face of the cementitious body and which incorporates a portion of inverted V-shape in cross-section which extends substantially longitudinally relative to the frame.

As herein used the term "cementitious material" means any structural material such as, for example, concrete which may be used in the manufacture of decking structures of the type with which the present invention is concerned and which is capable of being caused or allowed to set after being poured within a space defined by form members.

In order that the invention may be more clearly understood and more readily carried into effect the same will now, by way of example, be more fully described with reference to the accompanying drawings in which

FIG. 1 is an isometric view, partly broken away and partly exploded for clarity, showing the manufacture of a decking structure according to a preferred embodiment of the invention;

FIG. 2 is a sectioned view on the line 2—2 in FIG. 1; and

FIG. 3 is a view in the direction of the arrow A in FIG. 1 of part of the decking structure shown therein.

Referring to the drawing, **10, 11** and **12** denote generally three form members which, together with additional form members (not shown), are positioned to define the peripheral faces of a decking structure, the members **10** and **11** which are conventional wooden form members defining, respectively, the base of the structure and one of the side edges of the structure, and the form member **12** defining a front edge of the structure. The form members **10, 11** and **12** may be supported in any suitable manner, such as on wooden beams **13.**

The form member **12** is constituted by a metallic frame which is substantially channel-shaped in cross-section and which comprises a vertically disposed web portion **14,** an upper limb portion **15** and a lower limb portion **16,** the upper limb portion **15** presenting a downwardly directed flange **17** at a spaced distance from the web portion **14,** and the lower limb portion **16** incorporating a portion **18** which extends substantially longitudinally relative to the frame **12** and hence parallel to the web portion **14** and which is of inverted V-shape in cross-section. The function of this portion **18** is hereinafter explained in detail.

Securement means comprising at least two spaced securement members **19** is provided, the members **19** being disposed through apertures provided in the web portion **14** of the metallic frame **12,** with the members **19** being fixed relative to the frame **12** by means, for example, of welding **20** (FIG. 2). Each member **19** is in the form of an L-shaped metallic rod constituted by a first limb **21** and a second limb **22.** The first limb **21** together with the adjacent portion of the second limb **22** of each rod **19** project inwardly of the metallic frame **12** and together constitute one end portion of said rod **19,** said one end portions of the rods **19** together constituting one end portion of said securement means. The remaining portion of the second limb **22** of each rod **19** projects outwardly from the metallic frame **12** and constitutes a further end portion of said rod **19,** said further end portions of said rods **19** together constituting a further end portion, of furcated form, of said securement means. This further end portion of each rod **19** is screw-threaded. The second limbs **22** of the rods **19** are parallel to one another, and the first limb **21** of each rod **19** is parallel to, but directed in the opposite direction from, the first limb **21** of the adjacent rod **19,** as is most clearly shown in FIG. **3** of the drawing. Preferably the first limbs **21** of the rods **19** are inclined as shown in the drawing.

Reinforcing members **23,** only one of which is shown in the accompanying drawing, are disposed with one end of each member **23** secured as by welding to the undersurface of the upper limb portion **15** of the frame **12,** the member **23** being inclined in a downward direction away from the web portion **14** of the frame **12.**

After the form members **10, 11** and **12** together with the additional form members (not shown) have been positioned as hereinbefore described, and have been secured in position by, for example, nails such as nails **24** which are disposed through holes in the lower limb portion **16** of the metallic frame **12** and in the end portion of each reinforcement member **23** remote from the upper limb portion **15** of the metallic frame **12,** and which serve to secure the frame **12** in position relative to the form member **10,** a body **25** of cementitious material such as, for example, concrete is poured within the space defined by the form members. The level of the poured body **25** of concrete is substantially flush with the upper limb portion **15** of the metallic frame **12** so that the downwardly directed flange **17** presented by the upper limb portion **15** of the frame **12** together with the above-mentioned one end portion of each rod **19** and the entirety of the reinforcing members **23** are embedded within the body **25** of concrete.

Thereafter the body **25** of concrete is caused or allowed to set, and the form members **10** and **11** together with the corresponding additional form members (not shown) are removed. It is to be emphasized, however, that the form member constituted by the metallic frame **12** is not removed but remains secured to the body **25** of concrete.

A guard which may be in the form of a metal railing comprising a plurality of at least two spaced upright members **26** interconnected by panels or by horizontal rails (not shown) is attached to the body **25** of concrete. The guard is provided with at least two spaced registering elements which in the preferred embodiment of the invention illustrated in the drawing are constituted by apertures **27** provided in a short plate **28** which constitutes a portion of the upright member **26** and which is secured as by welding to the lower end of the remaining portion of the member **26.** The rods **19** are so disposed that there is a predetermined spacing therebetween, this spacing being identical to the spacing between the apertures **27** in the plate **28** so that the screw-threaded end portions of the second limbs **22** of the rods **19** may, in the manufacture of the decking structure, be disposed through the apertures **27.** Nuts **29** are screw-threadedly engaged with the above-mentioned screw-threaded further end portions of the rods **19** thereby securely to connect the guard to said further end portions of the rods **19.**

Thus, the present invention provides a decking structure such as a cantilevered balcony in an apartment building in which in the decking structure the form member constituted by the metallic frame **12** remains secured to the body **25** of concrete, and a guard such as a metal railing is securely connected to the body **25** of concrete through the securements members **19,** the web portion **14** of the frame **12** cladding the edge face of the front edge portion of the body **25** of concrete, and the upper and lower limb portions **15** and **16,** respectively, of the frame **12** cladding the upper and lower main faces, respectively, of the body **25,** of con-

crete adjacent to said edge face of the body **25** of concrete. Furthermore, as will be noted the reinforcing members **23** extend to the lower main face of the body **25** of concrete in the completed decking structure.

The metallic frame **12** may be prefabricated as a factory made unit with the securement members **19** and also the reinforcing members **23** incorporated therein, thereby obviating the need for skilled labour to be used at the site in order to drill holes through wooden form members and to position anchor bolts or the like through these holes.

It is to be noted that the disposition of the rods **19** such that the first limb **21** of each rod **19** is parallel to, but directed in the opposite direction from, the first limb **21** of the adjacent rod **19** as hereinbefore described, tends to minimize any tendency for the rods **19** to be withdrawn from the body **25** of concrete in the completed decking structure as a result, for example, of excessive forces being applied to the guard railing. Furthermore, in the completed decking structure the portion **18** of the lower limb portion **16** of the frame **12** tends to prevent rain water or the like which may adhere to the lower main face of the structure from flowing across the lower main face of the body **25** of concrete from the front edge of the structure.

While in the preferred embodiment of the invention as shown in the accompanying drawing there are illustrated two securement members **19** and two registering elements constituted by the apertures **27** with the pre-determined spacing between the securement members **19** being identical to the spacing between the apertures **27**, it is to be understood that, in practice, there will generally, although not necessarily, be more than two securement members **19** and a corresponding number of apertures **27**, the pre-determined spacing between all the securement members **19** being identical to the spacing between the corresponding apertures **27**. In this connection, it is also to be emphasized that where the guard comprises spaced, interconnected upright members such as the members **26** and these upright members provide the registering elements it is not necessary for each upright member to provide more than one of the registering elements.

Although in the preferred embodiment of the invention illustrated in the accompanying drawing the adjacent securement members **19** are disposed at different levels this is not essential since all the securement members may, if desired, be disposed at the same level.

Furthermore, more than one of the edge portions of the body **25** of concrete may, if desired, be clad with a metallic frame, such as the frame **12**, all the metallic frames remaining secured to the body **25** of concrete in the completed decking structure.

What I claim as my invention is:

1. A decking structure comprising a guard provided with at least two spaced registering elements, a cementitious body at least a portion of the periphery of which is clad with a frame, and securement means fixedly disposed through the frame with one end portion of the securement means embedded within the cementitious body and with a further end portion of the securement means being furcated, said further end portion of the securement means projecting from the frame and being disposed outwardly of the cementitious body, the furcated parts of said further end portion of the securement means being positioned with a predetermined spacing therebetween, which spacing is identical to the spacing between the registering elements of the guard, the guard being securely connected to said furcated parts of said further end portion of the securement means with the registering elements of the guard in registration with said furcated parts of the further end portion of the securement means, and the frame having a lower limb portion which clads a peripheral portion of the lower main face of the cementitious body and which incorporates a portion of inverted V-shape in cross-section which extends substantially longitudinally relative to the frame.

2. A decking structure according to claim **1**, wherein the frame is disposed on an edge portion of the cementitious body, the frame being substantially channel-shaped in cross-section and comprising a vertically disposed web portion which clads the edge face of said edge portion of the cementitious body, together with said lower limb portion and an upper limb portion which clads the peripheral portion of the upper main face of the cementitious body adjacent to said edge face thereof.

3. A decking structure according to claim **2**, wherein the upper limb portion of the channel-shaped frame presents a downwardly directed flange at a spaced distance from said web portion of the frame, the flange being embedded within the cementitious body.

4. A decking structure according to claim **1**, wherein the securement means comprises at least two securement members which are each constituted by an L-shaped rod comprising a first limb and a second limb, said one end portion of the securement means being constituted by said first limb together with the adjacent portion of said second limb of each rod, and said further end portion of the securement means being constituted by the remaining portion of said second limb of each rod.

5. A decking structure according to claim **4**, wherein said second limb of each rod is parallel to said second limb of the adjacent rod, and said first limb of each rod is parallel to, but directed in the opposite direction from, said first limb of the adjacent rod.

6. A decking structure according to claim **2**, wherein reinforcement members are each disposed with one end thereof secured to the upper limb portion of the channel-shaped frame, each reinforcement member extending to the lower main face of the cementitious body and being wholly embedded therein.

7. A decking structure according to claim **1**, wherein the registering elements of the guard comprises apertures through which said furcated parts of the further end portion of the securement means are disposed, said furcated parts of the further end portion of the securement means being screw-threaded and the guard being securely connected thereto by means of nuts screw-threadedly mounted on said furcated parts of the further end portion of the securement means.

8. A decking structure according to claim **1**, wherein the guard comprises at least two spaced, interconnected upright members.

9. A decking structure according to claim **1**, wherein the frame and the securement means are metallic, the securement means being fixed to the frame by welding.

10. A balcony structure comprising a guard which comprises at least two spaced, interconnected upright members provided with apertures; a cementitious body having a front edge portion which is clad with a metallic frame of substantially channel-shape in cross-

section, the frame comprising a vertically disposed web portion which clads the edge face of said edge portion of the cementitious body, together with upper and lower limb portions which clad the portions of the upper and lower main faces, respectively, of the cementitious body adjacent to said edge face thereof, with the lower limb portion of the frame incorporating a portion which extends substantially parallel to the web portion of the frame and which is of inverted V-shape in cross-section; reinforcement members each disposed with one end thereof secured to the upper limb portion of the frame, with each reinforcement member extending to the lower main face of the cementitious body and being wholly embedded therein; and at least two securement members fixedly disposed through the frame with one end portion of each securement member embedded within the cementitious body and with a further end portion of each securement member projecting from the frame and disposed outwardly of the cementitious body, each securement member being constituted by an L-shaped rod comprising a first limb and a second limb, with said one end portion of each securement member being constituted by said first limb together with the adjacent portion of said second limb of each rod, and said further end portion of each securement member being constituted by the remaining portion of said second limb of each rod, the securement members being positioned with a predetermined spacing therebetween which spacing is identical to the spacing between the apertures in the upright members of the guard, and said further end portions of the securement members being screw-threaded and being disposed through the apertures in the upright members of the guard with nuts screw-threadedly mounted on said further end portions of the securement members securely to connect the guard to the securement members.

11. A decking structure comprising a guard provided with at least two spaced registering elements, a cementitious body at least a portion of the periphery of which is clad with a frame, and at least two securement members fixedly disposed through the frame with one end portion of each securement member embedded within the cementitious body and with a further end portion of each securement member projecting from the frame and disposed outwardly of the cementitious body, the securement members being positioned with a predetermined spacing therebetween which spacing is identical to the spacing between the registering elements of the guard, the guard being securely connected to said further end portions of the securement members with the registering elements of the guard in registration with said further end portions of the securement means, and the frame having a lower limb portion which clads a peripheral portion of the lower main face of the cementitious body and which incorporates a portion of inverted V-shape in cross-section which extends substantially longitudinally relative to the frame.

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