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(54) **GUARDRAIL SYSTEM AND ASSOCIATED METHODS**

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(57) **ABSTRACT**

A guardrail system includes a plurality of posts and at least one rail member detachably connected to and extending between the plurality of posts. Each of the plurality of posts includes a first post member, and a second post member that slidably engages the first post member. The second post member includes a first cable connector connected to a lower portion thereof, and a second cable connector connected to an upper portion thereof and including a pair of inverted and opposing J-shaped second cable connector members.

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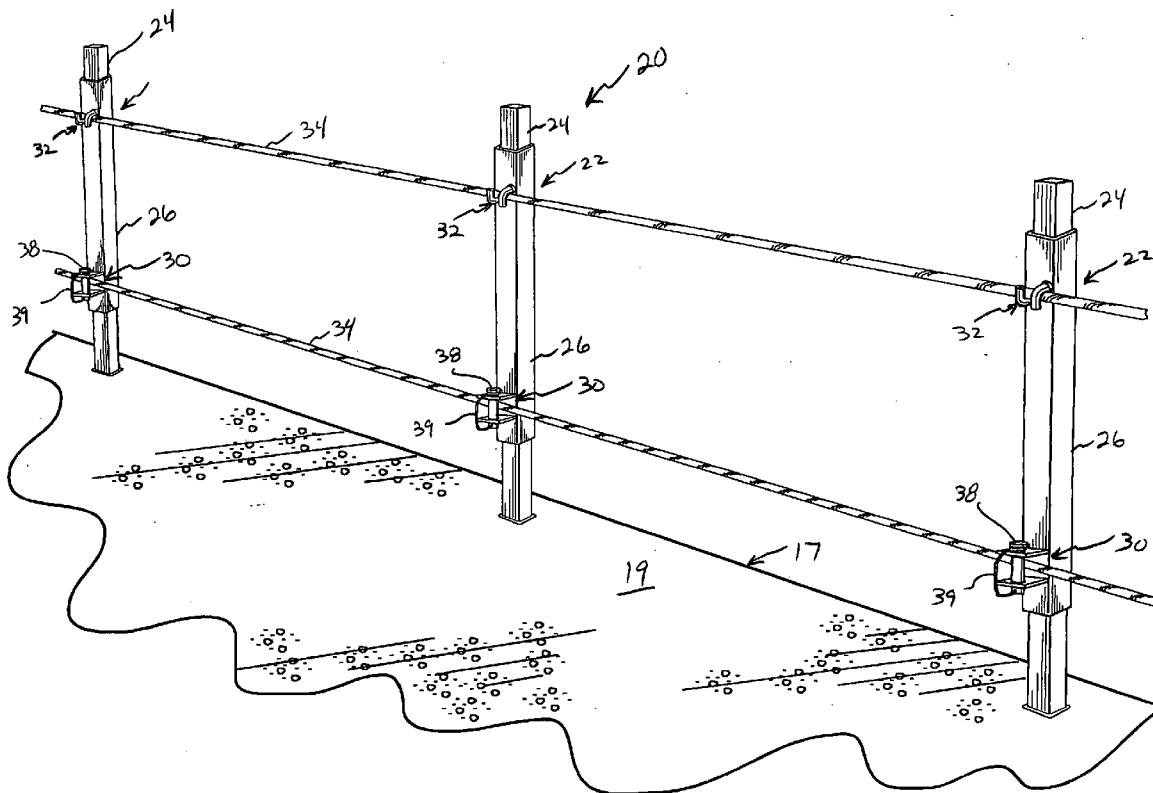
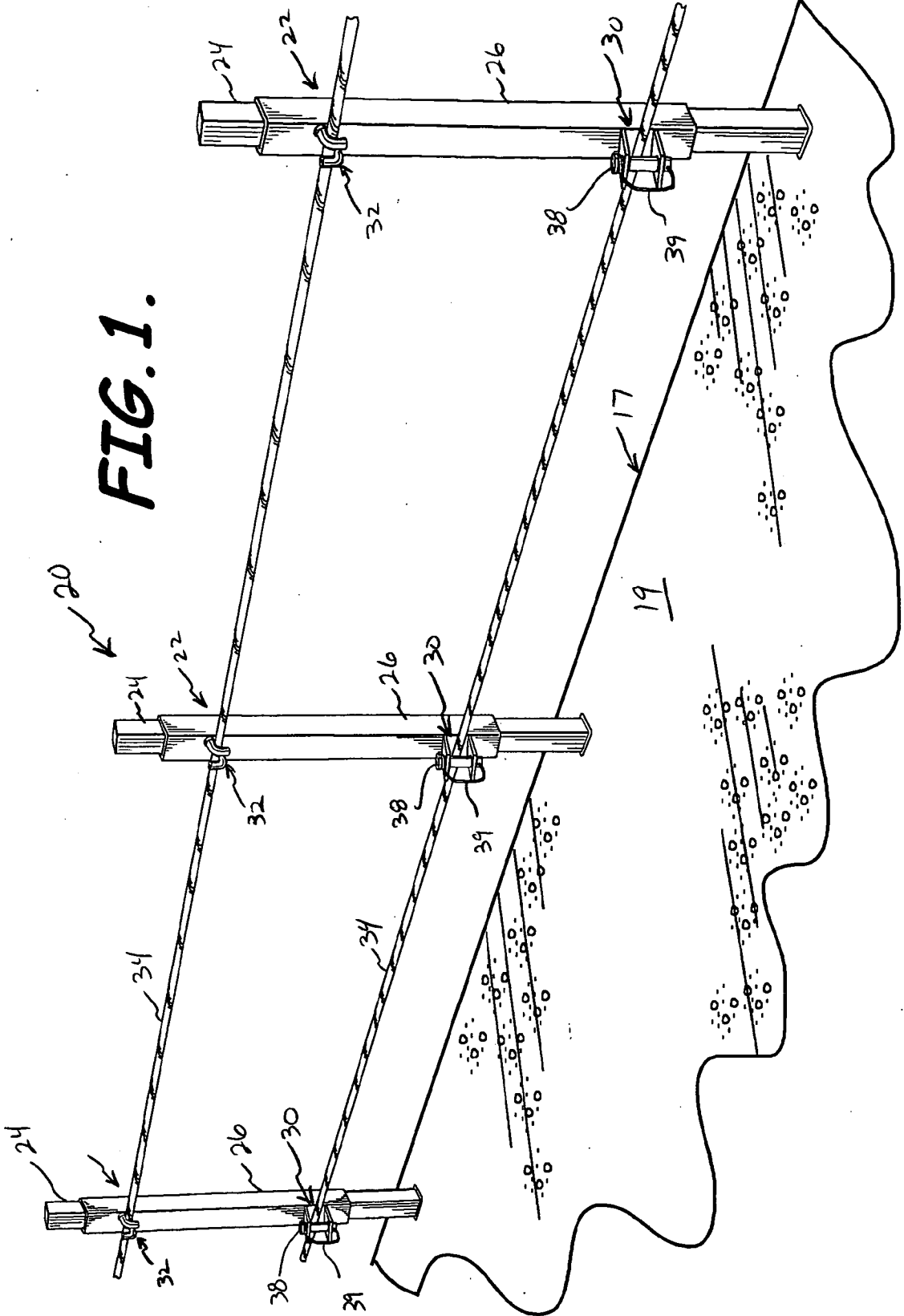
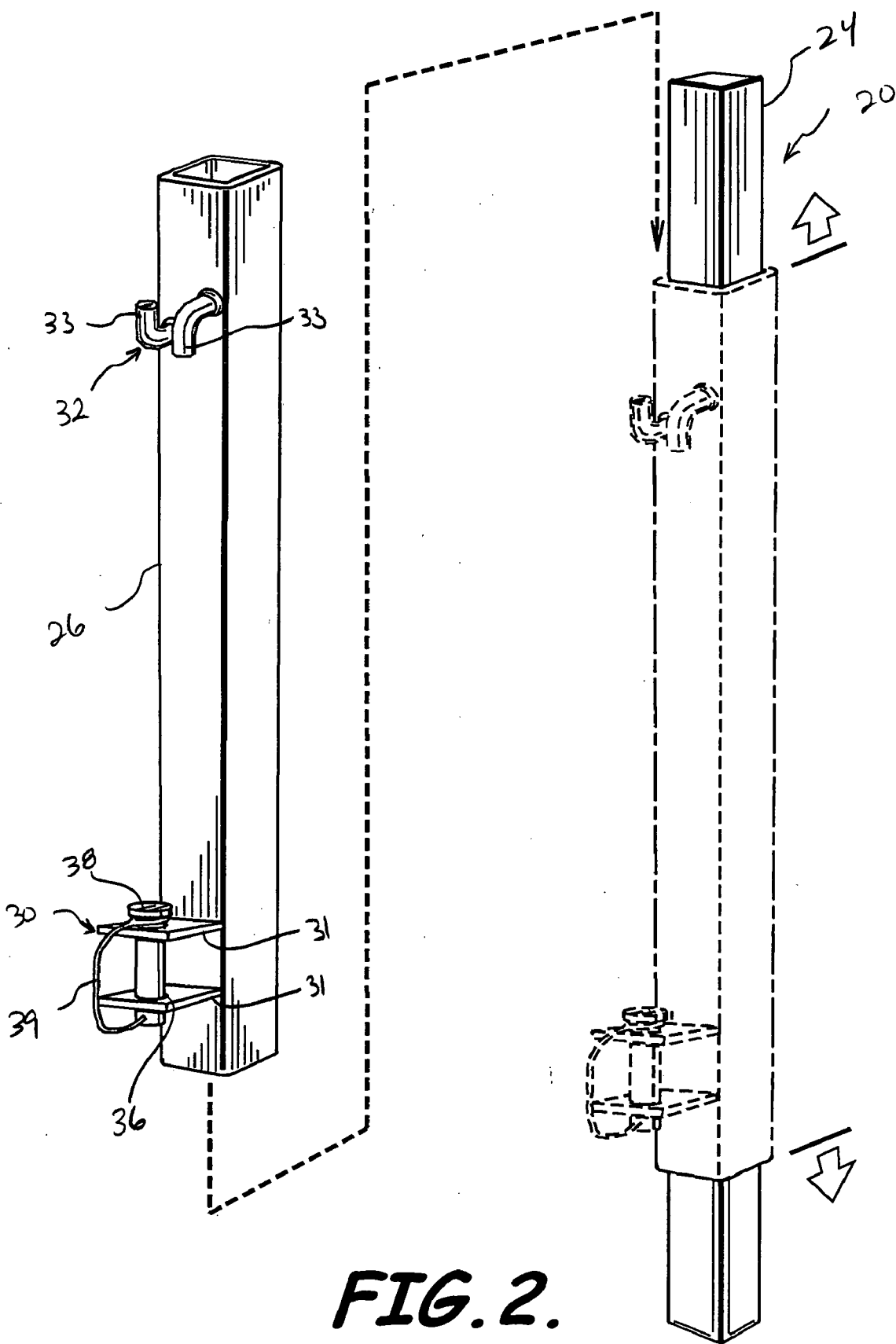
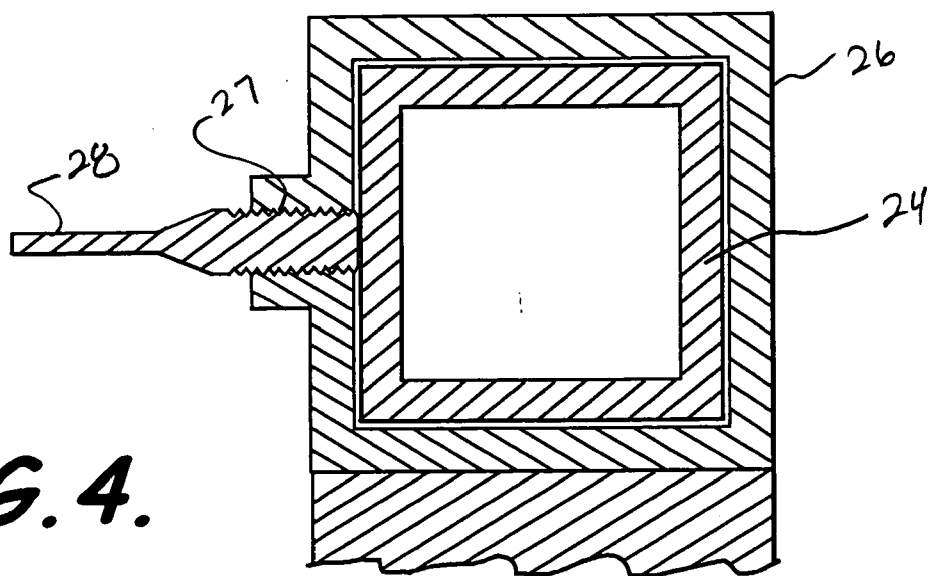
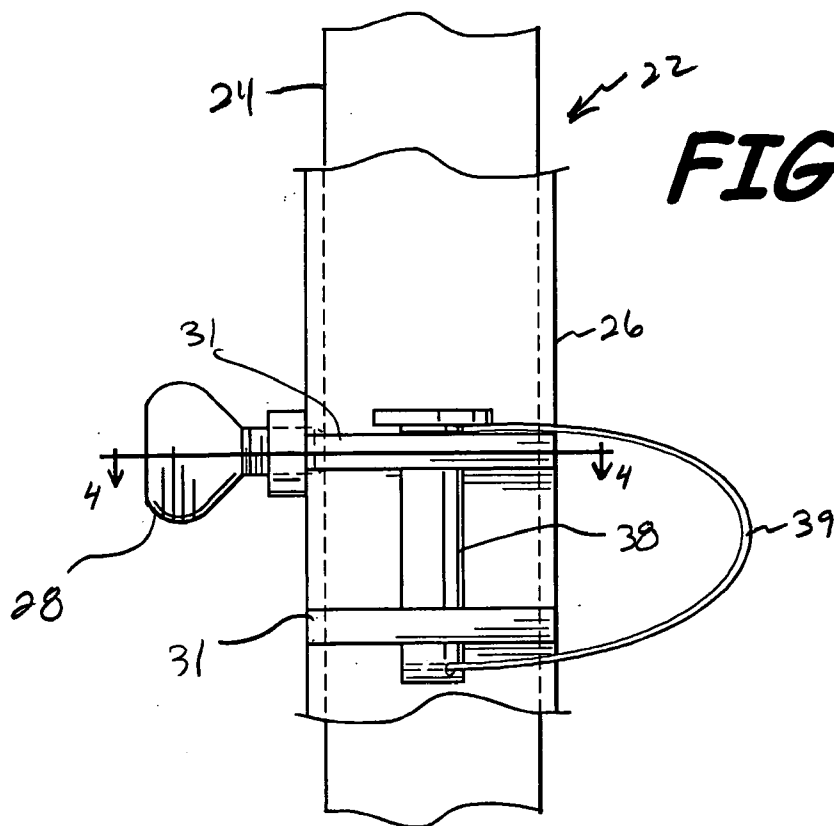


FIG. 1.







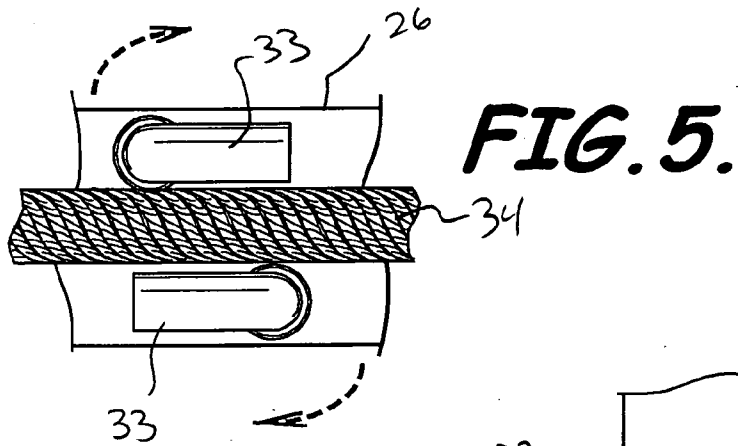


FIG. 5.

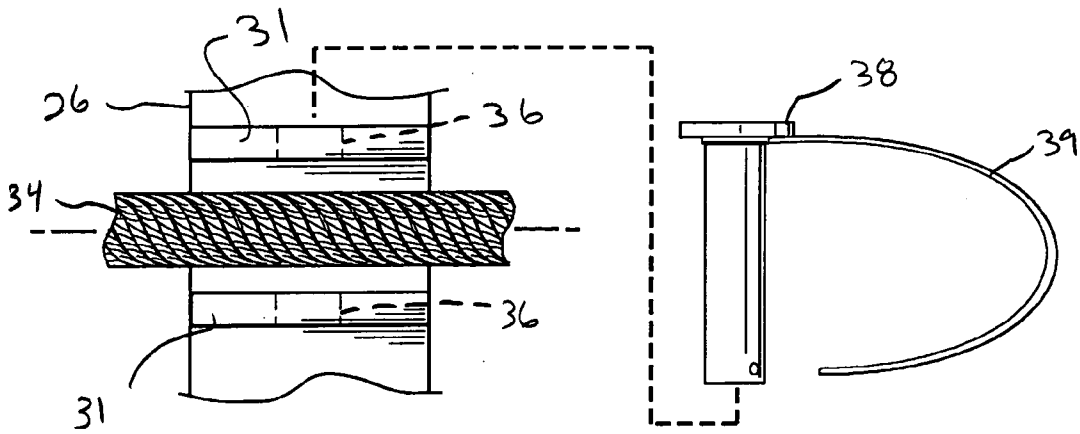
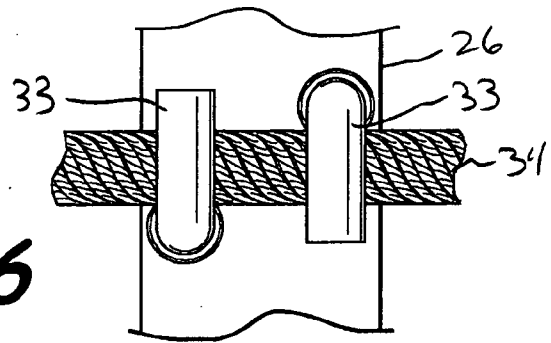


FIG. 7.

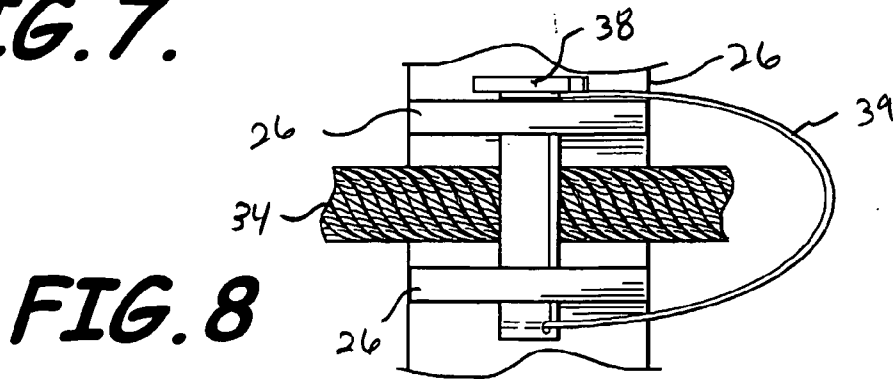


FIG. 8

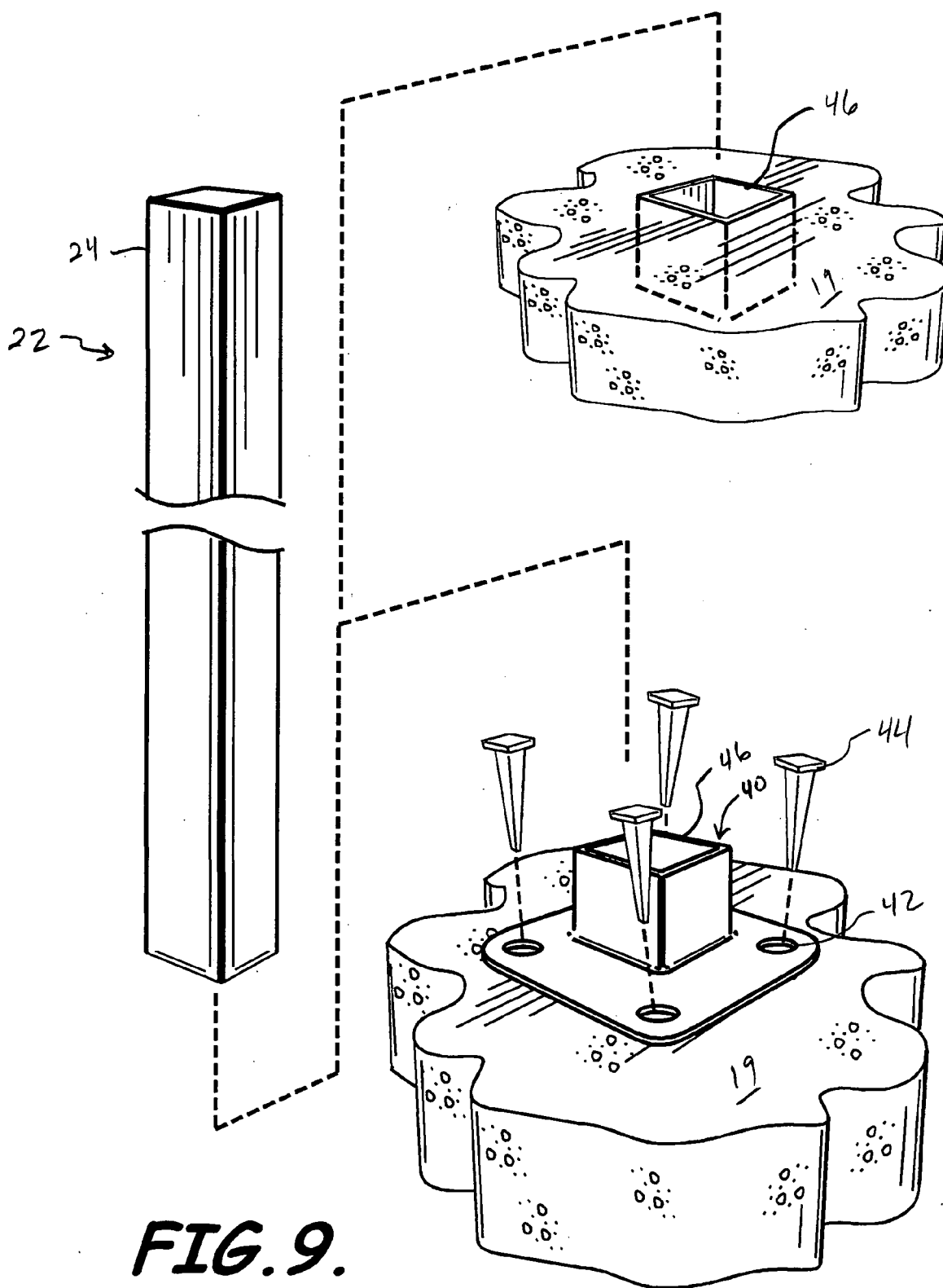


FIG. 9.

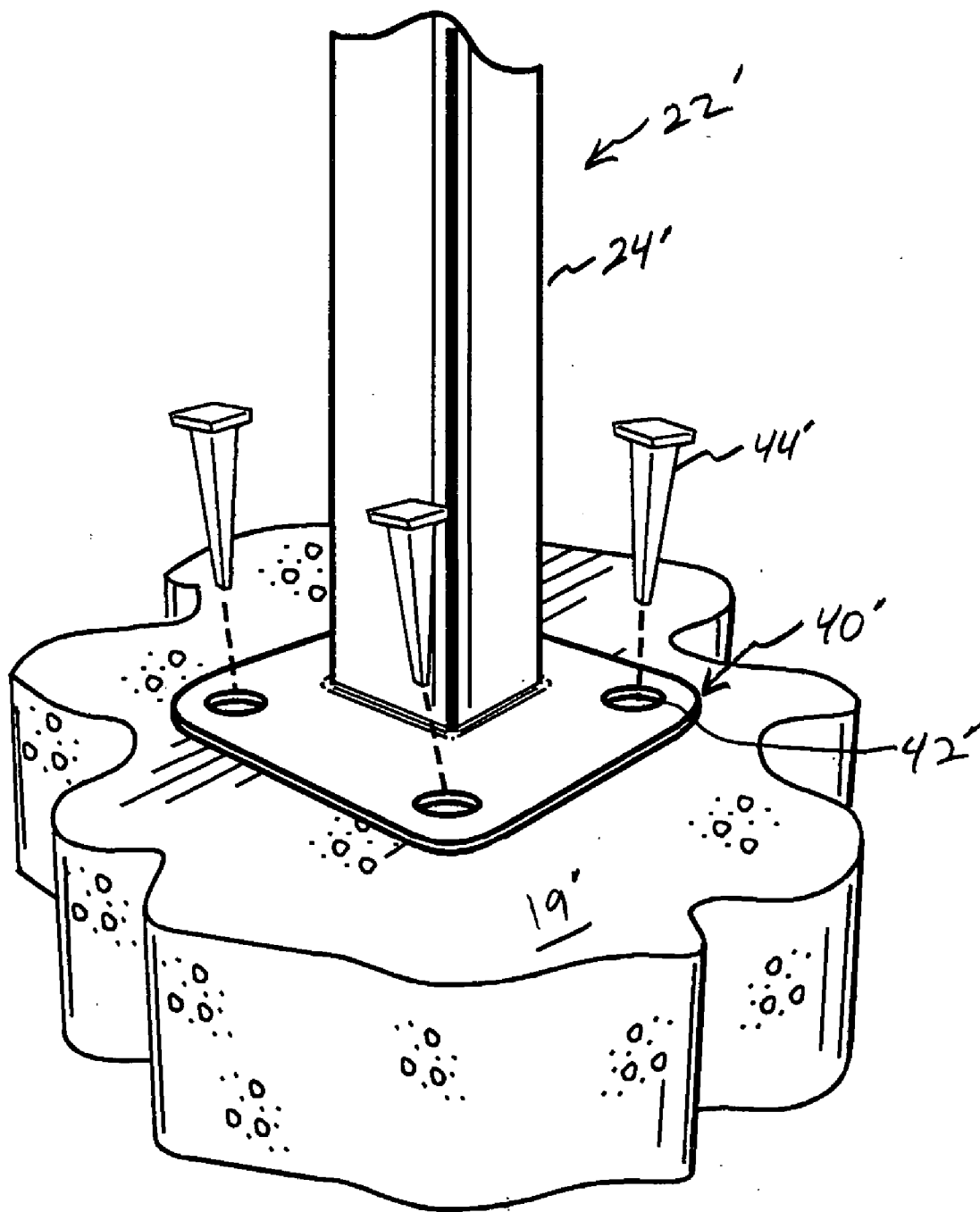


FIG. 10.

GUARDRAIL SYSTEM AND ASSOCIATED METHODS

RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Patent Application Ser. No. 60/641,385, filed on Jan. 4, 2005, the entire contents of which are incorporated herein by reference.

FIELD OF THE INVENTION

[0002] The present invention relates to the field of building construction and, more particularly, to the field of temporary guardrail systems for use during construction, and related methods.

BACKGROUND OF THE INVENTION

[0003] During construction of buildings, both commercial and residential, there has been a problem in providing temporary guardrails adjacent to roof edges, decks, balconies, and even elevated floors prior to the construction of exterior walls.

[0004] Temporary guardrails may be constructed adjacent a rooftop with materials commonly found on a construction site, such as excess lumber, for example. A platform is typically built adjacent the edge of the rooftop, and is braced against a wall supporting the rooftop. Spaced-apart guardrail posts are connected to the platform and extend upwardly therefrom, and rails are extended between the guardrail posts to form a barrier adjacent to the edge of the rooftop. The rails may also be provided by excess lumber found on a construction site. A skid-guard, or kickplate, may be connected between the guardrail posts to provide a barrier adjacent the edge of the roof.

[0005] Although this type of guardrail system may be effective, installation may be expensive, time inefficient, and itself hazardous. More specifically, the guardrail system is generally installed after roof members have been elevated and connected to top portions of support walls. In other words, installation of the guardrail system is performed at, or near, the elevation of the rooftop, before fall protection is provided.

[0006] One type of temporary guardrail system using cables is disclosed in U.S. Pat. No. 6,270,057 to Highley et al. The Highley et al. patent discloses a temporary guardrail system including a plurality of guardrail posts that are fastened to a perimeter frame by bolting a corresponding plurality of securement plates to a back surface of the perimeter frame. Each of the guardrail posts comprises a plurality of apertures formed in the lower portion, the medial portion and the upper portion. A plurality of cables pass through the apertures between each of the guardrail posts. The apertures are spaced apart so that the cable may be positioned at varying heights. Installation of this guardrail system, however, may be quite time consuming.

[0007] One example of a guardrail system for a pitched roof is disclosed in U.S. Pat. No. 5,711,398 to Bartholomew. The guardrail system includes a plurality of spaced apart rail support assemblies aligned along an edge of a pitched roof, and a plurality of rails extending between the support assemblies. Each of the rail support assemblies includes a

hinged base that is anchored into the roof with a hook so that the base may be positioned on the rooftop.

[0008] Problems with exposed elevated areas of construction still exist. In fact, these problems are of such a serious nature that the Occupational Hazards Safety Act (OSHA) agency has promulgated regulations to require temporary railings on open elevated building structures that are capable of withstanding at least two hundred pounds of pressure without failing.

SUMMARY OF THE INVENTION

[0009] In view of the foregoing background, it is therefore an object of the present invention to provide a temporary guardrail system for use on construction sites that can be efficiently installed.

[0010] This and other objects, features, and advantages in accordance with the present invention are provided by a guardrail system comprising a plurality of posts and a rail member detachably connected to and extending between the plurality of posts. Each of the plurality of posts may comprise a first post member and a second post member that slidably engages the first post member.

[0011] More particularly, the second post member may comprise a first cable connector connected to a lower portion thereof. The second post member may also comprise a second cable connector connected to an upper portion thereof. The second cable connector may include a pair of inverted and opposing J-shaped second cable connector members.

[0012] The first cable connector may comprise a pair of spaced-apart opposing first cable connector members connected to the lower portion of the second post member. Further, the rail member may be detachably connected to the second post member and extend between the pair of first cable connector members. Each of the pair of first cable connector members may have a passageway formed therethrough. The guardrail system may also include a locking pin member that matingly engages the passageways to retain the rail member between the pair of first cable connector members.

[0013] The rail member of the guardrail system may advantageously comprise a first rail member and a second rail member. The first rail member may be detachably connected to the second post member adjacent the first cable connector. The second rail member may be detachably connected to the second post member adjacent the second cable connector.

[0014] The second post member may have a passageway formed therethrough. The guardrail system may also comprise a height fastener to matingly engage the passageway, and contact the first post member to fix a height of the second post member with respect to the first post member. This advantageously allows for the rails of the guardrail system to have an adjustable height. The rail member may be a steel cable. The first post member and the second post member may be polygonally shaped tubes.

[0015] In one embodiment, the guardrail system may comprise a plurality of bases. Each base may be connected to a bottom portion of the respective first post member. Further, each base may have a plurality of passageways

formed therethrough for receiving a respective plurality of fasteners to fasten the base to a surface.

[0016] In another embodiment, the bases of the guardrail system may be sleeves for receiving a bottom portion of the first post member. Similarly, each base may have a plurality of passageways formed therethrough for receiving a respective plurality of fasteners to fasten the base to a surface.

[0017] The guardrail system according to the present invention advantageously allows for simplified installation. More specifically, the rail member may be readily connected to the second cable connector by engaging the rail member between the pair of inverted and opposing J-shaped second cable connector members when the second post member is in a horizontal position. The second post member may then be rotated to a vertical position to retain the cable member between the pair of J-shaped members.

[0018] A method aspect of the present invention is for installing a guardrail system. The method may include fastening a base of the first post member to a surface. The method may also include slidably engaging the second post member with the first post member, and detachably connecting a rail member to each of the plurality of posts so that the rail member extends between each of the plurality of posts.

[0019] Another embodiment of the method for installing the guardrail system comprises fastening the plurality of bases to a surface, and slidably engaging the first post member of each of the posts with a respective base. The method may also include slidably engaging the second post member with the first post member, and detachably connecting a rail member to each of the plurality of post members so that the rail member extends between each of the plurality of posts.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] **FIG. 1** is partial environmental view of a guardrail system according to the present invention.

[0021] **FIG. 2** is an exploded perspective view of a post of the guardrail system illustrated in **FIG. 1**.

[0022] **FIG. 3** is a partial front elevational view of a second post member slidably engaging a first post member of the guardrail system according to the present invention.

[0023] **FIG. 4** is a cross sectional view of the contact between the first post member and the second post member taken through line 4-4 in **FIG. 3**.

[0024] **FIGS. 5-6** are partial perspective views of the engagement between a rail member and a second cable connector on the second post member of the guardrail system according to the present invention.

[0025] **FIGS. 7-8** are partial perspective views of engagement between a rail member and a first cable connector on a second post member of the guardrail system according to the present invention.

[0026] **FIG. 9** is a partial exploded perspective view of a post of a guardrail system according to the present invention being inserted into a base.

[0027] **FIG. 10** is a partial perspective view of a post of a guardrail system according to the present invention having its base secure to a surface.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0028] The present invention will now be described more fully hereinafter with reference to the accompanying drawings, in which preferred embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. Like numbers refer to like elements throughout, and prime notation is used to indicate similar elements in alternate embodiments.

[0029] Referring initially to **FIGS. 1-4**, a guardrail system **20** according to the present invention is now described in detail. The guardrail system **20** illustratively includes a plurality of posts **22**. The plurality of posts **22** are preferably spaced apart, and positioned adjacent an exposed elevated edge **17** of a flat surface **19**, such as a rooftop or balcony under construction, for example.

[0030] Each of the plurality of posts **22** comprises a first post member **24** and a second post member **26** that slidably engages the first post member. The first and second post members **22**, **24** are preferably elongate post members.

[0031] The second post member **26** includes a first cable connector **30** connected to a lower portion thereof. The second post member **26** also includes a second cable connector **32** connected to an upper portion thereof. The second cable connector **32** illustratively includes a pair of inverted and opposing J-shaped second cable connector members **33**.

[0032] The guardrail system **20** also illustratively includes rail members **34** that are detachably connected to, and that extend between the plurality of posts **22**. The rail members **34** may, for example, be steel cable. Those skilled in the art, however, will appreciate that the rail members **34** may be made of any material having similar properties.

[0033] The first cable connector **30** of the guardrail system **20** may include a pair of spaced apart and opposing first cable connector members **31**. The first cable connector members **31** are connected to the lower portion of the second post member **26**. The rail member **34** may illustratively be detachably connected to the second post member **26** by extending between the first cable connector members **31**.

[0034] The first cable connector members **31** may extend outwardly from the second post member **26** so that the first cable connector **30** is U-shaped. The first cable connector members **31** are preferably polygonally shaped, but those having skill in the art will appreciate that the first cable connectors may have any other shape. Further, the first cable connector **30** is preferably welded to the second post member **26**. Those skilled in the art, however, will appreciate that the first cable connector members **31** may be connected to the second post member **26** in any other manner.

[0035] Each of the first cable connector members **31** illustratively has a passageway **36** formed therethrough. More particularly, the passageway **36** is preferably formed through a medial portion of each first cable connector member **31**. The passageway **36** is preferably sized to receive a locking pin member **38**. More particularly, the locking pin member **38** may extend through the passage-

ways 36 in the first cable connector members 31 to retain the rail member 34 between the pair of first cable connector members when the rail member is extended between the posts 22. The locking pin member 38 may include a passageway formed in a bottom portion thereof to receive a tether, i.e., a lock wire 39. Accordingly, when the locking pin member 38 is positioned between the passageways 36 of the first cable connector members 31 of the first cable connector 30, the locking pin member may be locked, i.e., secured, to retain the rail member 34 between the first cable connector members.

[0036] Referring now more specifically to **FIGS. 3 and 4**, additional aspects of the guardrail system 20 according to the present invention are now described in greater detail. More particularly, the second post member 26 has at least one passageway 27 formed therethrough. Further, the guardrail system 20 also includes a height fastener 28 that matingly engages the passageway 27 to contact the first post member 24. Accordingly, the height fastener 28 may be used to fix the height of the second post member 26 with respect to the first post member 24.

[0037] The passageway 27 may be formed in a side of the second post member 26 adjacent the first cable connector 30. Of course, those skilled in the art will appreciate that the passageway 27 may also be positioned anywhere along the second post member 26. The passageway 27 may be a threaded passageway, and the height fastener 28 may be a thumb screw, for example. Those skilled in the art will appreciate that the guardrail system 20 of the present invention contemplates the use of any other type of fastener to fix the height of the second post member 26 with respect to the first post member 24.

[0038] The posts 22 of the guardrail system 20 are preferably polygonally shaped tubes. More specifically, the first post member 24 and the second post member 26 are polygonally shaped tubes. Those skilled in the art, however, will appreciate that the first and second post members 24, 26 can have any shape. Further, the posts 22 are preferably made of steel material, but may also be made of any material having similar strength properties. Similarly, the first and second cable connectors 30, 32, are also preferably made of steel material, but may also be made of materials having similar strength properties.

[0039] The first post member 24 may have an interior predetermined perimeter, and the second post member 26 may have an interior predetermined perimeter. The interior predetermined perimeter of the second post member 26 is preferably larger than the interior predetermined perimeter of the first post member 24 so that the second post member may slidably engage the first post member.

[0040] Referring now more specifically to **FIGS. 5-8**, installation of the guardrail system 20 is now described in greater detail. When installing the guardrail system 20 of the present invention, the rail members 34 are preferably fixed to a plurality of end posts (not shown). More specifically, the rail members 34 may span a predetermined distance. The posts 22 of the guardrail system 20 of the present invention are used to advantageously support the rail members 34, and readily adjust the height of the rail members. The first and second cable connectors 30, 32 on the second post member 26 advantageously allow for rapid installation of the posts 22.

[0041] As briefly described above, the second cable connector members 33 are preferably J-shaped cable connector members. A first one of the second cable connector members 33 is preferably connected to the second post member 26 so that the end of the J-shape curves upwardly. The second one of the second cable connector members 33 is connected to the second post member 26 so that the end of the J-shape curves downwardly. In other words, the second cable connector members 33 are inverted with respect to one another. Further, the second cable connector members 33 are spaced apart. The pair of second cable connector members 33 are preferably welded to the second post member 26, but those having skill in the art will appreciate that the second cable connector members may be connected to the second post member in any other way.

[0042] When installing the posts 22, an installer may position the posts in a horizontal position so that the rail member 34 is positioned between the spaced apart pair of second cable connector members 33, as perhaps best illustrated in **FIG. 5**. The posts 22 may then be turned from a horizontal position to a vertical position, as illustrated in **FIG. 6**, so that the rail member 34 engages the second cable connector members 33, and is retained in place between the second cable connector members.

[0043] After the rail member 34 is retained between the second cable connector members 33, another rail member may be positioned to engage the first cable connectors 31, as perhaps best illustrated in **FIG. 7**. Thereafter, the locking pin member 38 may be passed through the passageways 36 formed in the first cable connector members 31. Accordingly, the locking pin member 38 is used to retain the rail member 34 between the pair of first cable connector members 31. A lock wire 39 may then be used to secure the locking pin member 38 in place to assist in preventing slipping of the locking pin member.

[0044] Referring now additionally to **FIG. 9**, another aspect of the guardrail system 20 according to the present invention is now described in greater detail. The guardrail system 20 may comprise a plurality of bases 40. Each base may include a plurality of passageways 42 formed therethrough for receiving a respective plurality of fasteners 44 to fasten the base to a surface. The fasteners 44 may be any type of fasteners suitable for connecting the base 40 to a surface. For example, the fasteners 44 may be concrete anchors, or any other type of fasteners as understood by those skilled in the art. Further, the bases 40 may include a sleeve 46 to receive a bottom portion of the first post member 24. In other embodiments, the sleeve 46 may simply be fixed within the surface, i.e., poured in concrete.

[0045] Referring now additionally to **FIG. 10**, another embodiment of the guardrail system 20' is now described in greater detail. In this embodiment of the guardrail system 20' the base 40' may be connected to a bottom portion of the first post member 24'. Again, the base 40' may have a plurality of passageways 42' formed therethrough for receiving a respective plurality of fasteners 44' to fasten the base to a surface. The other elements of this embodiment of the guardrail system 20' are similar to those of the first embodiment of the guardrail system 20, are labelled with prime notation, and require no further discussion herein.

[0046] A method aspect of the present invention is for installing a guardrail system 20. The method may include

fastening the base 40 to a surface. The method may also include slidably engaging the second post member 26 with the first post member 24, and detachably connecting the rail members 34 to the plurality of posts 22 so that the rail members extend between each of the plurality of posts. More specifically, the method includes detachably connecting a rail member 34 to the posts 22 adjacent the first cable connector 30 and detachably connecting another rail member to the post adjacent the second cable connector 32.

[0047] More information on temporary guardrails can be found in U.S. Published Patent Application Number 2004/0103589 titled *Guardrail System For A Roof Of A Building And Associated Methods*, and U.S. Published Patent Application Number 2002/0104987 titled *Temporary Guard Rail System*, both by the same inventor of the present invention, the contents of each of which are incorporated herein by reference.

[0048] Many modifications and other embodiments of the invention will come to the mind of one skilled in the art having the benefit of the teachings presented in the foregoing descriptions and the associated drawings. Therefore, it is understood that the invention is not to be limited to the specific embodiments disclosed, and that modifications and embodiments are intended to be included within the scope of the appended claims.

That which is claimed is:

- 1. A guardrail system comprising:
 - a plurality of posts, each of said plurality of posts comprising
 - a first post member, and
 - a second post member that slidably engages said first post member, said second post member comprising a first cable connector connected to a lower portion thereof, and a second cable connector connected to an upper portion thereof and including a pair of inverted and opposing J-shaped second cable connector members, and
 - at least one rail member detachably connected to and extending between said plurality of posts.
- 2. A guardrail system according to claim 1 wherein the first cable connector comprises a pair of spaced-apart opposing first cable connector members connected to the lower portion of said second post member; and wherein said at least one rail member is detachably connected to said second post member and extends between the pair of first cable connector members.
- 3. A guardrail system according to claim 2 wherein each of the pair of first cable connector members has a passageway formed therethrough; and further comprising a locking pin member that matingly engages the passageways to retain said at least one rail member between the pair of first cable connector members.
- 4. A guardrail system according to claim 3 wherein said at least one rail member comprises a first rail member detachably connected to said second post member adjacent the first cable connector, and a second rail member detachably connected to said second post member adjacent the second cable connector.
- 5. A guardrail system according to claim 1 wherein said second post member has at least one passageway formed therethrough; and further comprising a height fastener to

matingly engage the passageway and contact said first post member to fix a height of said second post member with respect to said first post member.

- 6. A guardrail system according to claim 1 wherein said at least one rail member is at least one steel cable.
- 7. A guardrail system according to claim 1 wherein said first post member and said second post member are polygonally shaped tubes.
- 8. A guardrail system according to claim 1 further comprising a plurality of bases, each base connected to a bottom portion of said respective first post member, said base having a plurality of passageways formed therethrough for receiving a respective plurality of fasteners to fasten said base to a surface.
- 9. A guardrail system according to claim 1 further comprising a plurality of bases; and wherein each of said plurality of bases includes a plurality of passageways formed therethrough for receiving a respective plurality of fasteners to fasten said base to a surface; and wherein each of said plurality of bases includes a sleeve to receive a bottom portion of said respective first post member.
- 10. A guardrail system comprising:
 - a plurality of posts, each of said plurality of posts comprising
 - a first post member, and
 - a second post member that slidably engages said first post member, said second post member comprising a first cable connector connected to a lower portion thereof and including a pair of spaced-apart opposing first cable connector members, and a second cable connector connected to an upper portion thereof and including a pair of inverted and opposing J-shaped second cable connector members, and
 - a first rail member detachably connected to said second post member adjacent the first cable connector; and
 - a second rail member detachably connected to said second post member and extending between the pair of first cable connectors;
- wherein said first and second post members are polygonally shaped tubes.

11. A guardrail system according to claim 10 wherein each of the pair of first cable connector members comprises a passageway formed through a main body portion thereof; and further comprising a locking pin member that matingly engages the passageway to retain said first rail member between the pair of first cable connector members.

12. A guardrail system according to claim 10 wherein said second post member has at least one passageway formed in a main body portion thereof; and further comprising a height fastener to matingly engage the passageway and contact a main body portion of said first post member to fix a height of said second post member with respect to said first post member.

13. A guardrail system according to claim 10 wherein said first and second rail members are steel cables.

14. A guardrail system according to claim 10 further comprising a plurality of bases, each base connected to a bottom portion of said respective first post member, said base having a plurality of passageways formed therethrough for receiving a respective plurality of fasteners to fasten said base to a surface.

15. A guardrail system according to claim 10 further comprising a plurality of bases; and wherein each of said plurality of bases includes a plurality of passageways formed therethrough for receiving a respective plurality of fasteners to fasten said base to a surface; and wherein each of said plurality of bases includes a sleeve to receive a bottom portion of said respective first post member.

16. A post for a guardrail system comprising:

a first post member; and

a second post member that slidably engages said first post member, said second post member having an upper portion and a lower portion, and comprising

a first cable connector connected to the lower portion of said second post member, and

a second cable connector connected to the upper portion of said second post member and comprising a pair of inverted and opposing J-shaped second cable connector members.

17. A post for a guardrail system according to claim 16 wherein said first cable connector comprises a pair of spaced-apart opposing first cable connector members.

18. A post for a guardrail system according to claim 17 wherein each of the pair of first cable connector members comprises a passageway formed therethrough for receiving a locking pin member to retain a rail member between the pair of first cable connector members.

19. A post for a guardrail system according to claim 16 wherein said second post member has at least one passageway formed therein; and further comprising a height fastener to matingly engage the passageway and contact said first post member to thereby fix a height of said second post member with respect to said first post member.

20. A post for a guardrail system according to claim 16 wherein said first post member and said second post member are polygonally shaped tubes.

21. A method of installing a guardrail system comprising a plurality of posts, each of the plurality of posts comprising a first post member having a base connected to a bottom portion thereof, and a second post member, the method comprising:

fastening the base of the first post member to a surface;

slidably engaging the second post member with the first post member, the second post member comprising a first cable connector connected to a lower portion thereof, and a second cable connector connected to an upper portion thereof, the second cable connector including a pair of inverted and opposing J-shaped second cable connector members; and

detachably connecting at least one rail member to each of the plurality of posts so that the at least one rail member extends between each of the plurality of posts.

22. A method according to claim 21 wherein the first cable connector comprises a pair of spaced-apart opposing first cable connector members connected to the lower portion of the second post member; and wherein the at least one rail member is detachably connected to the second post member and extends between the pair of first cable connector members.

23. A method according to claim 22 wherein each of the pair of first cable connector members comprises a passageway formed therethrough; and further comprising matingly

engaging a locking pin member with the passageway to retain the at least one rail member between the pair of first cable connector members.

24. A method according to claim 23 wherein the at least one rail member comprises a first rail member and a second rail member; and wherein detachably connecting the at least one rail member further comprises detachably connecting the first rail member to the second post member adjacent the first cable connector, and detachably connecting the second rail member to the second post member adjacent the second cable connector.

25. A method according to claim 21 wherein the second post member has at least one passageway formed therein; and further fixing the height of the second post member with respect to the first member by matingly engaging a height fastener with the passageway to contact the first post member.

26. A method according to claim 21 wherein the at least one rail member is at least one steel cable.

27. A method according to claim 21 wherein the first post member and the second post member are polygonally shaped tubes.

28. A method according to claim 21 wherein the base comprises a plurality of passageways formed therethrough; and wherein fastening the base to the surface further comprises passing a respective plurality of fasteners through the respective plurality of passageways and into the surface.

29. A method of installing a guardrail system comprising a plurality of bases, and a respective plurality of posts, each of the plurality of posts comprising a first post member, and a second post member, the method comprising:

fastening the plurality of bases to a surface;

slidably engaging the first post member of each of the posts with a respective base;

slidably engaging the second post member with the first post member, the second post member comprising a first cable connector connected to a lower portion thereof, and a second cable connector connected to an upper portion thereof, the second cable connector including a pair of inverted and opposing J-shaped second cable connector members; and

detachably connecting at least one rail member to each of the plurality of post members so that the at least one rail member extends between each of the plurality of posts.

30. A method according to claim 29 wherein the first cable connector comprises a pair of spaced-apart opposing first cable connector members connected to the lower portion of the second post member; and wherein the at least one rail member is detachably connected to the second post member and extends between the pair of first cable connector members.

31. A method according to claim 30 wherein each of the pair of first cable connector members comprises a passageway formed therethrough; and further comprising matingly engaging a locking pin member with the passageway to retain the at least one rail member between the pair of first cable connector members.

32. A method according to claim 31 wherein the at least one rail member comprises a first rail member and a second rail member; and wherein detachably connecting the at least one rail member further comprises detachably connecting the first rail member to the second post member adjacent the

first cable connector, and detachably connecting the second rail member to the second post member adjacent the second cable connector.

33. A method according to claim 29 wherein the second post member has at least one passageway formed therein; and further fixing the height of the second post member with respect to the first member by matingly engaging a height fastener with the passageway to contact the first post member.

34. A method according to claim 29 wherein the at least one rail member is at least one steel cable.

35. A method according to claim 29 wherein the first post member and the second post member are polygonally shaped tubes.

36. A method according to claim 29 wherein each of the plurality of bases includes a plurality of passageways formed therethrough, and wherein each of the plurality of bases includes a sleeve to receive a bottom portion of the respective first post members; and wherein fastening the bases to the surface comprises passing a respective plurality of fasteners through the respective plurality of passageways and into the surface.

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