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Honeycutt et al.

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(54) **FALL RESTRAINT EQUIPMENT COMPONENT AND METHOD FOR MANUFACTURING THE SAME**

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E06C 7/18 (2006.01)
E04H 17/00 (2006.01)

(52) **U.S. Cl.**
USPC **14/69.5**; 182/106; 256/65.04

(58) **Field of Classification Search**
USPC 14/69.5, 71.1; 182/106, 228.1, 2.1, 2.2, 182/21; 256/65.02, 65.03, 65.04, 65.05, 256/65.06, 65.07
See application file for complete search history.

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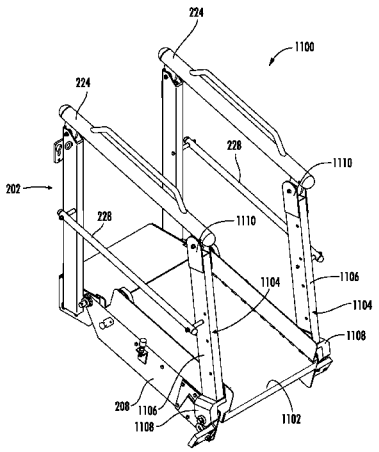
(57) **ABSTRACT**

Uprights and lateral or connecting posts to be used in conjunction with a gangway or other fall restraint equipment where the uprights and posts are created by cutting portions of integral, continuous pieces of tubular metal rather than welding smaller pieces of stock material together. Sidepost assemblies or handrails are created by connecting the uprights and posts together.

22 Claims, 11 Drawing Sheets



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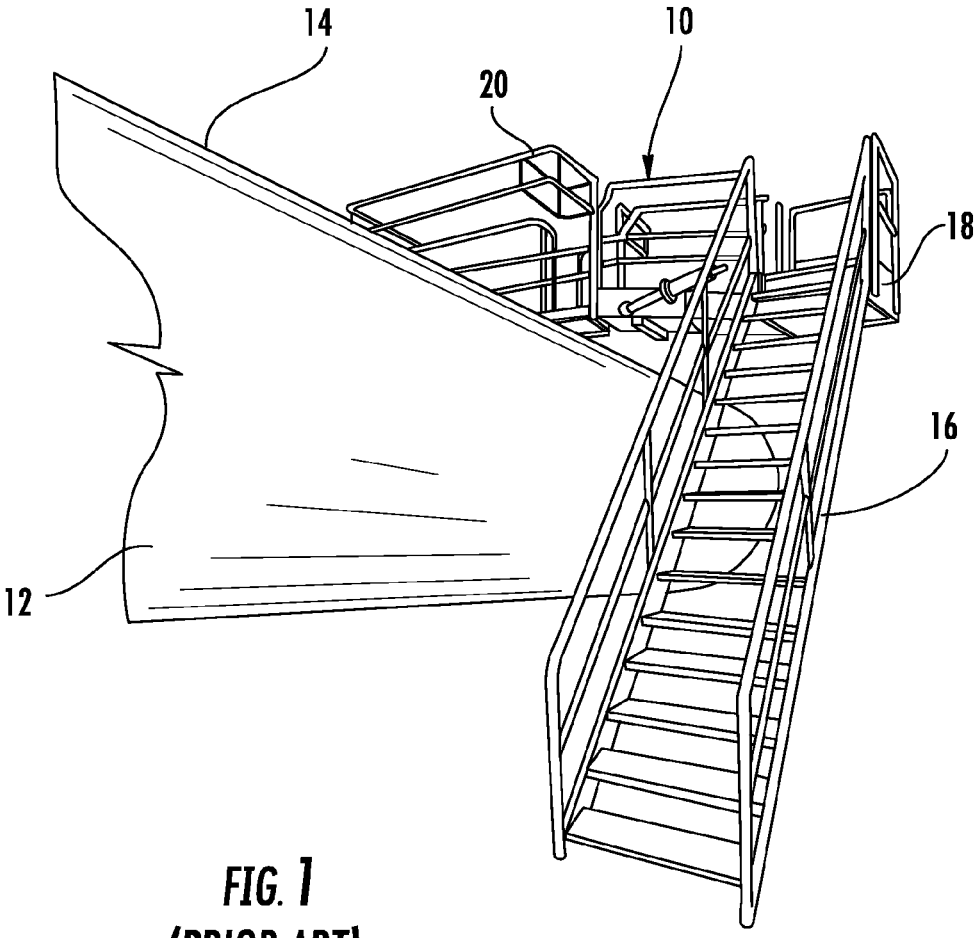

FIG. 1
(PRIOR ART)

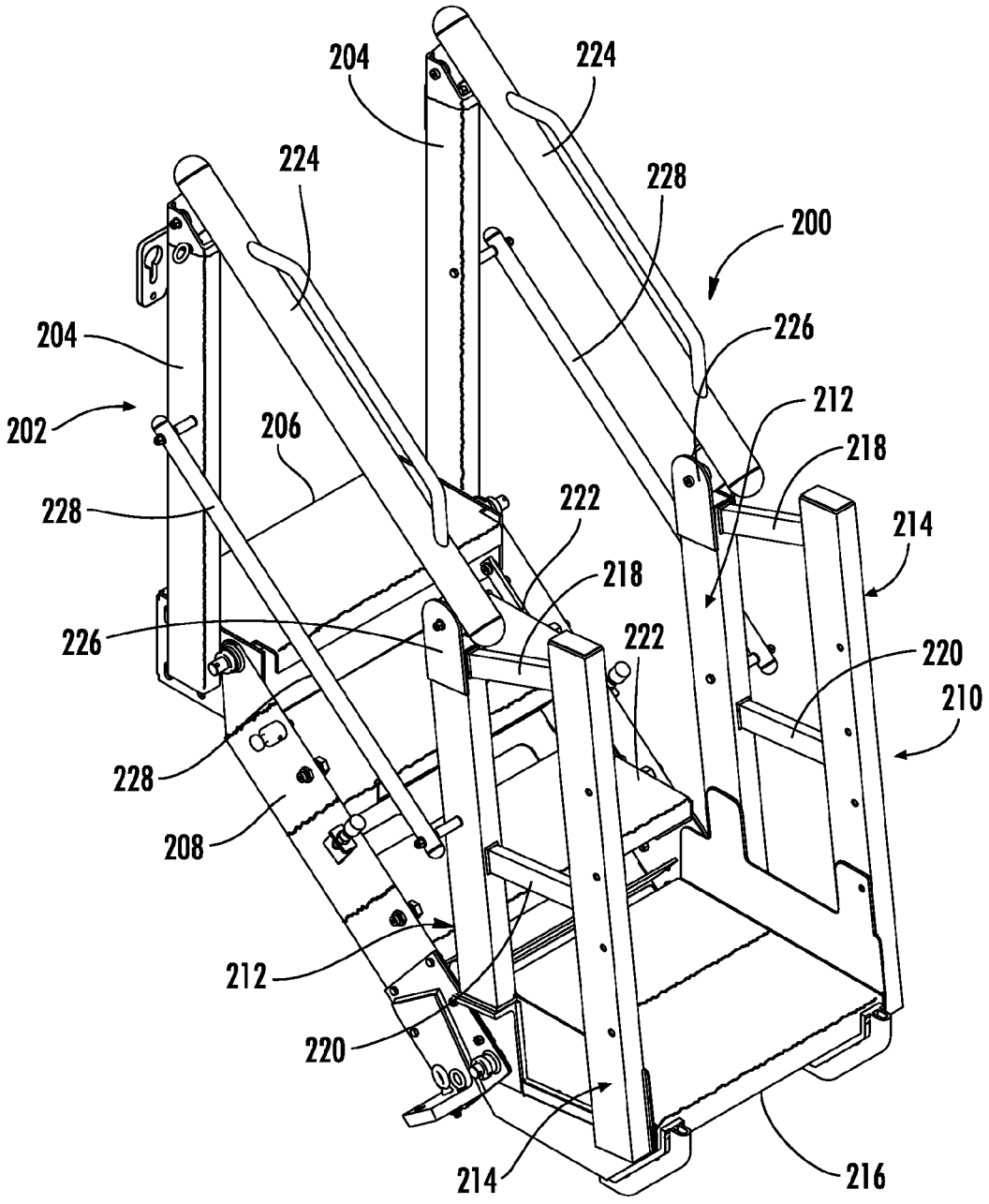

FIG. 2
(PRIOR ART)

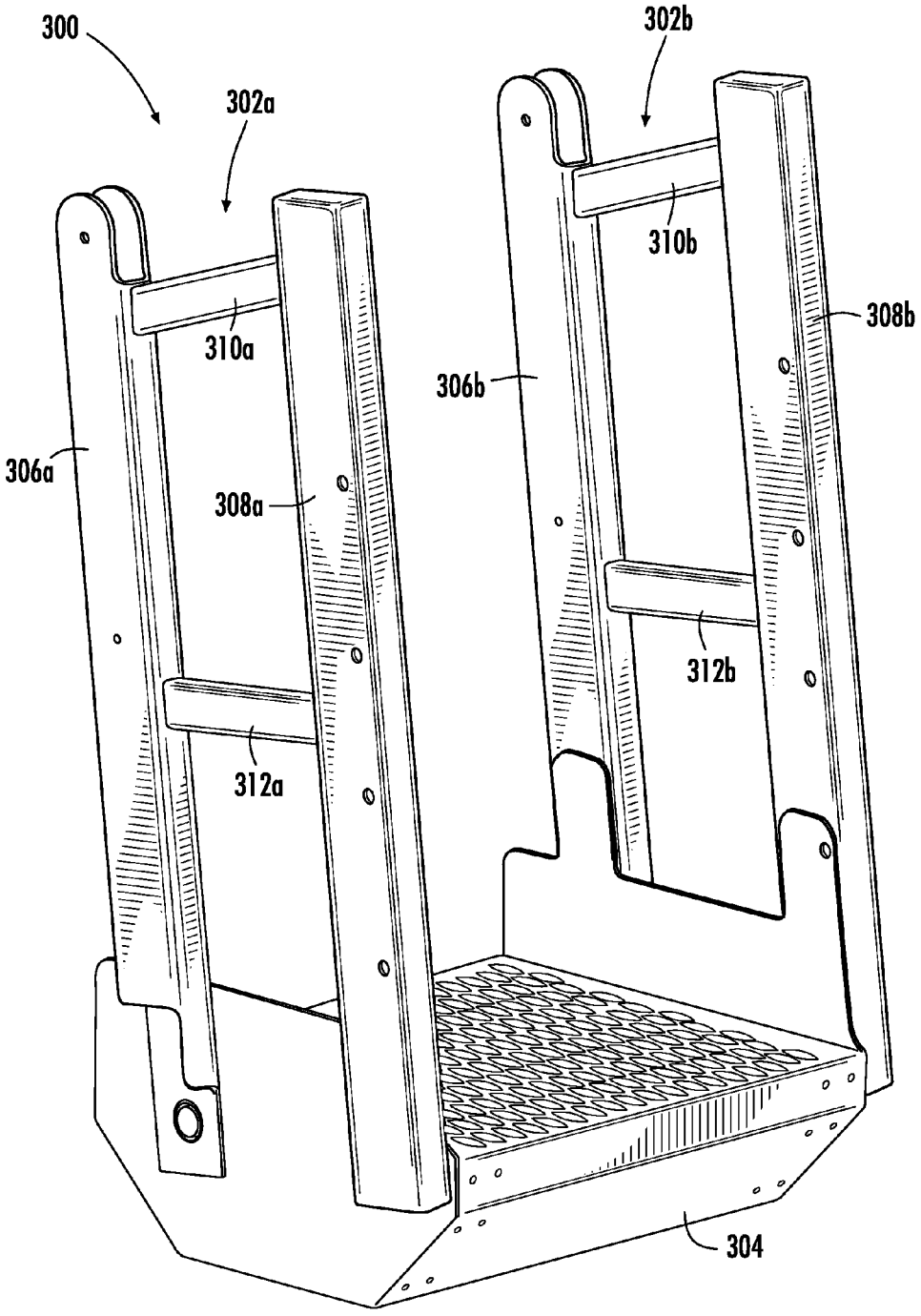

FIG. 3

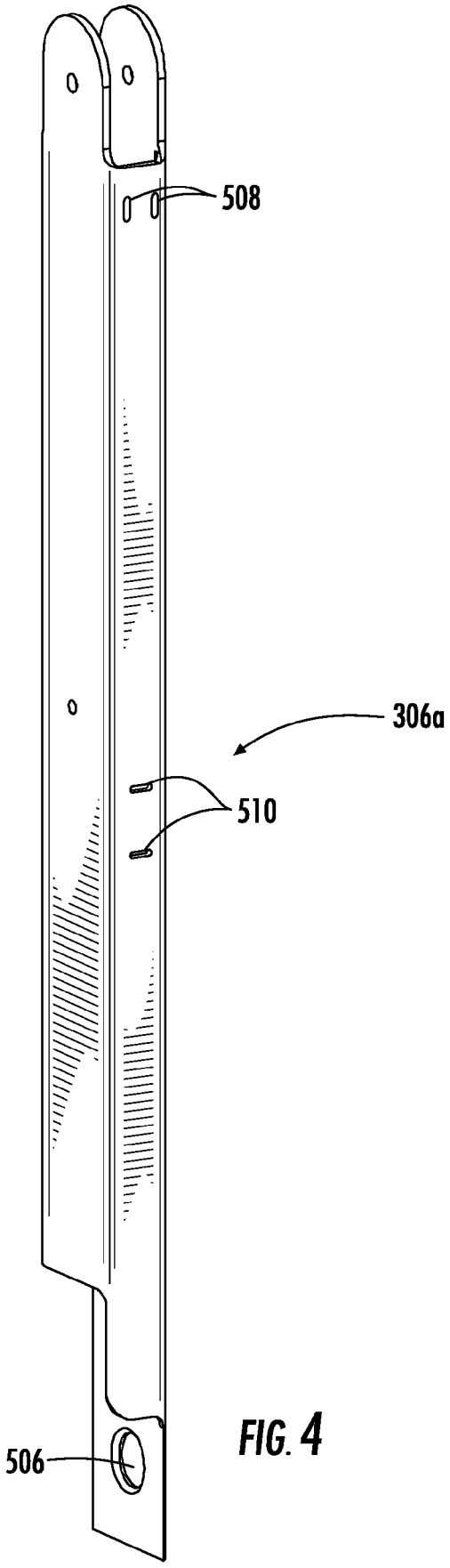

FIG. 4

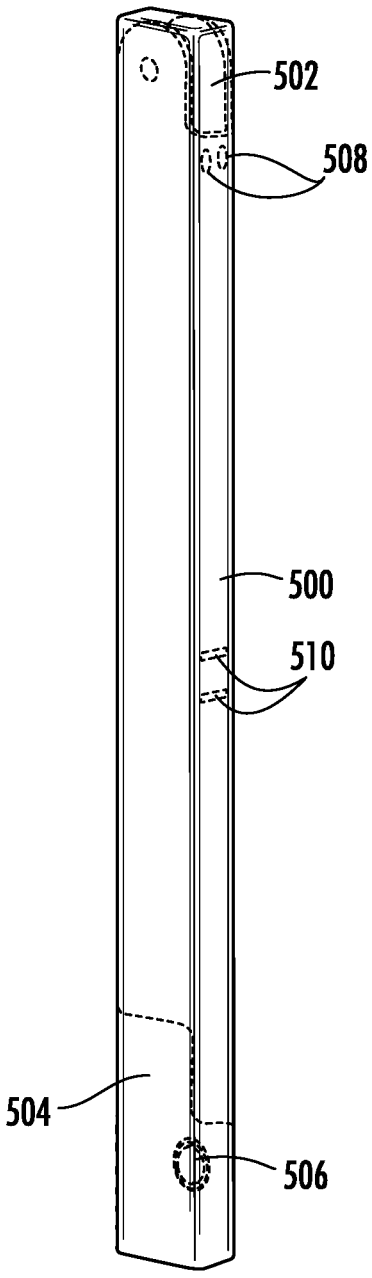

FIG. 5

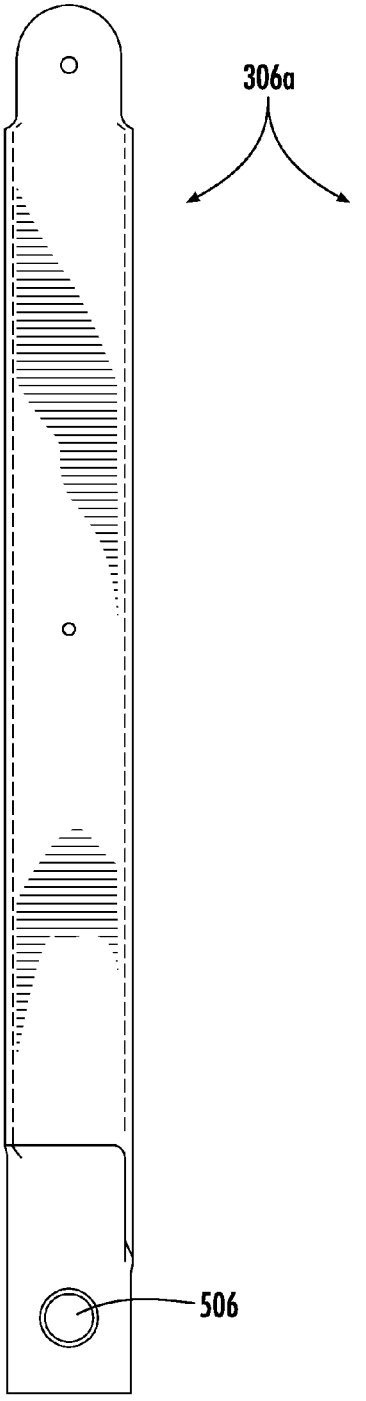

FIG. 6

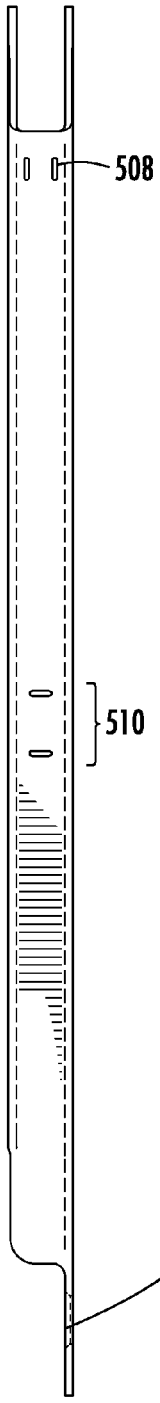

FIG. 7

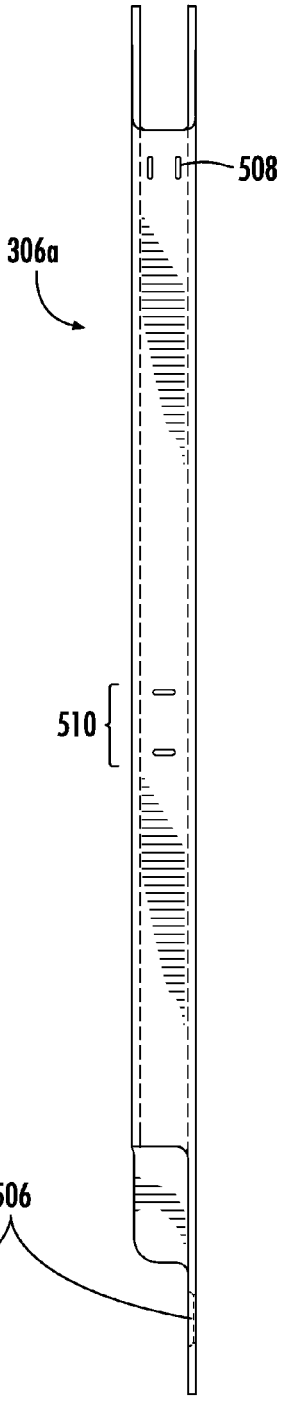

FIG. 8

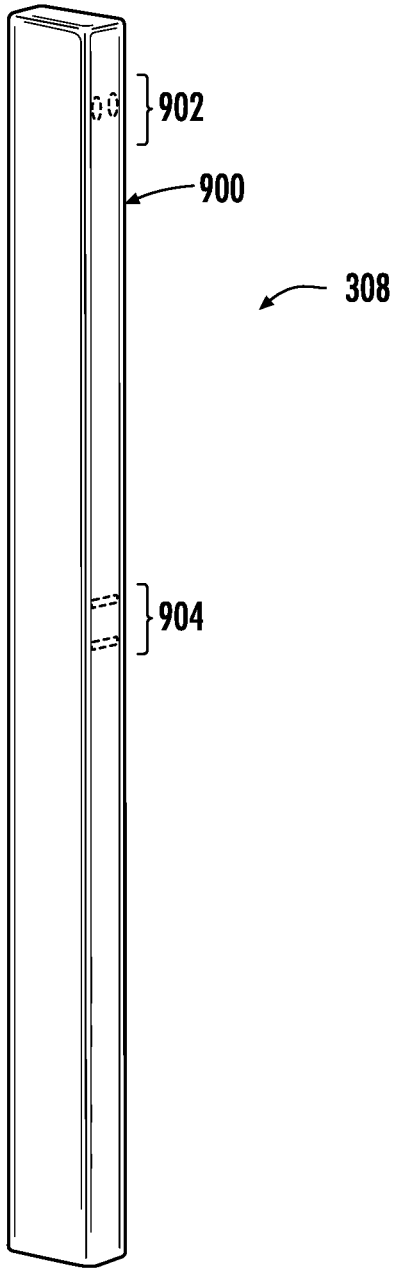

FIG. 9

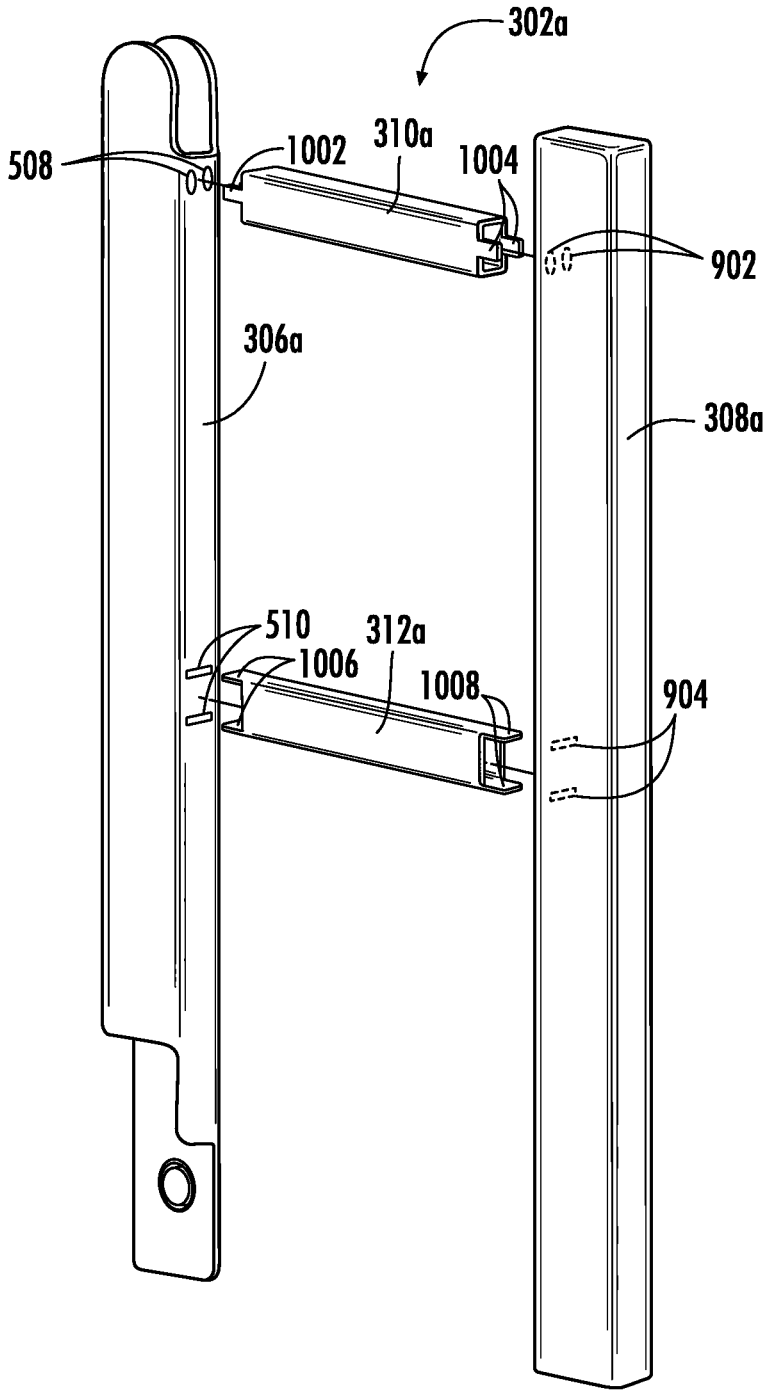

FIG. 10

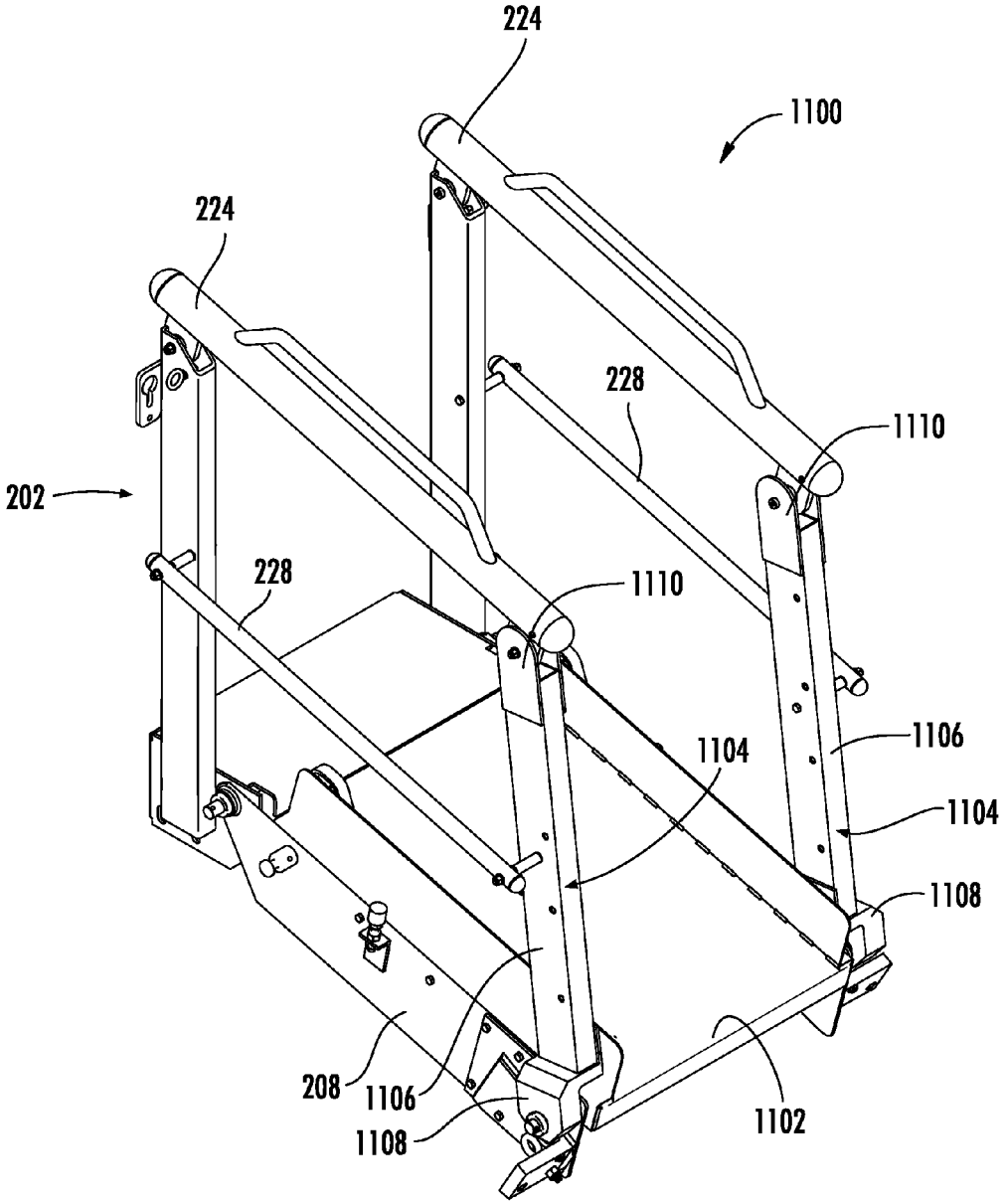
224
1100
224
228
1110
202
228
1110
1106
1104
1104
1108
208
1106
1108
1102

FIG. 11

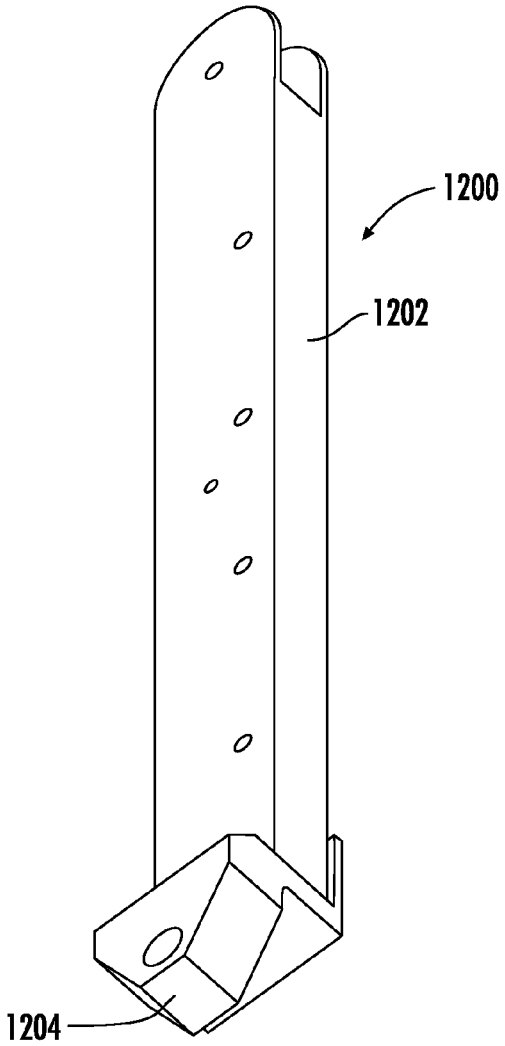

FIG. 12

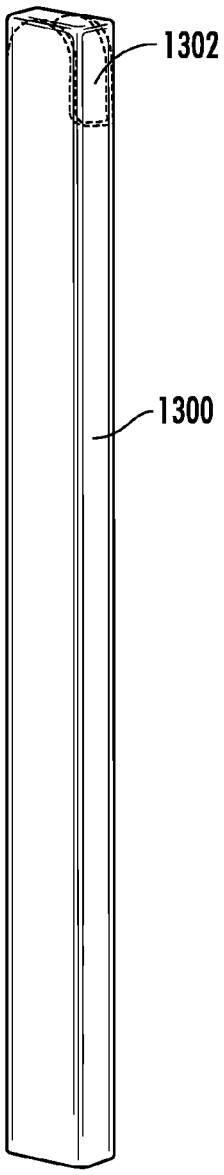

FIG. 13

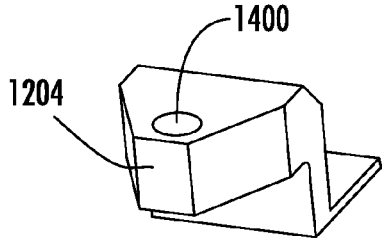

FIG. 14

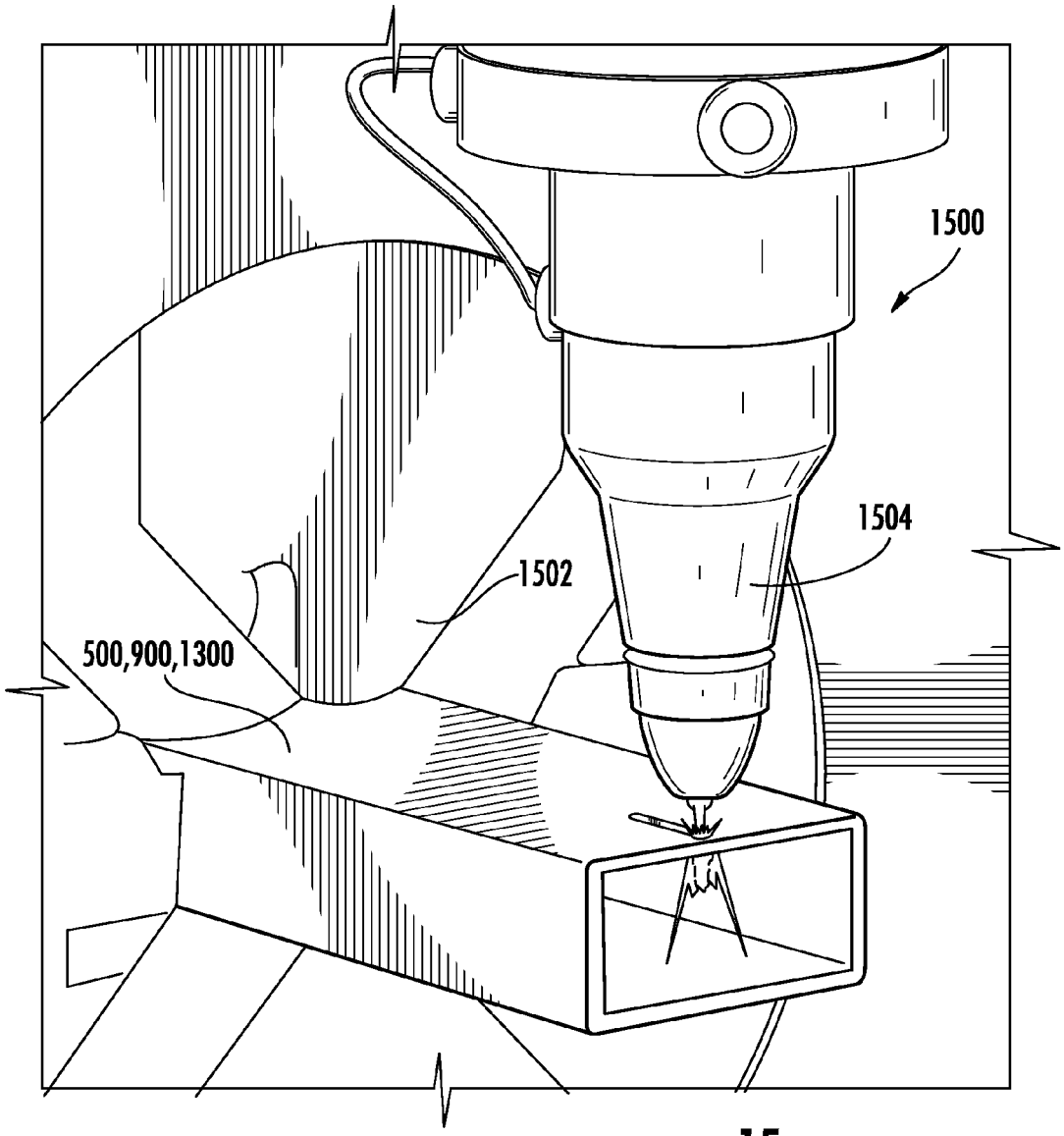

FIG. 15

FALL RESTRAINT EQUIPMENT COMPONENT AND METHOD FOR MANUFACTURING THE SAME

CLAIM OF PRIORITY

The present application claims the benefit of the United States provisional patent application filed on Aug. 10, 2008 by Robert W. Honeycutt for COMPONENTS OF SAFETY EQUIPMENT AND METHODS FOR MANUFACTURING THE SAME (Ser. No. 61/087,732), the entire disclosure of which is incorporated by reference as if set forth verbatim herein.

FIELD OF THE INVENTION

The present invention relates generally to fall restraint equipment components. More particularly, the present invention relates to posts for gangways.

BACKGROUND OF THE INVENTION

FIG. **1** illustrates an example of fall restraint equipment comprising a stairwell **16**, a platform **18**, and a gangway **10**. Stairwell **16** ascends to platform **18**, where gangway **10** is connected. An optional cage **20** may be connected to gangway **10** if desired. In this example, the fall restraint equipment provides a user with access to a top **14** of a container **12** (such as a railway car).

FIG. **2** illustrates a gangway **200** that may be used as gangway **10** of FIG. **1**. Gangway **200** comprises a base tread **202**, which includes two posts or "uprights" **204** connected to base tread support **206**. Uprights **204** are preferably welded to base tread support **206** but may be connected to the support by other suitable means, such as by bolting. Base tread **202** is conventionally connected to a fixed structure, such as platform **18** (FIG. **1**). An support structure or "underbody" **208** is pivotally connected to base tread support **206** at one end and is pivotally connected to another tread **210**, such as a seatainer tread, at the other end. Seatainer tread **210** is comprised of uprights **212** and **214** connected to each side of a tread support **216**. Each set of uprights **212** and **214** are interconnected by lateral posts **218** and **220**. Lateral posts **218** and **220** may be referred to as "joiners," "connectors," or "spacer tubes." In this example, gangway **200** additionally comprises a pair of self-leveling supports **222** pivotally connected to underbody **208**. Uprights **212** include top portions **226** that are configured to pivotally receive respective portions of a pair of handrails **224**. Likewise, uprights **204** are configured to pivotally receive opposite ends of handrails **224**. Gangway **200** may comprise additional components, such as a pair of supports, handrails, or "blocking rails" **228**, as desired or needed.

The pivotal connections between underbody **208** and base tread **202**, self-leveling supports **222**, and seatainer tread **210** enable gangway **200** to rotate with respect to a fixed structure, such as platform **18** (FIG. **1**). Additionally, the pivotal connections between uprights **204** and top portions **226** of uprights **212** allow seatainer tread **210** to rotate with respect to base tread **202**.

Components of fall restraint equipment, such as gangways, are generally formed by welding smaller pieces of stock material together. For instance, top portions **226** of uprights **212** are formed by welding various pieces of stock material together, which are drilled or cut prior to welding. Portions **226** are then welded to a tubular piece of metal. Other areas of uprights **212** are then formed in a similar manner. For example, the portions that connect the uprights to tread support **216** are likewise formed from smaller pieces of metal that have been cut and welded together. These portions are then welded to the bases of the tubular metal of uprights **212** in order to form the complete upright. Once uprights **212** and **214** have been created in this manner, respective ends of lateral posts **218** and **220** are welded to the uprights. Manufacturing components for fall restraint equipment in such a manner is a protracted process and increases the cost of the finished product.

BRIEF DESCRIPTION OF THE DRAWINGS

A full and enabling disclosure of the present invention, including the best mode thereof directed to one of ordinary skill in the art, is set forth in the specification, which makes reference to the appended drawings, in which:

FIG. **1** is a perspective view of an exemplary fall restraint system;

FIG. **2** is a perspective view of a gangway that may have been used in the system of FIG. **1**;

FIG. **3** is a perspective view of a seatainer tread of a gangway in accordance with an embodiment of the present invention;

FIG. **4** is a perspective view of an upright to be used in conjunction with the seatainer tread of FIG. **3**;

FIG. **5** is a perspective view of a continuous piece of tubular metal to be formed into the upright of FIG. **4**;

FIGS. **6**, **7**, and **8** are left side, front, and back elevation views, respectively, of the post of FIG. **4**;

FIG. **9** is a perspective view of another upright of the seatainer tread of FIG. **3**;

FIG. **10** illustrates the formation of a sidepost assembly of the seatainer tread of FIG. **3**;

FIG. **11** is a perspective view of another gangway that may have been used in the system of FIG. **1**;

FIG. **12** is a perspective view of an upright of a ramp of a gangway in accordance with an embodiment of the present invention;

FIG. **13** illustrates the formation of a top portion of the upright of FIG. **12**;

FIG. **14** is a perspective view of a bottom portion of the upright of FIG. **12**; and

FIG. **15** illustrates an exemplary process for forming an upright in accordance with an embodiment of the present invention.

Repeat use of reference characters in the present specification and drawings is intended to represent same or analogous features or elements of the invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Reference will now be made in detail to presently preferred embodiments of the invention, one or more examples of which are illustrated in the accompanying drawings. Each example is provided by way of explanation of the invention, not limitation of the invention. In fact, it will be apparent to those skilled in the art that modifications and variations can be made in the present invention without departing from the scope or spirit thereof. For instance, features illustrated or described as part of one embodiment may be used on another embodiment to yield a still further embodiment. Thus, it is intended that the present invention covers such modifications and variations as come within the scope of the appended claims and their equivalents.

FIG. **3** illustrates a seatainer tread **300**, which may be substituted for the seatainer tread **210** of gangway **200** (FIG.

2). Additional information regarding the construction and operation of gangways is contained in U.S. patent application Ser. No. 12/329,883, the entire disclosure of which is hereby incorporated by reference as if set forth verbatim herein. Seatainer tread **300** comprises two sidepost assemblies or handrails **302** connected to respective sides of support tread **304**. Each handrail **302** comprises a first post or upright **306** and a second post or upright **308** interconnected by lateral posts **310** and **312**.

The arrangement, construction, and formation of uprights **306** is described with reference to upright **306***a* although those of ordinary skill in the art should understand that upright **306***b* is a mirror image of upright **306***a* and is thus formed and used in substantially the same manner. Referring to FIGS. **4** and **5**, upright **306***a* is formed from a continuous piece **500** of tubular metal. Continuous piece **500** of tubular metal is butterflied, notched, lasered, or otherwise cut at locations **502** and **504** at the distal ends of piece **500** as illustrated in FIG. **5**. Area **502** is configured to receive and connect to an end of a handrail, such as handrail **224** (FIG. **2**). Area **504** is configured to connect to both support tread **304** (FIG. **3**) and a support structure of a gangway, such as underbody **208** (FIG. **2**). Additionally, continuous piece **500** of tubular metal is cut to define an aperture **506** configured to receive a connecting device, such as a bolt or rivet, in order to connect the upright to the support tread and the support structure. In another embodiment, the connecting device is a cross tube that extends through aperture **506** of upright **306***a* through the interior of tread support **304** and through aperture **506** of upright **506***b* on the other side. The cross tube is then welded at the connection of the cross tube, upright **306**, and tread support **304**. The shape of area **504** and the connecting device allow seatainer tread **300** (FIG. **3**) to rotate with respect to the support structure without interfering (or coming into contact) with the support structure. Continuous piece **500** of tubular metal is also notched or otherwise cut to define two sets of apertures **508** and **510**, such that the sets of apertures are configured to receive portions of respective lateral posts **310** and **312** (FIG. **3**) as described in more detail below. FIGS. **6**, **7**, and **8** illustrate upright **306***a* formed from continuous piece **500** of tubular metal.

Referring again to FIG. **3**, those of ordinary skill in the art will appreciate that upright **306***b* is a mirror image of upright **306***a*. Upright **306***b* may be connected to and used on the opposite side of seatainer tread **300** with respect to upright **306***a*. In contrast, uprights **308***a* and lateral posts **310***a* and **312***a* are identical to upright **308***b* and lateral posts **310***b* and **312***b*, respectively, so that each may be used on either side of seatainer tread **300**.

FIG. **9** illustrates upright **308** formed from another continuous piece **900** of tubular metal. Continuous piece **900** of tubular metal is notched or otherwise cut so that upright **308** defines two sets of apertures **902** and **904** configured to receive portions of respective lateral posts **310** and **312** (FIG. **3**) as described below.

FIG. **10** illustrates the formation of handrail **302***a* comprising uprights **306***a* and **308***a* and lateral posts **310***a* and **312***a*. The ends of lateral post **310***a* define inserts or "tabs" **1002** and **1004** that extend laterally from the post. Similarly, the ends of lateral post **312***a* define inserts **1006** and **1008**. Tabs **1002** of lateral post **310***a* are inserted into apertures **508** of upright **306***a*, and tabs **1004** of the post are inserted into apertures **902** of post **308***a*. Similarly, tabs **1006** of lateral post **312***a* are inserted into apertures **510** of upright **306***a*, and tabs **1008** are inserted into apertures **904** of upright **308***a*. Once connected, uprights **306***a* and **308***a* and lateral posts **310***a* and **312***a* may be welded and galvanized as desired. It should be understood by those of ordinary skill in the art that handrail **302***b* is formed in a similar manner. Handrails **302** are then connected to support tread **304** as described above.

Referring additionally to FIG. **3**, it should be understood that the ends of lateral posts **310** (and/or lateral posts **312**), including tabs **1002** and **1004**, as well as apertures **508** and **902**, may be formed so that lateral posts **310** (and/or lateral posts **312**) exhibit an angled arrangement and so that upright **306** is lower than upright **308** with respect to a horizontal plane. This provides easier access to and use of handrails **302** when the corresponding gangway is oriented in a lowered position, as illustrated by gangway **200** in FIG. **2**.

FIG. **11** in a perspective view of a gangway **1100** that may be used as gangway **10** of FIG. **1**. Among other elements, gangway **1100** comprises a ramp portion **1102**, posts or "uprights" **1104**, base tread **202**, and support structure **208**. Base tread **202** is pivotally connected to support structure **208** in a manner similar to that described above with respect to FIG. **2**. Ramp portion **1102** is also connected to support structure **208**. Uprights **1104** comprise tubular portions **1106** connected between bottom portions **1108**, which are pivotally connected to ramp portion **1102**, and top portions **1110**, which are configured to receive portions of handrails **224**. The pivotal connections between base tread **202** and support structure **208** and between the support structure and uprights **1104** allow ramp portion **1102** to rotate with respect to a fixed structure.

Top portions **1110** are formed by welding various pieces of metal and stock material together, which are drilled or otherwise cut prior to welding. Portions **1110** are then welded to lower portions **1108** in order to form upright **1104**. As set forth above, manufacturing components for fall restraint equipment in such a manner is a protracted and costly process.

FIG. **12** is a perspective view of an upright **1200**, which may be substituted for uprights **1104** of gangway **1100** (FIG. **11**). Upright **1200** comprises a post, tube, or "shaft" portion **1202** connected to a base portion **1204**. FIG. **13** illustrates the formation of shaft portion **1202** from a continuous piece **1300** of tubular metal. Continuous piece **1300** of tubular metal is butterflied, notched, lasered, or otherwise cut at a distal end **1302** to form the area configured to receive a portion of a handrail, such as handrail **224** of FIG. **11**. Referring to FIG. **14**, base portion **1204** defines an aperture **1400**. Referring to FIGS. **12**, **13**, and **14**, shaft portion **1202** is welded to base portion **1204** in order to form upright **1200**, which may then be galvanized if desired. Upright **1200** is then pivotally connected to a ramp of a gangway such as ramp portion **1102** of gangway **1100** (FIG. **11**) via a rod, bar, bolt, or other suitable device passing through aperture **1400**, the support structure, and the ramp.

Referring to FIG. **15**, a tube laser **1500** may be used to laser or otherwise cut continuous pieces **500**, **900**, and **1300** of tubular metal in order to form uprights **306**, **308**, and **1200**, respectively. Each of continuous pieces **500**, **900**, and **1300** of metal is inserted into a holding mechanism **1502** of the tube laser, which moves and rotates the continuous piece while a $C0_2$ laser **1504** penetrates the metal. Tube laser **1500** further comprises a processor and a processor-readable medium containing computer instructions that, when executed by the processor, perform the function of providing a graphical user interface ("GUI"). The GUI allows a user to provide tube laser **1500** with the desired dimensions of continuous piece **500** of metal and the location and dimensions of the portions of the piece that need to be cut and removed in order to form uprights **306**, **308**, and **1200**. Based on these instructions provided by the user, which are stored on the processor-

readable medium, the processor instructs tube laser **1500**, and more specifically, holding mechanism **1502** and laser **1504**, how to rotate, move, and cut each continuous piece of metal. It should be understood that other suitable processes may be utilized to cut the continuous pieces of metal to form the uprights, including the use of a cutting drill, screw machine, mill, saw, or handheld plasma or flame torch. It should be understood by those of ordinary skill in the art that lateral posts **310** and **312** may be constructed in a similar manner. For instance, two tubular pieces of metal may be lasered or cut in order to define tabs and inserts **1002**, **1004**, **1006**, and **1008** of respective posts **310** and **312**.

While one or more preferred embodiments of the invention have been described above, it should be understood that any and all equivalent realizations of the present invention are included within the scope and spirit thereof. The embodiments depicted are presented by way of example only and are not intended as limitations upon the present invention. Thus, it should be understood by those of ordinary skill in this art that the present invention is not limited to these embodiments since modifications can be made. Therefore, it is contemplated that any and all such embodiments are included in the present invention as may fall within the scope and spirit thereof.

The invention claimed is:

1. A method for assembly of a gangway having at least one handrail and a support, the method comprising:

providing a first upright post produced from a first continuous piece of tubular metal by cutting a top portion of the first continuous piece of tubular metal to define a first flange and a second flange such that the first flange and second flange are an integral portion with the first upright post and such that the upright post is formed completely from the first continuous piece of metal, wherein the first flange and the second flange extend entirely along a longitudinal axis of said first continuous piece of tubular metal and define a first area located between the first and second flanges that is configured to receive a portion of the at least one handrail;

connecting the portion of the at least one handrail to the first upright post between the first flange and the second flange such that the handrail and upright post are pivotally connected at a point located within the longitudinal extent of the first continuous piece of tubular metal, and in a manner that allows the at least one handrail to rotate with respect to the first continuous piece of tubular metal;

connecting the first upright post to a first side of the support.

2. The method of claim **1** further comprising galvanizing the first upright post.

3. The method of claim **1** wherein the first upright post defines a first bottom area configured to connect to the support, said first bottom area formed by cutting a bottom portion of the first continuous piece of tubular metal.

4. The method of claim **1**, wherein the gangway further comprises another handrail, the method further comprising:

providing a third upright post;

connecting the third upright post to the first side of the support;

providing a second upright post produced from a second continuous piece of tubular metal by cutting a top portion of the second continuous piece of tubular metal to define a third flange and a fourth flange, wherein the third flange and the fourth flange define a second area located between the third and fourth flanges configured to receive a portion of the another handrail;

connecting the portion of the another handrail to the second upright post between the third flange and the fourth flange in a manner that allows the another handrail to rotate with respect to the second continuous piece of tubular metal;

connecting the second upright post to a second side of the support;

providing a fourth upright post; and

connecting the fourth upright post to the second side of the support.

5. The method of claim **4** wherein the second upright post defines a second bottom area configured to connect to the support, said second bottom area formed by cutting a bottom portion of the second continuous piece of tubular metal.

6. The method of claim **1** further comprising:

providing a support bar;

providing an additional upright post; and

connecting said additional upright post to the first side of the support such that the support bar interconnects the first upright post and the additional upright post.

7. The method of claim **6** further comprising galvanizing the first upright post, the support bar, and the additional upright post.

8. The method of claim **6** wherein the support bar is formed from a continuous piece of tubular metal.

9. The method of claim **1** wherein the first upright post is fixedly connected to the first side of the support.

10. The method of claim **9** wherein the first upright post is fixedly connected to the first side of the support by welding.

11. The method of claim **1** wherein the support is a seatainer tread support.

12. A seatainer tread for a gangway comprising:

a tread support for supporting a user;

a first upright post comprising a first continuous piece of tubular metal connected to a rear portion of a first side of the tread support, a top portion of the first continuous piece of tubular metal is cut to define a first flange and a second flange such that the first flange and second flange are an integral portion with the first upright post, wherein the first flange and the second flange extend entirely along a longitudinal axis of said first continuous piece of tubular metal such that a first handrail and the first upright post are pivotally connected at a point located within the longitudinal extent of the first continuous piece of tubular metal, and wherein the first flange and the second flange define a first area between the first flange and the second flange that is configured to receive a portion of the first handrail of the gangway;

a second upright post comprising a second continuous piece of tubular metal connected to a rear portion of a second side of the tread support, wherein a top portion of the second upright post defines a third flange and a fourth flange such that the third flange and fourth flange are an integral portion with the second upright post, wherein the third flange and the fourth flange extend entirely along a longitudinal axis of said second continuous piece of tubular metal such that a second handrail and the second upright post are pivotally connected at a point located within the longitudinal extent of the second continuous piece of tubular metal, and wherein the third flange and the fourth flange define a second area between the third flange and the fourth flange that is configured to receive a portion of the second handrail of the gangway;

a third upright post connected to a front portion of the first side of the tread support, wherein the third upright post is connected to the first upright post via a first support bar; and

a fourth upright post connected to a front end of the second side of the tread support, wherein the fourth upright post is connected to the second upright post via a second support bar.

13. The seatainer tread of claim **12** wherein the first continuous piece of tubular metal comprises a bottom portion cut to define a first bottom area configured to connect to the tread support.

14. The seatainer tread of claim **12** wherein the third upright post comprises a third continuous piece of tubular metal.

15. The seatainer tread of claim **14** wherein the fourth upright post comprises a fourth continuous piece of tubular metal.

16. The seatainer tread of claim **14** wherein:

the first continuous piece of tubular metal defines at least one aperture configured to receive a first end of the first support bar; and

the third continuous piece of tubular metal defines at least one aperture configured to receive a second end of the first support bar.

17. The seatainer tread of claim **16** wherein the seatainer tread is galvanized.

18. The seatainer tread of claim **12** wherein the first and second upright posts are fixedly connected to the first and second sides of the tread support, respectively.

19. The seatainer tread method of claim **18** wherein the first and second upright posts are fixedly connected to the tread support by welding.

20. A gangway comprising:

an underbody having a first side and a second side interconnected by a middle section, wherein the first side and second side define relatively parallel planes opposite one another with respect to the middle section;

a support, wherein a first side of the support is rotatably connected to the first side of the underbody and a second side of the support is rotatably connected to the second side of the underbody;

an upright post fixedly connected to the first side of the support, wherein the connection of the upright post, the support, and the underbody defines a pivot axis about which the support and the upright post can pivot, wherein the upright post comprises a first continuous piece of metal, a top portion of the first continuous piece of metal defines a first flange and a second flange, wherein the first flange and second flange extend integrally and entirely along a longitudinal axis of said first continuous piece of metal and define a first area located between the first flange and the second flange; and

a handrail connected to the upright post, wherein a portion of the handrail is received within the first area and pivotally connected to the first flange and the second flange at a point located within the longitudinal extent of the first continuous piece of tubular metal.

21. The gangway of claim **20** wherein the support is a tread.

22. The gangway of claim **20** further comprising:

a second upright post fixedly connected to the second side of the support, wherein the connection of the second upright post, the support, and the underbody is situated at the pivot axis, wherein the second upright post comprises a second continuous piece of metal, a top portion of the second continuous piece of metal defines a third flange and a fourth flange, wherein the third flange and fourth flange extend integrally along a longitudinal axis of said second continuous piece of metal and define a second area located between the third flange and the fourth flange; and

a second handrail connected to the second upright post, wherein a portion of the second handrail is received within the second area and pivotally connected to the third flange and the fourth flange.

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UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO.	: 8,782,838 B2
APPLICATION NO.	: 12/487408
DATED	: July 22, 2014
INVENTOR(S)	: Honeycutt et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

On the Title Page:

The first or sole Notice should read --

Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 84 days.

Signed and Sealed this
Eighth Day of March, 2016

Michelle K. Lee

Michelle K. Lee
Director of the United States Patent and Trademark Office