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(54) Title: MODULAR GUARD RAIL ASSEMBLY

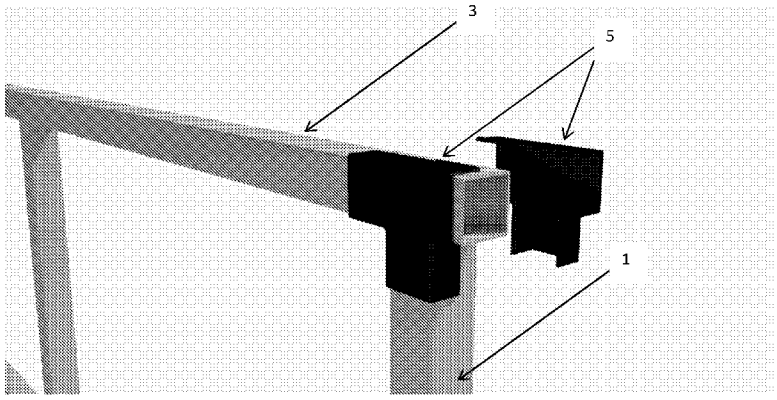

Figure 2

(57) Abstract: There is provided an easy to install guard rail assembly that may be assembled and installed without the aid of welding or soldering. The assembly makes use of a set of vertical bar elements and a set of horizontal bar element that are designed to mate with each other based on a special design. The assembly can be assembled and installed by without the aid of welding or soldering the without separate fastening means such as screws, rivets or the like for assembling the component parts of the fence to each other, and which can be assembled and installed with low-level skill and minimal tools.

MODULAR GUARD RAIL ASSEMBLY

FIELD OF THE INVENTION

The present invention relates to the field of rail assemblies. Specifically there is provided an easy to install guard rail assembly that may be assembled and installed without the aid of welding or soldering.

BACKGROUND OF THE INVENTION

In many constructions safety barriers or guard rails are required. Firstly, personal safety requires the erection of such rail, and secondly, it is also prevents the accidental dislodgement of articles which would otherwise cause a substantial safety hazard.

While such guard railings meet safety requirements, they require more than one person and a fair amount of time to construct and often result in the destruction of the materials used when they are disassembled. Obviously, the additional labour and cost of materials used will add to the expense of the job.

Many such railings also fail to pass the rigidity requirements of safety inspectors. As a result, various structures have been proposed to aid in the construction of safety barriers which prevent workmen from accidental falls and which meet strict safety guidelines. To a large extent, however, most of the proposed structures are impractical, expensive and too complicated to use.

Consequently, a need exists for a portable and simple guard rail system which is effective in preventing accidental falls, meets safety guidelines and which can be assembled and disassembled in an efficient manner. Especially there is a need for a guard rail system which can be assembled and installed by the ultimate user without the aid of welding or soldering the without separate fastening means such as screws, rivets or the like for assembling the component parts of the fence to each other, and which can be assembled and installed with low-level skill and minimal tools.

JPH 01168634 U discloses a guard rail assembly comprising a set of vertical bar elements of a rectangular cross section with two side walls, a frontal, and a rear wall, each bar element having at least one opening for receiving an upper horizontal bar element.

JPH 01168634 U futher discloses a set of horizontal bar elements of a rectangular cross section with an upper, lower, frontal, and rear wall, each bar element having at least two pairs of slits (8) for receiving vertical bar element. Finally, JPH 01168634 U discloses elastic brackets for holding the vertical and horizontal bar elements in place when assembled.

JPH 01168634 U does not discloses that each of the two slits extends orthogonally from the surface of rear wall of the bar element and 50-80% through the bar element, and that the opening in the vertical bar elements is designed so that a part of the front wall is fully open and 30-50% of the side walls is cut away, wherein the slits in said pair of slits of the upper bar element are positioned in a distance corresponding to the thickness of a vertical bar element, whereby the upper horizontal bar element mates with the opening in the vertical bar element.

A need exists for a metal safety rail that is reusable, that quickly assembles and disassembles, that disassembles into two separate members to prevent cooperating elements from being lost or damaged, and that is more stable, force resistant and safer than comparable wooden safety rails. Further, the metal safety rail must meet all specifications established by safety agencies.

SUMMARY OF THE INVENTION

The present invention provides in a first aspect a guard rail assembly comprising:

- a set of vertical bar elements of a rectangular cross section with two side walls, a frontal, and a rear wall, each bar element having at least one a slit that extends orthogonally from the surface of front wall of the bar element and 50-80% through the bar element;
- a set of upper horizontal bar elements of a rectangular cross section with an upper, lower, frontal, and rear wall, each upper horizontal bar element having at least two openings for receiving vertical bar elements; and
- elastic brackets for holding the vertical and horizontal bar elements in place when assembled;

wherein the openings in the upper horizontal bar elements are designed so that the rear wall is fully open and 30-50% of the lower wall is cut away, wherein said slit of the vertical bar element is positioned in a distance from the upper end of the vertical bar element corresponding to the thickness of a horizontal bar element, whereby the vertical bar element mates with the opening in the upper horizontal bar element.

It is preferred that the elastic brackets constitute pairs of T-shaped joining members fitting each side of the T-shaped joint established when the horizontal and vertical bar element are assembled, said joining members are designed to engage, preferably clickable, a corresponding portion of a joining member to provide rigidity and stability to the joint. In a preferred embodiment of the present invention the elastic brackets are made from a flexible polymer material, a plastic composite material or an elastic metal.

In one embodiment each vertical bar element is further provided with one or more openings each of which are designed so that the rear wall is fully open and 30-50% of the side walls is cut away, and wherein one or more lower horizontal bar elements is provided with corresponding pairs of slits, where the distance between a pair of slits corresponds to the thickness of a vertical bar element, and where each slit extends orthogonally from the surface of rear wall of the lower horizontal bar element and 50-80% through the bar element, whereby the pair of slits in the lower horizontal bar element mates with the opening in the vertical bar element.

In another embodiment one or more lower horizontal bar elements of a rectangular cross section with an upper, lower, frontal, and rear wall is provided, said lower horizontal bar elements each having at least two openings each of which are designed with the rear wall fully open and 30-50% of the upper and lower wall cut away, and wherein each vertical bar element is further provided with pairs of slits for receiving the lower horizontal bar element, where the distance between a pair of slits corresponds to the thickness of a horizontal bar element, and where each slit extends orthogonally from the surface of front wall of the vertical bar element and 50-80% through the bar element, whereby the vertical bar element mates with the opening in the lower horizontal bar element.

In the latter two embodiment of the present invention the assembly further includes elastic brackets of pairs of cross-shaped joining members fitting the outer dimensions of the cross-shaped joint established when the horizontal and vertical bar element is assembled,

said joining members are designed to engage, preferably clickable, a corresponding portion of a joining member to provide rigidity and stability to the joint.

In a second aspect of the present invention there is provided a guard rail assembly comprising:

- a set of vertical bar elements of a rectangular cross section with two side walls, a frontal, and a rear wall, each bar element having at least one opening for receiving an upper horizontal bar element;
- a set of upper horizontal bar elements of a rectangular cross section with an upper, lower, frontal, and rear wall, each bar element having at least two pairs of slits for receiving vertical bar element, and where each slit extends orthogonally from the surface of rear wall of the bar element and 50-80% through the bar element; and
- elastic brackets for holding the vertical and horizontal bar elements in place when assembled;

wherein the opening in the vertical bar elements is designed so that the front wall is fully open and 30-50% of the side walls is cut away, wherein the slits in said pair of slits of the upper bar element are positioned in a distance corresponding to the thickness of a vertical bar element, whereby the upper horizontal bar element mates with the opening in the vertical bar element.

It is preferred that the the elastic brackets constitute pairs of T-shaped joining members fitting each side of the T-shaped joint established when the horizontal and vertical bar element are assembled, said joining members are designed to engage, preferably clickable, a corresponding portion of a joining member to provide rigidity and stability to the joint. Preferably, the elastic brackets are made from a flexible polymer material, a plastic composite material or an elastic metal.

In one embodiment of the second aspect of the invention one or more lower horizontal bar elements of a rectangular cross section with an upper, lower, frontal, and rear wall is provided, said lower horizontal bar elements each having at least two openings each of which are designed with the rear wall fully open and 30-50% of the upper and lower wall cut away, and wherein each vertical bar element is further provided with pairs of slits for receiving the lower horizontal bar element, where the distance between a pair of slits corresponds to the thickness of a horizontal bar element, and where each slit extends orthogonally from the surface of front wall of the vertical bar element and 50-80% through

the bar element, whereby the vertical bar element mates with the opening in the lower horizontal bar element.

In another embodiment of the second aspect of the invention each vertical bar element is further provided with one or more openings each of which are designed so that the rear wall is fully open and 30-50% of the side walls is cut away, and wherein one or more lower horizontal bar elements is provided with corresponding pairs of slits, where the distance between a pair of slits corresponds to the thickness of a vertical bar element, and where each slit extends orthogonally from the surface of rear wall of the lower horizontal bar element and 50-80% through the bar element, whereby the pair of slits in the lower horizontal bar element mates with the opening in the vertical bar element.

In the latter two embodiment of the present invention the assembly further includes elastic brackets of pairs of cross-shaped joining members fitting each side of the cross-shaped joint established when the horizontal and vertical bar element is assembled as in claim 9, said joining members are designed to engage a corresponding portion of a joining member to provide rigidity and stability to the joint.
The bar elements of the present invention are preferably made from light weight steel, however, any metal or metal alloy is applicable. Also plastic composites and other polymer materials are useful in accordance with the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows a perspective view of the first aspect of the present invention before assembly.

Figure 2 shows a perspective view of the first aspect of the present invention after assembly.

DETAILED DESCRIPTION OF THE INVENTION

Referring to Figures 1 and 2 there are shown the guard rail assembly according to the first aspect of the present invention.

As can be derived from Figure 1 there is a set of vertical bar elements of a rectangular cross section with two side walls, a frontal, and a rear wall. These bar element have at least one a slit that extends orthogonally from the surface of front wall of the bar element and 50-80% through the bar element.

Figure 1 also discloses a set of upper horizontal bar elements of a rectangular cross section with an upper, lower, frontal, and rear wall, each upper horizontal bar element having at least two openings for receiving vertical bar elements.

Finally Figure 2 shows the elastic brackets for holding the vertical and horizontal bar elements in place when assembled.

As will be understood by the skilled reader the openings in the upper horizontal bar elements are designed so that the rear wall is fully open and 30-50% of the lower wall is cut away, wherein said slit of the vertical bar element is positioned in a distance from the upper end of the vertical bar element corresponding to the thickness of a horizontal bar element, whereby the vertical bar element mates with the opening in the upper horizontal bar element.

The second aspect of the present invention is within the general inventive concept of the present invention and basically concerns the substitution of slits and openings of the first aspect.

CLAIMS

1. A guard rail assembly comprising:
   - a set of vertical bar elements (1) of a rectangular cross section with two side walls, a frontal, and a rear wall, each bar element having at least one slit (2) that extends orthogonally from the surface of front wall of the bar element and 50-80% through the bar element;
   - a set of upper horizontal bar elements (3) of a rectangular cross section with an upper, lower, frontal, and rear wall, each upper horizontal bar element having at least two openings (4) for receiving vertical bar elements (1); and
   - elastic brackets (5) for holding the vertical (1) and horizontal (3) bar elements in place when assembled;

   wherein the openings (4) in the upper horizontal bar elements (3) are designed so that a part of the rear wall is open and 30-50% of the lower wall is cut away, wherein said slit (2) of the vertical bar element (1) is positioned in a distance from the upper end of the vertical bar element (1) corresponding to the thickness of a horizontal bar element (3), whereby the vertical bar element (1) mates with the opening in the upper horizontal bar element (3).

2. The guard rail assembly of claim 1, wherein the elastic brackets (5) constitute pairs of T-shaped joining members fitting each side of the T-shaped joint established when the horizontal and vertical bar element are assembled, said joining members are designed to engage, preferably clickable, a corresponding portion of a joining member to provide rigidity and stability to the joint.

3. The guard rail assembly of claim 1 or 2, wherein the elastic brackets (5) are made from a flexible polymer material, a plastic composite material or an elastic metal.

4. The guard rail assembly of any one of the claims 1-3, wherein each vertical bar element (1) is further provided with one or more openings each of which are designed so that the rear wall is fully open and 30-50% of the side walls is cut away, and wherein one or more lower horizontal bar elements is provided with corresponding pairs of slits, where the distance between a pair of slits corresponds to the thickness of a vertical bar element, and where each slit extends orthogonally from the surface of rear wall of the lower horizontal bar element (3) and 50-80% through the bar element,

whereby the pair of slits in the lower horizontal bar element mates with the opening in the vertical bar element.

5. The guard rail assembly of any one of the claims 1-3, wherein one or more lower horizontal bar elements of a rectangular cross section with an upper, lower, frontal, and rear wall is provided, said lower horizontal bar elements each having at least two openings each of which are designed with the rear wall fully open and 30-50% of the upper and lower wall cut away, and wherein each vertical bar element is further provided with pairs of slits for receiving the lower horizontal bar element, where the distance between a pair of slits corresponds to the thickness of a horizontal bar element, and where each slit extends orthogonally from the surface of front wall of the vertical bar element and 50-80% through the bar element, whereby the vertical bar element mates with the opening in the lower horizontal bar element.

6. The guard rail assembly of any one of the claims 4-5, wherein the assembly further includes elastic brackets of pairs of cross-shaped joining members fitting the outer dimensions of the cross-shaped joint established when the horizontal and vertical bar element is assembled as in claim 4 or 5, said joining members are designed to engage, preferably clickable, a corresponding portion of a joining member to provide rigidity and stability to the joint.

7. A guard rail assembly comprising:
   - a set of vertical bar elements of a rectangular cross section with two side walls, a frontal, and a rear wall, each bar element having at least one opening for receiving an upper horizontal bar element;
   - a set of upper horizontal bar elements of a rectangular cross section with an upper, lower, frontal, and rear wall, each bar element having at least two pairs of slits for receiving vertical bar element, and where each slit extends orthogonally from the surface of rear wall of the bar element and 50-80% through the bar element; and
   - elastic brackets for holding the vertical and horizontal bar elements in place when assembled;

   wherein the opening in the vertical bar elements is designed so that a part of the front wall is open and 30-50% of the side walls is cut away, wherein the slits in said pair of slits of the upper bar element are positioned in a distance corresponding to the

thickness of a vertical bar element, whereby the upper horizontal bar element mates with the opening in the vertical bar element.

8. The guard rail assembly of claim 7, wherein the elastic brackets constitute pairs of T-shaped joining members fitting each side of the T-shaped joint established when the horizontal and vertical bar element are assembled, said joining members are designed to engage, preferably clickable, a corresponding portion of a joining member to provide rigidity and stability to the joint.

9. The guard rail assembly of claim 7 or 8, wherein the elastic brackets are made from a flexible polymer material, a plastic composite material or an elastic metal.

10. The guard rail assembly of any one of the claims 7-9, wherein one or more lower horizontal bar elements of a rectangular cross section with an upper, lower, frontal, and rear wall is provided, said lower horizontal bar elements each having at least two openings each of which are designed with the rear wall fully open and 30-50% of the upper and lower wall cut away, and wherein each vertical bar element is further provided with pairs of slits for receiving the lower horizontal bar element, where the distance between a pair of slits corresponds to the thickness of a horizontal bar element, and where each slit extends orthogonally from the surface of front wall of the vertical bar element and 50-80% through the bar element, whereby the vertical bar element mates with the opening in the lower horizontal bar element.

11. The guard rail assembly of any one of the claims 7-9, wherein each vertical bar element is further provided with one or more openings each of which are designed so that the rear wall is fully open and 30-50% of the side walls is cut away, and wherein one or more lower horizontal bar elements is provided with corresponding pairs of slits, where the distance between a pair of slits corresponds to the thickness of a vertical bar element, and where each slit extends orthogonally from the surface of rear wall of the lower horizontal bar element and 50-80% through the bar element, whereby the pair of slits in the lower horizontal bar element mates with the opening in the vertical bar element.

12. The guard rail assembly of any one of the claims 10-11, wherein the assembly further includes elastic brackets of pairs of cross-shaped joining members fitting each side of the cross-shaped joint established when the horizontal and vertical bar element is

assembled as in claim 10 or 11, said joining members are designed to engage a corresponding portion of a joining member to provide rigidity and stability to the joint.

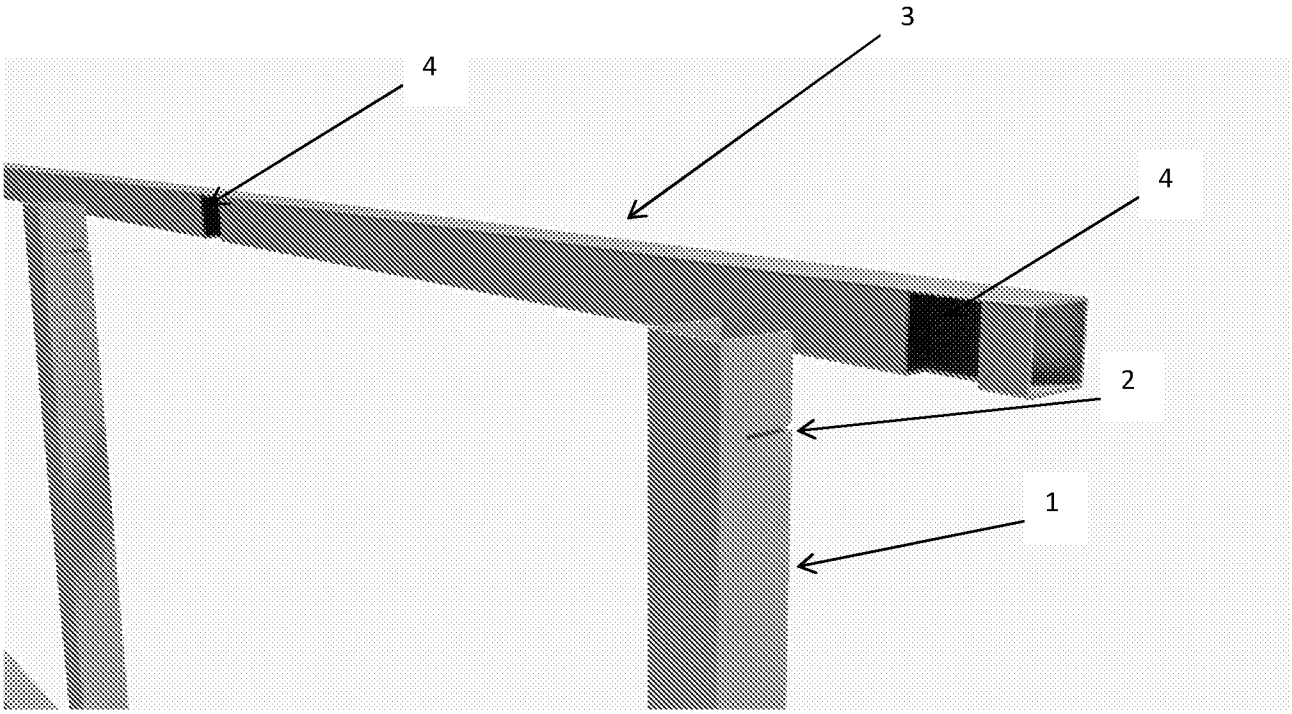

Figure 1

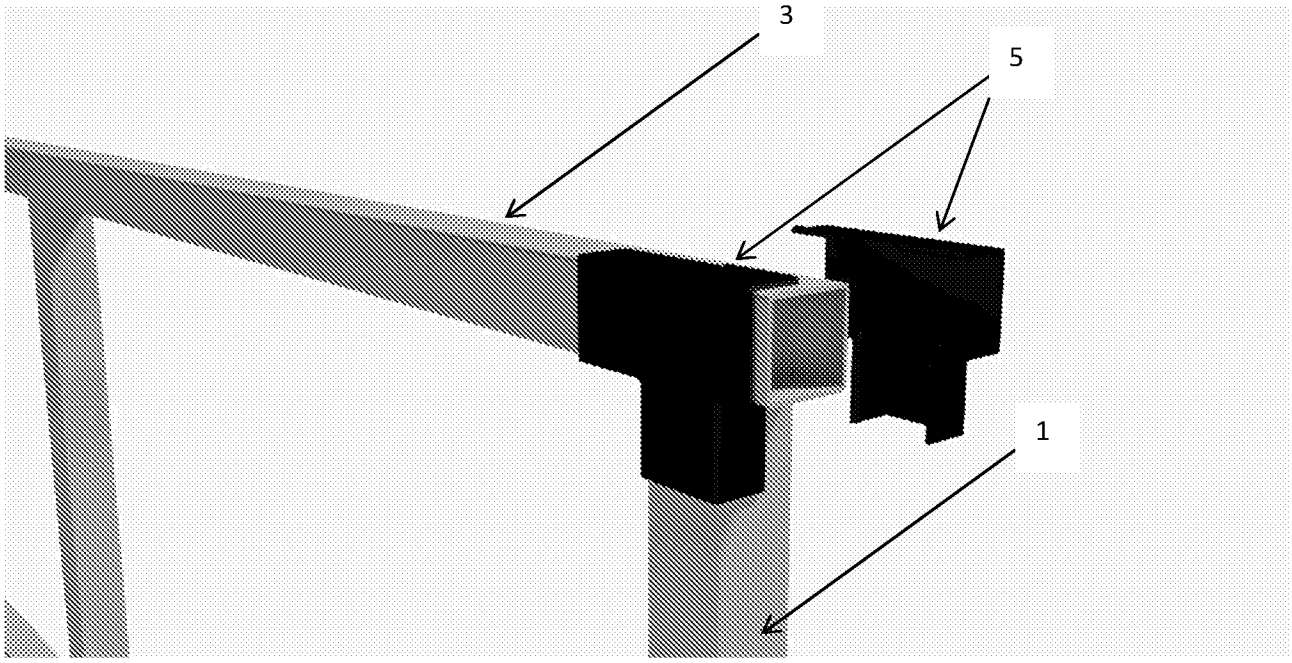

Figure 2

INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK2016/050050

A. CLASSIFICATION OF SUBJECT MATTER

E04H17/14 (2006.01), E01B5/18 (2006.01), E04F11/18 (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC/CPC: E04H, E01B, E04F, E04G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

DK, NO, SE, FI: Classes as above.

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPODOC, WPI, ENGLISH FULLTEXT

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JPS 60148632 A (TSUGAWA SHINICHI) 1985.08.05	1-12
A	JPH 01168634 U (UNKNOWN) 1989.11.28	1-12
A	JPS 5368537 U (UNKNOWN) 1978.06.08	1-12
A	JPS 6165135 U (UNKNOWN) 1986.05.02	1-12
A	US 2002179895 A1 (BEBENDORF) 2002.12.05	1-12
A	JPS 52141853 U (UNKNOWN) 1977.10.27	1-12

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
06/06/2016	07/06/2016
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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/DK2016/050050

Patent document cited in search report / Publication date	Patent family member(s) / Publication date
JPH 01168634 U 1989.11.28	JPH 0545693 Y2 1993.11.25
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