



US 20240167231A1

(19) **United States**

(12) **Patent Application Publication**
Singleton et al.

(10) **Pub. No.: US 2024/0167231 A1**

(43) **Pub. Date: May 23, 2024**

(54) **RAIL BRACE ASSEMBLY**

Publication Classification

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(51) **Int. Cl.**
E01B 9/60 (2006.01)

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(52) **U.S. Cl.**
CPC **E01B 9/60** (2013.01)

(57) **ABSTRACT**

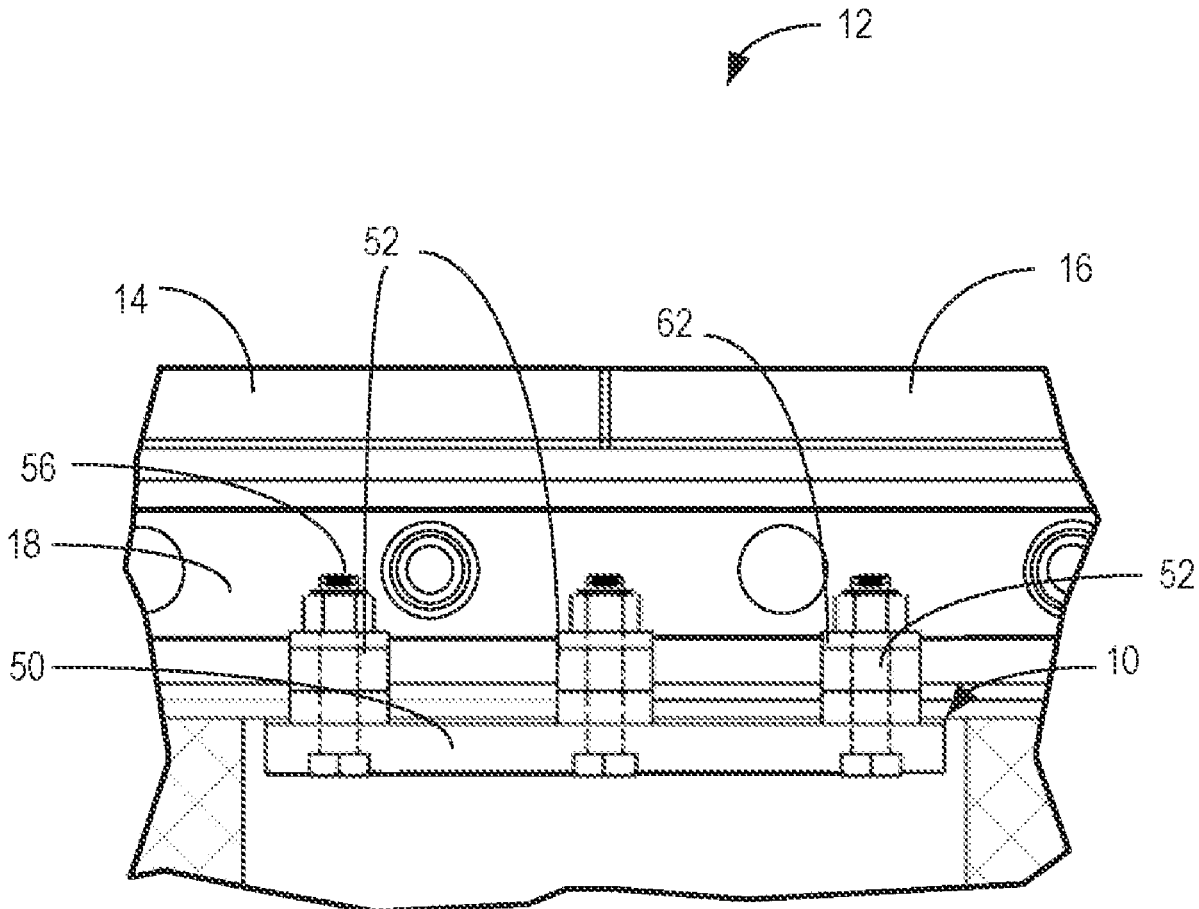
A rail brace assembly for first and second rails includes a first support having an electrically insulating material configured to be engaged with a first side of base portions of the first rail and the second rail, with the first support defining a plurality of openings, a second support having an electrically insulating material configured to be engaged with a second side of the base portions of the first rail and the second rail, with the second support defining a plurality of openings, a first base member having an electrically insulating material configured to be engaged with a bottom surface of the base portions of the first rail and the second rail, and a plurality of fasteners each configured to extend through one of the plurality of openings of the first support and the second support.

(21) Appl. No.: **18/510,368**

(22) Filed: **Nov. 15, 2023**

Related U.S. Application Data

(60) Provisional application No. 63/441,467, filed on Jan. 27, 2023, provisional application No. 63/426,940, filed on Nov. 21, 2022.



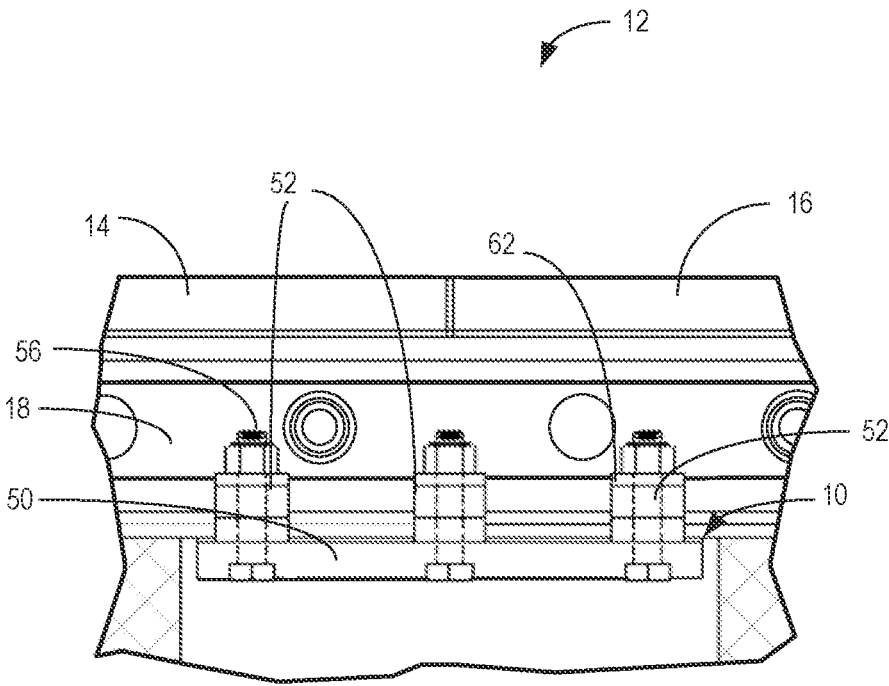


FIG. 1

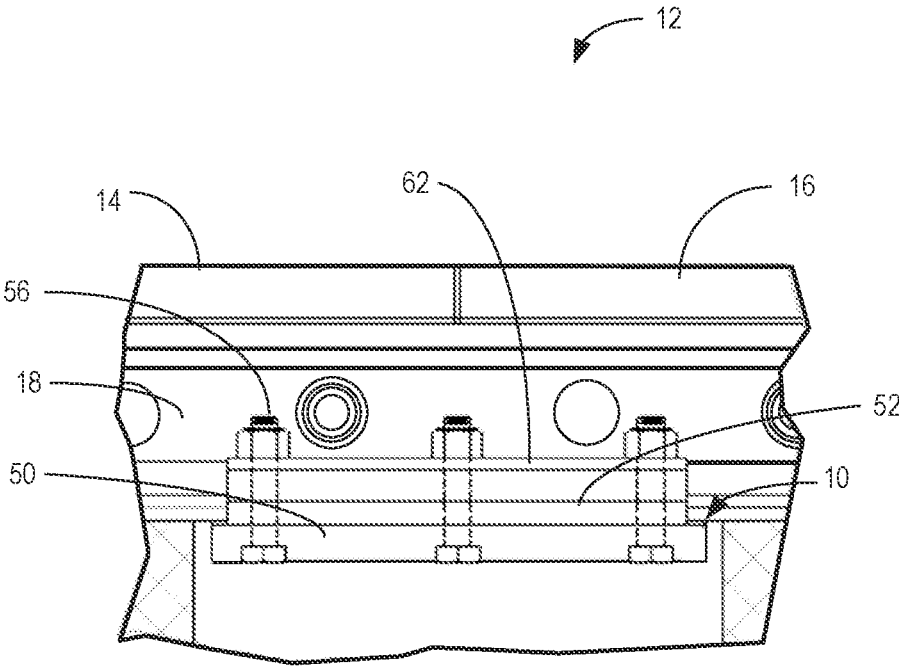


FIG. 2

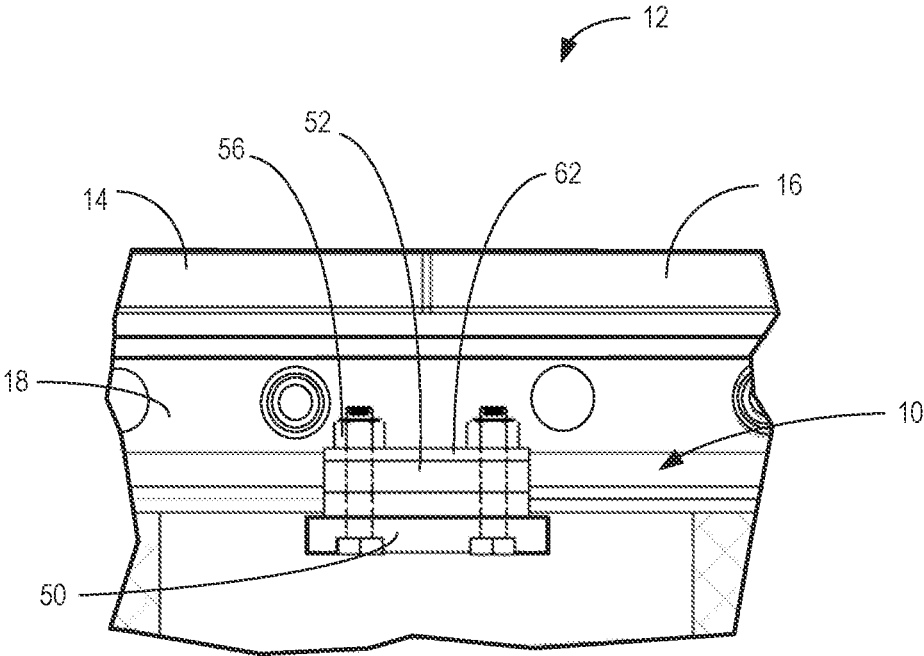


FIG. 3

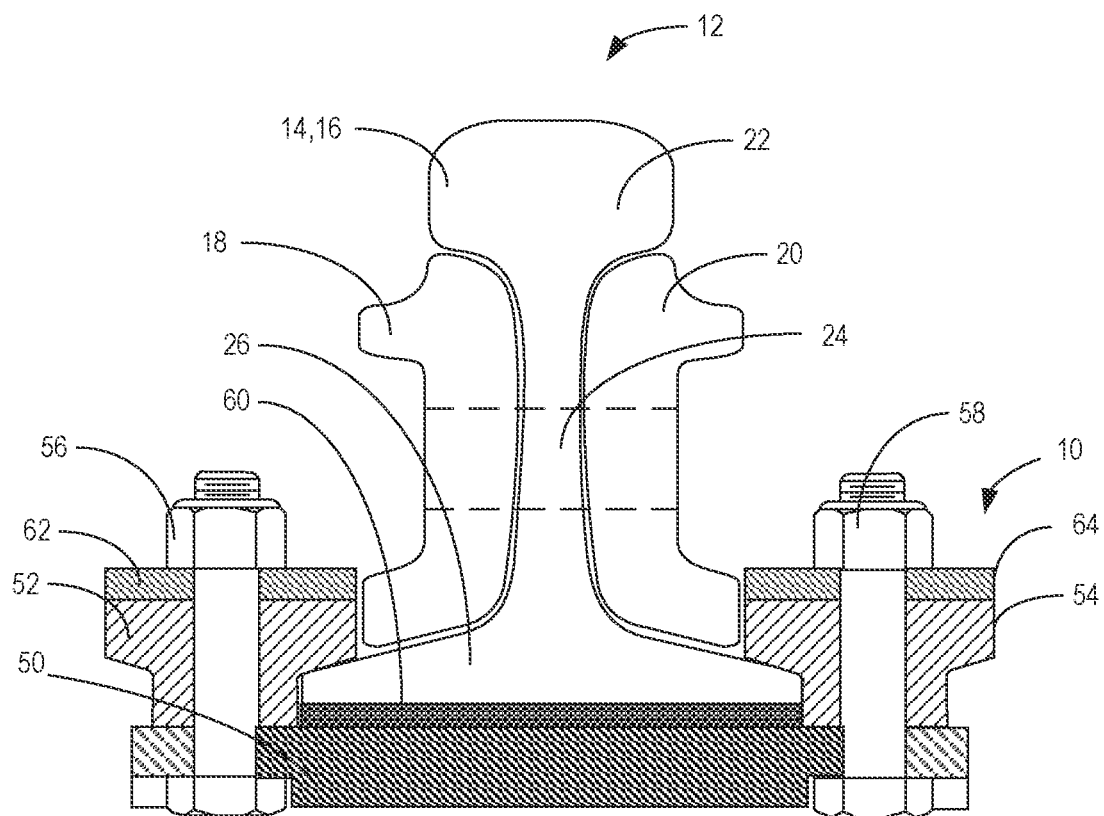


FIG. 4

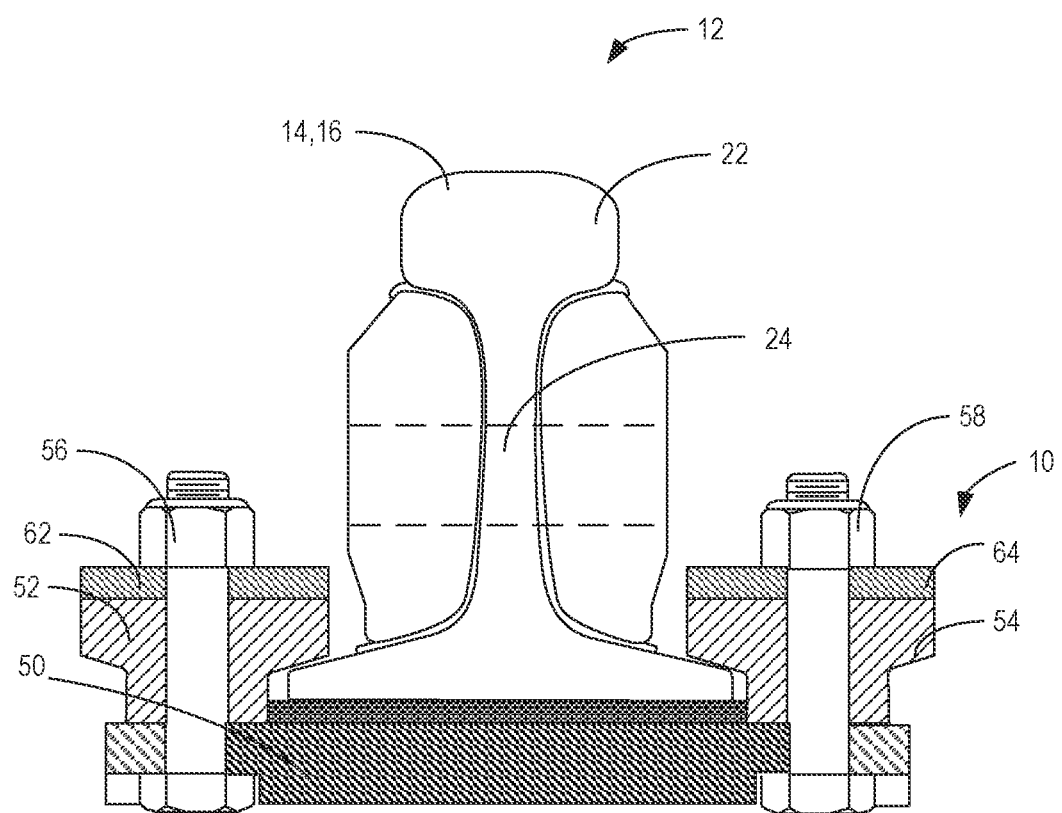


FIG. 5

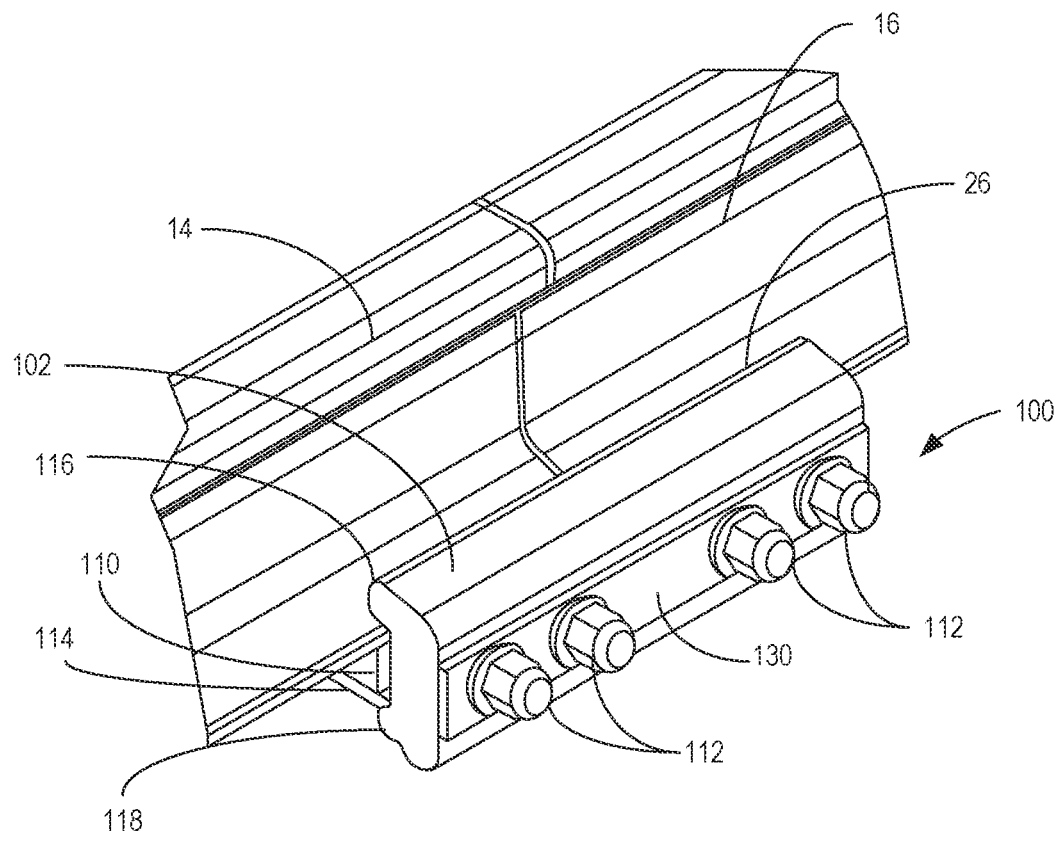


FIG. 6

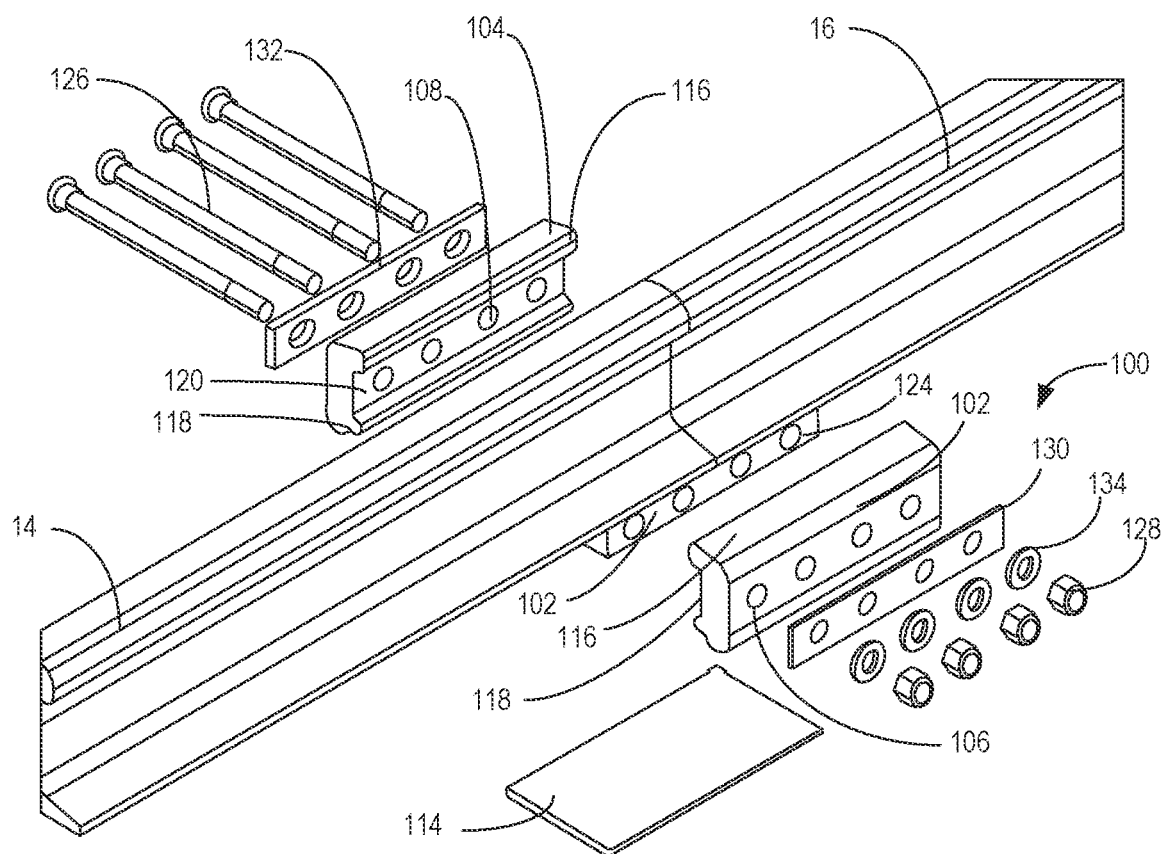


FIG. 7

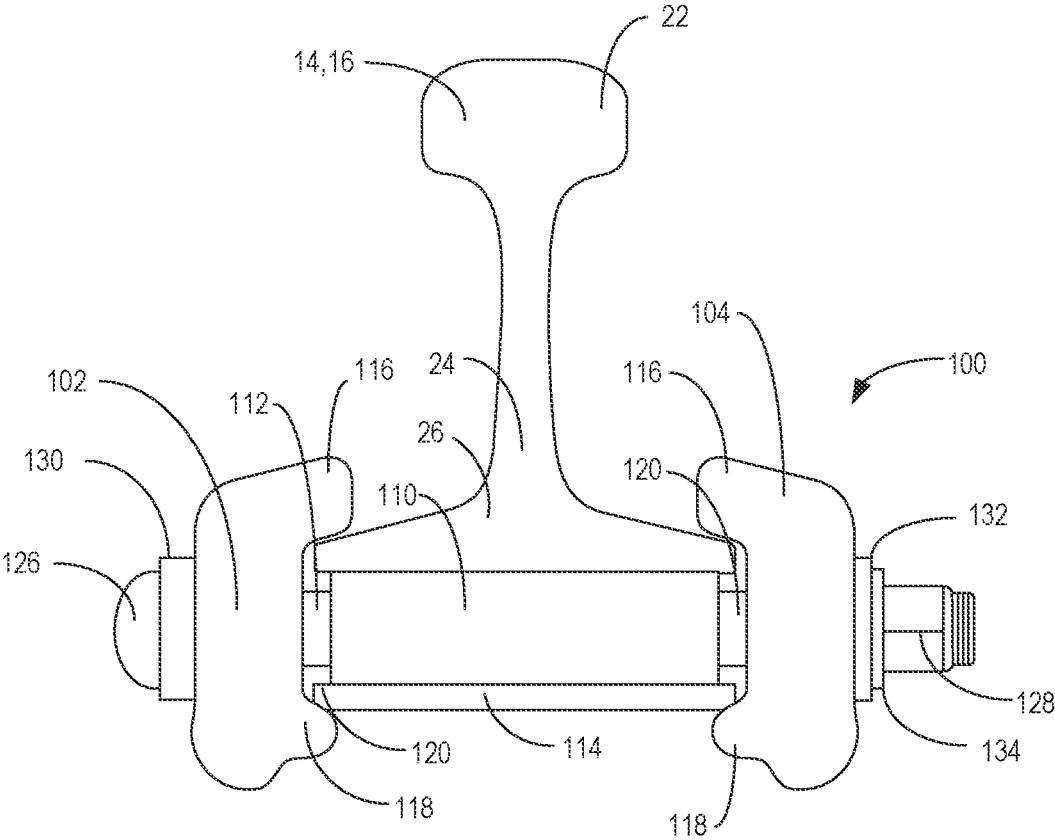


FIG. 8

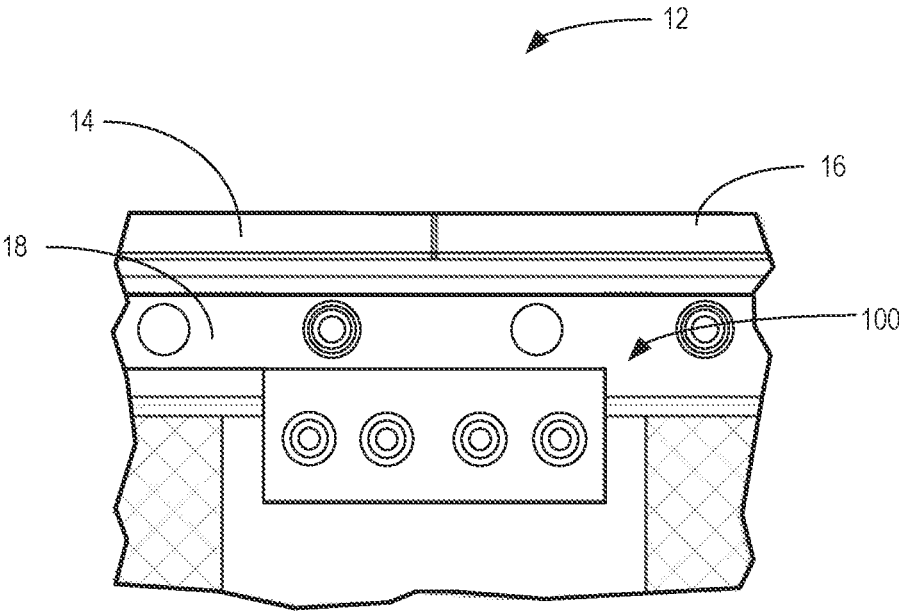


FIG. 9

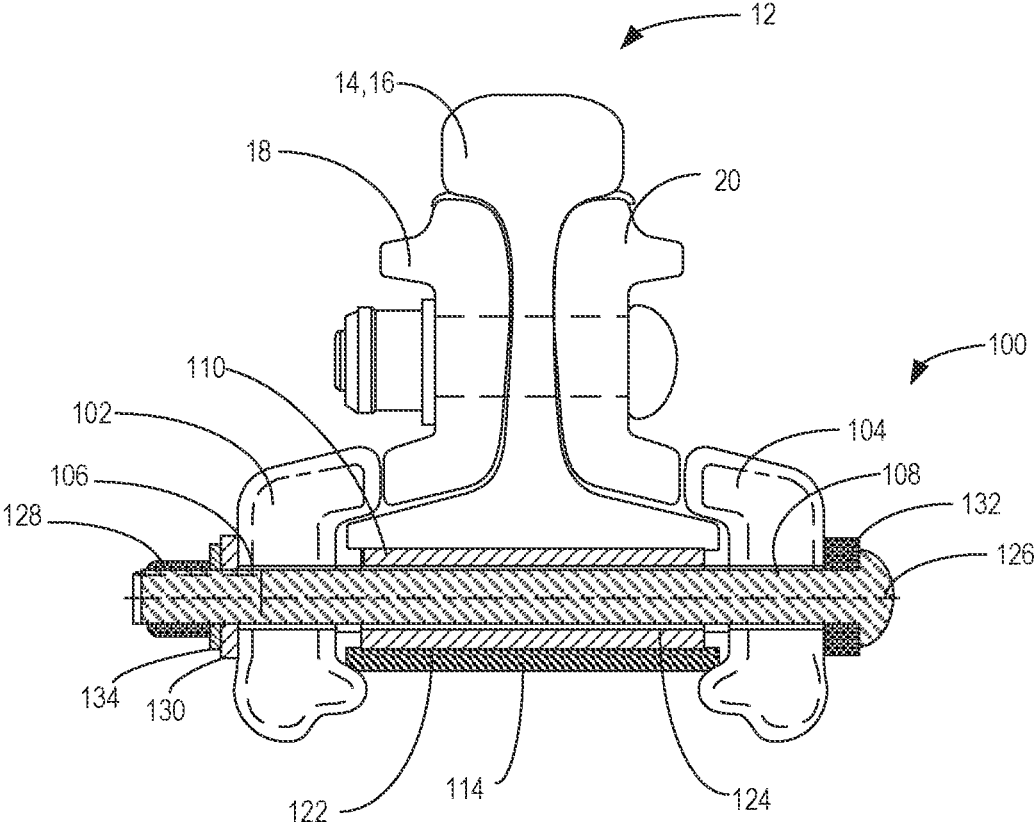


FIG. 10

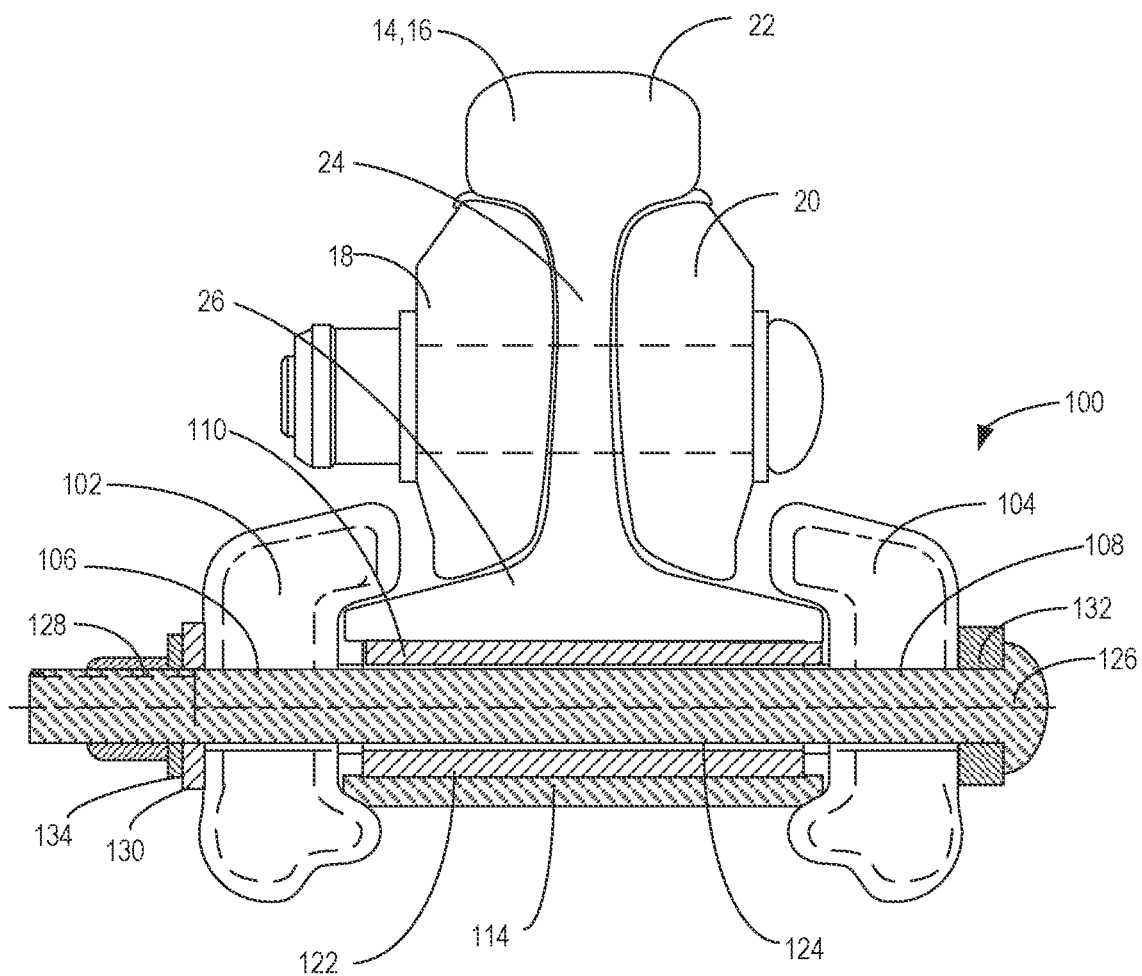


FIG. 11

RAIL BRACE ASSEMBLY

CROSS-REFERENCE TO RELATED APPLICATION

[0001] The present application claims priority to U.S. Provisional Application Ser. No. 63/426,940, filed Nov. 21, 2022, and U.S. Provisional Application Ser. No. 63/441,467, filed Jan. 27, 2023, the disclosures of which are hereby incorporated by reference in their entirety.

BACKGROUND OF THE INVENTION

Field of the Invention

[0002] This invention relates to a rail brace assembly.

Description of Related Art

[0003] A rail system is generally divided into sections or blocks for detecting trains, which permit more trains to travel on one stretch of track or railroad rails. Each section is electrically isolated from all other sections so that when no train is present, a high electrical resistance can be measured over the parallel railroad rails in that section. When a train enters the section, the train short circuits adjacent railroad rails and the electrical resistance drops, thus indicating that a train is in that section.

[0004] Railroad tracks are created generally by welding railroad rails to each other or by attaching railroad rails to each other using metal bars and bolts. High-performance, non-metallic joints are typically used for electrically-isolating adjacent rail sections of a rail system in order to create an electrically-isolated section. However, the non-metallic joints are very expensive due to the special high-performance material needed to endure the high tensile and flexural forces exerted on a rail joint as the wheels of a locomotive or rail car pass over the joint. An alternative to a non-metallic joint is a steel rail joint having electrically-insulating material, such as resin and/or composite material affixed to the rail joint surface for isolating rail sections. Standard or insulated rail joints may be positioned at an unsupported or suspended portion of the track, which increases the stress and forces on the rail joint and can lead to premature failure of the rail joint.

SUMMARY OF THE INVENTION

[0005] In one aspect or embodiment, a rail brace assembly for first and second rails each having a head portion, a web portion extending from the head portion, and a base portion extending from the web portion, with a longitudinal axis of the first rail aligned with a longitudinal axis of the second rail, includes a first support having an electrically insulating material configured to be engaged with a first side of the base portions of the first rail and the second rail, with the first support defining a plurality of openings, a second support having an electrically insulating material configured to be engaged with a second side of the base portions of the first rail and the second rail, with the second support defining a plurality of openings, a first base member having an electrically insulating material configured to be engaged with a bottom surface of the base portions of the first rail and the second rail, and a plurality of fasteners each configured to extend through one of the plurality of openings of the first support and the second support.

[0006] The rail brace assembly may further include a second base member configured to abut the first base member and extend between the first support and the second support. The second base member may be a metal plate.

[0007] The first support and the second support may each be a rail joint bar. The first support and the second support may each be a polyurethane encapsulated rail joint bar. The plurality of fasteners may each be a bolt and a nut.

[0008] The rail base assembly may further include a first washer plate configured to be engaged with the first support and a second washer plate configured to be engaged with the second support, where the first and second supports and the first and second washer plates are configured to be positioned between the nut and a head of the bolt. The first base member may include a body defining a plurality of openings configured to be aligned with the plurality of openings of the first and second supports.

[0009] In a further aspect or embodiment, a rail joint assembly includes a first rail having a head portion, a web portion extending from the head portion, and a base portion extending from the web portion, a second rail having a head portion, a web portion extending from the head portion, and a base portion extending from the web portion, with a longitudinal axis of the first rail aligned with a longitudinal axis of the second rail, a first rail joint bar attached to a first side of the first and second rails, a second rail joint bar attached to a second side of the first and second rails, and a rail brace assembly. The rail brace assembly includes a first support having an electrically insulating material engaged with a first side of the base portions of the first rail and the second rail, with the first support defining a plurality of openings, a second support having an electrically insulating material engaged with a second side of the base portions of the first rail and the second rail, with the second support defining a plurality of openings, a first base member having an electrically insulating material engaged with a bottom surface of the base portions of the first rail and the second rail, and a plurality of fasteners each extending through one of the plurality of openings of the first support and the second support.

[0010] In a further aspect or embodiment, a rail brace assembly for first and second rails each having a head portion, a web portion extending from the head portion, and a base portion extending from the web portion, with a longitudinal axis of the first rail aligned with a longitudinal axis of the second rail, includes a base plate defining a plurality of openings, a plurality of clips, with each of the plurality of clips having an electrically-insulating material configured to engage the base portion of the first rail or second rail, and with each of the plurality of clips defining an opening configured to be aligned with one of the plurality of openings of the base plate, and a plurality of fasteners configured to extend through respective openings of the plurality of clips and the plurality of openings of the base to secure the clips and the base plate to the first and second rails.

[0011] The base plate may be metal. The rail brace assembly may further include a plurality of washer plates configured to be positioned on a top surface of each of the plurality of clips, where the plurality of fasteners each include a bolt with a head and a nut. Each of the plurality of washer plates, each of the plurality of clips, and the base plate are positioned between the head of the bolt and the nut when the rail brace assembly is attached to the first and second rails.

rail brace assembly may further include an insulator plate configured to be positioned between the base portions of the first and second rails and the base plate.

[0012] In a further aspect or embodiment, a rail joint assembly includes a first rail having a head portion, a web portion extending from the head portion, and a base portion extending from the web portion, a second rail having a head portion, a web portion extending from the head portion, and a base portion extending from the web portion, with a longitudinal axis of the first rail aligned with a longitudinal axis of the second rail, a first rail joint bar attached to a first side of the first and second rails, a second rail joint bar attached to a second side of the first and second rails, and a rail brace assembly. The rail brace assembly includes a base plate positioned below the base portions of the first and second rails, with the base plate defining a first opening and a second opening, a first clip having an electrically-insulating material engaged with the base portion of the first rail or second rail at the first side of the first and second rails, with the first clip defining an opening, a second clip having an electrically-insulating material engaged with the base portion of the first rail or second rail at the second side of the first and second rails, with the second clip defining an opening, a first fastener extending through the opening of the first clip and the first opening of the base plate to secure the first clip and the base plate to the first and second rail, and a second fastener extending through the opening of the second clip and the second opening of the base plate to secure the second clip and the base plate to the first and second rails.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] FIG. 1 is a side view of a rail brace assembly according to one aspect or embodiment of the present application;

[0014] FIG. 2 is a side view of a rail brace assembly according to a further aspect or embodiment of the present application;

[0015] FIG. 3 is a side view of a rail brace assembly according to a further aspect or embodiment of the present application;

[0016] FIG. 4 is a partial cross-sectional view of a rail brace assembly according to one aspect or embodiment of the present application;

[0017] FIG. 5 is a partial cross-sectional view of a rail brace assembly according to one aspect or embodiment of the present application;

[0018] FIG. 6 is a perspective view of a rail brace assembly according to a further aspect or embodiment of the present application;

[0019] FIG. 7 is an exploded perspective view of the rail brace assembly of FIG. 6;

[0020] FIG. 8 is a front view of the rail brace assembly of FIG. 6;

[0021] FIG. 9 is a side view of the rail brace assembly of FIG. 6;

[0022] FIG. 10 is a partial cross-sectional view of the rail brace assembly of FIG. 6; and

[0023] FIG. 11 is a partial cross-sectional view of the rail brace assembly of FIG. 6, showing the rail brace assembly with a different rail profile.

DESCRIPTION OF THE INVENTION

[0024] For purposes of the description hereinafter, the words “upward” and “downward”, and spatial terms, if used, shall relate to the described embodiments as oriented in the drawing figures. However, it is to be understood that many alternative variations and embodiments may be assumed except where expressly specified to the contrary. It is also to be understood that the specific devices and embodiments illustrated in the accompanying drawings and described herein are simply exemplary embodiments of the invention.

[0025] Referring to FIGS. 1-5, a rail brace assembly **10** according to aspects or embodiments of the present application are shown. The rail brace assembly **10** is configured to reinforce or further support a rail joint positioned at an unsupported or suspended portion of the track. The rail brace assembly **10** is configured to support the rail joint to prevent excess force on the rail joint and to maintain alignment in the case of a mechanical rail joint failure.

[0026] Referring again to FIGS. 1-5, in one aspect or embodiment, a rail joint assembly **12** includes a first rail **14** having a head portion **22**, a web portion **24** extending from the head portion **22**, and a base portion **26** extending from the web portion **24**, a second rail **16** having a head portion **22**, a web portion **24** extending from the head portion **22**, and a base portion **26** extending from the web portion **24**, with a longitudinal axis of the first rail **14** aligned with a longitudinal axis of the second rail **16**, a first rail joint bar **18** attached to a first side of the first and second rails **14**, **16**, a second rail joint bar **20** attached to a second side of the first and second rails **14**, **16**, and the rail brace assembly **10**.

[0027] The rail brace assembly **10** includes a base plate **50** positioned below the base portions **26** of the first and second rails **14**, **16**, with the base plate **50** defining a first opening and a second opening, a first clip **52** having an electrically-insulating material engaged with the base portion **26** of the first rail **14** or second rail **16** at the first side of the first and second rails **14**, **16**, with the first clip **52** defining an opening, a second clip **54** having an electrically-insulating material engaged with the base portion **26** of the first rail **14** or second rail **16** at the second side of the first and second rails **14**, **16**, with the second clip **54** defining an opening, a first fastener **56** extending through the opening of the first clip **52** and the first opening of the base plate **50** to secure the first clip **52** and the base plate **50** to the first and second rails **14**, **16**, and a second fastener **58** extending through the opening of the second clip **54** and the second opening of the base plate **50** to secure the second clip **54** and the base plate **50** to the first and second rails **14**, **16**. The clips **52**, **54** may be formed entirely from an electrically-insulating material, such as fiberglass. In some aspects or embodiments, the clips **52**, **54** are formed from a metal core encapsulated by the electrically-insulating material, such as plastic or an elastomeric material. The base plate **50** may be formed from steel and the rail brace assembly **10** may include an insulating plate **60**, such as a fiberglass plate, positioned between the base portions **26** of the rails **14**, **16** and the base plate **50**.

[0028] Referring to FIG. 1, in one aspect or embodiment, the first clip **52** and the first fastener **56** includes a plurality of clips and fasteners, and the second clip **54** and the second fastener **58** includes a plurality of clips and fasteners.

[0029] Referring to FIG. 2, in one aspect or embodiment, the first and second clips **52**, **54** may each extend the length of an unsupported portion of the first and second rails **14**, **16**. The first and second clips **52**, **54** each have a length close to

the length of the base plate, such as 90-100% of the length of the base plate. In some aspects or embodiments, the base plate **50** is 12-15 inches long and may be 14 inches long.

[0030] Referring to FIG. 3, in one aspect or embodiment, the base plate **50** and the first and second clips **52**, **54** do not extend the full or close to the full unsupported length of the rail joint **12**. The base plate **50** may be 5-8 inches and the first and second clips **52**, **54** may be 4-7 inches. In one aspect or embodiment, the base plate **50** is 6.75 inches and the first and second clips **52**, **54** are 5.75 inches.

[0031] The rail brace assembly **10** may be utilized in connection with various rail profiles, with the rail brace assembly **10** configured to provide clearance with various types of existing rail joints. The rail brace assembly **10** may be utilized in connection with an existing bonded **136** RE type joint with a lug and toe (FIG. 4) or an existing bonded **115** RE type joint that is toeless (FIG. 5).

[0032] Referring again to FIGS. 1-5, in some aspects or embodiments, a first washer plate **62** is positioned on a top surface of the first clip **52** and a second washer plate **64** is positioned on a top surface of the second clip **54**, with the first and second fasteners **56**, **58** each including a bolt with a head and a nut. The first washer plate **62**, the first clip **52**, and the base plate **50** is positioned between the head of the bolt and the nut of the first fastener **56**, and the second washer plate **64**, the second clip **54**, and the base plate **50** are positioned between the head of the bolt and the nut of the second fastener **58**. The first and second washer plates **62**, **64** may be formed from steel.

[0033] Referring to FIGS. 6-11, a rail brace assembly **100** according to a further aspect or embodiment is shown in use with the first and second rails **14**, **16**. In a similar manner as the rail brace assembly **10** discussed above, the rail brace assembly **100** is configured to reinforce or further support a rail joint positioned at an unsupported or suspended portion of the track to prevent excess force on the rail joint and to maintain alignment in the case of a mechanical rail joint failure.

[0034] The rail brace assembly **100** includes a first support **102** having an electrically insulating material configured to be engaged with a first side of the base portions **26** of the first rail **14** and the second rail **16**, and a second support **104** having an electrically insulating material configured to be engaged with a second side of the base portions **26** of the first rail **14** and the second rail **16**. The first support **102** and the second support **104** each define a plurality of openings **106**, **108**. The rail brace assembly **100** also includes a first base member **110** having an electrically insulating material configured to be engaged with a bottom surface of the base portions **26** of the first rail **14** and the second rail **16** and a plurality of fasteners **112** each configured to extend through one of the plurality of openings **106**, **108** of the first support **102** and the second support **104**.

[0035] In some aspects or embodiments, the rail brace assembly **100** includes a second base member configured to abut the first base member **110** and extend between the first support **102** and the second support **104**. The second base member **114** is a metal plate, although other suitable materials and configurations may be utilized.

[0036] In some aspects or embodiments, the first support **102** and the second support **104** are each a rail joint bar. The first and second supports **102**, **104** may be polyurethane encapsulated rail joint bars having a metal core fully encapsulated with polyurethane. In other aspects or embodiments,

the first and second supports **102**, **104** may be fiberglass rail joint bars. A head portion **116** of the first and second supports **102**, **104** is configured to engage the base portion of the rails **14**, **18** and a toe portion **118** of the first and second supports **102**, **104** is configured to engage the second base member **114**. A recessed area **120** is defined between the head portion **116** and the toe portion **118** of the first and second supports **102**, **104**, with the recessed area **120** receiving a portion of the first and second rails **14**, **18** and the second base member **114**.

[0037] In some aspect or embodiments, the first base member **110** includes a body **122** defining a plurality of openings **124** configured to be aligned with the plurality of openings **106**, **108** of the first and second supports **102**, **104**. The first base member **110** may be a fiberglass block, although other suitable materials and configurations may be utilized.

[0038] Referring again to FIGS. 6-11, the rail brace assembly **100** is utilized to reinforce an unsupported rail joint, with the first support **102** engaged with the first side of the base portions **26** of the first rail **14** and the second rail **16** and the second support engaged with the second side of the base portions **26** of the first rail **14** and the second rail **16**. The first base member **110** is engaged with the bottom surface of the base portions **26** of the first rail **14** and the second rail **16**. The first base member **110** extends between the first support **102** and the second support **104**. The plurality of fasteners **112** each extend through one of the plurality of openings **106**, **108** of the first support **102** and the second support **104**. The second base member **114** abuts the first base member **110** and extends between the first support **102** and the second support **104**. The second base member **114** is configured to provide additional support to the first base member **110** and stiffen the rail brace assembly **100** while the first base member **110** maintains electrical isolation between first rail **14** and the second rail **16**, which is necessary for signaling purposes. The plurality of fasteners **112** are each a bolt **126** and a nut **128**, although other suitable fasteners may be utilized. Although four fasteners **112** are shown, two or more fasteners **112** may be utilized. A length of the first and second supports **102**, **104** is sufficient to overlap and support the first and second rails **14**, **16**.

[0039] In some aspects or embodiments, the rail brace assembly **100** further includes a first washer plate **130** engaged with the first support **102** and a second washer plate **132** engaged with the second support **104**, with the first and second supports **102**, **104** and the first and second washer plates **130**, **132** positioned between the nut **128** and a head of the bolt **126**. An additional washer **134** may be positioned between the nut **128** and the first washer plate **130**.

[0040] As shown in FIGS. 10 and 11, the rail brace assembly **100** may be utilized in connection with various rail profiles, with the position of the first and second supports **102**, **104** configured to provide clearance with various types of existing rail joints. The rail brace assembly **100** may be utilized in connection with an existing bonded **136** RE type joint with a lug and toe (FIG. 10) or an existing bonded **115** RE type joint that is toeless (FIG. 11).

[0041] Accordingly, the rail brace assemblies **10**, **100** are configured to be installed on an existing rail joint to further support the rail joint without necessitating the removal of the existing rail joint. In other words, the rail brace assemblies

10, 100 do not require the removal of the existing bolts or rail joint bars, which advantageously allows a more cost effective reinforcement.

[0042] Further, it will be readily appreciated by those skilled in the art that modifications may be made to the invention without departing from the concepts disclosed in the foregoing description. Accordingly, the particular embodiments described in detail herein are illustrative only and are not limiting to the scope of the invention, which is to be given the full breadth of the appended claims and any and all equivalents thereof.

The invention claimed is:

1. A rail brace assembly for first and second rails each having a head portion, a web portion extending from the head portion, and a base portion extending from the web portion, a longitudinal axis of the first rail aligned with a longitudinal axis of the second rail, the rail brace assembly comprising:

- a first support comprising an electrically insulating material configured to be engaged with a first side of the base portions of the first rail and the second rail, the first support defining a plurality of openings;
- a second support comprising an electrically insulating material configured to be engaged with a second side of the base portions of the first rail and the second rail, the second support defining a plurality of openings;
- a first base member comprising an electrically insulating material configured to be engaged with a bottom surface of the base portions of the first rail and the second rail; and
- a plurality of fasteners each configured to extend through one of the plurality of openings of the first support and the second support.

2. The rail brace assembly of claim **1**, further comprising: a second base member configured to abut the first base member and extend between the first support and the second support.

3. The rail brace assembly of claim **2**, wherein the second base member is a metal plate.

4. The rail brace assembly of claim **1**, wherein the first support and the second support each comprises a rail joint bar.

5. The rail brace assembly of claim **4**, wherein the first support and the second support each comprise a polyurethane encapsulated rail joint bar.

6. The rail brace assembly of claim **1**, wherein the plurality of fasteners each comprise a bolt and a nut.

7. The rail brace assembly of claim **6**, further comprising a first washer plate configured to be engaged with the first support and a second washer plate configured to be engaged with the second support, wherein the first and second supports and the first and second washer plates are configured to be positioned between the nut and a head of the bolt.

8. The rail brace assembly of claim **1**, wherein the first base member includes a body defining a plurality of openings configured to be aligned with the plurality of openings of the first and second supports.

9. A rail joint assembly comprising:

- a first rail having a head portion, a web portion extending from the head portion, and a base portion extending from the web portion;
- a second rail having a head portion, a web portion extending from the head portion, and a base portion

extending from the web portion, a longitudinal axis of the first rail aligned with a longitudinal axis of the second rail;

- a first rail joint bar attached to a first side of the first and second rails;
- a second rail joint bar attached to a second side of the first and second rails; and
- a rail brace assembly comprising:

- a first support comprising an electrically insulating material engaged with a first side of the base portions of the first rail and the second rail, the first support defining a plurality of openings;
- a second support comprising an electrically insulating material engaged with a second side of the base portions of the first rail and the second rail, the second support defining a plurality of openings;
- a first base member comprising an electrically insulating material engaged with a bottom surface of the base portions of the first rail and the second rail; and
- a plurality of fasteners each extending through one of the plurality of openings of the first support and the second support.

10. The rail joint assembly of claim **9**, further comprising: a second base member abutting the first base member and extending between the first support and the second support.

11. The rail joint assembly of claim **9**, wherein the first support and the second support each comprises a rail joint bar.

12. The rail joint assembly of claim **11**, wherein the first support and the second support each comprise a polyurethane encapsulated rail joint bar.

13. The rail joint assembly of claim **9**, wherein the plurality of fasteners each comprise a bolt and a nut.

14. The rail joint assembly of claim **9**, further comprising a first washer plate engaged with the first support and a second washer plate engaged with the second support, wherein the first and second supports and the first and second washer plates are positioned between the nut and a head of the bolt.

15. The rail joint assembly of claim **9**, wherein the first base member includes a body defining a plurality of openings aligned with the plurality of openings of the first and second supports.

16. A rail brace assembly for first and second rails each having a head portion, a web portion extending from the head portion, and a base portion extending from the web portion, a longitudinal axis of the first rail aligned with a longitudinal axis of the second rail, the rail brace assembly comprising:

- a base plate defining a plurality of openings;
- a plurality of clips, each of the plurality of clips comprising an electrically-insulating material configured to engage the base portion of the first rail or second rail, each of the plurality of clips defining an opening configured to be aligned with one of the plurality of openings of the base plate; and
- a plurality of fasteners configured to extend through respective openings of the plurality of clips and the plurality of openings of the base to secure the clips and the base plate to the first and second rails.

17. The rail brace assembly of claim **16**, wherein the base plate is metal.

18. The rail brace assembly of claim **16**, further comprising a plurality of washer plates configured to be positioned on a top surface of each of the plurality of clips, wherein the plurality of fasteners each comprise a bolt with a head and a nut, and wherein each of the plurality of washer plates, each of the plurality of clips, and the base plate are positioned between the head of the bolt and the nut when the rail brace assembly is attached to the first and second rails.

19. The rail brace assembly of claim **16**, further comprising an insulator plate configured to be positioned between the base portions of the first and second rails and the base plate.

20. A rail joint assembly comprising:

- a first rail having a head portion, a web portion extending from the head portion, and a base portion extending from the web portion;
- a second rail having a head portion, a web portion extending from the head portion, and a base portion extending from the web portion, a longitudinal axis of the first rail aligned with a longitudinal axis of the second rail;
- a first rail joint bar attached to a first side of the first and second rails;

a second rail joint bar attached to a second side of the first and second rails; and

a rail brace assembly comprising:

- a base plate positioned below the base portions of the first and second rails, the base plate defining a first opening and a second opening;
- a first clip comprising an electrically-insulating material engaged with the base portion of the first rail or second rail at the first side of the first and second rails, the first clip defining an opening;
- a second clip comprising an electrically-insulating material engaged with the base portion of the first rail or second rail at the second side of the first and second rails, the second clip defining an opening;
- a first fastener extending through the opening of the first clip and the first opening of the base plate to secure the first clip and the base plate to the first and second rails; and
- a second fastener extending through the opening of the second clip and the second opening of the base plate to secure the second clip and the base plate to the first and second rails.

* * * * *