



(51) International Patent Classification:

H01R 11/30 (2006.01) H01R 13/633 (2006.01)

H01R 4/64 (2006.01) H01R 11/14 (2006.01)

H01R 13/62 (2006.01) G01R 31/08 (2020.01)

(21) International Application Number:

PCT/EP2023/056941

(22) International Filing Date:

17 March 2023 (17.03.2023)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

2203745.1 17 March 2022 (17.03.2022) GB

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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CV, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, MG, MK, MN, MU, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(54) Title: MAGNETIC EARTH CLAMP FOR OVERHEAD LINE EQUIPMENT STRUCTURES

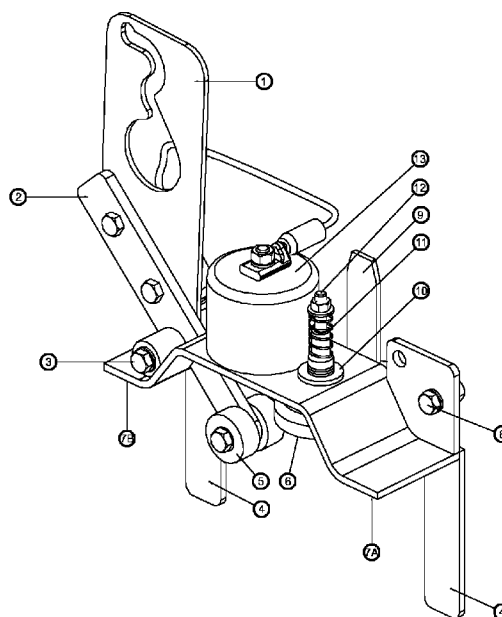


Figure 4

(57) Abstract: An earth clamp for overhead line structures, comprising a clamp frame comprising a profile having a flat contact point at each end of the profile and a middle part at different height than each contact point at each end of the profile, at least one magnetic part arranged to the clamp frame for magnetically attaching the clamp frame against a surface, said magnetic part being situated towards the middle part of the frame profile, wherein the magnetic part is arranged to move in relation to the frame between the level of the contact points and away from the level defined by the contact points towards the middle part, to allow the earth clamp to be attached to a structure facilitating mechanical and electrical connection thereof with the overhead line structure through the magnetic part and the contact points, and comprising means to move the earth clamp frame and/or the magnetic part in relation to the overhead line structure to counteract the magnetic force exerted by the magnetic part to the overhead line structure in order to release the earth clamp from the





(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, CV, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SC, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, ME, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

overhead line structure. A corresponding portable earth is presented.

MAGNETIC EARTH CLAMP FOR OVERHEAD LINE EQUIPMENT STRUCTURES

FIELD OF THE INVENTION

- 5 Generally, the present invention relates to electromechanic arrangements for earthing overhead line structures. Particularly, however not exclusively, the invention pertains to a universal portable earth clamp.

BACKGROUND

10

- Existing portable earthing solutions for Overhead Line Equipment (OLE) generally require the provision of structure mounted earth attachment points with associated fixings, which is usually in the form of a peg. The existing portable earthing solutions require structure mounted earth attachment points to apply a short portable earth. Such solutions are typically sprung jaw type in design. These solutions have the shortcoming of having to use earth attachment points, which can impact access and cause cancellation of work if earth attachment points are missing or broken since earth attachment points are typically only fitted 400 meters apart from each other. Since the earth attachment points are not provided at all structures this limits the overhead line structures where portable earths can be applied.

- 25 Hence, there is a need for a more universal type earth clamp solution that evades the use of earth attachment points and allows for associated safety, time and cost benefits be realised whilst optimising the time available to undertake work within very constrained railway infrastructure access windows.

30 SUMMARY OF THE INVENTION

- The objective of the embodiments of the present invention is to at least alleviate one or more of the aforementioned drawbacks evident in the prior art arrangements. The objective is generally achieved with an arrangement and method in accordance with the claim set.

The present invention provides an earth clamp especially usable for OLE structures that offer a suitable surface of ferromagnetic material. One ex-

ample of an application of the present invention is when a single earth or multiple earths are required at an OLE structure where there are no dedicated or specific earth attachment point pegs for the application of conventional earth clamps. Another example includes a situation where the earth attachment point pegs are damaged or missing preventing the application of conventional short portable earths. Some other applications include where long portable earths have been typically used. Some further applications include where a visible earth is required to be applied at a site of work to an OLE structure.

Benefits of the present invention comprise providing a short portable earth option that can be used on a number of overhead line structures having a suitable surface of ferromagnetic material without a requirement for earth attachment points to be fitted. Further, the present invention provides an alternative option to the use of long portable earths in certain cases thus offering a direct safety benefit due to the risks associated with long portable earths. Further, the present invention provides a short portable earth option that can be utilised in the case of broken or missing earth attachment points. Further, the present invention enables an optimised approach to earthing and the use of a single additional earth at an overhead line structure. Further, the present invention enables a visible earth to be applied at a site of work to an OLE structure to prove the equipment has been made dead. Further, the present invention is compatible with use of existing live working poles and associated dispensing/retrieval adaptors.

In accordance with one aspect of the present invention an earth clamp for overhead line structures, comprising:

- a clamp frame comprising a profile having a flat contact point at each end of the profile and a middle part at different height than each contact point at each end of the profile,
- at least one magnetic part arranged to the clamp frame for magnetically attaching the clamp frame against a surface, said magnetic part being situated towards the middle part of the frame profile,
 - wherein the magnetic part is arranged to move in relation to the frame between the level of the contact points and away from the level defined by the contact points towards the middle part, to allow the earth clamp to be attached to a

structure facilitating mechanical and electrical connection thereof with the overhead line structure through the magnetic part and the contact points, and

- comprising means to move the earth clamp frame and/or the magnetic part in relation to the overhead line structure to counteract the magnetic force exerted by the magnetic part to the overhead line structure in order to release the earth clamp from the overhead line structure.

10 In accordance with an embodiment of the present invention the earth clamp comprising mechanical actuation lever for moving the earth clamp frame and/or the magnetic part in a direction away from a structure when the earth clamp is attached to the structure.

15 In accordance with an embodiment of the present invention the mechanical actuation lever for moving the earth clamp frame and/or magnetic part at least away from the structure when the earth clamp is attached to a structure may be used with a dispensing head.

20 In accordance with an embodiment of the present invention the clamp frame may comprise a curvilinear profile.

In accordance with an embodiment of the present invention the earth clamp comprises a spring connected with the magnetic part to facilitate counterforce to the magnetic part and moving the magnetic part away from the level of the contact points.

In accordance with an embodiment of the present invention the earth clamp wherein connection between the magnet and the spring assembly is electrically insulated from the clamp frame.

In accordance with an embodiment of the present invention the magnetic part is electrically bonded to the clamp frame via a flexible braid connection.

35 In accordance with an embodiment of the present invention the earth clamp frame the earth clamp frame incorporates guides that aid correct positioning and application of the earth clamp frame.

In accordance with an embodiment of the present invention the earth clamp comprises a permanently attached protective cover applied over the magnet that allows safe handling and storage when not in use.

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In accordance with an embodiment of the present invention the earth clamp comprises a removable cover for the magnetic part.

10 In accordance with an aspect of the present invention a portable earth arrangement comprising the earth clamp arrangement of claim 1 and a line end connected thereto.

15 As briefly reviewed hereinbefore, the utility of the different aspects of the present invention arises from a plurality of issues depending on each particular embodiment.

The expression “a number of” may herein refer to any positive integer starting from one (1). The expression “a plurality of” may refer to any positive integer starting from two (2), respectively.

20

Different embodiments of the present invention are also disclosed in the attached dependent claims.

BRIEF DESCRIPTION OF THE RELATED DRAWINGS

25

Next, some exemplary embodiments of the present invention are reviewed more closely with reference to the attached drawings, wherein

- Fig. 1 illustrates a front view of an embodiment of the earth clamp,
30 Fig. 2 illustrates a rear view of an embodiment of the earth clamp,
Fig. 3 illustrates a side view of an embodiment of the earth clamp,
Fig. 4 illustrates an isometric view of an embodiment of the earth clamp,
Fig. 5 illustrates a view wherein an embodiment of the earth clamp is attached to an overhead line structure,
35 Fig. 6 illustrates a view wherein an embodiment of the earth clamp is attached to an overhead line structure,
Fig. 7 illustrates a general view of the earth clamp in use,

Fig. 8 illustrates a general view of another embodiment of the earth clamp, and

Fig. 9 illustrates another general view of another embodiment of the earth clamp.

5

DETAILED DESCRIPTION OF THE EMBODIMENTS

Figures 1-4 illustrate main aspects of the earth clamp.

10 The earth clamp in accordance with the illustrated embodiment comprises the following features.

- (1) Retrieval bracket
- (2) Release mechanism arm
- 15 (3) Release mechanism hinge point
- (4) Guide
- (5) Release mechanism roller
- (6) Magnet
- (7A) Clamp frame front contact point
- 20 (7B) Clamp frame rear contact point
- (8) Earth cable connection terminal
- (9) Application lug
- (10) Insulation
- (11) Spring
- 25 (12) Connection bolt
- (13) Magnet cap stow cup
- (14) Earth cable

The earth clamp comprises at least a clamp frame comprising a curvilinear
30 profile, having a flat contact point (7A, 7B) or pad at each end of the profile and a middle part at different height than each contact point (7A, 7B) at each end of the profile. The contact points (7A, 7B) are fixed and form the horizontal plane or level, which may connect with an OLE structure. The curvilinear profile of the clamp frame may comprise a continuous
35 profile with rounded edges between the middle part and the contact points (7A, 7B), as illustrated, or the clamp frame profile may comprise a profile with sharp edges between the middle part and the contact points (7A, 7B), for example wherein a horizontal middle part and horizontal contact points

(7A, 7B) have a vertical or angled areas therebetween with sharp corners dividing the different areas yielding e.g. a “top-hat shape” or the like.

The earth clamp further comprises at least one magnetic part, such as a magnet (6) or a plurality of magnets (6), arranged to the clamp frame for magnetically attaching the frame against a surface, said magnetic part being situated towards the middle of the frame profile. The magnet (6) is arranged to move in relation to the frame between the level of the contact points (7A, 7B) and above the level defined by the contact points (7A, 7B), as illustrated in Fig. 1 and 2 wherein the touching surface of the magnet (6) can be clearly seen to be moved above in relation to the level of the contact points (7A, 7B), i.e. away from the level defined by the contact points (7A, 7B), which is also the horizontal level or plane at which the magnetic part connects with the OLE structure, and towards the level of the middle of the clamp frame, to allow the earth clamp to be attached to a structure facilitating mechanical and electrical connection thereof with the overhead line structure through the magnetic part and the contact points. I.e. the magnet (6) is arranged to move “inside” the earth clamp profile, such as in a vertical direction via a spring connection (11) at the middle part of the clamp frame. The earth clamp also comprises means, such as a mechanical actuation lever formed by a retrieval bracket (1), release mechanism arm (2), a release mechanism hinge point (3) and release mechanism roller (5), to move, such as by lever actuation or simply pulling the earth clamp away from a structure, at least the clamp frame in relation to the overhead line structure to counteract and overcome the magnetic force exerted by the magnet (6) to the overhead line structure in order to release the earth clamp from the overhead line structure. For example, as illustrated in Figs. 1-6 the earth clamp comprises a retrieval bracket (1), release mechanism arm (2), a release mechanism hinge point (3) and release mechanism roller (5) wherein by operation of the retrieval bracket (1) the release mechanism roller (5) may be pressed against the OLE structure to which the earth clamp is connected and via the release mechanism arm (2) and release mechanism hinge point (3) a mechanical force can be exerted to move the earth clamp frame in relation to the overhead line structure and to release the earth clamp from the OLE structure. Alternatively, the earth clamp may comprise another type of mechanism to move the earth clamp in relation to the OLE structure, such as a retrieval bracket (1) connected directly to the earth clamp frame, as illustrated in

the embodiment of Figs. 8 and 9, so that the earth clamp may be pulled away from an OLE structure by pulling the retrieval bracket (1). Alternatively or additionally, the earth clamp may comprise means to move the magnet (6) at least away from the level of the contact points (7A, 7B). The magnet (6) may be connected with a spring (11) via insulation (10) at the frame to help counteract the magnetic force exerted by the magnet (6) and move the magnet at least away from the level of the contact points (7A, 7B) when the earth clamp is not connected to a structure. This way the magnet (6) may move against and attach to a ferromagnetic structure on level with the contact points (7A, 7B) attaching the earth clamp to the structure, and the earth clamp frame and/or the magnet (6) may also be moved away from connection by operation of the bracket (1) counteracting the magnetic force exerted to a structure and hence detaching the earth clamp from the structure. A protective cover, such as a magnet cap stow cup (13), may be used over the magnet that allows safe handling and storage when not in use. The protective cover may be permanently fixed or removable. The insulation (10) is used to electrically insulate the magnet and the spring assembly from the clamp frame. As illustrated, the magnet (6) may be electrically bonded to the clamp frame via a flexible braid connection.

The earth clamp may further comprise guides (4) for easier operation and attachment of the earth clamp to an OLE structure. Such guides (4) are beneficial since the earth clamp is operated by a live working pole from a distance away and at height. Further, the earth clamp may comprise an application lug (9) or similar structure for hoisting the earth clamp with a live working pole at height.

The earth clamp further comprises an earth cable connection terminal (8) connected via an earth cable (14) to the magnet (6) for connecting the earth clamp with a line end.

Although not illustrated the earth clamp may comprise a housing or a removable cover

The earth clamp further comprises a connection means for connecting a line end with a line to the earth clamp.

The earth clamp is particularly suitable railway applications and related environments including on 25 kV AC, 12 kA rated systems.

5 Figures 5-6 illustrate the earth clamp attached to an OLE. Therein the earth clamp is shown to be attached to flat surface of ferromagnetic material. The earth clamp is shown to be connected to a line end, which may comprise a conventional line end clamp operable at height by a live working pole the earth clamp and line end essentially constituting a portable earth. As illustrated, the live part is separated by the insulator from the rest
10 of the OLE structure such as the mast to which the earth clamp may be connected. The cable connection between the line end clamp and the earth clamp may be kept substantially short.

15 Figure 7 illustrates an example setting of the earth clamp in use. In this application an overhead line equipment structure for railways is shown for which the operator uses the earth clamp. The operator may use a conventional live working pole with suitable dispensing and retrieval adaptors, such as a dispensing head or other operating sockets, to attach and detach the earth clamp at height and at a preferred location having a surface of
20 ferromagnetic material. The operation is convenient since placing the earth clamp at a certain part is simple since only a sufficiently flat ferromagnetic surface is needed. Due to the magnetic force the earth clamp attaches automatically to a ferromagnetic surface and removal is also simple since the magnetic force can be easily counteracted via the mechanical ac-
25 tuation lever, which the operator can operate with the live working pole. As can be seen from the figure 7 the earth clamp provides for a visible earth which can be applied at a site of work to prove the overhead line equipment has been made dead. Since the earth clamp may be attached on any substantially flat ferromagnetic surface the earthing can be done at
30 height avoiding the need for a long portable earth.

35 The scope of the invention is determined by the attached claims together with the equivalents thereof. The skilled persons will again appreciate the fact that the disclosed embodiments were constructed for illustrative purposes only, and the innovative fulcrum reviewed herein will cover further embodiments, embodiment combinations, variations and equivalents that better suit each particular use case of the invention.

Claims

1. An earth clamp for overhead line structures, comprising
 - 5 - a clamp frame comprising a profile having a flat contact point at each end of the profile and a middle part at different height than each contact point at each end of the profile,
 - at least one magnetic part arranged to the clamp frame for magnetically attaching the clamp frame against a surface, said magnetic
10 part being situated towards the middle part of the frame profile,
 - wherein the magnetic part is arranged to move in relation to the frame between the level of the contact points and away from the level defined by the contact points towards the middle part, to allow the earth clamp to be attached to a
15 structure facilitating mechanical and electrical connection thereof with the overhead line structure through the magnetic part and the contact points, and
 - comprising means to move the earth clamp frame and/or the magnetic part in relation to the overhead line structure to
20 counteract the magnetic force exerted by the magnetic part to the overhead line structure in order to release the earth clamp from the overhead line structure.
2. The arrangement of claim 1 wherein the earth clamp comprising
25 mechanical actuation lever for moving the earth clamp frame and/or the magnetic part in a direction away from a structure when the earth clamp is attached to the structure.
3. The arrangement claim 2 wherein the mechanical actuation lever
30 for moving the earth clamp frame and/or magnetic part at least away from the structure when the earth clamp is attached to a structure may be used with a dispensing head.
4. The arrangement of any preceding claim wherein clamp frame
35 comprising a curvilinear profile.
5. The arrangement of any preceding claim wherein the earth clamp comprises a spring connected with the magnetic part to facilitate counter-

force to the magnetic part and moving the magnetic part away from the level of the contact points.

5 6. The arrangement of any preceding claim wherein the connection between the magnet and the spring assembly is electrically insulated from the clamp frame.

10 7. The arrangement of any preceding claim wherein the magnetic part is electrically bonded to the clamp frame via a flexible braid connection.

8. The arrangement of any preceding claim wherein the earth clamp frame incorporates guides that aid correct positioning and application of the earth clamp frame.

15 9. The arrangement of any preceding claim wherein the earth clamp comprises a permanently attached protective cover applied over the magnet that allows safe handling and storage when not in use.

20 10. The arrangement of any preceding claim wherein the earth clamp comprises a removable cover for the magnetic part.

11. A portable earth comprising the earth clamp arrangement of claim 1 and a line end connected thereto.

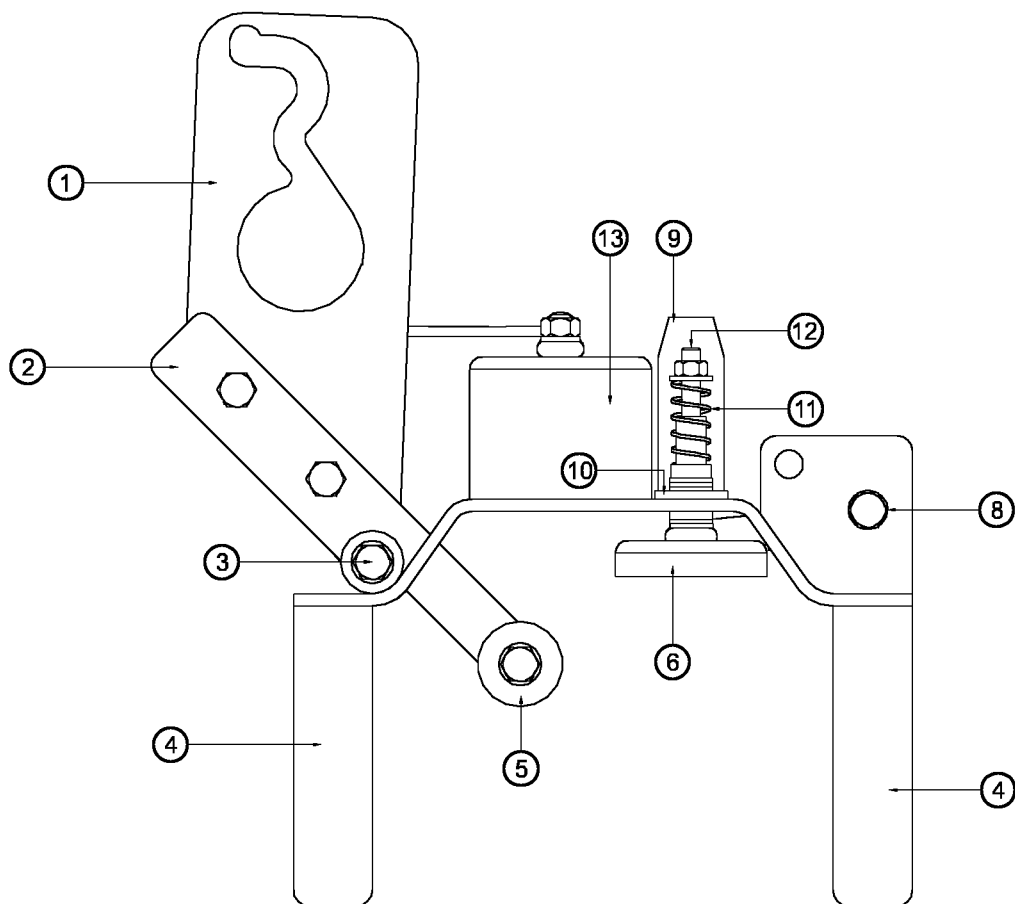


Figure 1

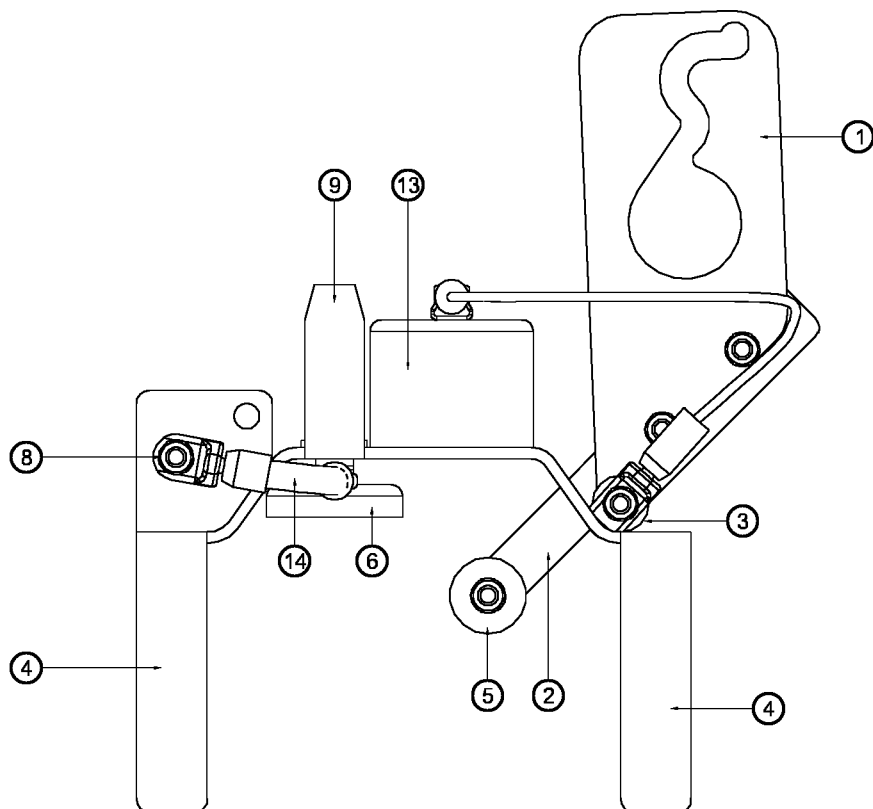


Figure 2

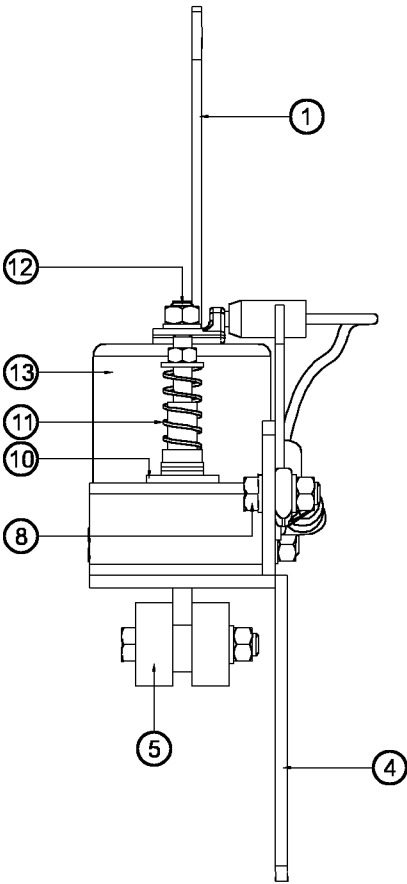


Figure 3

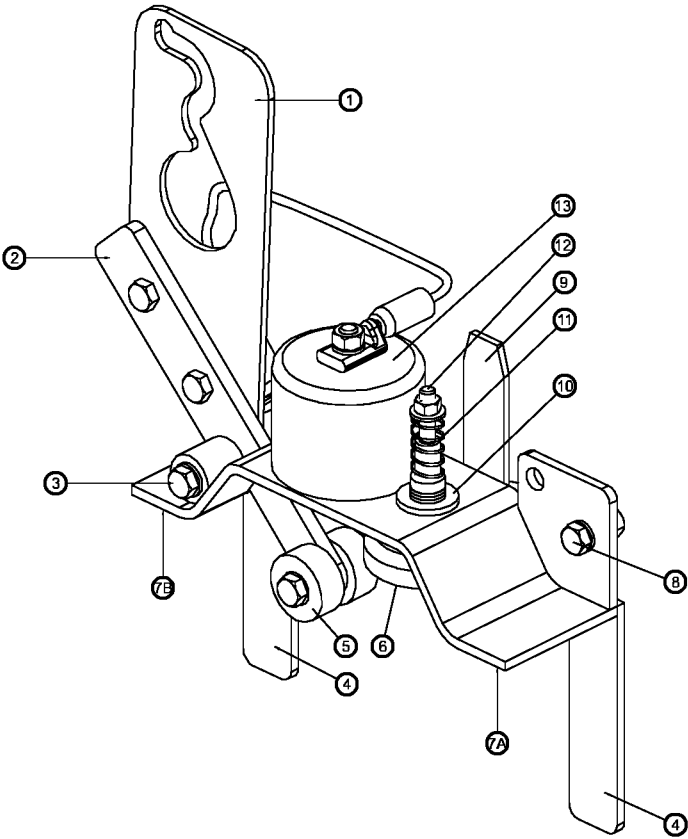


Figure 4

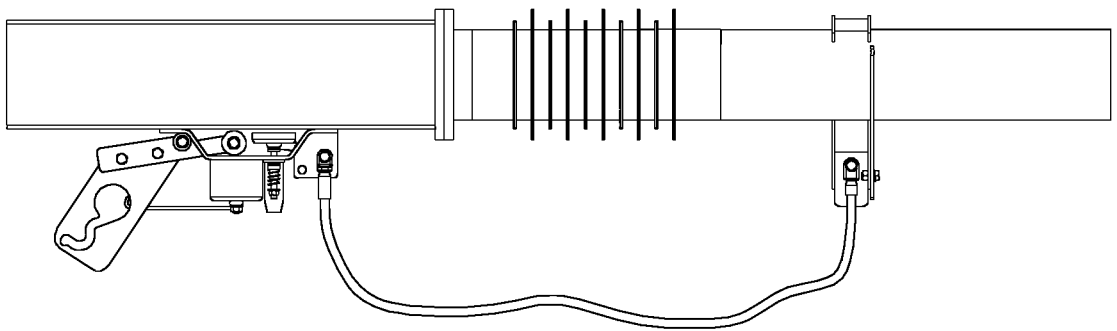


Figure 5

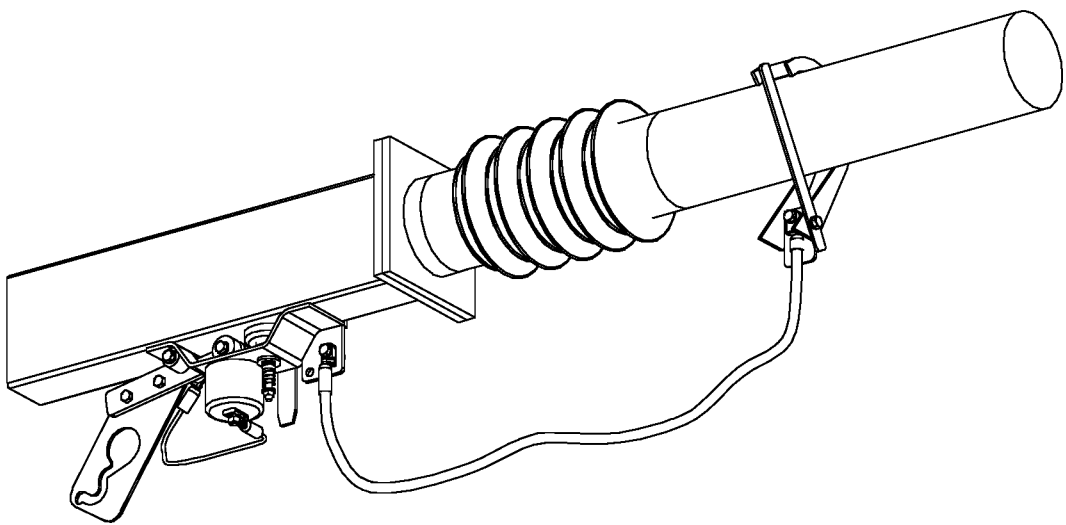


Figure 6

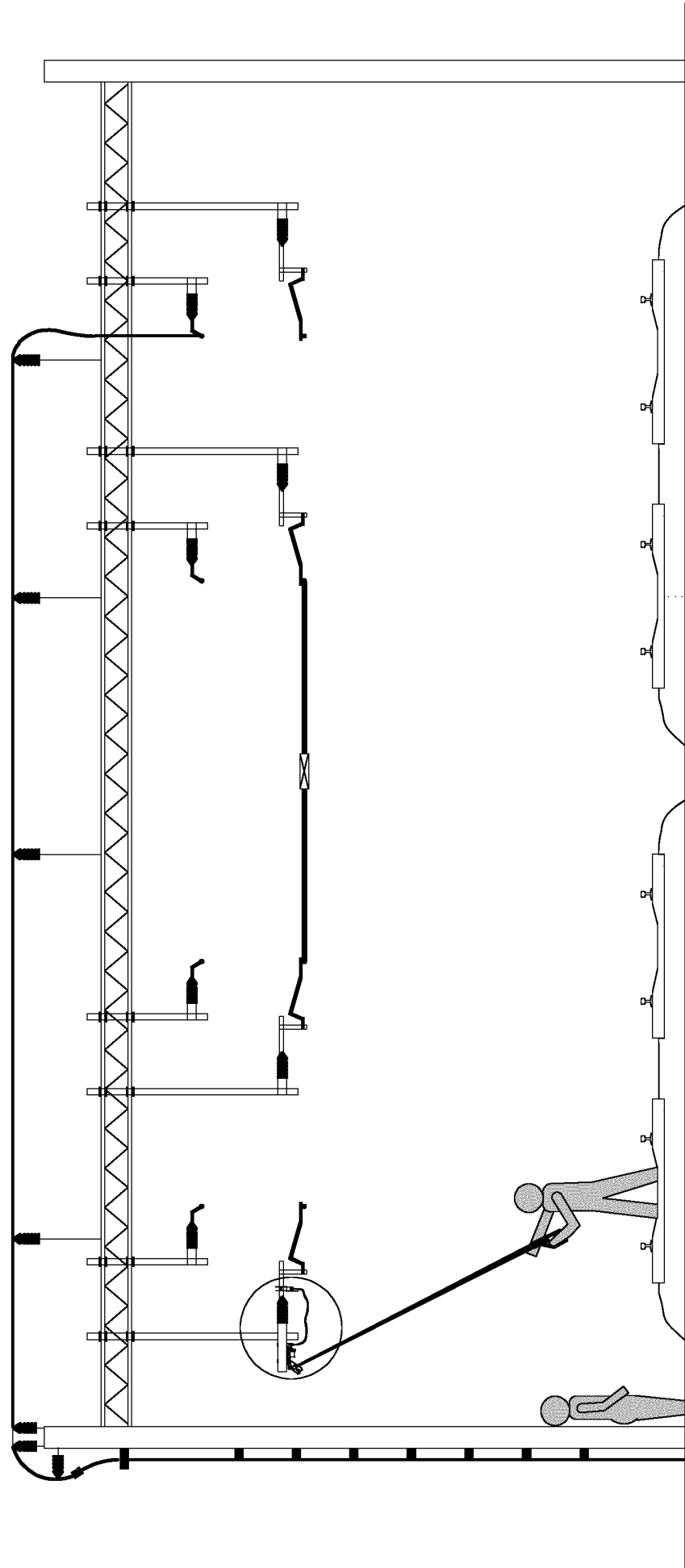


Figure 7

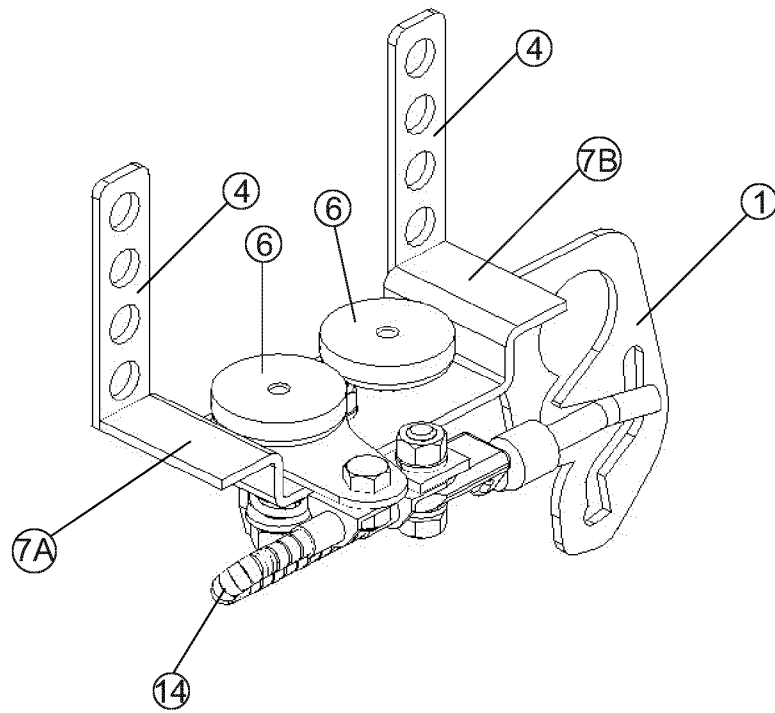


Figure 8

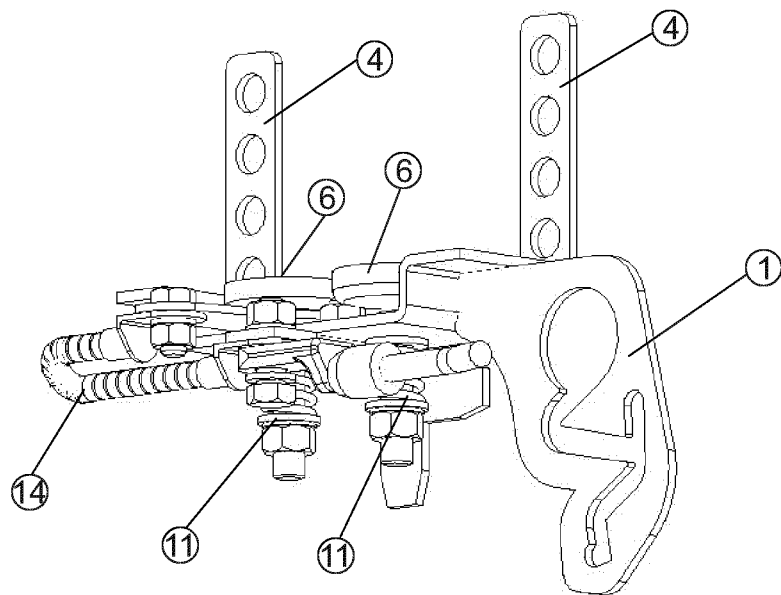


Figure 9

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2023/056941

A. CLASSIFICATION OF SUBJECT MATTER

INV. H01R11/30 H01R4/64

ADD. H01R13/62 H01R13/633 H01R11/14 G01R31/08

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)

H01R B60M H02G

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

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

EPO-Internal**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 112 117 555 A (BEIJING SENMA RAILWAY ELECTRICAL EQUIPMENT CO LTD) 22 December 2020 (2020-12-22) Description, "Example 1"; claims; figures -----	1-11
A	CN 113 991 330 A (MAINTENANCE BRANCH COMPANY OF STATE GRID HEBEI ELECTRIC POWER SUPPLY C) 28 January 2022 (2022-01-28) Description, "Detailed Ways"; figures -----	1-11
A	CN 213 905 630 U (JINZHOU ELECTRIC POWER SUPPLY CO OF STATE GRID LIAONING ELECTRIC POWER) 6 August 2021 (2021-08-06) Description, "Detailed Ways"; figures ----- --/--	1-11



Further documents are listed in the continuation of Box C.



See patent family annex.

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"A" document defining the general state of the art which is not considered to be of particular relevance

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

6 June 2023

Date of mailing of the international search report

19/06/2023

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INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2023/056941

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 688 694 A1 (NL SPOORWEGEN NV [NL]; RAILBOUW BV [NL]) 27 December 1995 (1995-12-27) column 5, line 39 - column 6, line 53; figures 1-4 -----	1-11

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2023/056941

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
CN 112117555	A	22-12-2020	NONE	

CN 113991330	A	28-01-2022	NONE	

CN 213905630	U	06-08-2021	NONE	

EP 0688694	A1	27-12-1995	AT 186024 T	15-11-1999
			EP 0688694 A1	27-12-1995



(21) 申请号 202380025908.5

(22) 申请日 2023.03.17

(30) 优先权数据

2203745.1 2022.03.17 GB

(85) PCT国际申请进入国家阶段日

2024.09.06

(86) PCT国际申请的申请数据

PCT/EP2023/056941 2023.03.17

(87) PCT国际申请的公布数据

W02023/175168 EN 2023.09.21

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(51) Int.Cl.

H01R 11/30 (2006.01)

H01R 4/64 (2006.01)

H01R 13/62 (2006.01)

H01R 13/633 (2006.01)

H01R 11/14 (2006.01)

G01R 31/08 (2006.01)

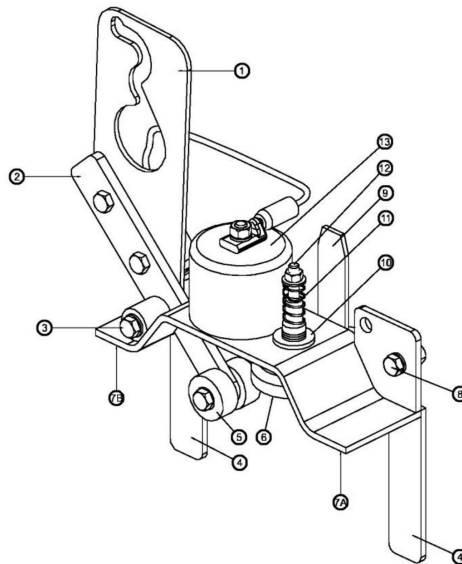
权利要求书1页 说明书5页 附图6页

(54) 发明名称

用于架空线路设备结构的磁性接地夹具

(57) 摘要

一种用于架空线路结构的接地夹具,该接地夹具包括:夹具框架,所述夹具框架包括型材,型材在该型材的每个端部处均具有平坦的接触点,并且型材具有处于与型材的每个端部处的每个接触点不同的高度处的中间部分;至少一个磁性部件,该磁性部件布置到夹具框架,以用于将夹具框架磁性地附接抵靠一表面,磁性部件朝向框架型材的中间部分定位,其中磁性部件布置成相对于框架在接触点的水平面之间并且远离由接触点限定的水平面而朝向中间部分移动,以允许接地夹具附接到便于接地夹具通过磁性部件和接触点与架空线路结构进行机械和电气连接的结构件,并且所述接地夹具包括下述器件:所述器件用于使接地夹具框架和/或磁性部件相对于架空线路结构移动,以抵消由磁性部件施加到架空线路结构的磁力,从而将接地夹具从架空线路结构释放。提出了对应的便携式接地件。



1. 一种用于架空线路结构的接地夹具,所述接地夹具包括:

- 夹具框架,所述夹具框架包括型材,所述型材在所述型材的每个端部处均具有平坦的接触点,并且所述型材具有处于与所述型材的每个端部处的每个接触点不同的高度处的中间部分,

- 至少一个磁性部件,所述磁性部件布置到所述夹具框架,以用于将所述夹具框架磁性地附接抵靠一表面,所述磁性部件朝向所述框架型材的所述中间部分定位,

其中,所述磁性部件布置成相对于所述框架在所述接触点的水平面之间并且远离由所述接触点限定的水平面而朝向所述中间部分移动,以允许所述接地夹具附接到便于所述接地夹具通过所述磁性部件和所述接触点与所述架空线路结构进行机械和电气连接的结构件,以及

所述接地夹具包括下述器件:所述器件用于使所述接地夹具框架和/或所述磁性部件相对于所述架空线路结构移动,以抵消由所述磁性部件施加到所述架空线路结构的磁力,从而将所述接地夹具从所述架空线路结构释放。

2. 根据权利要求1所述的布置结构,其中,所述接地夹具包括机械致动杆,以用于在所述接地夹具附接到所述结构件时使所述接地夹具框架和/或所述磁性部件沿远离所述结构件的方向移动。

3. 根据权利要求2所述的布置结构,其中,用于在所述接地夹具附接到结构件时使所述接地夹具框架和/或所述磁性部件至少远离所述结构件移动的所述机械致动杆能够与分配头一起使用。

4. 根据任一前述权利要求所述的布置结构,其中,所述夹具框架包括曲线型材。

5. 根据任一前述权利要求所述的布置结构,其中,所述接地夹具包括弹簧,所述弹簧与所述磁性部件相连接,以便于对所述磁性部件的反作用力并且从而将所述磁性部件移动远离所述接触点的所述水平面。

6. 根据任一前述权利要求所述的布置结构,其中,所述磁体和所述弹簧组件之间的连接部是与所述夹具框架电绝缘的。

7. 根据任一前述权利要求所述的布置结构,其中,所述磁性部件经由柔性编织连接部而电接合至所述夹具框架。

8. 根据任一前述权利要求所述的布置结构,其中,所述接地夹具框架结合有引导件,所述引导件辅助所述接地夹具框架的正确定位和应用。

9. 根据任一前述权利要求所述的布置结构,其中,所述接地夹具包括施加在所述磁体上的永久附接的保护盖,所述保护盖允许在不使用所述磁体时安全处理和存储所述磁体。

10. 根据任一前述权利要求所述的布置结构,其中,所述接地夹具包括用于所述磁性部件的可移除式盖。

11. 一种便携式接地件,所述便携式接地件包括根据权利要求1所述的接地夹具布置结构以及连接到所述接地夹具布置结构的线路端部。

用于架空线路设备结构的磁性接地夹具

技术领域

[0001] 一般而言,本发明涉及用于将架空线路结构接地的机电布置结构。具体地但非排他地,本发明涉及一种通用便携式接地夹具。

背景技术

[0002] 架空线路设备(OLE)的现有便携式接地解决方案通常需要提供带有相关固定件的结构安装的接地附接点,这些固定件通常采用栓钉的形式。现有的便携式接地解决方案需要结构安装的接地附接点来应用短的便携式接地。此类解决方案通常采用弹簧夹爪式设计。这些解决方案的缺点是必须使用接地附接点,如果接地附接点丢失或损坏,这可能会影响访问并导致工作取消,因为接地附接点通常仅安装在彼此相距400米的地方。由于并非所有结构都设置有接地覆接点,这限制了可以应用便携式接地的架空线路结构。

[0003] 因此,需要一种更通用的接地夹具解决方案,避免使用接地附接点,并允许实现相关的安全、时间和成本效益,同时优化可用于在非常有限的铁路基础设施通道窗口内进行工作的时间。

发明内容

[0004] 本发明实施方式的目的是至少减轻现有技术布置结构中明显的前述缺陷中的一个或更多个。该目的通常通过根据所附权利要求的布置结构和方法来实现。

[0005] 本发明提供了一种特别适用于提供合适的铁磁材料表面的OLE结构的接地夹具。本发明的应用的一个示例是当OLE结构处需要单个接地件或多个接地件时,在OLE结构处不存在用于应用传统接地夹具的专用或特定接地附接点栓钉。另一个示例包括接地附接点栓钉损坏或缺失的情况,从而妨碍了传统短便携式接地件的应用。一些其他应用包括通常使用长便携式接地件的地方。一些另外的应用包括需要在工作现场将可见接地件应用到OLE结构的情况。

[0006] 本发明的优点包括提供一种短的便携式接地选项,其可以用在具有合适的铁磁材料表面的许多架空线路结构上,而不需要安装接地附接点。此外,本发明提供了在某些情况下使用长便携式接地件的替代选择,因此由于与长便携式接地件相关的风险而提供了直接的安全益处。此外,本发明提供了一种短的便携式接地选项,其可以在接地附接点损坏或丢失的情况下使用。此外,本发明实现了接地的优化方法以及在架空线路结构处使用单个附加接地件。此外,本发明使得能够在工作现场将可见的接地件应用到OLE结构以证明设备已经失效。此外,本发明与现有的带电工作杆和相关的分配/回收适配器的使用兼容。

[0007] 根据本发明的一个方面,用于架空线路结构的接地夹具,包括:

[0008] -夹具框架,所述夹具框架包括型材,所述型材在所述型材的每个端部处均具有平坦的接触点,并且所述型材具有处于与所述型材的每个端部处的每个接触点不同的高度处的中间部分,

[0009] -至少一个磁性部件,所述磁性部件布置到所述夹具框架,以用于将所述夹具框架

磁性地附接抵靠一表面,所述磁性部件朝向所述框架型材的所述中间部分定位,

[0010] 其中,所述磁性部件布置成相对于所述框架在所述接触点的水平面之间并且远离由所述接触点限定的水平面而朝向所述中间部分移动,以允许所述接地夹具附接到便于所述接地夹具通过所述磁性部件和所述接触点与所述架空线路结构进行机械和电气连接的结构件,以及

[0011] 所述接地夹具包括下述器件:所述器件用于使所述接地夹具框架和/或所述磁性部件相对于所述架空线路结构移动,以抵消由所述磁性部件施加到所述架空线路结构的磁力,从而将所述接地夹具从所述架空线路结构释放。

[0012] 根据本发明的实施方式,所述接地夹具包括机械致动杆,以用于在所述接地夹具附接到所述结构件时使所述接地夹具框架和/或所述磁性部件沿远离所述结构件的方向移动。

[0013] 根据本发明的实施方式,用于在所述接地夹具附接到结构件时使所述接地夹具框架和/或所述磁性部件至少远离所述结构件移动的所述机械致动杆能够与分配头一起使用。

[0014] 根据本发明的实施方式,所述夹具框架包括曲线型材。

[0015] 根据本发明的实施方式,所述接地夹具包括弹簧,所述弹簧与所述磁性部件相连接,以便于对所述磁性部件的反作用力并且从而将所述磁性部件移动远离所述接触点的所述水平面。

[0016] 根据本发明的实施方式,在所述接地夹具中,所述磁体和所述弹簧组件之间的连接部是与所述夹具框架电绝缘的。

[0017] 根据本发明的实施方式,所述磁性部件经由柔性编织连接部而电接合至所述夹具框架。

[0018] 根据本发明的实施方式,所述接地夹具框架结合有引导件,所述引导件辅助所述接地夹具框架的正确定位和应用。

[0019] 根据本发明的实施方式,所述接地夹具包括施加在所述磁体上的永久附接的保护盖,所述保护盖允许在不使用所述磁体时安全处理和存储所述磁体。

[0020] 根据本发明的实施方式,所述接地夹具包括用于所述磁性部件的可移除式盖。

[0021] 根据本发明的一方面,一种便携式接地布置结构包括根据权利要求1所述的接地夹具布置结构以及连接到接地夹具布置结构的线路端部。

[0022] 如上文简要回顾的,本发明的不同方面的实用性源自取决于每个特定实施方式的多问题。

[0023] 表述“多个”在本文中可以指从一(1)开始的任何正整数。表述“多个”可以分别指从二(2)开始的任何正整数。

[0024] 本发明的不同实施方式也在所附的从属权利要求中公开。

附图说明

[0025] 接下来,参考附图更仔细地回顾本发明的一些示例性实施方式,在附图中,

[0026] 图1示出了接地夹具的实施方式的前视图,

[0027] 图2示出了接地夹具的实施方式的后视图,

- [0028] 图3示出了接地夹具的实施方式的侧视图,
- [0029] 图4示出了接地夹具的实施方式的等距视图,
- [0030] 图5示出了接地夹具附接至架空线路结构的实施方式的视图,
- [0031] 图6示出了接地夹具附接至架空线路结构的实施方式的视图,
- [0032] 图7示出了使用中的接地夹具的总视图,
- [0033] 图8示出了接地夹具的另一实施方式的总视图,以及
- [0034] 图9示出了接地夹具的另一实施方式的另一总视图。

具体实施方式

[0035] 图1至图4说明了接地夹具的主要方面。

[0036] 根据所示实施方式的接地夹具包括以下特征。

- [0037] (1) 收回支架
- [0038] (2) 释放机构臂
- [0039] (3) 释放机构铰接点
- [0040] (4) 引导件
- [0041] (5) 释放机构滚轮
- [0042] (6) 磁体
- [0043] (7A) 夹具框架前接触点
- [0044] (7B) 夹具框架后接触点
- [0045] (8) 接地线缆连接端子
- [0046] (9) 应用凸耳
- [0047] (10) 绝缘体
- [0048] (11) 弹簧
- [0049] (12) 连接螺栓
- [0050] (13) 磁体盖存放杯
- [0051] (14) 接地线缆

[0052] 接地夹具至少包括夹具框架,该夹具框架包括曲线型材,曲线型材在型材的每个端部处均具有平坦接触点(7A、7B)或垫,并且曲线型材具有处于与型材的每个端部处的每个接触点(7A、7B)不同的高度处的中间部分。接触点(7A、7B)被固定并形成水平平面或水平面,其可以与OLE结构连接。如图所示,夹具框架的曲线型材可以包括在中间部分与接触点(7A、7B)之间具有圆形边缘的连续型材,或者夹具框架型材可以包括在中间部分与接触点(7A、7B)之间具有尖锐边缘的型材,例如其中,水平中间部分与水平接触点(7A、7B)之间具有竖向或成角度的区域,其中锐角划分不同区域,从而产生例如“顶帽形状”等。

[0053] 该接地夹具还包括至少一个磁性部件,例如一个磁体(6)或多个磁体(6),至少一个磁性部件设置到夹具框架,以用于将所述夹具框架磁性地附接抵靠一表面,所述磁性部件朝向框架型材的中部定位。磁体(6)布置成相对于框架在接触点(7A、7B)的水平面与由接触点(7A、7B)限定的水平面上方之间移动,如图1和在图2中所示,其中,可以清楚地看到磁体(6)的触摸表面相对于接触点(7A、7B)的水平面移动到上方,即远离由接触点(7A、7B)限定的水平面移动,由接触点(7A、7B)限定的水平面也是磁性部件与OLE结构连接的平面或

平面,并且朝向夹具框架的中部的水平面移动,以允许所述接地夹具附接到便于所述接地夹具通过所述磁性部件和所述接触点与所述架空线路结构进行机械和电气连接的结构件。即,磁体(6)布置成在接地夹具型材的“内部”移动,例如通过夹具框架的中部部分处的弹簧连接件(11)沿竖向方向移动。接地夹具还包括如下器件:所述器件诸如为由收回支架(1)、释放机构臂(2)、释放机构铰接点(3)和释放机构滚轮(5)形成的机械致动杆,以诸如通过杆致动或简单地将接地夹具拉离结构件而使夹具框架至少相对于架空线路结构移动,以抵消并克服由磁体(6)施加到架空线路结构的磁力,从而将接地夹具从架空线路结构释放。例如,如图1至图6所示,接地夹具包括收回支架(1)、释放机构臂(2)、释放机构铰接点(3)和释放机构滚轮(5),其中通过操作收回支架(1),释放机构滚轮(5)可以压靠接地夹具所连接的OLE结构,并且通过释放机构臂(2)和释放机构铰接点(3),可以施加机械力以相对于架空线路结构移动接地夹具框架并且将接地夹具从OLE结构释放。替代性地,接地夹具可包括另一种类型的机构以相对于OLE结构移动接地夹具,例如直接连接到接地夹具框架的收回支架(1),如图8和图9的实施方式中所示,使得可以通过拉动收回支架(1)来将接地夹具从OLE结构拉开。替代地或附加地,接地夹具可以包括用于将磁体(6)至少远离接触点(7A、7B)的水平面移动的器件。磁体(6)可以通过框架处的绝缘体(10)与弹簧(11)连接,以帮助抵消由磁体(6)施加的磁力并且当接地夹具未连接至结构件时使磁体至少远离接触点(7A、7B)的水平面移动。这样,磁体(6)可以抵靠铁磁结构移动并附接到铁磁结构,该铁磁结构与将接地夹具附接到该结构件的接触点(7A、7B)齐平,并且接地夹具框架和/或磁体(6)可以也可以通过操作支架(1)抵消施加到结构件上的磁力并因此使接地夹具与结构件分离而被从连接部上移开。可以在磁体上使用保护盖,例如磁体盖存放杯(13),以便在不使用磁体时可以安全处理和存储磁体。保护盖可以是永久固定的或可移除的。绝缘体(10)用于使磁体和弹簧组件与夹具框架电绝缘。如图所示,磁体(6)可以通过柔性编织连接部而电接合至夹具框架。

[0054] 接地夹具还可以包括引导件(4),以便更容易操作接地夹具并将接地夹具附接到OLE结构。这种引导件(4)是有益的,因为接地夹具是由带电工作杆从远处且在高处操作的。此外,接地夹具可以包括应用凸耳(9)或类似结构,以用于将接地夹具与带电工作杆一起提升至高处。

[0055] 接地夹具还包括接地线缆连接端子(8),接地线缆连接端子(8)通过接地线缆(14)连接至磁体(6),以用于将接地夹具与线路端部连接。

[0056] 尽管未示出,但接地夹具可以包括壳体或可移除式盖。

[0057] 接地夹具还包括用于通过线路将线路端部连接至接地夹具的连接器件。

[0058] 该接地夹具特别适合铁路应用和相关环境,包括关于25kV AC、12kA的额定系统。

[0059] 图5至图6说明了附接到OLE的接地夹具。其中,接地夹具被示出为附接至铁磁材料的平坦表面。接地夹具被示出为连接到线路端部,线路端部可以包括可通过带电工作杆在高处操作的常规线路端部夹具,接地夹具和线路端部基本上构成便携式接地件。如图所示,带电部分通过绝缘体与OLE结构的其余部分、例如可以连接接地夹具的桅杆分隔开。线路端部夹具与接地夹具之间的线缆连接部可以保持相当短。

[0060] 图7说明了使用中的接地夹具的设置示例。在该应用中,示出了操作员使用接地夹具的铁路架空线路设备结构。操作员可以使用具有合适的分配和回收适配器(例如分配头

或其他操作插座)的常规带电工作杆,以在高度处以及在具有铁磁材料的表面的优选位置处附接和拆卸接地夹具。由于只需要足够平坦的铁磁表面,因此将接地夹具放置在某个部位很简单,因此操作方便。由于磁力,接地夹具自动附接到铁磁表面,并且移除也很简单,因为磁力可以通过机械致动杆轻松抵消,操作员可以使用带电工作杆进行操作。从图7中可以看出,接地夹具提供了可见的接地,可以将其应用在工作现场以证明架空线路设备已经失效。由于接地夹具可以附接在任何基本上平坦的铁磁表面上,因此可以在高处进行接地,从而避免了对长便携式接地件的需要。

[0061] 本发明的范围由所附权利要求及其等同物确定。技术人员将再次理解这样的事实:所公开的实施方式仅出于说明性目的而构建,并且本文中回顾的创新支点将覆盖更适合本发明的每个特定使用情况的另外的实施方式、实施方式组合、变型和等同物。

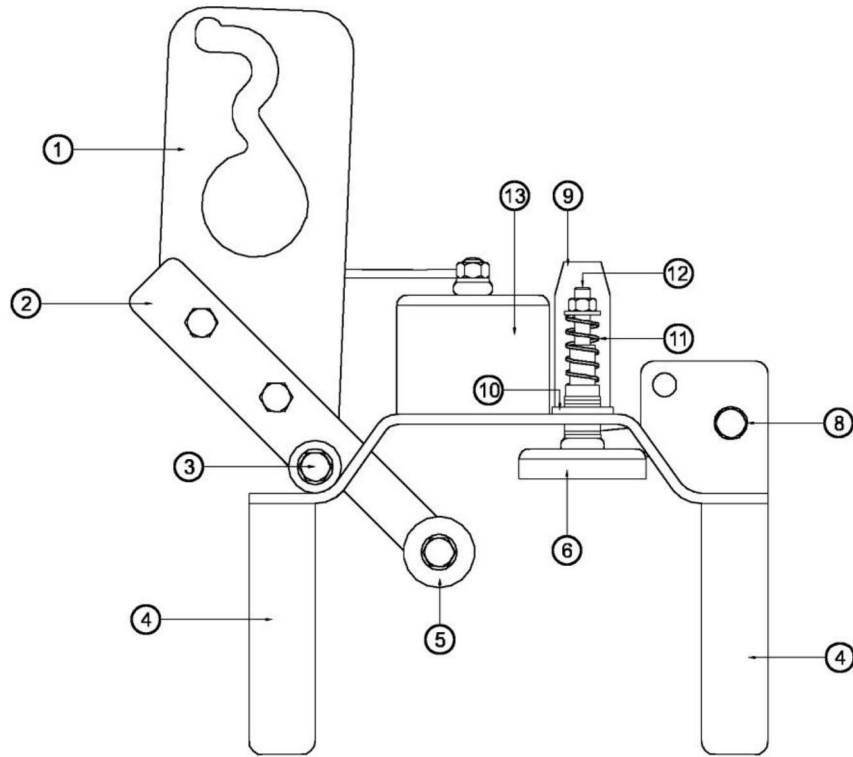


图1

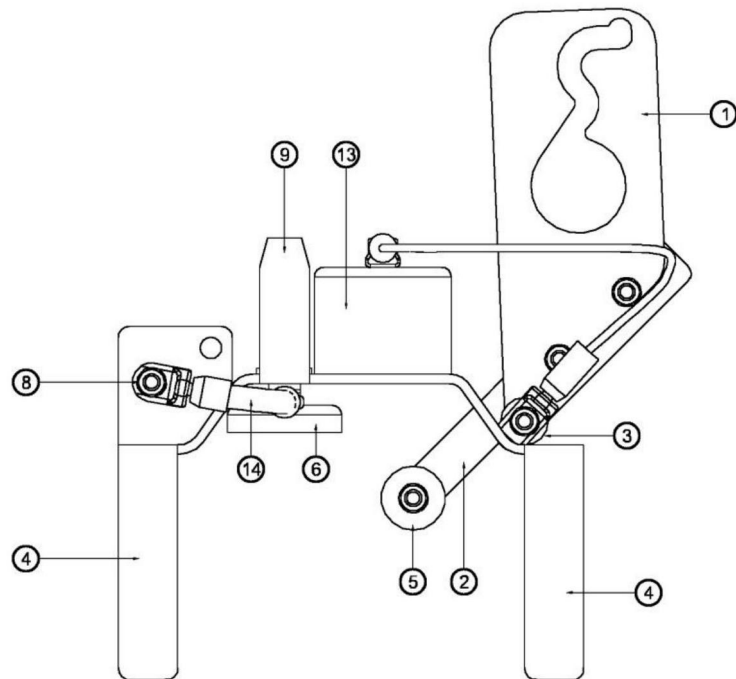


图2

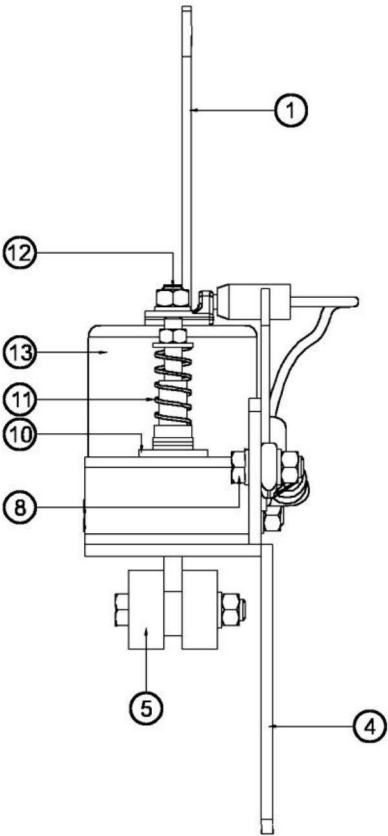


图3

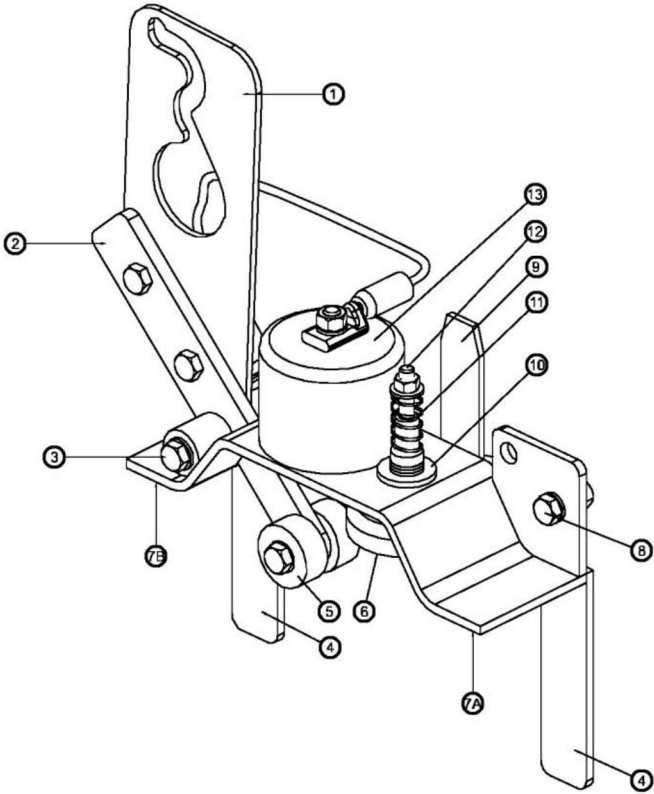


图4

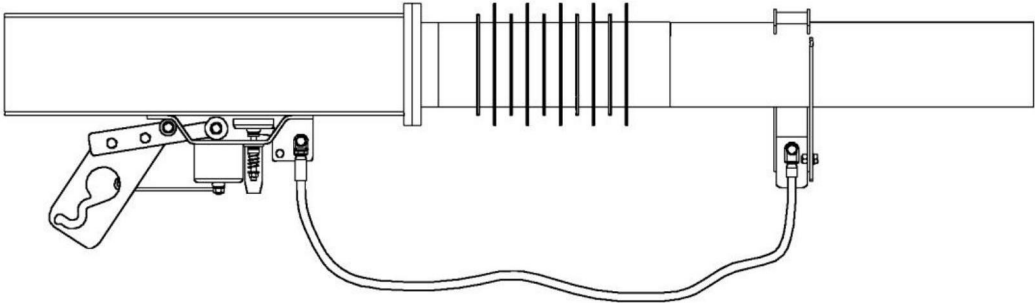


图5

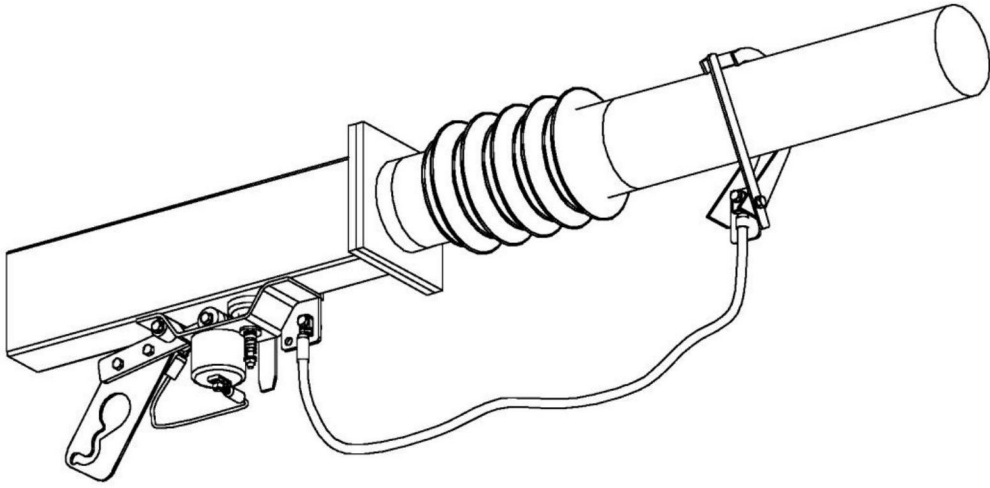


图6

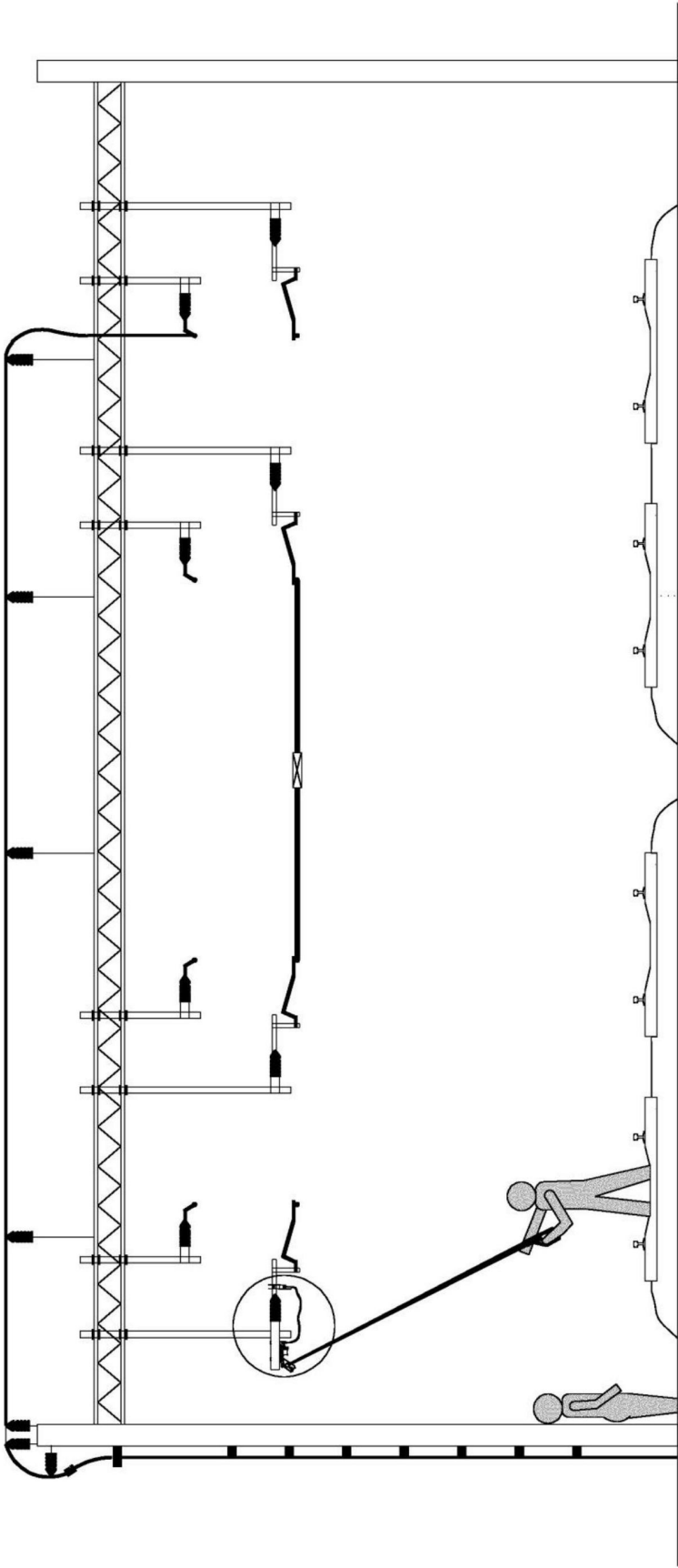


图7

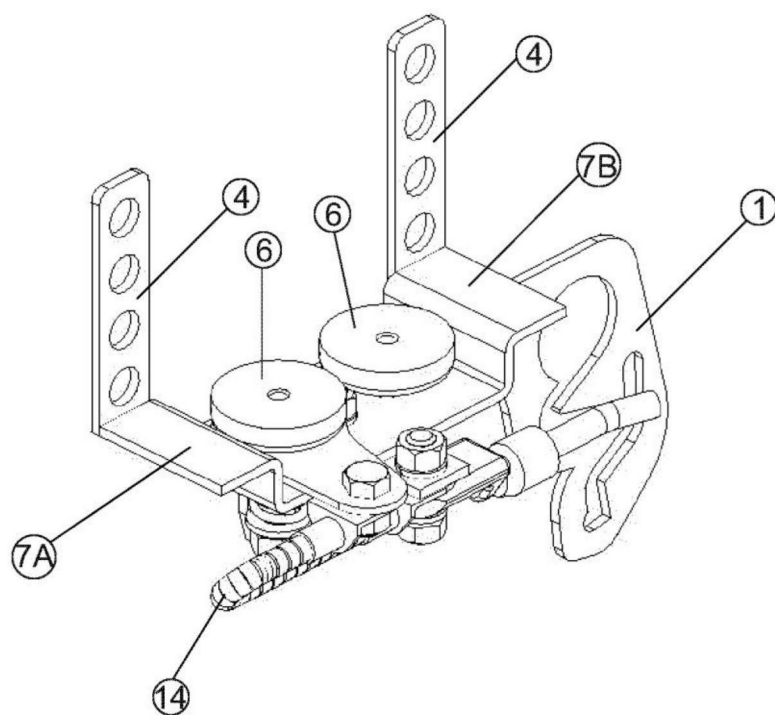


图8

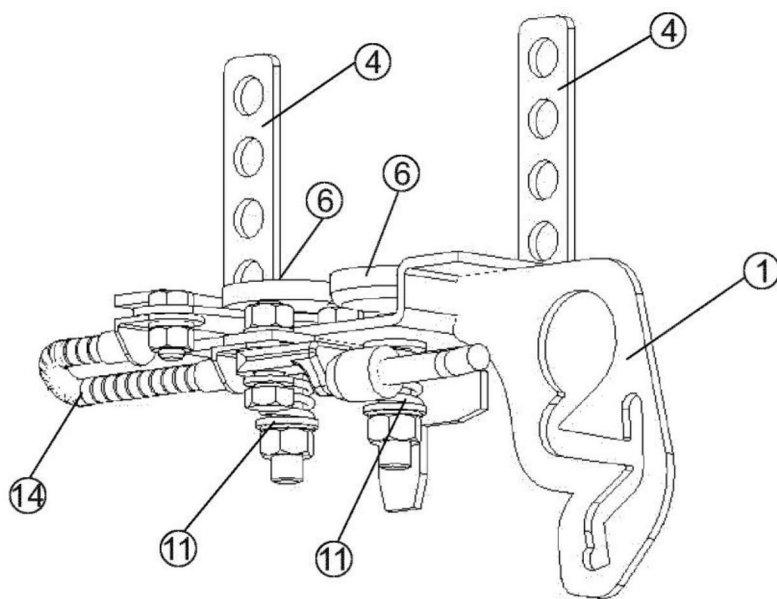


图9