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United States Patent
Poteet , et al.**9,614,355**
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Portable electrical substation racking mechanism

Abstract

A racking mechanism for moving elements of a mobile electrical substation between a transport mode and an operational mode is provided. The racking mechanism includes a fixed structural member; a moveable structural member; and a bearing disposed between a side surface of the fixed structural member and a side surface of the moveable structural member.

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F16M 11/2085 (20130101)**Current International Class:**H02B 1/04 (20060101); F16M 11/20 (20060101); H02B 5/00 (20060101);
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Parent Case Text**RELATED APPLICATION**

This application claims the benefit of priority to U.S. Provisional Patent Application Ser. No. 62/024,575, filed Jul. 15, 2014, the contents of which are incorporated in this application by reference.

Claims

What is claimed:

1. A racking mechanism for moving elements of a mobile electrical substation between a transport mode and an operational mode, the racking mechanism comprising: a fixed structural member; a moveable structural member; a bearing disposed between a side surface of the fixed structural member and a side surface of the moveable structural member; and at least one of (i) a locking mechanism for locking the fixed structural member with respect to the moveable structural member, such that when the locking mechanism is locked the fixed structural member does not move with respect to the moveable structural member in the transport mode of the mobile electrical substation, or (ii) a stop element on the fixed structural member for limiting movement of the moveable structural member during retraction of the moveable structural member into the transport mode of the mobile electrical substation.
2. The racking mechanism of claim 1 wherein the moveable structural member defines a channel on a side surface of the moveable structural member configured to be engaged with the bearing.
3. The racking mechanism of claim 2 wherein the bearing is attached to the fixed structural member.
4. The racking mechanism of claim 1 wherein the bearing includes a plurality of bearings, and wherein the moveable structural member defines a first channel on a first side surface of the moveable structural member, and a second channel on a second side surface of the moveable structural member, each of the first channel and the second channel configured to be engaged with at least one of the plurality of bearings.
5. The racking mechanism of claim 1 wherein the fixed structural member defines a channel on a side surface of the fixed structural member configured to be engaged with the bearing.

6. The racking mechanism of claim 5 wherein the bearing is attached to the moveable structural member.
7. The racking mechanism of claim 1 wherein the bearing includes a plurality of bearings, and wherein the fixed structural member defines a first channel on a first side surface of the fixed structural member, and a second channel on a second side surface of the fixed structural member, each of the first channel and the second channel configured to be engaged with at least one of the plurality of bearings.
8. The racking mechanism of claim 1 the bearing includes a plurality of bearings disposed between side surfaces of the fixed structural member and side surfaces of the moveable structural member.
9. The racking mechanism of claim 1 wherein the moveable structural member includes a support platform configured for supporting elements of an electrical switchgear.
10. A multi-phase racking mechanism for moving elements of a multi-phase mobile electrical substation including a plurality of portions of electrical switchgear between a transport mode and an operational mode, the multi-phase racking mechanism comprising: a plurality of fixed structural members; a plurality of moveable structural members, each of the moveable structural members being engaged with a corresponding one of the fixed structural members; and a plurality of bearings disposed between side surfaces of each of the fixed structural members and side surfaces of a corresponding one of the moveable structural members, wherein each of the moveable structural members includes a support platform configured for supporting a respective portion of the electrical switchgear, the multi-phase racking mechanism further comprising a stationary platform configured for supporting another portion of the electrical switchgear, the stationary platform being positioned between the support platforms of the moveable structural members in each of the transport mode and the operational mode.
11. The multi-phase racking mechanism of claim 10 wherein each of the moveable structural members defines a channel on a side surface of the moveable structural member configured to be engaged with at least one of the plurality of bearings.
12. The multi-phase racking mechanism of claim 11 wherein the plurality of bearings are attached to ones of the plurality of fixed structural members.
13. The multi-phase racking mechanism of claim 10 each of the plurality of moveable structural members defines a first channel on a first side surface of the moveable structural member, and a second channel on a second side surface of the moveable structural member, each of the first channel and the second channel configured to be engaged with at least one of the plurality of bearings.
14. The multi-phase racking mechanism of claim 10 wherein each of the plurality of fixed structural members defines a channel on a side surface of the fixed structural member configured to be engaged with at least one of the plurality of bearings.
15. The multi-phase racking mechanism of claim 14 wherein the bearing is attached to the moveable structural member.
16. The multi-phase racking mechanism of claim 10 wherein each of the plurality of fixed structural members defines a first channel on a first side surface of the fixed structural member, and a second channel on a second side surface of the fixed structural member, each of the first channel and the second channel configured to be engaged with at least one of the plurality of bearings.
17. The multi-phase racking mechanism of claim 10 further comprising the electrical switchgear supported by at least one of the plurality of fixed structural members and the plurality of moveable structural members.
18. The multi-phase racking mechanism of claim 17 wherein the electrical switchgear includes circuit breaker devices.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 11 is a perspective view of a conventional multi-phase electrical substrate racking mechanism.

DETAILED DESCRIPTION

The fixed structural member may include various different parts, depending on the specific configuration. The configuration is influenced by the bearing arrangement. A bearing arrangement can be to one or both

sides of the movable structural member (see FIGS. 1-9, where bearings are shown on both sides of the moveable structural member). A protective, stabilizing protective cover (as shown in the drawings) can be employed if the fixed structural member consists of multiple parts.

By employing the inventive racking mechanism of the present invention, the height of the racking mechanism may desirably be kept lower, enabling more spacing for the mobile components achieving higher kV and MVA. Further, the weight of the racking mechanism can be kept lower, as an all steel construction can be used. Further still, the mechanism is more robust, employing less movable parts--and the mechanism is better suited for manufacturing.

Although the present invention has been illustrated primarily with respect to a channel/groove on the moveable structural member (as in FIGS. 1-9), the present invention is not limited thereto. For example, the groove/channel may be arranged on the fixed structural member (e.g., with bearings coupled to the moveable structural member, either directly or indirectly).

Likewise, although the present invention is illustrated primarily with respect to channels/grooves on each side of the moveable structural member (with corresponding bearing(s) on each side of the moveable structural member for engagement with the channels/grooves), the present invention is not limited thereto. For example, in certain arrangements a single channel/groove (and corresponding bearing(s)) may support the motion of the moveable structural member between the transport mode and the operational mode.

As illustrated in the drawings provided herein, certain moveable structural members of the present invention may be used to move switchgear components related to a phase of three-phase electrical system. That is, one moveable structural member (and corresponding fixed structural member(s) and bearing(s)) may be used to move a portion of given phase of a three-phase electrical system. In the illustrated embodiments, such as in FIG. 8: (a) one such moveable structural member is used to move a first phase on a first end, and another such moveable structural member is used to move the first phase on a second end (opposite from the first end); (b) two stationary members may be used to support a second (middle) phase of the three-phase electrical system; (c) one such moveable structural member is used to move a third phase on a first end, and another such moveable structural member is used to move the third phase on a second end (opposite from the first end).

While the present invention may often be used in connection with movement of switchgear components on the high voltage side of the mobile electrical substation, it is not limited thereto.

Referring now to FIGS. 1-6, a portable electrical substation racking system 100 is shown. Each system 100 includes a first racking mechanism 104 including a mounting platform 104a, a fixed structural member 104b, a moveable structural member 104c, and a protective cover 104d (covering elements of fixed member 104b including bearing elements 104e1, 104e2, 104e3, 104e4, etc.). As shown throughout the drawings, bearing elements 104e1, 104e2, 104e3, 104e4, are secured to one of the two sides of fixed structural member 104b, for example, using back plates and fasteners (such as screws or bolts). Moveable structural member 104c defines channels 104c1, 104c2 on opposite sides from one another. During movement of moveable structural member 104c, channels 104c1 and 104c2 ride along the bearings.

Each system 100 also includes a second racking mechanism 106 including a mounting platform 106a, a fixed structural member 106b, a moveable structural member 106c, and a protective cover 106d (covering elements of fixed member 106b including bearing elements 106e1, 106e2, 106e3, 106e4, etc.). As shown throughout the drawings, bearing elements 106e1, 106e2, 106e3, 106e4, are secured to a one of the two sides of fixed structural member 106b, for example, using a back plate and fasteners (such as screws or bolts). Moveable structural member 106c defines channels 106c1, 106c2 on opposite sides from one another. During movement of moveable structural member 106c, channels 106c1 and 106c2 ride along the bearings.

Each system 100 also includes stationary support structure 108 including a support post 108b attached to an assembly base 102, and a mounting platform 108a on top of the post 108b. Assembly base 102 acts as a base support structure for fixed structural member 104b and fixed structural member 106b.

FIGS. 1-2 illustrate system 100 in a retracted position (i.e., in a transport mode). FIG. 3 illustrates system 100 in an extended position (i.e., in an operational mode, providing the desired clearance between electrical

