

Description

Title: VIBRATION REDUCTION DEVICE FOR GAS INSULATED SWITCHING DEVICE

TECHNICAL FIELD

[001] The present disclosure relates to a vibration reduction device for a gas-insulated switching device.

BACKGROUND ART

[002] A gas-insulated switching device is used in power systems such as substations and power transmissions. The gas-insulated switching device is used for opening/closing or grounding, branching, and monitoring of high-voltage circuits from thousands of volts to tens of thousands of volts in power systems.

[003] For example, a gas-insulated switching device of a substation is configured by embedding a circuit breaker, a disconnecting switch, an earthing switch, a bus, and a branch circuit in a grounded metal enclosure. The enclosure is filled with an insulating gas with good insulation and extinguishing

properties.

[004] When such a gas-insulated switching device is installed on the ground of a substation, there should be no transmission of vibration. In order to prevent the transmission of vibration, a pad made from an elastic material is installed between the ground of the substation and the frame where the gas-insulated switching device is installed to block an impact transmission, thereby reducing vibration.

[005] As shown in FIG. 1, the gas-insulated switching device 1 is supported on a base frame 7 by a plurality of support legs 3. The base frame 7 is installed on a foundation frame 5 installed on a floor of a substation with a plurality of pads 9 interposed therebetween. The pad 9 is fixed to the foundation frame 5 and the base frame 7 with a plurality of stud bolts 10.

[006] However, the pad 9 may be deteriorated with prolonged use, and may require replacement. In order to replace the pad 9, the base frame 7 on which the gas-insulated switching device 1 is installed is lifted, and after replacing the pad 9, the base frame 7 is lowered again to be installed on the ground of the substation. However, the pad 9 is fastened using a plurality of stud bolts 10 between the foundation frame 5 and the base frame 7, thus the replacement operation is very inconvenient.

[007] In addition, the base frame 7 and the foundation

frame 5 in which the gas-insulated switching device is installed are assembled at a factory and moved to an installation site in an assembled state to be fixedly installed. To this end, the transfer and installation work is performed with the pad 9 positioned between the foundation frame 5 seated on the ground and the base frame 7 on which the gas-insulated switching device 1 is installed. During the transfer and installation work, in order to prevent damage to the pad 9 due to relative movement between the frame 5 and the base frame 7, the base frame 7 should be relatively lifted with respect to the foundation frame 5. However, in the prior arts, there is an inconvenience of using a separate jack-up device.

[008] Meanwhile, the prior arts include Japanese Patent No. Pyeongseung 06-311613, Japanese Patent No. Pyeongseung 06-35116, and Japanese Patent No. 2002-253521.

Disclosure

Technical Problem

[009] An object of the present disclosure is to solve the problems of the prior arts as described above, and to minimize an impact transmission between a first frame installed on the ground and a second frame on which a gas-insulated switching device is installed.

[010] Another object of the present disclosure is to facilitate replacement of a pad positioned between the first frame and the second frame.

[011] Still another object of the present disclosure is to allow the pad to be transferred in a state where the gap between the first frame and the second frame is higher than the height of the pad.

Technical Solution

[012] According to features of the present disclosure for achieving the above objectives, the present disclosure may comprise: a first frame seated on a ground; a pad seated on the first frame and configured to absorb vibration; a second frame positioned on the pad and having a gas-insulated switching device mounted therein; and a bolt penetrating and movably fastened to the second frame, and penetrating through the pad and the first frame to be fastened to a nut.

[013] The second frame may be provided with a fastener having a screw portion formed on the inner surface thereof so that the bolt penetrates and is fastened.

[014] A first through hole may be formed in the first frame at a position corresponding to the fastener of the second

frame so that the bolt may pass therethrough.

[015] The bolt includes a bolt head and a bolt body. In addition, a collar made of an impact-absorbing material may be installed at a portion of the bolt body positioned within the pad.

[016] The collar may be configured to surround the bolt body.

[017] As the nut is fastened to the bolt, an insulating washer may be installed on the bolt so as to be in close contact with the first frame.

[018] A plurality of the nuts may be used.

[019] A jack-up block may be fastened to a front end of the bolt body of the bolt while being supported by the first frame, and while the jack-up block and the bolt rotate integrally, the distance between the first frame and the second frame may be adjusted.

[020] The center of the lower surface of the jack-up block may be formed of a flat surface, and the edge of the lower surface of the jack-up block may be formed of a curved surface.

Advantageous Effects

[021] A vibration reduction device for a gas- insulated switching device according to the present disclosure may have at least one or more of the following effects.

[022] First, in the present disclosure, a pad for absorbing impact may be positioned between a first frame and a second frame, and a bolt penetrating the first frame, the second frame, and the pad may be fastened to the second frame. According to such a configuration, the pad may be accurately positioned between the first frame and the second frame and may absorb an impact. Accordingly, the transmission of the impact between the first frame and the second frame may be blocked, and the impact generated in the gas-insulated switching device may be transmitted to the outside through the ground, thereby preventing vibration from occurring.

[023] In the present disclosure, the bolt penetrating the first frame, the second frame, and the pad may be screw-fastened to the second frame, so that the relative distance between the first frame and the second frame may be adjusted by rotation of the bolt. Accordingly, when the second frame is raised relative to the first frame by rotating the bolt while being supported by a jack-up block installed in the first frame, the pad positioned between the first frame and the second frame may be easily replaced.

[024] Further, in the present disclosure, a penetrating portion formed in the pad and through which the bolt penetrates may be formed at an edge of the pad so that one side thereof may be opened. As the penetrating portion is opened to one side of the pad, the pad may be easily replaced by adjusting the distance between the first frame and the second frame with the bolt.

[025] In addition, the jack-up block installed in the first frame may be fastened to the end of the bolt so that the distance between the first frame and the second frame may be greater than the height of the pad. In this way, when the first frame and the second frame on which the gas-insulated switching device is installed are transported, the pad may be transported in a state in which the pad is not subjected to an external force by the first frame and the second frame.

Description of Drawings

[026] FIG. 1 is a front view showing a configuration in which a general gas-insulated switching device is supported.

[027] FIG. 2 is a perspective view showing an important part of a preferred embodiment of a vibration reduction device for gas-insulated switching device according to the present disclosure.

[028] FIG. 3 is a schematic cross-sectional view showing a configuration of a preferred embodiment of the vibration reduction device shown in FIG. 2.

[029] FIG. 4 is a perspective view showing a state in which a distance between a first frame and a second frame is maintained in the vibration reduction device of the present disclosure.

[030] FIG. 5 is a cross-sectional view showing a configuration corresponding to FIG. 4.

[031] FIG. 6 (a) and (b) are perspective views showing various modifications of pads that may be used in the embodiment of the present disclosure.

[032] FIG. 7 (a), (b), and (c) are perspective views showing various modifications of pads that may be used in the embodiment of the present disclosure.

[033] FIG. 8(a) is a perspective view showing the configuration of a jack-up block used in the present disclosure.

[034] FIG. 8(b) is a front view showing a configuration of the jack-up block used in the present disclosure.

Mode for Disclosure

[035] Hereinafter, some embodiments of the present disclosure will be described in detail with reference to exemplary drawings. In assigning reference numerals to the components of each drawing, it should be noted that the same components are given the same reference numerals as much as possible even though the same components are indicated on different drawings. In addition, in describing the embodiment of the present disclosure, if it is determined that a detailed description of a related known configuration or function interferes with the understanding of the embodiment of the present disclosure, the detailed description thereof will be omitted.

[036] In addition, in describing the components of the embodiment of the present disclosure, terms such as first, second, A, B, (a), (b), etc. may be used. These terms are only used to distinguish between the components, and the nature, or order of the components are not limited by the terms. When a component is described as being "combined with", "coupled to" or "connected to" another component, the component may be directly connected to or combined with each other, but it should be understood that another component may be "connected to", "coupled to" or "combined with" each of the components therebetween.

[037] A preferred embodiment of a vibration reduction device of the present disclosure will be described with reference to the drawings. First, FIGS. 2 to 5 illustrate only important parts of the device of the present disclosure, and the configuration of a gas-insulated switching device is omitted for convenience, and only a part of a first frame 30 and a second frame 40 are illustrated.

[38] The first frame 30 is seated on the ground. In the illustrated embodiment, a cross part thereof may have a shape in which the letter 'H' is rotated by 90 degrees as shown in FIG. 2. In the first frame 30, a first lower plate 33 may be positioned at a lower end of the plate-shaped first support plate 31. The first lower plate 33 may be seated on the ground. The first lower plate 33 and the first support plate 31 may be formed orthogonal to each other. A first upper plate 35 may be positioned at an upper end of the first support plate 31. The first upper plate 35 may be parallel to the first lower plate 33. The first support plate 31, the first lower plate 33, and the first upper plate 35 may be formed to extend long. In the drawings, only a part of the first frame 30 is illustrated.

[039] A first through hole 37 may be formed by penetrating one portion of the first upper plate 35 of the first frame 30. The first through hole 37 is a portion through which a bolt body

64 of a bolt 60 to be described below may pass. The inner diameter of the first through hole 37 may be the same as or slightly larger than an outer diameter of a collar 70 to be described below.

[040] The second frame 40 may be installed at a predetermined distance from the first frame 30 in a state where a pad 50 to be described below is positioned on the first frame 30. A distance between the first frame 30 and the second frame 40 may be maintained by the pad 50.

[041] The configuration of the second frame 40 may also be the same as or similar to that of the first frame 30. In the drawings of the present disclosure, the configuration of the first frame 30 and the second frame 40 is similarly drawn. A gas-insulated switching device may be installed directly or indirectly on the second frame 40. The second frame 40 may have a second support plate 41, and a second lower plate 43 may be formed orthogonal to a lower portion of the second support plate 41. A second upper plate 45 may be positioned parallel to the second lower plate 43 and orthogonal to the upper end of the second support plate 41.

[042] On the second lower plate 43 of the second frame 40, there may be a fastener 47 at a position corresponding to the first through hole 37 formed in the first upper plate 35 of the first frame 30. A second through hole 47' may be formed by

penetrating the fastener 47 and the second lower plate 43. The bolt body 64 of the bolt 60 to be described below may also penetrate the second through hole 47'. A screw portion 48 may be formed on the inner surface of the second through hole 47' formed through the fastener 47 and the second lower plate 43. As another example of the fastener 47, a kind of nut may be used as the fastener 47. That is, the second through hole 47' is formed through the second lower plate 43, and the fastener 47, which is a nut, may be coupled to the second lower plate 43 concentrically with the center of the second through hole 47'.

[043] A pad 50 may be positioned between the first frame 30 and the second frame 40. The pad 50 may block an impact from being transmitted between the first frame 30 and the second frame 40. The pad 50 may be made of an impact absorbing material, for example, a material having elasticity. A penetrating portion 52 may be formed by vertically penetrating the pad 50. The penetrating portion 52 may be formed at a position corresponding to the first through hole 37 and the second through hole 47'. The bolt body 64 of the bolt 60 to be described below may be disposed in the penetrating portion 52.

[044] The penetrating portion 52 formed in the pad 50 may be formed at various positions of the pad 50. FIG.6 and 7 show various modified examples of the pad 50 having various positions

and numbers of the penetrating portion 52. In FIG. 6(a), the penetrating portion 52 is formed to penetrate vertically at one edge of the hexahedral pad 50 and to be opened to one side surface of the pad 50. When the penetrating portion 52 is formed in this way, it may not be necessary to separate the bolt 60 to be described below from the first frame 30 and the second frame 40 when replacing the pad 50.

[045] In FIG. 6 (b), the penetrating portion 52 is additionally formed on the opposite side surface of the pad 50. In this case, the first frame 30 and the second frame 40 may be coupled by using two bolts 60. In this case, when replacing the pad 50, at least one of the two bolts 60 must be separated from the first frame 30 and the second frame 40. As another example, although not shown in the drawings, the two penetrating portions 52 may be formed at adjacent edges of the pad 50. In this case, the pad 50 may be replaced without removing the bolt 60 from the first frame 30 and the second frame 40.

[046] FIG. 7 (a) and (b) show a modified example in which the penetrating portion 52 is formed at an edge of the hexahedral pad 50. In FIG. 7(a), there is one penetrating portion 52, and in FIG. 7(b), two penetrating portions 52 are formed at adjacent corners. In this case, the pad 50 may be replaced without separating the bolt 60 from the first frame 30 and the second

frame 40.

[047] In Fig. 7(c), the penetrating portion 52 is formed by vertically penetrating the center of the pad 50. In this case, the pad 50 may be replaced only when the bolt 60 is separated from the first frame 30 and the second frame 40.

[048] A bolt 60 may be disposed to fasten the first frame 30 and the second frame 40 to each other at the position where the pad 50 is located. The bolt 60 may include a bolt head 62 and a bolt body 64. A screw portion may be formed on the outer surface of the bolt body 64 to be fastened to the screw portion 48 of the fastener 47. In the bolt body 64, the opposite end of the bolt head 62 penetrates the first through hole 37 formed in the first upper plate 35 of the first frame 30 to be fastened to nuts 67 and 68.

[049] An insulating washer 66 and a flat washer 66' may be positioned between the nut 67 and the lower surface of the first upper plate 35. The insulating washer 66 may be in close contact with the lower surface of the first upper plate 35 by the flat washer 66'. The insulating washer 66 may also serve to block an impact transmission. The insulating washer 66 may be made of a material capable of absorbing an impact.

[050] The nuts 67 and 68 are not necessarily used in two, but the use of the two nuts 67 and 68 may prevent the nut 67

from being loosened. A spring washer may be further installed between the nuts 67 and 68.

[051] Meanwhile, a collar 70 may surround a portion of the bolt body 64 of the bolt 60 positioned in the penetrating portion 52 of the pad 50. The collar 70 may serve to prevent external impact from being transmitted between the first frame 30 and the second frame 40 through the bolt body 64. The collar 70 may be made of a material capable of absorbing an impact. The collar 70 may have a function to block an impact from being transmitted by contacting the bolt body 64 of the bolt 60 with surrounding components. The collar 70 may surround at least a portion of the bolt body 64. This is because even if the collar 70 surrounds only a part of the bolt body 64, direct contact between the peripheral parts and the bolt body 64 may be prevented, thereby blocking the impact transmission.

[052] A jack-up block 80 may be positioned on the first lower plate 33 of the first frame 30 so as to be coupled to the front end of the bolt body 64 of the bolt 60. The jack-up block 80 may be used when lifting the second frame 40 to be spaced apart from the pad 50 or when transporting the entire device.

[053] In the present embodiment, the jack-up block 80 may have a column shape. A fastening hole 82 may be formed to be opened to an upper surface of the jack-up block 80. A screw

portion 84 coupled to the screw portion formed on an outer surface of the bolt body 64 may be formed on an inner surface of the fastening hole 82. The jack-up block 80 may have a hexahedron shape or may have various shapes. The jack-up block 80 may be fastened to the bolt body 64 and integrally rotated with the bolt 60 to adjust a distance between the first frame 30 and the second frame 40, more specifically, between the first upper plate 35 and the second lower plate 43.

[054] The direction in which the jack-up block 80 is fastened to the bolt body 64 may be opposite to the direction in which the bolt 60 is tightened to the fastener 47 of the second frame 40. In this way, when the jack-up block 80 is rotated together with the bolt 60, the fastening between the jack-up block 80 and the bolt 60 may not be released.

[055] When the jack-up block 80 is rotated together with the bolt 60, in order to reduce friction with the first frame 30, the center of the lower surface of the jack-up block 80 may be flat 86 and the edge of the lower surface may be curved 88. This allows the flat surface 86 to provide a minimum area in which the jack-up block 80 may stably stand on the first frame 30, and the curved surface 88 may not contact the first frame 30, thereby minimizing frictional force.

[056] Hereinafter, the vibration reduction device for gas-

insulated switching device according to the present disclosure having the above-described configuration will be described as being used, installed, and transported.

[057] The configuration in the case where the vibration reduction device of the present disclosure is installed in a substation, for example, is shown in FIGS. 2 and 3. As shown here, the second frame 40 on which the gas-insulated switching device is installed may be installed on the first frame 30 seated on the ground with the pad 50 interposed therebetween. Here, a plurality of the pads 50 may be dispersed and positioned at various locations. Accordingly, the impact generated by the gas-insulated switching device may be absorbed by the pad 50 without being transmitted from the second frame 40 to the first frame 30.

[058] It will be described that the bolt 60 is fastened at a portion where the pad 50 is positioned. The bolt body 64 of the bolt 60 is installed through the fastener 47 so as to penetrate the second through hole 47' of the second frame 40. The bolt body 64 penetrates the second through hole 47', the penetrating portion 52 of the pad 50, and the first through hole 37, such that the front end of the bolt body 64 is positioned between the first upper plate 35 and the first lower plate 33.

[059] In this state, the collar 70 is installed close to

the bolt body 64. The collar 70 may be installed by being lightly press-fitted into the bolt body 64. The collar 70 is inserted through the first through hole 37 formed in the first upper plate 35 of the first frame 30 to surround the bolt body 64.

[060] Next, when the insulating washer 66 and the flat washer 66' are installed and the nuts 67 and 68 are sequentially fastened, the state of FIGS. 2 and 3 may be obtained. In such a state, the gas-insulated switching device may be operated.

[061] Meanwhile, it will be described that the second frame 40 is slightly lifted apart from the pad 50. The nuts 67 and 68 are released, and the insulating washer 66 and the flat washer 66' are removed. Next, the bolt 60 is rotated with respect to the fastener 47 of the second frame 40, such that the bolt 60 is raised with respect to the second frame 40.

[062] When the bolt 60 is raised as a whole to secure a space for installing the jack-up block 80 between the front end of the bolt body 64 and the first lower plate 33, the jack-up block 80 is positioned on the first lower plate 33, and the front end of the bolt body 64 is fastened to the fastening hole 82.

[063] When the bolt 60 is rotated in this state, the jack-up block 80 and the bolt 60 are integrally rotated, and when the bolt 60 is continuously rotated in a direction tightened to the

fastener 47 while the jack-up block 80 is supported on the first lower plate 33, the second frame 40 may be relatively lifted. As the second frame 40 is lifted as described above, a gap is created between the pad 50 and the second frame 40, and the pad 50 may be removed between the second frame 40 and the first frame 30. Next, the pad 50 may be replaced. Such operations may be sequentially performed at positions where each pad 50 is installed.

[064] Meanwhile, while the pad 50 is positioned between the first frame 30 and the second frame 40, the first frame 30 and the second frame 30 may be transported together in a state where a distance between the first frame 30 and the second frame 40 is maintained greater than a height of the pad 50 by using the jack-up block 80. The transportation in such a state may be performed without causing damage to the pad 50 by an external force.

[065] Even though it has been described that all components constituting the embodiments of the present disclosure are combined into one or operated in combination with each other, the present disclosure is not necessarily limited to the embodiments. That is, within the scope of the objective of the present disclosure, all the components may be selectively combined into at least one and operated. In addition, the terms

such as "include", "consist of", or "have" described above mean that the corresponding component may be present unless otherwise stated, and thus should be construed that the terms do not exclude other components, but may further include other components. All terms, including technical or scientific terms, have the same meaning as commonly understood by those skilled in the art to which the present disclosure belongs, unless defined otherwise. Generally used terms, such as terms defined in the dictionary, should be interpreted as being consistent with the contextual meaning of the related art, and should not be interpreted in an ideal or excessively formal meaning unless explicitly defined in the present disclosure.

[066] The above description is merely illustrative of the technical idea of the present disclosure, and those skilled in the art to which the present disclosure belongs may perform various modification and changes within the scope not departing from the essential characteristics of the present disclosure. Accordingly, the embodiments disclosed in the present disclosure are not intended to limit, but to explain the technical idea of the present disclosure, and the scope of the technical spirit of the present disclosure is not limited by these embodiments. The scope of protection of the present disclosure should be interpreted by the claims below, and all technical spirits within the scope equivalent to the scope of the claims should

be interpreted as being included in the scope of the claims of the present disclosure.

CLAIMS

1. A vibration reduction device for gas-insulated switching device comprising:

a first frame seated on the ground;

a pad seated on the first frame and configured to absorb vibration;

a second frame positioned on the pad and having a gas-insulated switching device mounted thereon; and

a bolt penetrating the second frame and fastened relatively movable to the second frame, and the bolt penetrating the pad and the first frame to be fastened to a nut.

2. The vibration reduction device of claim 1, wherein the second frame is provided with a fastener having a screw portion formed on an inner surface thereof so that the bolt passes through to be fastened.

3. The vibration reduction device of claim 2, wherein a first through hole is formed in the first frame at a position corresponding to the fastener of the second frame so that the bolt passes therethrough.

4. The vibration reduction device of claim 3, wherein the bolt includes a bolt head and a bolt body, and a collar made of a material for absorbing impact is installed in a portion of the bolt body positioned within the pad.

5. The vibration reduction device of claim 4, wherein the collar is configured to surround the bolt body.

6. The vibration reduction device of claim 1, wherein as the nut is fastened to the bolt, an insulating washer is installed on the bolt so as to be in close contact with the first frame.

7. The vibration reduction device of claim 6, wherein a plurality of nuts are used.

8. The vibration reduction device of any one of the claims 1 to 7, wherein a jack-up block is fastened to a front end of the bolt body of the bolt while being supported by the first frame, and

Wherein while the jack-up block and the bolt rotate integrally, the distance between the first frame and the second frame is adjusted.

9. The vibration reduction device of claim 8, wherein the center of the lower surface of the jack-up block is formed of a flat surface, and the edge of the lower surface of the jack-up block is formed of a curved surface.