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(54) **ADAPTING DEVICE FOR AN ARC EXTINGUISHING TOOL THAT ALLOWS DISCONNECTING CIRCUITS THAT DO NOT HAVE THE OPENING SUPPORT**

(57) The present invention relates to an adapting device to be used together with an arc extinguisher, allowing safe opening of circuit breakers do not have retention hooks for said arc extinguisher.

FIELD: Electrical and mechanical engineering industry, in particular maintenance and repair operations for electricity distribution lines and mechanical devices that enable safety during operation.

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Description

TECHNICAL FIELD OF THE INVENTION

[0001] The invention is related to the operation in electric power distribution lines, particularly with mechanical devices that enable safety during maintenance or repair work in these distribution lines.

BACKGROUND OF THE INVENTION

[0002] Among the electric power distribution networks, the usage of circuit breakers is required to protect the equipment connected to the network from overload. During the maintenance or repair processes, these circuit breakers should be open to interrupt the flow of electricity and allow safe intervention of the equipment. This opening requires, according to the regulations, the use of an arc extinguishing tool (load break switch) to certify the safety of both the operator and the network equipment:

"19.1 Switching

[0003] (...) *The opening of load breakers that may cause arcs that endanger the safety of the operator or equipment is prohibited, unless arc-extinguish equipment is used.*"¹

¹ Ministry of Energy and Mines, Resolution No. 18 1294 August 6, 2008, RETIE

[0004] **"Article 64.** *Operation of elements unloaded elements. Circuit breakers, break switches or blades should operate without charge, for which the de-energizing of the circuit must be requested. If this is not possible, they must be operated using equipment that extinguishes the arc*".²

² Ministry of Social Protection, Resolution No. 001348 of 2009, Title IV Distribution, Chapter I, Preventive measures - electricity distribution

[0005] Within the technical field of the invention, the most commonly used arc-extinguishing tool or load break switch is Loadbuster® which extinguishes the arc for a great number of devices such as load breaks, short-circuits, potency fuse or limiting fuses.

[0006] However, there are technical specifications that these devices must meet so that the use of such Loadbuster is possible³:

³ S&C ELECTRIC COMPANY, Descriptive Bulletin 811-30S, May 12, 2003.

[0007] "This is what you should look for when selecting a break switch, circuit breaker, power fuse or limiting fuse to be operated with the Loadbuster:

- There should be a hook at the top end (clamp) of the device, which could hook the Loadbuster anchor; and a pull-ring at the load break blade or fuse tube of the device that can be easily locked with the hook for the pullshot of the Loadbuster and stay engaged with the pull-ring latch.

- The device must be mechanically coordinated with the Loadbuster's operating sequence such that (a) Hooking the Loadbuster does not cause nor allow the load break blade or fuse tube to prematurely open and (b) The fixing hook maintains the Loadbuster effectively anchored until the shot occurs, while (c) allowing quick removal of the Loadbuster either if the opening stroke is completed or if for any reason the device being sectioned has been restored after a partial (or incomplete) opening.

- The device must be easy to handle in an effective manner with the Loadbuster from all practical angles and directions and in all mounting positions for which the device is designed, keeping to a minimum the mechanical requirements "

[0008] However, in Colombia, many of the circuit breakers currently installed within the distribution network do not have all these features and in particular, do not have a fixing hook or latching device (clamp) that allows the coupling the arc extinguisher to the Loadbuster and thus its opening cannot be made following safety standards.

[0009] The replacement of these fuses with devices including the retention hooks is costly and involves a great amount of time; thus, such replacement is not viable.

[0010] Consequently, there is within the state of the art the need for an adapting device that acts as a bridge between the Loadbuster arc extinguisher and the circuit breaker without retention hooks so that maintenance and repair operations for the equipment of the network can be performed even in this type of circuit breakers.

[0011] In this sense, the present invention provides a novel adapting device that enables safe and efficient use of the Loadbuster even in circuit breakers that do not have retention hooks.

BRIEF SUMMARY OF THE INVENTION

[0012] The invention provides a mechanical device acting as an adapter for the Loadbuster and enables the opening of circuit breakers that are do not have opening support, which engages the Loadbuster to the circuit breaker disconnection mechanism.

[0013] Said device of the invention enables the conduction of electricity discharged through the Loadbuster, leading to the obtainment of efficient arc extinction and therefore, ensure safe operation.

[0014] Likewise, when the device is installed in the Loadbuster, contact with the power line occurs by means of a conducting bar that enables the passage of electricity, and once positioned, the Loadbuster normally attaches to the rim of the cane and may tug the whole system to disconnect the electrical circuit.

BRIEF DESCRIPTION OF THE FIGURES

[0015]

Figure 1 corresponds to the Loadbuster® commercial arc extinguisher.

Figure 2 shows a circuit breaker having retention hooks to engage the arc extinguisher.

Figure 3 corresponds to the coupling of the Loadbuster arc extinguisher to said circuit breaker and operation with the pole for the opening of the circuit breaker.

Figure 4 shows a circuit breaker that has no retention hooks for hooking the arc extinguisher.

Figure 5 corresponds to the adapting device of the invention.

Figure 6 shows a side view of said adapter.

Figure 7 is a top view of the adapting device of the invention.

Figure 8 shows the adapting device of the invention coupled to the Loadbuster arc extinguisher.

Figure 9 corresponds to the configuration of the adapting device of the invention coupled to the Loadbuster in use on a pole.

DETAILED DESCRIPTION OF THE INVENTION

[0016] During the operation of electricity distribution networks, it is necessary to cut the power when performing maintenance or repair works on the equipment connected to the network. Said equipment has circuit breakers that protect from overload and allow said power cut for the operation of the network, with the cane-like circuit breakers being the most commonly used circuit breakers.

[0017] For the opening of the circuit breaker, regulations require that in order to protect the operator and the equipment, this should be done using an arc extinguisher or a load break switch, which is commercially known as Loadbuster®.

[0018] This Loadbuster engages a pole and it is manipulated for opening the circuit breaker; however, said circuit breaker must meet a number of technical features, mainly to have a fixing hook that allows hooking the Loadbuster.

[0019] This proves to be a drawback, since a large number of circuit breakers currently installed in the medium voltage network in Colombia do not have such retention hooks making it impossible to safely open these circuit breakers. Also, given the large number of such circuit breakers within the network, their replacement with

circuit breakers including said retention hooks due to the high costs and additional operating times involved.

[0020] In this sense, the present invention provides a novel solution to this problem by providing an adapting device that acts as a bridge between the circuit breaker and the Loadbuster arc extinguisher, and enables the safe operation in distribution networks regardless if the circuit breakers do not have hooks for the Loadbuster coupling.

10 [0021] Figure 1 shows the Loadbuster® commercial arc extinguisher that is commonly used within the circuit breaker opening, which has on its top a hinged latch which engages with the retaining hooks of the circuit breaker. On the other hand, Figure 2 shows a circuit breaker suitable for coupling with the Loadbuster arc extinguisher.

15 [0022] Figure 2 illustrates that the cane-like circuit breaker suitable for coupling with the Loadbuster has two hooks at the top of the fuse tube, which, as seen in Figure 3, allow coupling with the Loadbuster and, as a result of the force made on the pole, secure opening of the circuit breaker is achieved.

20 [0023] Contrary to this, and as shown in Figure 4, a large number of circuit breakers already installed in the distribution network, although being cane-like, do not have the aforementioned fastening hooks at the top of the fuse tube which renders impossible the coupling with the Loadbuster and thus the safe opening of the circuit breaker.

25 [0024] Figure 5 shows an adapting device of the invention, which is designed to couple in a firm and secure manner the Loadbuster arc extinguisher and to enable engagement and opening of the cane.

30 [0025] Said adapting device of the invention is formed by fastening means which allow the coupling to the Loadbuster, a movable arm which enables the mechanical displacement of the adapter and two rods attached to said arm, the first being a contact rod (10) and the second a guide rod (11).

35 [0026] As will be evident from Figure 6, in a preferred embodiment of the invention the retention means comprise a press (1) inserted into a clamp (2) which has a threading system (3) that allows adjustment.

40 [0027] These fasteners allow the adapter to be located on right or left position in the structural part of the Loadbuster's articulated hitch.

45 [0028] In a preferred embodiment of the invention on the press (1) a strip (8) is fixed by means of a fastening screw (9), said strip allows the electrical contact between the adapting device and the "Loadbuster" arc extinguisher equipment.

50 [0029] Moreover, in a preferred embodiment of the invention, the movable arm (7) is L-shaped with a degree of tilt between 0° and 120°, which arm is attached to the press (1) by means of a pin (6) and is adjusted by means of two retaining rings (5).

[0030] Said movable arm (7) has two holes in which the guide rod (11) is first inserted and the contact rod

(10) is then inserted, which rods are fastened to the movable arm (7) by means of knobs (12) as shown in Figure 7.

[0031] The guide rod (11) allows securing the location of the system to the electric point, so as to accurately perform the operation with the pole of Loadbuster coupled to the device of the invention.

[0032] In turn, the contact rod (10) is located in the power line, allowing the passage of current and thus ensuring the proper functioning of the Loadbuster arc extinguisher.

[0033] In this manner, in a preferred embodiment of the invention the contact rod (10) has a rounded end, more particularly a semi-sphere has coupled at its outer end that allows reaching the end point of displacement of the contact rod when opening the circuit breaker. Also, this end facilitates the adjustment of the contact rod to the guide rod.

[0034] In a preferred embodiment, the contact bar (10) is made of an electricity conductive material, for example steel.

[0035] Similarly, the mobile arm (7), the press (1) and the clamp (2) are made of an electricity conductive material, preferably the mobile arm (7) is made of steel and the press (1) and clamp (2) are made of aluminum.

[0036] Figure 8 shows the coupling of the adapting device of the invention to the arc extinguisher Loadbuster. As shown in said figure, the press and the clamp hold the articulated Loadbuster latch, and this engagement is secured with the threaded system (3).

[0037] Figure 9 shows the adapting device of the invention already coupled to the Loadbuster on a pole, and the use of such coupled device for opening the cane of a circuit breaker that has not gripping hooks.

[0038] Once the guide rod (11) and the contact rod (10) are located on the upper rear part of the circuit breaker, the adapting device of the invention enables manipulation for opening the cane in a safe manner, in a similar way as would occur if these circuit breakers would have gripping hooks, also ensuring proper operation of the Loadbuster arc extinguisher, since once the coupling between the adapting device of the invention and the Loadbuster is positioned, the latter is normally attached to the rim of the cane and it is possible to pull the whole system to disconnect the electric circuit.

[0039] Although a particular embodiment of the invention has been disclosed in detail for illustrative purposes, it will be recognized that variations or modifications to the embodiment fall within the scope of the present invention.

Claims

1. Adapting device that acts as a bridge between an arc extinguisher and a circuit breaker, said device **characterized in that** it comprises: fastening means to the arc extinguisher, a movable arm (7), a guide rod (11) and a contact rod (10); wherein the movable

arm (7) supports said guide rod (11) and contact rod (10), said contact rod (10) makes contact with the power line and said guide rod (11) allows the location of the adapter to the electrical point and wherein said adapter is designed to allow safe opening of the circuit breaker by means of a pole.

2. The device of claim 1 wherein the fastening means comprises a press (1) inserted into a clamp (2) which has a threading system (3) that allows adjustment.
3. The device of any of the preceding claims, wherein on the press (1) a strip (8) is fixed by a means of a retention screw (9), wherein said strip allows the electrical contact between the adapting device and the arc extinguisher equipment.
4. The device of any of the preceding claims, wherein the movable arm (7) is connected to the press (1) by means of a pin (6) and is adjusted by means of two retaining rings (5).
5. The device of any of the preceding claims, wherein the movable arm (7) is L-shaped with a degree of inclination between 0° and 120°.
6. The device of any of the preceding claims, wherein said movable arm (7) has two holes in which the guide rod (11) and the contact rod (10) are inserted.
7. The device of any of the preceding claims, wherein the guide rod (11) and the contact rod (10) are fastened to the movable arm (7) by means of knobs (12).
8. The device of any of the preceding claims, wherein the contact bar (10) has a rounded end.
9. The device of claim 8, wherein the rounded end is a semi sphere.
10. The device of any of the preceding claims, wherein the contact bar (10), the movable arm (7), the press (1) and the clamp (2) are made of electricity conductive materials.

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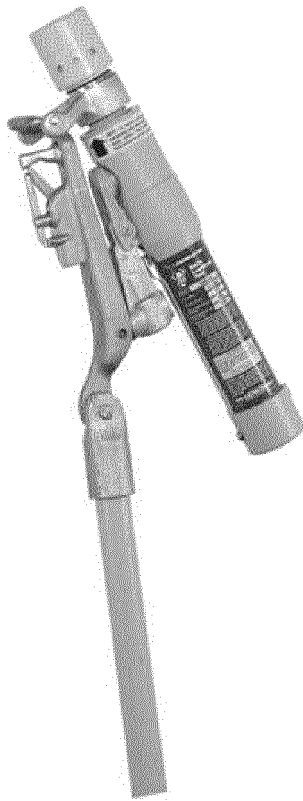


FIG. 1



FIG. 2



FIG. 3

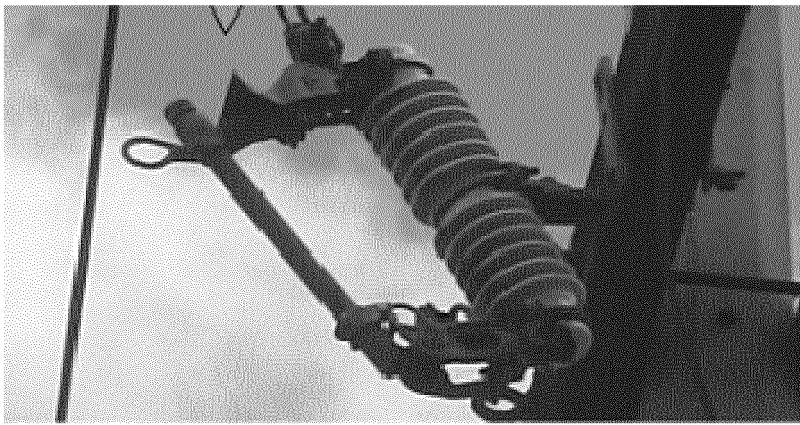


FIG. 4

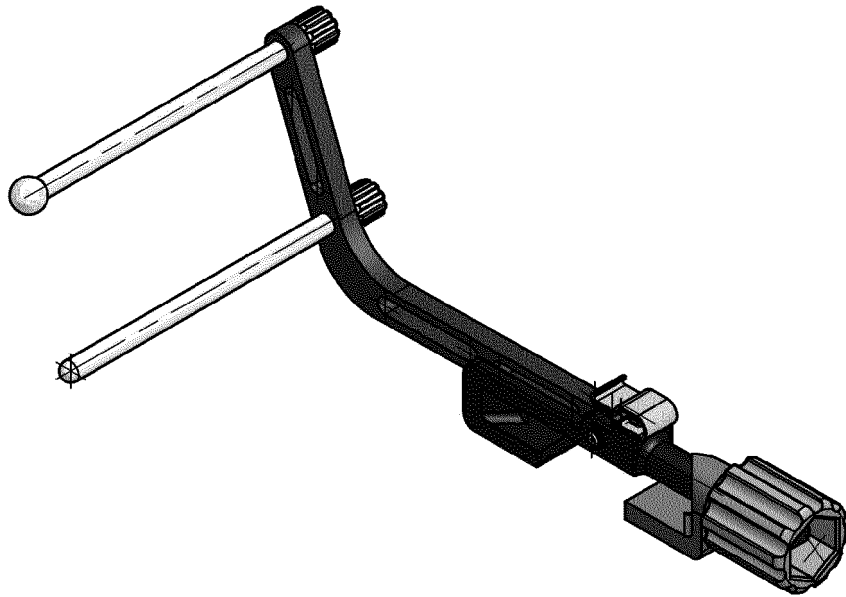


FIG. 5

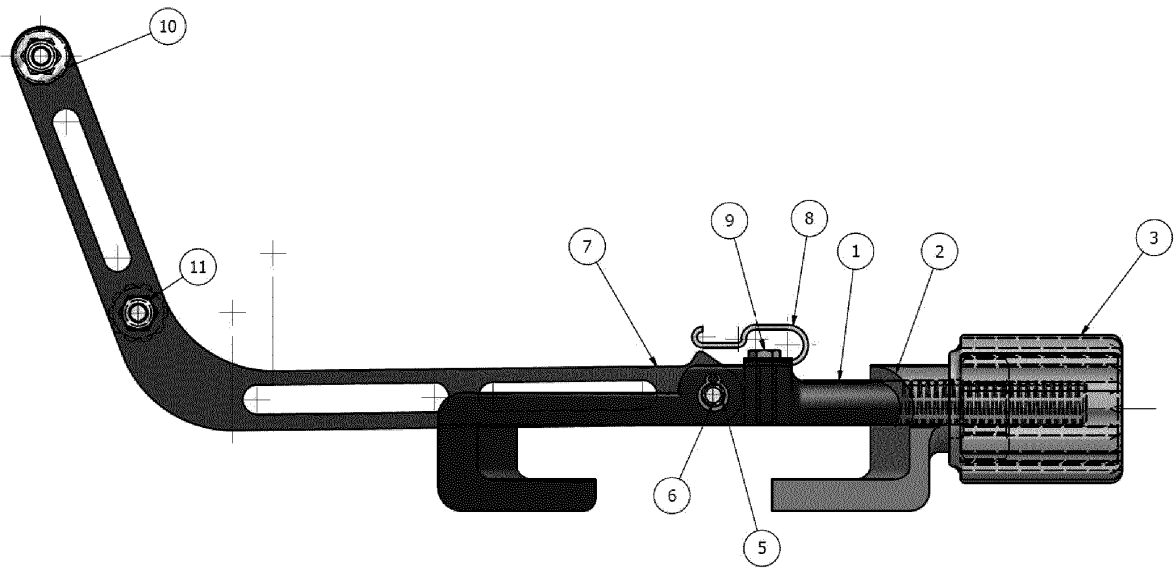


FIG. 6

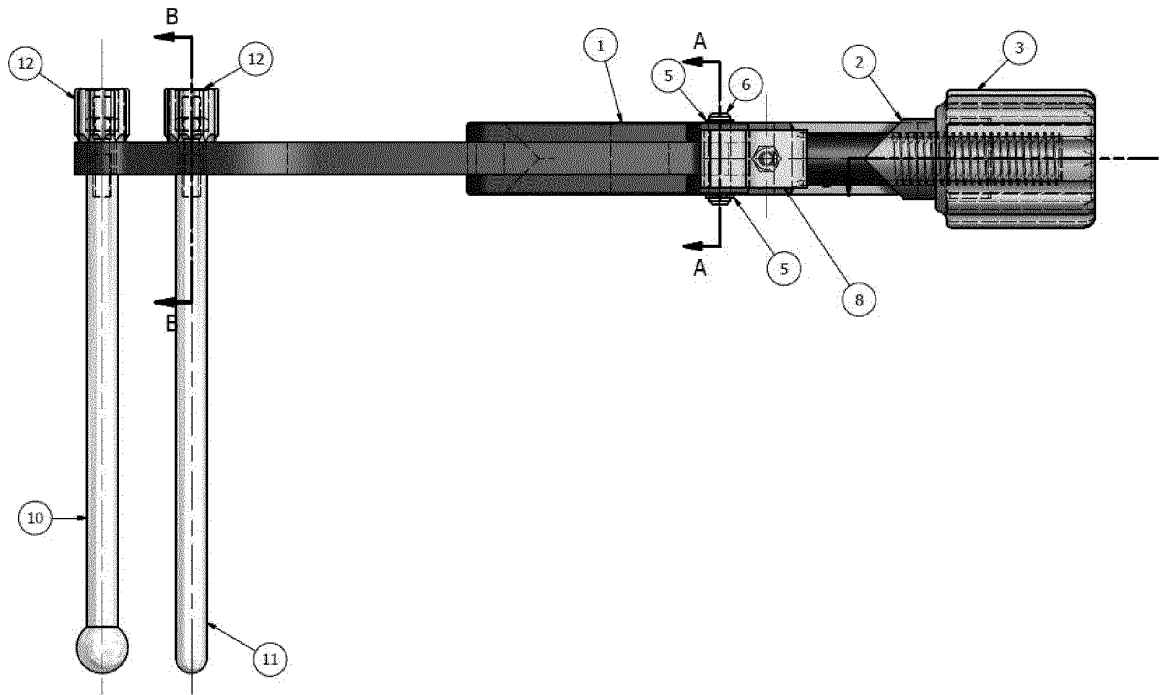


FIG. 7



FIG. 8



FIG. 9

REFERENCES CITED IN THE DESCRIPTION

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Non-patent literature cited in the description

- Ministry of Energy and Mines, Resolution No. 18 1294, 06 August 2008 **[0003]**
- Title IV Distribution. Ministry of Social Protection, Resolution No. 001348. 2009 **[0004]**
- Descriptive Bulletin 811-30S. S&C ELECTRIC COMPANY, 12 May 2003 **[0006]**