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(54) Benævnelse: **BOMMONTERBAR AFBRYDER OG FREMGANGSMÅDER TIL ANVENDELSE DERAF**

(56) Fremdragne publikationer:
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US-A- 5 538 207
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DESCRIPTION

Description

FIELD OF INVENTION:

[0001] This disclosure generally relates to overhead power transmission lines. In particular, the disclosure relates to a boom mountable breaker and methods of using same for working on overhead power transmission lines.

BACKGROUND:

[0002] Electric power transfer systems use one or more phases of conductors to transfer electric current within a grid. The conductors may be used for bulk transmission from a power generating plant to centers of high demand and for distribution within the centers of high demand. The conductors are supported above the ground by support structures, including towers, which are usually of metal lattice construction, and poles, which may be of wood, cement or steel (collectively referred to herein as support structures).

[0003] Over time one or more parts of the electric power transfer system may require maintenance or the installation of new equipment. For example, one or more sections of the conductors may require repair or replacement. One or more of the support towers may also require repair or replacement. Additionally, new equipment, such as sub-stations may be added to the system. For the safety of workers and equipment, the flow of electrical current is often shut off before maintenance, construction or other operations are performed.

[0004] Document US2005/133244A1 relates to HV power transfer system. In particular Fig.30-31 disclose an electrical circuit breaker mounted on a boom. The device comprises a platform on which three insulators are disposed with their lower ends connected to the platform. Document US55538207 discloses a telescopic robotic arm for temporarily supporting energized power lines to enable repair or replacement of transmission poles. The robotic arm is connectible to the boom of a service vehicle and is operable by remote control.

SUMMARY:

[0005] According to the present invention, there is provided a boom mountable breaker system as claimed in claim 1. According to the present invention, there is provided a method as claimed in claim 5.

[0006] The present invention may allow for a safer and quicker interruption of electrical transmission by positioning the breaker proximal to the energized conductor. For example, electrical connection of the breaker to the energized conductor requires shorter lengths of conductive connecting wires, which are easier to handle safely in comparison to wires that extend to the surface below the energized conductor. Furthermore, shorter lengths of conductive connecting wires may be more easily handled in a safe manner when they are disconnected from the energized conductor.

BRIEF DESCRIPTION OF DRAWINGS:

[0007] Various examples of the apparatus are described in detail below, with reference to the accompanying drawings. The drawings may not be to scale and some features or elements of the depicted examples may purposely be embellished for clarity. Similar reference numbers within the drawings refer to similar or identical elements. The drawings are provided only as examples and, therefore, the drawings should be considered illustrative of the present invention and its various aspects, embodiments and options. The drawings should not be considered limiting or restrictive as to the scope of the invention.

Figure 1 is front elevation view of an example support tower for supporting conductors and static wires of an overhead power line system.

Figure 2 is the diagrammatic, side elevation view of two example support towers that support a conductor therebetween and form a section of the overhead power line system of Figure 1.

Figure 3 is the diagrammatic, side elevation view of Figure 2 showing the installation of a jumper line.

Figure 4 is the diagrammatic, side elevation view of Figure 3 showing the installation of an electrically insulated inline opener.

Figure 5 is the diagrammatic, side elevation view of Figure 4 showing the positioning of a first boom mounted breaker below the jumper line.

Figure 6 is the diagrammatic, side elevation view of Figure 5 showing the connecting of the conductor to the first boom mounted breaker, with the breaker in an open position.

Figure 7 is the diagrammatic, side elevation view of Figure 6 showing the first boom mounted breaker in a closed position.

Figure 8 is the diagrammatic, side elevation view of Figure 7 showing the removal of the jumper line.

Figure 9 is the diagrammatic, side elevation view of Figure 8 showing the first boom mounted breaker in the open position for de-energizing a downstream portion of the conductor.

Figure 9a is an enlarged view of a portion of Figure 9.

Figure 10 is the diagrammatic, side elevation view of Figure 9 showing the first boom mounted breaker removed from the section of the overhead power line system.

FIG. 11 is the diagrammatic, side elevation view of the section of the overhead power line system of FIG. 4 showing the connecting of the conductor to the second boom mounted breaker, which is in an open position.

FIG. 12 is the diagrammatic, side elevation view of FIG. 11 showing the second boom mounted breaker in a closed position.

FIG. 13 is the diagrammatic, side elevation view of FIG. 12 showing the removal of the jumper line.

FIG. 14 is the diagrammatic, side elevation view of FIG. 13 showing the second boom mounted breaker in the open position.

FIG. 15 is a side elevation view of the first boom mounted breaker.

FIG. 16 is a side elevation view of the second boom mounted breaker.

DETAILED DESCRIPTION

[0008] FIG. 1 depicts an example support structure 12 that is used in an electric power transfer system 1000. The electric power transfer system 1000 may comprise one or both of transmission systems or distribution systems. Support structures 12 may also be support poles, towers, pylons or other structures all of which are referred to herein collectively as support structures. The support structure 12 is depicted as comprising two support poles 11, but this is not intended to be limiting. For example, the support structures 12 may comprise a single support pole, multiple support poles, latticed support towers or combinations thereof, as would be known to one skilled in the art. The support structure 12 has a cross arm 14 that supports an insulator or insulators 16 from which a conductor 20 is supported.

[0009] FIG. 1 depicts three phases of conductors 20; namely, conductors 20A, 20B, and 20C. Each conductor 20 is supported by at least one corresponding insulator 16 and each conductor 20 may or may not be energized with flowing electric current and/or have a voltage potential. Energized conductors 20 may also be referred to as hot, live or electrified. While FIG. 1 depicts three phases of conductors 20, this is not intended to be limiting, as there may be one, two, three, or more phases of conductors 20. Figure 1 also depicts the three phases as being spaced from one another in a horizontal plane with a single conductor 20 for each phase, this is not intended to be limiting. For example, the overhead power transfer system 1000 may comprise phases that are spaced apart in a vertical or non-vertical plane and each phase may comprise multiple conductors 20.

[0010] When the conductors 20 are energized the conductors 20 conduct high-voltage electricity (for example, above 69 kV or more) for bulk transmission of power from a power plant to both high demand sub-stations and rural sub-stations.

[0011] The support structure 12 may also include an upper portion 15 that supports one or more static lines 18, which may also be referred to as optic lines or shielding lines. Typically, the static lines 18 are not energized. Rather, the static lines 18 provide protection from lighting strikes and, optionally, they may be or include fiber optic cables that are used to transfer optical signals.

[0012] Figure 2 is a side elevation view of a section 10 of the electric power transfer system 1000. The section 10 is depicted, without intending to be limiting, as including two support structures 12A and 12B that support one or more conductors 20 and one or more static lines 18 therebetween. Support structures 12A and 12B may comprise the same features of one or more support poles 11, a cross arm 14, an insulator 16 and an upper portion 15, or not. The section 10 may comprise one or more phases of conductors 20 and one or more static lines 18.

[0013] Arrow "X" indicates the direction that electrical current is being transferred through the section 10, from support structure 12A to support structure 12B. Electric current enters the section 10 first at an upstream end of the section 10 near to the support tower 12A and then exits the section 10 at a downstream end of the section 10, which may be near the support tower 12B. The upstream end of the section 10 may also be referred to as the load end. The distance between the two support towers 12A, B may be in the order of tens of meters to hundreds or thousands of meters.

[0014] Often times it is desired to stop the flow of electric current through the section 10. For example, maintenance operations may be required on the overhead power transfer system 1000 at a portion that is downstream of the section 10 or it may be necessary to install new equipment downstream of the section 10. Therefore, it is desirable to stop the flow of current for the safety of the line workers. Various embodiments of the present invention comprise the use of a circuit breaker to create an alternate circuit for the purpose of stopping the flow of current through the section 10.

[0015] Figure 3 depicts a step of connecting a jumper 22 to the conductor 20 within section 10. The jumper 22, which may also be referred to as a jumper line, and may be rated based upon the ability to conduct the entire current load that is flowing through the section 10. In an alternative option, the jumper 22 may be rated to only conduct a portion of the entire current load that is flowing through the section 10 and more than one jumper 22 may be used. When installed, the jumper 22 is electrically connected to the conductor 20 to define a first alternate circuit 28. The first alternate circuit 28 has an upstream end 28A and a downstream end 28B. Similarly, the jumper 22 has an upstream end 22A and a downstream end 22B. Typically the conductor 20 is energized and, therefore, the jumper 22 can be installed using hot sticks or other live-line techniques. In some instances, however, it may be that the conductor 20 is not energized, for whatever reason, when the jumper 22 is installed and live-line techniques may not be required, keeping in mind that live-line techniques may still be employed if the possibility exists of an induced voltage in the non-energized line. Using techniques known by those skilled in the art, the ends of jumper 22 may be removably installed across where it is desired to install an inline opener 24 in section 10 so that the jumper 22 may subsequently be detached from the conductor 20. The length of jumper 22 may depend upon the physical characteristics of the section 10, such as the distance and terrain between the support structures 12A, B. The length of jumper 22 may also depend upon the electrical characteristics of the section 10, such as the current load and voltage within the section as would be known to one skilled in the art. The jumper 22 must be long enough to allow the installation of the insulated inline opener 24 seen in FIG. 4. Jumper 22 is removably connected using conventional removable connectors such as bolted clamps, etc.

[0016] FIG. 4 shows a step of installing the insulated inline opener 24 on the conductor 20 between the upstream and downstream ends 22A, B of the jumper 22. The insulated inline opener 24 may be made up of one or more dielectric materials such as, but not limited to, a polymer, a blend of multiple polymers, ceramic or a combination thereof. In a preferred embodiment the insulated inline opener 24 is a polymer insulator that prevents the transmission of current load within the section 10.

[0017] When the inline opener 24 is installed on the conductor 20, the entire current load flows through the first jumper 22 around the inline opener 24, such as via the first alternate circuit 28. In addition to providing the first alternate circuit 28, the jumper 22 provides to a worker working in the section 10 a visual cue that the first alternate circuit 28 has been established.

[0018] At high voltages (for example, above 69 kV or more), due to arcing, it may be unsafe to merely disconnect the jumper 22 from the conductor 20 to interrupt current flow or transmission of current load through section 10. Further, given sufficient high voltages, it may even be impossible to directly electrically disconnect the jumper 22 from the conductor 20 due to the arcing.

[0019] FIG. 5 depicts a step of positioning of a first breaker 100, into the section 10, proximal to the conductor 20. It is understood that the first breaker 100 may be positioned below, and/or to the side, substantially level with, laterally of the conductor 20, or adjacent combinations thereof. In a preferred embodiment, the first breaker 100 is positioned close, at a distance not less than the minimum approach distance (MAD), to the conductor 20, so that long lengths of conductive connecting wire (such as for example would be required to reach a circuit breaker positioned on a truck or trailer) are not required to electrically connect the first breaker 100 to the conductor 20. The MAD is well known to those skilled in the art.

[0020] The first breaker 100 is mounted on the distal end of a boom 101, which provides a support for a breaker platform or base 106, that in the illustrated embodiment not intended to be limiting, comprises a lower portion 102, an upper portion 104 and a support base 106. The boom 101 may be connected at one end of the lower portion 102 to a vehicle, such as a truck or trailer (not shown). In one embodiment, the boom 101 may be rotatably connected to the vehicle by a rotating pedestal or other known apparatus. The lower portion 102 may comprise one or more extendible and retractable sections that may be telescopically arranged with each other, for changing the axial length of the boom 101. For example, the length of the lower portion 102 may increase or decrease along a longitudinal axis of the boom 101 (see broken line "Y" in Figure 5). The upper portion 104 may be connected to the lower portion 102, opposite from the vehicle. Preferably, the upper portion 104 is made of, or coated in, a dielectric material. The dielectric material prevents electric current from being conducted along or through the upper portion 104. Optionally, the upper portion 104 may also comprise extendible and retractable sections that move along the longitudinal axis of the boom 101.

[0021] The support base 106 is connected to the distal end of the upper portion 104, opposite to the lower portion 102, for example by means of a boom adaptor 106a. The support base 106 is able to pivot into various positions relative to the longitudinal axis of the boom 101. The first breaker 100 is mounted to the support base 106 so as to be upstanding therefrom.

[0022] The position of the boom 101 may be controlled remotely by an operator. For example, the position of the boom 101 relative to the vehicle can be changed, as can the axial length of the boom 101. Furthermore, the operator can change the position of the support base 106 relative to the upper portion 104. For example, the support base 106 may be rotated by a scissor linkage 107 mounted along boom adaptor 106a. The scissor linkage 107 may include one or more actuators 107a, whose actuation can be selectively controlled hydraulically, or otherwise, acting on the common hinged joint 107b between linkage members 107c, as would be known to one skilled in the art. As will also be appreciated by those skilled in the art, changing the position of the support base 106 relative to the upper portion 104 may be achieved by methods and means that are not limited to the scissor linkage 107. For example, various other pivots, hinges, actuators, telescopic or sliding arrangements or combinations thereof may also be used.

[0023] Positioning of the boom 101 may be controlled by a control system (not shown) which may consist of a hydraulic system (not shown) having hydraulic hoses and valves. For example, the hydraulic system may fluidly connect an auxiliary hydraulic port of the vehicle, the lower portion 102 and the support base 106. The control system may be remotely operated by means of digital radio signals, fiber optic cables, or other suitable insulated control means.

[0024] U.S. Patents 5,538,207 "Boom-mountable Robotic Arm" and US2012175575 entitled "Boom Mountable Robotic Arm" both describe booms that are suitable for use as the boom 101 in the present invention.

[0025] The first breaker 100 can be actuated between a closed position and an open position. When in the closed position the first breaker 100 comprises electrical contacts that are in direct contact with each other and can conduct the electric current that is flowing through the section

10 without generating unacceptable amounts of resistance or heat. When in the open position, the electrical contacts within the first breaker 100 are physically separated and any arcing therebetween has been suppressed so that the first breaker 100 acts as an electrical insulator that does not conduct electric current. Actuation of the first breaker 100 between the closed and open positions is controlled remotely, and may be manually controlled or it may be automatically controlled. In a preferred embodiment, actuation of the first breaker 100 is manually controlled remotely, as seen by way of example in Figure 9, by the operator to permit or stop the flow of current through the first breaker 100 as desired.

[0026] Figure 5 and corresponding magnified views provided in Figures 9a and 15 each depict one embodiment of the first breaker 100 that comprises a boom-mounted control box or housing 108, a support insulator 110, a breaking or breaker unit 112, as used interchangeably herein, or interrupter, having terminals 115, 117 at the ends thereof.

[0027] The boom-mounted control box or housing 108 contains an actuating mechanism (not shown) for actuating the first breaker 100 between the open and closed positions. For example, the actuating mechanism may be a single motion or a double motion design that may be selected from, but not limited to, the following: an energy storage mechanism, such as a spring; a driven mechanism, such as an electric motor, a hydraulic motor, a pneumatic-based mechanism; or combinations thereof.

[0028] The support insulator 110 insulates the breaking unit 112 and the terminals 115, 117 from earth ground. The support insulator 110 may be a hollow body made of porcelain, or a dielectric composite, that may contain SF_6.

[0029] The breaking unit 112 houses the electrical contacts of the first breaker 100 and the moving components that couple electrical contacts with the mechanism within the housing 108. The breaking unit 112 may comprise an extinguishing mechanism for extinguishing any arcing between the electrical contacts when the first breaker 100 is actuated to the open position. For example, the extinguishing mechanism may be a SF_6 puffer design, a SF_6 self-blast design or other types of known extinguishing mechanisms. In one embodiment, the breaking unit 112 comprises an upstream breaking portion 114 and a downstream breaking portion 116. Optionally, the upstream and downstream breaking portions 114, 116 are substantially co-axially aligned with each other along a common longitudinal axis (shown as broken line "Z" in Figure 5) that is substantially perpendicular to the support insulator 110. This embodiment of the first breaker 100 may also be referred to as a "T breaker". Each of the breaking portions 114, 116 are made of porcelain, or a composite material, and filled with pressurized SF_6 gas. Because the terminals 115, 117 are positioned on either end of the breaking unit 112, the breaking unit 112 can become live and subject to voltage and current when the first breaker 100 is closed and electrically connected with the conductor 20.

[0030] Figure 6 depicts a step of electrically connecting the first breaker 100 to the conductor 20. This step is preceded by a step of confirming that the first breaker is in the open position. In Figure 6, the first breaker 100 is in an open position and it does not conduct electric current.

A conductive connection jumper or wire 118 is connected to the upstream terminal 115 of the first breaker 100 and to the conductor 20, upstream of the upstream end 22A of the jumper 22. Another conductive connection jumper cable or wire 119 is connected to the downstream terminal 117 and the conductor 20, downstream of the downstream end 22B of the jumper 22. The conductive connection wires 118, 119 may also be rated to handle the voltage and current load within the section 10. For example, the gauge of conductive connection wires 118, 119 may be the same as the jumper 22.

[0031] Figure 7 depicts a step of actuating the first breaker 100 to the closed position. In the closed position, electric current can be conducted through the first breaker 100. Together, the conductive connection wires 118, 119 and the first breaker 100 define a second alternate circuit 128. The second alternate circuit 128 has an upstream end 128A and a downstream end 128B. The second alternate circuit 128 is parallel to the first alternate circuit 28 and thus at least a portion of the current load in the system 10 diverts through the second alternate circuit and around the first alternate circuit 28 and the inline opener 24.

[0032] Figure 8 depicts a step of disconnecting the jumper 22 from the conductor 20 so that the current load within the section 10 flows through the second alternate circuit 128. Figure 9 depicts a step of actuating the first breaker 100 back into the open position. This step generates a de-energized portion 21 of the conductor 20 that is downstream of the first breaker 100. Figure 10 depicts a step of disconnecting the conductive connection wires 118, 119 from the conductor 20 and moving the first breaker 100 into a position that is away from the conductor 20. For example as illustrated the first breaker 100 may be moved completely away from section 10.

[0033] The first breaker 100 is rated to meet the voltage and current specifications of the system 1000. In one embodiment, the first breaker 100 is selected from known circuit breakers such as, but not limited to, magnetic breakers, thermal magnetic breakers, and live tank breakers, such as sulfur hexafluoride (SF_6) breakers all of which provide intentional actuation between the open and closed positions, as would be appreciated by one skilled in the art. As seen in Fig 9 by way of example, a power cord 108a runs through travellers 108e on the boom 101 from the actuating mechanism in boom-mounted control box 108 to a circuit breaker open/close control box 108b at the ground level. The control box 108b may for example be mounted on a support truck (not shown). Another power cord 108c runs between the circuit breaker open/close control box 108b and a generator 108d similarly located on or near the ground level, for example on the support truck, etc.

[0034] Figure 11 depicts another embodiment of the present invention that utilizes a second breaker 200, better seen in Figure 16, instead of the first breaker 100. Figure 11 depicts the section 10 with the same features described above regarding Figure 5 with the difference between Figure 5 and Figure 11 being the use of the second breaker 200. Figure 11 depicts the second breaker 200 mounted on the support base 106 upon the boom 101. The second breaker 200 can be actuated between a closed position and an open position. When in the closed position the first breaker 200 comprises electrical contacts that are in direct contact with each other and can conduct the electric current that is flowing through the section 10 without generating unacceptable amounts of resistance or heat. When in the open position, the electrical contacts within the second breaker 200 are physically separated and any arcing therebetween has been suppressed so that the second breaker 200 acts as an electrical insulator that does not conduct electric current.

[0035] One embodiment of the second breaker 200, which is shown in a corresponding magnified view in Figure 16, comprises a housing 208, a support insulator 210, a breaking unit 212 with a primary terminal 215, 217 at each end of the breaking unit 212 (see Figure 16). This embodiment of the second breaker 200 may also be referred to as an "I breaker". The features of the second breaker 200 perform the same functions as those described above regarding the first breaker 100. For example, the housing 208 houses a mechanism for actuating the second breaker 200 between the open and closed positions. The support insulator 210 insulates the breaking unit 212 from ground. The breaking unit 212 houses the electrical contacts and the mechanical components that couple the electrical contacts with the mechanism within the housing 208. As with the breaking unit 112, the breaking unit 212 may comprise an extinguishing mechanism for extinguishing any arcing between the electrical contacts when the second breaker 200 is actuated to the open position. For example, the extinguishing mechanism may be a SF_6 puffer design, a SF_6 self-blast design or other types of known extinguishing mechanisms.

[0036] As depicted in Figure 11, the second breaker 200 is electrically connected to the conductor 20 on either side of the jumper 22 by conductive connection wires 216, 218. The second breaker 200 is in the open position in Figure 11.

[0037] Figure 12 depicts a step of actuating the second breaker 200 to the closed position, which creates a third alternate circuit 228. The third alternate circuit 228 has an upstream end 228A and a downstream end 228B. The third alternate circuit 228 is parallel to the first alternate circuit 28 and a portion of the current load in the system 10 diverts around the first alternate circuit 28 and the inline opener 24.

[0038] Figure 13 depicts a step of disconnecting the jumper 22 from the conductor 20. The second breaker 200 is still in the closed position so that the current load within the section 10 flows through the third alternate circuit 228.

[0039] Figure 14 depicts a step of actuating the second breaker 200 to the open position. This stops the conduction of the current load through the second breaker 200 resulting in the de-energized portion 21 of the conductor 20 downstream of the second breaker 200. As described above regarding the first breaker 100, the second breaker can then be disconnected from the conductor 20 and moved to a position that is away from the conductor 20. This leaves the section 10 with a portion of live conductor 20 and a de-energized portion 21.

[0040] While the above disclosure describes certain examples of the present invention, various modifications to the described examples will also be apparent to those skilled in the art. The scope of the claims should not be limited by the examples provided above; rather, the scope of the claims should be given the broadest interpretation that is consistent with the disclosure as a whole.

REFERENCES CITED IN THE DESCRIPTION

Cited references

Patent documents cited in the description

- US2005133244A1 **[0004]**
- US55538207B **[0004]**
- US5538207A **[0024]**
- US2012175575A **[0024]**

Patentkrav

1. Bommonterbart afbrydersystem til montering på den distale ende af en bom, og som omfatter:

a. en bomadapter (106A), der kan monteres på den distale ende af bommen (101);

b. en platform (106), der er drejeligt monteret på bomadapteren (106A);

c. en selektivt aktiverbar aktuator (107A) monteret på, for at samarbejde mellem, bomadapteren (106A) og platformen (106), hvor aktivering af aktuatoren (107A) selektivt drejer platformen i forhold til bomadapteren;

d. en selektivt styret elektrisk kredsafbryder (100) monteret på, for at være elektrisk isoleret og opretstående fra, platformen (106), hvor den elektriske kredsløbsafbryder (100) indbefatter en opretstående, elektrisk isolerende nedre isolator (110) med modsatte øvre og nedre ender, og mindst en elektrisk isolerende øvre isolator (114, 116), der har adskilte elektriske opstrøms- og nedstrømskonnektorer derpå, hvor de elektriske konnektorer er konfigureret til montering af elektrisk ledende kabler derpå, og hvor mindst én elektrisk isolerende øvre isolator har en kredsafbryderenhed monteret deri, og hvor den øvre isolator (114, 116) er monteret på den øvre ende af den nedre isolator (110), og den nedre ende af den nedre isolator (110) er monteret på platformen (106);

e. en afbryderstyring monteret på platformen (106) mellem den nedre ende af den nedre isolator (110) og platformen (106), hvilken afbryderstyring (108) er konfigureret til selektivt at åbne og lukke den elektriske kredsløbsafbryder (100), hvor afbryderstyringen indbefatter et hus (108).

2. Bommonterbart afbrydersystem ifølge krav 1, hvor aktuatoren (107A) indbefatter en lineær aktuator forbundet til, for at drive, en kobling (107), der opererer mellem bomadapteren (106A) og støttebasen (106).

3. Bommonterbart afbrydersystem ifølge krav 2, hvor koblingen (107) indbefatter en saksekobling.

4. Bommonterbart afbrydersystem ifølge krav 1, hvor den elektriske kredsløbsafbryder (100) vælges fra den gruppe, der omfatter: en T-afbryder eller en I-afbryder.

5. Fremgangsmåde, hvor det bommonterbare afbrydersystem ifølge krav 1 anvendes til selektiv afbrydelse af elektrisk transmission i et segment af en strømførende leder ved et ønsket brudsted, hvilken fremgangsmåde omfatter:

a. tilvejebringelse af:

i. bomadapteren (106A), der kan monteres på den distale ende af bommen (101);

ii. platformen drejeligt monteret på bomadapteren;

iii. en selektivt aktiverbar aktuator monteret på, for at samarbejde mellem, bomadapteren og platformen, hvor aktivering af aktuatoren selektivt drejer platformen i forhold til bomadapteren;

iv. den selektivt betjente, elektriske kredsløbsafbryder monteret på, således at den er elektrisk isoleret og opretstående fra, platformen;

b. montering af bomadapteren på enden af bommen;

c. placering af den elektriske kredsløbsafbryder (100) ved hjælp af aktuatoren (107A) og bommen (101) i en position under og stødende op til det ønskede brudsted på den strømførende leder (20);

d. med afbryderen (100) åben, elektrisk tilslutning af afbryderen (100) for således at forbinde:

i. det ønskede brudsted på lederen (20);

ii. en inline-åbner (24) monteret i lederen (20) på det ønskede brudsted og

iii. en jumper (22) monteret på lederen (20) hen over inline-åbneren (24);

e. lukning af den elektriske kredsløbsafbryder (100), hvorved transmission af en elektrisk strømbelastning muliggøres gennem den elektriske kredsløbsafbryder (100) for at omgå inline-åbneren (24) og jumperen (22);

f. fjernelse af jumperen (22) fra lederen (20);

g. åbning og derefter fjernelse af kredsløbsafbryderen fra lederen (20).

6. Fremgangsmåde ifølge krav 5, og som endvidere omfatter en kobling (107), der er konfigureret til at samarbejde mellem bomadapteren (106A) og støttebasen (106), og sammenkobling af koblingen (107) med aktuatoren (107A) og støttebasen (106).

7. Fremgangsmåde ifølge krav 5, og som endvidere omfatter et mellemtrin inden trin (d) ifølge krav 5 med montering af den elektriske jumper hen over det ønskede brudsted.

8. Fremgangsmåde ifølge krav 7, og som endvidere omfatter montering af inline-åbneren (24) i lederen (20) på det ønskede brudsted efter trinnet i krav 7.

DRAWINGS

Drawing

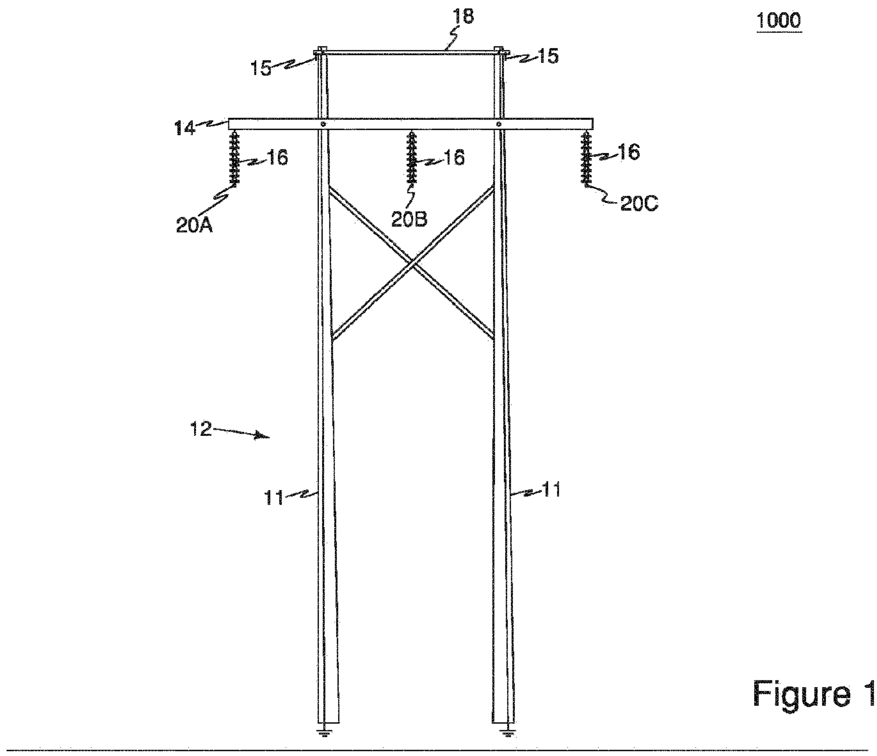


Figure 1

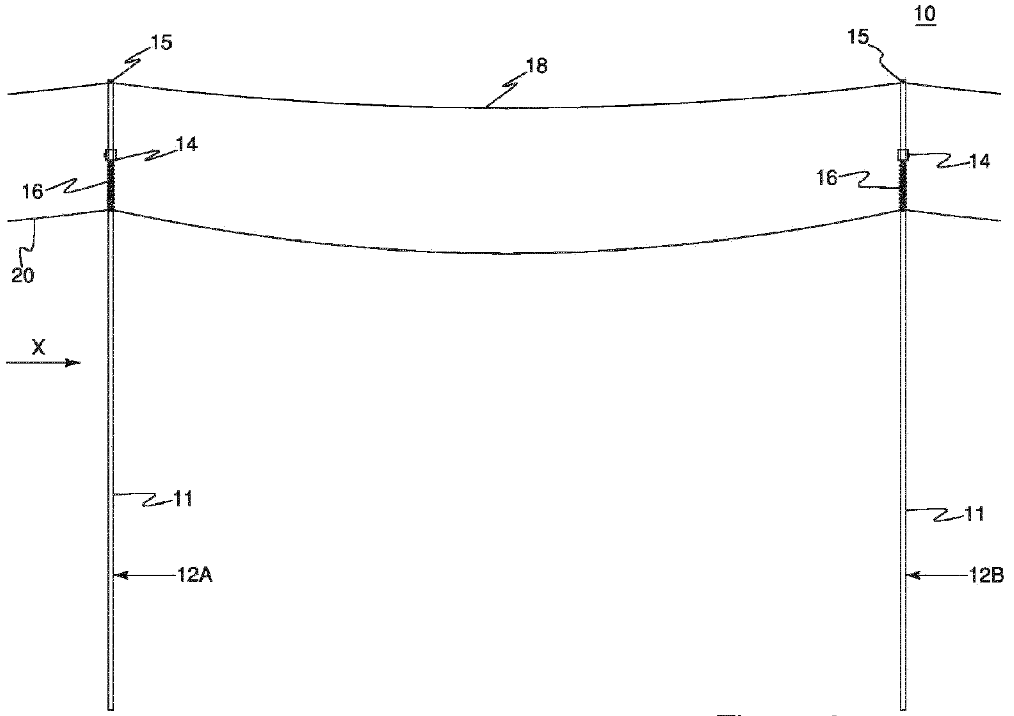


Figure 2

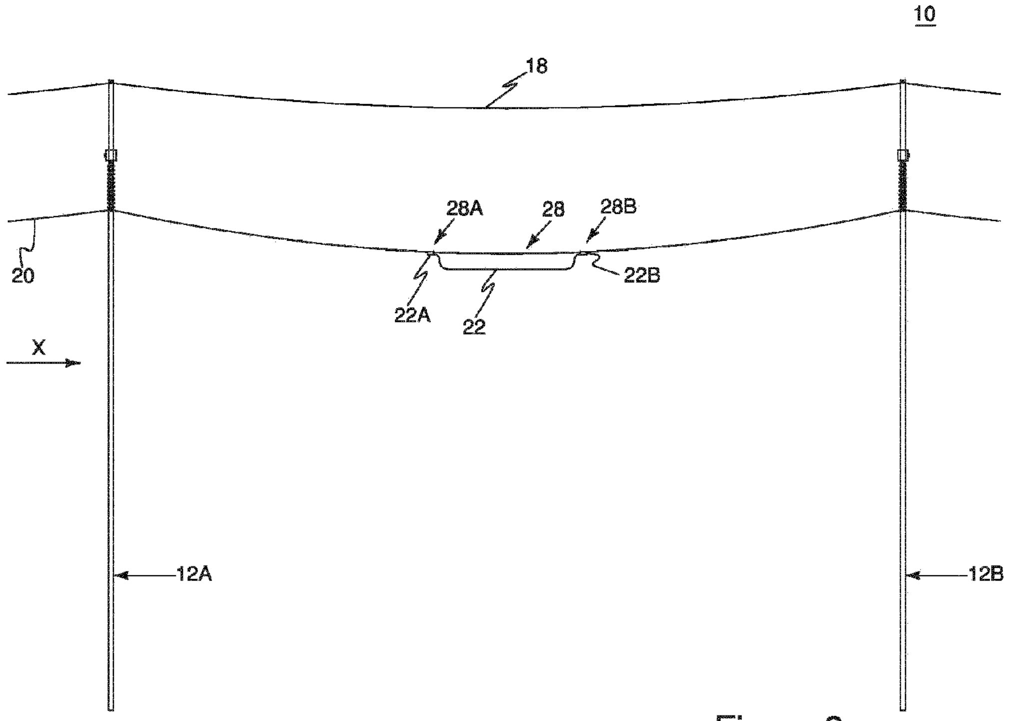


Figure 3

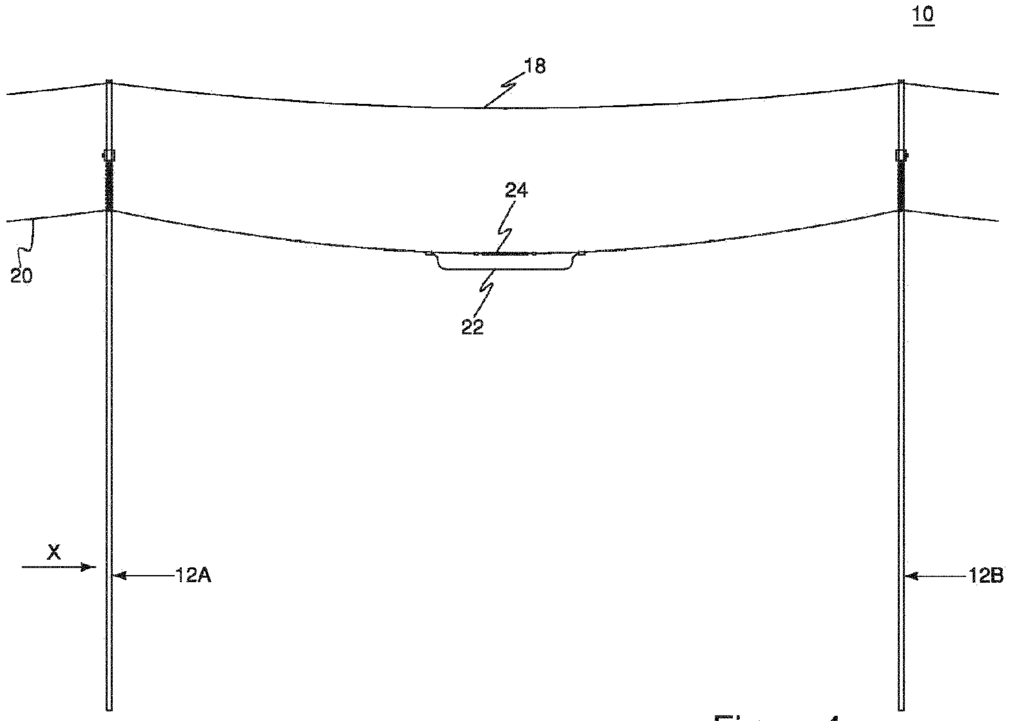


Figure 4

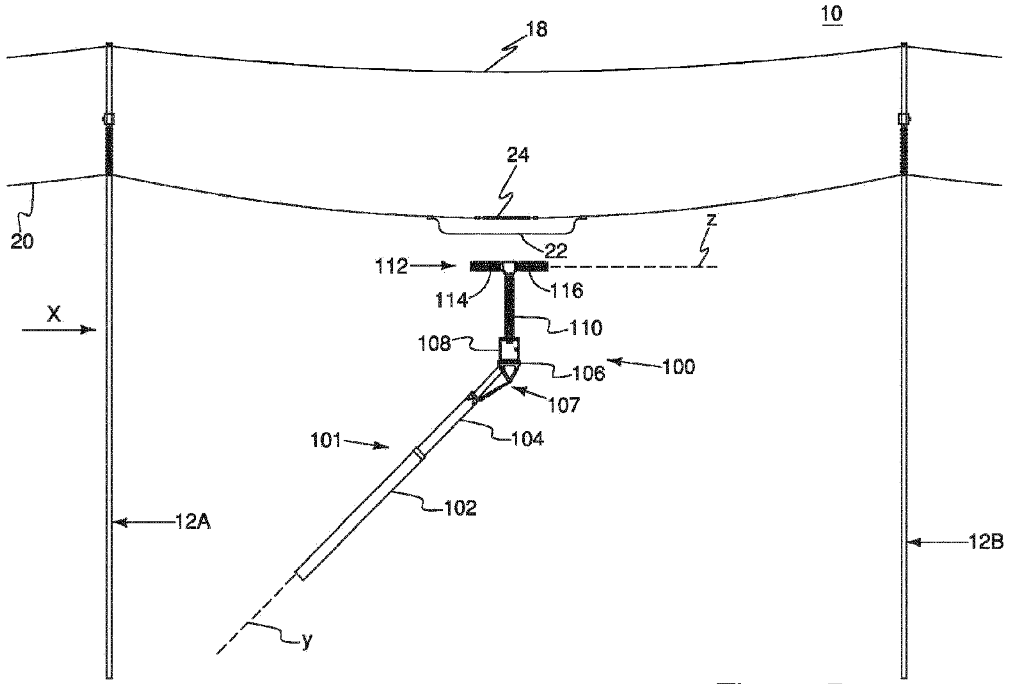

10
18
24
20
22
z
112
114
116
110
X
108
106
100
107
101
104
102
12A
12B
y

Figure 5

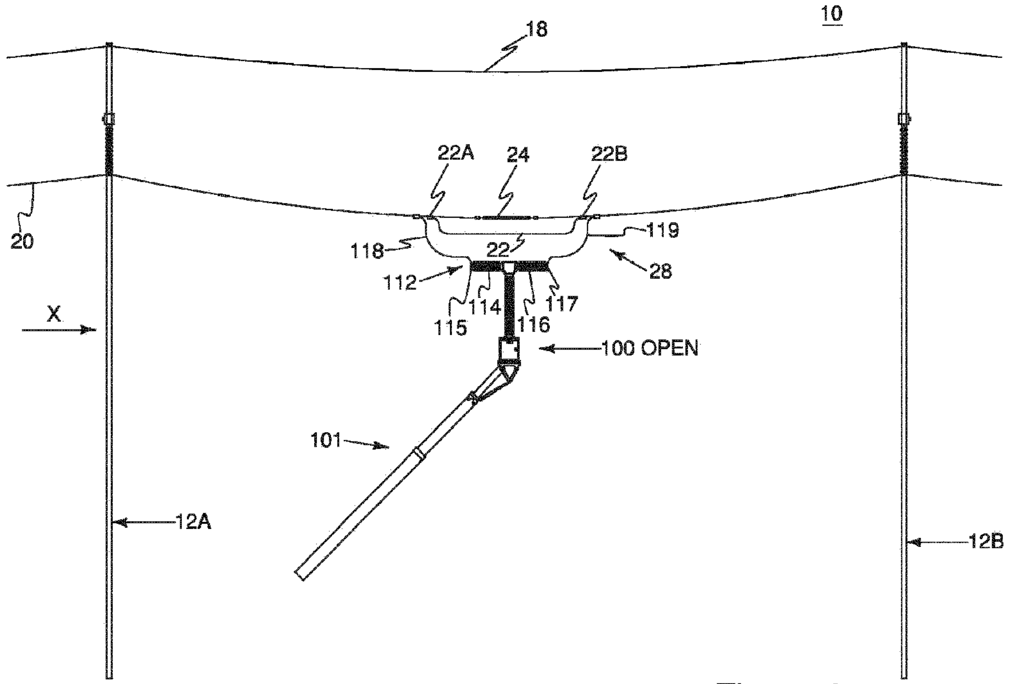

10
18
22A
24
22B
20
118
119
22
28
112
114
117
115
116
X
100 OPEN
101
12A
12B

Figure 6

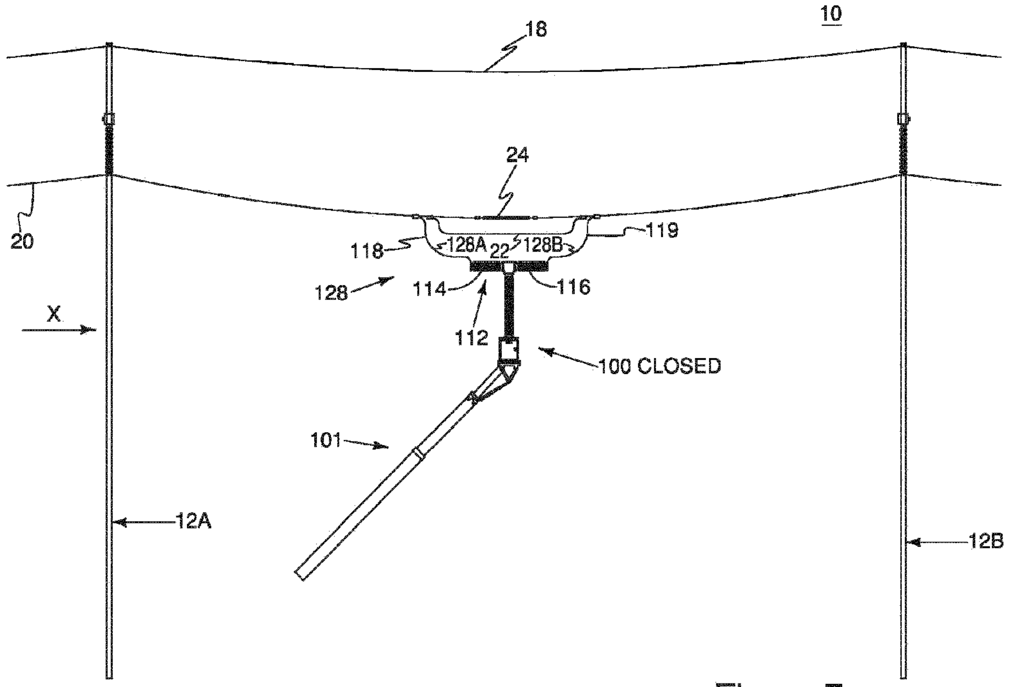

10
18
24
20
118
128A
22
128B
119
128
114
116
112
X
100 CLOSED
101
12A
12B

Figure 7

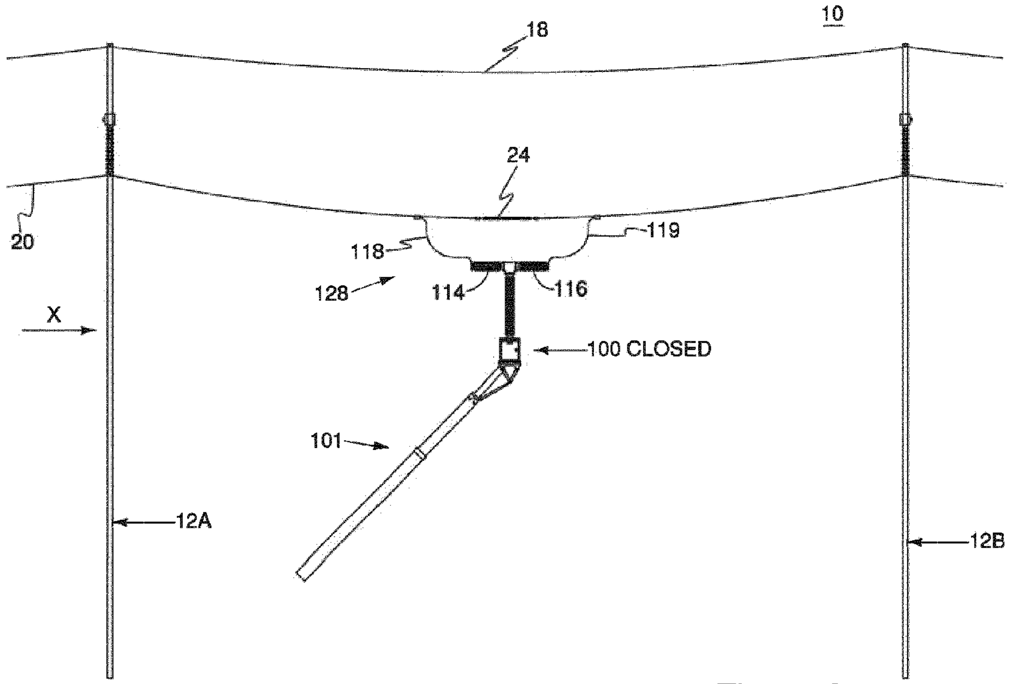


Figure 8

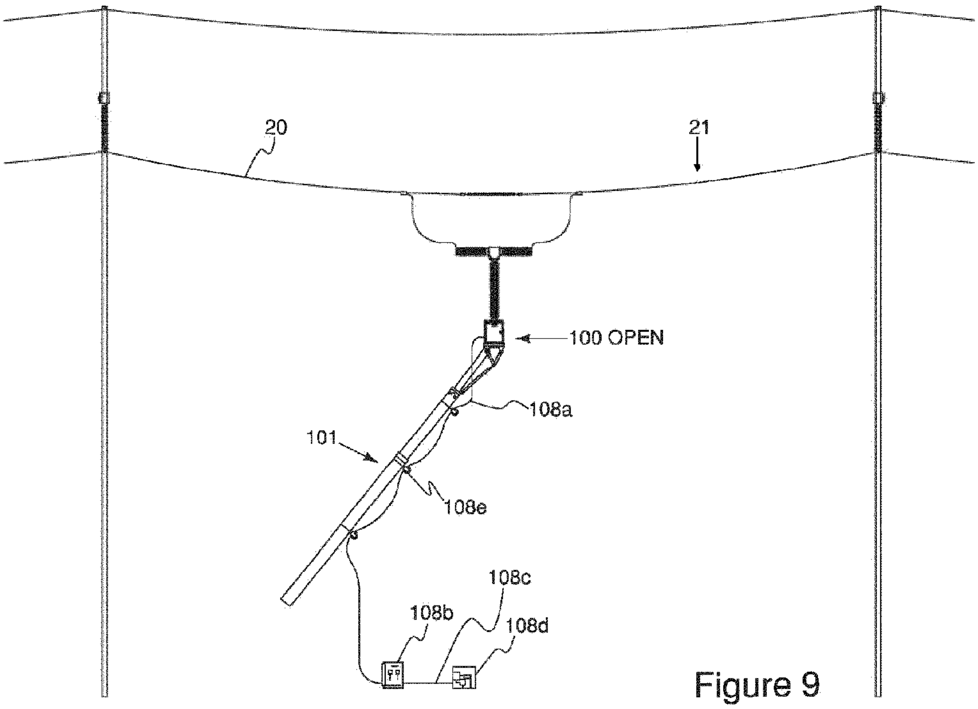


Figure 9

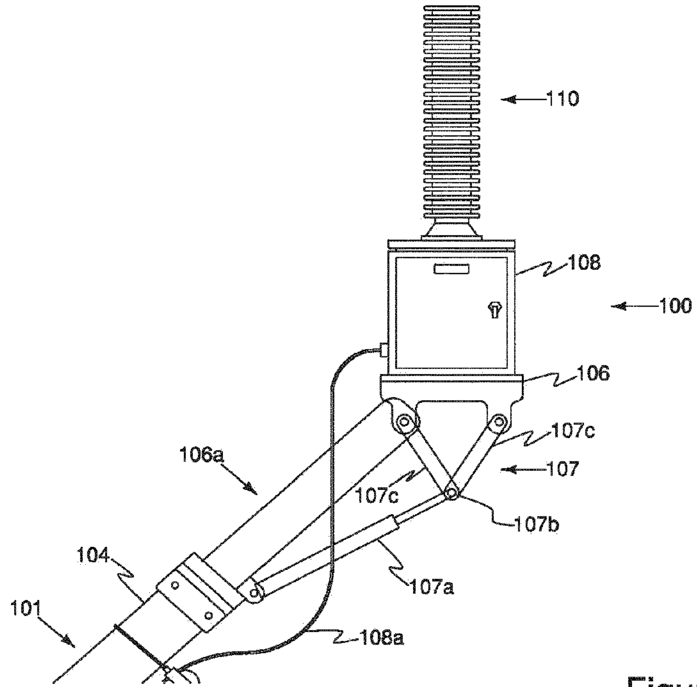


Figure 9a

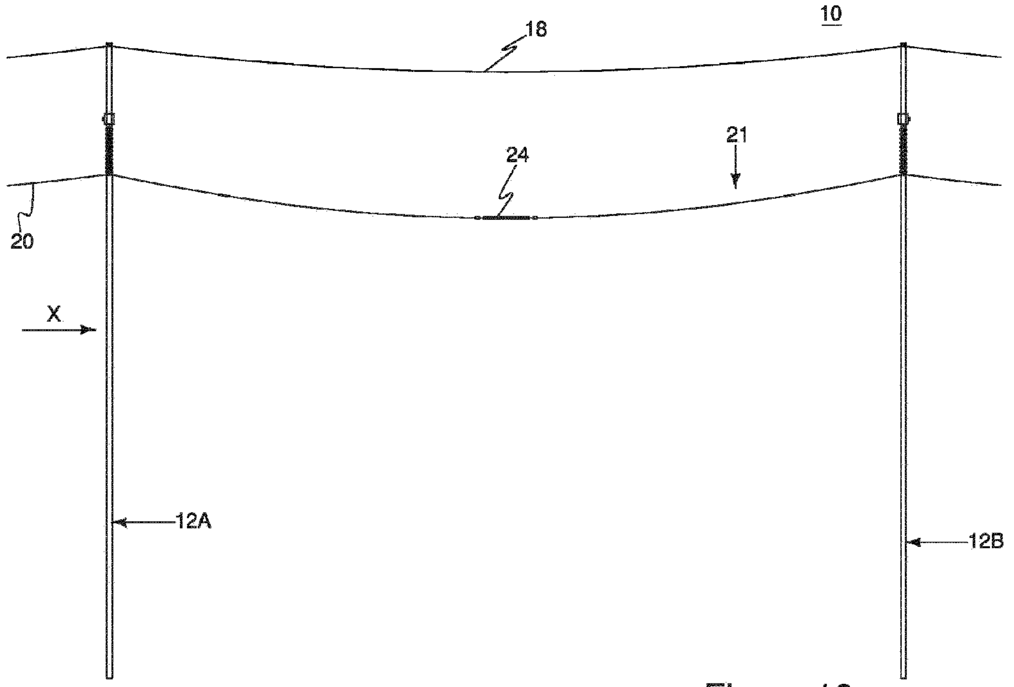


Figure 10

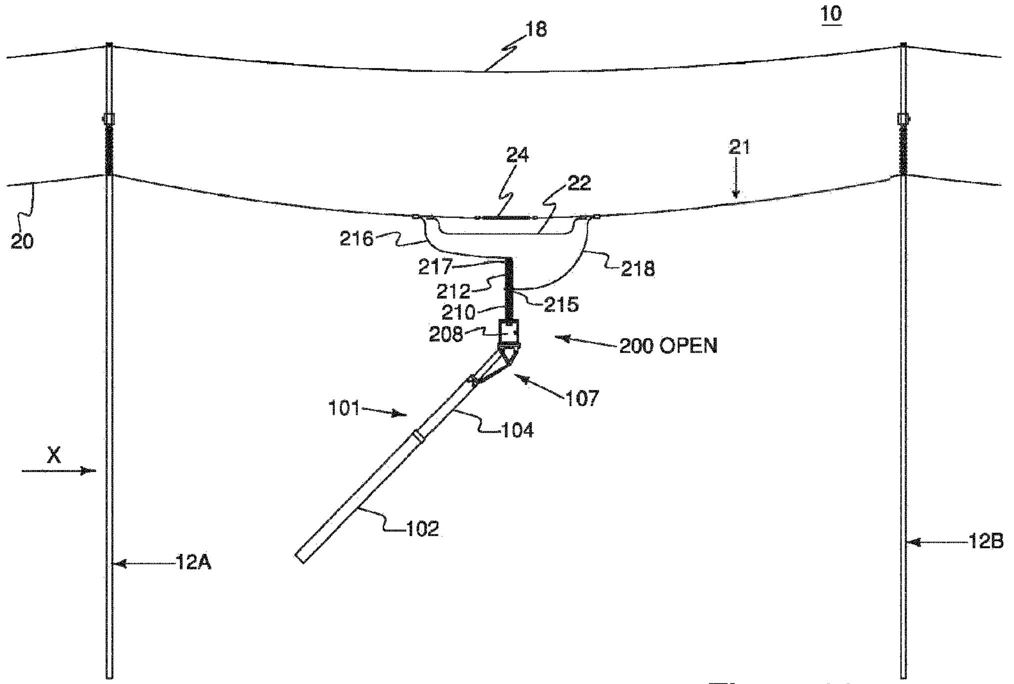
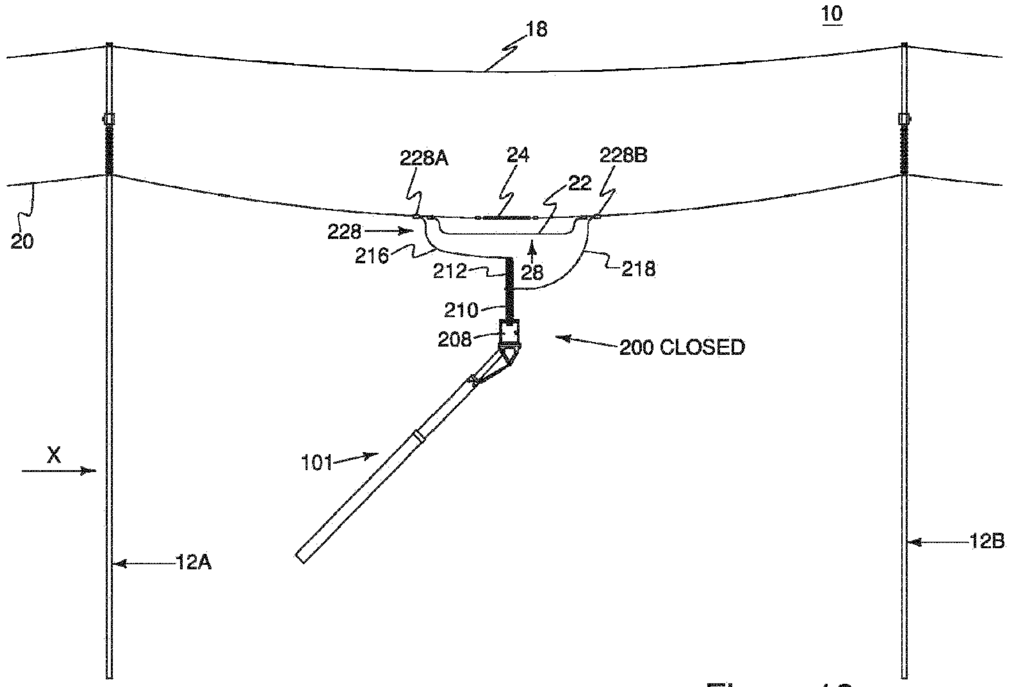

10
18
24
22
21
20
216
217
218
212
215
210
208
200 OPEN
107
101
104
X
102
12A
12B

Figure 11



10
18
228A
24
228B
22
20
228
216
212
28
218
210
208
200 CLOSED
101
X
12A
12B

Figure 12

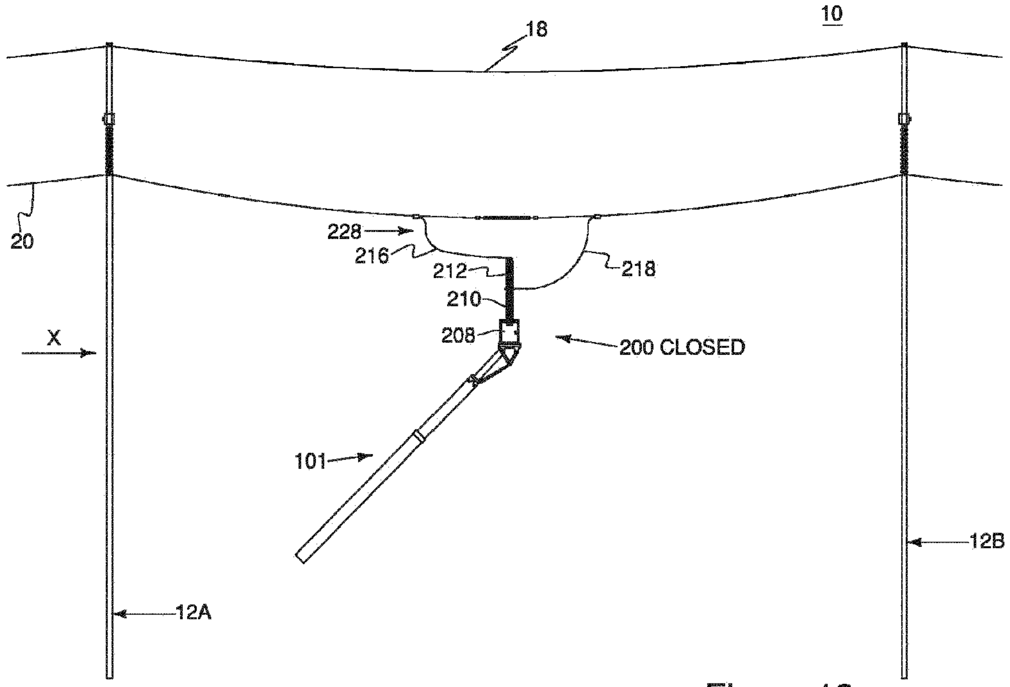


Figure 13

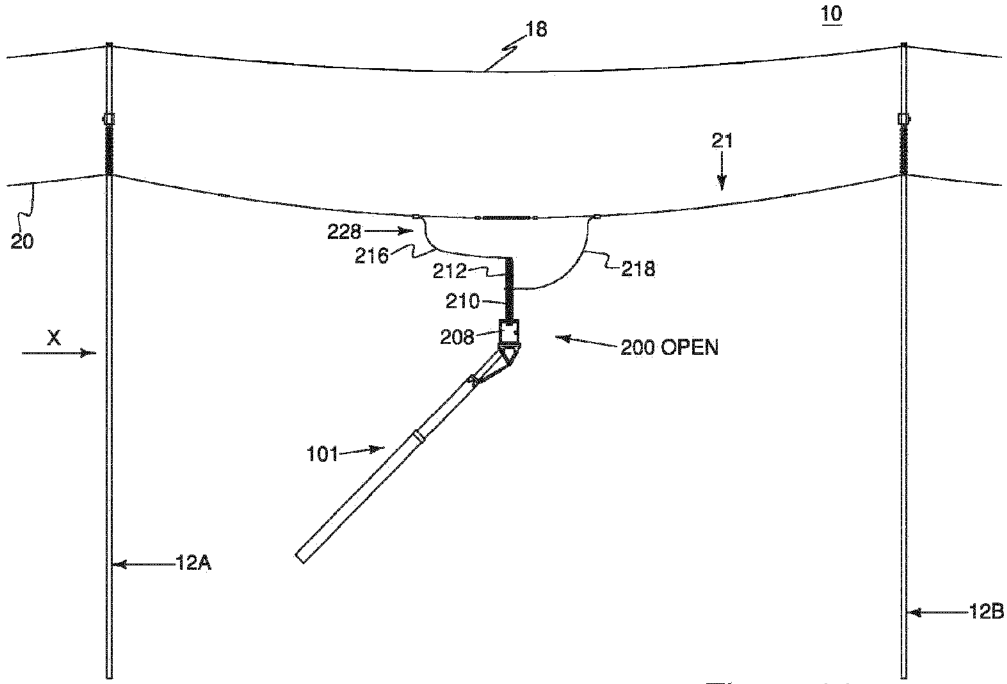


Figure 14

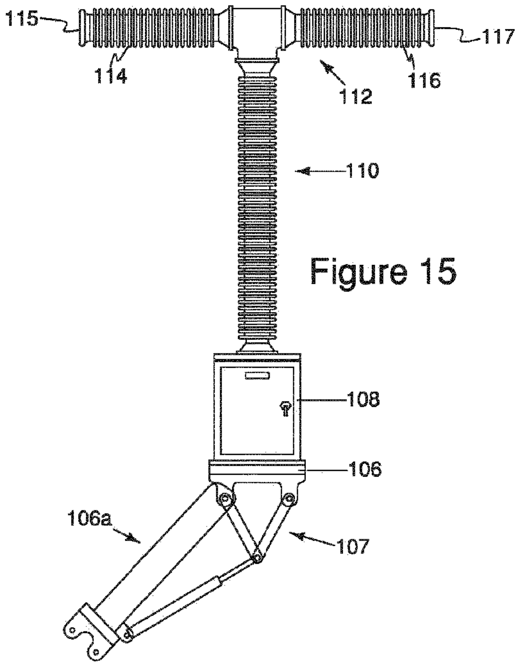


Figure 15

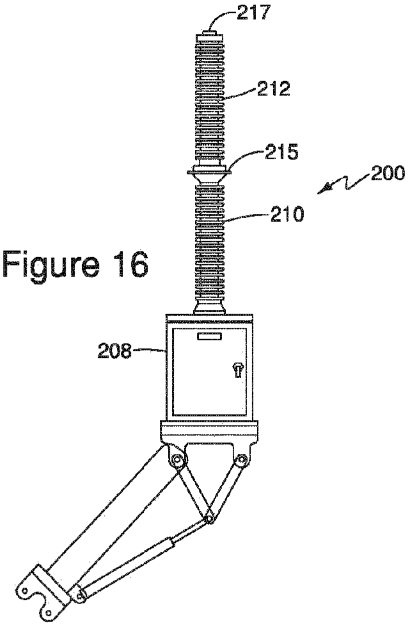


Figure 16