Feb. 17, 1948. F. H. COLE 2,436,290

DISCONNECT SWITCH

Filed May 11, 1943 3 Sheets-Sheet 1

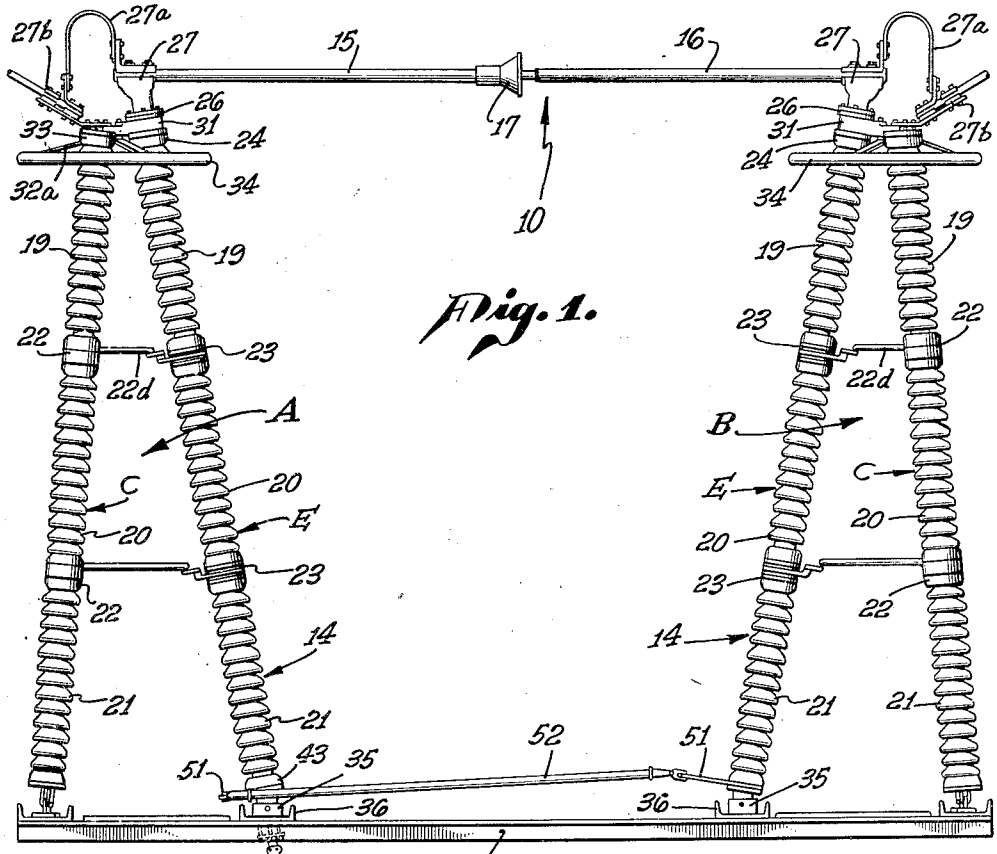


Fig. 1.

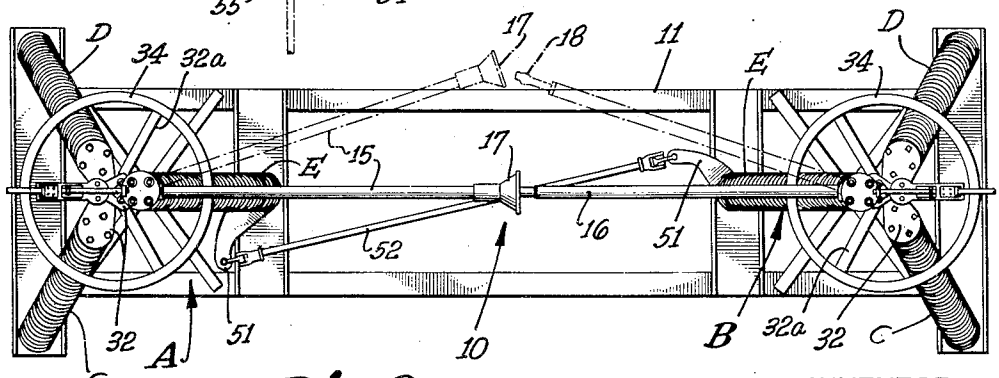


Fig. 2.

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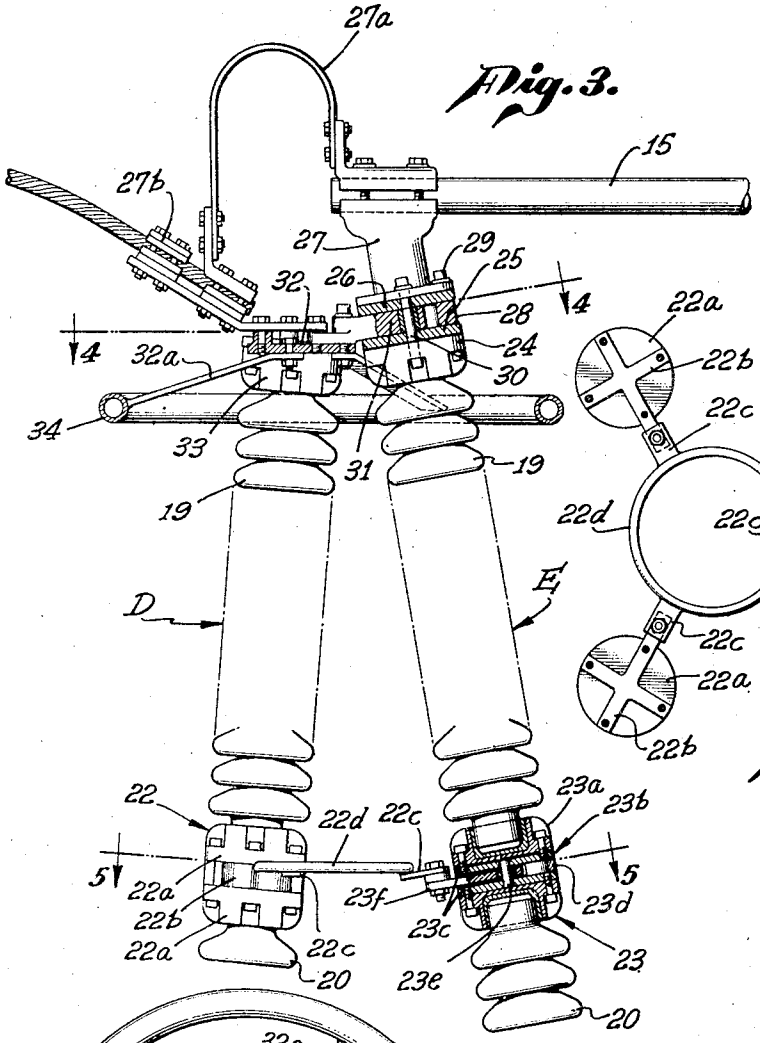


Fig. 3.

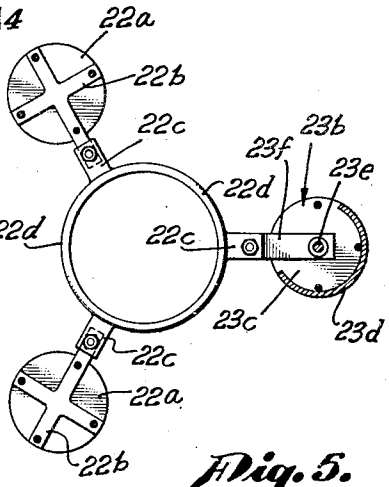


Fig. 5.

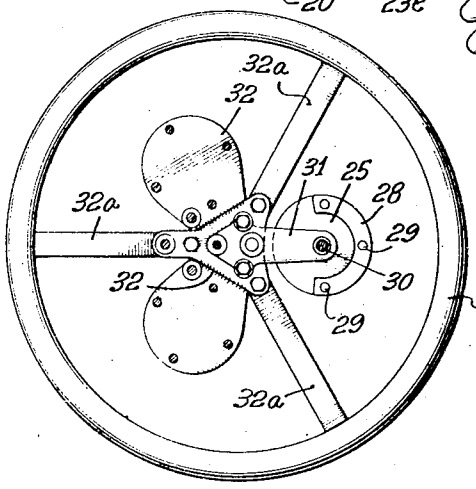


Fig. 4.

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DISCONNECT SWITCH

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Fig. 7.

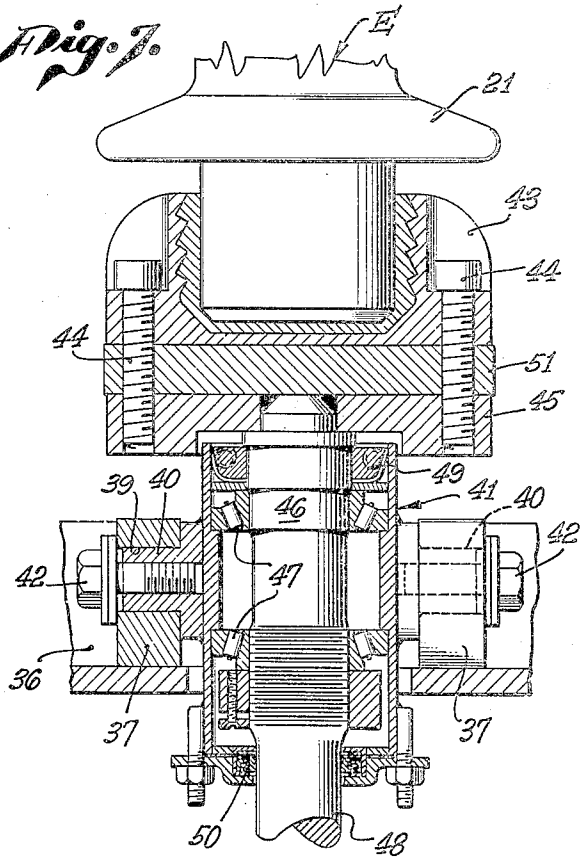


Fig. 6.

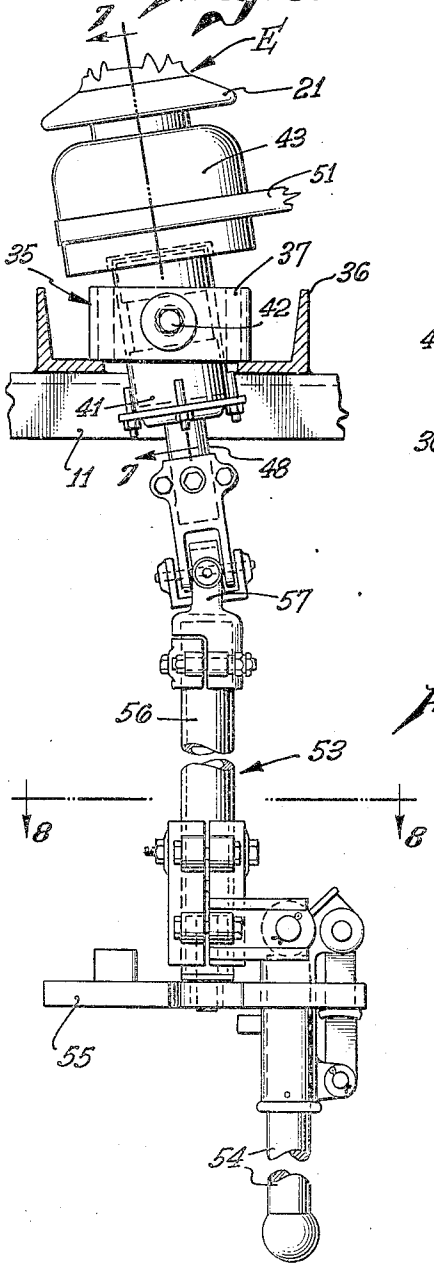
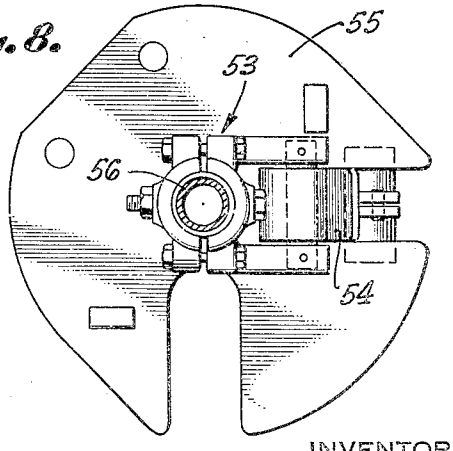


Fig. 8.



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UNITED STATES PATENT OFFICE

2,436,290

DISCONNECT SWITCH

Fred H. Cole, Los Angeles, Calif.

Application May 11, 1943, Serial No. 486,505

2 Claims. (Cl. 200—48)

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This invention relates to electrical equipment and particularly pertains to what is generally termed a disconnect switch.

It is the principal object of my present invention to provide a generally improved disconnect switch structure.

It is a further object of my present invention to provide a disconnect switch structure which will withstand earthquakes and like shocks.

It is a further object of my present invention to provide an improved tripodic tower for disconnect switches so constructed as to be rigid and of sufficient strength to withstand earthquakes and like shocks without crumbling of the insulators.

One form which my invention may assume is exemplified in the following description, and illustrated by way of example in the accompanying drawings, in which:

Fig. 1 is a view in side elevation of an improved disconnect switch embodying the preferred form of my invention.

Fig. 2 is a plan view of my improved switch.

Fig. 3 is an enlarged fragmentary view, partly in section of the upper end of one tower.

Fig. 4 is a plan section of one tower taken on line 4—4 of Fig. 3.

Fig. 5 is a sectional view taken on line 5—5 of Fig. 3.

Fig. 6 is an enlarged fragmentary view showing the connection between one operating leg of a tower and the base and showing the operating mechanism.

Fig. 7 is an enlarged fragmentary view in section taken on line 7—7 of Fig. 6.

Fig. 8 is a sectional view taken on line 8—8 of Fig. 6.

Referring more particularly to the accompanying drawings, 10 indicates a disconnect switch for use in power lines of high potential. This switch is particularly adapted for use in bypassing the load at sub-stations in the event of earthquakes or other shocks of severity sufficient to disrupt the operability of the sub-station. My improved switch, however, is capable of use in many other capacities.

The switch 10 includes a rectangular horizontal base 11 suitably constructed of structural steel as illustrated. At each end of the base 11 there is mounted a tripodic switch blade tower 14. These towers are indicated by the letters A and B. The tower A carries the female switch blade 15 while the tower B carries the male switch blade 16. The blade 15 is formed with a socket 17 in its end to receive the male contact end

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18 of the blade 16. The formation of these parts and the swinging action of the blades is such that a wiping type of contact is made as the blades are swung to close or open the switch. It is obvious of course, that other types of contact between the blades may be substituted for those shown without departing from the invention.

The towers A and B are identical in construction and each comprises three insulator stacks or legs C, D and E arranged to form a tripod. Each leg is connected at its lower end to the base and the three legs are connected together at their upper ends and at intermediate points so that the tower will be formed as a rigid tripod. Each leg is formed of a plurality (in this case three) porcelain insulators 19, 20, and 21 rigidly connected together by connectors 22 (in the case of the stationary legs C and D) and by connector bearings 23 in the case of the rotating leg E.

It is the operating leg E which is connected to the associated switch blade for operating the same. This connection between the switch blade and the leg E is best illustrated in Figs. 3 and 4. Referring to Figs. 3 and 4, it will be seen that the upper insulator 19 of the leg 18 is fitted with a connector 24 having a bearing disk 25. A similar bearing disk 26 is fitted to the underside of a switch blade clamp 27 and is rigidly held in axially spaced relation to the bearing disk 26 by a spacer 28 and bolts 29, the latter rigidly connecting the connector 24 to the clamp 27 as illustrated. Extending coaxially and centrally between the bearing disks 25 and 26 is a bearing pintle 30 which is secured at its ends in the disks 25 and 26.

Projecting radially between the bearing disks 25 and 26 is a radius arm 31 which is bored at its outer end to rotatably receive the bearing pintle 30. At its other end the arm 31 is rigidly secured to a top plate 32 which in turn is bolted or otherwise secured to connectors 33 at the upper ends of the insulators 19 of the fixed legs C and D. A ring 34 is also connected to the top plate 32 by radial arms 32a. Thus, a rigid connection is established between the upper ends of the three legs C, D, and E, but permitting the latter to revolve a limited amount sufficient to open and close the switch.

It will be noticed that the upper end of the switch blade clamp 27 is formed to removably receive the end of the switch blade and is connected by a flexible braid conductor 27a to a terminal 27b fixed on the top plate 32 and by means of which the current is led to the switch blade.

By reference to Figs. 3 and 5, it will be seen that the connectors 22 between the insulators 19, 20, and 21 of the stationary legs C and D of each tower comprise complemental connector members 22*a* fixed to adjoining ends of the adjacent insulators and fastened together by bolts or capscrews as shown. Between the two members is interposed a connector arm 22*b* which is fastened thereto by the bolts or capscrews which connect the connector members 22*a*. The connector arm 22*b* extends radially as shown so that it may be bolted to an ear 22*c* of a connector ring 22*d* arranged between the three legs as illustrated.

Referring to Fig. 3 it will be seen that the connector bearings 23 between the insulators 19, 20, and 21 of the operating leg E of the tower each comprise a pair of complemental connector members 23*a* fixed to adjacent ends of adjoining insulators. These members are spaced apart so as to receive therebetween a bearing 23*b*. This bearing comprises two bearing plates 23*c* between which is an arcuate spacer 23*d* welded to each plate.

A bearing pin 23*e* is located coaxially of the plates 23*c* and held thereby as illustrated. A bearing arm 23*f* is interposed between the plates 23*c* and pivoted on the pin 23*e* as shown. This arm 23*f* extends radially so that it may be bolted to an ear 22*c* of the connector ring 22*d*.

After the legs C, D, and E are erected and connected together at their upper ends as described and connected to the base 11 as will be hereinafter described so as to be in proper relative alignment, the connector rings are fitted in place and bolted to the arms 22*b* and 23*f* to form a supporting connection between the legs C, D, and E as well as intermediate bearings for the operating leg E. It will be seen that such a connection is provided at each junction between the insulators. It should be pointed out that I may choose to use a greater or lesser number of insulators than that shown.

At their lower ends, the fixed or stationary legs C and D are connected by a clevis type of connection to the base 11 to give a certain amount of flexibility to the fixed legs during the erection of the towers to enable proper alignment of the legs and elimination of stresses due to improper alignment.

The operating legs E of the towers are each connected to the base 11 by a thrust bearing structure shown in Figs. 6 and 8 inclusive and indicated in Fig. 1 by numeral 35. Referring to Figs. 6 to 8 inclusive, it will be seen that each bearing is mounted on a transverse channel 36 forming a rigid part of the base 11. Each bearing 35 includes a heavy collar 37 which is securely fixed on the channel 36 by welding or otherwise so that it will form a rigid part thereof.

At diametrically opposite points, and on an axis which is transversely positioned with respect to the base 11, the collar 37 is formed with aligned bores 39 to receive trunnions 40 fixed on a bearing cage 41. This bearing cage is coaxially disposed with respect to the leg E.

From Fig. 7 it will be seen that clamping studs 42 are provided which thread coaxially into the trunnions 40, the latter of which being of a length that they extend short of the outer perimeter of the fixed collar 37. Obviously when these clamping studs are tightened, rotating movement of the trunnions 40 in the bores 39 is prevented. Thus, during erection of the tower, the clamping studs 42 are maintained loose until the entire

tower has been erected and it has been ascertained that the leg E is in perfect alignment. Thereafter the clamp studs 42 are tightened to maintain the leg E in proper alignment.

The lower extremity of the leg E is fitted with a fixed connector 43 which in turn is bolted by means of studs 44 to a matching disk 45 to which is secured a pintle 46. The latter, of course, extends coaxially of the leg E and projects into the bearing cage 41 and is mounted therein in thrust bearings 47.

In the case of the leg E of one tower, the pintle 46 extends through the lower end of the bearing cage 41 to provide an operating shaft 48. However, in the case of the leg E of the opposite tower, the pintle 46 terminates within the cage 41. Suitable grease tight caps 49 and 50 are provided at the ends of the cage 41 so that the bearings 47 may be packed with a lubricant.

Clamped between the connector 43 and the disk 45 at the lower end of each leg E is a crank arm 51. The crank arms 51 of the two legs E are connected by a connecting rod 52 so that when one pintle 46 is revolved, both legs E of the two towers will be revolved simultaneously. It is by this rotative movement of the legs E that the switch blades are moved to open and closed position, as clearly illustrated in Fig. 2 of the drawings.

From Figs. 1 and 6 it will be seen that the operating shaft 48 is provided with an operating mechanism 53 including a crank handle 54. A mounting plate 55 which may be secured in any desired position is provided for the mounting mechanism 53 and for latching the handle 54 as illustrated. The operating mechanism 53 includes a shaft 56 connected by a universal joint 57 to the operating shaft 58. Obviously when the crank handle 54 is swung to a horizontal position, it may be utilized to turn the shaft 56 and through it a shaft 48. This in turn will turn the pintle 46 of one leg E and through the crank arm 51 and the connecting rod 52 will turn the other leg E of the other tower a similar amount. As previously described, this swing turning movement of the legs E of the towers, acts to swing the switch blades either to open or closed position depending upon the position of the parts and the direction of movement of the crank handle 54.

In actual practice the parts are constructed and assembled as previously described. After the top of the legs of each tower have been connected together and their lower ends have been connected with the base as described, and the legs are found in perfect alignment, they are secured in this condition as previously described.

The electrical connections are then made to the terminals of the two switch blades so that when the switch is closed the current will be conducted from one conductor to the other through the medium of the switch blades. If it is desired to open the switch, the operating handle 54 is unlatched from the plate 55 and swung in a horizontal plane. This as described causes a turning movement of the operating leg E of one tower and causes swinging movement of its switch blade. This movement will be simultaneously transmitted to the operating leg E of the other tower through the medium of the crank arms 51 and the connecting rod 52 so that the two switch blades will swing to either open or closed position in unison.

As is well known, insulators such as used in erecting disconnect switch towers are compara-

tively weak in tensile strength, that is to say, they are not shock resistant. However, by my tripodic construction of the towers, I have so arranged the legs thereof that the towers will be able to withstand earthquakes and like severe shocks.

While I have shown the preferred form of my invention, it is to be understood that various changes may be made in its construction by those skilled in the art without departing from the spirit of the invention as defined in the appended claims.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. In a device of the character described, a tripodic tower, each leg of said tower being formed of a plurality of connected insulators, two of said legs being held stationary and one being adapted to rotate on its axis, connecting means at the top of said legs and at intermediate points therealong, said means including radial members connected with the legs at the top and each intermediate point therealong, the connections with the rotatable leg forming bearings to permit rotation thereof, and a switch blade connected with said rotatable leg to be operated thereby.

2. In a device of the character described, a

tripodic tower, each leg of said tower being formed of a plurality of connected insulators, two of said legs being held stationary and one being adapted to rotate on its axis, connecting means at the top of said legs and at intermediate points therealong, said means including radial members connected with the legs at the top and each intermediate point therealong, the ring connecting the top of said legs being arranged exteriorly thereof while the ring at each intermediate point is arranged interiorly of the legs, the connections with the rotatable leg forming bearings to permit rotation thereof, and a switch blade connected with said rotatable leg to be operated thereby.

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