March 20, 1962 T. F. JOHNSON 3,026,388

MECHANISM FOR OPENING OR CLOSING A SWITCH
BY MEANS OF AN ELECTRIC MOTOR

Filed July 13, 1960 3 Sheets-Sheet 1

Fig. 1

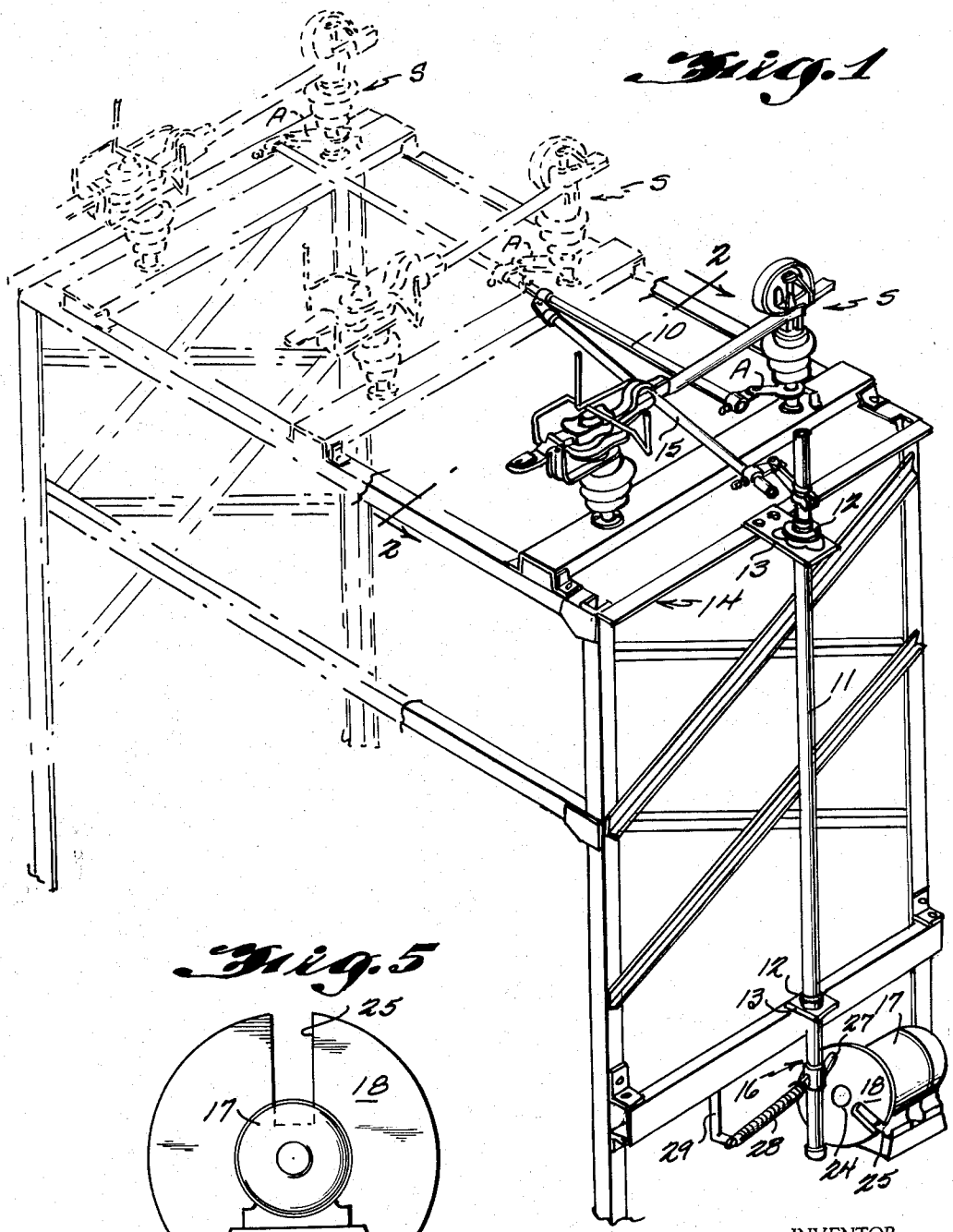


Fig. 5

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MECHANISM FOR OPENING OR CLOSING A SWITCH BY MEANS OF AN ELECTRIC MOTOR

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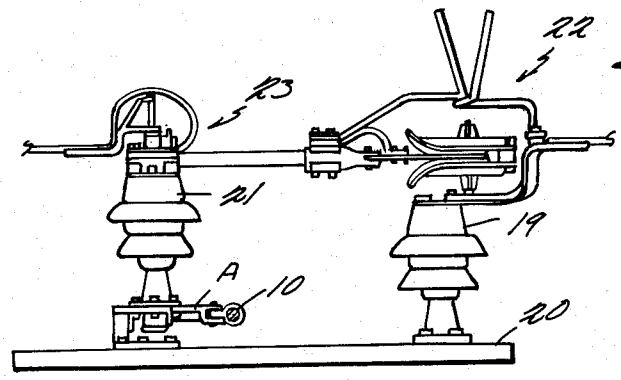


Fig. 2

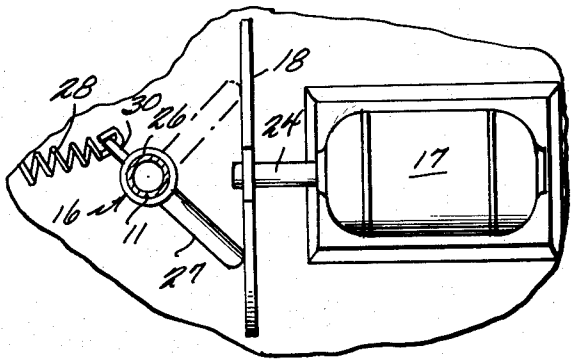


Fig. 4

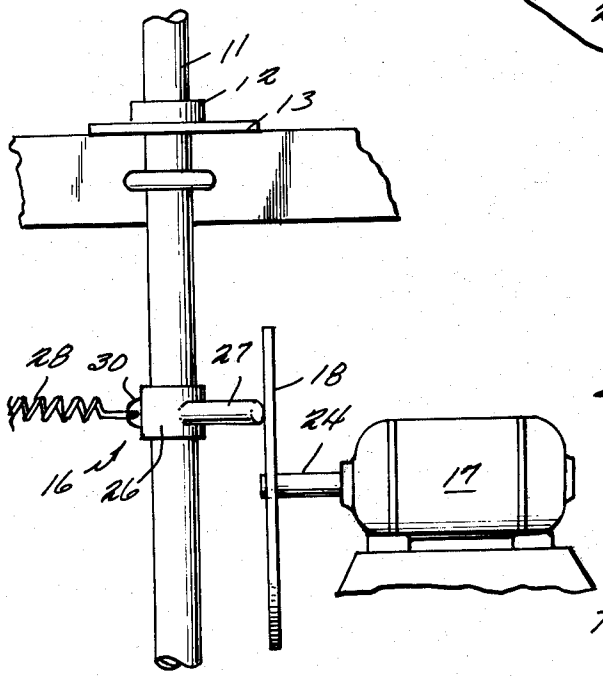


Fig. 3

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MECHANISM FOR OPENING OR CLOSING A SWITCH BY MEANS OF AN ELECTRIC MOTOR

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Fig. 6

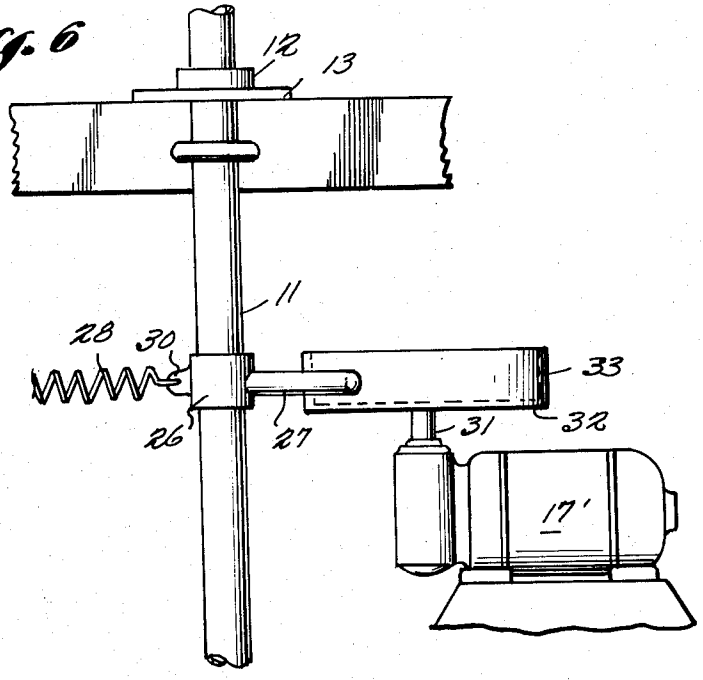
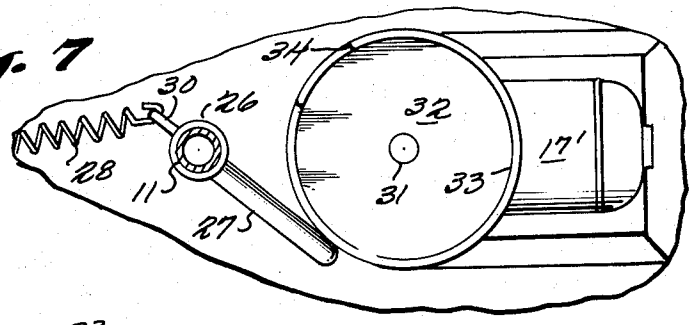


Fig. 7



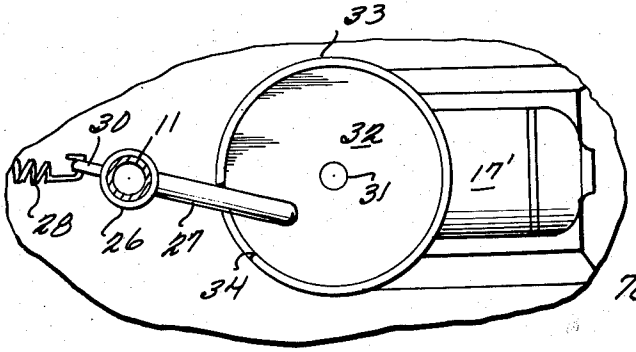


Fig. 8

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3,026,388

MECHANISM FOR OPENING OR CLOSING A SWITCH BY MEANS OF AN ELECTRIC MOTOR

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Filed July 13, 1960, Ser. No. 42,704
10 Claims. (Cl. 200—92)

This invention relates to high tension electric switches and has more particular reference to apparatus for opening and closing gang operated high tension electric switches.

One object of the present invention is to provide novel and improved apparatus for opening and closing gang operated high tension electric switches.

Another object of the present invention is to provide novel and improved apparatus, as characterized above, including electrically operated means for moving the switches to closed and opened positions and locking means for holding the switches in the position to which they have been moved.

A further object of the invention is to provide apparatus for opening and closing gang high tension electric switches which is simple and inexpensive in construction and efficient in carrying out the purposes for which it is designed.

Other objects and advantages of the invention will appear in the following specification when considered in connection with the accompanying drawings, wherein:

FIG. 1 is a perspective view, with parts broken away, of a gang of high tension electric switches and showing them connected to one embodiment of apparatus for opening and closing the switches and holding them in their opened or closed position, constructed in accordance with the present invention;

FIG. 2 is a vertical sectional view, taken on the line 2—2 of FIG. 1, showing the construction of a switch unit;

FIG. 3 is a fragmentary view showing the reversible gear electric motor shown in FIG. 1, and the manner in which it is connected to rotate the vertical switch operating shaft for the gang of switches;

FIG. 4 is a plan view of the apparatus shown in FIG. 3;

FIG. 5 is a rear end view of the gear motor shown in FIG. 3;

FIG. 6 is a view similar to that shown in FIG. 3, but showing a modified way of connecting the reversible motor to rotate the switch operating shaft; and

FIGS. 7 and 8 are plan views of the apparatus shown in FIG. 6, showing the operating arm in different positions.

The present invention provides novel and improved apparatus for operating high tension electric switches of the movable insulator type wherein a stationary insulator carrying switch jaws and a movable insulator carrying a switch blade are mounted on a common support. The invention provides novel and improved means for moving the switches to either opened or closed position and holding them in the position to which they have been moved.

The improved apparatus is particularly designed for operating groups or gangs of such high tension electric switches.

While the improved apparatus, for operating a gang of high tension electric switches, of the present invention, can be used with high tension electric switches of either the vertical break rotating type switch, such as disclosed in my prior Patent No. 2,248,876, the side break rotating type such as disclosed in my prior Patent No. 2,231,809, or the rocking insulator type such as disclosed in my Patent No. 2,794,871; for the purpose of illustration, it will be shown and described as used with a high

tension side break rotating switch of the type shown in FIG. 6 of my Patent No. 2,231,809.

Referring now to the drawings, there is illustrated, in FIGS. 1 to 6, inclusive, a gang or group of side break rotating insulator type switch units connected to one embodiment of apparatus constructed in accordance with the present invention for operating the switch units as a group to move them to closed or opened position and to hold them in the position to which they have been moved. As there shown, the apparatus comprises a gang or group of switch units S, three such being shown, each having the operating arm A of its rotating insulator pivotally connected to an interphase rod or pipe **10**; a vertical rotatable operating shaft or down pipe **11** journaled in suitable bearings **12** carried by brackets **13** mounted on the frame, indicated generally at **14**, which support the switch units S; a reach pipe **15** pivotally connected at one end to the interphase pipe **10** and having its other end pivotally connected to the down pipe **11**; a spring biased operating arm device, indicated generally at **16**, fixedly secured on the bottom end portion of the down pipe **11**; and a reversible electric gear motor **17** having a cam member **18** in the form of a slotted disc mounted on an extension shaft of the gear mechanism for engaging the arm device **16** to rotate the down pipe **11**.

The switch units S are generally similar to the switch unit shown in FIG. 6 of my prior Patent No. 2,231,809, and, as shown in FIG. 3, each comprises a stationary insulator **19**, fixedly mounted on one end of an ordinary structural channel member forming the base member **20** of the switch unit, and a rotating insulator **21** mounted on the other end of the base member. The stationary insulator **19** carries the usual switch jaws and terminal connections, indicated generally at **22**, and the rotating insulator **31** carries the usual switch blade assembly and terminal connections, indicated generally at **23**.

The operating rod **10** is pivotally connected to the usual operating arm A of each of the rotating insulators for rotating these arms simultaneously as a unit to simultaneously open or close all of the switches.

The gear motor **17** may be of any suitable usual commercial type of a combined reversible electric motor and reduction gearing. In this particular modification, the gear motor is designed to rotate the cam disc **18** fixedly mounted on the extension shaft **24** from the gear motor at from 8 to 10 r.p.m. The cam disc **18** is provided with one or more radially extending slots **25** for a purpose hereinafter to be described.

The spring biased operating arm device **16** is shown as comprising a collar **26** fixed on the down pipe **11** and having a short laterally projecting arm **27** formed integral therewith, the outer end of the arm **27** is rounded. A coil spring **28** having one end connected to a bracket **29** carried by the frame **14** and its other end connected to an eye **30** formed on the collar **26**, normally holds the arm **27** in horizontal alignment with the spring.

The down pipe **11**, the reach pipe **15**, and the interphase pipe **10** are so connected that the pipe **11** must be rotated through 90° to move the switches from closed to open position or from open to closed position, and the collar **26** is secured on the down pipe **11** so that the arm **27** will project in a vertical plane coinciding with the vertical plane passing through the longitudinal center line of the shaft **24** of the gear motor, when the down pipe **11** has been rotated 45° away from the position it occupies when the switch units are opened and when they are closed. When the arm **27** is in this position it will project into and through one of the slots on the cam disc **18**. As the cam disc **18** is rotated in either direction, one of the edges of the slot will engage the side of the arm **27** and, with a cam-like action, will cause the arm to be swung either to the right or left until it

has reached the limit of its 90° movement, at which time it will have moved out of the slot and will be held in engagement with the outer surface of the disc by the action of the coil spring **28**. This will be true, regardless of the direction of rotation of the disc. The starting and stopping and reversing the direction of the motor are controlled by an operator by means of a suitable usual switch panel (not shown) located in a remote control room.

From the foregoing, the operation of the apparatus is believed apparent. With the switches closed, as shown in FIG. 1, the motor is stopped, the arm **27** is resiliently held against the surface of the disc **18**, thereby locking the switches in closed position. When the operator starts the motor to turn in a direction to open the switches (to the left or counterclockwise as viewed in FIG. 1) the end of the arm **27** will ride over the surface of the disc until the slot **25** reaches a position where the spring pressure forces the end of the arm into the slot, as the disc continues to rotate the side wall of the slot causes the arm to turn upon the disc, the arm projecting further into the slot until aligned, then the arm starts withdrawing from the slot and, at the point of withdrawal, the down pipe **11** will have been rotated through 90°, moving the switches from closed to open position. The arm is resiliently held against the outer surface of the disc, thus holding the switches locked in their open position. Then the operator stops the motor. If the disc should revolve after the arm has completed its movement in either direction, it would have no effect on the switches.

In FIGS. 6, 7 and 8, there is illustrated a modified cam disc construction for engaging the operating arm on the down pipe. As there shown, the gear motor **17'** is connected to rotate a vertical shaft **31** on which is fixedly mounted a horizontal disc **32** having an upturned circular flange **33** around its periphery. The flange **33** projects upwardly at a 90° angle to the surface of the horizontal disc and has one or more vertical slots **34** formed therein. The disc **32** is so positioned relative to the operating arm **27** that the arm engages the outer surface of the circular flange **33** and projects through the slots **34** formed therein when the slots are brought into alignment with the arm.

The operation of this modified form of apparatus is similar to the apparatus shown in FIG. 1. The rotation of the disc in one direction opens the switches and rotation in the opposite direction closes the switches. The spring **28** holds the switches locked in either closed or open position.

From the foregoing description, it readily will be seen that there has been provided novel, and improved electrically operated apparatus for opening and locking open and closing and locking closed, as a unit, a gang of high tension electric switches; apparatus which is simple in construction, inexpensive, and efficient in operation.

While the apparatus has been illustrated and described as operating a triple pole switch made up of three high tension switch units of the rotating insulator type, obviously, it could just as readily be employed to operate double pole or single pole switches of the rotative or rocking insulator type.

Obviously, too, the invention is not restricted to the particular embodiments thereof herein shown and described.

What is claimed is:

1. Apparatus for operating a group of high tension electric switches of the movable insulator type comprising a horizontal rod connected to the movable insulator of each of said switches for turning the movable insulators, as a unit to simultaneously open and close all of said switches; a vertical rotatable shaft having its upper end connected to operate said horizontal rod and having a laterally projecting operating arm fixedly secured thereon intermediate its ends; a rotatable cam member for moving said operating arm to a position in which said switches are closed and to a position in which said switches are open; spring biased means for locking said switches in their closed and open positions; and a reversible electric motor for rotating said cam member.

2. Apparatus as set forth in claim 1, wherein said cam member comprises a disc having an outwardly opening radial slot formed therein, said disc being mounted for rotation about a horizontal axis and so positioned relative to said operating arm that the free end of the arm engages the surface of the disc and projects through the slot therein when they are brought into alignment.

3. Apparatus as set forth in claim 2, wherein said spring biased means comprises a coil spring mounted to normally resiliently hold said arm against the surface of said cam member.

4. Apparatus as set forth in claim 1, wherein said cam member comprises a disc mounted for rotation about a vertical axis and having an upturned circular flange around its periphery, said flange having an opening formed therein and being so positioned relative to said operating arm that the outer free end of said arm engages the outer surface of the flange and projects through said opening therein when the opening and arm are brought into alignment.

5. Apparatus as set forth in claim 4 wherein said spring biased means comprises a coil spring mounted to normally resiliently hold said arm against the surface of said cam member.

6. Apparatus for operating a high tension electric switch of the movable insulator type comprising a vertical rotatable shaft having its upper end connected to turn the movable insulator to open and close the switch and having a laterally projecting operating arm fixedly secured thereon intermediate its ends; a rotatable cam member for moving said operating arm to a position in which said switch is closed and to a position in which said switch is open; spring biased means for locking said switch in its closed and open positions; and a reversible electric motor for rotating said cam member.

7. Apparatus as set forth in claim 6, wherein said cam member comprises a disc having an outwardly opening radial slot formed therein, said disc being mounted for rotation about a horizontal axis and so positioned relative to said operating arm that the free end of the arm engages the surface of the disc and projects through the slot therein when they are brought into alignment.

8. Apparatus as set forth in claim 7, wherein said spring biased means comprises a coil spring mounted to normally resiliently hold said arm against the surface of said cam member.

9. Apparatus as set forth in claim 6, wherein said cam member comprises a disc mounted for rotation about a vertical axis and having an upturned circular flange around its periphery, said flange having an opening formed therein and being so positioned relative to said operating arm that the outer free end of said arm engages the outer surface of the flange and projects through said opening therein when the opening and arm are brought into alignment.

10. Apparatus as set forth in claim 9, wherein said spring biased means comprises a coil spring mounted to normally resiliently hold said arm against the surface of said cam member.

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