July 7, 1964 T. F. JOHNSON 3,140,367

GANG OPERATED COMBINATION SWITCH UNITS EACH COMPRISING A HORIZONTALLY OPENING SWITCH AND A VERTICALLY OPENING BYPASS SWITCH

Filed April 25, 1962 2 Sheets-Sheet 1

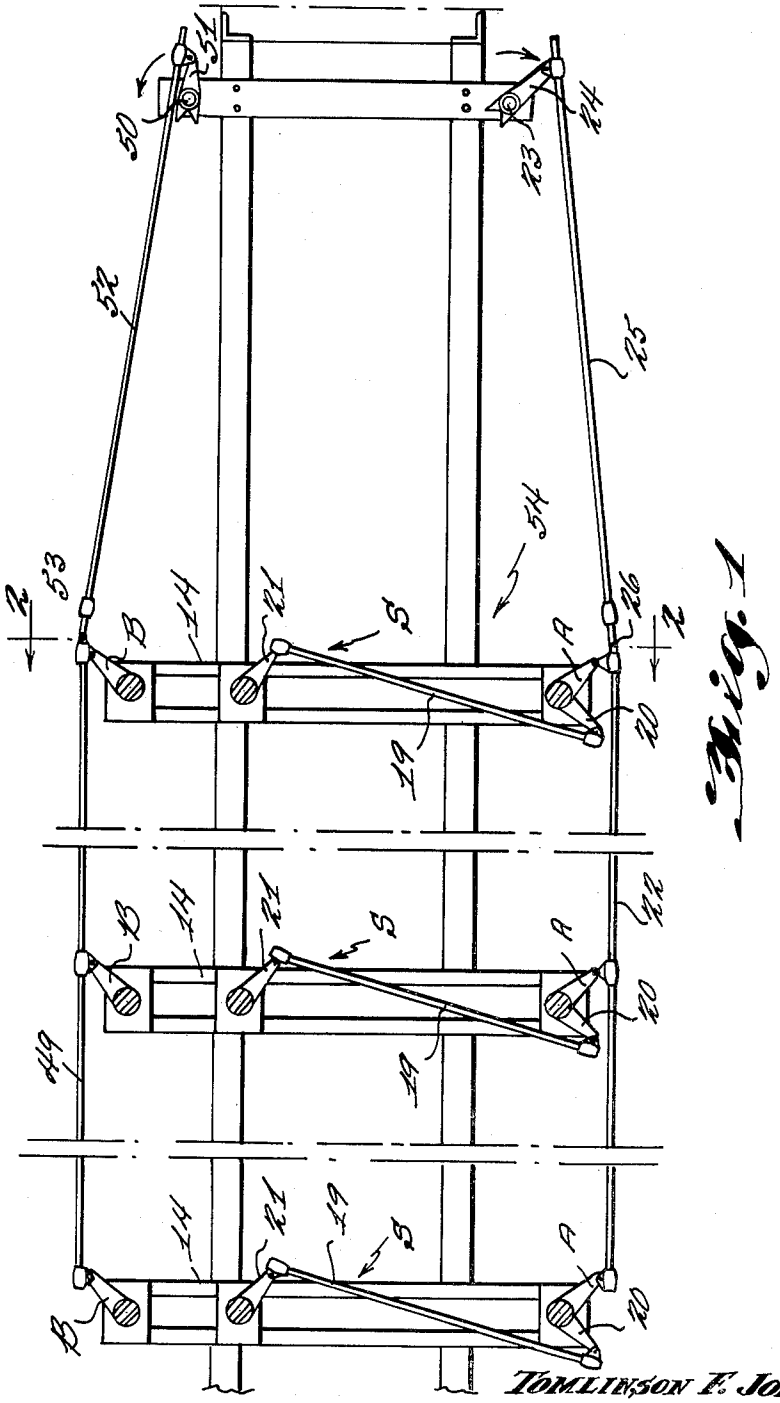



Fig. 1

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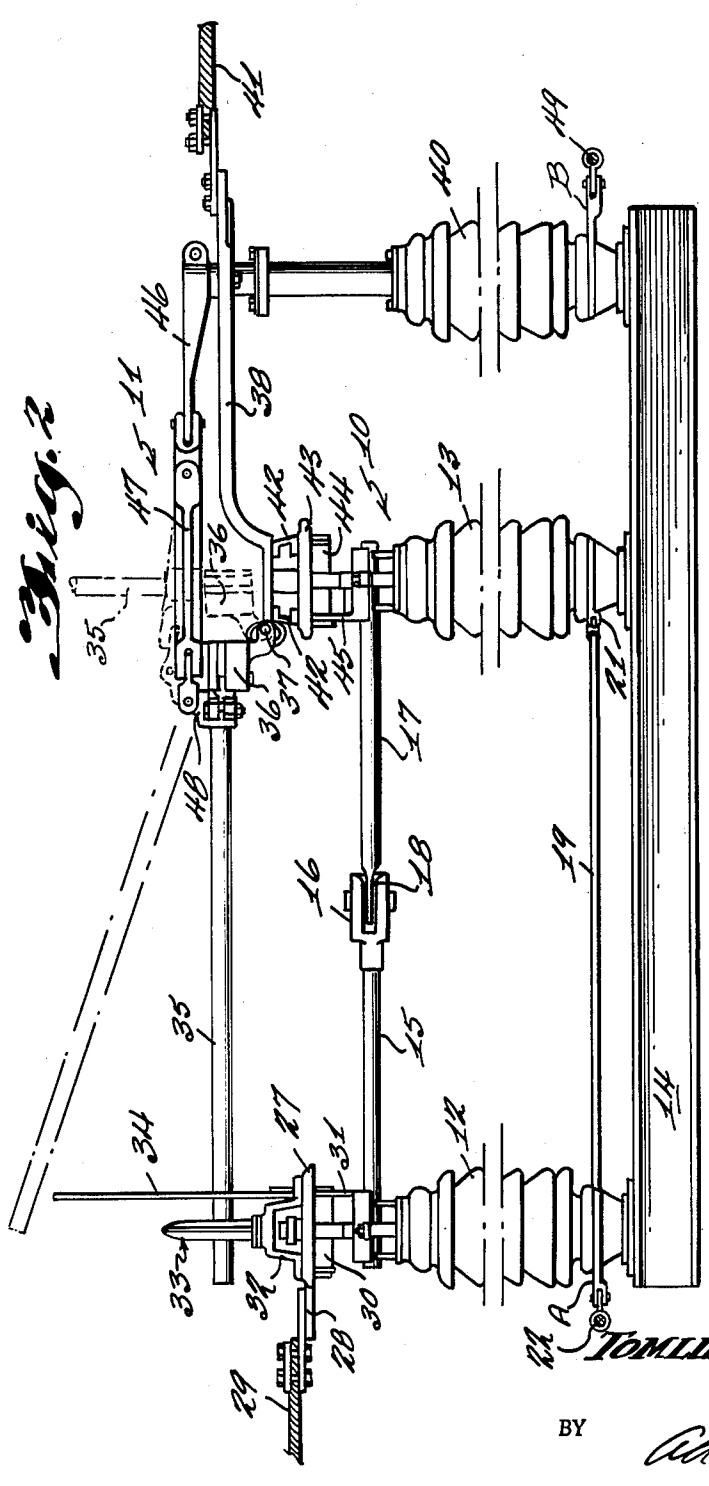


Fig. 2

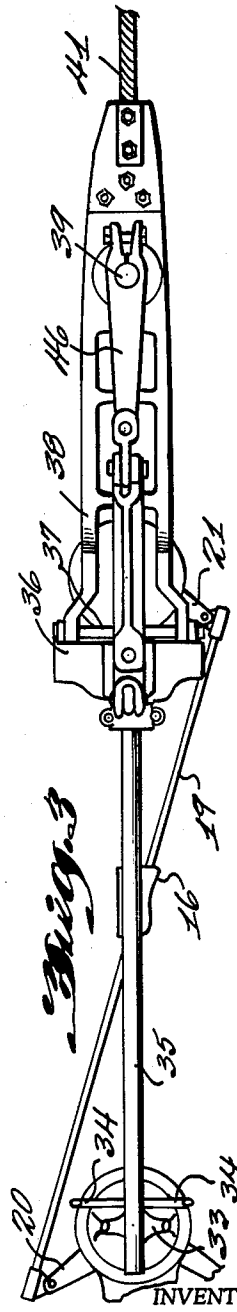


Fig. 3

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# GANG OPERATED COMBINATION SWITCH UNITS EACH COMPRISING A HORIZONTALLY OPENING SWITCH AND A VERTICALLY OPENING BYPASS SWITCH

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7 Claims. (Cl. 200—48)

This invention relates to high tension electric switches and has more particular reference to gang operated combination switch units each comprising a horizontally opening switch and a vertically opening bypass switch.

One object of the present invention is to provide a novel and improved combination switch unit comprising a horizontally opening switch and a vertically opening bypass switch so that when the horizontally opening switch is to be test opened and closed the normally open bypass switch may be closed for the test so that there will be no effect on the flow of current.

Another object of the present invention is to provide a novel and improved combination switch unit, as characterized above, which may be employed in a group or gang with separate operating mechanisms including vertically rotatable down pipes for the horizontal switches of the unit and for the bypass switches of the unit, thereby permitting the unit combination to be mounted on the usual high steel frames.

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 plan view with parts broken away of a gang of combination high tension horizontally opening switches and bypass switches, and showing how they are connected to separate operating apparatus;

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

FIG. 3 is a plan view of the apparatus shown in FIG. 2.

The present invention provides novel and improved combination gang switch units each including a horizontally opening switch and a vertically opening bypass switch with separate operating mechanism for the horizontally opening and the vertically opening bypass switches.

The improved apparatus is designed to provide a gang operated bypass switch in combination with a gang operated horizontal switch so that when the gang operated horizontally opening switches are to be test opened and closed, the normally open gang operated bypass switches may be closed so that there will be no effect on the flow of current.

Referring now to the drawings, there is illustrated in FIGS. 1, 2 and 3, a gang or group of combination switch units S, each including a horizontally opening center break switch and a vertically opening bypass switch. The switch units S are identical in construction and, as shown in FIGS. 2 and 3, each comprises a horizontally opening center break switch, indicated generally at **10**, and a vertically opening bypass switch, indicated generally at **11**.

The center break switch **10** is shown as comprising a pair of rotatable insulators **12**, **13**, spaced from each other and mounted on a base member **14**. The rotatable insulator **12** carries a switch element in the form of a copper tube or arm **15** supporting the usual switch jaws **16**. The rotatable insulator **13** carries a switch element in the form of a copper tube or arm **17** supporting the switch blade **18**.

The two rotatable insulators **12** and **13** are connected for simultaneous rotation by a connecting rod **19** pivotally connected in the usual manner to operating arms **20**, **21** carried by the insulators **12** and **13**, respectively.

The gang of center break horizontally opening switches



**10** are operated by an operating rod **22** connected to an operating arm A carried by the rotatable insulator **12** of each center break switch unit (see FIG. 1). Movement of the rod **22** in one direction closes the group of center break switches and the movement of the rod **22** in the opposite direction opens the group of center break switches.

In the particular embodiment of the invention illustrated, the horizontally opening center break switches **10** are opened and closed by suitable motor operated apparatus connected to rotate a down pipe **23** having an operating arm **24** fixed at its upper end and pivotally connected to a short rod **25** which has its inner end pivotally connected at **26** to the operating rod **22**. The construction is such that by rotation of the vertical shaft **23**, the operating rod **22** may be moved to simultaneously open or close all of the center break switches **10**.

The bypass switches **11** may be of any suitable usual type of vertical break air gap switch. The bypass switches are identical in construction and, as shown in FIGS. 2 and 3, each comprises a brass conductor plate-like fitting **27** free to swivel on an upright pin fixedly secured to the top of rotatable insulator **12**. The plate **27** carries a terminal connector **28** to which is connected the terminal **29** of the power line, and a depending flexible arc-shaped copper strip **30** which is engaged by an upstanding conductor blade fitting **31** carried by the arm **15** of the center break switch. While the plate **27** is free to swivel, it remains stationary whenever the rotatable insulator **12** is rotated, being held stationary by the stiff electrical conductor **29**. The plate **27** also carries a red brass support member **32** which supports a switch element in the form of switch jaws **33** and guide horns **34** for guiding the aluminum bypass switch blade **35** into the switch jaws **33**.

The vertically swingable bypass switch blade **35** is connected to a support member **36** pivotally mounted on a pin **37** carried by a supporting arm member **38**.

The conductor support member **38** has its outer end portion swivelly mounted on an upstanding pin **39** fixed to the top of a rotatable insulator **40** mounted on the support member **14**. The outer end of the member **38** is connected to the other terminal **41** of the power line. While the support member **38** is free to swivel, it remains stationary whenever the rotatable insulator **40** is rotated, being held stationary by the stiff electrical terminal **41**.

The inner end of the support member **38** is secured, as by brass clip members **42** to the top of a brass conductor plate **43**, free to swivel on an upright pin fixedly secured to the top of rotatable insulator **13**. The conductor plate **43** carries a depending flexible arc-shaped copper strip **44** which is engaged by an upstanding conductor blade fitting **45** carried by the arm **17** of the center break switch. While the conductor plate **43** is free to swivel, it remains stationary whenever the rotatable insulator **13** is rotated, due to its connection to the arm member **38**.

The bypass blade is swung upward to its normal open position (as shown in dotted lines in FIG. 2), by means of a horizontally swinging crank arm **46** fixedly mounted on the pin **39** carried by the rotatable insulator **40** and pivotally connected at its outer end to a double jointed connecting rod **47** which is pivotally connected at its forward end to an upstanding ear formed on a member **48** carried by the blade **35**.

Upon rotation of insulator **40** in one direction the arm **46** retracts the link **47** to swing the member **36** upwardly about the pivoted pin **37** and thereby swing the blade **35** to its normal open position with the blade **35** being substantially vertical. Upon rotation of the insulator **40** in the opposite direction the arm **46** acts on link **47** to swing the blade **35** downward into engagement with the switch jaws **33**, thereby closing the switch, the

blade 35 being guided into the switch jaws by the guide horns 34.

The gang or group of bypass switches 11 are operated by an operating rod 49 connected to an operating arm B carried by the rotatable insulator 40 of each bypass switch. Movement of the rod 49 in one direction closes the group of bypass switches and the movement of the rod 49 in the opposite direction opens the group of bypass switches.

In the particular embodiment of the invention illustrated the bypass switches 11 are opened and closed by rotation of a down pipe 50 having an operating arm 51 fixed to its upper end and pivotally connected to a short rod 52 which has its inner end pivotally connected at 53 to the operating rod 49. The construction is such that by rotation of the vertical down pipe 50, the operating rod may be moved to simultaneously open or close all of the bypass switches 11. The down pipes 23 and 50 for operating the center break switches 10 and the bypass switches 11 are journaled in suitable bearings carried by the frame construction, indicated generally at 54, on which the switch units are mounted.

The operation of the apparatus is believed obvious. Whenever it is desired to test the automatically operated control mechanism which operates the opening and closing of the center break switches, the bypass switches which are normally maintained in open position are closed, then the center break switches can be opened and closed without any effect on the flow of current.

From the foregoing, it will be apparent that there has been provided a novel and improved gang operated bypass switch and horizontally opening switch combination which permits the automatically controlled horizontally opening switches to be tested by opening and closing without any effect on the flow of current, the gang operated bypass switches permitting the combination switch units to be mounted on the usual high steel frames.

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

What is claimed is:

1. The combination with a gang of automatically controlled and operated high tension horizontally opening center break electric switches, each switch including a rotatable insulator carrying switch jaws, a rotatable insulator carrying a switch blade, and a connecting rod pivotally connected to each of the rotatable insulators, of a gang of vertically opening bypass switches with each bypass switch connected to be simultaneously opened and closed by means of an operating rod and a rotatable vertical down pipe connected to reciprocate said operating rod, and, wherein said vertically opening bypass switches are mounted on said center break switches with each bypass switch having switch jaws carried by one of the rotatable insulators of the center break switch upon which the bypass switch is mounted, and a vertically swingable switch blade carried by the other of the rotatable insulators of the center break switch upon which the bypass switch is mounted and wherein the operating mechanism for raising and lowering the blade of the bypass switch to open and closed positions includes a rotatable insulator having an operating arm pivotally connected to said operating rod for simultaneously opening and closing the bypass switches.

2. Apparatus as set forth in claim 1, wherein the switch jaws of each bypass switch are mounted on a conductor plate swivelly carried by the rotatable insulator of the center break switch carrying the center break switch jaws, said conductor plate being fixedly connected to one line terminal and electrically connected to the switch jaws of the bypass switch and the switch jaws of the center break switch.



3. Apparatus as set forth in claim 2, wherein each bypass switch includes a conductor arm having one end portion swivelly mounted on the rotatable insulator for operating the mechanism for raising and lowering the bypass switch blade with the end of the conductor arm connected to the other line terminal and its other end connected to a conductor plate swivelly mounted on the rotatable insulator carrying the center break switch blade and electrically connected to the switch blades of the bypass switch and the center break switch.

4. A combination high tension electric switch unit comprising a horizontally opening center break switch having an operating arm adapted to be operated by an automatically controlled rotatable down pipe, solid center break switch comprising a rotatable insulator carrying switch jaws, a rotatable insulator carrying a switch blade, and a connecting rod pivotally connected to each of the rotatable insulators, and a vertically opening bypass switch having an operating arm adapted to be operated by a rotatable down pipe, and, wherein said bypass switch is mounted on said center break switch with said bypass switch having switch jaws carried by one of the rotatable insulators of the center break switch and a vertically swingable switch blade carried by the other rotatable insulator of the center break switch and wherein the operating mechanism for raising and lowering the blade of the bypass switch to open and closed positions includes a rotatable insulator which carries the operating arm adapted to be operated by a rotatable down pipe.

5. Apparatus as set forth in claim 4, wherein the switch jaws of the bypass switch are mounted on a conductor plate swivelly mounted on the rotatable insulator, the bypass switch jaws and said conductor plate being fixedly connected to one line terminal and electrically connected to the switch jaws of the bypass and center break switches, the construction and arrangement being such that said line terminal keeps said conductor plate from rotating when the rotatable insulator upon which it is swivelly mounted is rotated.

6. Apparatus as set forth in claim 5, including a conductor arm having one end portion swivelly mounted on the rotatable insulator for operating the bypass switch with the end connected to the other line terminal and its other end connected to a conductor plate swivelly mounted on the other of the rotatable insulators of the center break switch and electrically connected to the switch blades of the bypass switch and the center break switch, and wherein said bypass switch blade is pivotally connected to the inner end of said conductor arm and to a double link mechanism pivotally connected to be operated by a crank arm fixedly mounted on the rotatable insulator for operating the bypass switch blade, the construction and arrangement being such that said conductor arm remains stationary whenever said bypass switch or center break switch is operated.

7. In combination a high tension horizontal opening switch and a vertically opening bypass switch comprising a pair of spaced insulators, a horizontally arranged high tension switch blade secured to one insulator, high tension switch receiving jaws for the switch blade secured to the other insulator, means for rotating one of the insulators to open and close the high tension switch, a bypass switch blade, means pivotally mounting the bypass switch on one of the insulators for vertical movement, bypass switch receiving jaws for the bypass blade on the other insulator, a third insulator, means for rotating the third insulator, and means interconnecting the third insulator to the bypass blade pivotal mounting, for pivoting the bypass blade upon rotation of the insulator.

No references cited.