March 14, 1933. J. F. D. HOGE 1,901,449

MULTICONTACT SWITCH

Filed Feb. 24, 1930

FIG. 4.

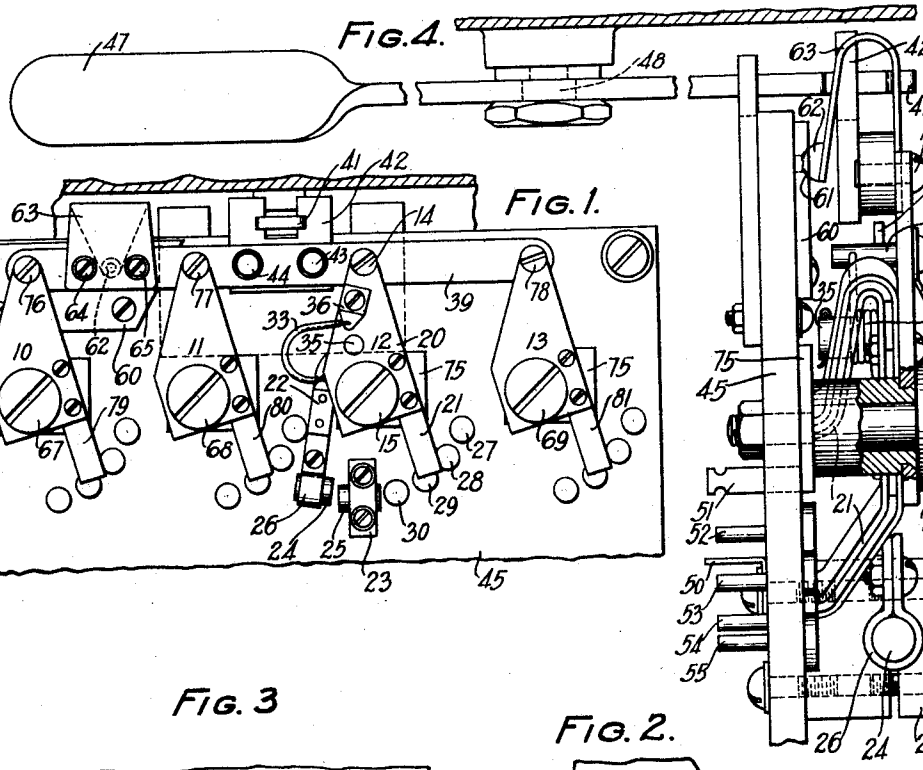


FIG. 1.

FIG. 3

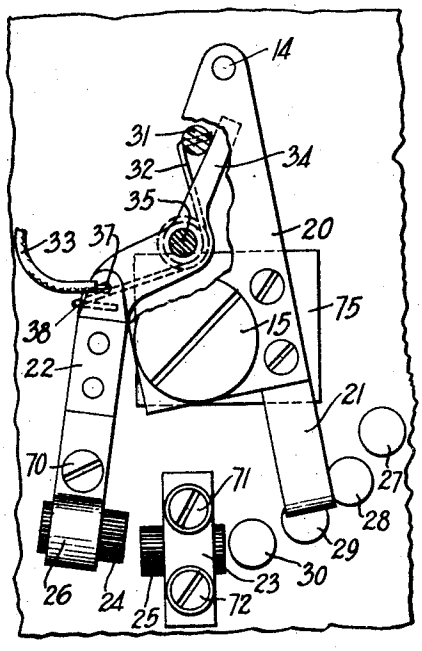
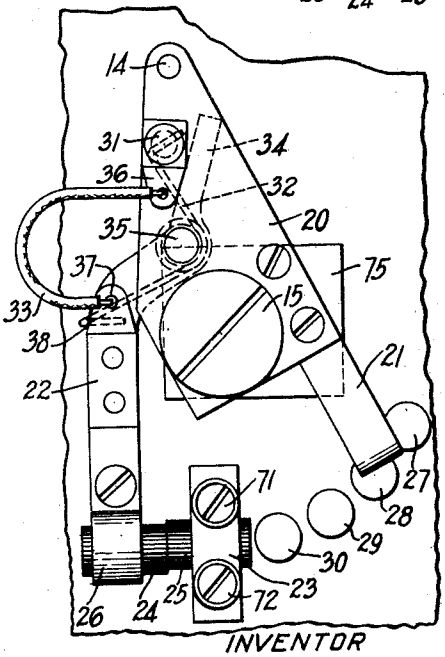


FIG. 2.



INVENTOR

J. F. D. HOGE

BY G. H. Heydt

ATTORNEY

Patented Mar. 14, 1933

1,901,449

UNITED STATES PATENT OFFICE

JOSEPH F. D. HOGE, OF NEW YORK, N. Y., ASSIGNOR TO BELL TELEPHONE LABORATORIES, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK

MULTICONTACT SWITCH

Application filed February 24, 1930. Serial No. 430,472.

This invention relates to multi-contact switches having carbon contacts auxiliary to certain metal contacts.

In switching units for making and breaking circuits of high impedance, a spark of considerable magnitude is unavoidable, particularly when such circuit is broken. A spark of this nature quickly deteriorates metal contact surfaces, bringing about a high resistance between the surfaces of brush and contact. Ordinarily the metal contacts of a switch are not easily replaced. Therefore, in circuits of this nature carbon contacts are used to supplement the metal contacts. It is also desirable to prevent the formation of high resistance substances upon the surfaces of carbon contacts in order to positively eliminate any arcing at the metal contacts. The formation of high resistance substances is ordinarily prevented by imparting motion to the carbons when making and breaking. This is accomplished in circuit breakers by attaching the carbons to the ends of a spring which is attached to a metal brush in a manner shown in Patent 841,035, issued January 8, 1907, to J. E. Morris. It is recognized by the inventor that carbon contacts have also been used in starting switches and multi-contact switches as shown in Patent 447,827, issued to W. Hochhousen, March 10, 1891, and Patent 1,473,838, issued to J. Driessen, November 13, 1923. Difficulty has however been experienced in imparting a rubbing or wiping motion to carbon contacts used with multi-contact switches and thus the switching arrangements disclosed in the above patents which do not have means for setting up a rubbing motion between the surfaces of the carbon contacts are limited in their use.

The object of this invention is therefore to provide a multi-contact switch with circuit breaker carbon contacts, one of which is mounted on an arm movable for rubbing the surfaces of the carbon contacts to remove high resistance substances formed on said surfaces.

One embodiment of the present invention comprises a multi-contact switch having a plurality of metal brushes with a plurality of metal contacts associable with each brush. Each switch arm is mounted on a separate axle commonly controlled by an insulated bar movable in a given plane. A particular switching unit has mounted thereon a stationary carbon element and a movable carbon element, the movable carbon element being mounted in a secondary arm eccentrically pivoted to the switch arm. The movement of the switch arm imparts an eccentric movement in the secondary arm thus causing a motion between the surfaces of the carbons during certain movements of the switch arm. In certain positions of the switch arm, the secondary arm is under the control of a spring which maintains the carbons together. A pin is provided on the switch arm for disassociating the carbon contacts after the metal brush has moved over a given number of metal contacts. The carbon contacts are mounted in holders arranged for adjustment and replacement of the carbon elements when necessary.

In the illustrated embodiment, Fig. 1 shows a manually controlled multi-contact switch embodying this invention; Figs. 2 and 3 show front elevations of the switch with an auxiliary or secondary switch arm in two positions; Fig. 4 shows an end elevation of the multi-contact switch.

The assembly of the switching unit is best shown in Fig. 1 wherein four switches 10, 11, 12 and 13 are shown, all operated by the movement of insulated bar 39. The insulated bar 39 is connected to a lever arm 41 through the agency of plate 42 which is secured to the insulated bar 39 by bolts 43 and 44. The manner of imparting motion to the switch brushes is best shown in Fig. 4 wherein the lever 41 is shown pivoted at 48 and operable by the movement of lever handle 47. A spring positioning member 63 is also fastened to the insulated bar 39 by screws 64 and 65. The positioning member 63 has riveted thereto a semi-spherical button 62 which may register successively with countersunk portions 61 on plate 60 when the brushes are resting accurately on the switch contacts 27, 28, 29 or 30. Thus an operator of the switch is guided in positioning the

switch brushes by the pressure of the spring member 63 in notches 61.

The switching units have their axes at 67, 68, 15 and 69 which are maintained in position by fastenings in contact panel 45. The movement of insulated bar 39 to the right thus moves the metal brushes 79, 80, 21 and 81 to the left in a circular movement over the surfaces of the metal contacts.

Switching unit 12 is arranged for opening a circuit of high impedance and for this reason an auxiliary set of carbon contacts is placed in multiple with brush 21 and contact 27. An auxiliary arm 22 carrying contact holder 26 and carbon contact 24 is controlled by a spring 32 which causes the carbon contact 24 to touch carbon contact 25 when the brush 21 is resting on contact 27. The spring 32 is held at one end in pin 31, coiled around the auxiliary arm pivot pin 35 and bent over the auxiliary arm at 38. Pin 31 and pivot pin 35 are rigidly fastened to plate 20 of the switch arm.

It will be noted that the pivot for brush 21 is at 15 and that the pivot for the auxiliary arm 22 is at 35. Thus when motion is imparted to the switch arm 20, the pin 35 revolves in a circular bearing surface of the auxiliary arm 22 and an eccentric movement is imparted to the auxiliary arm 22 during the time that the spring is free to hold the carbon surfaces together and until such time as the carbon contacts are opened. When the carbon contacts are opened a circular and upward movement is imparted to the auxiliary arm. This will be more clearly understood by a detailed description of the related movement of the switch arm 20 and the auxiliary arm 22. Let it be assumed that brush 21 is resting fully on contact 27. In this position of the switch arm, carbon contact 24 is pressed against carbon contact 25 by spring 32 and the carbon contact 24 is in a slightly lower position than is shown in Fig. 2. When movement is imparted to the switch arm through the agency of lever handle 47 to move brush 21 toward contact 28, an eccentric motion is imparted to arm 22 causing the surface of carbon contact 24 to rub upwardly against the surface of carbon contact 25. This movement continues until pin 31 which is attached to the plate of switch arm 20 is brought to bear against piece 34 which is an extension of the auxiliary arm 22. The pressure of the pin 31 against piece 34 operates against spring 32 to carry the contact 24 away from contact 25. During the breaking period of these contacts, the upward rubbing movement of contact 24 continues against contact 25 until the contacting surfaces are actually broken. The pin 31 engages arm 34 immediately after brush 21 has been moved away from contact 27. Thus the high impedance circuit, which is made by brush 21 and contact 27, is opened at these contacting surfaces previous to the opening of the same circuit by the carbon contacts 24 and 25. The carbon contacts are broken as the brush 21 is moved over contact 28 to contact 29.

When insulated bar 39 is moved to the left, assuming brush 21 to be cooperating with contact 30, the carbon contact 24 makes with carbon contact 25 when brush 21 reaches a position on contact 28 and thereafter the continued movement of switch arm 20 causes the carbon contact 24 to wipe downwardly over the surface of carbon contact 25.

In view of the rubbing between carbon contacts, the surfaces wear and thus the carbons must be adjusted from time to time. The adjustment of carbon 24 can be made by loosening screw 70 which releases pressure on the carbon. In the same way, carbon 25 may be adjusted by loosening screws 71 and 72. The carbons may also be replaced by loosening these screws.

The manner of connecting the brushes together is indicated by connector 33 which is a copper wire soldered to terminal 36 and terminal 37. This connects the auxiliary arm electrically to the switch arm since terminal 36 is fastened under the head of pin 31 and terminal 37 is riveted to arm 22.

By reference to Fig. 4 the terminals for other electrical connections can be seen extending from the terminal side of panel 45. Terminal 50 provides a connection to carbon contact 25, terminals 52, 53, 54 and 55 provide for electrical connection to contacts 27, 28, 29 and 30, and terminal 51 provides for an electrical connection to the switch brush 21 through the plate 75. Brush 21 is designed for balanced pressure, one end riding on the surface of plate 75 and the other end riding on the surface of contacts 27 to 30 inclusive. A connector similar to 33 may be soldered to terminals 50 and 52 for connecting contacts 27 and 25 together.

It is not intended that the invention be limited to the specific structure and electrical circuit arrangement disclosed and described.

What is claimed is:

1. In a multi-contact switch, a brush guiding member having an axle pivoted to a stationary support, a metal brush fastened rigidly to said member, a secondary arm having a separate axle bearing, a carbon contact attached to said secondary arm, an axle pin for said secondary arm rigidly attached to said guiding member in a position to eccentrically pivot said secondary arm, a series of stationary metal contacts arranged to contact with said metal brush, a stationary carbon contact arranged to contact with said secondary arm carbon contact, a tension spring for holding said carbon contacts together, means to move said guiding member to wipe said metal brush over said metal contacts and thereby rotate said axle pin in said secondary arm bearing for wiping the surface of

said secondary carbon contact over the surface of said stationary carbon contact during a period of rotation of said brush guiding member, a stationary pin mounted in said guiding member, and an extension on said secondary arm for engaging said pin to open said carbon contacts.

2. In a multi-contact switch, a brush guiding member having an axle pivoted to a stationary supporting member, a series of metal contacts radially mounted on said stationary support and having said axle as a center, a metal brush fastened rigidly to said guiding member having the end associated with the contacts diagonally intercepting the radii on which the contacts are mounted to provide a two-directional movement over said contacts, a secondary arm having a separate axle bearing, a carbon contact attached to said secondary arm, an axle pin for said secondary arm rigidly attached to said guiding member in a position to eccentrically pivot said secondary arm, a stationary carbon contact arranged to contact with said secondary arm carbon contact, a tension spring for holding said carbon contacts together, means to move said guiding member to wipe said metal brush over said metal contacts and thereby rotate said axle pin in a circumference having said primary axle member as a center for wiping the surface of said secondary arm carbon contact over the surface of said stationary carbon contact during a period of rotation of said brush guiding member, a stationary pin mounted in said guiding member and an extension on said secondary arm for engaging said pin to open said carbon contacts.

In witness whereof, I hereunto subscribe my name this 17th day of February, 1930.

JOSEPH F. D. HOGE.