March 7, 1939. C. F. JAMES ET AL 2,149,699

THREE-WAY SWITCH

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Fig. 1.

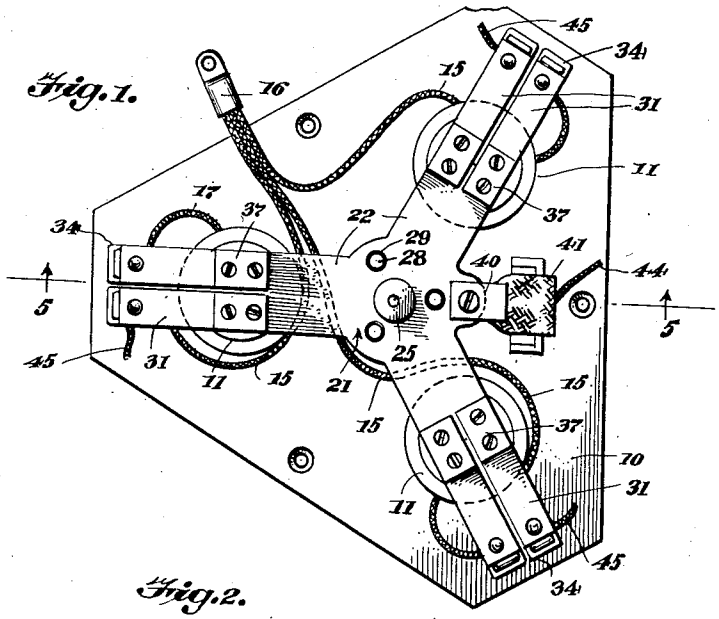


Fig. 2.

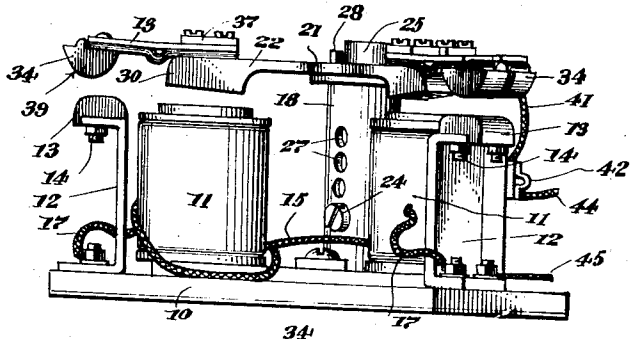
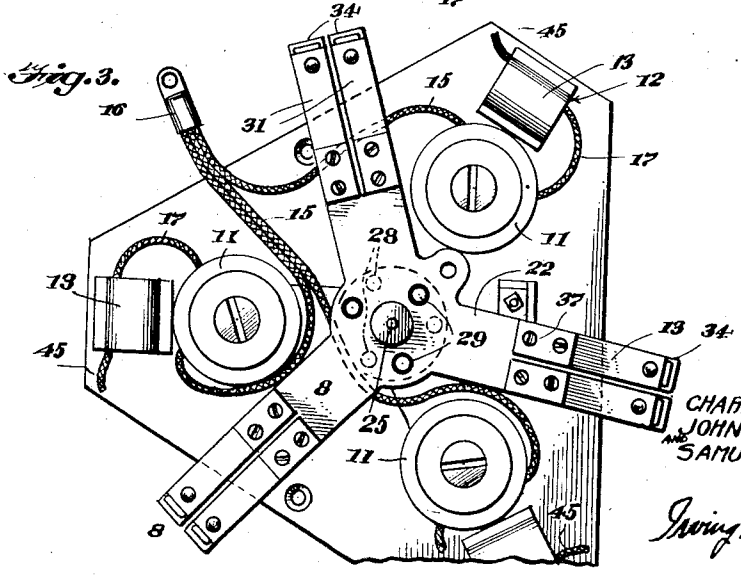


Fig. 3.



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Fig. 4.

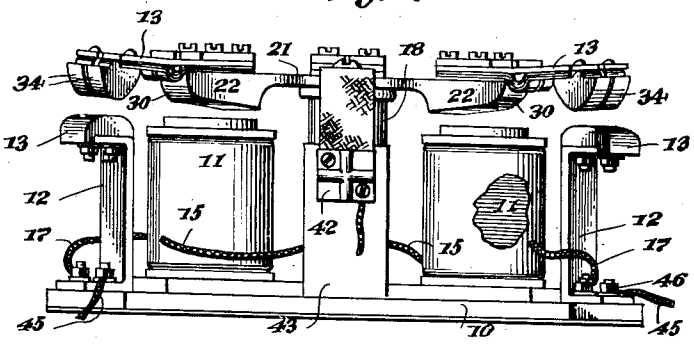


Fig. 5.

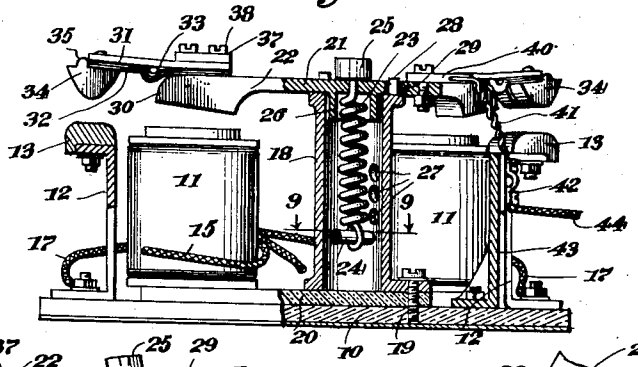


Fig. 6.

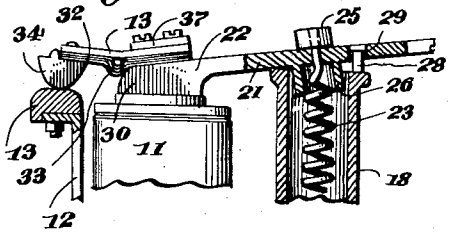


Fig. 7.

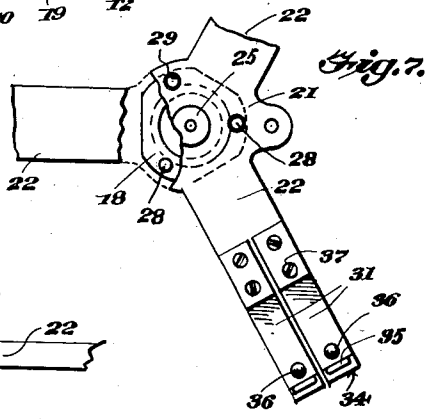


Fig. 8.

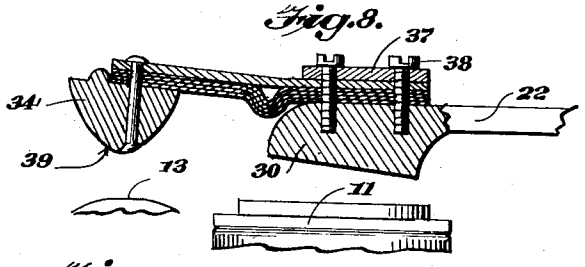
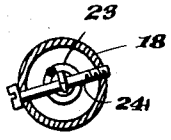


Fig. 9.



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UNITED STATES PATENT OFFICE

2,149,699

THREE-WAY SWITCH

Charles F. James and John H. Buckley, Beards Fork, and Samuel D. Buckley, Alloy, W. Va.

Application November 9, 1936, Serial No. 109,956

4 Claims. (Cl. 200—98)

This invention relates to three-way switches, and has for one of its objects the production of a simple and efficient three-way switch having the contact arms thereof arranged in radiating triangular relation for contact with terminals also arranged in triangular relation whereby when one contact arm is moved to a contacting position the other arms will be positively lifted or moved to an open or contact-breaking position.

A further object of this invention is the production of a three-way switch, the radiating arms of which are provided with yieldably mounted contact fingers so constructed as to prevent the formation of an arc when contact is made by providing a wiping or rocking contact between the contact fingers and their respective terminals.

Another object of this invention is the production of a three-way switch having a plurality of radiating arms connected at their inner ends and rockably and releasably mounted so that when one arm is in a contacting position the other arms will be lifted to an open position and whereby the arms may be rotated to a shifted position so that access may be had to the operating magnets.

Other objects and advantages of the present invention will appear throughout the following specification and claims.

In the drawings:—

Figure 1 is a top plan view of the three-way switch;

Figure 2 is a side elevation of the structure shown in Figure 1;

Figure 3 is a top plan view of the three-way switch, showing the contact arms shifted to allow access to the electro-magnets, a portion of the base being broken away;

Figure 4 is a side elevation of the switch wherein all three terminals are illustrated;

Figure 5 is a longitudinal sectional view taken on line 5—5 Figure 1;

Figure 6 is a fragmentary side view of one portion of the contact arm, certain portions thereof being shown in section including a portion of the supporting standard;

Figure 7 is a top plan view of a portion of the switch arm;

Figure 8 is an enlarged longitudinal section taken on line 8—8 of Figure 3; and

Figure 9 is a transverse sectional view taken on line 9—9 of Figure 5.

By referring to the drawings it will be seen that 10 designates the triangular base plate which is preferably formed of insulating material upon which base plate 10 is supported near each of its corners the upstanding electro-magnets 11, these magnets 11 being arranged in triangular formation, as illustrated clearly in Figures 1 and 3. Adjacent each electro-magnet 11 is mounted an upstanding terminal bracket 12, each upstanding terminal bracket 12 carrying a terminal shoe 13 which is removably secured to the bracket 12 through the medium of securing bolts 14, so that the shoe 13 may be replaced when desired. A conducting wire 15 is electrically connected to each magnet 11, as shown in Figures 1, 2 and 3, these wires 15 leading to a common terminal 16, which terminal may be connected in any suitable or desired manner to a convex electrical lead. Each magnet 11 is also connected to its companion terminal bracket 12 by means of a conducting wire 17, as clearly shown in the drawing.

The insulated base plate 10 supports a centrally located upstanding tubular standard 18, which standard 18 is located centrally of the group of magnets 11, the magnets 11 being in other words grouped about the central standard 18 and equally spaced from each other and from the standard. The standard 18 is preferably anchored to the base by means of suitable anchoring bolts 19 and the standard may be either supported directly upon the base plate 10 or supported upon an additional insulated plate 20, as shown in Figure 5.

A three-way switch member 21 is supported upon the standard 18 and preferably comprises three radiating arms 22 which arms are arranged in triangular relation, two of the arms being so arranged as to extend to the opposite side of the central axis of the switch member 21 with respect to the remaining arm, as shown clearly in Figure 1. The switch member 21 rests upon the upper end of the standard 18 and is normally held firmly upon the standard against accidental displacement by means of a tension spring 23 which is anchored at its lower end upon a pin 24 carried near the lower end of the standard 18, the upper end of the spring being secured to the switch member 21, as at 25. The switch member 21 is preferably provided with a depending collar 26 which fits into the upper end of the hollow standard 18 and tends to hold the arm against accidental shifting, the collar 26 also constituting a socket for the upper end of the spring 23. The standard 18 may, if desired, be provided with a plurality of apertures 27 to permit the tension of the spring 23 to be adjusted. The standard 18 carries a plurality of upstanding pins 28 which extend through enlarged sockets 29 formed in switch member 21, the sockets being of sufficient

size and shape to allow the switch member to rock from side to side, as shown in Figure 6, without displacing the switch member 21, the spring 23 providing sufficient tension to prevent the switch member from accidentally jumping off the upper end of the standard 18.

Each arm 22 is provided with a depending show portion 30 at its outer end in a position to normally overhang one of the magnets 11, a separate magnet being provided in aligned position with respect to the outer end of the arms 22. Each arm 22 also carries upon its upper face a pair of parallel spring fingers 31 which project outwardly with respect to the outer ends of the arms 22, and these fingers 31 carry upon their under faces laminated strips of metal 32 of high conductivity, such as copper and the like, which strips 32 are so mounted as to allow the fingers 31 to freely flex through the medium of the crimped portion 33. A contact shoe 34 is carried by the outer end of each finger 31 and this shoe 34 is provided with a transverse rib 35 which abuts upon its upper face against the outer end of the finger and laminated strips 32 to assist in holding the shoe 34 in proper alignment, a suitable rivet 36 being employed in each instance for anchoring the shoe 34 in place. A clamping plate 37 is preferably supported upon the inner end portion of each finger 31 through which the anchoring screws 38 pass for firmly holding the fingers 31 in engagement with the arms 22. It is important to note that the shoes 34 are provided with a rounded under face 39 to present a rounded contact nose for engagement with the contact shoe 13 supported upon its companion terminal bracket 12. Consequently, as the switch member is swung to a contacting position, the rounded nose or underface 39 of the shoe 34 will provide a wiping contact upon the upper face of the shoe 13 due to the shape of the shoe 34, and the fact that the shoe 34 is flexibly supported, as described above. This will prevent the forming of an arc at the point of contact between the shoes 34 and 13 both at the time the contact is made and when the contact is broken, a rocking action taking place in each instance due to the shape of the under face of the shoe 34 and the flexible supporting means of this shoe 34. This feature is of great importance in a switch of this character, particularly in view of the fact that the elimination of all arcs and sparks at the point of contact.

As is shown in the drawings, the arms 22 are arranged in triangular relation and are preferably three in number, the arms being so arranged as to cause only one contact to be made at a time and when one arm is thrown to a contacting position, the other two arms will be definitely raised to an inoperative position due to the rocking action of the switch member making it impossible for more than one arm to provide an electrical contact. The switch member 21 is electrically connected to a terminal plate 40, which plate 40 is connected to a flexible conductor strip 41 extending to a clamp 42 carried by a supporting bracket 43 anchored upon the base 10. A lead wire 44 is in turn connected to the bracket 43 to provide a terminal or leadout for the circuit, the terminal 16 providing the opposite side of the line.

A suitable feed wire 45 is connected to each terminal bracket 12 by being secured to one of the securing bolts 46 of the intake brackets 12, which brackets 12 constitute intake terminal posts, the wire 44 leading to the supporting bracket 43 constituting an outlet terminal and the bracket 43 constituting an outlet terminal post.

It should be understood that the parallel fingers 31 carried by each arm 22 will provide a flexible contact means, each of the spring fingers 31 carrying its own shoe 34, as described and illustrated.

The contact member 31, as illustrated and as previously described, is not only rockably mounted upon the upper end of the standard 18 but is removably mounted thereon so that the contact member may be lifted up from the pins 28 in order that the contact member may be positioned, as shown in Figure 3, the arms 22 extending in between the magnets 11, thereby facilitating access to the magnets for the purpose of replacement, repair or adjustment.

The operation of the device is as follows:—As one magnet 11 is energized, one of the arms 22 will be drawn down or attracted by the magnet from the position shown in Figure 4 to the position shown in Figure 6, this causing the contact shoes carried by the fingers 31 of this arm to contact with its companion shoe 13 carried by the supporting bracket 12. When this action takes place, the rearwardly extending and radiating arms 22 of the switch member 21 will be elevated or moved upwardly away from the respective companion contact shoes 13, in this way insuring a contact only upon one arm, the other arms being positively and definitely lifted to a non-contacting or open position as will be obvious. In this way the respective magnets 11 may be selectively energized to draw the selected arm 22 to a contacting position and for the reason that the arms are preferably arranged in groups of threes arranged in triangular relation, it will be noted that two of the arms are at all times extended to the opposite side of the central axis of the contact member with respect to the third arm, in this way providing the positive lifting action of two of the arms to an open position when the third arm is in a contacting position. This is provided for through the rocking mounting of the switch member 21 upon the standard 18 and due to the wiping contact provided by the shoes 34, it should be understood also that the danger of forming an arc at the point of contact will be eliminated and the sticking of the shoes 34 or the shoes 13 will be eliminated by the flexible mounting of the shoes 34 upon the arms 22, a rocking action being provided for the shoes 34 both at the time when the shoes move to a contacting position and also when the shoes are moved to a circuit-breaking position.

It should be understood that the current will enter through one of the wires 45 to one of the brackets 12, through one of the leads 17, through one of the magnets 11 out through one of the leads 15 to the terminal 16 and then to the negative side of the line. The enlarged depending end 30 of one of the arms 22 will be attracted by this energizing magnet 11 causing the contact of its shoes 34 with the shoes 13 of the bracket 12, and the current through the medium of this contact will pass through the arm 22 of the switch member 21 and out through the members 40, 41 and line 44. The other magnets may be selectively energized for causing a selective contact for the other arms.

It should be understood that certain detail changes in the mechanical construction, combination and arrangement of parts may be em-

ployed without departing from the spirit of the invention, so long as such changes fall within the scope of the appended claims.

Having described the invention, what is claimed as new is:

1. A switch of the class described comprising a base, a supporting standard carried by said base, a contact member having a plurality of extending arms, a plurality of parallel spring fingers carried by and extending outwardly from the outer end of each arm in side by side relation to each other, flexible conducting strips extending from the arms under the spring fingers and secured to the arms and the fingers, a shoe carried by the outer end of each finger and having a rounded nose upon its lower face to provide wiping contact, electro-magnets cooperating with said arms for swinging the arms to a contacting position, and intake terminals adapted to contact with said shoes, the shoes because of said spring fingers and its shape providing a wiping contact with the intake terminal.

2. A switch of the class described comprising a base, a supporting standard carried by said base, a contact member rockably carried by said standard and having a plurality of extending arms, a plurality of parallel spring fingers extending from the outer end of each arm, flexible conducting strips extending under the spring fingers, a shoe carried by the outer end of each finger and having a rounded nose upon its lower face to provide wiping contact, electro-magnets cooperating with said arms for selectively swinging the arms to a contacting position, an intake terminal adapted to contact with each shoe, each shoe because of its spring fingers and its shape providing a wiping contact with the companion intake terminal, and each shoe having a transverse rib upon its upper face abutting against the outer end of the cooperating strips, and fingers for holding the shoe in proper alignment.

3. A switch of the class described comprising a base, a standard carried by said base, a plurality of electro-magnets grouped in spaced relation around said standard, a contact member supported by said standard, said contact member having three radiating arms extending in triangular relation with respect to each other, said standard having upstanding pins at its upper end, said contact member having enlarged apertures for receiving said pins whereby the contact member may be rocked upon said standard and at the same time be held against accidental displacement, spring means for yieldably holding said contact member stationary extending longitudinally in the standard and having its upper end secured to the contact, an anchor for the lower end of said spring, adjustably carried by the standard, an intake terminal located adjacent each magnet, means carried by each arm for forming a contact with one of the selected intake terminals as one of the selected magnets is energized, said contact member having a depending collar fitting within said standard for allowing free rocking movement of the contact member upon the standard, and at the same time preventing lateral displacement of the contact member with respect to the standard.

4. A switch of the class described comprising a base, a hollow centrally located standard carried by said base, a plurality of electro-magnets grouped about said standard in triangular relation, a contact member rockably supported upon the upper end of said standard, a coil spring connected to said contact member and extending down into said standard longitudinally thereof, openings being formed in walls of the standard and spaced from each other longitudinally thereof for adjustably anchoring the lower end of said spring within said standard for yieldably holding said contact member against displacement upon the upper end of the standard, said anchoring means consisting of a pin engaged by the spring and extending transversely through the standard and engaged in selected ones of the openings, means for anchoring the contact member against lateral shifting, intake terminals carried by the base, and contact means carried by said contact member for contacting with said intake terminals.

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