Sept. 22, 1936. H. F. WOERNLEY 2,055,114

COMPENSATING CONTACT FINGER

Filed July 29, 1932

Fig. 1

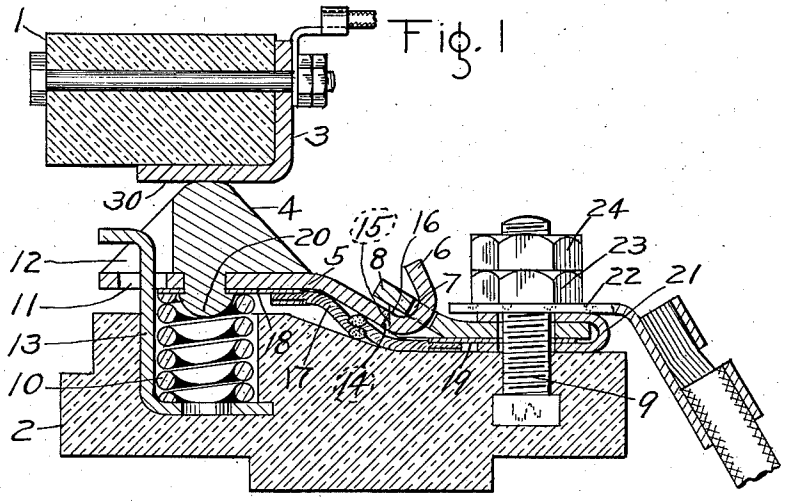


Fig. 2

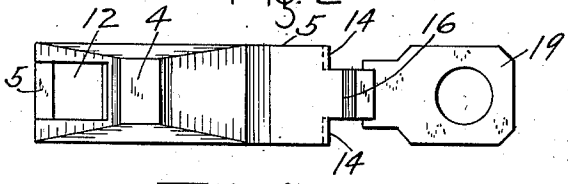


Fig. 3

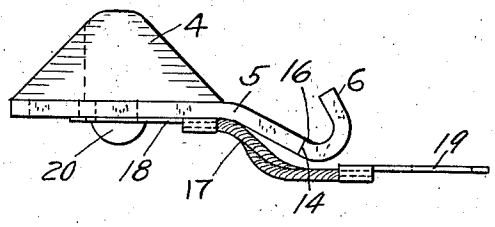


Fig. 4

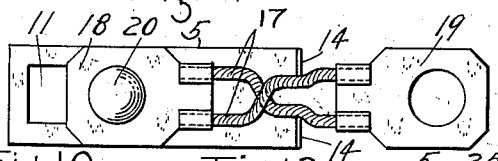


Fig. 5

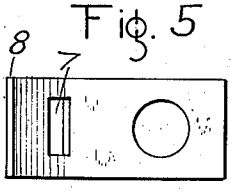


Fig. 8

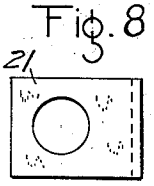


Fig. 6

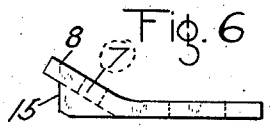


Fig. 9

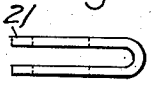


Fig. 7

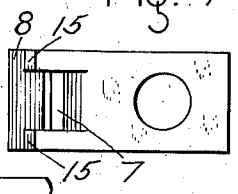


Fig. 10

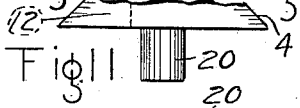


Fig. 12

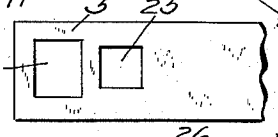


Fig. 11

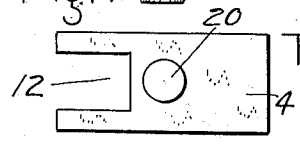
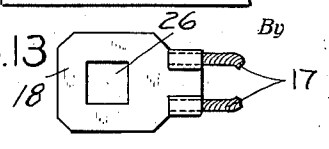


Fig. 13



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Patented Sept. 22, 1936 2,055,114

UNITED STATES PATENT OFFICE

2,055,114

COMPENSATING CONTACT FINGER

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Application July 29, 1932, Serial No. 625,611

4 Claims. (Cl. 200—171)

This invention relates to electric switch devices and more particularly to a contact mechanism for a switch device.

The invention has special reference to a switch device of the character in which a circuit is adapted to be controlled through a resiliently supported finger carried by one member and adapted to engage or disengage a plate contact fixed on another member, according to the relative movement between the two members.

A switch device having a contact mechanism of the above described character is disclosed in Patent No. 1,832,887, issued to me on November 24, 1931. In the construction disclosed in this patent, the contact finger is hinged to permit movement only in a direction toward the plate contact and it is intended that the parts of the hinge be fitted sufficiently close to form a part of the circuit controlled through the finger.

If in the above construction, there should be any misalignment of the contact finger and contact plate, a proper bearing between the brush on the finger and the contact plate will not be obtained. A plurality of switches of this type are often mounted side by side in train wire couplers and it is especially difficult under this condition to ensure the proper bearing between the several brushes and their respective plate contacts.

It has also been proposed to provide a hinged contact finger in which the finger is adapted to turn slightly around its longitudinal axis, so that when the brush on the finger engages the contact plate, the brush can adjust itself to the contact plate and obtain a good bearing.

With either of the above or other types of hinged contact fingers, it is necessary to employ materials of good electrical conductivity, although it is difficult with such materials to provide a structure of adequate strength, particularly where the contact finger must be small.

In order to overcome the above difficulty, the principal object of my invention is to provide a hinged contact finger of the above type with a flexible electrical conductor which is adapted to electrically connect the hinged members of the contact finger so as to provide an electrical conductor which is independent of the hinge.

By this construction, the hinge portion of the contact member is not depended upon to conduct current and can thus be made of materials which will provide adequate strength, while at the same time ensuring electrical conductivity at all times, regardless of the positions of the hinge joint.

Other objects and advantages will appear in the following more detailed description of the invention.

In the accompanying drawing; Fig. 1 is an assembly view, mainly in section, of a switch device embodying my improved contact mechanism; Fig. 2 is a plan view of the contact finger with its associated current conducting members; Fig. 3 is a side elevation of the parts shown in Fig. 2; Fig. 4 is an inverted plan view of the parts shown in Fig. 2; Fig. 5 is a plan view of the stationary portion of the contact finger; Fig. 6 is a side elevation of the member shown in Fig. 5; Fig. 7 is an inverted plan view of the member shown in Fig. 5; Fig. 8 is a plan view of a clip; Fig. 9 is a side elevation of the clip shown in Fig. 8; Fig. 10 is a side elevation of the finger contact brush; Fig. 11 is an inverted plan view of the finger contact brush; Fig. 12 is a plan view of a portion of the brush carrying member; and Fig. 13 is a plan view of the cable tip at the brush end of the hinge shunt.

As shown in the drawing, the switch device comprises two relatively movable members or insulating blocks 1 and 2, the member 2 being provided with a contact or brush 4 adapted to slidably engage a plate contact 3 on the member 1 for closing a circuit.

The brush 4 is secured to one end of a carrying member 5 by means of a rivet 20, the other end of member 5 being turned up to provide a hook 6 which loosely works in an opening 7 through one end of a member 8, the other end of said member being secured to a binding post 9 and therefore held rigid. The brush carrying member 5 is reduced in width to provide the portion for forming hook 6 and also to provide a thrust shoulder 14 on each side of the hook, the shoulders 14 being provided in a portion of member 5 outside of that which is distorted to form hook 6 so as to obtain maximum resistance against distortion of said member when subject to forces tending to move it towards the right hand, as viewed in Fig. 1 of the drawing, as will be hereinafter described. The member 8 is provided on each side with a depending thrust lug 15 having a face adapted to engage the shoulders 14 on the member 5, these faces being arranged at right angles to the direction of the line of force applied by contact plate 3 to the brush 4 in the act of closing the contacts, as will be hereinafter described. A spring 10 is carried in a recess in the member 2 and is adapted to urge the contact brush 4 into engagement with the contact plate 3.

The brush carrying member 5 is provided with a through opening 11 aligned with a slot 12 in one end of the brush 4. A member 13 having one

arm secured in the member 2 below the lower end of spring 10 extends through the opening 11 and slot 12, and is provided with another arm adapted to engage the member 5 for limiting outward movement of said member by spring 10.

The member 2 may be carried by the housing of a train wire coupling (not shown), while the member 1 may be carried by a movable member or slide in the train wire coupling, so that the member 1 is adapted to move relatively to the member 2.

In the drawing the members 1 and 2 are shown in their circuit closing position. In order to open the circuit controlled through the engagement of the contact brush 4 and contact plate 3, the member 1 is moved toward the left hand relative to the member 2. Through the medium of the hook 6, the brush 4 is dragged across the contact plate 3 until the contact plate is moved out of engagement with said brush, at which time the spring 10 moves the brush outwardly until the member 5 engages the outer arm of the stop member 13.

If it is desired to close the circuit through the contact brush 4 and contact plate 3, the member 1 is moved towards the right hand and when the contact plate 3 engages the brush 4, the brush and brush carrying member 5 are also moved toward the right hand until the shoulders 14 engage lugs 15 on the support member 8, under which condition the outer surface of the hook 6 is free of or does not engage the member 8 in the opening 7. Further movement of the contact plate 3 against the brush 4 then acts to displace the brush 4 in a downwardly direction, the force thus applied through member 5 to lugs 15 tending to cause the line contact between shoulders 14 and lugs 15 to shift downwardly, such downward shifting being limited however by the engagement of the inner surface of the hook 6 with member 8 on the edge of opening 7. After the brush 4 is thus displaced sufficiently, the contact plate 3 moves over the top of said brush to the circuit closed position, as shown in Fig. 1.

The movement of the contact plate 3 into circuit closing engagement wth the brush 4 occurs substantially instantaneously, so that the brush 4, carrying member 5 and member 8 are subjected to such forces as to tend to cause distortion particularly of the members 5 and 8. To prevent such distortion, these members are made as rugged as possible in view of the limited space available and they are also made of material having high compressive strength, such as steel. In addition to the above however, the shoulders 14 on the brush carrying member 5 are formed in a portion of said member which is not distorted in forming hook 6, so that when compressive force is applied to the portion of said member adjacent hook 6, said force acts in a straight line through said portion of said member and the shoulders 14 against lugs 15, thereby obtaining maximum resistance to bending of said member 5.

Upon moving contact plate 3 into circuit closing engagement with brush 4 as above described, the brush 4 is adapted to adjust itself to said contact plate in case of misalignment of either said brush or plate with respect to each other. This adjustment is obtained by the shifting of the line of contact between shoulders 14 and lugs 15 either during the downward movement of said shoulders on said lugs or after engagement of the inner surface of hook 6 with member 8 within the opening 7.

In either case, the brush 4 and carrying member 5 turn axially around an axis substantially parallel to the line of the direction of force applied by contact plate 3 to brush 4, and during this turning, contact is maintained between both of the shoulders 14 and their respective lugs 15. This axial turning of the member 5 is very free, and due to the face of lugs 15 engaged by shoulders 14 being formed at right angles to the direction of line of force applied by contact plate 3 to brush 4, the member 5 is maintained substantially, squarely in working alignment with member 8, that is, during such turning movement of member 5, the axis of member 5 is maintained square with respect to a plane passing vertically through the center of member 8, as viewed in Fig. 1 of the drawing, thereby substantially equally dividing between shoulders 14 and their respective lugs 15 and squarely applying to the above described face of said lugs, the force applied to member 5.

If the face of lugs 15 engaged by shoulders 14 were formed at any angle other than a right angle as above described, then the advantages of applicant's construction would be substantially lost, for if the brush 4 should have to turn to compensate for misalignment of contacts, either one shoulder 14 or the other would tend to turn away from or undesirably bind against its respective lug, according to the character of such misalignment, with the result that the brush 4 and carrying member 5 would move out of square working alignment with the lugs 15 on member 8, and such action would tend to promote binding and possible distortion and breakage particularly of the members 5 and 8.

As hereinbefore described, the members 5 and 8 are preferably made of material, such as steel, on account of its strength, and are therefore poor electrical conductors. In order to obtain a path of high electrical conductivity between the contact 4 and terminal clip 22, shunts, made of material such as copper, are provided around the members 5 and 8 connecting said contact to said terminal clip.

One shunt consists of two copper tips 18 and 19 connected by two flexible, and preferably stranded, copper cables 17. The tip 18 is riveted against the member 5 by means of the rivet 20 which is an integral part of the copper brush contact 4. The tip 19 is preferably clamped against the member 8, where said member fits over the binding post 9, by means of a copper clip 21. A terminal tip 22 is then mounted on top of the clip 21, and the tips 22 and 19, clip 21 and member 8 are then firmly clamped together and in tight engagement with the insulating block 2 by means of a nut 23 having screw-threaded engagement on the binding post 9. A lock nut 24 is provided to prevent the holding nut 23 from becoming loose.

It will now be evident that the shunt consisting of tip 18, cables 17 and tip 19, and the shunt clip 21 connecting tip 19 to the terminal tip 22 provides a path of high electrical conductivity from the brush contact 4 directly to the terminal tip 22, so that neither the hinge-like joint between members 5 and 8 nor the fact that said members are made of steel will affect the continuity or conductivity of the circuit closed by way of the switch finger.

The shunt cables 17 are sufficiently long to prevent being placed under tension at any time during the movement of member 5, said cables being preferably crossed or loosely twisted together, as indicated in Figs. 1, 3 and 4, in order to better confine said cables to the limited space

between the members 5 and 8 and the insulating block 2.

Before mounting the member 8 and cable tip 19 on the binding post 9, said member and tip are firmly clamped together by means of the shunt clip 21. This is very desirable in that it holds the various parts of the finger together forming what may be termed a unitary structure which facilitates mounting and removal of the finger structure upon and from the insulating block 2.

The brush 4 is manufactured with a pin 20, as shown in Figs. 10 and 11, and after the assembly of the brush 4 with the member 5 and the cable tip 18, the end of the pin 20 is riveted down. The member 5 is provided with a square opening 25, as shown in Fig. 12, and the cable tip 18 is provided with a like square opening 26, as shown in Fig. 13. The square openings 25 and 26 are sufficiently large for the insertion of pin 20 and during the riveting process, the pin 20 is upset or pushed out into the openings 25 and 26 so as to firmly lock the brush 4 against turning on the member 5.

It will now be evident that I have provided an electrical shunt of high conductivity which is independent of the hinge joint in the contact finger and, therefore, the contact brush carrying members can be made of materials of adequate strength to withstand the tension and compression forces to which they are subjected in operation.

While one illustrative embodiment of the invention has been described in detail, it is not my intention to limit its scope to that embodiment or otherwise than by the terms of the appended claims.

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

1. The combination with an electrical terminal post, of a flexible contact mechanism adapted to be applied to said terminal post as a unit and removable from said terminal post as a unit, said mechanism comprising a support member adapted to be applied to said terminal post and having in one end an opening, a contact member having at one end a hook disposed in said opening forming an open hinge, a flexible shunt element having one end secured to said contact member and the other end adapted to be applied to said terminal post, and a U-shaped clip clamping said other end of said shunt element to the end of said support member and applied to said terminal post for holding said mechanism assembled as a unit and to facilitate the application and removal of said unit to and from said terminal post.

2. An electrical contact mechanism comprising a contact carrying member having a contact at one end and the other end bent in the form of a hook, a support member having at one end an opening adapted to loosely receive said hook, said hook being adapted to engage said support member within said opening for pulling said contact carrying member in one direction, two spaced lugs on said support member, and two spaced shoulders on said contact carrying member adapted to engage said lugs to resist endwise movement of said contact carrying member in the opposite direction, said shoulders being formed on said contact carrying member, one either side of said hook, and in a portion of said contact carrying member outside of the distorted portion including said hook.

3. An electrical contact mechanism comprising a contact carrying member having a contact at one end and the other end bent in the form of a hook, a support member having at one end an opening adapted to loosely receive said hook, said hook being adapted to engage said support member within said opening for pulling said contact carrying member in one direction, two spaced lugs on said support member, and two spaced shoulders on said contact carrying member adapted to engage said lugs to resist endwise movement of said contact carrying member in the opposite direction, said shoulders being slidable on said lugs to permit turning of said contact carrying member relative to said support member, the face of said lugs engaged by said shoulders being arranged at right angles to the direction of line of force applied to said contact whereby the turning of said contact carrying member is about an axis substantially parallel to said direction of line of force.

4. An electrical contact mechanism comprising a contact carrying member having a contact at one end and the other end bent in the form of a hook, a support member having at one end an opening adapted to loosely receive said hook, said hook being adapted to engage said support member within said opening for pulling said contact carrying member in one direction, two spaced lugs on said support member, and two spaced shoulders on said contact carrying member adapted to engage said lugs to resist endwise movement of said contact carrying member in the opposite direction, said shoulders being slidable on said lugs to permit turning of said contact carrying member relative to said support member, the face of said lugs engaged by said shoulders being so arranged with respect to the direction of force applied to said contact and urging said shoulders into engagement with said lugs as to maintain the contact carrying member squarely in working alignment with said support member upon said turning of said contact carrying member.

HARRY F. WOERNLEY.