Sept. 2, 1941. H. A. WILCOX 2,254,720

INSULATED ELECTRICAL CONTACT

Filed June 16, 1938

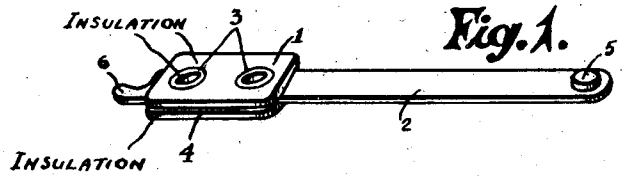


Fig. 1.

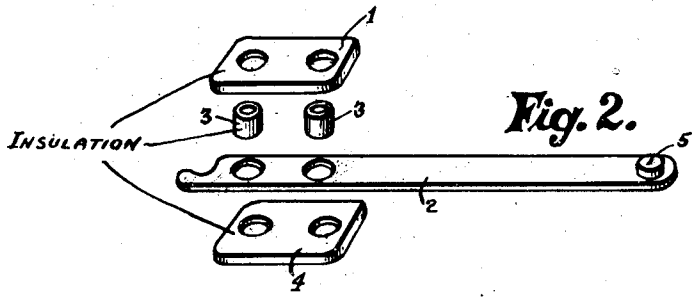


Fig. 2.

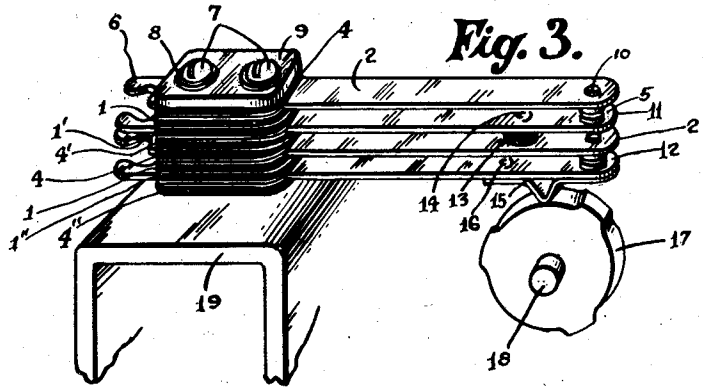


Fig. 3.

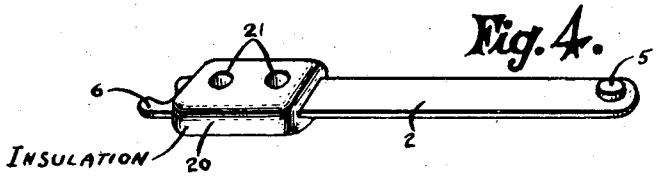


Fig. 4.

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INSULATED ELECTRICAL CONTACT

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Application June 16, 1938, Serial No. 214,116

1 Claim. (Cl. 200—166)

This invention relates to insulated electrical contacts and more particularly to a unit assembly of a contact finger and an attached insulated separator to insulate the finger individually from other contact fingers with which it may be assembled in a pile-up or group and also to insulate it from mounting screws, plates and the base on which it may be mounted.

Contact fingers are usually provided with a free end having a smaller contact member of precious metal and a fixed or mounting end provided with holes or slots for screws fastening the contact fingers to a rigid base.

The use of insulated separator plates or washers between a contact finger and the base or between the individual contact fingers in a group is well known in the art, but such separator plates and washers are all separate from the contact fingers and are inserted between fingers at the time of assembly and mounting of a contact finger pile-up. Thus when there is occasion to remove a contact finger because of breakage or wear or wiring changes requiring a different grouping of contacts these insulated separators have to be handled as loose parts which require more labor and care in assembly or reassembly.

In accordance with the present invention the insulating separators are attached to each contact finger as a sub-assembly either by means of tightly interlocked parts or by molding the insulation material around the contact finger.

The invention has particular advantage where the contact fingers carry extremely small electric currents, as for example in circuits involving vacuum tubes or gas discharge tubes or involving the slow charging or discharging of an electric condenser, where relatively high voltages and circuit resistance require extremely high insulation qualities to prevent leakage of minute currents leading to break-down.

It is a primary object of the invention to provide individually insulated contact fingers with each finger having its insulation attached.

An additional object is to provide an individually insulated contact finger in which the insulation is molded permanently on the finger.

A further object is to provide an individually insulated contact finger in which plates of insulation material are held attached on opposite sides of the contact finger by tight fitting bushings of insulation material.

With the foregoing objects in mind a complete embodiment of the invention and a practical application of the same will now be described with reference to the accompanying drawing in which:

Fig. 1 illustrates one form of individually insulated contact finger having insulating plates and bushings assembled on the contact finger.

Fig. 2 illustrates a disassembled view of the parts of the assembly of Fig. 1.

Fig. 3 illustrates a pile-up assembly of a group of individually insulated contact fingers mounted on a base support and showing how such contact fingers may be operated by a cam.

Fig. 4 illustrates another form of individually insulated contact fingers in which the insulation material is molded permanently around the finger.

Referring now to Fig. 1, plate members 1 and 4 are made of insulation material such as Bakelite or other molded or compressed plastic or ceramic material for example, and are assembled on upper and lower surfaces at the mounting end of a contact finger 2 of conducting metal such as bronze or nickel silver for example. The plate members 1 and 4 are held rigidly into close contact with the finger 2 by the bushings or collars 3 which pass through the holes shown in the finger 2 and fit tightly into corresponding holes in the plates 1 and 4. The bushings 3 are preferably slightly over size so that they are forced into the holes in the plates 1 and 4 in assembling.

The contact finger is shown bearing a contact 5 near the right end or free end. The contact 5 may be made of silver, or platinum or tungsten for example. The opposite end of contact finger is provided with a connecting lug or terminal as shown or other suitable means for attaching wires for example.

Fig. 2 shows the same parts as Fig. 1 but in a separated view before assembly in order to provide a clearer view of the several parts and mode of assembly.

In Fig. 3 one example of a multiple contact finger assembly is shown in which several individual insulated contact fingers are mounted in one pile-up, on a base number 19 and operated by a cam 17 adapted to rotate on a shaft 18. In this illustrative assembly the contact fingers are preferably of the spring type so as to be self-restoring where the base 19 is fixed. It will be understood however that rigid moving contacts may be employed on a rocking type assembly with separate restoring springs.

The topmost contact finger 2 in Fig. 3 is identical with the corresponding finger of Figs. 1 and 2 but in the instance of Fig. 3 is turned over so that its upper and lower surfaces are reversed from their appearance in Figs. 1 and 2.

The several individually insulated contact fingers are attached to the base 19 by means of the two screws 7 provided with small washers or projecting flanges 8. A metal plate 9 is preferably employed on the top of the contact finger pile-up to serve as a bearing surface for the screws 7 or washers 8. These screws 7 pass through the holes in the bushings 3 which are in

turn fitted in the holes of the finger 2. The holes of the several finger and insulation units register fairly closely.

The top contact strip 2 in Fig. 3 has its attached plates 1 and 4 as in Fig. 1 and the small rivet head 10 by which the contact 5 is attached may be seen at the right end of the finger. The next lower contact finger 11 is provided with its attached insulation plates 1' and 4' corresponding to plates 1 and 4 of Fig. 1. Finger 11 also has attached a small spacer button of insulation 13 by means of rivet 14 in order to transmit the contact raising action of cam 17 from the lower to the upper contact group.

The bottom contact finger 12 has a V shaped cam rider 15 attached at the contact corresponding to contact 5 of Fig. 1 and also at the rivet 16. This contact finger 12 has its individual attached insulation plates 1'' and 4'' corresponding to plates 1 and 4 of Fig. 1. Finger 12 cooperates with the finger 2 immediately above it in closing the contacts at the free end when raised by cam 17, and at the same time contact finger 11 cooperates with top finger 2 to close their contacts 5 as the fingers are raised by the cam action.

Another form of the invention is shown in Fig. 4 in which the insulation 20 is molded around the mounting end of the contact finger 2, the insulation being formed with holes 21 to provide for mounting screws such as shown at 7 in Fig. 3 and the holes 21 being somewhat smaller in diameter than the corresponding holes which are provided in contact strip 2 as shown in Fig. 3. The diameter of the holes 21 may preferably be of the order of the inside diameter of the bushings 3 of Figs. 1 and 2. The insulation 21 may be Bakelite or other suitable molded plastic, rubber or vitreous material.

As mentioned above in this specification the invention has particular advantage in contact assemblies for circuits involving relatively high voltages between adjacent contact fingers and very high control resistance in the circuits so that the leakage path through and along the surfaces of insulator separators must be as long as possible and must have an extremely high resistance to break down.

With the separable insulator and contact finger assembly employed before the present invention it was necessary on such circuits to coat the fixed end of the multiple contact finger assembly with an insulating varnish or other coating of high dielectric strength to provide an effective seal of the clearance spaces around the several parts. This is best applied by dipping in hot varnish and baking the assembly, including the mounting base. With this coating process however, if it becomes necessary to change a contact finger for repairs for example the seal of the special varnish is broken and cannot be readily restored by an individual repair man under field conditions, but requires a reprocessing by the factory for proper results.

In accordance with the present invention however, the individual contact finger and insulator assembly is made with very close tolerances so that the abutting surfaces are well sealed with a tight fit and it has proved unnecessary to coat with insulating varnish. Because of the independent sealed insulation of each contact finger the leakage paths between fingers and between each finger and the mounting screws and the base are all made more effective against breakdown.

In the molded type of unit in Fig. 3 the contact finger is completely enclosed along part of its length and leakage path is reduced in width or cross-section, without any natural change in length of path, as compared with the assembled type of Fig. 1.

In the separable types of insulators formerly used it was customary in my experience to employ long bushings instead of the short bushings 3 illustrated in Fig. 2. These long bushings were employed in multiple contact finger assemblies of the type illustrated in Fig. 3 for example, to insulate the several contact fingers from the mounting screws. When these were used in connection with high resistance circuits of the type described it was found that breakdawn of the insulation often occurred along the surface of this long bushing where impurities such as a very small amount of perspiration or moist dust would extend for some distance lengthwise along its surface. The use of a series of short individual bushings which is practical in accordance with the present invention reduces materially the possibility that any traces of impurities along the surface of the different bushings will match up or connect on the different individual insulated contact fingers.

A further advantage arises in connection with one aspect of the invention in that by the forced fitting of the bushing 3 into the insulator plates 1 and 4 the abutting surfaces are cleared of impurities to a marked degree.

While I have described certain specific embodiments of my invention and materials employed therein, it will be understood by those skilled in the art that various modifications of the parts and arrangement and mode of assembly thereof as well as substitutions for the materials used therein may be made without departing from the spirit of the invention as defined by the claim.

It will also be appreciated that although I have illustrated the employment of the individually insulated contact fingers for cam operation such fingers may also be employed in electric relays, solenoids and for operation by manually controlled switches or push buttons.

I claim:

In an electrical contact device the combination of a plurality of contact strips of extended length and resilient conducting material and each formed with corresponding apertures in a part of the strips, a plurality of bushings of insulation material individual to the several contact strips, each bushing extending through the aperture of its individual contact strip on each side of said strip, and a plurality of strips of insulation material including a pair of strips individual to each contact strip and arranged on each side of each contact strip on such part thereof, and said insulation strips having apertures registering with the apertures of the contact strips and having each bushing fit tightly in the apertures of the pair of insulation strips individual to the contact strip, so as to individually insulate each of said contact strips on both sides and the aperture thereof, a mounting support member, and means extending through the several bushings in the apertures of the associated insulation strips and contact strips to attach the same to said support member.

HARRY A. WILCOX.