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H. O. SIEGMUND

2,294,482

ELECTRICAL CONTACT AND TERMINAL BANKS

Filed Oct. 28, 1939

FIG. 1

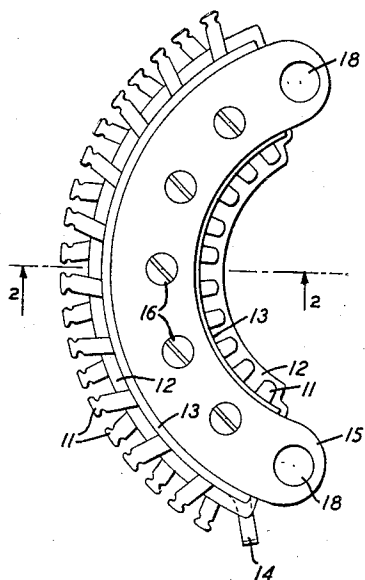


FIG. 3

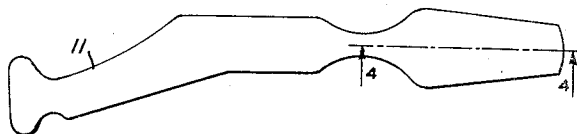


FIG. 4a

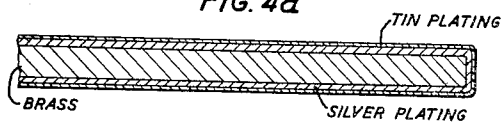


FIG. 4b

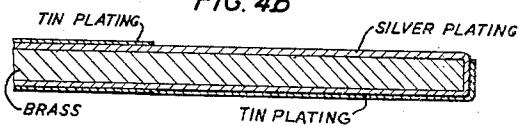
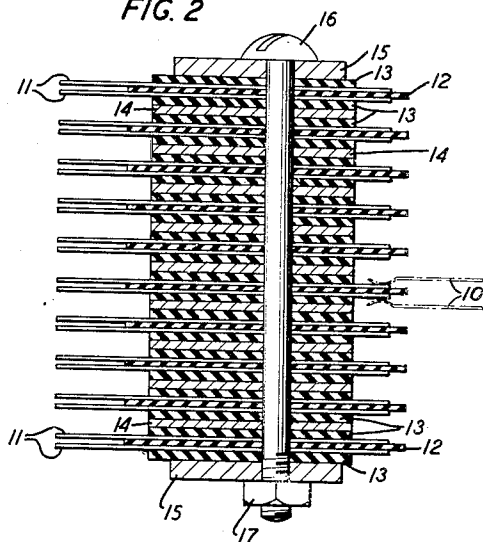


FIG. 2



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ELECTRICAL CONTACT AND TERMINAL BANK

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Application October 28, 1939, Serial No. 301,745

1 Claim. (Cl. 200—166)

This invention relates to contact spring assemblies and particularly to terminal banks of automatic switches such as are employed in telephone systems.

Objects of the invention are a decrease in the deterioration of the insulating characteristics of the insulating separators between contacts in spring assemblies or terminal banks, an increase in the serviceable life of such assemblies and banks, and the provision of a terminal bank having satisfactory mechanical, physical and electrical characteristics when subjected to normally existing and operating differences of potential between adjacent terminals and to severe conditions with respect to temperature and humidity.

In the terminal banks of rotary and two-motion step-by-step switches, such as are well known in automatic and semi-automatic telephone systems, the terminals of each of a plurality of sets are separated by a thin sheet of insulating material. Phenol fibre separators have been used because this material has the desired electrical and mechanical characteristics necessary for use in such banks. The terminals usually comprise thin strips of brass which are silver plated or otherwise silver surfaced to prevent corrosion and to insure low-resistance, non-microphonic electrical contact with the switch wipers. In most cases, the circuit units to which the sets of terminals are connected are so arranged that battery potential is normally connected to the terminals on one side of a separator and ground potential is normally connected to the contacts on the other side of the separator. In some cases, for instance, in the banks of connector switches having access to party lines, adjacent terminals on the same side of a separator are normally connected, one to ground and the other to battery. It has been found that the banks having silver-surfaced terminals deteriorate due to leakage currents when subjected to normally existing or working differences in potential between the contacts. The leakage currents appear to carry silver ions into the separators, and, as the deposit of silver therein proceeds, the insulation qualities of the separators become impaired. If the bank is subjected to high service temperatures, and particularly to high humidity, this deterioration is accelerated.

The invention is a contact bank comprising terminals fixed between and separated by sheets of insulating material, for instance, phenol fibre, and spaced for individual engagement at one end by a wiper or wipers. The terminals con-

sist of thin pieces of brass having a heavy plating or overlay of silver and having another plating, for instance, tin or brass, over the silver for separating the silver from the insulation. The outside plating does not cover the area with which the wiper engages so that low-resistance, non-microphonic electrical contact between the terminal and wiper is assured. The silver may initially be entirely covered by the tin or brass plating, in which case the outside plating is a light, flash plating readily removable by abrasion in the area engaged by the wiper.

A feature of the invention is a terminal for use in contact spring assemblies or contact banks, the terminal being a thin piece of brass or other suitable metal having a silver surface and having a plating of tin or brass over the silver, the silver being exposed at one end for engagement by a wiper or other contact element.

Another feature of the invention is a terminal for use in spring assemblies or contact banks, the terminal being a thin strip of brass or other suitable metal, having a heavy plating or overlay of silver, and having a plating of tin or brass over the silver, the plating over the silver being a light or flash plating readily removable by abrasion to expose the silver in a desired and limited area for engagement by a wiper or other contact element. The removal of the tin flashing may result merely from the rubbing of the wipers over the terminals during normal use or may be obtained by operation of the wiper prior to normal use in which case an abrasive may be applied to accelerate exposure of the silver.

The drawing which forms a part of this specification shows a terminal bank of the type employed in two-motion step-by-step switches. The invention is not limited in its application to the banks of such switches but may be applied to single motion and single level switches. The invention is generally applicable to contact spring assemblies and to banks of switches comprising a wiper and a plurality of terminals.

Referring to the drawing:

Fig. 1 is a top view of the bank of a two-motion step-by-step switch;

Fig. 2 is an enlarged section taken on a line 2—2 of Fig. 1;

Fig. 3 is an enlarged top view of one terminal;

and Figs. 4a and 4b are further enlarged partial side views of the terminal shown in Fig. 3.

Reference may be had to the patent to Keith et al. No. 815,321, of March 13, 1906, for disclosure of the structure of a two-motion switch

with a bank similar to that shown in Figs. 1 and 2.

The bank shown in the drawing comprises ten pairs of metal terminals 11 in each of ten levels. One of the terminals of each pair in a level is separated from the other terminal of the pair by a phenol fibre insulating separator 12 which extends slightly beyond the terminals at the end which is engaged by the brushes of the switch. The other end of each terminal 11 is notched to form a soldering lug for connecting a wire which leads to another switch, a trunk, or a line, as the case may be. The terminals of each level are separated from the terminals of the next level by phenol fibre insulating separators 13 and by a metal spacer 14 which also acts as an electrostatic shield to prevent cross-talk. Each spacer 14 is provided with a soldering lug, as shown in Fig. 1, so that they may be strapped together and connected to ground. To secure proper spacing between levels, thin sheets of paper or cambric may be inserted between the separators 13 and metal spacers 14; these sheets are not shown in the drawing. The terminals, insulating separators, and metal spacers for the ten levels are clamped between metal end-pieces 15 by bolts 16 and nuts 17. Insulating separators 13 are also provided between the end-pieces 15 and the top and bottom layers of terminals. The holes 18 in the end-pieces 15 enable the mounting of the bank on the switch frame. A pair of wipers 19 are shown in Fig. 2 in engagement with terminals in the fifth level of the bank.

Each terminal 11 consists of a thin strip of brass, shaped as shown in Fig. 3, having a heavy silver plating or silver overlay over the brass and an outside plating of tin or brass over the silver as shown in Fig. 4a. The plating over the silver is a light, flash plating which is readily removed from one side of the contact end of the terminal to expose the silver for engagement by

a wiper, as shown in Fig. 4b, thereby assuring low-resistance, non-microphonic electrical contact between the terminal and the wiper. The plating over the silver may be removed from the wiper-engaged area before assembly of the bank or may be removed by abrasion after the bank is assembled.

The plating over the silver is primarily useful in separating the silver from the phenol fibre insulating separators 12 and 13, thereby eliminating or substantially reducing any possible interaction between the silver and insulation which otherwise may result in the breakdown of the insulation resistance due to the deposit of silver in the insulation by leakage currents between terminals normally subjected to a substantial difference in potential. If the outside plating is a tin plating, it is also of use in facilitating the soldering of wires to the terminals. Otherwise, a separate tinning of each lug would be required.

Reference may be had to an application of J. M. Wilson, Ser. No. 300,937, filed October 24, 1939, for a more complete description of the manner in which leakage currents effect the deterioration of phenol fibre insulation between silver-surfaced terminals.

What is claimed is:

In electrical apparatus including a pile-up of terminals and insulators subject to mechanical pressure and continuing electrical potential differences, the surface of said terminals being low resistance conducting material having a tendency under ordinary atmospheric conditions and the said electrical potential conditions to set up migratory conducting paths through insulators of most well-known materials, means for preventing establishment of such migratory conducting paths consisting of a metallic coating or sheath over the surfaces of said terminals where such surfaces come in physical contact with said insulators.

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