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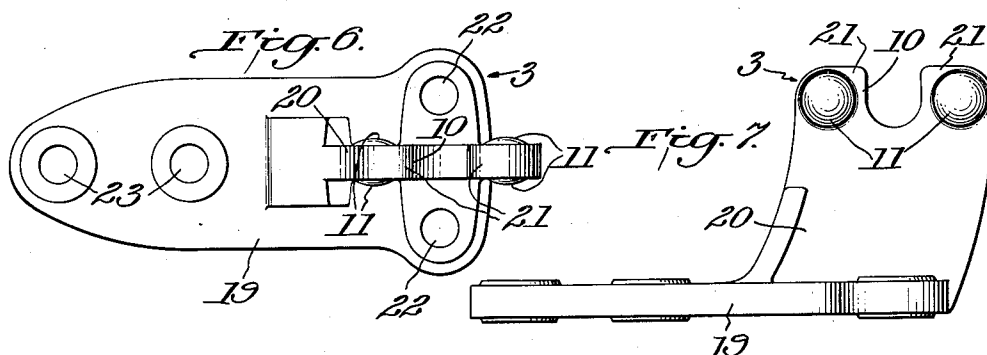
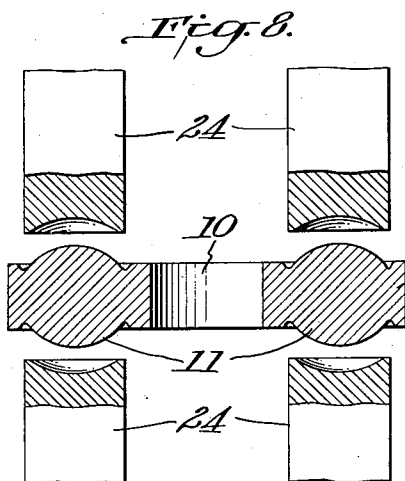
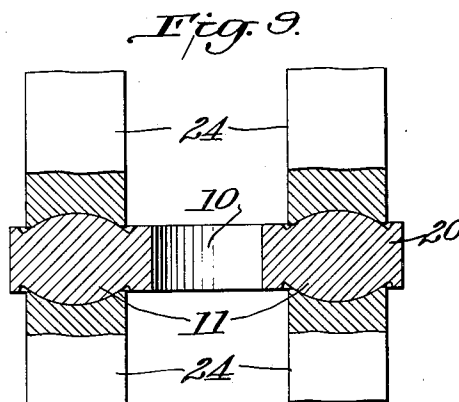
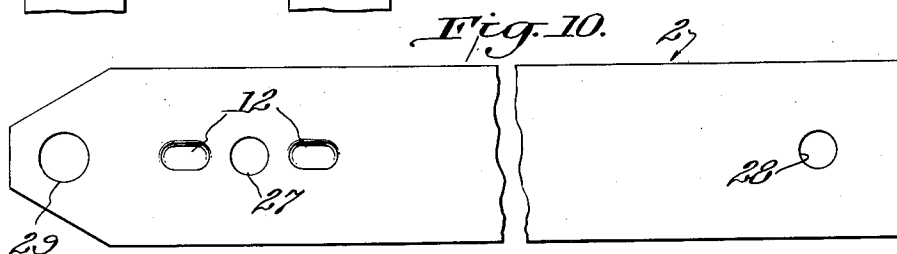
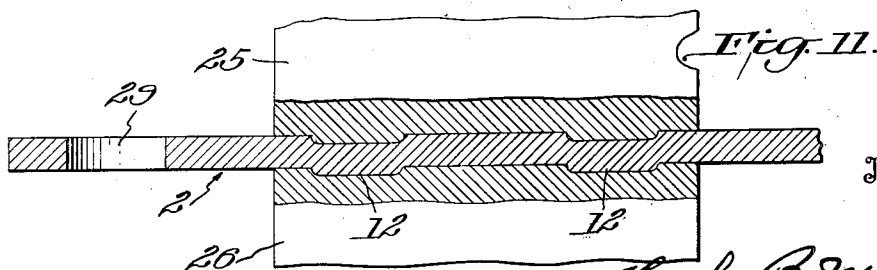
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1,935,513

METHOD OF MAKING ELECTRIC SWITCHES

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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METHOD OF MAKING ELECTRIC SWITCHES

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Serial No. 580,140

3 Claims. (Cl. 29—155.55)

This invention relates to a method of making electric switches and particularly to switches of the high contact pressure type wherein contact surfaces of very small area are provided by raised portions formed on the switch members. More particularly, the invention relates to a method of making the various members of a switch of this type, such as is disclosed in applicant's copending application Serial No. 551,456, filed July 17, 1931.

The principal object of the invention is to provide a method of forming switch members for switches of the above-stated type having polished and hard contact surfaces upstanding from the principal surfaces of the respective members, which method is simple and inexpensive to practice and which produces highly efficient contact surfaces which will not stick or burn under any conditions of service.

Other objects will appear from the following description and accompanying drawings, wherein:

Fig. 1 is a side elevational view showing a switch constructed according to the invention,

Figs. 2 and 3 are enlarged views showing the pivot terminal,

Figs. 4 and 5 are somewhat diagrammatic views showing the method of finishing the pivot terminal,

Figs. 6 and 7 are enlarged views showing the contact terminal,

Figs. 8 and 9 are somewhat diagrammatic views showing the method of finishing the contact terminal,

Fig. 10 is an enlarged view showing the blade, and

Fig. 11 is a view showing the method of forming the contact buttons on the blade.

One form of switch, constructed according to the present invention, is shown in its completed form in Fig. 1 and comprises three principal members, a pivot terminal 1, a pair of blades 2 pivoted thereto, and a contact terminal 3 disposed in the path of movement of the blades 2 for cooperation therewith. The blades 2 are pivoted to the pivot terminal 1 by suitable means, such as a hollow rivet 4 which extends through a perforation 5 in the pivot terminal 1 and is spun over at its ends against spring washers 6, which washers 6 press the blades 2 against raised annular ridges 7 formed on the pivot terminal 1. At the other end the blades 2 are connected by a second hollow rivet 8 spun over against spring washers 9, which rivet 8 and washers 9 resiliently limit the separation of the blades 2 at their free ends. A notch 10 is formed in the contact ter-

minal 3 for the accommodation of the rivet 8, adjacent which slot 10 there are provided raised contact buttons 11 arranged to bear against aligned raised contact bosses 12 projecting from the inwardly facing sides of the blades 2.

As described in the above referred to application, the annular ridges 7, the contact buttons 11, and the contact bosses 12 provide contact areas of the order of one one-hundredth of an inch. Since the total pressure on these areas is, for example, from 25 to 75 pounds, the unit pressure is very high. It has been found that where such high contact pressures are employed, the current density that may be carried safely is also very high and hence large currents may be carried by the switch without damage to the same.

It is an essential requirement to the proper operation of this type of switch that the contact surfaces be smooth and hard as the unit pressure is so high that any unevenness in the surface will cause destructive cutting or galling of the contacts when contacts are operated into or out of engagement. The contact surfaces formed according to the present invention have such desirable characteristics of smoothness and hardness.

Referring to Figs. 2 and 3, the pivot terminal 1 is shown as comprising, a base portion 13 and an upstanding portion 14 through which the perforation 5 for accommodating the pivot rivet 4 extends. On each face of the upstanding portion 14 and concentrically surrounding the perforation 5, are the raised annular ridges 7 which have a semicircular cross-section. A pair of perforations 15 are provided in the base 13 to receive bolts (not shown) for securing conductors to the terminal and a second pair of perforations 16 are provided for bolts (not shown) by which the terminal end of a conductor (not shown) is secured to a supporting base 13.

The terminal 1 is cast from conducting material, preferably relatively soft copper or copper alloys of high electrical and thermal conductivity, with the ridges slightly thicker than the finished size. The terminal 1 is then placed between a pair of dies 17, having annular grooves 18 in their faces, which grooves 18 cooperate with the crest portion of the respective ridges 7. Pressure is applied to force the dies 17 toward one another to press the ridges 7 to the desired shape and size and to smooth and harden the crest portions thereof. It is not necessary that the ridges be cast with the terminal and then die pressed as described but they may be formed by any suit-

able process which will provide ridges intimately joined to the terminal and having hard and smooth surfaces. The surfaces of the grooves 18 are highly polished, and the curvature of the grooves 18 is preferably somewhat flatter than that of the cast ridges 7, thus insuring that the outer or contact portions of the ridges 7 will be most highly compressed, polished and hardened. The bosses surrounding the bolt-receiving perforations in the base may be finished in a like manner but this is not generally practical since it is not necessary that the surfaces of the bosses be of an exact size. The bosses are generally finished by a simple grinding operation.

It will be noted that the central perforation 5 for receiving the pivot rivet 4 is not drilled until after the die stamping operation. This is essential as the lateral flow of metal in the die-stamping step would tend to prevent the attainment of the desired hardness and polish at the ridges 7.

In Figs. 6 and 7 is shown the contact terminal 3 which comprises, a base portion 19 and an upstanding portion 20. In the upstanding portion 20 is formed the slot 10, thus providing a pair of arms 21 on which are formed the dome-shaped contact buttons 11. Perforations 22, 23 for the reception of mounting bolts (not shown), and terminal bolts (not shown) are formed in the base 19 similar to the perforations 15, 16 in the base 13 of the pivot terminal 1.

The contact terminal 3 is formed in a manner similar to that in which the pivot terminal 1 is formed, the terminal 3 being cast to the desired size and shape, except as to the contact buttons 11 which are cast slightly thicker than the desired thickness. The contact buttons 11 are pressed between dies 24 which cooperate with the crown portions of the buttons 11 to force them into the proper size and shape. The pressing also smooths and hardens the buttons 11 to provide satisfactory contact surfaces.

The blade 2, shown in Fig. 10, is formed by cutting from a strip of rolled conducting material, preferably copper, a section of the desired length and pressing the same between a pair of male and female dies 25, 26 (as shown in Fig. 11) to force out of the principal plane of the strip a pair of spaced bosses 12. After the bosses are formed, a perforation 27 is punched or drilled, through the blade 2, intermediate the bosses 12 for the reception of the hollow rivet 8. A perforation 28 for the hollow pivot rivet 4 and a larger opening 29 adapted to receive a hook stick (not shown) for operating the switch are formed either before or after the bosses are pressed.

Where the blade 2 is formed of cast material instead of rolled material, raised contact buttons

are provided to replace the bosses and are finished in a manner similar to the manner in which the buttons 11 on the contact terminal 3 are finished.

From the above, it will be seen that the present invention provides a simple and inexpensive method for forming the various members of a switch of the type herein described and that the contact surfaces so formed are smooth and hard, and thus will operate efficiently and will not stick or burn under any conditions of service.

The copending application of Arthur T. Musgrave, Ser. No. 444,579, filed April 15, 1930, describes and claims a method of forming hardened contact bosses on switch contact members by cold-working the metal of the member to project a hardened contact boss beyond the original plane of the member. In that process, the extreme surface of the boss which is to engage another switch contact member was not die pressed. In accordance with the present invention, the active surface of the raised contact boss, i. e., that portion which is to engage another contact member is hardened and smooth finished to the exact contour desired by coin pressing in a die which is accurately shaped to that desired curvature.

I claim:

1. The method of forming pivot terminals for electric switches of the type having axially aligned contact rings which comprises, casting a terminal member having raised annular ridges formed on the side walls and of approximately the desired shape and slightly excess thickness, applying a pressure on said ridges to harden and finish the surfaces of the crests of the ridges, and thereafter perforating the portion of the terminal member bounded by the ridges.

2. In the art of making electrical switch members of a copper-like metal and having contact surfaces projecting therefrom, the process which comprises shaping a mass of the copper-like metal to a blank having oversized projecting surfaces thereon, and finishing the active portions of said projecting surfaces to their final form by cold coin-pressing the said oversized projecting surfaces, thereby simultaneously to harden and smooth finish the same.

3. In the art of making an electrical contact member having contact surfaces projecting beyond the body of the member, the process which comprises casting a mass of metal to form a homogeneous blank having oversized contact surfaces projecting therefrom, and finishing the active portions of said projecting surfaces to their final form by cold coin-pressing the said oversized projecting surfaces, thereby simultaneously to harden and smooth finish the same.

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