April 7, 1931. H. O. SIEGMUND 1,799,651

ELECTRICAL SWITCHING APPARATUS

Filed Nov. 27, 1928

FIG. 1.

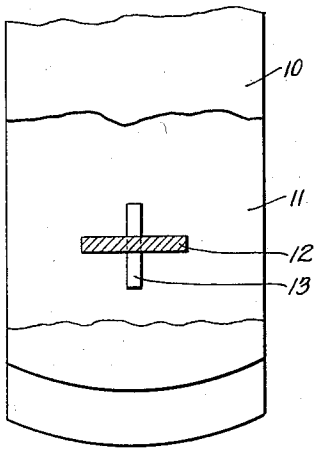


FIG. 2.

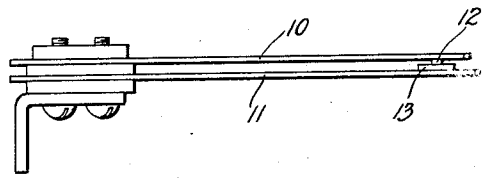
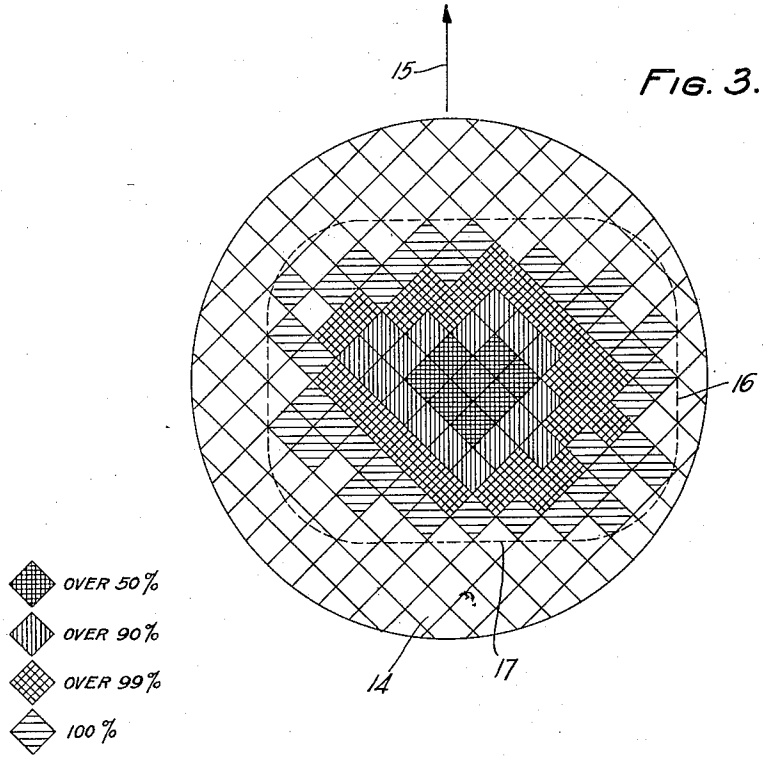


FIG. 3.



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UNITED STATES PATENT OFFICE

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ELECTRICAL SWITCHING APPARATUS

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This invention relates to electrical apparatus and more particularly to contact members for use in such apparatus.

In contact springs of the type used in relays, for example, the springs are generally assembled in a pile-up arrangement with superposed insulating spacer members and the whole held in an adjusted position on a common supporting member by a number of screws. While the clearance holes in the springs through which the fastening screws thread, are maintained at accurate alignment with respect to the longitudinal axis of the springs and at accurately spaced distances from the central axis of the contact points, due to the deviation of the springs relative to each other or their relative displacements upon their assembly on the support, it was necessary to make at least one of the contact elements of a much greater diameter where circular shaped contacts are used, or each of a much greater length where cross contacts are used, in order to assure registration between associated contacts with consequent wasting of a considerable amount of contact or precious metal.

Applicant has discovered that the registering areas of springs thus assembled were deviated in two directions at right angles to each other, that is, laterally and longitudinally, and that the maximum deviation occurred at right angles with respect to the longitudinal axis of the springs, thus deviating the contacts within a parallelogram area of contact registration. Applicant further discovered that by disposing the contacts with their longitudinal axis parallel to two adjacent sides of the parallelogram bounding the maximum deviation of the springs, and of the same length as that of the parellelogram sides, any point within its boundary may be covered by these contacts while effecting a considerable saving of precious metal for the contacts.

Applicant further discovered that a maximum of efficient operations is obtained and the greatest amount of precious metal saved by using non-precious metal for the body portion of the contact and using precious metal for the effective portion of the contact. In the manufacture of the contact of this invention, the non-precious and the precious metals are preferably formed into strips and welded in superposed arrangement. The cross-section of the strips, however, is such that the precious metal partly covers the sides of the non-precious metal in order to form a protective apron in the sparking region of the contact. The strip of bi-metal thus formed may then be welded to a supporting member and cut the required length in a subsequent operation.

Other features of the invention and advantages will appear from the following description and by the claims appended thereto, reference being had to the accompanying drawings, in which,

Fig. 1 is an enlarged view of switch springs equipped with contacts made according to this invention, one of the springs being shown with portions cut away,

Fig. 2 is a side view of the switch springs shown in Fig. 1 showing the springs in an assembled position on their supporting bracket, and

Fig. 3 is a diagram showing the extent of deviation in the registration of the contacts.

According to this invention, switch springs 10 and 11 shown in Figs. 1 and 2 are each provided with a contact member 12 and 13 which may be secured in adjusted position thereon as by welding or in any other well known manner.

Contact 12 is disposed substantially at right angles with respect to the longitudinal axis of spring 10 and its associated contact 13 in line parallel to that of the longitudinal axis of the supporting spring 11, these contacts, however, being so disposed relative to each other that upon the accurate alignment of springs 10 and 11 the area of registration is substantially at the middle point of these contacts.

In Fig. 3 each square represents in an enlarged scale, one position of the cooperative effective area of contacts 12 and 13 and the parallelogram inscribed in dotted lines within the circle indicates the maximum deviation of the springs 10 and 11 measured from a relatively large number of switch spring units

and the arrow 15 in Fig. 3 indicates the relative position of the parallelogram with respect to the length of the springs. In Fig. 3 the fine screened group of squares shows that of over 50% of the springs tested the contacts 12 and 13 register within this area; the circle of vertically lined squares shows that over 90% of the contacts register within the area bounded by this circle; the circle of coarse screened squares shows that over 99% of the contacts register within this area and the circle of horizontally lined squares shows that all the contacts tested registered within the area bounded by the inscribed parallelogram.

According to a feature of this invention contacts 12 and 13 are each made of a length corresponding to that of two adjacent sides of the parallelogram, above referred to. Contact 13, the length of which corresponds to the length of side 16, is disposed on the longitudinal axis of spring 11 and contact 12, which corresponds to that of side 17, is disposed at right angles with respect to that of the longitudinal axis of the supporting spring 10 and therefore at right angles with respect to its associated contact 13, thus permitting the registration of the contacts within the maximum deviation of their supporting springs.

The contacts of this invention may be constructed by welding portions of a relatively long strip of bi-metal in adjusted positions on the springs and cutting the contacts the required length in subsequent operations. Further it is obvious that any extent of effective or registering area between two associated contacts may be obtained by changing the dimensions of one or both contacts 12 and 13 in proportion to the area bounded by the sides of the inscribed parallelogram shown in Fig. 3.

What is claimed is:

1. In electrical switching apparatus, associated switching members secured at one end to a common supporting member, said members having a permissible non-alignment or sweep with respect to each other representing a rectangular area, contact bars of different length mounted in angular relation on the free ends of said members, each of said contact bars extending in a line parallel with respect to the boundary lines of said area.

2. In electrical switching apparatus, a pair of associated switching members carrying contacts, said switching members having a permissible relative non-alignment or sweep and said contacts having a dimension bearing a definite relation to the extent of the non-alignment of said switching members.

3. In electrical switching apparatus, a pair of associated switching members carrying contact elements, said switching members having lateral and longitudinal displacements relative to each other and said contacts having a linear dimension bearing a definite relation to the extent of the lateral and longitudinal displacements of said switching members.

4. In electrical switching apparatus, a pair of associated switching members each carrying a contact element, said switching elements having lateral and longitudinal displacements relative to each other and one of said contacts having a linear dimension bearing a definite relation to the extent of the lateral displacement and the other contact having a linear displacement bearing a definite relation to the extent of the longitudinal displacement of said switching members.

5. In electrical switching apparatus, a pair of associated switching members carrying contacts disposed at right angles to each other, said switching members having lateral and longitudinal displacements relative to each other and each of said contacts having a linear dimension bearing a definite relation to the extent of the lateral and longitudinal displacements of said switching members.

6. In electrical switching apparatus, a pair of associated switching members carrying contacts, said switching members having an inherent lateral and longitudinal displacement relative to each other and each of said contacts being of a length no greater than the maximum displacement of said switching members.

7. In electrical switching apparatus, a pair of associated switching members having an inherent lateral and longitudinal displacement, the longitudinal displacement being of a greater magnitude than the lateral displacement and a contact for each switching member of said pair, said contacts being of different lengths, the longer contact being positioned on its respective switching members in alignment with the longitudinal axis of said switching member and the shorter contact being positioned on its respective switching member at right angles to the longitudinal axis thereof.

In witness whereof, I hereunto subscribe my name this 26th day of November, 1928.

HUMPHREYS O. SIEGMUND.