

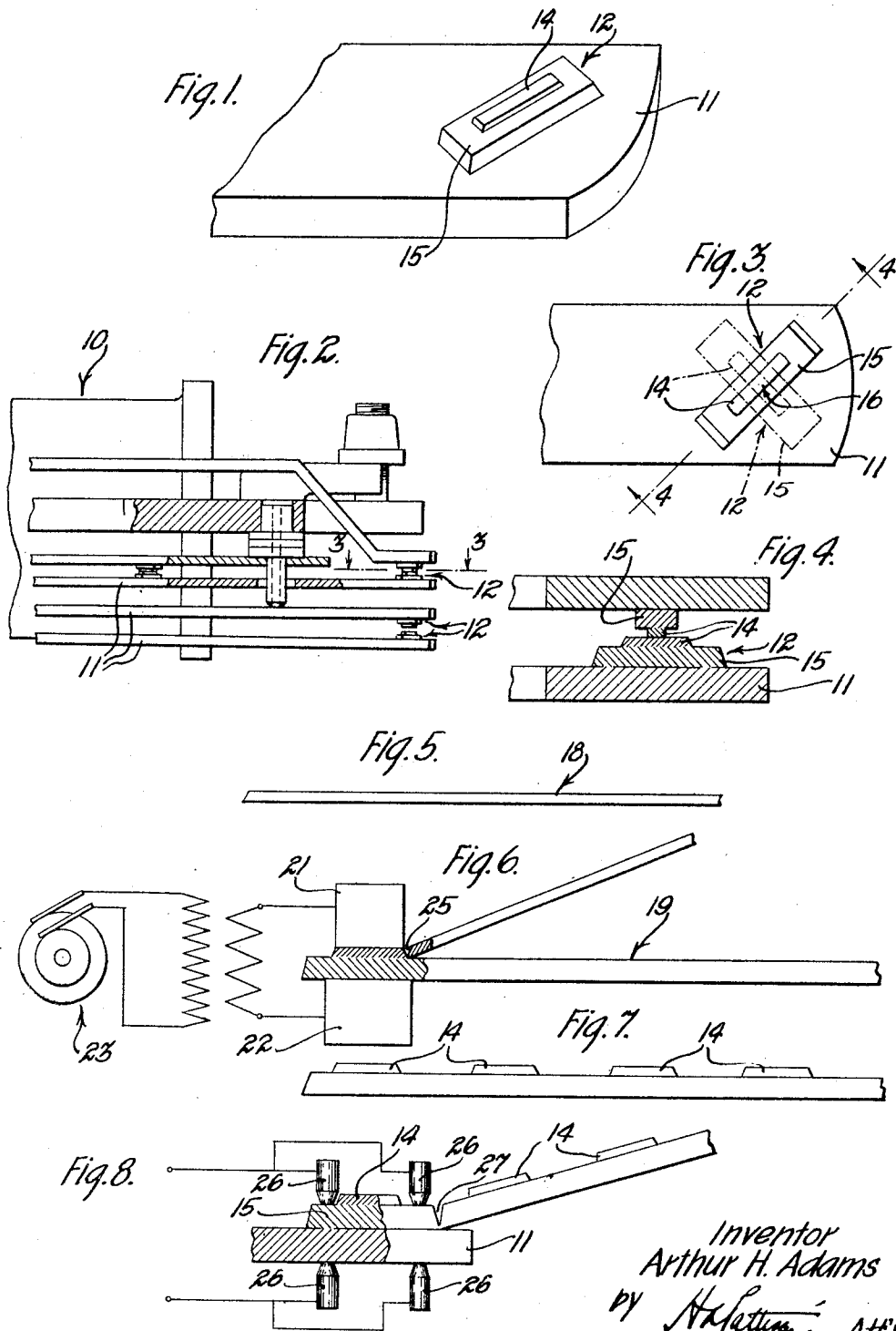
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METHOD OF MANUFACTURING ELECTRICAL SWITCHING APPARATUS

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METHOD OF MANUFACTURING ELECTRICAL SWITCHING APPARATUS

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This invention relates to methods of manufacturing electrical switching apparatus, and more particularly to methods of manufacturing parts for such apparatus provided with electrical contact members.

In certain types of electrical switching apparatus, such as electro-magnetic relays extensively employed in telephone exchange systems, a plurality of super-imposed circuit closing springs are operated by a common armature. The free extremities of certain of these springs are provided with contact points or elements to effect the opening and closing of circuits in response to the movement of the springs. It has been found preferable in order to insure efficient service over an extended period of time to construct these contact elements of certain precious metals and therefore it is desirable to use elements which require a minimum volume of material to present maximum areas of cooperating contact surfaces and which function efficiently under operating conditions incident to the use of relay contact springs.

The primary objects of this invention are the provision of switching apparatus having economically constructed and efficiently operable contact members and methods of expeditiously manufacturing parts constituting such apparatus.

In accordance with these and other objects, the invention contemplates a method which consists in welding sections of a strip of contact metal to a continuous base member. The unwelded portion of the strip is broken away from each welded section at a transverse indentation to simultaneously determine the strength of the weld. Sections of the base member carrying the strip sections are then welded diagonally across switching elements or contact springs and these welds are similarly tested by breaking a portion of the base member at transverse indentations. Contact elements thus welded on oppositely disposed springs are angularly disposed relative to each other, the angular disposition being made to effect a desired predetermined area of contact between the strip sections.

These and other objects will be apparent from the following detailed description when

considered in connection with the accompanying drawings, wherein

Fig. 1 is a perspective view of a fragmentary portion of a relay contact spring provided with an angularly disposed contact member produced in accordance with the teachings of the invention;

Fig. 2 is an enlarged fragmentary detailed elevational view of a relay of the type employed in telephone circuits which is equipped with springs and contact members of the type disclosed in Fig. 1;

Fig. 3 is a plan view of a spring and associated contact member as viewed on the line 3—3 of Fig. 2, the companion super-imposed contact member carried by the adjacent or upper spring being shown in dot and dash lines;

Fig. 4 is a vertical sectional view taken on the line 4—4 of Fig. 3;

Fig. 5 is a side elevational view of a strip of contact metal;

Fig. 6 discloses a section of the contact metal in the process of being welded to a continuous base member;

Fig. 7 discloses a base member provided with a plurality of separated sections of contact metal welded thereto, and

Fig. 8 discloses a section of a base member in the process of being welded to a contact spring.

Referring now to the drawings wherein like numerals have been employed to designate similar parts throughout the various figures, it will be observed that for purposes of illustrating one embodiment of the invention, an electro-magnetic switching device or relay is shown which comprises a plurality of superimposed switching elements or contact springs 11 positioned adjacent an electro-magnet. Positioned near the extremity of certain pairs of springs 11 on the opposing surfaces thereof is a pair of cooperating contact members indicated generally by the numeral 12, each of which comprises a section 14 of contact metal in strip form welded to the surface of a metallic base member 15. This contact member 12 is welded to its companion spring 11 diagonally thereof as clearly shown in Figs. 1 and 3. It will be ob-

served that the contact member 12 carried by one of the pair of opposing springs 11 is positioned angularly with respect to the cooperating contact member 12 carried by the other or companion spring. By having this arrangement a cross contact is effected between the adjacent sections of contact metal 14 in response to the movement of the springs 11 and the area or position of contact is indicated by the numeral 16 in Fig. 3.

The contact members 12 may be produced in a very convenient and simple manner by applying a section of a strip of contact metal 18 (Figs. 5 and 6) to the upper surface of a portion of a strip of base metal 19. A pair of welding electrodes 21 and 22 electrically connected with a suitable source of current supply 23 may then be carried into association with the associated parts and contemporaneously with the welding operation a notch or indentation 25 may be formed by any suitable means (not shown) so as to partially sever the strip 18. Upon the completion of the weld and after the removal of the electrodes 21 and 22 the unwelded portion of the strip 18 is broken away in any suitable manner from the welded section 14 and during the breaking operation sufficient force or pull is exerted to test the strength of the weld. Thus, if the section 14 is properly welded to the base member the unwelded portion of the strip 18 may be broken away without displacing the section 14. The steps just described in welding sections of the strip 18 to the strip of base metal 19 may be repeated so as to weld a plurality of sections 14 in spaced relation along the surface of the base metal 19 as clearly shown in Fig. 7.

After welding the sections 14 to the strip 19 the extremity of the strip may be carried into association with the surface of one of the switching springs 11 so as to occupy a position diagonally thereof. The section of the base strip 19 associated with the springs 11 (Fig. 8) may now be welded to the spring by means of suitable welding electrodes 26 positioned adjacent opposite extremities of the section of contact metal 14, and contemporaneously with this welding operation, indentations 27 are produced in any suitable manner in the strip of base metal 19 so as to partially sever the unwelded portion thereof from the welded portion or section 15. In breaking the unwelded portion of the strip 19 from the welded section 15 a test similar to the test already described in connection with the welding of the section 14 is thus applied to the base metal section 15. Breaking the materials away from the welded section as described affords a very convenient and positive method for testing the strength of the welded parts and it will be understood that the section 15 may be very conveniently positioned in any desired angular relation with respect to its companion spring 11. Sections of the

strip of base metal 19 may be successively applied or welded to individual spring members 11 by practicing the steps just described.

From the foregoing it will be apparent that the angular relationship of the cooperating members 12 will determine the area of the contacting surfaces of their respective sections 14. Thus, for example, when the contact members 12 are positioned at right angles as shown in Fig. 3, the contacting areas of the sections 14 thereof will assume the form of a square at the position indicated at 16, but if the angular relationship between these members 12 is varied, the contacting surfaces of their respective sections 14 will likewise vary and the areas of these contacting surfaces will be rhomboidal. The shape and area of the contacting surfaces of the sections 14 will be dependent upon the electrical requirements incident to their use and hence the improved method of producing parts of electrical switching apparatus makes it possible to angularly position the contact members thereof in accordance with a desired predetermined contacting surface. This method also enables the production of very efficiently operable contact members with the use of a minimum volume of contact metal.

What is claimed is:

1. The method of producing switching apparatus contact members, which consists in welding a section of a strip of contact metal to a base member, and breaking away the unwelded portion of the strip to determine the strength of the weld.
2. The method of producing switching apparatus contact members, which consists in welding a section of a strip of contact metal to a base member, producing an indentation in the strip, and breaking the unwelded portion thereof at the indentation.
3. The method of producing switching apparatus parts, which consists in welding a section of contact metal in strip form to a companion base member, and then welding the composite parts to cooperating switching elements in angular relationship to each other.
4. The method of producing switching apparatus parts, which consists in welding a section of contact metal in strip form to a portion of a continuous base member, welding the portion of the base member carrying the strip section to a switching member, and breaking the unwelded portion of the base member to determine the strength of the weld.
5. The method of producing switching apparatus parts, which consists in welding a section of contact metal in strip form to a portion of a continuous base member, welding the portion of the base member carrying the strip section to a switching element, producing an indentation in the base member, and breaking the unwelded portion of the

base member at the indentation to determine the strength of the weld.

6. The method of producing switching apparatus parts, which consists in welding a section of contact metal in strip form to a base member which is longer than the strip, and then welding the opposite extremities of the base member to a switching element.

7. The method of producing switching apparatus parts, which consists in welding sections of contact metal in strip form to base members which are longer than the strips, and then spot welding the extremities of the base members to cooperating switching elements in angular relationship to each other.

8. The method of producing switching apparatus parts, which consists in welding sections of a strip of contact metal to a continuous base member in spaced relation, welding sections of the base member supplied with the strip sections to opposing switching elements in angular relationship with respect to each other.

9. The method of producing switching apparatus parts, which consists in welding a section of a strip of contact metal to a continuous base member, contemporaneously producing an indentation in the strip, and breaking the unwelded portion of the strip to test the weld.

10. The method of producing switching apparatus parts, which consists in welding sections of contact metal in strip form to companion base members, and then welding the base members to opposing switching elements in angular relationship to each other, the angular relationship being in accordance with a desired area of contact between the strips of contact metal.

11. The method of producing switching apparatus contact members, which consist in welding a section of a strip of contact metal to a base member, and breaking away the unwelded portion of the strip.

12. The method of producing switching apparatus contact members, which consists in welding a section of a strip of contact metal to a base member short of the ends thereof, and welding the ends of the base member to a switching member.

In witness whereof, I hereunto subscribe my name this 18th day of October, A. D. 1927.

ARTHUR HERMAN ADAMS.

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