May 18, 1943 J. E. LAKE 2,319,610

ELECTRIC CONTACT MEMBER

Filed Sept. 12, 1941

Fig. 1 Fig. 1a Fig. 4 Fig. 4a Fig. 5 Fig. 5a Fig. 6 Fig. 6a

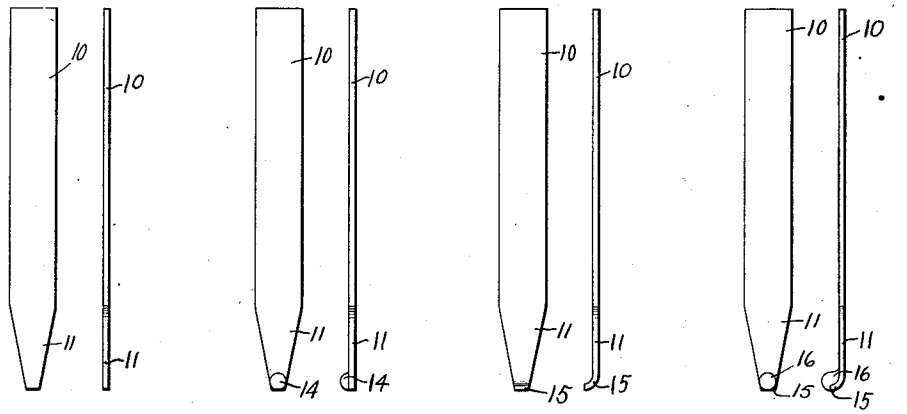


Fig. 7 Fig. 7a Fig. 8 Fig. 8a

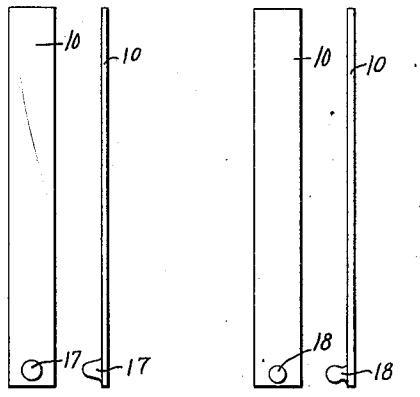


Fig. 2.

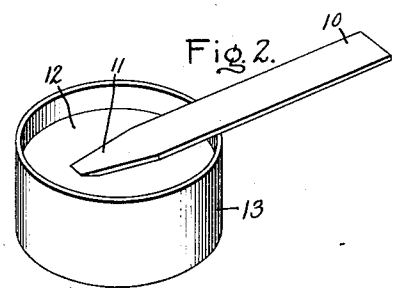
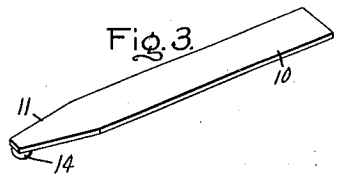


Fig. 3.



Inventor:
John E. Lake,
by Harry E. Dunham
His Attorney.

Patented May 18, 1943 2,319,610

UNITED STATES PATENT OFFICE

2,319,610

ELECTRIC CONTACT MEMBER

John E. Lake, Schenectady, N. Y., assignor to General Electric Company, a corporation of New York

Application September 12, 1941, Serial No. 410,528

4 Claims. (Cl. 117—114)

My invention relates to electric contact members, more particularly to a contact member, such as a flexible arm, having a contact or mass of electric contact material, such as silver secured to it, and has for its object a simple, reliable and low cost contact member of this type, and method of manufacturing it.

In carrying out my invention, I apply the mass of electric contact material to its supporting member by dipping the supporting member into a molten bath of the contact material, such as silver, whereby upon withdrawal of the member from the molten material a globule or bead of the material, constituting a contact, is formed thereon. In particular, my invention is applicable to the formation of electric contacts on the ends of spring arms. To facilitate the formation of the contact at the desired point and further to facilitate the adherence of the material to the flexible arm, the end of the arm is suitably shaped. It may be tapered to a relatively narrow point which defines and limits the size of the contact. Also, this narrow point may be bent somewhere at its extreme end to form thereby a recess, for the contact material. Another expedient for localizing the contact is to form a protuberance on the spring arm at the point where the contact is to be secured.

For a more complete understanding of my invention, reference should be had to the accompanying drawing in which Figs. 1 and 1*a* are plan and side elevation views of a spring arm provided with a tapered end for the contact; Fig. 2 is a view in perspective showing a crucible containing a quantity of molten contact material with the end of a spring arm immersed therein; Fig. 3 is a perspective view showing the spring arm withdrawn from the molten material; Figs. 4 and 4*a* are views similar to Figs. 1 and 1*a* showing the contact in place; Figs. 5 and 5*a* are plan and side elevation views of a tapered contact arm having its end bent over somewhat; Figs. 6 and 6*a* are views similar to Figs. 5 and 5*a* with the contact in place on the arm; Figs. 7 and 7*a* are plan and side elevation views of a contact strip provided with a protuberance for positioning the contact; and Figs. 8 and 8*a* are views similar to Figs. 7 and 7*a* with the contact in place.

Referring to the drawing, I have shown in Figs. 1 and 1*a* a supporting member or electric contact arm in the form of a rectangular strip 10 of flexible, resilient material such as bronze. The end on which the mass of contact material, such as silver, is to be formed is tapered to a relatively narrow end portion 11 of such width as to limit the amount of molten contact material which adheres to this end of the strip when it is removed from the molten bath of contact material.

In applying the mass of contact material, the material 12, preferably silver, is first melted in a suitable crucible 13. The strip 10 is then inserted into the molten material, the tapered end portion 11 being immersed in the molten bath for a distance sufficient for the silver to wet an area on the side on which the contact is to be formed substantially equal to the cross-sectional area of the mass of silver to be deposited on the spring arm. If necessary, a suitable flux is used although the flux may not be necessary if the surface of the strip is perfectly clean.

Preferably, as indicated in Fig. 2, the strip is held when being inserted into the molten bath at an angle of about 30 degrees with the horizontal. This angle determines the point where the globule or bead of silver will adhere when the strip is withdrawn. The 30-degree angle is suitable when the bead is formed on the end of the strip.

When the supporting member or strip 10 is made of quite thin material, a momentary immersion only of the end of the strip in the molten silver is required to heat the end of the strip to the temperature approximately of the silver thereby to cause wetting of the end of the strip by the silver. The strip is then withdrawn from the bath and the molten silver adhering to it collects on the tapered end 11 of the strip which is held lowermost in the form of a globule or bead 14. The position of the bead or contact 14 on the end of the strip is determined to a considerable extent by the angular position of the strip after it is removed from the bath. As shown in Fig. 3 when the strip is removed from the bath, the silver collects on the lower side of the strip and with the strip held at about a 30-degree angle with the horizontal, as shown, the bead forms on the lower side of the strip and with the lowermost edge of the bead substantially flush with the end of the strip. The strip is held in this position, indicated in Fig. 3, momentarily to allow the molten silver to collect as desired and cool and harden. Also, the strip is held so that it is horizontal in a lateral direction, i. e., so that a transverse cross section lies in a horizontal plane. The bead of molten silver assumes a substantially spherical surface shape because of its relatively high surface tension while molten as shown in Figs. 4 and 4*a*.

Preferably, the silver is maintained at a tem-

perature of 1050° C. varying slightly above or below that temperature when supporting strips made of different thicknesses of bronze are used. A temperature which is too high may remove the temper from the bronze material. I contemplate that the temperature of the molten bath will be maintained automatically as by temperature responsive electric heating equipment at a predetermined desired temperature and the strips will be handled and immersed by suitable mechanism.

In Figs. 5 and 5*a*, I have shown a flexible strip support of bronze similar to that shown in Figs. 1 and 1*a* except that the extreme end of the tapered portion is bent slightly laterally to form a bent portion or projection **15**. This bent portion, which is immersed in the molten silver, forms a seat for the molten bead and helps to secure and position the bead **16**, as indicated in Figs. 6 and 6*a*.

Figs. 7 and 7*a* show a rectangular flexible bronze strip having a laterally extending projection or protuberance **17** on one side near the end for positioning the silver bead, which protuberance may be conveniently formed by extrusion by means of a prick punch applied to the opposite side of the strip. In this case the silver is applied by dipping the end of the strip into the silver in such manner that the protuberance only is immersed in the silver, the strip being held during the dipping operation with the protuberance underneath. The strip is also held in this position when removed from the bath so that the silver bead **18** forms around and on the protuberance as shown in Figs. 8 and 8*a*. This method of immersing the protuberance only results in the formation of a small bead of silver on a relatively large strip area. The silver because of its surface tension assumes a spherical form.

While I have shown a particular embodiment of my invention, it will be understood, of course, that I do not wish to be limited thereto, since many modifications may be made and I, therefore, contemplate by the appended claims to cover any such modifications as fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. The method of forming a metal electric contact on one end of a metal supporting member which consists in dipping said end of the supportng member in a molten bath of the metal of the contact and causing the molten metal to wet the member, removing the member from the bath together with a small amount of the molten contact metal adhering to the member, and then holding the member with said end lowermost so as to cause the molten metal to collect on said end and harden to form a contact body having a spherical surface.

2. The method of forming an electric silver contact on one end of a flexible metal strip which consists in forming a portion on one end of the strip having a width substantially the same as the desired width of the contact, dipping said end of the strip in a molten bath of silver and causing the molten silver to wet the strip, removing the strip from the bath together with a small amount of molten silver adhering to the strip, and then holding the strip with said end lowermost so as to cause the molten silver adhering to said strip to flow together on said portion and harden into a globule having a spherical surface.

3. The method of forming a metal electric contact on one end of a metal spring strip which consists in forming a protuberance on said end, dipping said end of the strip into a molten bath of contact metal so as to immerse said protuberance in the bath and cause the molten metal to wet the protuberance, removing the strip from the molten bath, together with a small amount of the molten metal adhering to the strip and then holding the strip in a position to cause the molten metal adhering to it to collect on the protuberance and harden.

4. The method of forming an electric contact made of silver on one end of a spring strip made of bronze which consists in forming a protuberance on one side of said end by striking the opposite side of the strip, dipping said end of the strip into a molten bath of silver so as to immerse the protuberance in the silver and cause the silver to wet the protuberance, removing the strip from the molten bath, together with a small amount of molten silver adhering to the strip and then holding the strip with said protuberance lowermost so as to cause the molten silver adhering to it to collect on the protuberance and harden into a globule having a spherical surface.

JOHN E. LAKE.