Nov. 29, 1927.

A. J. LIEBMANN

1,650,897

TUNGSTEN CONTACT BREAKER ARM

Filed Oct. 30, 1924

Fig. 1.

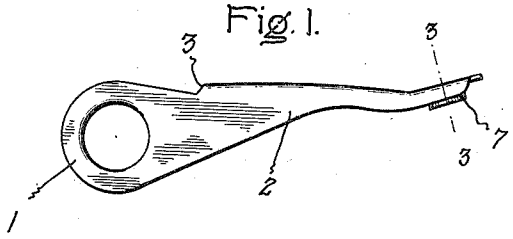


Fig. 2.

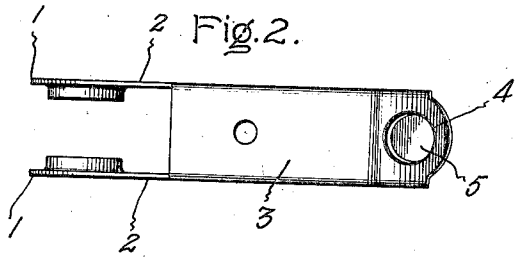


Fig. 3.

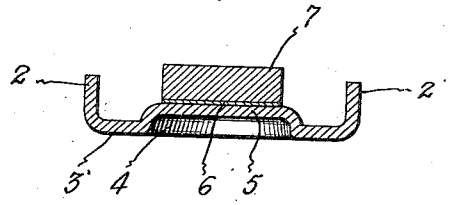
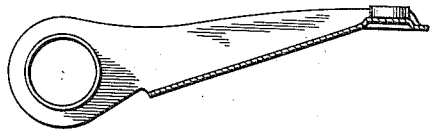


Fig. 4.



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UNITED STATES PATENT OFFICE.

ALFRED J. LIEBMANN, OF NEW YORK, N. Y., ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

TUNGSTEN CONTACT-BREAKER ARM.

Application filed October 30, 1924. Serial No. 746,723.

My invention relates to devices for making and breaking electric circuits and more particularly to breaker or distributor arms provided with contacts of tungsten or similar high melting metal and constructed to vibrate to make and break a circuit in which the contacting elements are required to engage with a high degree of precision in order to reduce sparking to a minimum. Such breaker arms are commonly used in magnetos, ignition systems for automobiles, and similar devices.

Contact points or elements of tungsten are well adapted for use in making and breaking electric circuits, such as the ignition circuits of automobiles. The circuit is usually controlled by two cooperating contacts of tungsten, one of which is stationary and secured to the end of a steel screw to be adjustable, and the other is secured to a vibrating breaker arm which is moved to bring the contact points into and out of engagement. Heretofore the contact point in the breaker arm consisted of a tungsten disc attached to the head of a steel rivet which in turn was riveted in place on the breaker arm. Accurate positioning of the riveted contact point is difficult because there must be in the arm a hole larger than the shank of the rivet to permit the contact point to be riveted to the arm, and the position of the contact point is uncertain to the extent of the clearance between the shank of the rivet and the edge of the hole. In many cases, the shanks of the contact points are not riveted or spun over to the proper extent, so that the contacts are loose on the arm, do not operate properly, and make a poor electrical contact with the arm. Another serious disadvantage is the frequency with which the tungsten face of the contact point is marred, cracked, or otherwise injured during the operations of riveting or spinning the shank of the contact point. Worn out contacts are often replaced by riveting new, but inferior, contact points to the original arm causing faulty operation, and injury to the reputation of the equipment in which the breaker arm is used.

In accordance with my invention the contact of tungsten or other high melting metal is very accurately positioned on the contact arm by welding the contact to a projection formed on the contact arm during its manufacture. A convenient way of accomplishing this result is to stamp or press in a flat part of a sheet steel contact arm a cup or depression, thereby raising on the other side of the contact arm a very accurately positioned projection or table, and to weld to the top of this table a tungsten contact disc of substantially the diameter and shape of the table and accurately centered on the table, the contact arm and tungsten disc becoming practically integral and together constituting a very accurately made breaker arm. A convenient way is to weld the disc to the steel arm by means of a linking layer of a metal, such as copper or of an alloy, which wets or alloys with both tungsten and steel. By this property of wetting, the copper when fused forms a fluid meniscus between the tungsten and steel whereby forces due to the surface tension thereof operate to obtain equilibrium and centre substantially accurately the tungsten disc over the projection on the contact arm.

My invention will best be understood in connection with the accompanying drawing, in which I have illustrated some forms of breaker arms, and in which Figure 1 is a side elevation of a sample form of arm constructed in accordance with my invention; Figure 2 is a plan view of the arm shown in Figure 1; Figure 3 is a cross-section along the line 3—3 of Figure 1; and Figure 4 is a longitudinal section of another form of arm.

The particular form of contact arm shown in Figure 1 is stamped or pressed out of one piece of sheet metal, such as sheet steel; and has perforated ears 1 on flanges 2 which form part of and stiffen the flat web 3 of the arm. At the point where the contact point is to be secured to the arm a cup or depression 4 is stamped or pressed in one side of the web 3, thereby producing on the other side a projection or table 5, preferably circular, and with its top somewhat above the level of the surface of the web 3.

To mount the contact disc accurately upon the table 5, I prefer to use a linking layer 6 of some metal, such as copper, or brass, or similar alloy, which melts at a temperature below that at which the metal of the arm softens, and which, when melted, will adhere to or wet the metal of the arm and also the metal of the contact disc. In the particular embodiment of the invention shown a circular disc of tungsten 7 of sub-

stantially the same diameter as the circular table 5 is used, and I find that upon the melting of the copper linking layer 6 the tungsten contact 7 automatically centers itself upon the table, so that when the linking layer cools the tungsten point is not only welded to the table, but is very accurately centered on it.

In the practice of my invention the tungsten disc 7 is placed upon a copper disc which is about the diameter of the tungsten contact disc and rests upon the table 5, as illustrated in Figure 3. The assemblage is then heated in a muffle furnace in an atmosphere of hydrogen, until the copper disc 6 melts, wetting both the sheet steel contact arm and the tungsten contact point, whereupon, because of the forces above referred to operating in the melted copper, the tungsten contact point 7 centers itself very accurately upon the table, and remains centered as the assemblage cools down, with the result that the accurately positioned contact point is firmly welded to the contact arm.

A marked commercial advantage of my invention is that the contact arm which the tungsten disc welded to it forms a unitary integral breaker arm upon which the maker can place his name and trade-mark, as indicated in Fig. 2. Breaker arms of this type on which the contact discs are worn out are replaced by genuine ones made by the original manufacturer, because the worn out tungsten contact cannot be replaced by riveting to the old contact arm a new but inferior contact. The contact disc is more accurately and permanently positioned than is feasible with riveted contact points, and the electrical conductivity is very much better than where the contact point is secured to the arm by riveting.

Figure 4 is a longitudinal section of another form of breaker arm in which the contact disc is welded to the table on the arm and is permanently in proper relation to the remainder of the arm.

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

1. A contact arm adapted for precision make and break service in electrical circuits, comprising a body member of sheet steel deformed to have a pivotal supporting portion and a substantially flat supporting surface struck up at a desired distance from said pivotal supporting portion, a contact element of tungsten having substantially the same size and shape as said supporting surface, and an interposed layer of brazing material having a relatively low melting point and adapted to wet when melted both tungsten and steel whereby, when fused, it operates both to centre and to weld said contact element to said body member.

2. A contact arm adapted for precision make and break service in electrical circuits, comprising a body member of up-set sheet steel formed with a portion having a relatively flat surface, a depending portion providing an axis of oscillation parallel to said flat surface, and a struck-up circular table portion spaced a desired distance from said axis, a circular contact element of tungsten having substantially the same cross-sectional area as said table portion, and a linking layer of copper interposed between said element and said table portion and adapted when brought to a welding temperature to center said contact element upon the said table whereby said element is in a predetermined relation to said axis and projects above said surface portion, having its cylindrical axis normal to the surface of said surface portion.

3. A method of manufacturing vibrating contact arms of sheet metal which are adapted for precision make-and-break service in electrical circuits, comprising forming the body of the arm from sheet metal shaped to provide pivotal support, striking up from the surface of the same a substantially flat projecting portion, providing a refractory metallic contact element adapted to be affixed to said projecting portion and of the same size and shape, and welding the latter to said struck-up portion by means of interposed material adapted to melt at a temperature lower than either the metal of said arm or of said contact element and to centre automatically said element upon said projecting portion by the surface tension thereof when fused.

In witness whereof, I have hereunto set my hand this 24th day of October, 1924.

ALFRED J. LIEBMANN.