March 18, 1941. F. SCHILGEN ET AL 2,235,171

CONTACT FOR VIBRATORS

Filed March 24, 1939

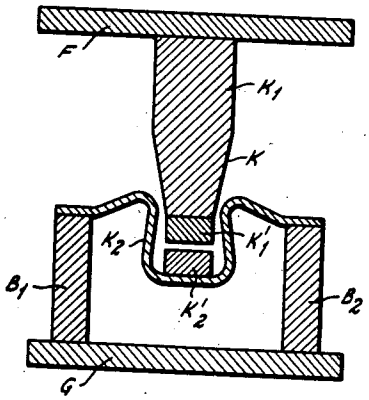


Fig. 1

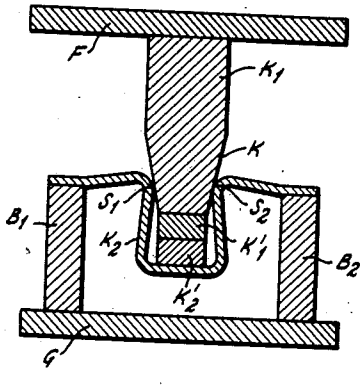


Fig. 2

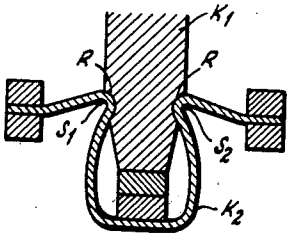


Fig. 3

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Patented Mar. 18, 1941

2,235,171

UNITED STATES PATENT OFFICE

2,235,171

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Application March 24, 1939, Serial No. 263,966
In Germany March 24, 1938

4 Claims. (Cl. 200—166)

The invention relates to a make and break contact and more especially to a contact device for a vibrator (interrupter with vibrating reed).

Vibrator contacts are usually formed and arranged in such a manner that the two touching contacts are pressed together. The advantage of such an arrangement is that the friction and therefore the loss of energy of the vibrating reed is small. Further the contact opens and closes very quickly, because the motion is directed perpendicular to the contact surface. Thereby the sparks (or arcs) at the closing and opening are diminished.

A disadvantage of such a device is that the two contact pieces touch each other at only a few points of their surfaces for the reason that the contact surfaces with no or little friction existing are not sliding over each other. This causes the transmission resistance of the contact to be quite large and to increase during the working period. The large transmission resistance causes the contact to become very hot especially for large currents, thus appreciably decreasing the life of the contacts. It is also a fact that with such device pin-formation (that is, travel of material) is accelerated whereby a pin-like excrescence arises almost at the cathode and a considerably deep crater is formed at the anode. In the operation of the device under such conditions, the crater usually destroys the anodic contact piece very rapidly.

It is known to form a contact so that a substantially frictional contact touching arises. The transmission resistance of such contact is small since the pieces slide over each other and clean themselves automatically. But in such cases the loss of energy and material is very large. Also the sparks or arcs at the closing and opening are very large, because the motion as the contact touches is directed tangential to the contact surfaces and therefore the opening and closing is very slow. As the result of this such formed contacts have not been employed heretofore at vibrators.

It is a main object of the present invention to avoid these disadvantages by forming and arranging the contact in that manner such a substantially pressing contact results at one place and a substantially frictional contact at another place.

The present invention combines the advantages of both the pressing and the frictional contact devices without their disadvantages. The pressing part of the contact effects the rapid closing and opening of the contact. The frictional part of the contact is conducting the largest part of the current during the largest part of the time that the contact is closed. Therefore the pressing part is unburdened and is prevented from becoming hot. As the pressing part of the contact wears slowly and its transmission resistance increases, the other part acts to conduct more and more of the current. In this way the life of the contacts is considerably increased.

The advantages above set forth are effective preferably if the contact is formed and arranged in such a manner that while it is being closed the pressing contact arises first and the frictional contact secondly, while when the contact is being opened the two contact places are severed in the reverse succession. Thus the pressing part closes at first with little sparking because of the high velocity of closing and thereafter the frictional part closes without a spark since the other part has already closed and no voltage exists between the two contact pieces of the frictional part of the contact. At opening of the contact, sparking is avoided by severing the sliding part before the pressing part, the latter being opened a short time after the sliding part has been opened.

The invention is illustrated in reference to the accompanying drawing, of which

Fig. 1 shows an embodiment of the invention in the "open" position diagrammatically,

Fig. 2 shows the same embodiment in the "close" position,

Fig. 3 shows another embodiment of the invention.

In Fig. 1 the vibrating reed F of a mechanical interrupter which is shown in cross-section perpendicular to the direction of the reed, carries a pin-like contact piece K_1, which is consisting of carbon at least at its conical front part K. This front part carries a little plate K_1, consisting of a hard metal (for instance wolfram). The countercontact-piece is a little plate K_2', consisting also of wolfram which is carried by the U-like blade-spring K_2. This spring is consisting of copper or another metal which is not too hard and is fastened on the counter-plate G by supports B_1 and B_2.

While Fig. 1 shows the arrangement in the normal position in which the contact is opened, Fig. 2 shows the same arrangement in that position in which the reed F is bent off to below and closes the contact. At the motion to below the passing contact pieces K_1' and K_2' touch each other. Therefore the elastic spring K_2 is pressed

down and is strained simultaneously so that the U-like formed part is stretched and is contracted at its mouth. As the result of this the mouth places S_1 and S_2 of the spring K_2 touch frictionally the side surfaces of the cone K consisting of carbon. Now a considerable part of the current is flowing through the frictional contact part. The contact parts open in the adverse succession.

After a large work-time of the interrupter if the pressing contact pieces consisting of wolfram are worn out, the contact pin K_1 engages more deep into the U-like formed aperture of the counter-contact spring K_2. Therefore the percentage portion of the frictional contact part at the conducting of current increases.

The counterplate G can be rigid, if the spring K_2 is elastic sufficiently. Furthermore a vibrating lever instead of a vibrating reed may be controlling the contact pin K_1.

Fig. 3 is showing another embodiment of the invention, which is similar to the embodiment shown in Fig. 1 and Fig. 2, but differs in that the moved contact pin K_1 is supplied with a groove R in which the side-walls of the counterpiece K_2 are able to snap in, so that the pin is arrested during a large portion of the time in which the contact is closed. Thereby a very large velocity of opening is obtainable.

What we claim is:

1. In a vibrating interrupter, a make and break switch adapted to be operated at high speeds, said switch comprising a vibrating pin-like element forming one electrode thereof and a substantially fixedly mounted spring-cradle element forming the cooperating electrode of the switch, said two elements being positioned with respect to each other so that one end of the pin-like element operates within the spring-cradle, the range of movement of the pin-like element being sufficient so that in one direction of operation thereof said end of the pin-like structure first comes in contact with a portion of the inner side of the base of said spring-cradle and continues its motion to an extent sufficient to tension the cradle and cause its sides to come in sliding contact with the outer surface of the pin-like element and in the other direction to completely break contact with the spring-cradle.

2. The arrangement described in the next preceding claim wherein the end of the pin-like element which makes said first contact and the portion of the spring-cradle with which said end comes in contact are made of comparatively hard conductive material to withstand wear whereas the portions of said elements which come in sliding contact are made of material having high electrical conductivity.

3. In a vibrating interrupter provided with a make and break switch adapted to be operated at high speeds, said switch comprising a vibrating pin-like element forming one electrode of the switch and a substantially fixedly mounted spring-cradle element forming the cooperating electrode, said two elements being positioned with respect to each other so that in the operation of the interrupter one end of the pin-like element makes and breaks contact with a portion of the inner side of the base of the spring-cradle, the range of movement of said pin-like element being sufficient in one direction to tension the cradle sufficiently so as to cause its sides to come in sliding contact with the outer surface of the pin-like element on make and in the other direction to move completely free from the cradle whereby on make a substantially fixed pressure contact is first established between a portion of the cradle element and a portion of the pin-like contact element and thereafter a sliding contact is established between different portions of said elements and on break said sliding contact is first broken after which said pressure contact is broken.

4. In a vibrating interrupter provided with a make and break switch adapted to be operated at high speeds, said switch having one contact element formed as a pin-like structure and a cooperating contact element formed as a spring-cradle, a contact piece mounted within the spring-cradle and positioned so as to contact one end of the pin-like element and thereby establish contact between said two elements on make, said two contact elements being arranged so that the pin-like contact element is moved toward said contact piece to make contact between said elements and away from the contact piece to break contact between said elements, the pin-like element being arranged to continue its movement in the direction of make for a predetermined distance after contact is established between said end thereof and the contact element, said continued motion acting upon the spring-cradle to bring the sides thereof in sliding engagement with the outer surface of the pin-like structure whereby on make a substantially fixed contact is first established between said end of the pin-like element and the contact piece and thereafter a sliding contact is established between a portion of the spring cradle and the pin-like element, and on break the sliding contact is first broken after which said substantially fixed contact is broken.

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