

Sept. 23, 1958

F. E. ROMMEL ET AL
ELECTRIC CONTACT-MAKING DEVICES

2,853,578

Filed Oct. 31, 1955

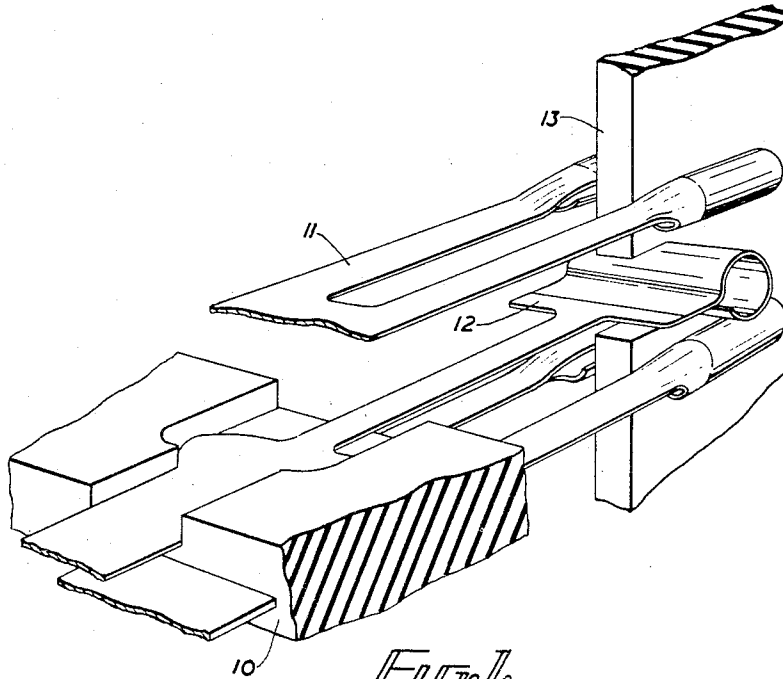


FIG. 1.

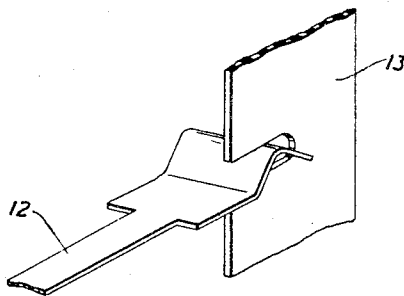


FIG. 2.

INVENTORS
FREDERICK EMIL ROMMEL
AND NORMAN FRANCIS PETTET
by Pierce, Scheffler & Parker

ATTORNEYS

1

2,853,578

ELECTRIC CONTACT-MAKING DEVICES

Frederick Emil Rommel, Ilford, and Norman Francis Pettet, South Norwood, London, England, assignors to Telephone Manufacturing Company Limited, a British company

Application October 31, 1955, Serial No. 543,828

3 Claims. (Cl. 200—104)

This invention relates to electric contact making devices. The invention finds its chief use in electromagnetic relays, especially of the type used in telecommunication and similar light current apparatus, and for convenience the invention will hereinafter be described in relation to such apparatus, but the invention can be used in other circumstances where similar conditions exist.

In relays having a plurality of moving and fixed contacts operated simultaneously in response to an armature movement it is necessary that at least the moving contacts, or more conveniently the carriers on which they are mounted, should be engaged by insulating separating means, by which the contacts can be simultaneously moved while retaining the relative separation of the moving contacts within certain limits. Though it can take various forms, such an insulating and separating means will hereinafter be identified as a card.

In accordance with the present invention there is provided an electromagnetic relay comprising at least one moving contact carrier and an actuating member moved by the armature of said relay for moving said carrier, said actuating member presenting facing surfaces between which said carrier enters, the carrier having an effective dimension, at the part engaging said surfaces, and in the direction of movement of the actuating member, which is greater than at least another part of the carrier, and which is substantially equal to the distance between said surfaces.

The invention also includes an electromagnetic relay comprising at least one moving contact carrier, said carrier being supported near one end in a support member, and engaging near its other end entering between opposing surfaces on an actuating member moved by the armature of the relay and by which the carrier is moved, said carrier over a major part of its length having a dimension, in the direction of movement of the actuating member, which is substantially less than the corresponding effective dimension at the part engaging said surfaces.

The invention will be better understood from the following description of one embodiment thereof given by way of example, in conjunction with the accompanying drawing, in which:

Figure 1 is a fragmentary perspective and partly exploded view showing a moving contact and the card, and the immediately related parts, and

Figure 2 is a sketch of a modification.

Briefly, the contact assembly comprises an insulating support 10 in which a series of spaced, generally parallel fixed contact carriers 11 are held. In this case, as in our prior application, the fixed carriers, of thin resilient metal strip, have twin arms; the extremities of the arms are coated with precious metal to provide the contacts. These carriers are short and stiff and when they have been secured in the support 10 all the fixed carriers can be adjusted simultaneously by bending them alternately to and fro, to a decreasing extent each time. In this way the fixed contacts can all be easily and quickly adjusted with respect to some datum surface on the assembly.

2

The moving contact carriers 12, also of thin resilient metal strip, are arranged to be insertable in the support 10 after the fixed carriers are secured and without affecting the position of adjustment of the fixed contacts. The moving contacts do not rely for their accurate positioning upon the mounting of the moving carriers in the support 10 but upon an insulating member or card 13 which also serves to move the moving carriers, and hence the contacts, in accordance with the movement of the armature, not shown.

The contact ends of the moving contact carriers enter slots in the edge of the cards, and are in consequence located by the spacing of the slots. Thus, by giving the slots the appropriate dimensions the desired separation of the moving contacts can be obtained. In the construction described the slots are required to be no wider than is necessary to receive a single thickness of the metal strip used for the carriers.

Since the metal used for the moving carriers is thin, the slots must be correspondingly narrow, and in practice too narrow for it to be practicable for them to be blanked out from sheet insulating material of which the card is made. In addition, the tolerances on the dimensions of the slots and their spacings along the edges of the card will produce corresponding variations in the separation of the moving carriers and will supplement the tolerances on the fit of the carriers in the slot. If the slots are milled or sawn, which is a more expensive way of producing them, much the same remarks apply.

It is to be observed that if the moving carriers fit closely within the slots of the card and are thereby accurately determined, the carriers can engage the card with negligible pressure. On the other hand if the construction is such, as with more conventional type relays with multiple spring sets, that the moving carriers or springs must engage the cards with a pressure sufficient to ensure that the carrier locates against that surface of the slot by which it is moved on actuation of the relay, there is an aggregate pressure against which the armature must act.

By the present invention these difficulties of design of the moving carriers and slots are largely mitigated, by arranging that the ends of the moving carriers are self-locating in the slots, and by permitting the slots to be wider than the thickness of the metal.

As shown in Figure 1, the contact ends of the moving carriers are rolled or barrelled, and the slots in the card are made of a corresponding dimension to receive the thus enlarged ends of the carriers. The carrier is made of thin resilient metal, such as Phosphor bronze, and so it is possible to arrange that the barrelled contacts engage resiliently both the upper and lower surfaces of the slot. The slots will be seen to be substantially wider than the thickness of the metal of the carrier, and in practice wide enough for the cards, with the slots, to be blanked in one operation. By such a construction, in addition to the greater ease of manufacture there are obtained the advantages that because the contact ends of the carrier fit the slot closely the only significant tolerance affecting the contact spacing is the accuracy of the slots, which is high, and consequently that there is not need to tension the moving contacts against the cards. In turn, this means that the carrier, not being required to exert pressure, can be made thinner or narrower leading to even lower force required to operate the card.

An advantage of the use of the barrelled or cylindrical ended carriers is that it is possible to make the contacts reversible so that they can be inserted in the insulating support either way up without affecting the contact spacing. This effect will be seen to be obtained if the contact making surfaces lie at equal distances from the plane of the carrier or, more strictly and more generally, at equal

3

distances from those parts of the surface of the carrier or contact which is adapted to engage the walls of the slot. Reversible contact carriers lead to easier assembly.

This advantage of easier assembly can also be obtained for the fixed carriers if the fixed contacts are barrelled in the same way. A similar result is obtained if the fixed carriers are made of wire, rod or the like; in this also bimetallic contact surfaces can be used.

A particular feature arising from this method of construction coupled with the tensionless nature of the moving contact carriers, is that all contact carriers, both fixed and moving may be disposed at equal distances apart in the main insulating support and that the use of adjacent contact carriers as make or break actions will be determined solely by the location of the slot in the card. Thus it becomes possible to produce a standard contact assembly which permits a wide variety of make or break actions to be obtained as desired, and at any time by mere selection of a suitable actuating card. To take best advantage of this feature the moving carriers would be mounted in the support so as to have equal freedom of movement in either up or down direction.

Other methods can be used to ensure the carriers will accurately locate in the slots, and one other such construction is shown in Figure 2. In this modification the extremity of the movable contact carrier is given a V-section shape to form the contact and to enable the carrier to adjust itself to the dimensions of the slot.

The short spring contact set disclosed in our prior application having a relatively rigid fixed contact carrier in combination with the present disclosure of a relatively rigidly spaced moving contact is particularly advantageous in that bounce free operation of the contacts is secured. Contact bounce is often a serious problem in relays, and particularly in constructions where both the fixed and moving contact carriers are tensioned against buffer blocks and cards respectively.

We claim:

1. An electromagnetic relay comprising a vertical support; a pair of fixed electrical contact carriers each secured at one end to said support and extending horizontally in vertically-spaced relation therefrom, each of said fixed electrical contact carriers consisting of an elongated horizontal sheet of flexible metal axially bifurcated

4

at its free end to form two longitudinally extending limbs, each of said limbs being bent about axes parallel to the longitudinal axis of the carrier to form cylindrical fixed electrical contacts; a movable contact carrier secured at one end to said vertical support intermediate said movable contact carriers, said movable contact carrier consisting of an elongated horizontal sheet of flexible metal having an enlarged portion at its free end to form a movable electrical contact, said enlarged portion having a lateral dimension at least as great as the maximum width of the bifurcated ends of said fixed contact carriers; and means for moving the free end of said movable contact carrier alternately toward or away from the free ends of said fixed contact carriers to cause the movable electrical contact to engage both fixed electrical contacts of one of said fixed contact carriers, said means for moving said movable contact carriers comprising a vertical actuating member vertically movable in accordance with the energization of the relay and extending intermediate the fixed electrical contacts of each of said fixed contact carriers, said vertical member having a horizontal slot therein adapted to receive said movable contact intermediate its lateral extensions.

2. An electromagnetic relay as defined in claim 1 wherein said enlarged portion at the free end of said movable contact carrier is bent to form a cylindrical sleeve about a horizontal axis transverse to the longitudinal axis of said movable contact carrier.

3. An electromagnetic relay as defined in claim 1 wherein said enlarged portion at the free end of said movable contact carrier is bent into a V-shaped configuration about a horizontal axis normal to the longitudinal axis of said movable contact carrier.

References Cited in the file of this patent

UNITED STATES PATENTS

2,347,834	Livingston	May 2, 1944
2,416,358	Stilwell	Feb. 25, 1947
2,472,709	Knapp	June 7, 1949
2,638,514	Martin	May 12, 1953
2,755,346	Fisher	July 17, 1956

FOREIGN PATENTS

116,680	Australia	Mar. 8, 1943
---------	-----------	--------------