

Aug. 5, 1958

N. F. PETTET

2,846,547

ELECTRIC CONTROL MAKING DEVICES

Filed Aug. 28, 1956

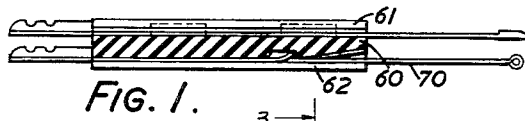


FIG. 1.

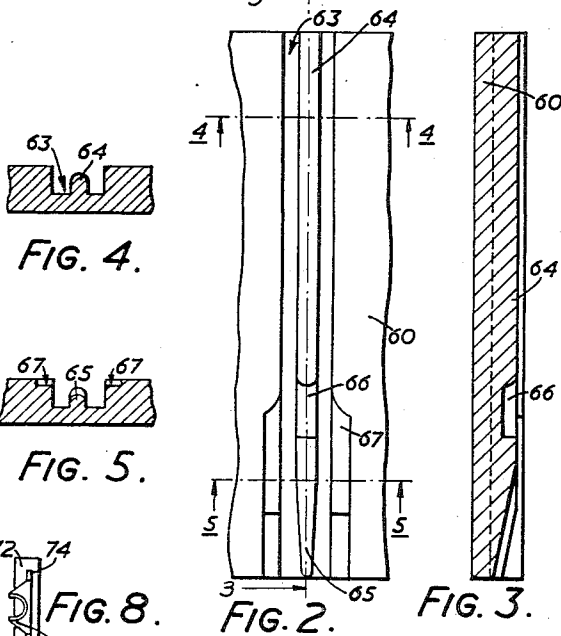


FIG. 2.

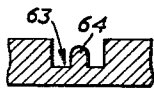


FIG. 4.

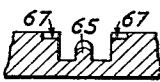


FIG. 5.



FIG. 8.

FIG. 3.

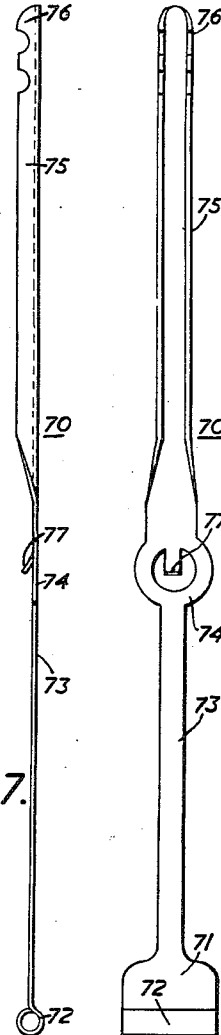


FIG. 7.

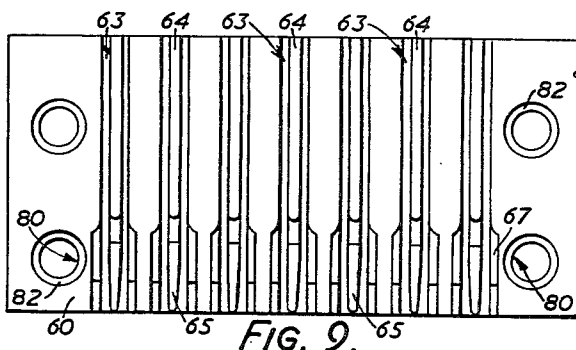


FIG. 9.

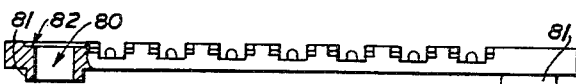


FIG. 10.

FIG. 6.

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ELECTRIC CONTROL MAKING DEVICES

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Application August 28, 1956, Serial No. 606,773

Claims priority, application Great Britain September 1, 1955

5 Claims. (Cl. 200—166)

This invention relates to electric contact making devices, and the invention is concerned with an improved construction of such devices. The invention is of particular application to electromagnetic relays, but can be used also in connection with other contact making devices.

In carrying the invention into effect there is provided a contact carrying member which is supported from an insulating support, and this member is arranged to be attached to the support by a simple insertion and whereby it can be retained against removal, without the need for further retaining means.

Other features and advantages of the present invention will appear from the following description of an embodiment thereof, given by way of example, in conjunction with the accompanying drawings, in which:

Figure 1 is a sectional view of a pair of contact carriers in a support;

Figure 2 is a fragmentary plan view of one of the parts of the support, on a larger scale;

Figure 3 is a cross section of the support of Figure 2, taken on the line 3—3 of Figure 2;

Figure 4 is a section on the line 4—4 of Figure 3;

Figure 5 is a section on the line 5—5 of Figure 3;

Figure 6 is a plan view, on an enlarged scale, of a moving contact carrier;

Figure 7 is a side view of the contact carrier of Figure 6;

Figure 8 is an end view of the carrier of Figure 6;

Figure 9 is a plan view of a support for a plurality of contact carriers; and

Figure 10 is a front view of the support of Figure 8, partly in section.

The embodiments of the invention shown in these drawings and to be described hereinafter are intended for use in an electromagnetic relay comprising at least one set of contacts arranged to be actuated upon energisation of the relay; the relay may have a plurality of such sets of contacts, operable by a common main armature, but each such set having an associated finger magnet so arranged that upon operation of the main armature only that contact set is operated of which the associated finger magnet has been previously energised. A relay of this kind is described and shown in British specification No. 728,891, and another form of the same general type of relay is shown in our co-pending applications Nos. 23,285/53 and 23,286/53. Referring, for example to the two applications, the relay described therein includes an insulating support formed from a stack of insulating members 36, in which the fixed and moving carriers 35, 37 respectively are mounted. The carriers 35, 37 are arranged in approximate vertical alignment and are alternately "moving," that is to say, moved by the armature of the relay, and "fixed," that is to say, are stationary or move only in response to the "moving" carriers.

The fixed carriers 35 are firmly held in the support by being clamped between adjacent members 36, and are not provided with means to locate the contacts which are provided on them adjacent their free ends; the fixed carriers are adjusted by bending to bring the contacts to the desired position. This adjustment is carried out be-

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fore the moving carriers are attached to the support; thereby it is possible to bend all the fixed contacts simultaneously, to bring them all to a standard position in relation to a datum on the support, by means of a suitable machine. It is most convenient if the fixed contacts are thereby equally spaced.

The moving contact carriers 37 are subsequently inserted in the opening in the support formed by insulating members 36. The moving carriers are moved by cards 40, one to each vertical set of fixed and moving contacts, moved in response to the operation of the main magnet 20, but only if first there has been energised a finger magnet 11 pertaining to that contact set. The finger magnet moves an interference piece 50 into a position where it acts to couple the movement of an actuator 30, moved by the armature of the main magnet, to the appropriate card.

In the embodiment according to the present invention the support is composed of a stack of insulating plates, formed by moulding a synthetic resin, alternating with plain sheets of an insulating material, the fixed carriers being clamped firmly between the surfaces of adjacent plates and sheets, whilst the moving contact carriers are accommodated in recesses defined between adjacent sheets and plates. The moving contacts cooperate with the recesses, whereby they are automatically retained in position after insulation.

In the accompanying drawings the moulded insulating plates are indicated at 60, and the adjacent plates at 61, 62. As shown in Figure 2, the upper surface of plate 60 has formed in it a recess 63; the recess has the shape of a groove, extending straight across the one surface of the plate, the groove for the most part being substantially rectangular in cross-section. From the floor of this groove at the rearward end, that is, the end remote from the free part of the carrier, there is an elongated projection 64 the height of which is slightly less than the depth of the groove, so that the top of the projection lies just below the surface of the plate. The projection lies parallel to the length of the groove, and the top is rounded; in this way the recess is of inverted U-shape in cross section over that part of its length where the projection exists, as shown in Figure 4.

The projection 64 extends to within a short distance of the front edge of the plate and near its end adjacent this front edge the projection has a part 65 which is of slightly less height and width. Also intermediate the ends of the projection and on its upper part, a recess 66 is provided which for convenience can be identified as a notch. Additionally the groove is enlarged in width at 67 from the notch to the front face. This enlargement of the groove is shallow only, as shown in Figure 5, and does not extend to the full depth of the groove.

The moving carrier 70, Figures 6 and 7, for insertion in the opening formed by the recess, is made from thin resilient strip or sheet material, such as phosphor bronze, or the like. The front end of the carrier can be bimetallic, to provide the contact surface 71. The contact surface is comparatively wide, and is preferably made circular at 72 as described in our co-pending application No. 31,655/54.

Behind this contact surface the carrier is reduced in width at 73, to give it the desired mechanical compliance, and then at a point where in use it lies within the opening in the support it is enlarged in width at 74 for a short distance; the rear part 75 of the carrier being of intermediate width, and of U-section to give the necessary rigidity to the tag portion 76 formed at its end. Within the enlargement is a hole, which is shaped so as to form a tongue 77 pointing in the direction of the contact or free ends of the carrier. The contact surface of the

carrier is transversely cylindrical, as described above; the compliant part is flat; the tongue in the enlargement is bent out of alignment with the main axis of the carrier.

The plate 60 and the moving carrier 70 are so proportioned that the rear end 75 of the carrier can be inserted in the front end of the opening defined by the recess in plate 60 and the adjacent sheet 61, and then pushed therein to a limiting position of which the rear or tag end of the carrier projects from the rear aperture to form a connection point. In this movement, the U-shaped cross section part 75 of the carrier fits in the inverted U-shaped part of the recess 63; the tongue 77 fits in the notch 66 and the enlargement 74 fits in the enlarged part 67 of the groove. The inward movement of the carrier is limited by the enlargement 74 on the carrier engaging the end of the enlarged part 67 of the groove, and once the carrier has been inserted it cannot be removed without appreciable force, owing to the tongue coming up against the end of the notch, which is accordingly made near vertical to prevent the tongue riding up over it. All that part of the carrier within the support is bounded by one side by a straight line as shown in Figure 7, so that it can rest against the flat surface of the adjacent sheet of the clamped stack.

The moving carrier described can be easily inserted in the support, and once in position will not fall out; assembly of the carriers in the support is accordingly much facilitated.

When the moving carriers have been inserted, the free ends are located in slots in the "card" 40 of insulating material as described above; these slots determine the separation of the moving contacts. The card is moved by the armature of the relay to actuate the contacts, and so bring them into engagement with the fixed contacts, as described.

The plate 60 is formed, as shown in Figures 9 and 10, with a plurality of recesses 63, one for each vertical set of contacts of the relay. In addition four holes 80 are formed in the plate, and round each hole on the underside of the plate as shown in Figure 10, is a flange or collar 81, whilst on the upper surface is a shallow recess 82. The sheets 61 are rectangular and of the same external dimensions as plate 60, and have four holes to locate them on collars 81. The fixed contact carriers 35 are formed integrally, as described in applications Nos. 23,285 and 23,286/53, and likewise have four holes to locate them on collars 81, between plate 60 and sheet 61. The whole assembly can then be clamped by bolts passing through holes 80.

I claim:

1. A contact assembly for an electromagnet relay comprising a support member constituted by at least two superposed insulating members defining between contiguous surfaces thereof an elongate opening for the reception and retention of part of a contact carrier, the first of said members having an open recess extending across the upper surface thereof, which recess is closed by the contiguous lower surface of the second of said members to define said opening, said recess being formed with a longitudinal ridge upstanding from the floor of said recess towards said closing surface but spaced from said closing surface by a predetermined spacing, and a contact carrier shaped over at least part of its length to sit astride said ridge when received in said opening.

2. A contact assembly as claimed in claim 1 in which said first member has a plurality of said open recesses extending across the upper surface thereof in parallel relation and the contiguous lower surface of said second member is a plane surface closing all said recesses to define a plurality of said openings.

3. A contact assembly for an electromagnetic relay comprising a support member constituted by at least two superposed insulating members defining between contiguous

surfaces thereof an elongate opening for the reception and retention of part of a contact carrier, the first of said members having an open recess extending across the upper surface thereof, which recess is closed by the contiguous lower surface of the second of said members to define said opening, said recess being formed with a longitudinal ridge upstanding from the floor of said recess towards said closing surface but spaced from said closing surface by a predetermined spacing, and a contact carrier shaped over at least part of its length to substantially U-shape in section the dimensions of said carrier over its U-shaped part being such that it is received by said opening with the limbs of the U astride said ridge and the base of the U substantially completely filling said predetermined spacing.

4. A contact assembly for an electromagnet relay comprising a support member constituted by at least two superposed insulating members defining between contiguous surfaces thereof an elongate opening for the reception and retention of part of a contact carrier, the first of said members having an open recess extending across the upper surface thereof, which recess is closed by the contiguous surface of the second of said members to define said opening, said recess being formed with a longitudinal ridge upstanding from the floor of said recess towards said closing surface but spaced from said closing surface by a predetermined spacing, and a contact carrier shaped over at least part of its length to sit astride said ridge when received in said opening, said ridge having an interruption intermediate its ends and said contact carrier having a resilient projection disposed so as to be flexed out of its normal position by engagement with the uninterrupted part of said ridge during insertion movement of said carrier into said opening and to engage in said interruption upon completion of said insertion movement whereby to restrain said carrier against withdrawal once it has been inserted.

5. A contact assembly for an electromagnetic relay comprising a support member constituted by at least two superposed insulating members defining between contiguous surfaces thereof a plurality of parallel elongate openings for the reception and retention of a like plurality of contact carriers, the first of said members having a plurality of parallel open recesses extending across the upper surface thereof, the contiguous surface of the second of said members being a plane surface which closes all said recesses to define said plurality of openings, each said recess being formed with a longitudinal ridge upstanding from the floor of said recess towards said closing surface but spaced therefrom to a predetermined extent whereby each said opening presents an approximate U shape in section, said ridge having an interruption therein intermediate its ends and the section of said opening being stepped in the vicinity of said interruption in at least one dimension, and a plurality of contact carriers each shaped to U shape in section over part of its length so as to sit astride said ridge when inserted in one of said openings and provided with an enlargement in a dimension corresponding to the dimension in which said opening is stepped and disposed to engage the shoulder formed by said step so as to limit insertion of said carrier into said opening; each of said carriers being also provided with a resilient projection formed out of the material of said enlargement and disposed so as to be flexed away from its normal position by engagement with the uninterrupted part of said ridge during the insertion movement of said carrier into said opening and to engage in said interruption when said enlargement engages said shoulder whereby to retain said contact against withdrawal once it has been inserted.

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