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M. FRITTS
CONTACT SPRING

2,587,458

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FIG. 1

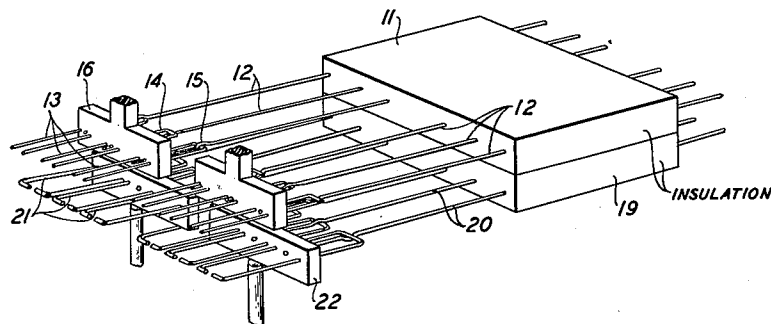


FIG. 2

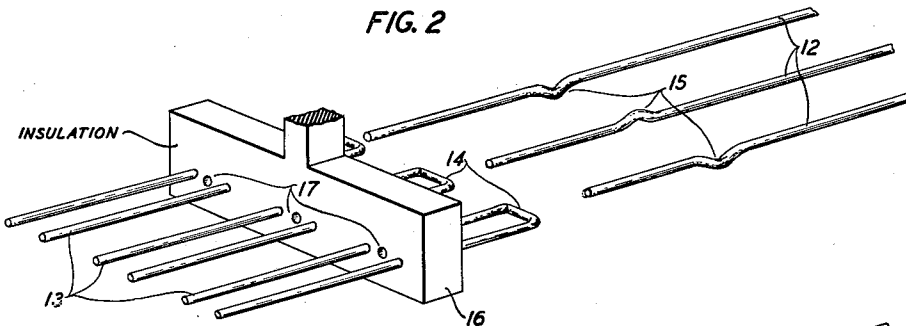


FIG. 3

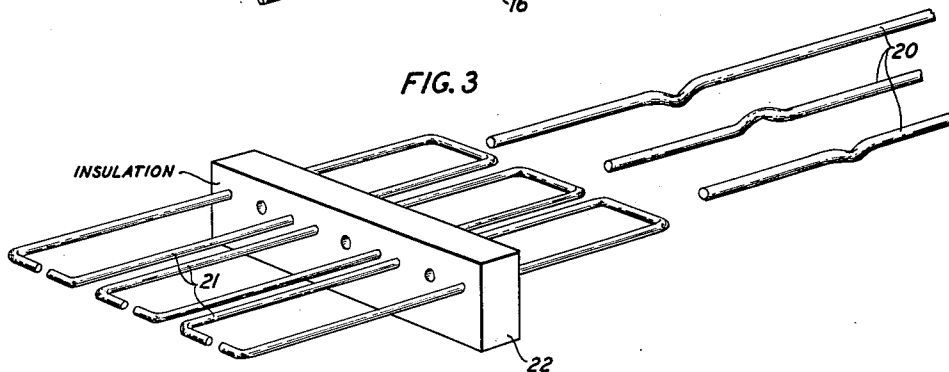
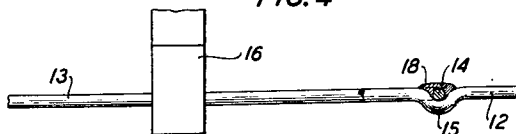


FIG. 4



INVENTOR
M. FRITTS
BY
J. H. Schmitt
ATTORNEY

UNITED STATES PATENT OFFICE

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CONTACT SPRING

Morris Fritts, Chatham, N. J., assignor to Bell Telephone Laboratories, Incorporated, New York, N. Y., a corporation of New York

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This invention relates to electric circuit controlling apparatus and more particularly to the contact-making elements thereof.

In the controlling of electrical circuits, means in the form of switches, relays, keys, etc., are frequently employed to complete or interrupt the circuit paths. The contact elements thereof must complete the circuits with minimal impedance at the point of contact. Inefficiencies frequently arise in applications of these devices from three major causes: improper engagement of the mating contacts due to malalignment thereof, foreign matter such as dust between the mating contacts, and vibration leading to the well-known "contact chatter." These deficiencies have been appreciably reduced through the use of a pair of contacts engaging a single mating contact as is shown, for example, in the application of H. C. Harrison, Serial No. 993, filed January 7, 1948. The present invention improves upon this previous advance in the art by providing a structure in which the twin contacts are essentially self-aligning and self-pressure adjusting while retaining the advantages obtained from the use of twin contacts. The present invention further effectively eliminates the problem of obtaining and maintaining parallelism between the adjacent long spring members and permits an appreciable saving of material. The invention permits a ready interchangeability of parts whereby without removing the apparatus from its mounting and without disabling the apparatus but for a short time, the contacts and the controlling members therefor may be replaced with elements of different contact materials or controlling members of different configuration to change the combination of make and break contacts.

An object of this invention is to provide twin electrical contacts with a single flexible wire supporting member therefor.

Another object of this invention is to provide readily removable and replaceable contact members and controlling members therefor.

In general, the preferred embodiment of the invention comprises a plurality of single-wire supporting springs molded or otherwise affixed in a base member in a cantilever fashion. Twin contacting members are provided for each of these springs. Each of these members preferably comprises a wire member looped back on itself to form the two contacting elements. This wire member is then molded in or otherwise affixed to a controlling member of insulating material, frequently referred to as a "card,"

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This insulating controlling member is the means by which the contacts associated therewith are maintained in a stationary position or are actuated. The assembly comprising the contact members and the insulating controlling member therefor is then associated with the single wire supported spring. In the preferred embodiment, this is accomplished by inserting the supporting springs in apertures in the controlling members with the bights of the contact members engaging the supporting spring. Each supporting spring may be provided with a detented portion at the point of contact with the bight of the contact member to provide linearity and automatic positioning means.

The invention may be more fully understood from the following detailed description of a preferred embodiment thereof when read in conjunction with the accompanying drawings in which:

Fig. 1 discloses an exemplary contact assembly embodying the principles of the invention;

Figs. 2 and 3 show the upper and lower portions, respectively, of the assembly of Fig. 1 as they appear prior to assembly; and

Fig. 4 discloses a partially cut away view of the elements of Fig. 2 as they appear when assembled and demonstrates the use of solder to more permanently associate the parts if desired.

Referring now to Fig. 1, the exemplary contact assembly comprises an upper portion and a lower portion. The upper portion comprises a base member 11 of insulating material of any suitable shape and size into which is clamped, molded or otherwise affixed a plurality of wire supporting springs 12. These supporting springs 12 are flexible, wire, current-carrying members and may be extended to the rear of the base member 11 to provide wiring terminals. Mounted at the anterior end of each supporting spring 12 is a U-shaped contact member 13 which is also of relatively flexible wire. The bight 14 of each U-shaped contact member 13 engages the associated supporting spring 12 and is in firm electrical and mechanical contact therewith. As will be seen hereinafter, at the point of engagement between the bight 14 of each contact member 13 and its associated supporting spring 12, the latter may be provided with a detented portion 15. Associated with a group of contact members 13 is a controlling member 16 of insulating material. This member may be provided with suitably spaced apertures into which the contact members 13 are inserted, may comprise two mating sections which are clamped over the

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contact member 13, or may be molded directly on a group of contact members 13. The insulating controlling member 16 may be of any appropriate shape in accordance with the conformation of the other elements of the apparatus of which the contact assembly is to be a part. Apertures are provided in the controlling member 16 in plane with the contact members 13 and at points intermediate each pair of points at which the two arms on each contact member 13 extend through the controlling member. These apertures accept the supporting springs 12 and are preferably of substantially the same diameter as those springs to provide a tight engagement therewith.

Referring now to Fig. 2, it will be seen that the assembly comprising the contact members 13 and the controlling member 16 is readily removable from the supporting spring 12. Thus, in any apparatus, the assembly comprising the controlling member 16 and the contact members 13 may be replaced, either for the purpose of providing a controlling member of different peripheral configuration or to provide contact members of different material. As is apparent in Fig. 2, the contact members 13 preferably lie in a single plane, and in that plane apertures 17 are provided in controlling member 16 intermediate the two arms of each of the contact members as above mentioned. In assembling the elements of Fig. 2, the anterior ends of the supporting springs 12 are inserted in aperture 17. If, as is preferable, the supporting springs 12 are provided with detented portions 15, it is desirable that adjacent supporting springs be detented in opposite vertical direction. Thus, in Fig. 2, the rearmost and forwardmost supporting springs 12 are detented as at 15 so that the bights 14 of the associated contact members 13 rest on top of the supporting springs when they are cradled in the detented portions of those springs, while the middle supporting spring 12 is detented so that that spring rests on top of the bight 14 of the associated contact member 13 when the apparatus is fully assembled. The depth of the detent 15 is preferably equal to or slightly less than the diameter of the wire of the contact members 13 as shown in Fig. 4, in which a portion of the contact member 13 has been cut away for purposes of clarity. Therefore, when the elements of Fig. 2 are assembled, the contact members 13 exert forces on adjacent support members 12 in opposite directions thereby providing an integral assembly which will resist accidental relative movement. A low impedance electrical connection between the supporting spring 12 and the contact members 13 is thereby insured.

As shown in Fig. 4, if desired, the bights 14 of the contact members 13 may be affixed within the detents 15 of the supporting springs 12 by means of solder 18 to provide additional assurance of the electrical and mechanical integrity of the elements.

Referring now to Figs. 1 and 3, the lower portion of the assembly is substantially identical to the upper portion as above described, and comprises a base member 19, a plurality of supporting springs 20, a double contacting member 21 for each supporting spring, and an insulating controlling member 22 associated with groups of said springs. The interassociation of the contact members, controlling members and supporting springs is preferably identical with that of the upper portion. The lower portion differs

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from the upper portion in that the configuration of the controlling members 22 will normally be different than that of the controlling members 16 and in that the contact members 21 are properly conformed to mate with the contact members 13. This may be accomplished by forming each of the lower contact members 21 so that the two arms thereof are separated more widely than are the corresponding arms of the upper contact members 13, i. e., so that when the elements are completely assembled, the arms of the upper contact members 13 do not lie in the same vertical planes with the arms of the lower contact members 21. To provide engagement between the contact members, the outermost ends of the lower contact members 21 may be bent towards each other at right angles to the arms of those members thereby providing a contact surface which will mate with the arms of the associated upper contact members 13 either when the upper controlling member 16 is forced downwardly or when the lower controlling member 22 is forced upwardly. It will be obvious to one skilled in the art that the arms of each of the lower contact members 21 may be spaced more closely than the arms of each of the upper contact members 13 with the outermost ends of the arms of the lower contacting member 21 being bent outwardly to provide a contact surface. It will also be apparent that the contact members 13 and 21 may be provided with additional mating precious-metal contacts if desired.

The controlling members 16 or 22 may be associated with only one of the spring members 12 or 20 if desired, although an association with more than one spring member has been found to be advantageous in view of the above-discussed considerations. It has also been found expeditious to make the supporting springs 12 or 20 of slightly differing lengths to aid in the aligning of these members with the appropriate apertures in the associated control member.

It will be noted that by critical location of the detents in the supporting springs and by manufacturing control of the positioning of the contact members in the controlling members, the elements are essentially self-aligning and self-pressure adjusting in assembly, a feature which permits ready interchangeability without the necessity of critical testing of the assembled result.

It is to be understood that the above-described arrangements are illustrative of the application of the principles of the invention. Numerous other arrangements may be devised by those skilled in the art without departing from the spirit and scope of the invention.

What is claimed is:

1. In a contact spring assembly, a controlling member of insulating material, a U-shaped contact member physically connected thereto, and a supporting spring physically engaging said controlling member and continuously engaging said contact member.

2. In a contact spring assembly, a controlling member of insulating material, a U-shaped contact member supported therein, and a round wire supporting spring inserted in an aperture in said controlling member and engaging the bight of said U-shaped contact member.

3. In a contact spring assembly, a single wire spring and means for providing two separate contact elements therefor, said means comprising a U-shaped wire contact member having two arm portions parallel to the axis of said single wire spring and a bight portion engaging said

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single wire spring, and a controlling member of insulating material having apertures therein through which the arms of said contact member and said single wire spring extend.

4. In a contact spring assembly, a base member of insulating material, a plurality of round wire springs supported therein and extending therefrom, a controlling member of insulating material removably mounted on said wire springs, and a plurality of contact members, each of said contact members comprising a U-shaped wire supported in said controlling member and having a bight portion firmly engaging an associated one of said wire springs.

5. In a contact spring assembly, a controlling member of insulating material having three apertures therein, a U-shaped wire contact member having a bight portion and two arm portions, the arm portions of said contact member engaging two of the apertures in said controlling member, and a wire supporting member removably engaging the other aperture in said controlling member and having a detented portion engaging the bight of said contact member.

6. In a contact spring assembly, a first and a second controlling member of insulating material each having a plurality of apertures therein, a plurality of U-shaped wire contact members each having a bight portion and two arm portions, the arm portions of each of certain ones of said contact members engaging apertures in said first controlling member, the arm portions of each of certain others of said contact members engaging apertures in said second controlling member, and a plurality of wire supporting springs, certain of said springs engaging apertures in said first controlling mem-

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ber and the bight portions of said certain ones of said contact members, certain others of said springs engaging apertures in said second controlling member and the bight portions of said certain others of said contact members.

7. In a contact spring assembly, a first and a second controlling member of insulating material each having a plurality of apertures therein, a plurality of U-shaped wire contact members each having a bight portion and two arm portions, the arm portions of each of certain ones of said contact members engaging apertures in said first controlling member, the arm portions of each of certain others of said contact members engaging apertures in said second controlling member, and a plurality of wire supporting springs, certain of said springs engaging apertures in said first controlling member and lying in plane with certain ones of said contact members and having detented portions engaging the bight portions of said certain ones of said contact members, certain others of said springs engaging apertures in said second controlling member and lying in plane with said certain others of said contact members and having detented portions engaging the bight portions of said certain others of said contact members.

MORRIS FRITTS.

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