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F. E. RADCLIFFE
MOMENTARY CONTACT SWITCH

2,883,565

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FIG. 1

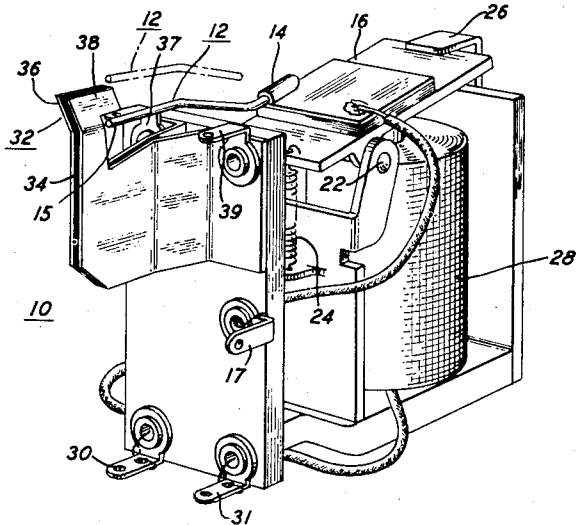


FIG. 2a

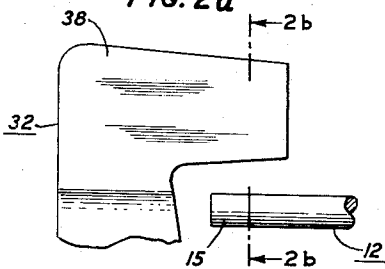


FIG. 2b

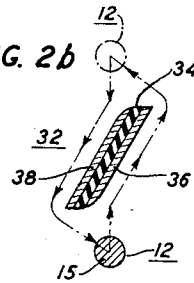


FIG. 3

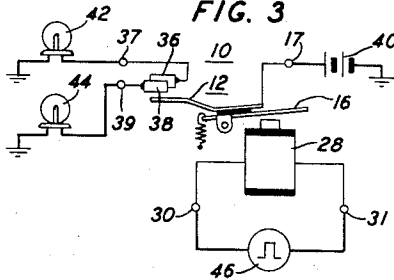
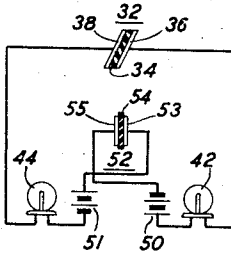


FIG. 4



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MOMENTARY CONTACT SWITCH

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9 Claims. (Cl. 307—132)

This invention relates to electric switching structures and more particularly in an important aspect to an electric switch for momentarily and automatically effecting successive closures in plural electric circuits.

Heretofore it has been known to employ the elastic properties of switching contact members to implement switching closures and openings of electric circuits. Such switching structures of the prior art have, however, lain open to the objections of complexity and consequent costliness in their adaptations to perform multiple switching operations with a single mechanism. These structures of the prior art have, for example, employed auxiliary cams to direct movements of conductive contact members. The structural complexity introduced to switching apparatus by such auxiliary cams not only necessitates an increased equipment cost but, as well, leads to some measure of operational unreliability.

Accordingly, it is an object of the present invention to accomplish plural momentary switching operations reliably and, at the same time, to simplify the structures with which these operations are accomplished.

Following the principles of the invention this dual object is achieved with a structure having two contact members at least one of which has two major conductive contact surfaces. These two major surfaces are substantially parallel and are mutually insulated. One of these contact members is constructed of elastic spring material. One of these members, also, is mounted for relative motion with respect to the other member in a path lying substantially in a fixed plane. One member, also, is disposed to intersect that path of motion in inclined relation. Thus, as the one contact member travels into contact with the other member to effect a first circuit closure through one of the parallel conductive surfaces, that one of the contact members which is elastic is displaced from its normal position until contact is broken. At this instant the elastic member restores itself to its normal disposition with respect to the above-mentioned fixed plane of motion. This restoration places an alternate one of the parallel conductive surfaces in nearest proximity to the other contact member.

Upon return of the movable contact member in a direction reciprocal to that which led to the first circuit closure, contact is thus made with that alternate one of the substantially parallel conductive surfaces and a second circuit closure is effected. This closure is terminated abruptly as the moving contact member moves beyond the other member and that one of these members which is elastic again restores itself to its normal planar disposition. Thus, following the principles of the invention, the contact members themselves act not only to effect electric circuit closures but are endowed with an intelligence to act as movement directing cams and to close plural circuits consecutively.

The invention will be more fully apprehended and other objects, features, and advantages thereof will become apparent from a consideration of the following brief

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description of an illustrative embodiment of the invention taken together with the accompanying drawings.

In the drawings:

Fig. 1 is an isometric drawing of a signal operated switch illustrating principles of the invention;

Figs. 2(a) and 2(b) are respectively elevation and sectioned end views of a structural detail of the illustrative embodiment of the invention shown in Fig. 1;

Fig. 3 discloses a circuit embodying the structure of Fig. 1;

Fig. 4 is a partial schematic drawing showing an end view of a structural detail of an element which may be employed alternatively to that of Fig. 2 in the practice of the invention.

Referring now more particularly to the drawings, in Fig. 1 there is shown a multiple circuit, momentary contact switch 10 in accordance with the invention. One contact member of this switch is a conductive spring wire 12 having a mounting end portion 14 fixedly mounted on an armature 16 associated with a substantially conventional signal operated relay. This fixed end of the spring wire is connected to an input terminal 17. The armature, as shown, is mounted for rotation about a horizontal pivot 22. A tensioned restoring spring 24 holds the armature of the unenergized relay in an extreme rotated position as limited by a stop 26. As shown, this extreme armature rotation places the free end portion 15 of the spring wire conductor in an extreme lower position.

The relay winding 28 is disposed in magnetizing relation with the armature such that, when it is energized by an electric signal applied to terminals 30, 31, it rotates the armature to an opposite extreme position. The armature, in being rotated, constrains the spring wire conductor 12 to move along a vertical planar path to an upper extreme position as indicated in Fig. 1 by the dashed phantom image of that conductor.

Affixed to the frame of the relay is a second, output, contact member 32. This member includes two substantially parallel, conductive major surfaces 36, 38. These major surfaces are rendered electrically independent by an insulating sheet 34 interposed therebetween. Associated with these surfaces 36, 38 are output terminals 37, 39 respectively. The second contact member 32 is mounted in inclined relation with the vertical planar path along which the free end portion 15 of the spring wire conductor is constrained to move by rotation of the armature. The second contact member is located substantially at the midpoint of this path and is dimensioned such that its projection on this path falls short of the two extreme positions of the free end of the spring wire 12.

The operational relationship between this spring wire and the second contact member 32 is made more clear by inspection of Figs. 2(a) and 2(b). In the former figure there is shown an elevation view of the second contact member 32 with one surface 38 of its two substantially parallel, conductive contact surfaces disposed above the free end portion 15 of the wire conductor 12, shown in its lower extreme position.

In Fig. 2(b) there is shown an end view of a section of the structural detail shown in Fig. 2(a). Here the spring wire conductor 12 is shown in solid section in its lower extreme position. In this section view, a dashed path illustrates the motion of the free end portion 15, or contact portion, of this conductor 12 as it is urged by the relay first upwardly against the contact surface 36 to make a momentary contact. In dashed section this conductor is shown in its upper extreme position having returned from its contact with the conductive surface 36 to its normal plane of motion. From this upper extreme position a dashed path illustrates the motion of the spring conductor as, upon deenergization of the relay winding, it moves downwardly under the urging of the restoring

spring 24 to make momentary contact with surface 38.

In Fig. 3 there is shown an illustrative circuit for the employment of a switch 10 in accordance with the invention as illustrated in Fig. 1. A source of potential, the battery 40, energizes the spring wire conductor 12 through the terminal 17. Output terminals 37 and 39 are respectively connected to the two substantially parallel contact surfaces 36, 38. These output terminals are further respectively connected through load impedances 42, 44 in serial connection with the potential source through a common ground connection. These load impedances 42 and 44 in this illustrative embodiment are simple light bulbs, though they may be any well-known electric device. Similarly the illustrative battery 40 may be any well-known potential source including voice signal generators and the like.

A source of signals 46 is connected to energize the relay winding 28 to actuate the relay armature 16 against the restoring force of the tensioned spring. Thus, as an energizing signal is supplied from the source 46, the spring wire conductor is driven upwardly to make momentary contact with the conductive surface 36 and, from that surface, to supply electrical energy from the potential source 40 through the output terminal 37 to the load impedance 42. Upon termination of this energizing signal, the spring conductor 12 moves downwardly to make momentary contact with the opposite parallel conductive surface 38 and to supply energy through that conductive surface and through the output terminal 39 to the alternate load impedance 44.

The above-described embodiment of the invention is an illustrative one only.

Within the principles of the invention numerous variations will readily occur. Fig. 4, for example, illustrates a modification to the switch 10 for employment in the similarly modified circuitry of Fig. 3. Fig. 4 shows two contact members 32 and 52 in end view comparable to that of Fig. 2(b). The flexible two-conductor contact member 52, however, replaces the single conductor flexible contact member 12. The former two-conductor member, as shown, comprises two substantially parallel, mutually insulated conductive surface plates 53, 55 separated by an insulating member 54. As indicated, these surfaces are parallel to the plane of motion of the member 52. Consonant with this variation in the conductor 12, the circuitry of Fig. 4 is modified from that of Fig. 3 in the replacement of the potential source 40 with two potential sources 50, 51 which are respectively connected in serial relation with the load impedances 42, 44, and the contact member conductive surfaces 36, 38 and 55, 53.

Thus, modified within the principles of the invention, the switch and circuitry of Figs. 1 and 3 operate to yield successive momentary closures of two independent electrical circuits under a single actuation by a signal from the source 46.

What is claimed is:

1. A momentary contact switch comprising a first contact member including at least one conductive surface, a mounting portion and a contact portion, mounting means connected to said mounting portion for constraining said contact portion to move substantially in a fixed planar path, and a second contact member comprising at least one conductive surface disposed in a plane inclined to and intersecting said path, one of said contact members comprising a pair of substantially parallel and electrically independent conductive surfaces, at least one of said contact members being constructed of flexible material.

2. A momentary contact switch comprising a first contact member and a second contact member, a first one of said members comprising a pair of substantially parallel, mutually insulated conductive surfaces, the second one of said members comprising a mounting portion and a free portion, and one of said members

being constructed of elastic, flexible material, mounting means connected with said mounting portion for constraining said free portion of said second one of said members to move between extreme limit positions in a substantially planar path with respect to said first member, the conductive surfaces of said first member being disposed in inclined intersecting relation with said path and having a geometric projection thereon lying between said extreme limit positions, and means for urging said free portion of the second one of said members alternately in reciprocal directions along said path.

3. Apparatus as set forth in claim 2 wherein said urging means comprises signal responsive means for urging said free contact member portion and, in combination therewith, signal generating means connected in circuit for energizing said signal responsive means.

4. Apparatus as set forth in claim 2 wherein said urging means comprises restoring means responsive to displacements of said free contact member portion along said path for urging said free portion in a direction reciprocal to said displacement.

5. Apparatus as set forth in claim 2 wherein said second contact member comprises first and second substantially parallel, mutually insulated conductive surfaces disposed in substantially parallel relation to the plane of said path, and in combination therewith first and second potential sources having one terminal connected to said last named parallel surfaces respectively, first and second electric load impedance circuits respectively connected in series between said first named parallel surfaces and said last named parallel surfaces through said potential sources.

6. Apparatus for energizing plural electric circuits momentarily and successively which comprises, a first and a second electric load circuit to be energized, a first contact member having a pair of substantially parallel, electrically insulated conductive surfaces, said surfaces being connected in circuit with said load circuits respectively, a second contact member having a contact portion, at least one of said contact members being constructed of elastic, flexible material, mounting means for constraining said second member contact portion to move in a substantially fixed planar path with respect to said first contact member, the parallel conductive surfaces being mounted in inclined, intersecting relation with said path of relative motion, signal responsive means for urging said second member contact portion in a given direction along said path of relative motion, and restoring means for reciprocally urging said second member contact portion along said path in response to displacements of said second member along that path, and signal generating means for energizing said signal responsive means.

7. A momentary contact switch comprising an input contact member and an output contact member, each of said members comprising a pair of substantially parallel, mutually insulated conductive surfaces, one of said members comprising a mounting portion and a free portion and one of said members being constructed of flexible, elastic material, mounting means connected with said mounting portion for constraining said free portion of one member to move between extreme limit positions in a substantially planar path with respect to said other member, that other of said members being disposed in inclined relation to the plane of said motion and in intersecting relation with said path between said limit positions, that intersecting other one of said members having a geometric projection on said path lying between said limit positions, and means for urging said free portion of one member to travel alternately reciprocal directions along said path.

8. A momentary contact switch for successively energizing plural electric load circuits comprising a source of energizing potential, a first and a second load circuit

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to be energized, each of said circuits having a common connection with one terminal of said source, a first contact member comprising two substantially parallel and mutually insulated conductive surfaces, said surfaces being respectively connected to said load circuits, a longitudinally extending spring wire conductor having a free contact portion and a mounting portion, said conductor being serially connected to said common load circuit through said potential source, mounting means for constraining said free spring wire portion to move with respect to said first contact member in a substantially planar path inclined to and intersecting said parallel surfaces, said path extending in reciprocal directions beyond the projection of said surfaces thereon, and means for urging said free spring wire portion alternately in reciprocal directions along said path.

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9. A momentary contact switch comprising a flexible contact member having a mounting end and a contact end, means attached to said mounting end for constraining the contact end to move in a given plane, conductive contact means having a pair of mutually insulated and substantially parallel plane contact surfaces so disposed at an angle to said given plane as to intercept said contact end as it moves, and means for imparting reciprocal motion to said contact member in a path extending beyond the projections of said conductive contact means on said given plane, whereby alternate, momentary contact is made between said contact end and the two contact surfaces of said conductive contact means.

No references cited.