MULTIPLE CONTACT SYSTEM FOR CAM OPERATED SWITCHES

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ABSTRACT

A multiple contact switching apparatus having a plurality of individual switching compartments independent of one another and a printed wiring board which is an integrated component of the apparatus and common to all switching compartments.

10 Claims, 25 Drawing Figures
Fig. 21
1 MULTIPLE CONTACT SYSTEM FOR CAM OPERATED SWITCHES

The invention relates to a multiple contact system for cam operated switches, especially for use in automatic cyclic operations, consisting of a multiplicity of individual systems independent of one another and a printed wiring board which is an integrated component of the contact housing common to all individual systems and whose wiring paths lead to the individual systems.

Multiple contact systems for cam operated switches have already been known. Thus, for example, in the German printed application 1 166 892 an apparatus for the switching of circuits is described where the circuits are switched by contact elements arranged on a fixed board, which scan the concentric grooves of a revolving board provided with trip cams. In the published application it was indicated that it would also be possible to execute the fixed board with the contactelementas a "printed circuit." The object of this printed application however is disadvantageous in that, for example, the actual switch and the plugs used to feed the current have not been provided with correspondingly insulated housings, so that the wiring system is made inaccessible and the circuit connections are conducted out on all four sides of the cam operated switch, as a result of which a number of different plugs is required.

In US. Pat. No. 3 375 337 a push-button switch has been described whose housing is closed by a printed wiring board and whose solid contacts are formed by wiring paths. The wiring system of this switch will be assured by the printed wiring board being attached on a cup of the housing. With the object of this American patent however it is not possible to establish a number of individual contact systems which can be operated by a single cam disk.

It is the object of the invention to create a multiple contact system for cam operated switches where there is the possibility of a simultaneous equipping of the complete system with parts without additional inner wiring. The individual contact systems are to be made in such a way that they will operate with the least possible chatter. Changes in the components in accordance with the desires of the clients should be possible to execute without the entire switching apparatus having to be opened. It should be possible to bring out as much as possible all contacts on one or more sides for quick contact of the entire switching apparatus. In order to assure as high as possible a degree of operating reliability of the device, there should be a way that any possibly sticking network contacts are opened positively. Moreover, the object of the application is to meet the requirement for an especially flat manner of construction. The individual switching systems are to be capable of switching system capacity.

As compared to known switching devices, pertaining to the status of the prior art, the object of the application has several advantages. With the object of the application it will be possible to equip the entire multiple contact system in a single operation with component parts. Since the assembly is accomplished merely by a simple insertion of all necessary parts, only this single operation will be necessary for this. Since the contact bridges are operated with springs, they are largely free of chatter even on the permanent support. Later changes of the components based on unforeseeable requests of the clients can be achieved very easily without opening the actual device for the automatic cyclic operation by simply opening the contact system. Since all power supply leads can be brought out collected as conductor paths on one or more sides of the contact system, the establishment of contact, for example, with the aid of spring strips, is possible with the least possible expenditure of time. Moreover, in the case of this arrangement a very flat design of the contact system will be obtained. In the case of use of lined printed wiring boards, the number of possibilities for wiring is practically unlimited. In the case of certain designs of the object of the application, thermal stress occurs only in those parts of the housing which cannot be touched from the outside; because of the low thermal requirements made of the plastic, one can use material with a relatively favorable price. A further savings in costs results from the production of all printed fixed contacts in a single operation. Galvanic through-contacts which are necessary otherwise can be omitted as a result of the arming of the fixed contacts of the printed wiring board with the assistance of inserted rivets.

As soon as the spring strip has been attached to the proper connections of the printed wiring board, the device for the automatic cyclic operation will be shockproof at this place.

The invention will be explained with the help of drawings and on the basis of a series of embodiments by way of example. In the drawings:

FIG. 1 shows a multiple contact system with a change over switch shown partly in section,
FIGS. 2 - 5 show an individual contact system in various switching stages in section,
FIG. 6 shows an individual contact system with a plug connection slipped onto the printed wiring board, in section,
FIGS. 7 and 8 show an individual contact system with a U-shaped operating lever, in section,
FIG. 9 shows a multiple contact system with a change over switch in perspective whereall parts are cut away,
FIGS. 10 - 13 show an individual system of the multiple system of FIG. 9, in section, in various switching states,
FIG. 14 shows in perspective presentation a multiple contact system each time with two contact bridges per individual system, partly in section,
FIGS. 15 - 18 show a single system of the presentation of FIG. 14 in different switching stages, in section,
FIGS. 19 and 20 show a single system of the multiple system of FIG. 14, however with a U-shaped operating lever in section,
FIG. 21 shows in perspective presentation a multiple contact system, partly in section,
FIGS. 22 - 24 show a single system of the multiple system of FIG. 21 in different switching states, in section,
FIG. 25 shows a single system of the multiple system of FIG. 21, however with a stamped metal part as contact bridge, in section.

A multiplicity of individual contact systems has been housed in a housing part 13 (FIG. 1). The individual contact systems may be separated from each other by intermediate walls in this housing part 13. The housing part 13 is closed by a printed wiring board 4 which may carry wiring paths on one or both sides. Fixed contacts 5 may be formed by the ends of the wiring paths. The printed wiring board 4 may be provided with one or more parts developed as plug connections 16. A free end 10 of an operating lever may project through a perforation in the housing part 13 and there may scan a cam disk or cam roller. Structure and method of operation of the individual contact systems will be explained in more detail on the basis of FIGS. 2 to 5.

The housing part 13 (FIG. 2) encompasses all moving parts of the contact system. The side of printed wiring board 4 turned toward the inside of the housing has been provided with wiring paths, the ends of which constitute the firm contact elements 5 inside the housing. A contact bridge 1 has been developed as a two-armed lever. For this purpose an arc shaped support 19 is disposed in the embodiment presented by way of example. Naturally a disk shaped support could also be used.

An operating lever 3 which is mounted with its support 21 in a half opened bearing 20 carries a spring 6 which exerts pressure on one arm of contact bridge 1. A free end 9 of the operating lever 3 reaches through a perforation 8 in housing part 13 and scans cam 7 of a cam carrier. The arm of contact bridge 1 not under pressure from the spring rests on a switching finger 22 of the operating lever 3.

The printed wiring board 4 has been prolonged beyond the housing part 13 and developed as a plug connection element or a plug strip 15. In this case the wiring paths brought out from the housing constitute the electrically conductive component of the plug strip.
In FIG. 2 the switching system has been shown in such a way that the operating lever 3 just happens to scan an interval between cams 7. In this position the part of the contact bridge fitting against the switching finger 22 of the operating lever 3 runs by one contact over a rivet attached to it on the one hand and the support 19 on the other hand. In FIG. 3 a middle position of the contact bridge is shown. The free end 10 of operating lever 3 is on a cam 7 of medium height. Since the contact bridge 1 is constantly under pressure exerted by spring 6, the position of contact bridge merely depends on the positioning of the switching finger 22 of operating lever 3.

In FIG. 4 the contact bridge 1 closes the opposite contact between a rivet attached to its spring loaded part on the one hand and the support 19 on the other hand.

If now in the case of a change over from the switching position in FIG. 2 the contact shown there is welded firmly, then the switching finger 22 of operating lever 3 (FIG. 5) is separated form contact bridge 1, spring 6 is more strongly compressed and projection 18 attached to the operating lever 3 will release the contact bridge via the counterlever in a positive manner. In the case of this process therefore, there is a positive force between the pertinent cam 7 and the contact bridge 1 via the operating lever 3.

Insofar as considerable performances must be switched, the firm contacts formed by the ends of the wiring paths will be reinforced by means of rivets 11 (FIG. 6). The rivets inserted in this manner can serve simultaneously as through connectors between the wiring paths on both sides of the printed wiring board.

Naturally the rivets can also be used in the case of unilaterally lined printed wiring boards. In this case it is also possible to place the wiring paths on the outside of the housing and to permit only the rivet to project into the inside of the housing.

In order to avoid a lateral escape of both the operating lever 3 and the contact bridge 1, rivets 8 can be attached at the intermediate walls which separate the individual switching systems one from the other (FIG. 1). Corresponding recesses in contact bridges and operating levers must then be provided.

Instead of the contact bridges described hitherto, which had been stamped and subsequently shaped, one can effectively also use those bridges which have been developed merely as flat stamped elements (FIG. 7). These flat contact bridges 1 are operated by an operating lever 3 with a U-shaped cross section. The contact bridges have projections 26 which engage through corresponding slots in the operating lever 3. In the case of an operation of a single contact system, which, besides, will be described like the ones described in FIGS. 2 to 6, the contact bridge 1 will be shifted somewhat in longitudinal direction with respect to the operating lever; as a result of that, a steady cleaning of the contact will be assured. Contact bridge 1 has been secured against tipping from the upright position through lateral walls of the operating lever 3 which are pulled up (FIG. 8).

In the case of the design of the contact systems according to FIGS. 7 and 8, additional advantages will result as compared to the known switches. The flat stamped elements after stamping have very precise dimensions and are more stable in operation. It will be possible to rivet any possibly necessary contact rivets simultaneously with the stamping. Additional guides in the contact housing are superfluous in the case of use of the operating lever described. This lever, because of its U-shape, has greater stability.

It will also be possible to coat the solid contacts 5 with a protective covering, for example, of silver instead of the contact rivets 11 (FIG. 6). Possibly the opening contacts may be reinforced with rivets and the fixed contact may be coated with silver at the permanent support 19. A third possibility results from the fact that the fixed contact in the case of the opening contacts are coated with silver and the fixed contacts at the permanent support can be provided merely with polished wiring paths.

FIG. 9—similarly as in FIG. 1—shows another embodiment by way of example of a multiple contact system in perspective presentation and partially in section. A single system is shown also of this contact system on the basis of FIGS. 10 to 12 in various switching states.

This switch housing again is formed by a housing part 13 on the one hand and a printed wiring board 4 as a closing lid on the other hand (FIG. 10). Inside the contact housing an operating lever 3 has been disposed with a support 19 in a half opened bearing 20. At the opposite end of operating lever 3 there is a switching finger 22. Between the switching finger and the free end 10 of this lever there is a projection 18.

A contact bridge 1 made of spring material rests on the one hand on the switching finger 22 and the projection 18 on the other hand on a fixed contact 5 of the printed wiring board 4. The contact bridge 1 encloses an angle of less than 180°, so that this results in a balance shaped form. In the bend of contact bridge 1, a spring 6 is supported by the operating lever 3. This spring 6 on the one hand forces contact bridge 1 at the tipping point against the printed wiring board 4 and on the other hand induces operating lever 3 to scan cams 7 with its free end 10.

In the position of the contact system shown in FIG. 10, the operating lever scans a gap between cams 7, as a result of which a circuit is closed via the contact of the arm of the switching bridge 1 lying on the switching finger and the tipping point.

In FIG. 11 a middle position of contact bridge 1 is shown. This position is achieved by the operating lever being lifted up by a cam 7 of medium height, as a result of which the contact bridge 1 is lifted up on one side by means of projection 18 and is lowered on the other side by switching finger 22.

The last described process continues in the same direction insofar as a high cam 7 (FIG. 12) will induce the operating lever to be shifted even further out from its rest position. One can see from the drawing that the opposite contact, which is attached to the arm of the switching bridge 1 which rests on projection 18, is closed. This will then result in a circuit between this contact and the tipping place of switching bridge 1.

If, basically, very considerable performances are to be switched, then it is possible to use contact rivets 11. If in addition to contact rivets 11 a printed wiring board lined on both sides is used, then one largely has a free hand in the wiring of the entire switching device.

From FIG. 9 it becomes clear that the printed wiring board 4 can be extended beyond the actual contact housing and can form one or more plug connections 15.

The contact bridge 1 can be equipped with contact rivets. FIG. 14 shows a perspective presentation, partly in section, of a further embodiment of the multiple contact system by way of example, where every individual contact is equipped with two contact bridges. Again, the printed wiring board 4 can be developed as a plug connection 15 extending beyond the housing part 13. The function and the arrangement of this embodiment given by way of example will be explained in more detail on the basis of FIGS. 15 to 18.

Every individual contact system (FIG. 15) is formed essentially by the housing part 13 and the printed wiring board 4 as a cover. In the housing part 13 there is first of all an operating lever 3, which is supported by a support 21 in a half opened bearing 20 of the housing part 13. The operating lever 3 has a free end 10 which projects through a perforation 9 at the housing part 13 and scans cams 7. Cams 7 are attached to a cam carrier which can be, for example, a cam disk or a cam roller. At the opposite end the operating lever 3 has a switching finger 22. Between its free end 10 and support 21, an auxiliary arm 24 has still been attached. Two springs 6 are supported by operating lever 3 between its support 21 and the auxiliary arm 24. On the other side, these springs 6 engage with two contact bridges 2 and 1. These contact bridges are made in the shape of a balance, whereby one contact bridge 2 has been shaped as a two-armed lever and the other contact
bridge 1 as a one-armed lever. They either have—as shown in the drawings—bent elements (for example 19) or edge-shaped elements (not shown in the drawings), with which they have been mounted movably on fixed contacts 5 of the printed wiring board 4. Bent parts are advantageous in that in the case of tipping of the switching bridges they will have more friction than, for example, an edge. As a result of that, the place of contact is constantly kept free of layers of oxide.

In the switching position shown in FIG. 15, a contact between the contact rivet of the contact bridge 2 and its support is established while contact bridge 1 does not close any contact. The switching finger 22 of operating lever 3 holds the contact bridge counter to the direction of the spring of the pertinent spring 6 in a closed position. An auxiliary arm 24 embracing the contact bridge 1 holds said contact bridge in an opened position counter to the spring action of the pertinent spring 6.

If now a cam 7 of medium height (FIG. 16) lifts up operating lever 3 at its free end 10, then switching finger 22 will permit the lifting (removing) of the contact bridge 2 from the fixed contact 5 with the help of the spring action. Auxiliary arm 24 will permit the contact bridge 1 to move under pressure of the pertinent spring 6 toward its pertinent fixed contact 5. In the position shown in FIG. 16 therefore, both contacts are opened.

If the cam carrier is moved on in the direction of arrow 14, then a high cam 7 will induce operating lever 3 to move out still further from its original position. Even before the free end 10 of the operating lever has reached the upper edge of a high cam 7, the contact rivet of the contact bridge 1 will have reached the pertinent fixed contact 5 or a contact rivet 11, which is to be explained later on. As soon as the free end 10 then reaches the upper edge of a high cam 7, the embracing part of auxiliary arm 24 fitting up to this point against the contact bridge 1 will have separated from the bridge. The contact therefore is closed under spring pressure. The other contact bridge 2 in this position has moved even further from the pertinent fixed contact under the pressure of the pertinent spring 6 and the retreated switching finger 22.

In FIG. 17, in addition to the fixed contacts 5, rivets 11 have been shown which are used whenever particularly large performances must be switched. In the case of the use of a printed wiring board lined on both sides, the particular advantage of the contact rivet consists in this, that it will be possible to achieve simultaneously through connections of wiring paths of both sides with the help of the contact rivet. Nevertheless, however, it is possible just the same to use contact rivets on a printed wiring board which has been equipped with wiring paths either on the inside of the contact housing or on the outside.

FIG. 18 shows another development of the operating lever 3. In this case a second auxiliary arm 23 is used instead of a switching finger 22 (FIGS. 15, 16 and 17). The latter embraces, just like auxiliary arm 24, its pertinent contact bridge 2. With the help of this second auxiliary arm 23, the advantage will be achieved that a contact rivet of the contact bridge 2 welded to the fixed contact 5 can be opened positively by the cam via the operating lever. FIG. 18 shows the state in which a welding contact of the contact bridge 2 is in the position just before the positive opening. When the free end 10 of the operating lever 3 is lifted further by a cam 7, then the embracing part of auxiliary arm 23 pulls the contact bridge 2 open by force.

Instead of the hitherto described, stamped and subsequently shaped contact bridges, one can also use bridges which are developed merely as flat stamped parts (FIG. 19). These flat contact bridges 1 are operated by an operating lever 3 with a U-shaped cross section. The auxiliary arms 23 and 24 have the shape apparent in FIG. 19. At the same time, they penetrate corresponding slits in the operating lever 3. These auxiliary arms 23 and 24, in addition to a pure contact operation, still have the advantage that in the case of the operation of the switching system, contact bridges 1 are shifted slightly in their longitudinal direction relative to operating lever 3 and, as a result of that, they make possible the cleaning of the contact. Otherwise the system shown in FIG. 19 operates exactly the same way as the switching systems described on the basis of FIGS. 15 to 18. Holding ribs 27 attached in the operating lever 3 will prevent contact bridge 1 fitting against these ribs from slipping out in one direction; auxiliary arm 24 takes over this guidance in the other direction.

FIG. 20 shows the operating lever in cross section. From this drawing the guidance of the contact bridge 1 can be recognized by the inside wall of the U-shaped operating lever 3. In the case of the development of the contact system according to FIGS. 19 and 20, additional advantages result as compared to known switches. The flat stamped parts, after stamping, have precise dimensions and they are more stable in operation than flat contact bridges. As a result, there will be a certain saving in material since the contact bridges can be made of thinner material. It is possible to insert possibly necessary contact rivets into the contact bridges simultaneously with the stamping. Additional guides in the contact housing are unnecessary in the case of the operating lever described. Because of its U-shape, this lever has greater stability.

An additional and very simple embodiment of the object of the application given by way of example will be explained on the basis of FIG. 21. This FIG. 21 shows in perspective presentation a multiple contact system, in which load can be only transmitted by the case of this contact system too, a housing part 13 is used and a printed wiring board 4 as a housing cover. In the case of this system too, the printed wiring board 4 may be extended beyond the housing part 13 and be developed as a plug connection 15. Structure and method of operation of each individual system will be explained in more detail on the basis of FIGS. 22 to 25.

Every individual contact system is enclosed by a housing which consists of a housing part 13 (FIG. 22) and a printed wiring board 4. At the same time, the housing part 13 on the basis of its trough shape constitutes the largest part of the housing and is closed by the printed wiring board 4 as a lid. The printed wiring board 4 has wiring paths 12, the ends of which constitute on the one hand fixed contacts 5 and on the other hand conductive components of plug-in strips 15. The plug-in strips 15 are formed in a known manner by the printed wiring board 4 itself (see also FIG. 21).

A contact bridge 1, housed in the contact housing, carries a contact rivet and has been provided with a free end 10 which penetrates a perforation 9 in the printed wiring board 4. The free end 10 has the function of scanning cams 7 disposed on a cam disk or cam roller. The cam carrier moves in the direction of arrow 14 and induces contact bridge 1 to assume various positions in correspondence with the cam 7 engaging with the free end 10 of the contact bridge 1.

The contact bridge 1 is under pressure of a spring 6 which is supported on the one hand—as is evident in FIG. 22—by the housing part 13 and on the other hand by contact bridge 1. FIG. 22 shows the contact system in its closed state. In order to be able to open the contact (FIG. 23), the contact bridge 1 is lifted up by cam 7, as a result of which the rivet attached to the contact bridge 1 is lifted off the fixed contact 5. Contact bridge 1, which at its end opposite free end 10 has been bent approximately at right angles, rests with this bent part constantly on a fixed contact of the wiring paths 12. Upon opening the electric contact, the bent part of the contact bridge rubs against the fixed contact. As soon as free end 10 of contact bridge 1 can again drop into a gap between two cams 7, the contact is again closed.

During its movement, contact bridge 1 is guided by a rib 8 disposed in the housing part 13. Additional ribs can be disposed in the housing part 13 for guidance. If need be it is also possible to achieve a certain guidance of contact bridge 1 at its free end 10 by properly shaping perforation 9.

Performance contacts under a high load can be reinforced with the assistance of rivets 11 (FIG. 24). Such rivets however
are needed only when this is absolutely necessary because of the high switching performances. The printed wiring board 4 can also be lined on both sides with an electrically conductive layer. In the case of use of such a printed wiring board and of the additional use of rivets 11, the additional introduction of electric through-contacts is largely unnecessary, which are to establish galvanic connections of wiring paths on one side to wiring paths on the other side of the printed wiring board.

A multiple contact system provided with a printed wiring board lined on both sides and with performance contacts in the form of contact rivets constitutes a particularly abundant variety of wiring possibilities since crossings of lines can be realized at any time.

The contact system described in FIGS. 22 to 24 has the advantage mentioned briefly further above, that only the printed wiring board 4 can be put under thermal load during operation of the contact system. The parts of this printed wiring board 4 under thermal load however can not be touched from the outside. Therefore, housing part 13 does not have to fulfill any special requirements with regard to thermal load capacity.

Another possibility of the arrangement of a single contact system is shown in FIG. 25. The essential differences with regard to the arrangements of FIGS. 22 to 24 are to be seen in that in the system according to FIG. 25 the free end 10 of contact bridge 1 penetrates the housing part 13 in order to scan cam 7 of a cam carrier. From this it results in the case of this arrangement that the printed wiring board 4 can be touched from the outside, since it is not opposite the cam carrier.

In FIG. 25, furthermore, two ribs 8 are shown which can be used in the systems just the same as those according to FIGS. 22 to 24 and which serve to center the contact bridge 1. In the contact system according to FIG. 25 and in contrast to the contact systems described above, a stamped part can be used. Stamped contact bridges can be produced particularly economically since the final shape of the contact bridge will have already been determined by the stamping process and therefore better precision can be achieved.

It becomes clear from FIG. 21 that even in the case of this multiple system the free end 10 of contact bridge 1 can reach through a perforation 9 in the printed wiring board 4. A cam disk or cam roller running past on the other side of the printed wiring board 4 will move contact bridge 1 into various operating positions.

In the case of all contact systems described, one can do without the use of contact rivets 11 whenever the fixed contacts 5 are coated with a protective coating made, for example, of silver. Possibly the opening contacts can also be reinforced with rivets and the fixed contacts (friction contacts) can be coated with silver at their constant support. A third possibility provides that the fixed contacts be coated with silver in the case of opening contacts and the fixed contacts at the permanent support (friction bearing) are equipped only with a polished material for wiring paths.

The formation of fixed contacts and of the movable contacts of contact bridges 1 (inserted rivet or a corresponding shaping of the contact bridges themselves) remains a matter of effectiveness for different individual cases.

What is claimed is:

1. A multiple contact switching apparatus, comprising:
a non-conductive housing including a plurality of individual compartments, said housing including integral wiring paths terminating at fixed contacts, each of said compartments including fixed contacts connected to respective ones of said wiring paths, a support member, and an opening;
a plurality of switching mechanisms each mounted respectively in one of said compartments, each of said switching mechanisms comprising,
an operating lever mounted on said support member, said operating lever including spaced switching fingers and an element extending through said opening outside said housing;
a contact bridge mounted on said operating lever and extending over said switching fingers, said contact bridge including spaced contact elements aligned with corresponding contacts on said housing, support means extending from said contact bridge and in contact with said housing;
means in interconnecting said operating lever and said contact bridge for biasing said contact bridge so that one of said switching fingers engages said contact bridge thereby causing one of said contact elements to engage with an aligned one of said contacts on said housing; and
means engaging with each of said elements extending from said housing for moving said operating lever to cause said other switching finger to engage said contact bridge whereby said contact bridge is rotated so that the other of said contact elements engages with a respective aligned one of said contacts on said housing.

2. A multiple contact switching apparatus as in claim 1 wherein said operating lever has a U-shaped cross section and said contact bridge is mounted within the arms of said operating lever by a projection engaging with said operating lever.

3. A multiple contact switching apparatus as in claim 2 wherein said contact bridge consists of a blade-like element.

4. A multiple contact switching apparatus as in claim 1 wherein said operating lever is bent to be in contact with each of said switching fingers.

5. A multiple contact switching apparatus as in claim 1 wherein each of said switching mechanisms further comprises an additional contact bridge mounted on said operating lever by an additional biasing means and said additional contact bridge includes an additional support means in contact with said housing.

6. A multiple contact switching apparatus as in claim 5 wherein each of said compartments includes a projection and one end of said additional contact bridge is pivotally connected to said projection.

7. A multiple contact switching apparatus as in claim 5 wherein each of said switching fingers is in the form of a supporting arm having a respective opening through which said contact bridge and said additional contact bridge respectively protrude whereby upon rotation of said operating lever said contact bridge and said additional contact bridge are slightly shifted to cause a wiping action of the contact elements.

8. A multiple contact switching apparatus as in claim 5 wherein said operating lever has a U-shaped cross section and said contact bridge and said additional contact bridge are mounted within the arms of said operating lever by projections engaging with said operating lever.

9. A multiple contact switching apparatus as in claim 1 wherein one side of said housing extends beyond an adjacent wall thereof and includes said fixed contacts at the end portion of said extended side.

10. A multiple contact switching apparatus, comprising:
a non-conductive housing including a plurality of individual compartments, said housing including integral wiring paths terminating at fixed contacts, each of said compartments including fixed contacts connected to respective ones of said wiring paths, a support member, and an opening;
a plurality of switching mechanisms each mounted respectively in one of said compartments, each of said switching mechanisms comprising,
a contact bridge including spaced contact elements aligned with corresponding contacts on said housing, support means extending from said contact bridge and in contact with said housing, one end of said contact bridge is pivotally engaged with said housing and the other end of said contact bridge extends through said opening;
means interconnecting said contact bridge and said housing for biasing said contact bridge so that one of said contact elements is in contact with an aligned fixed contact on said housing; and
means engaging with each of said elements extending from said housing for moving said contact bridge whereby said contact bridge is rotated so that the other of said contact elements engages with a respective aligned one of said contacts on said housing.