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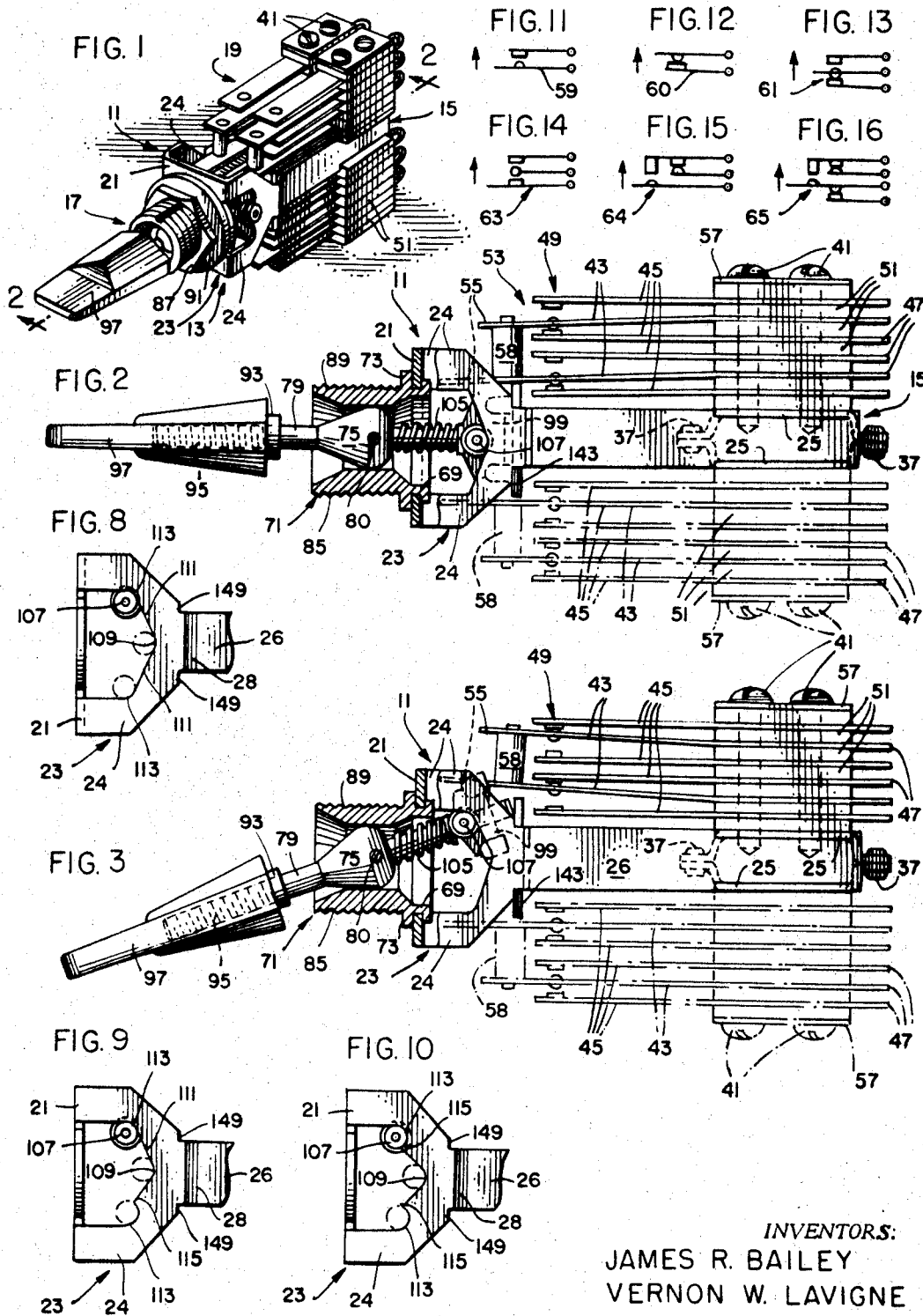
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LEVER SWITCH HAVING MEANS TO AVOID TRANSIENT SWITCHING

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LEVER SWITCH HAVING MEANS TO AVOID TRANSIENT SWITCHING

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ABSTRACT OF THE DISCLOSURE

An electrical switch assembly embodying switching elements supported on a rigid frame comprising a bent sheet metal strip providing a pair of spaced arms and a medial lever mounting portion interconnecting the arms, at one end of the frame, and a pair of clamping plates interlocked with and rigidly interconnecting and securing the arms in spaced relation at the other end of the frame, said plates providing support for switching elements, on either or both sides of the frame, in position for actuation by a lever mechanism mounted on the medial portion of the frame and including a pivoted member carrying an axially slidable, switch actuating shoe, yieldingly urged toward a normal or neutral position. The switch elements in neutral or standby position, are entirely disconnected from the actuating lever or shoe, to thereby avoid transient switching through lever or shoe oscillation.

The present invention relates in general to electrical switching, and has more particular reference to an improved switch construction, embodying a rigid frame or base for mounting switch blades of the leaf-spring type.

An important object of the present invention is to provide an improved electrical switch embodying a frame structure of simple, inexpensive character having unusual strength and rigidity for mounting switch components in position for actuation, as by means of a lever mounted on the frame; a further object being to provide a switch frame of rigid, generally box-like character formed essentially of a bent sheet metal strip providing a pair of spaced arms and a medial portion integrally interconnecting the arms at one end of the frame, the arms, at the opposite end of the frame, being rigidly secured in spaced relation to form a box-like structure; a further object being to provide a pair of connection plates rigidly secured together in facing relationship and in clamping engagement with the opposite edges of the arms of the bent frame forming strip at the ends of said arms remote from the medial portions of the strip; a still further object being to form the spaced arms of the strip and the clamping plates with cooperating interfitting notches and shoulders to aid in rigidifying the box-like structure formed thereby.

Another important object of the invention is to provide an electrical switch of the character mentioned embodying a rigid frame for the support of leaf-spring switch components in position for actuation by a lever tiltable from a neutral or stand by position to a shifted position to move the switch components between switch open and switch closed position; a further object being to provide a frame adapted to support switch components on one or the other, or both, of the opposite sides of the frame, so that an actuating lever mounted medially on the frame may serve to actuate switch components on one side of the frame, in response to lever movement in one direction from a neutral or stand by position, and may serve to selectively actuate switches mounted on opposite sides of the frame, in response to lever movement in opposite directions from a neutral position; a still further

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object being to provide stop means on the frame for limiting the movement of the actuating lever direction from its medial position; yet a further object being to provide an inexpensive slotted plate interlockingly secured in the frame, during the formation thereof, for limiting lever movement on the frame; a still further object being to provide a switch structure wherein the movement limiting means serves to limit lever movement in one direction from a neutral or stand by position and to stop lever movement, in the opposite direction in stand by position.

Another important object is to provide a switch, of the character mentioned, wherein the switch actuating lever embodies a rockable member, carried by a pivot on the switch frame, and a switch actuating shoe, axially slidable on a portion of the rockable member, on one side of the lever pivot, as the lever is moved on the frame, said axially slidable shoe and the support frame being formed with cooperating latch means for yieldingly holding the switch actuating shoe and the rockable member in each of the switch actuating positions to which the same may be moved; a further object being to form the switch actuating shoe with one or more projecting fingers in position to cooperate with slotted stop means, on the frame, to permit the switch actuating lever to move in either direction from a neutral position, in operating switch components mounted on opposite sides of the frame, or to permit the lever to move in one direction only from neutral position, where the switch components are mounted on one side of the frame only, depending upon the configuration of the slotted stop means provided on the frame.

The foregoing and numerous other important objects, advantages and inherent functions of the invention will become apparent as the same is more fully understood from the following description which, taken in conjunction with the accompanying drawings, discloses preferred embodiments of the invention.

Referring to the drawings:

FIG. 1 is a perspective view of an electrical switching structure embodying the present invention;

FIGS. 2 and 3 are enlarged side views of the device shown in FIG. 1, respectively showing the switching structure in normal and in relatively shifted position;

FIG. 4 is an exploded view showing, in perspective, some of the constituent components of the switching structure shown in FIGS. 1, 2 and 3;

FIGS. 5 and 6 are sectional views respectively taken substantially along the lines 5—5 and 6—6 in FIG. 4;

FIG. 7 is a face view of a component that may be employed in switches embodying the invention.

FIGS. 8, 9 and 10 are alternate forms of switch actuating cam mechanism that may be incorporated in switch structures embodying the invention; and

FIGS. 11—16 show various switch units of the sort adapted for incorporation in switching structures embodying the invention.

To illustrate the invention, the drawings show an electrical switching structure 11 comprising a rigid frame 13, having a switch mounting portion 15, at one end, and formed, at its opposite end, to carry a switch actuating mechanism 17, leaf-spring switch components 19 being mounted on the frame portion 15 in position to be moved between switch open and switch closed positions by operation of the mechanism 17.

The frame 13 is of unusually rigid character and comprises a formed strip of material, such as sheet metal, having a medial portion 21 and a pair of spaced arms 23 bent from the medial portion, at its opposite sides, and extending thence to the opposite end of the frame. The arms may have relatively wide portions 24, immediately

adjacent the medial portion 21, and somewhat narrower portions 26 extending, outwardly of the portions 24, to the terminal ends of the arms, said narrower portions 26, preferably being offset mutually inwardly, with respect to the portions 24, as indicated at 28. The terminal end portions of the arms 23 are rigidly interconnected and secured in spaced relation by means of a pair of bracing and spacing plates 25, preferably of sheet steel, secured together in position extending between the arms, and in engagement with their opposite side edges. The plates 25 are interfittingly and interlockingly engaged with the terminal end portions of the arms 23, the opposite side edges of which are cut away to form seats 27 defined between spaced abutments 29.

The plates 25 may be generally rectangular and of length and width slightly greater, respectively, than the distance between the spaced arms 23, at their terminal ends, and the distance between the abutments 29. The side edges of the plates 25 are formed with spaced notches 31 adjacent and inwardly of their opposite ends, the spacing of said notches being equal to the distance between the terminal end portions of the arms 23, at the seats 27, in order to interlockingly receive the abutments 29 and thereby firmly anchor the plates on said arms and in said seats, when the plates are fastened together. To secure the plates together, the same may be formed with laterally projecting riveting ears 33, at their opposite side edges, between the notches 31, said ears 33 each having a rivet receiving opening 35 formed therethrough. The ears 33 are preferably offset from the plane of the plate 25 a distance equal to one half the spacing of the seats 27 in an arm 23, so that the ears of a pair of plates may extend in facing engagement, when mounted in the seats 27. When so mounted, the rivet openings 35 of the plates will be in alignment and the plates, consequently, may be secured in their seats by rivets 37 extending in the openings 35 and fastening the ears 33 together.

The plates 25 not only serve to rigidly interconnect the arms 23 of the frame, but also form the switch mounting portion 15 of the frame. To mount the switch components 19 on the frame, the plates 25 may be formed with preferably screw-threaded openings 39 for engaging the threaded ends of switch mounting screws 41. As shown more particularly in FIG. 4 of the drawings, are preferably arranged in pairs aligned transversely of the plates, and including a medial pair of openings 39-M, disposed medially between the opposite edges of the plates, and a lateral pair of openings 39-L located between the medial pair and each of the opposite side edges of the plates, whereby the axes of the several pairs of openings in a plate extend in planes between and parallel to its opposite side edges.

The switch components 19 may each comprise an elongated metallic strip or blade of leaf-spring material 43, forming a movable pole, and one or more preferably somewhat shorter strips of metallic leaf-spring material 45, forming contactor blades adapted, with the blade 43, to form a switch combination, or unit. The blades 43 and 45 may have ends formed with conventional connection terminals 47 and opposite ends formed with conventional contact buttons 49; and the blades may be arranged in stacked relation with intervening plates or blocks of insulating material 51, disposed adjacent the terminals 47, to form a switching array 53 extending outwardly of the blocks, the opposite ends of the blades extending outwardly of the opposite ends of the blocks. The pole blades 43, being somewhat longer than the contactor blades, have switch actuating ends 55 projecting outwardly of the contact carrying ends of the contactor blades, in position to be moved by the actuating mechanism 17, when operated.

A switching array 53 may comprise a single switch unit, or several units may be superposed, one upon the other, as shown in FIGS. 1, 2 and 3 to form the switching array. A switching array 53 may be mounted on one or other, or both of the plates 25 and hence disposed on either or both

sides of the frame 13, each array being clampingly secured together and to the plate on which it is mounted by the threaded screws 41, which may extend in aligned openings formed in the blades 43 and 45, in the insulating plates 51 of the array, and also in a preferably metallic cover plate 57 overlying the outermost of the insulating plates 51, on the side of the array remote from the plate 25 on which it is mounted. The fastening screws 41, of course, are insulated from the blades 43 and 45 at the openings therein through which the clamping screws extend; and each array is held together by the threaded engagement of the head remote ends of its clamping screws in the threaded plate openings 39, the heads of the screws clampingly engaging the cover plate 57 to effect such clamping action. When so mounted, the contact carrying ends of the blades may extend adjacent the lever carrying end of the frame, and the switch actuating ends 55 of the pole forming blade or blades 43 extend, beyond the ends of the contactor blades, toward the lever carrying frame portion 21.

If desired, a switching array 53 may comprise a single, normally open switch unit 59, or a single normally closed switch 60, each embodying a single pole 43 and a cooperating contact blade 45, as shown respectively in FIGS. 11 and 12; or the array may embody a plurality of switch units.

As shown in FIG. 13, the assembly may comprise a double-throw switch 61 having a pole 43 and a pair of cooperating contactor blades 45 adapted alternately to make electrical contact with the pole, when the same is shifted from a normal switching position, and the pole being arranged to normally connect electrically with one of the contact blades, to form a normally closed switch therewith, and to open such normally closed switch and to electrically connect with the other contactor blade, to form a closed switch therewith, when shifted from normal position. Alternately, a switch assembly may embody mixed single and double-throw switch units, which may be arranged for actuation in unison or alternately.

As shown in FIG. 14, a switch unit 63 may comprise a pair of normally open switches arranged to close when the actuating mechanism is shifted from its normal position.

As shown in FIG. 15, a switch unit 64 may comprise a pair of contactor blades 45 forming a normally closed switch and a pole 43 movable from its normal position to open such normally closed switch and simultaneously to make switching contact with one of the contactor blades 45. As shown in FIG. 16, a switching unit 65 may be mounted on either or both of the plates 25, said unit including the elements of the unit shown in FIG. 15, together with an additional contactor blade forming a normally closed switch with the operable blade.

Other switch forming combinations will suggest themselves to those familiar with electrical switching requirements.

Where but a single switch unit, or a single stack of switch units, is mounted on a plate 25, the mounting screws 41 may be secured in the medial openings 39-M, to mount the switch unit or stack medially on the switch frame. A pair of switch units, or a pair of switch stacks, however, may be mounted, side by side, on a plate by securing the mounting screws in the openings 39-L.

The invention includes the provision of means biasing the actuating mechanism toward a normal position, so that it may be moved to and held in shifted position, by manual or other externally applied force, the mechanism being returnable to normal position, upon release of such external force. If desired, latch means may be provided for holding the actuating mechanism in shifted position, against the influence of the biasing means until released for return to normal position.

For the actuation of the switch arrays 53, the mechanism 17 may conveniently comprise a lever forming rod or

bar 66 and means for pivotally mounting the bar for rocking movement on the frame 13. To this end, the medial portion 21 of the frame may be formed with a central opening 67 sized to press-fittingly receive the end 69 of a lever mounting sleeve 71, said sleeve having a peripheral flange 73 spaced from said sleeve end 69 in position to overlie and seat upon the outer face of the frame portion 21 when the end portion 69 is mounted in the opening 67; and the sleeve may be held in place in the opening 67 by swaging or otherwise expanding the end of the sleeve portion 69 over upon the inner face of the frame portion 21. The sleeve 71, thus, may project forwardly of the frame portion 21 and may be sized internally to rockingly receive a preferably bulbous, generally spherical enlargement 75 formed medially on the lever rod 66, thereby defining a switch actuating rod portion 77 and a lever actuating portion 79, at the opposite ends of the rod.

The rod may be mounted for pivotal movement, in the sleeve 71, by means of a pivot pin 80 extending in a diametral bore 81 in the bulbous enlargement 75 of the lever rod, the pin having oppositely projecting ends seated in diametrically disposed openings 83 in the side walls of the sleeve 71. The axis of the pin 80 preferably lies in the plane extending through the center of the frame opening 21 and medially between the plates 25. When so mounted, the operable end 79 of the lever rod will extend outwardly of the front end of the sleeve 71, while the switch actuating end 77 will extend within the frame adjacent the actuating end or ends 55 of the switch blades 43. The sleeve 71 may be formed with external screw threads 85 for the reception of a conventional clamping nut 87 and may also be formed with a longitudinal groove 89 to slidably engage the spline lug of a conventional mounting washer 91, provided to secure the assembly in vertically mounted position on a support panel.

The operable end portion 79 of the rod 66 may be formed, medially, with a peripheral flange 93; and said end portion, between its terminal end and the flange may be formed with screw threads 95 for engaging and mounting a lever actuating finger piece 97 of preferably high-impact plastic material, such as polystyrene, or similar handle forming material to facilitate the manual operation of the lever.

The switch actuating end 77 of the lever 66 may carry an axially slidable switch actuating shoe 99. This shoe may conveniently comprise a block of suitable insulating material, such as polystyrene, or other molded plastic, the shoe having generally rectangular configuration and being sized, as to its length, to fit snugly yet in freely movable fashion between the spaced arm portions 24 of the frame 23, which arm portions 24 may be cut away to form openings 101 therethrough opposite the ends of the shoe 99. The shoe 99 is formed medially with a hole 103 forming a slide bearing for receiving the rod portion 77; and the shoe is normally biased or urged on the rod portion in a direction away from its pivot 80 by a helical biasing spring 105 embracing the rod portion 77 between the pivot portion 80 and the shoe.

Retaining wheels or rollers 107 may be mounted on the shoe, at its opposite ends, in position to rollingly engage the edges of the openings 101 remote from the medial frame portion 21 and thereby limit the movement of the shoe, on the lever portion 77 under the influence of the biasing spring 105. The roller engaging edges of the openings 101 may be formed with medial portions 109 spaced from and facing toward the frame portion 21, and lateral edge portions 111, on opposite sides of the medial portions 109 and inclined toward the frame portion 21, outwardly of the medial portions, whereby the rollers 107, under the influence of the spring 105, when seated in said medial edge portions, may serve normally to urge and to hold the lever and the lever mounted shoe in a central, neutral or normal position, in axial alignment with the central plane of the frame, which

extends through the center of the opening 67 and medially between the switch mounting plates 25. As shown more especially in FIG. 8 of the drawings, these lateral edge portions 111 may form inclined tracks upon which the rollers may ride, as the lever 66 is moved, in one direction or the other, from the neutral position defined by the centering portion 109, into either one of a pair of shifted switch actuating positions 113, from either of which the lever, when released will be returned to its neutral position by action of the biasing spring 105. If desired, as shown in FIGS. 9 and 10, the roller engaging edges of the openings 101, intermediate the neutral and either or both of the switch actuating positions 113, may be formed with a latching projection or projections 115 adapted to retain the rollers in one or other of both of such shifted switch actuating positions, so that the lever 66 and the shoe 99 will not return automatically to the neutral position, from a shifted position, merely upon release of the handle 97, but will require the application of sufficient force to the handle to push the rollers over the projections 115, in order to return the switch actuating lever to its neutral position.

The rollers or wheels 107 may conveniently comprise molded plastic elements of flanged configuration each having an axial channel 117, a cylindrical hub portion 119, forming a wheel adapted to ride upon the wheel receiving edge of a frame opening 101, and an adjacent flange portion 119, adapted to overlie the inner face of the frame forming strip portion 24, at the wheel engaging edge of an opening 101. The wheels may be mounted on the shoe 99, at the opposite ends thereof, by means of preferably metallic axle elements 121 having preferably rectangular mounting body portions 123, adapted for reception in correspondingly shaped sockets 127 formed in, and opening upon, the opposite ends of the shoe. The elements 121 having axially extending pins 125 formed thereon in position to project outwardly of the opposite ends of the shoe, said pins forming axles for the rollers 107. The wheel flanges 119, when in engagement with the inner faces of the spaced frame portions 24, serve to hold the rollers 107 on the axles of the elements 121, and to hold the body portions 123 of the axle elements in their mounting sockets 127, so that the rollers and mounting elements need not be positively attached on the shoe.

The shoes 99 may each conveniently comprise a generally rectangular block, of polystyrene or other suitable molded plastic, having a top, embodying downwardly and outwardly sloping sides 128 and a medial, longitudinally extending transversely curved ridge 129 joining and interconnecting the sloping sides 128. The block preferably has flat parallel ends 131, upon which open the sockets 127, a flat bottom 133 and flat, preferably parallel spaced apart side walls 135. Mutually inwardly inclined surfaces 137, forming bevelled or chamfered bottom corners on the shoe, may extend between and interconnect the opposite side edges of the bottom wall 133 and the lower edges of the side walls 135. The lever receiving channel 103 preferably extends medially between and parallel to the opposite end walls 131 and between the opposite side walls 135. A pair of downwardly extending stub fingers 139 may be formed on the bottom of the shoe in position spaced equally from and on opposite sides of the channel 103. Relatively thin integral ears 141 may be formed on the opposite end walls 131 of the shoe, at the opposite sides of its bottom 133, said ears projecting outwardly of the side walls 135 and the inclined walls 137, and having lower edges extending in alignment with the shoe bottom 133.

The frame 13 is provided with means for supporting the movable blades 43 of the mounted switch units in their normal position. To this end, the frame may carry a switch positioning plate 143 having parallel side edges 145 and opposite end edges formed with notches 147 sized to snugly receive and interfit with the narrower

portions 26 of the side arms of the frame, at the junction thereof with the relatively wide frame portions 24, which may be formed with spaced shoulders 149 for engaging the forwardly facing surfaces of the plate 143, at the opposite ends of the notches 147, the plate being held against said shoulders 149 by engagement of the inwardly offset arm portions 28 with the rearwardly facing surfaces of the plate 143, at and inwardly of the bottoms of the notches 147.

The plate 143 may be assembled between and in inter-fitting engagement with the side arms 23 of the frame immediately prior to the assembly and attachment of the frame plates 25 in mounted position in the frame structure, to thereby hold the plate lockingly in operative position in the frame. The opposite side edges 145 of the mounted plate are disposed in position to underlie and support the movable blade of a switch assembled on a plate 25, or the movable blade of the lower most switch unit of a stack of switch units assembled on plate 25.

The plate 143 may be provided with a pair of transversely extending slots 151 having opposite ends spaced inwardly of the opposite side edges 145, so as to accommodate the stub fingers 139 of the shoe and thereby permit the shoe to turn freely, in either direction, from the normal or neutral switch position, shown in FIG. 2 of the drawings, in which the stub fingers extend in the slots 151, medially between the opposed edges of the plate 143, to a shifted position outwardly of the ends of the slots, as shown in FIG. 3. Where the switch structure is arranged with switch units 19 disposed on one side of the frame only, the plate 143, as shown in FIG. 7, may be formed with openings 151', having ends extending adjacent one side of the plate only and opposite ends terminating medially between the opposite side edges of the plate in position to engage one side of the stub fingers 139 when the shoe is in its normal position, the medially disposed stub finger engaging ends of the slots 151' serving to prevent shoe movement in one direction from neutral position, and permitting shoe movement only in a direction to actuate the mounted switch units, on the switch carrying side of the frame.

Where a switching array 53 comprises more than a single switch unit, the poles of the units may be drivably interconnected for operation in unison, by means of a connecting member 58, which may be made of suitable insulating material, where the poles of the switches are to be electrically isolated. The actuating end 55 of the pole of the lower most switch unit in a multiple unit array, like the actuating end of the pole of a single plate mounted switching unit normally rests upon an edge 145 of the support plate 143, and projects forwardly of said plate into position opposite the shoe 99 of the switch actuating mechanism 17. Accordingly, when the lever 66 of said mechanism is tilted on the pivot pin 80 and moved to switch actuating position, as shown in FIG. 3 of the drawings, one side or other of the shoe 99 will engage the terminal end of the switch pole, outwardly of the plate and raise the same sufficiently to throw the switch unit or units of the array into shifted position, the meeting edges of the side and bevelled corner edges 135 and 137 of the shoe, between the ears 141 at the opposite ends of the shoe forming the pole blade engaging and actuating portion of the shoe.

Among the features thought to embody patentable novelty are the switch actuating shoe 99 mounted for spring urged axial movement on the lever 66; the cam track 111, on the frame 13 and the cam follower 107 on the switch actuating shoe; the stop means 143, which carries the switch pole in its normal position, and which serves as a damping block to absorb the impact of the switch pole, when returned abruptly from shifted to normal position, thereby preventing transient switching action; and the provision of cooperating stop means in the block forming plate 143 and in the shoe 99, said stop means preferably comprising stub fingers 139, on

the shoe, and slots 151', forming stop shoulders in the plate, in position to laterally engage the stub fingers 139 and, thereby, limit movement of the switch actuating means, in one direction, when the switch actuating mechanism is in its normal position, while permitting relative movement of the actuating mechanism, in the opposite direction, from said neutral position toward said shifted position.

It is thought, further, that patentable novelty resides in the arrangement of the roller support 121 with a rectangular base 123, and the roller 107 with a peripheral flange 119, which, in conjunction with the side wall portions 24 of the frame, at the cam track 111, permits the cam following rollers 107 and the axle elements 121 to be retained, in operating position, on the switch actuating shoe 99, without the provision of additional fastening expedients; in the formation of the frame as a low-cost sheet metal stamping, with spaced arms formed to interlock the damping block or plate 143 in place, in the frame, without rivets or other fastening means; and in the formation of the frame as a box-like structure which, because of the clamp plates 25 riveted together in position interlocking with the ends of the frame arms, affords an exceedingly rigid frame structure.

The prevention of transient switching by the damping plate 143 is a particularly important aspect of the invention. As the switch mechanism is returned from the shifted position, shown in FIG. 3, to the normal or standby position, shown in FIG. 2, the actuator blade or blades 43 of the switches become supported on the shoulder provided by the edge 145 of the damping plate 143, and the switch actuating shoe becomes disengaged from the switch actuator blades. This permits oscillation of the shoe 99 and actuating lever 66, in the neutral position, when entirely disengaged from the switch blades, which is particularly significant when the switch is operated momentarily and then permitted to snap back into neutral or centered position. In prior lever switches, oscillation of the switch actuating mechanism in neutral position has produced transient switching effects, due to oscillations transmitted to the connected switches. In switches embodying the present invention, the actuating lever 66 can be moved through a substantial displacement angle, of the order of 10° from the neutral position, before the shoe 99 drivably engages the switch actuator blades. In other words, switch movement occurs at the end of the actuating stroke of the lever. This feature, in association with the damping effect of the plate 143, minimizes unwanted transient switching effects, if indeed it does not entirely eliminate them.

It is thought that the invention and its numerous attendant advantages will be fully understood from the foregoing description, and it is obvious that numerous changes may be made in the form, construction and arrangement of the several parts without departing from the spirit or scope of the invention, or sacrificing any of its attendant advantages, the forms herein disclosed being preferred embodiments for the purpose of illustrating the invention.

The invention is hereby claimed as follows:

1. An electrical switching mechanism comprising a frame embodying a pair of spaced arm forming strips, plate means perpendicular to and connecting the arms together at one end of the frame and forming a switch mounting support, at one end of the frame, switch means secured on said support, said frame including a panel extending between and interconnecting the arms, at the other end of the frame, a support member on said panel, and movable switch actuating means movably supported by said support member with a switch actuating member of said actuating means actuating said switch means upon movement thereof.

2. An electrical switching mechanism, as set forth in claim 1, wherein the frame comprises a sheet metal strip having a medial portion forming said panel and opposite

end portions bent from the medial portion to form said spaced arms.

3. An electrical switching mechanism, as set forth in claim 1, wherein said plate means comprises a pair of plates extending between and overlying and interfittingly engaging the opposed edges of said arms, said arms and plates being formed with interfitting notches and projections, and said plates being clampingly secured together to hold them mounted on the arms.

4. An electrical switching mechanism, as set forth in claim 1, wherein said arms each have an elongated notch formed in an edge thereof, at and inwardly of its panel remote end, and defining a pair of upstanding abutments and a seat therebetween, said plate means comprising a rectangular plate element extending between said arms and resting in said seats, adjacent and inwardly of its end edges, said plate having notches formed in its opposite side edges in position to interfittingly receive said abutments, whereby to brace and rigidify the frame at its panel remote end.

5. An electrical switching mechanism, as set forth in claim 1, wherein the movable switch actuating means comprises a lever supported for rocking movement, on a sleeve mounted pivot, and having a switch actuating end projecting toward said switch mounting support, a switch actuating shoe, axially movable on the switch actuating end of said lever and resiliently biased thereon in a direction away from the pivot, a cam track formed on the frame in position facing said pivot, said track having a medial pocket and lateral portions connected with and extending on opposite sides of said pocket and inclined toward said pivot, outwardly of the pocket, a cam follower on the shoe in position riding the track, whereby to urge the shoe and the lever into position presenting the cam follower in said medial pocket, to thereby define the normal switching position of the mechanism.

6. An electrical switching mechanism, as set forth in claim 5, wherein said lateral portions of said cam track, outwardly and on opposite sides of said medial pocket, are each formed to provide a station for receiving the cam follower, when the switch actuating means is in a shifted switch actuating position displaced from said normal position, in one direction or the other, said lateral cam track portions being formed each with a latching projection in position to hold the cam follower, releasably, at the station formed therein.

7. An electrical switching mechanism, as set forth in claim 5, wherein a said lateral portion of said cam track, outwardly of said medial pocket, forms a station for receiving the cam follower, when the switch actuating means is in a shifted switch actuating position displaced from said normal position.

8. An electrical switching mechanism, as set forth in claim 7, wherein said lateral portion of said cam track is formed with a latching projection in position to hold the cam follower releasably at said station whereby to retain the switch actuating means in said shifted position.

9. An electrical switching mechanism, as set forth in claim 1, including stop means forming a support shoulder on and facing outwardly of the frame, on one side thereof, intermediate the panel and the switch mounting support, said switch means comprising leaf-spring pole and contactor blades, carried on the mounting support and extending toward said panel, said leaf-spring pole having an actuating end supported on said shoulder, in a normal switching position, and projecting toward the panel, beyond the support shoulder of the stop means, in position to be moved from said normal switching position to a shifted switching position outwardly of the support shoulder, by operation of said movable switch actuating means.

10. An electrical switching mechanism, as set forth in claim 9, wherein said stop means comprises a plate extending between and supported on the spaced arm form-

ing strips of the frame, said plate and arms being formed with interfitting notch and abutment means for securing the plate in mounted position on and between said arms.

11. An electrical switching mechanism, as set forth in claim 9, wherein said stop means comprises a plate mounted in said frame between said switch mounting support and said panel, said switch actuating means comprising an actuating member movable adjacent and transversely of said plate between a normal position and a shifted switch actuating position, said switch actuating means and plate having cooperating stop means formed thereon to limit movement of said member in one direction when in said normal position, while permitting movement of said member in the opposite direction, toward said shifted position.

12. An electrical switching mechanism, as set forth in claim 1, wherein said switch means comprises stacked leaf-spring elements and longitudinally spaced mounting studs anchoring the stacked elements on said mounting support in position extending longitudinally of said frame, said mounting support being formed with a medial pair of longitudinally spaced stud anchoring openings, and also with lateral pairs of anchoring openings, formed in the plate means on opposite sides of said medial pair, whereby a stack of leaf-spring switch elements may be mounted, respectively, centrally on said support with its mounting studs secured in said medial pair of openings, or a pair of stacks of such elements may be secured in parallel relation, on opposite sides of the central longitudinal plane of the frame with their mounting studs secured in said lateral pairs of openings.

13. An electrical switching mechanism, as set forth in claim 1, wherein said switch means comprises stacked leaf-spring elements and longitudinally spaced anchoring studs securing the stacked elements on said mounting support, said plate means including oppositely facing plate portions secured on said frame and formed with longitudinally spaced stud anchoring openings for engaging the anchoring studs of the stacked elements.

14. An electrical switching mechanism comprising a frame and plate means forming a switch mounting support, switch means including a movable member secured on said plate means, movable switch actuating means, means on said frame supporting said actuating means for movement from a normal retracted standby position, entirely disengaged from said switch means, into switch engaging position, and thence to a switch actuated position, displaced from said engaging position, and vice versa, and means secured to said frame to underlie and support the movable member whereby the actuating means in returning to its normal retracted position releases the switch means and thus isolates the same from transient switching effects otherwise produced in response to oscillation of the actuating means upon reaching standby position.

15. An electrical switching mechanism, as set forth in claim 14, wherein said last mentioned means includes buffer means on the frame in position to support the switch means normally in position to be engaged and moved by the actuating means to a shifted switch actuated position, said buffer means serving to stop movement of said switch means and disengage same from the switch actuating means as it returns to its standby position.

References Cited

UNITED STATES PATENTS

2,560,324 7/1951 Babcock.
2,630,499 3/1953 Weld.

ROBERT K. SCHAEFER, *Primary Examiner*.

MORRIS GINSBURG, *Assistant Examiner*.

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