Sept. 22, 1953 V. G. KRENKE 2,653,198

ELECTRIC SWITCHING DEVICE

Filed Jan. 22, 1952 2 Sheets-Sheet 1

Fig.1.

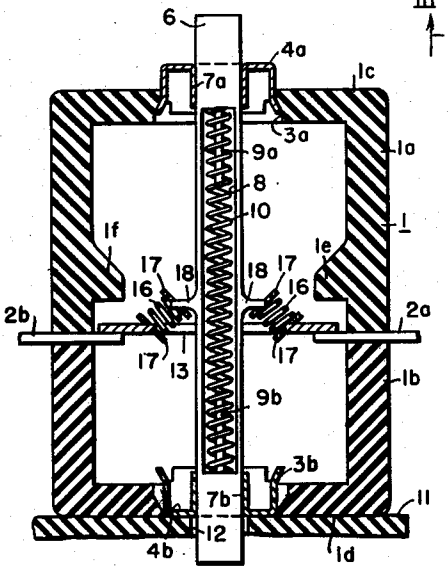


Fig.2.

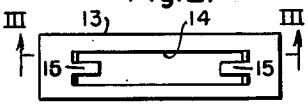


Fig.3.

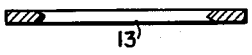


Fig.4.

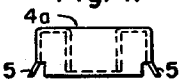


Fig.5.



Fig.20. Fig.21.

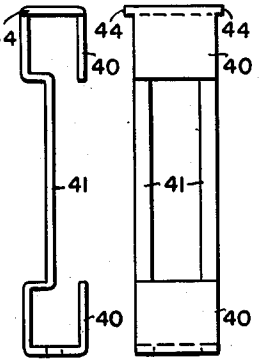


Fig.22.

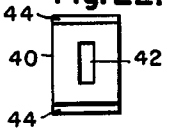


Fig.6.



Fig.7.

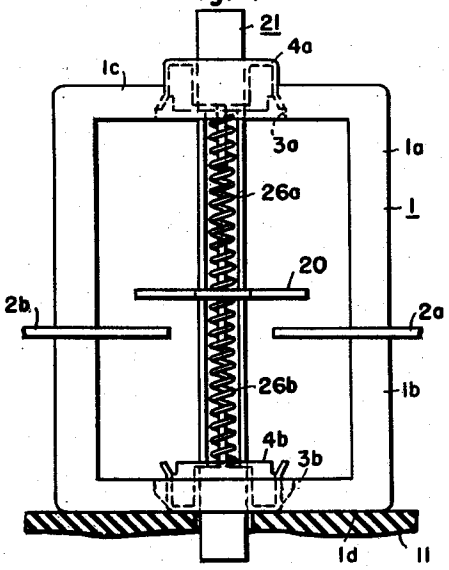


Fig.8.

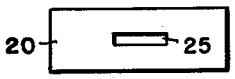
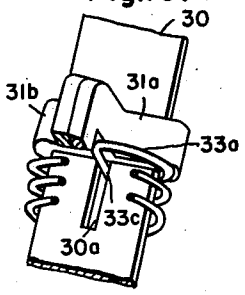


Fig.9.



Fig.16.



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ELECTRIC SWITCHING DEVICE

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Fig.10.

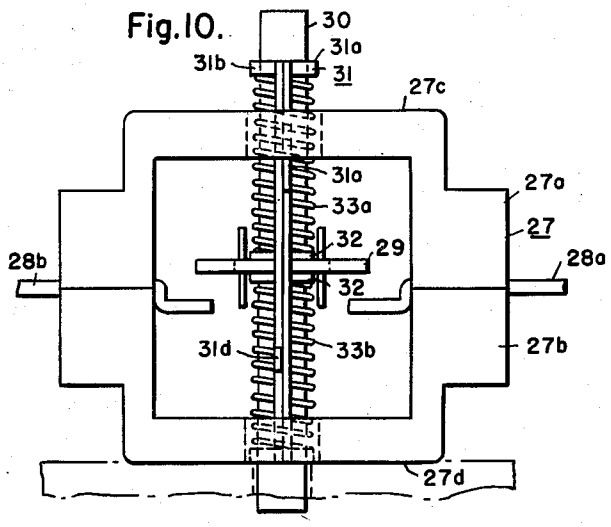


Fig.11.

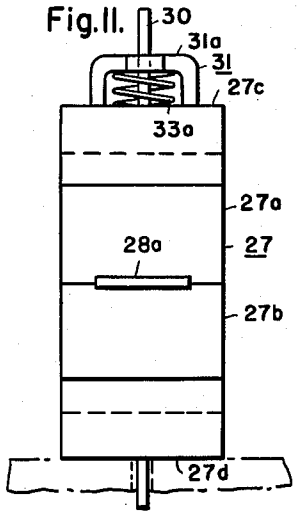


Fig.12.

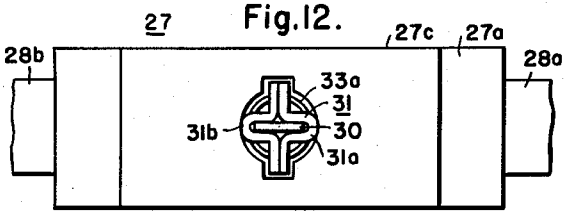


Fig.13.

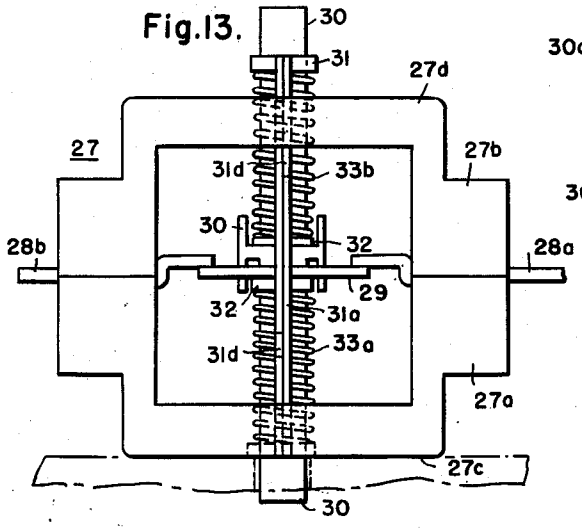


Fig.14.

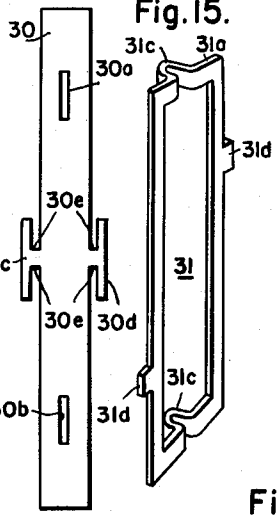


Fig.15.

Fig.19.

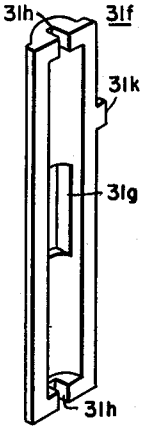


Fig.17.

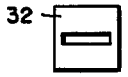
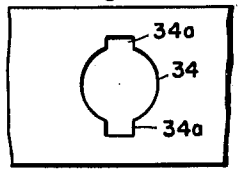


Fig.18.



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2,653,198

UNITED STATES PATENT OFFICE

2,653,198

ELECTRIC SWITCHING DEVICE

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Application January 22, 1952, Serial No. 267,545

10 Claims. (Cl. 200—67)

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This invention relates generally to electric switching devices and more particularly to such devices which are generally classified as electrical interlocks.

Such devices usually comprise a push rod or plunger-operated switching mechanism used for various switching operations in circuits. In the application of these interlocks to electrical circuits, the circuit requirements may be such as to indicate normally open interlock switching in some instances, normally closed interlock switching in other instances and in still other instances both. As a general rule in the assembly of electric control panels wherein such switching is required, electrical interlocks of the two different types, namely the normally closed contact type and the normally open contact type, must be stocked.

In view of this situation, in an effort to minimize the stocking of varieties of different items, attention has been devoted in the past to the development of electrical interlocks which could be assembled or modified on the job to provide either of the two types of switching mentioned. Such operations, however, are time consuming and for the most part are not entirely satisfactory.

Accordingly, it is a principal object of this invention to provide an electrical interlock of the character generally referred to, which is operable either as a normally open or normally closed switching device.

Further to the preceding object, it is an object of this invention to provide such an electrical interlock which may be used either as a normally open or normally closed interlock without the need of disassembling or reassembling the mechanism.

More specifically stated, it is an object of this invention to provide an electrical interlock of the character generally described having two mounting faces and suitable mechanism wherein by mounting the interlock on one mounting face, normally open interlock operation may be obtained, and by mounting the interlock on the remaining mounting face, normally closed interlock operation may be obtained.

A general object of this invention is to provide an interlock of the character hereinabove referred to which is simple with respect to operational requirements, positive in operation, and easily manufactured.

The foregoing statements are merely illustrative of the various aims and objects of this invention. Other objects and advantages will become apparent upon a study of the following disclosure when considered in conjunction with the accompanying drawings, in which:

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Figure 1 is a longitudinal sectional view of an electrical interlock embodying the principles of this invention;

Figs. 2 through 6 are details of several of the components of the interlock of Fig. 1;

Fig. 7 is a modification of the invention illustrated in Fig. 1;

Figs. 8 and 9 illustrate details of certain of the structural components of Fig. 7;

Fig. 10 is a side elevational view of another embodiment of this invention;

Fig. 11 and 12 are respectively end and top views in elevation of the structure of Fig. 10;

Fig. 13 illustrates the interlock of Fig. 10 arranged for normally closed contact operation;

Figs. 14 through 18 illustrate certain structural details of the embodiment of this invention shown in Figs. 10 through 13;

Fig. 19 is a variation of the structure illustrated in Fig 15; and

Figs. 20, 21 and 22 show a further variation of the structure of Fig. 15.

In general, this electrical interlock accomplishes the aforesaid objects in the manner in which the interlock plunger is mounted in the interlock casing. In all of the arrangements illustrated herein, the plunger is slidably mounted by suitable guide means which in turn is slidably mounted in the interlock casing. The guide means is movable between two positions, and in this operation carries the plunger and movable contact mounted on the plunger between the mentioned two positions. In one position of the guide means, the movable contact is completely disengaged from the stationary contacts of the interlock. In the other position of the guide means, the movable contact is engaged with the stationary contacts, affording by means of this simple manipulation of the guide means selective normally closed or normally open operation of the interlock.

One specific structure functioning according to the aforesaid general principle, is illustrated in Fig. 1 and comprises generally a casing 1 which is arranged in two halves 1*a* and 1*b*. Stationary contacts 2*a* and 2*b* are secured between the two sections of the casing 1*a* and 1*b* at the time of assembly. Openings 3*a* and 3*b* are provided in the respective casing sections 1*a* and 1*b* in positions in opposite ends of the assembled casing structure and slidably receive therein for limited outward movement the re-

spective guide members 4a and 4b. These guide members, as illustrated, are identical and as better seen in Figs. 4 and 5, are provided with outwardly projecting flanges 5, which engage suitably shaped surfaces of the respective openings 3a and 3b to limit the outward travel of the guide members. These guide members may be extrusions of sheet material or may be molded articles of any suitable material. Moreover, any suitable means for limiting the indicated outward movement of the respective guide members may be utilized.

A plunger 6 is slidably mounted through the openings 7a and 7b of the respective guide members. This plunger is a stamping of sheet material provided with a spring-receiving slot 8 having spring guide projections 9a and 9b projecting inwardly of the slot 8 from each end thereof. A coil spring 10 under a predetermined degree of compression is fitted over the spring-receiving projections 9a and 9b, and seats in the extremities of the slots 8. The length of this slot and consequently the position of the respective ends of the compression spring 10 correspond to a predetermined normal spacing of the guide members 4a and 4b along the plunger 6 for the specific interlock casing which has been illustrated.

The respective end faces 1c and 1d of the casing sections constitute the mounting faces of the interlock assembly. The details in which the interlock may be secured on a mounting surface, such as 11, which is only fragmentarily shown, have not been illustrated in the interest of simplicity since any of the numerous conventional mounting means may be utilized.

When the interlock is mounted with the face 1d against a suitable mounting surface or panel, such as 11, having an opening 12 therein sufficiently large to clear the bottom end of the plunger 6, as viewed, the guide member 4b is moved inwardly of the interlock casing to a position in which its outer face is flush with the surface 1d of the bottom section of the interlock casing. The inner edge of the opening 7b in the guide member 4b abuts the bottom end of compression spring 10 and moves the plunger 6 to the position illustrated. The upper guide member 4a rides the upper end of the compression spring 10, and as a consequence is thrust outwardly of the interlock casing to a position in which the locks 5 engage the corresponding surfaces of the opening 3a in which position the movement is stopped. As earlier noted, this position corresponds substantially to the position occupied by the upper end of the slot 8 in the plunger 6.

The movable contact assembly is also a stamping of sheet material which for this application is preferably a good conductor of electric current since the movable contact conducts current between the respective stationary contacts 2a and 2b. The plan view of the movable contact is illustrated in Fig. 2, and a sectional view taken on the line III—III of Fig. 2, and differing from that illustrated in Fig. 1, appears in Fig. 3. This movable contact 13 is provided with a slot 14 of sufficient width to clear the coils of the spring 10. Projections 15 project inwardly from each end of the slot 14 in the movable contact. This movable contact is resiliently attached to the plunger by a pair of springs 16 which are disposed between respective mounting or spring plates 17 fitted over respective projections 18 on the plunger and the respective projections 15 on the movable contact.

The arrangement is such that the springs are in compression when the movable contact is in the position illustrated against the stationary contacts 2a and 2b or when the movable contact rides against the stops 1e and 1f, which are integrally formed with the upper interlock casing section 1a. The normal position of the contacts when this assembly is mounted upon the surface 1d for the closed position which is as illustrated.

If under these conditions a force is applied to the upper end of the plunger 6 to effect movement thereof downwardly against the force of the spring 8, the spring 8 is compressed, and the projections 18 on the plunger move downwardly through the plane of the movable contact to a position below this plane in which the force of the springs 16 has a component directed towards the stops 1e and 1f. This force drives the movable contact in a snap-acting movement from its position contacting the stationary contacts into engagement with the stops 1e and 1f to open the electrical connection across the stationary contacts. When the force is removed from the plunger 6, spring bias returns the plunger to the position illustrated in which the spring-carrying projections 18 on the plunger 6 again cross the plane of the movable contact, and with a snap-acting movement, the movable contact is engaged with the two stationary contacts.

If it is desired to operate the interlock of Fig. 1 as a normally open switching device, the entire assembly is inverted, and the end face 1c of the interlock casing is positioned on the mounting surface 11 with the end of the plunger 6 projecting through the opening 12 in the mounting surface in the same manner as illustrated. In this instance, the guide member 4a is moved inwardly of the interlock casing until its outer face is flush with the plane of the mounting face 1c. The entire plunger assembly is moved by the force applied thereto through engagement of guide member 4a with the end of the compression spring 10. Projections 18 of the plunger pass through the plane of the movable contact 13, and the toggle action of springs 16 moves the movable contact into a position engaging the stops 1e and 1f. The other end of the compression spring 10, which engages guide member 4b, now thrusts this guide member outwardly of the interlock casing to a position corresponding to that illustrated in connection with guide member 4a, and the switch is now ready for use as a normally open switching device.

Although the snap-acting toggle-type operation of the movable contact, which has been illustrated in Fig. 1, may be desirable for certain circuit applications, such switching action is not required in every application. In Fig. 7, a type of mounting of a movable contact 20 is provided in which make and break operation at a speed corresponding to the speed of movement of a plunger 21 is obtained. In Fig. 7, parts corresponding to those of Fig. 1 bear like reference characters.

Plunger 21 in this application is of the configuration illustrated in Fig. 9 and is provided with two slots 22 and 23, each having spring-receiving projections 24 projecting inwardly from the ends of the slots. The inner ends of these slots are symmetrically disposed with respect to the geometric center lengthwise of the plunger and are spaced apart a distance corresponding to the thickness of the movable contact 20.

Movable contact 20 is provided with a slot 25

of slightly larger dimension in length and in width than the cross-sectional dimensions of plunger 21. This movable contact is slipped over the plunger 21, and thereafter the springs 26a and 26b are positioned in the respective slots 22 and 23 over the projections 24 to resiliently secure the movable contact substantially centrally of the plunger.

As in the case of Fig. 1, this movable plunger is mounted in suitable guide members 4a and 4b which are slidably fitted in the respective openings 3a and 3b in the respective casing sections 1a and 1b of the interlock casing 1. The stationary contacts 2a and 2b are again clamped between the respective casing sections 1a and 1b in positions to intercept the movable contact in its movement with the plunger. The interlock is assembled on the surface 11 in normally open position. In this arrangement, the guide member 4b projects inwardly of the interlock casing and the guide member 4a projects outwardly of the casing.

In its inoperative position, the plunger is supported in the position shown, that is, it is prevented from axial movement through the respective guide members by the spring 26a and 26b. When a force is applied to the upper end of the plunger 21, as viewed, the spring 26b is compressed as the plunger moves downwardly. When the movable contact 20 engages the stationary contacts, spring 26a is compressed and thus provides secure contact engagement. When the force is removed from the plunger 21, both springs 26a and 26b urge the plunger upwardly, as viewed, until such time as movable contact 20 disengages the stationary contacts. Spring 26b then restores the plunger 20 to its normal position.

As in the case of Fig. 1, this interlock assembly may be operated as a normally closed switching device by the simple expedient of inverting the assembly on the surface 11, which reverses the positions of the respective guide members 4a and 4b with respect to the interlock housing and moves the plunger therewith to a position in which the movable contact 20 engages the stationary contacts. When so mounted, application of force to the opposite end of plunger 21 separates the movable contact 20 from the stationary contacts. In this operation, compression spring 26a alone supplies the biasing force.

In the embodiments of the invention hereinabove considered, no consideration has been made with regard to structural symmetry, for example, of the sections 1a and 1b of the interlock casing. It is believed that structural symmetry of such items is desirable from a manufacturing point of view since the number of production tools required to produce the parts for the unit may thereby be minimized. Inasmuch as such design problems are believed to be within the capacities of those skilled in the art, no effect has been made herein with regard to these two embodiments to illustrate symmetrical designs.

That such symmetry, however, is feasible, is illustrated in that embodiment of the invention illustrated in the remaining figures of the drawings. This will be appreciatied by reference to Figs. 10, 11 and 12, illustrating an improved embodiment of this invention.

By particular reference to Fig. 10, it will be seen that the interlock casing 27 is comprised of a pair of identical upper and lower sections as viewed, designated 27a and 27b. The general structural features of this interlock arrangement are similar in principle to those illustrated in Figs. 1 and 7, and afford certain advantages thereover, as will be apparent from the following discussion.

In this assembly, a pair of identical stationary contacts are gripped between the respective housing sections 27a and 27b. These stationary contacts are designated 28a and 28b, and are provided with similarly shaped offset contact ends. These ends project into the casing into positions to be straddled by the movable contact 29.

The plunger 30 of this embodiment is detailed in planform in Fig. 14 and is provided with a pair of spaced slots 30a and 30b adjacent opposite ends thereof, and is further provided with T-shaped projections 30c and 30d which project laterally thereof at the center of the plunger. These projections provide spring seats 30e which are spaced apart a distance corresponding to the thickness of the movable contact 29. The movable contact is provided with a longitudinal slot of a width corresponding to the thickness of the plunger material and of the length to straddle the T-shaped projections 30c and 30d.

The plunger is slidably mounted in a yoke 31 which is comprised of two identical stamped and formed sheet metal sections 31a and 31b of the general configuration illustrated in perspective in Fig. 15. Opposite ends of this yoke are provided with U-shaped sections 31c which are displaced in the same direction from the plane of the section and of an internal width corresponding to the thickness of the plunger 30. The depth of the U-shaped section 31c corresponds roughly to a little more than half the width of the plunger body. When these items are assembled as illustrated in Fig. 10, for example, the U-shaped sections 31c forming a bearing or guide for sliding movement of the plunger therethrough. The distance between the outer ends of the respective slots 30a and 30b in the plunger corresponds to the internal longitudinal dimension of the respective yoke sections.

In the assembly of this structure, the movable contact 29 is slipped over the plunger 30 to its normal position centrally thereof. Respective spring plates 32 are then slipped over the plunger from opposite ends thereof to abut opposite sides of the movable contact 29. Respective springs 33a and 33b are then slipped over the opposite ends of the plunger 30, the inner ends of these springs abutting the respective spring plates 32. The outer ends of of the springs 33a and 33b are shaped as illustrated in the perspective detail of Fig. 16, having a diametrically disposed end piece 33c fitting through the respective slots 30a and 30b in positions engaging the confronting inner ends of the yokes assembled about the plunger. Thus, outward travel of the outer ends of the respective springs is limited by the respective slots 30a and 30b, while travel of the mentioned outer ends of the springs inwardly or in compression is obtainable within the limits of the lengths of the respective slots 30a and 30b.

The respective ends 27c and 27d of housing sections 27a and 27b are provided with openings of the configuration shown in Fig. 18. In this figure, a circular opening 34 is provided with diametrically disposed slots 34a. The diameter of the opening 34 is sufficient to clear the dimension across the U-shaped sections of the assembled yoke, and the dimension between the bottoms of the slots 34a is sufficient to clear the side sections of the assembled yoke and func-

tion as a guide for the side sections to prevent rotation of the yoke in the interlock casing.

The longitudinal dimension of the yoke is greater than the dimension across the faces 27c and 27d of the interlock casing. As a consequence, when the interlock is mounted on any one of its mounting surfaces, for example, the surface 27d as shown in Fig. 10, the bottom end of the yoke is moved upwardly into the plane of the mounting surface, and the upper end projects above the top of the casing. In view of the connection between the yoke and the plunger by means of the respective springs 33a and 33b, the plunger assembly including the movable contact is displaced upwardly with respect to the casing to a position in which the movable contact is disengaged from the stationary contacts. This constitutes the normally open position of the interlock assembly. When force is applied to the upper end of the plunger 30 moving the plunger downwardly, spring 33a is compressed at the time movable contact 29 engages the stationary contacts. Spring 33a is moved in compression until the downward limit of travel of the plunger is reached. When the plunger is released, both springs thrust the plunger upwardly, and when movable contact 29 disengages the stationary contacts, spring 33b returns the plunger to the position illustrated.

In this construction, provision is made to limit the extent of axial movement of the plunger and yoke assembly with respect to the casing to that which is required for positioning either end of the yoke in the plane of the respective mounting faces 27c and 27d. This is accomplished by means of lugs 31d which project from opposite sides of the yoke in diagonally disposed positions. These projections or lugs, when the yoke is assembled, occupy positions longitudinally of the yoke assembly, and consequently constitute a limit of movement for either direction of movement of the plunger and yoke assembly with respect to the casing. By making the sections of the yoke with the diagonally disposed projections 31d, the sections of the yoke may be assembled in face-to-face relation without regard for the positions of the projections as would be the case if but one lug per section were used.

Alternatively, the yoke 31 may be a molded item, as illustrated in Fig. 19, and designated 31f. Such a molded item may be a semi-cylindrical structure having a slot 31g longitudinally disposed centrally thereof for the purpose of clearing the movable contact 29 and further provided with the slots 31h in the respective ends to receive and guide sliding movement of the plunger 30. Projections or lugs 31k correspond to projections 31d of Fig. 15. The principles of this construction, together with its function, will be understood from the discussions concerning the respective yoke sections 31a and 31b.

Figs. 20, 21 and 22 are three views of a single piece plunger guide having box-shaped end sections 40 interconnected by legs 41 which are spaced apart laterally a distance sufficient to clear contact supporting springs such as 33a and 33b. The end faces of sections 40 are each rectangularly slotted at 42 to receive the plunger such as 30. Lugs 44 project from the slotted end faces to prevent the plunger guide from sliding out of the housing after assembly. The same principles regarding overall plunger guide length apply here as in the structure of Fig. 10, for example.

Fig. 13 illustrates the application of the embodiment of the invention in Fig. 10 as a normally closed interlock. In accomplishing this, as in the previously described embodiments, the interlock assembly is inverted, the surface 27c being mounted upon the indicated mounting surface. The yoke and plunger assembly is now displaced in a direction to engage the movable contact 29 with the stationary contacts 28a and 28b. Some overtravel is provided in this case as in the previously described cases so that the contact faces are engaged before the end of the yoke is positioned in the plane of the mounting face 27c. Thus, the spring 33a is compressed, and a contact making force is applied to the contact assembly.

The arrangement shown in Fig. 13 can be modified to operate a little differently by eliminating the upper portion of the housing, as viewed, securing the plunger guide in the bottom part of the housing, providing a slightly stiffer spring 33a than 33b so that contact 29 when released from contacts 28a and 28b will occupy a normally open position thereabove and riveting contacts 28a and 28b in the position shown so that they may be swung aside about the rivet to release moving contact 29 which would then be forced up by spring 33b to a position above contacts 28a and 28b for normally open operation, after which contacts 28a and 28b are swung back.

From the foregoing considerations, it will be appreciated that the various objects of this invention hereinbefore enumerated, together with other objects which have since become obvious, have been accomplished in each of the several embodiments herein illustrated and described, and that these objects are accomplished by the simple expedient of affording a degree of relative movement between a plunger and a plunger guide, and slidably mounting such plunger guide in the interlock casing.

In the illustration and description of this invention, certain specific structures for accomplishing the given end have been illustrated. However, there are many other ways in which this basic mechanical principle may be practiced in such structures without departing from the spirit and scope of this invention. For example, in all of the illustrated embodiments, the guide means has been designed to project from the casing so that when a particular mode of operation of the interlock is desired, it may be easily obtained by the simple expedient of mounting the proper surface of the interlock casing against the mounting handle or surface for the interlock. The guide means by engagement with the surface of the mounting panel is therefore moved in the proper direction and in the proper amount to pre-position the interlock mechanism for the required mode of operation.

While it is thought that such an arrangement represents a convenient and substantially foolproof design, it will be appreciated that this same principle may be practiced with guide or yoke assemblies which do not project from the interlock casing but which lie wholly within the interlock casing. Such guide means may then be reached through suitable access holes in the casing proper with a screwdriver or other suitable instrument, and pushed in the required direction to lock the movable contact assembly in a position to give the required mode of operation. With such an arrangement, the guide means may be suitably frictionally engaged with the casing so that movement during normal operation will not obtain, or stated otherwise, so that move-

ment unless by the instrumentality suggested will not occur.

Likewise, although this interlock has been illustrated with a single set of contacts which are bridged by the longitudinal dimension of a current carrying movable contact, will be appreciated that contact assemblies involving bridging of stationary contacts across its lateral dimension at each end of the movable contact may also be provided.

Accordingly, it is intended that the foregoing disclosure and the showings made in the drawing shall be considered only as illustrative of the principles of this invention and not interpreted in a limiting sense.

I claim as my invention:

1. An electrical switch interlock comprising, a casing having openings through opposite end faces thereof, guide means slidably supported in said openings, a plunger slidably mounted in said guide means and projecting out of said guide means at each end of said casing, spring means axially disposed of and mounted on said plunger, said spring means having displaceable end portions on said plunger adjacent confronting portions of said guide means, stationary contact means mounted in said casing, movable contact means mounted on said plunger to move therewith between positions engaging and disengaging said stationary contact means, the outer end faces of said guide means defining a dimension therebetween greater than the dimension between said end faces of said casing, said guide means being movable between two positions in said casing and moving said plunger therewith, affording selectively normally open and normally closed positioning of said movable contact with respect to said stationary contact means.

2. An electrical switch comprising, a casing having openings through opposite end faces thereof, contact actuating means including a plunger and guide means slidably engaging said plunger at spaced points on said plunger, said guide means being slidably mounted in said openings, spring means on said plunger having end portions displaceably engaged with said plunger at said spaced points, corresponding portions of said guide means engaging said end portions of said spring means, the outer end faces of said guide means defining a dimension greater than the dimension across the end faces of said casing, stationary contact means mounted in said casing, movable contact means mounted on said plunger for movement with said plunger between positions engaging and disengaging said stationary contact means, said guide means because of engagement with said spring means being effective to displace said plunger and movable contact between normally open and normally closed contact positions upon sliding movement of said guide means through said openings.

3. An electrical switch comprising, a casing having openings through opposite end faces thereof, stationary contact means mounted in said casing, a plunger, spring means axially disposed of said plunger and having end portions displaceably connected to said plunger at spaced points therealong, guide means slidably mounted in said openings and slidably mounting said plunger through said casing, corresponding confronting end portions of said guide means engaging said end portions of said spring means, said guide means having a dimension across the outer end faces thereof greater than the dimension across the opposite end faces of said casing, movable contact means mounted on said plunger to move therewith between positions engaging and disengaging said stationary contact means, said guide means because of engagement with said spring means being effective to displace said plunger and movable contact between normally open and normally closed contact positions upon sliding movement of said guide means through said openings.

4. An electrical switch comprising, a casing having openings in opposite ends thereof, stationary contact means mounted in said casing, a plunger, spring means axially disposed of said plunger and having end portions displaceably connected with said plunger at axially spaced points, movable contact means mounted on said plunger, guide means slidably mounted in said openings and slidably mounting said plunger therethrough and engaging said end portions of said spring means, sliding movement of said guide means through said openings displacing said plunger and movable contact means with respect to said stationary contact means between normally open and normally closed contact positions.

5. An electrical switch comprising, a casing, stationary contact means mounted in said casing, guide means slidably mounted in said casing, a plunger slidably mounted in said guide means, movable contact means mounted on said plunger, spring means on said plunger and engageable with said guide means for biasing said guide means and said plunger toward given relative axial positions, said guide means being movable between two positions in said casing and moving said plunger therewith, affording selectively normally closed and normally open positioning of said movable contact with respect to said stationary contact means.

6. An electrical switch comprising, a support, stationary contact means mounted on said support, guide means slidably mounted on said support, a plunger slidably mounted on said guide means, movable contact means slidably mounted on said plunger, spring means interconnecting said plunger, said guide means and said movable contact means for biasing said plunger, said guide means and said movable contact means into a given relative axial relationship; said guide means being slidable on said support between two positions, respectively, normally engaging and normally disengaging said moving contact means with said stationary contact means.

7. An electrical switch comprising, a support, stationary contact means mounted on said support, guide means slidably mounted on said support, a plunger slidably mounted on said guide means, movable contact means slidably mounted on said plunger, spring means interconnecting said plunger, said guide means and said movable contact means for biasing said plunger, said guide means and said movable contact means into a given relative axial relationship; said guide means being slidable on said support between two positions, respectively, normally engaging and normally disengaging said moving contact means with said stationary contact means, and projections at spaced points on said guide means engageable with cooperating portions of said support for limiting the extent of sliding movement of said guide means on said support.

8. An electrical switch comprising, a support, stationary contact means mounted on said support, a moving contact, a plunger slidably mounting said moving contact, guide means comprising

a pair of sections having slots therein, said guide means straddling said plunger from opposite sides thereof and slidably mounting said plunger in said slots, spring means engaging said guide means, said plunger and said moving contact for biasing said guide means, said plunger and said moving contact into a given relative axial relation, said guide means being slidable on said support between two positions respectively normally engaging and normally disengaging said moving contact with said stationary contact means.

9. An electrical switch comprising, a support, stationary contact means mounted on said support, a moving contact, a plunger slidably mounting said moving contact, guide means comprising a pair of sections having slots therein straddling said plunger from opposite sides thereof slidably mounting said plunger in said slots, spring means engaging said guide means, said plunger and said moving contact for biasing said guide means, said plunger and said moving contact into a given relative axial relation, said guide means being slidable on said support between two positions respectively normally engaging and normally disengaging said moving contact with said stationary contact means, and projections at longitudinally spaced points on at least one of said sections and engageable with cooperating portions of said support for limiting the extent of sliding movement of said guide means on said support.

10. An electrical switch comprising, a support, stationary contact means mounted on said support, a plunger guide slidably mounted on said support and having a pair of interconnected longitudinally spaced end sections each having an opening therein, a plunger slidably fitted through the openings in said plunger guide, a pair of compression springs coaxially disposed about said plunger, the outer ends of said compression springs each releasably engaging a cooperating portion of said plunger adjacent the respective end sections of the plunger guide, a moving contact slidably disposed on said plunger between said compression springs, said plunger guide being slidable on said support between positions normally engaging and disengaging said moving contact with said stationary contact.

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