April 3, 1951 A. S. CASWELL 2,547,153

DOUBLE THROW CLAMPING SWITCH

Filed Aug. 21, 1946 3 Sheets-Sheet 1

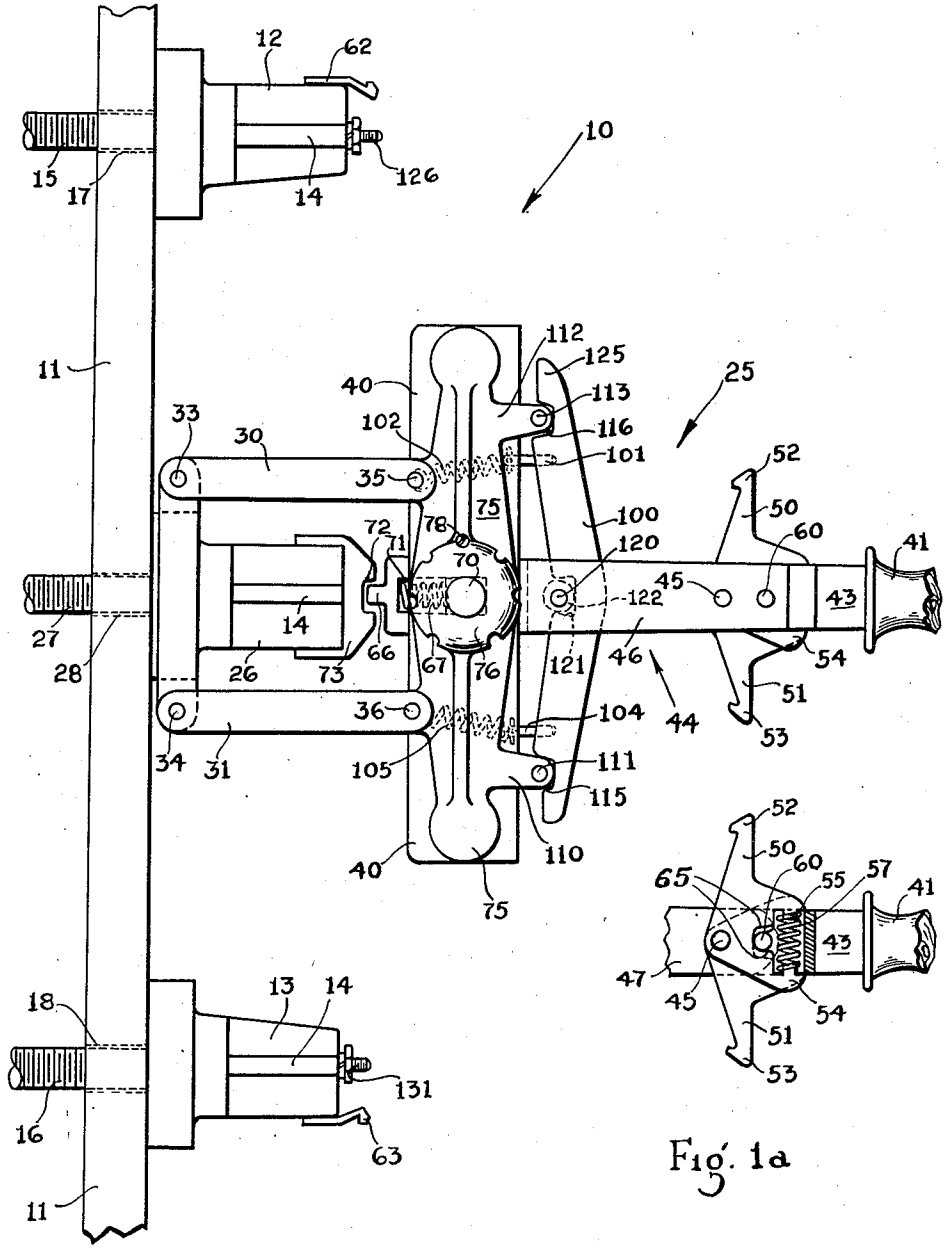


Fig. 1

Fig. 1a

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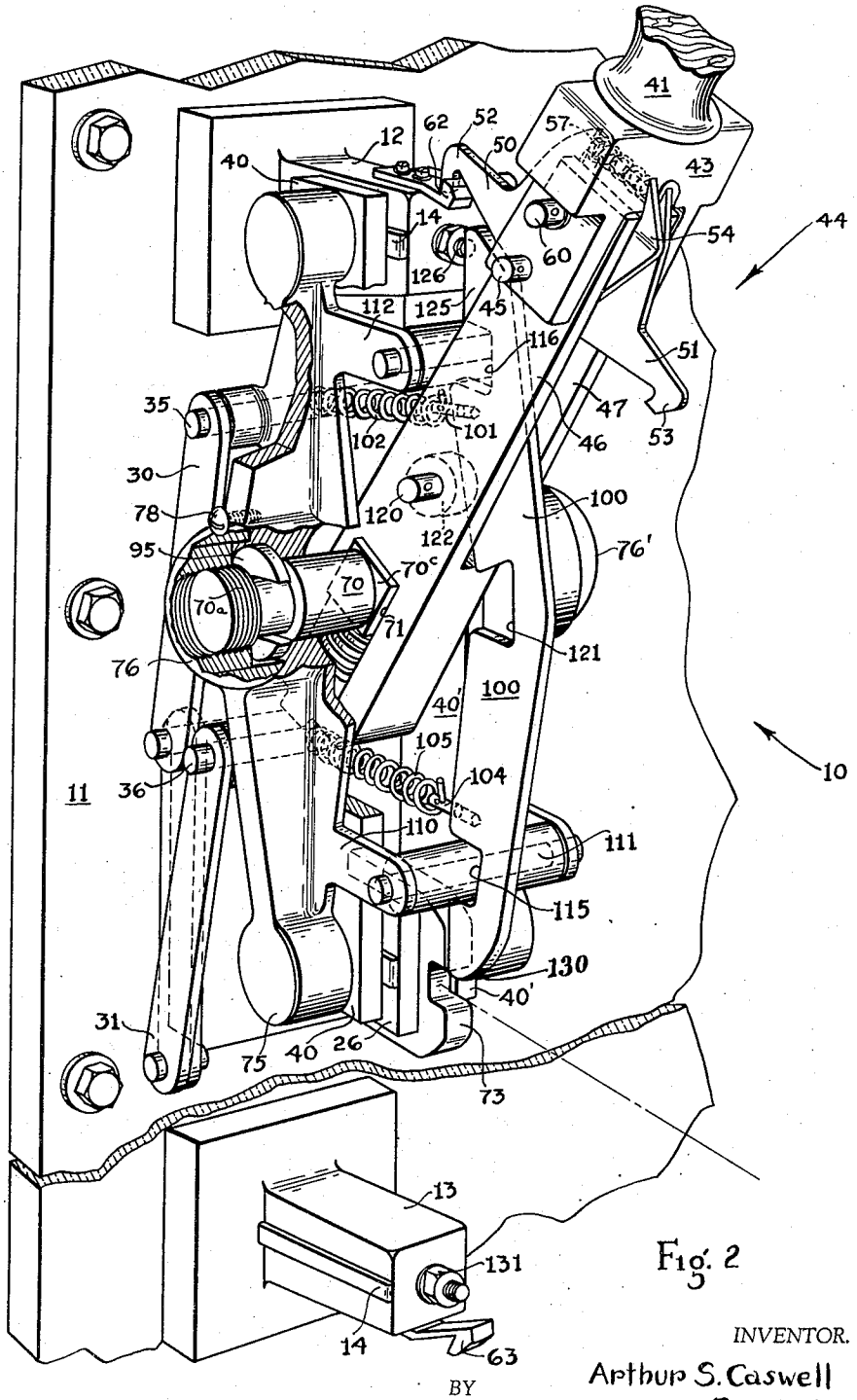


Fig. 2

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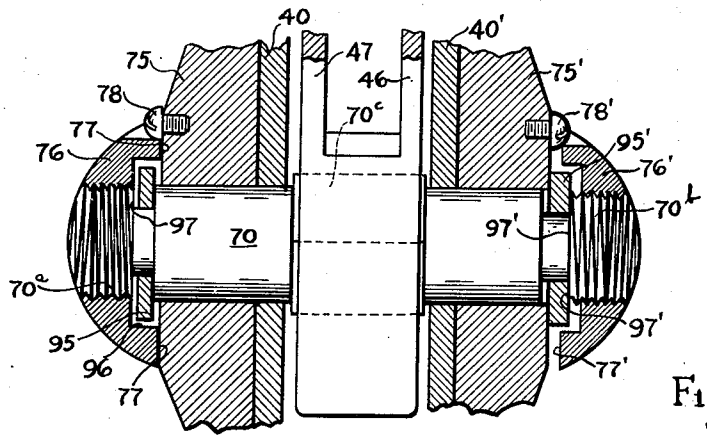


Fig. 3

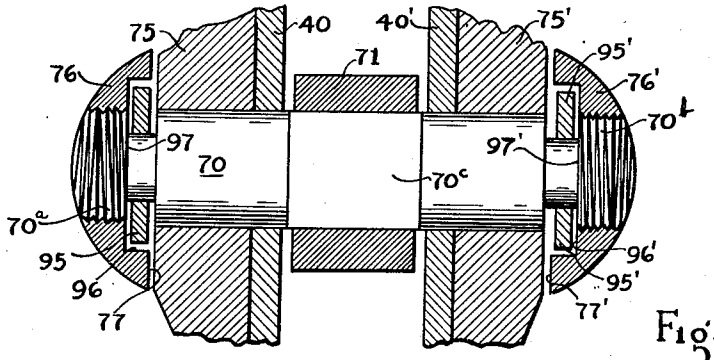


Fig. 4

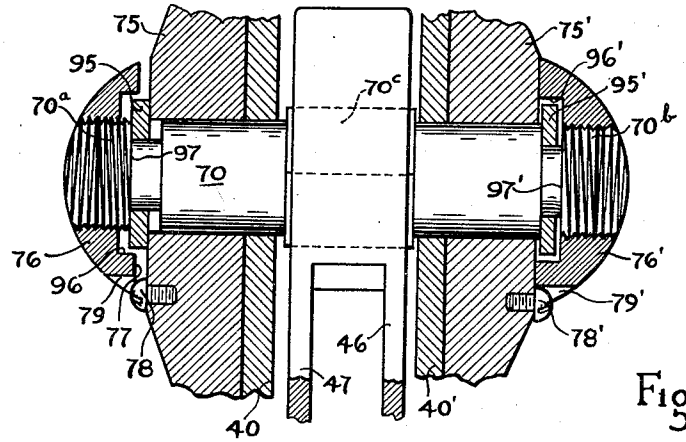


Fig. 5

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UNITED STATES PATENT OFFICE

2,547,153

DOUBLE-THROW CLAMPING SWITCH

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1 Claim. (Cl. 200—170)

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My present invention relates to switchgear and more particularly to double throw switchgear arranged to engage the movable contact with the stationary contacts in a tight clamping arrangement in each position of the double throw switch.

Heretofore in switchgear of the knife switch type, it has been customary to provide a clamping arrangement for interengaging the movable element of the knife switch with the stationary contact. A portion of the closing movement of the switch was used to bring the movable contact or blade up into registry with the stationary contact and the remaining movement of the switch handle performed the clamping action. This type of clamping action is shown in the Scott Patent 2,246,072, assigned to the assignee of the present invention.

However, the problem becomes more complex in double throw switches where the movable contact blade has a neutral position as well as two separate contacting positions 180° apart.

Various means have been attempted to provide for adequate clamping pressure at both contacting positions of the knife blade but these have resulted either in extremely complex duplicate clamping mechanisms or in having a clamped contact arrangement at one position only with the other position being subjected to only light clamping engagement.

In general, my invention contemplates the utilization of a single right hand thread screw member which will be actuated when the switch is closed in either direction to clamp the switch blades tightly across the contacts, although it will be understood that a left handed screw may be employed, if desired.

More specifically, my invention contemplates a clamp tight switch arrangement in which the movable contact carrying arm is mounted on a screw member threaded at both ends. The switch is a two-blade single pole switch and is so arranged that when the contact is moved into either of its contact engaging positions, it is clamped against the stationary contact members.

When the contact member is in one of its contact engaging positions, the screw member is rotated clockwise. Clockwise rotation causes the screw to react on a nut at one end as at the left end through the nut to compress the contact member against the stationary contact, the direction of the clamping force being opposite to the direction of axial movement of the screw member.

The same clockwise rotation of the screw member causes the other end of the screw to directly compress the movable contact against the opposite side of the fixed contact, the force being in the same direction as the axial movement of the screw member.

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When the movable contact is moved to its opposite pole, the screw member is rotated counterclockwise. Counterclockwise rotation of the screw member causes the screw to rotate on the nut located on the opposite side from the above described nut, namely, on the right hand and through this other nut to compress the movable contact against the fixed contact in a direction opposite to the axial movement of the screw member. The same counterclockwise rotation causes the other end of the screw member to directly compress the movable contact against the fixed contact into the same direction as the axial movement screw member.

Summarizing the above, a screw member arrangement is thus provided which clamps a movable contact against one of its two pole terminals when the movable contact is moved clockwise and clamps it against the other of its two pole terminals when the movable contact is moved into opposite counterclockwise direction.

Accordingly a primary object of my present invention is to provide a simple clamping mechanism primarily for a double throw knife type switch wherein a single clamping member and single operating means therefor is effective to create proper contact engaging clamping pressure at both contact closing positions of the knife switch.

Another object of the present invention is the provision of clamping means for a double throw knife type switch wherein the clamping means is released when the switch blade is in neutral intermediate position but wherein the clamp is operated to engaged position on movement of the switch handle in either direction from the neutral.

Another and important object of my invention is the construction and arrangement of the operating mechanism so that the movable contacts will be clamped only when engaged with the stationary contacts.

A further object of my invention is the arrangement of the operating mechanism of my switch to ensure appropriate sequential operation of the contact and clamping mechanism to clamp the contacts in engagement only after contact is fully made.

The foregoing and many other objects of my invention will become apparent in the following description and drawings in which

Figure 1 is a side view showing the general operation of my novel clamping means for a double throw knife type switch.

Figure 1*a* is a detail view of the handle locking mechanism of my novel switch.

Figure 2 is a perspective view showing my novel switch in the upper connected position partially broken away to show the operation of the clamping means and the double dog latch.

Figure 3 is a cross sectional view of the clamping mechanism 70 when the switch is in the upper connected position.

Figure 4 is a view corresponding to that of Figure 3 showing the arrangement of the clamping mechanism when the switch is open with the switch handle in the neutral position.

Figure 5 is a view corresponding to Figure 3 showing the arrangement of the clamping mechanism with the switch in the lower connected position.

Referring now to Figure 1, my novel double-throw knife type switch 10 is mounted on an insulating panel 11 which carries the upper stationary contact terminal 12 and the lower stationary contact 13. Contact terminals 12 and 13 are supplied with special contacting surfaces 14, 14 and are connected to connection studs 15, 16 which pass through appropriate openings 17, 18 in the insulating panel 11.

The movable contact assembly 25 is mounted on the central terminal block 26 which in turn is conductively secured to the back connection stud 27 which passes through opening 28 in insulating panel 11. Terminal block 26 carries the pair of upper link members 30 and the pair of lower link members 31 pivotally secured thereto at pivots 33 and 34, respectively. The opposite ends of the upper link members 30 are pivotally secured by the rivets 35 to the clamp plate 75 hereinafter described. The lower link members 31 are similarly pivotally secured by the rivets 36 to the clamping plate 75.

My novel device is so arranged, as hereinafter described, that the contact plates or blades 40 are bridged and clamped across central terminal block 26 and contact terminal 12 in the upper closed position of the switch, and across terminal 26 and contact terminal 13 in the lower closed position of the switch; but that in any intermediate position, the plates or blades 40 will be spaced apart sufficiently so that they may readily move from one contact bridging position to the other.

In operation, when the switch is in the up position of Figure 2, the initial downward movement of handle 41 will release the clamp which holds the contact plates 40 tightly against the stationary contact 12 and terminal 26. Subsequent downward movement of handle 41 will move the contact plates 40 down to the neutral position shown in Figure 1. Still further downward movement of handle 41 will bring the contact plates 40 into registry with the lower stationary contact 13 and terminal 26. The final downward movement of handle 41 will clamp the contact plates 40 tightly against the lower contact 13 and the terminal 26.

The entire clamping action is accomplished by a single clamping screw hereinafter described which screw will effect the clamping operation when it is turned clockwise with respect to Figure 2 when the switch handle 41 is raised; and counterclockwise with respect to Figure 2 as the switch handle 41 is lowered to the down position.

The switch handle 41 is, as shown in Figure 2, secured in any suitable manner to the bracket 43, which bracket 43 is mounted for limited rotation on the pin 45 carried between the side members 46, 47 of the handle assembly.

Latches 50 and 51 as shown in Figures 1 and 1a, are also rotatably mounted on pin 45 and are each provided with latch tip elements 52, 53 respectively and dog leg portions 54, 55 respectively. Dog leg portions 54, 55 of latches 50 and 51 extend

up on either side of pin 60 which is carried between the plates of bracket 43.

When the handle 41 and the entire movable contact assembly 25 are raised to the upper contacting position, latch tip 52 of latch 50 engages the keeper 62 at the top of stationary contact element 12. Similarly when the handle 41 and the movable assembly 25 are in the lower position, latch tip 53 of latch 51 engages the keeper 63 on the lower stationary contact 13. These latches thus prevent the handle assembly, including the movable contact, from dropping down or being physically shocked out of engaged position and thus actually relieving the clamping pressure on the contact blades 40. These latches also prevent the blade from being blown off in case of excessively high current.

When, however, with the elements shown in Figure 2, handle 41 is pulled down, handle member 43 bears against dog leg 54 of latch 50 and rotates latch 50 clockwise to disengage latch tip 52 from keeper 62. Further downward movement of handle 41 brings the projection 65 of the latch 50 against the stop pin 60 to prevent further movement of handle member 41 and handle member 43 around the pin 45 so that the entire contact assembly now rotates about the pivots 33 and 34 to move down.

Similarly, when the lower contact 13 is engaged, a lift of handle 41 will first cause pin 60 to engage dog leg 55 of latch 51 to disengage latch tip 53 from keeper 63 and subsequent lifting of handle 41 causes latch 51 to bear against the opposite side of member 65 so that further lifting of handle 41 causes the contact assembly to rotate upwardly around pivots 33 and 34. This movement of the entire contact assembly 25 around pivots 33 and 34 is in addition to the movement of the plates 46, 47 around the center of clamp operating screw 70 hereinafter described.

When the contact assembly 25 is in the neutral central position shown by Figure 1, projection 66 is pressed by the compression spring 67 into the notch 72 of the central extension 73 of the terminal 26, mounted on the front of panel 11 and thus maintains the entire movable contact 25 in neutral position.

In order to rotate the movable contact assembly 25 to the upper connected position of Figure 1 the handle 41 is first pulled to the right with respect to Figure 1. This compresses the spring 67 and removes the projection 66 from the centering notch 72 in the central extension 73 and permits the entire contact assembly 25 to be rotated around the pivots 33 and 34 until the contact blades 40—40' are in engagement with the upper stationary contact terminal 12 and the central contact terminal block 26. At this point further upward motion of the handle 41 will rotate the operating handle assembly 44 in a counter-clockwise direction, with respect to Figures 1 and 2, to cause the contact blades 40 to be clamped tightly against the upper and central terminals as hereinafter described.

The same action occurs, of course, during downward movement of the contact assembly 25 toward 13.

Thus the movable contact assembly 25 when it is in any of the three positions above set forth actually has three centers of rotation. First the handle 41 and its bracket 43 rotates about pin 45 to disengage either the latch 50 or 51 depending on whether contact is made at the top or bottom. Second, the contact assembly is then rotated to its next position about the centers 33 and 34.

Thirdly, after either contacts 12 or 13 have been engaged, the handle assembly rotates about the screw 70 to clamp the contact blades 40 against either of the stationary contacts 12 or 13 and terminal 26.

The first and second centers of rotation (pin 45, and pivots 33 and 34) have already been described both as to characteristics and operations. The operation of the third center of rotation (about screw 70) in order to clamp the movable contact blades 40 against either of the stationary contacts is shown more specifically in connection with Figures 3, 4 and 5.

Each of the pair of movable contact blades 40 and 40' is provided with a clamping plate 75, 75'. The clamping nuts 76 and 76' bear against the clamping p'ates 75 and 75' in order to exert pressure on the blades 40 and 40'. The clamping nuts 76 and 76' are adjusted and locked by set screws 78, 78' registering and engaging some of the notches 79, 79' of each of the nuts 76, 76'; the set screws being threaded into appropriate threaded openings in the clamping plates 75, 75'.

It should first be pointed out that the clamping screw 70 is a right hand threaded screw and that this single screw is utilized to perform the clamping function at both the top and bottom position. The advantage of this type of construction lies in the fact that right hand threads are standard practice in the manufacture of screws and thus eliminates the necessity for a special machining operation requiring composite threading; and also the arrangement shown in Figures 3, 4 and 5 is such that for the first time a clamping action is accomplished by rotating an ordinary right-hand clamping screw in either a clockwise or counterclockwise direction. It will be understood, however, that a left-handed screw may be used or a double threaded screw at opposite ends may be employed for direct action in place of the reaction on the nut.

The handle assembly 44 is keyed to the clamping screw 70 through the rectangular recess 71. Clamping screw 70 is a substantially cylindrical member as shown having a squared portion 70c. Handle assembly 44 is provided with a matching rectangular recess 71 receiving the squared portion 70c of the member 70. Clamping screw 70 is provided with the threaded end 70a engaging the threads of nut 76 and the threaded end 70b engaging the threads of nut 76'.

When the movable contact assembly 25, including the operating handle assembly 44 has moved the blades 40 and 40' to the upper contacting position, the blades 40, 40' and the clamping plates 75, 75' can no longer move counterc'ockwise. Thereafter further lifting of the handle 41 rotates the screw 70 in a counterclockwise direction, with respect to Figure 1.

This rotation about the center of the screw 70 occurs after the entire assembly has been rotated around the pivots 33 and 34 to the upper bridging position. This rotation now unwinds the threaded end 70b of clamping screw 70 from the right-hand clamping nut 76', and turns the threaded end 70a into the left-hand clamping nut 76, Figure 3.

Since the clamping nuts 76 and 76' are prevented from rotating by the set screws 78, 78' the further rotation of the operating handle 44 draws the face 77 of the clamping nut 76 against the clamping plate 75 and the annular shoulder 97' of the screw 70 against the right hand clamping washer 95' forcing the washer against the right hand clamping plate 75'.

In this position the corresponding left-hand clamping washer 95 in recess 96 of left-hand end of the screw 70 is loose.

Thus, the further rotation of screw 70 above described will draw the clamping plates 75, 75' together to exert clamping pressure on blades 40, 40' and drive the blades into tight clamping engagement with contacts 12 and 26.

This pressure is obtained as shown by clamping nut 76 firmly engaging clamping plate 75 and by clamping washer 95' firmly engaging clamping plate 75'.

The reverse or opposite action of the above procedure takes place when the handle assembly is moved downwardly as shown in Figure 5. Here the screw 70 is turned clockwise with respect to Figure 1 and draws the right-hand clamping nut 76' against the right-hand clamping plate 75' and the left-hand clamping washer 95 against the left-hand clamping plate 75, thereby exerting clamping pressure on the switch blades 40, 40'.

The entire assembly is released and returns to neutral position as shown in Figure 4 on movement of the switching members from the position of Figure 3 or the position of Figure 5 (the up or down positions) toward the central or neutral position.

By means of the foregoing it will thus be seen that a single member having ordinary simply machined right-hand threads at each end may readily be used to provide an effective clamp for a double throw knife blade type switch wherein the bridging or connecting blades are effectively clamped at both the upper and lower positions.

In constructions heretofore proposed, the mechanism corresponding to handle assembly 25 is so arranged in relation to the clamp tightening screw 70, the clamps 75 and the contact blades 40 that should the operator be careless, it may be possible for him to rotate the handle assembly with respect to contact blades 40 and clamps 75 to tighten the clamps before the blades are across the contacts 12 and 26 or contacts 13 and 26.

A skilled operator may, however, be relied on to hold the handle assembly 25 horizontally while raising the contacts to the upper bridging condition or lowering them to the lower bridging condition. However, should an unskilled operator undertake to operate my novel switch, he may accidentally rotate the handle assembly 25 with respect to the contact blades 40 and clamps 75 before the contacts are engaged; or when the contacts are engaged, for instance, in the up position, he may pull the handle down through its complete rotation about the center of screw 70 to reclamp the blades across the up contact position without removing the blades from its up contact position.

Accordingly, my invention provides for a double dog latch 100 which is secured to the contact assembly. The upper end of the double dog latch 100 has an extension 101 secured to the tension spring 102 which in turn is secured to the rivet 35 carried by the clamping plates 75, 75'. The lower end of double dog latch 100 also has an extension 104 connected to the tension spring 105 which in turn is connected to the rivet 36.

The tension springs 102—105 maintain the double dog latch 100 in a position substantially parallel to contact blades 40, 40' and thus carries the double dog latch 100 along with the contact blades. The lower end of clamps 75 are provided with extensions 110 carrying the latch roller 111 between them. Similarly, the upper ends of clamps 75 are provided with extensions

112 carrying the latch roller 113 between them.

The double dog latch 100 is provided with recesses 115 and 116 receiving respectively the rollers 111 and 113. The handle assembly 44 is provided with the pin 120 which supports the latch roller 122 in the central recess 121 of the double dog latch 100 when the movable contact assembly 25 is not in either the upper or lower connected positions. In the open horizontal position of the switch, the roller 122 of handle assembly 44 is held in the latch recess 121. As the handle assembly 44 is raised to bridge the blades 40 across contacts 12 and 26, the engagement of roller 122 in latch recess 121 prevents handle assembly 44 from rotating with respect to blades 40 and clamps 75. Consequently the entire assembly rotates on the pivots of links 30 and 31.

When the upper position is reached, the upper end 125 of double dog latch 100 strikes against adjusting pin 126 of the upper contact 12 and further lifting movement of handle assembly 44 causes the upper end 125 of double dog latch 100 to rotate outwardly or clockwise. By this time contact blades 40 are across contacts 12 and 26 but unclamped. As the double dog latch 100 is rotated outwardly clockwise by adjusting pin 126 engaging its end 125 as above described, the latch recess 121 is disengaged from latch roller 122 of handle assembly 44 and the handle assembly 44 may now rotate about the center of screw 70 to the position where latch roller 122 will reach the location shown in Figure 2.

At this time, therefore, handle assembly 44 rotates about the center of screw 70 with respect to the contact blades 40 and clamps 75 thus clamping the contact blades 40 across contacts 12 and 26 as above described.

When the switch is opened, handle assembly 44 is first unlatched as previously described, and then rotated downwardly or in a clockwise direction. As it rotates downwardly, it rotates about the center of screw 70 thus unclamping the blades 40.

When the unclamped position is reached, latch roller 122 has moved from the location of Figure 2 into the latch recess 121. Thereafter further pulling down of handle assembly 44 pulls the contact 40 out from across contacts 12 and 26 and the rotation of the entire moveable contact assembly 25 is controlled by links 30 and 31. Thus the handle is controlled so that it cannot clamp the contact blades together until after the contact blades are across the terminals.

During the opening operation after the contact blades are unclamped, further movement of the handle assembly toward neutral position must be followed by movement of the contact blades toward neutral position owing to the engagement of roller 122 in latch recess 121. Accordingly the clamp cannot be operated until after the bridging contacts have been engaged across the terminals and also the clamp cannot be operated falsely by a complete rotation of handle assembly 44 to reclamp across the same terminals. The motion which opens the clamp must necessarily be followed by movement of the switch blades toward neutral position.

Similarly when the contact blades 40 and clamps 75 are moved to a position where they bridge terminals 13 and 26 in the down closed position of the switch, end 130 of double dog latch 100 first strikes adjusting pin 131 on the lower terminal 13. This occurs just after the contact blades 40 have moved to a position bridging terminals 26 and 13.

When the lower end 130 of double dog latch 100 is thus moved out, latch roller 122 is then released from the latching recess 121 so that the handle assembly 44 may then be moved down to clamp. Similarly during opening from the bottom closed position toward neutral, the handle assembly 44 first rotates about the center of screw 70 to release the clamping engagement of the switch blades across the lower contact position and then the roller 122 engages in recess 121 so that further lifting of handle assembly 44 moves the switch blades from the lower contacting position back toward neutral.

By this means therefore, the clamping operation is made fool-proof and the switch may be operated to the up or down position and will not be clamped until after the contacts have been engaged and will also not be accidentally reclamped across the same set of contacts when the intention is to open the contacts.

Thus, even an unskilled operator may operate the switch of my invention moving the switch blades across the contacts and thus clamping them in the appropriate sequence or unclamping the switch blades and removing them from across the contacts also in proper sequence.

In the foregoing I have described my invention solely in connection with a specific preferred embodiment thereof. Since many variations and modifications of my invention should now be obvious to those skilled in the art, I prefer to be bound not by the specific disclosure herein contained, but only by the appended claim.

I claim:

A double throw switch comprising a first contact, a second contact, a switch blade carrying a contact and having a neutral position and movable in one direction to engage said first contact and in the opposite direction to engage said second contact, a screw clamp member arrangement carried on and rotated by said blade to clamp said switch blade contact against said first contact when the movable contact is moved clockwise and clamp it against said second contact when the movable contact is moved into opposite counterclockwise direction, a double dog latch secured to and operable with said blade, spring means for maintaining said latch substantially parallel to said switch blade in its movement, said latch preventing rotation of said screw member until contact engagement between said switch arm and first or second contact occurs, and means automatically operative when contact engagement is effected for moving said double dog latch to permit rotation of said screw by said blade for effecting clamping engagement.

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