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DISCONNECTING SWITCH

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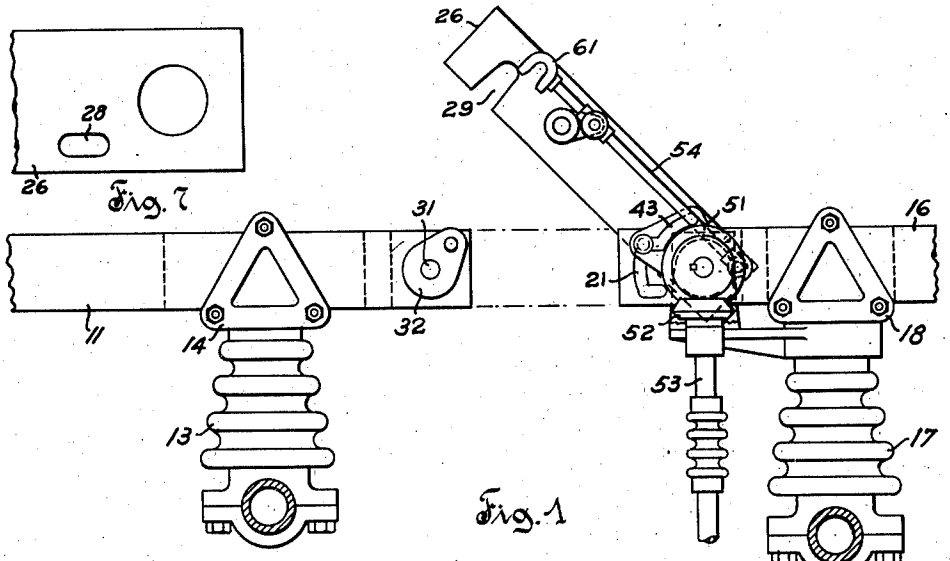



Fig. 1




Fig. 7

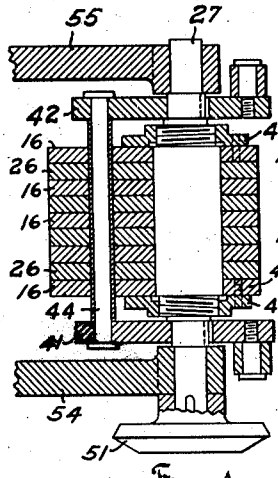



Fig. 4

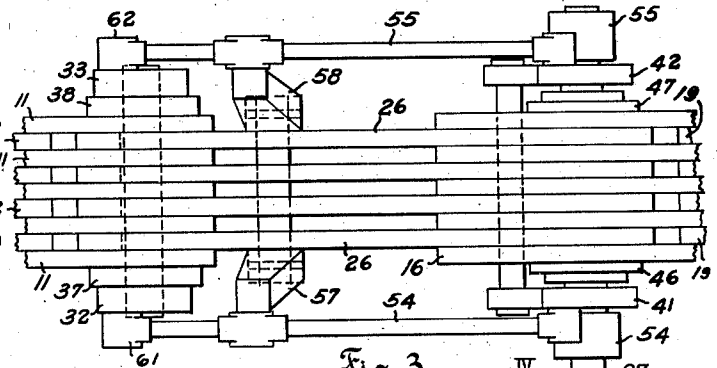



Fig. 3

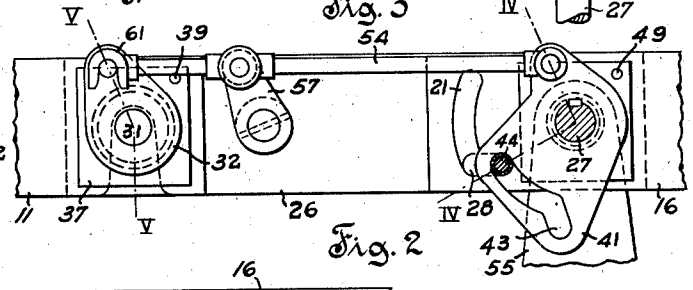



Fig. 2

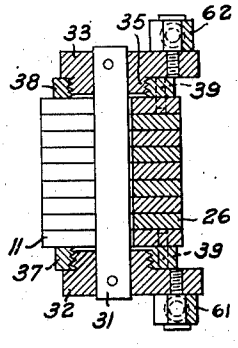



Fig. 5

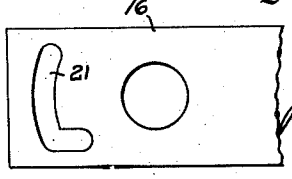



Fig. 6

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# UNITED STATES PATENT OFFICE

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## DISCONNECTING SWITCH

Application filed July 15, 1932, Serial No. 622,602, and in Germany July 14, 1931.

This invention relates to improvements in switches for disconnecting electric circuits and more particularly to switches of the character known as disconnecting switches.

Electric power circuits are generally provided with switches for the purpose of disconnecting such circuits as opposed to interrupting the circuits. Such disconnecting switches are adapted to be operated only when the circuit is without current, i. e. after an interrupting circuit breaker has operated. The usual construction of such switches includes a stationary member and a member movable into and out of engagement with the stationary member by suitable means. The stationary member generally is in the form of resilient jaws or jaws pressed toward each other by springs between which jaws the movable member in the form of a blade is held under sufficient pressure to permit current flow through the switch without material resistance at the contact surfaces thereof. Repeated movement of the blade into and out of such jaws, however, causes abrasion of the jaws and the blade which eventually reduces the area of the surfaces in good contact and increases the resistance to flow of current to a point at which flow of high currents through the circuit heats the jaws or the pressure springs thereby causing loss of resiliency, or such heating may cause welding of the jaws and the blade which renders the switch inoperative.

Disconnecting switches of the character above described are also generally provided with means such as latches for preventing the undesired opening of the switch due to the electro dynamic forces produced upon the flow of high currents such as short circuit currents through the circuit including the switch. Such latching device, however undesirably complicates the construction of the switch and prevents the ready operation thereof. It has been found in practice that proper operation of such switches is frequently impossible due to failure of the jaws as above described or failure of the latch which permits undesired opening or prevents opening of the switch when such operation is required.

Among the disadvantages of a switch of the character above described should also be noted the fact that the use of resilient jaws or contact pressure springs produces a switch in which the friction of the jaws and the blade must be overcome during the opening and closing operation of the switch and also the fact that, in the closed position of the switch, the position of the blade relative to the jaws varies.

It is therefore among the objects of the present invention to provide a disconnecting switch for electric circuits in which the movable and the stationary portions thereof are operable without frictional engagement of the several portions thereof which are however firmly clamped together in the closed position.

Another object of the invention is to provide a disconnecting switch for electric circuits in which the movable and the stationary portions thereof are held together under pressure in the closed position of the switch by mechanical means as opposed to the use of resilient jaws or other resilient constructions.

Another object of the invention is to provide a disconnecting switch for electric circuits in which the movable and the stationary portions thereof are locked in the closed position by the same means as are used to cause movement of one portion of the switch into and out of engagement with other portions thereof.

Another object of the invention is to provide a disconnecting switch for electric circuits in which the movable and the stationary portions thereof are locked in the closed position by a positive mechanical latch and by clamping of the several elements of the stationary and movable portions thereof, the positive latching and the clamping being interconnected and operated by the switch operating means.

Objects and advantages other than those above set forth will be apparent from the following description when read in connection with the accompanying drawing in which:

Fig. 1 is an elevation of one embodiment of

the invention showing the switch in the opened position,

Fig. 2 is a partial elevated view showing the switch in the closed position,

Fig. 3 is a partial plan view of the switch shown in the closed position,

Fig. 4 is a section taken on the line IV—IV of Fig. 2,

Fig. 5 is a section taken on the line V—V of Fig. 2,

Fig. 6 is a fragment of one of the stationary conductors of the switch at the end at which the blades of the switch are pivotally connected therewith, and

Fig. 7 is a fragment of one of the blades of the switch.

Referring more particularly to the drawing by characters of reference, the reference numeral 11 designates one end of a bus bar formed from a plurality of bars or conductors spaced from each other by spacers 12. The bus bar end 11 is supported on an insulator 13 and is attached thereto by suitable means 14. The other end of the bus bar is designated at 16 and is supported in spaced relation with the end 11 on an insulator 17 to which it is attached by suitable means 18. The several bars of the bus bar end 16 are spaced from each other by suitable spacers 19. The bars of the bus bar 16 are each formed with a slot 21 as illustrated in Fig. 6 for a purpose which will appear hereinafter. The two ends of the bus bar are connected, when the electric circuit including the bus bar is closed, by means of blades 26 interleaved between the several bars 16 and mounted on a shaft 27 extending through the bars 16 and the blades 26. Each of the blades 26 is formed with a cam shaped slot 28 as shown in Fig. 7 for a purpose which will appear hereinafter.

The blades 26 are each notched as at 29 to engage a shaft 31 having mounted thereon cranks 32, 33 each having a hub portion 34 or 35 respectively formed with screw threads in the periphery thereof. The screw threads are so cut that one of the threads is right handed and the other is left handed. The threads engage with nuts 37 and 38 respectively which are pinned as at 39 to the outer bars 11. Thus when the cranks are rotated as will be described hereinafter, the nuts 37 and 38 are moved toward or away from each other and clamp together or release the interleaved bars 11 and the engaging ends of the blades 26 thus, in the first instance, securing such pressure between the bars and the movable blades as to minimize the contact resistance therebetween. When the switch is opened and the nuts move away from each other the pressure is released and the ends of the blades 26 may move from between the bars 11 with the minimum of friction.

Cranks 41 and 42 are mounted on the ends of shaft 27 extending through blades 26 and beyond bars 16. Each of the cranks is formed with a slot as at 43 in Fig. 2. A pin 44 extends through the slots 43 in the cranks, the slots 21 in the bars 16 and the slots 28 in the blades 26. The ends of the shaft 27 extending beyond the bars 16 are provided with screw threads extending between the outer bars 16 and the cranks 41 and 42 to receive nuts 46 and 47 which are severally pinned as at 49 to the outer bars 16. The threads on the shaft 27 are left handed and right handed respectively so that rotation of the shaft causes the nuts to move toward or away from each other thus securing a tight clamping together of the ends of blades 26 and bars 16 or a releasing of such pressure dependent on the direction of rotation of the shaft 27 which is obtained by any suitable means. One means by which such rotation may be secured comprises a gear 51 mounted on the end of the shaft 27 and engaging with a gear 52 mounted on and driven by a shaft 53 which may be rotated manually or by any desired means.

The cranks 41 and 42 have pivotally attached thereto rods 54 and 55 respectively at one of the ends thereof. The rods are supported for longitudinal movement at substantially their central portion on arms 57 or 58 attached to a spindle 59 extending through the blades 26 adjacent the central portion thereof. The free ends of the rods, i. e. the ends of the rods not connected with the cranks 41 and 42, are each provided with hooked ends 61 or 62 arranged to engage pins extending outwardly from the cranks 32 and 33 respectively when the blades 26 are being moved into the closed or engaging position with the bars 11 forming the jaws of the switch.

Consideration of Fig. 1 of the drawing will show the relative positions of the several portions of the structure when the switch is in the opened position. It will be seen from Fig. 1 that cranks 32 and 33 have been rotated in a clockwise direction from the position shown in Fig. 2 which illustrates the relative positions of the several portions of the structure when the switch is in the closed position. Rods 54 and 55 have released the pins of the cranks 32 and 33 and have moved longitudinally to the right, due to the clockwise rotation of shaft 27 and cranks 41 and 42, from the position shown in Fig. 2. Such rotation of cranks 41 and 42 has caused movement of pin 44 to the end of slot 28 in blades 26 and has caused movement of pin 44 upwardly to the end of slot 21 in bars 16. Such upward movement of pin 44 has caused lifting of the blades 26 from the position shown in Fig. 2 into the position shown in Fig. 1. Clockwise rotation of shafts 31 and 27 has caused nuts 37, 38 and 46, 47 to move away from each other thus releasing the clamping action of the pairs of nuts on the

bars 11 and blades 26 and on the bars 16 and blades 26 respectively. Due to the release of such clamping action the movement of the blades into the open position shown in Fig. 1 has been obtained without the necessity for overcoming more than a minimum of friction between the contacting surfaces of the switch.

When the switch is to be closed, i. e. moved into the position shown in Fig. 2 from the position shown in Fig. 1, shaft 27 and cranks 41 and 42 are rotated in a counterclockwise direction by causing gear 51 to rotate in a counter-clockwise direction. Such movement of the cranks first causes counterclockwise movement of blades 26 between the ends of the jaws 11 and causes engagement of hooks 61, 62 with the pins of cranks 32, 33 respectively. During this movement pin 44 is retained in the transverse portion of slot 43 and the arcuate portion of slot 21. Continued movement of shaft 27 causes pin 44 to slide to the right hand end of the transverse slot portion of slot 21 thereby permitting further counterclockwise movement of cranks 41, 42 and of cranks 32, 33. During the latter counterclockwise movement of the two pairs of cranks, the nuts 46, 47 and 37, 38 are moved toward each other due to the action of the right and left handed threads until, in the position shown in Fig. 2, the pairs of nuts clamp the ends of the blades between the conductors forming the jaws 11 and the stationary conductors 16 forming one end of an electric circuit.

It will be seen from consideration of Fig. 2 that, in addition to the clamping pressure on the blades, the cranks and rods cooperate to produce a positive mechanical interlock between the several portions of the switch which prevents undesired opening of the switch under all conditions and by any means other than deliberate rotation of shaft 53. The same means are employed to secure closing movement of the switch blades and clamping of the several portions of the switch thereby permitting frictionless operation with the production of any predetermined contact pressure between the stationary and the movable portions of the switch. Due to the absence of any resiliently formed or resiliently controlled portions the end positions of the switch are always exactly determinable and exactly the same.

Although but one embodiment of the present invention has been illustrated and described, it will be apparent to those skilled in the art that various changes and modifications may be made therein without departing from the spirit of the invention or from the scope of the appended claims.

It is claimed and desired to secure by Letters Patent:

1. A bus sectionalizing switch comprising two bus bar sections having laminated end portion arranged in spaced alinement, a switch blade having laminations adapted to interlard with the laminations of said end portions respectively, a hinge connection for rotatably securing one end of said switch blade to one of said end portions, two clamping devices carried by said end portions respectively, said devices each comprising a pair of cranks, a pair of clamp actuating rods carried by said switch blade, each rod having one end thereof operatively connected with the cranks associated with the end portion which carries said switch blade, and having the other end thereof provided with means for engaging the clamping cranks associated with said other end portion only when said switch blade bridges said end portions, and means operable by a continuous movement thereof to first move said switch blade to bridge said end portions and then to simultaneously actuate all of said clamping devices.

2. A bus sectionalizing switch comprising two bus bar sections having laminated end portions arranged, in spaced alinement, a switch blade having laminations adapted to interlard with the laminations of said end portions respectively, a hinge connection for rotatably securing one end of said switch blade to one of said end portions, two clamping devices carried by said end portions respectively, said devices each comprising a pair of cranks, a pair of clamp actuating rods carried by said switch blade, each rod having one end thereof operatively connected with the cranks associated with the end portion which carries said switch blade, and having the other end thereof provided with means for engaging the clamping cranks associated with said other end portion only when said switch blade bridges said end portions, and means operable by a continuous movement thereof to first move said switch blade to bridge said end portions, then to simultaneously actuate both of said clamping devices, said means comprising a mechanism operable only during the final portion of said clamping movement to positively lock said switch blade in its bridging position.

3. A switch for sectionalizing a bus, comprising in combination, two bus bar sections having laminated end portions arranged in alined spaced relation, a shaft extending through each of said bus bar sections adjacent the ends thereof, a laminated switch blade having one end thereof rotatively mounted on one of said shafts and having each end thereof interlarded with the laminations of said end portions respectively, clamping mechanism mounted on each end portion each comprising a clamp actuating crank, means operable to simultaneously release the clamping action of each clamping mechanism and then disconnect one end of said switch blade from one of said end por-

tions, said means comprising a link member connected at one end with the crank associated with said one of said shafts and detachably associated at the other end thereof with the other of said cranks.

4. A switch for sectionalizing a bus, comprising in combination, two bus bar sections having laminated end portions arranged in alined spaced relation, a laminated switch blade normally bridging said end portions and interlarded therewith, a shaft extending through each of the interlarded portions of said switch blades and said end portions, one of said shafts being arranged to serve as a pivot for one end of said switch blade, the other end of said switch blade having an open slot therein permitting disengagement thereof with the end portion normally interlarded therewith, means associated with each shaft for clamping each end portion and the switch blade interlarded therewith, said means comprising clamping cranks secured to said shafts, means operable to simultaneously actuate the cranks of said clamping means to release the clamping action thereof and then to disconnect the slotted end of said switch blade from the respective end portion, said last mentioned means comprising a pin and slot connection between said switch blade, one of said end portions and certain of said cranks.

In testimony whereof, the signatures of the inventors are affixed hereto.

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