May 24, 1938. W. O. SCHULTZ ET AL 2,118,270

DISCONNECTING FUSE SWITCH

Filed June 9, 1934 2 Sheets-Sheet 1

Fig. 1

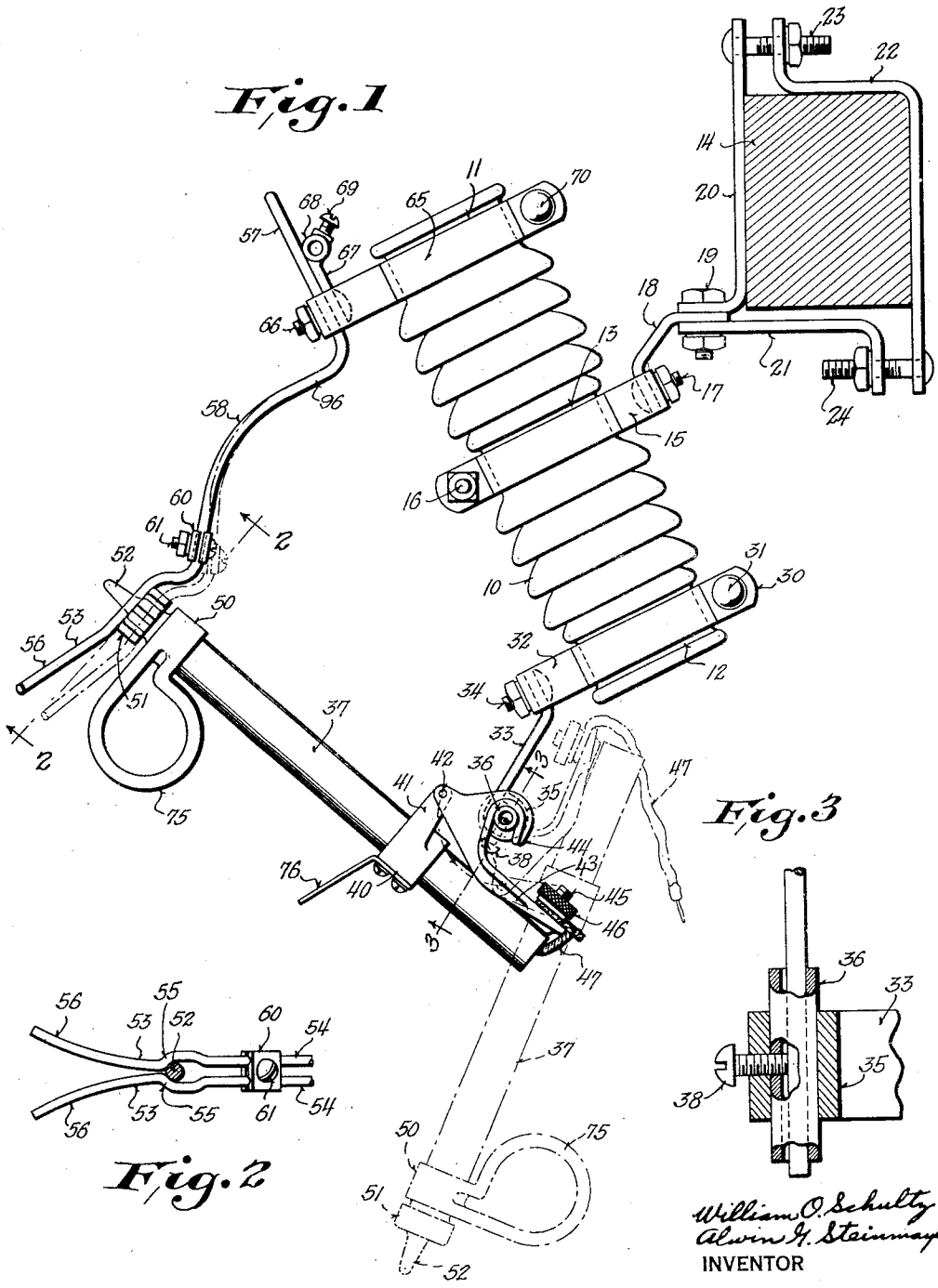


Fig. 2

Fig. 3

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Fig. 4

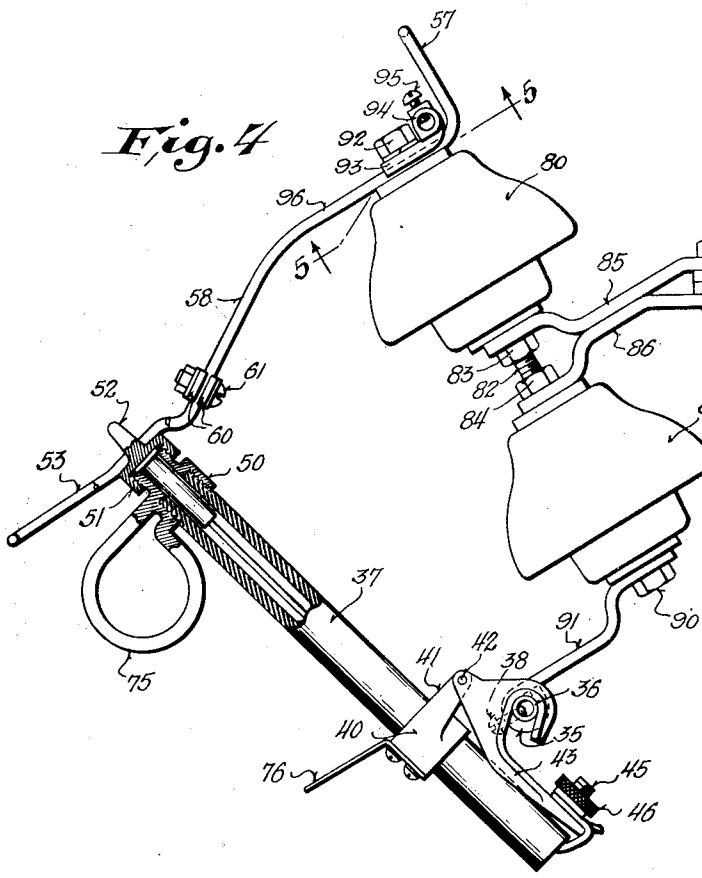


Fig. 6

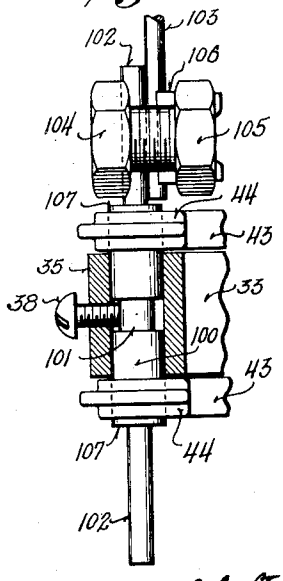
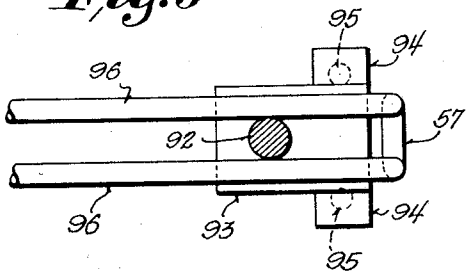


Fig. 5



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2,118,270

DISCONNECTING FUSE SWITCH

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Application June 9, 1934, Serial No. 729,804

25 Claims. (Cl. 200—114)

This invention relates to disconnecting fuse switches.

It is the principal object of this invention to provide an open type drop out fuse in which the fuse tube is pivotally supported from a line terminal for movement into engagement with projecting horn-like contacts supported from a second line terminal, the horn contacts being adapted to force the fuse tube to an open position when the fuse blows and to delay disengagement from the horn contacts during the time that the fuse is blowing.

It is another object to provide adjustable horn contacts which may be adjusted relative to the terminal supporting it in order to give the desired tension to the horns for engagement with the fuse tube contact.

It is also an object to provide an adjustable contact for switches which is adapted for use in connection with any one of a plurality of insulator support assemblies.

It is also an object to provide for drop out fuses, latch mechanism in which the contact arrangement acts as a portion of the latch mechanism for securing the fuse tube in closed position and adapted to release the fuse tube for movement to open position when the fuse blows, said contact being adjustably mounted on its support to thereby obtain a desired latching tension serviceable to move the tube to open position.

Still another object is to provide resilient contact horns in which the maximum resilient strength may be utilized to secure a corresponding maximum contact of the horns with a fuse terminal contact.

A further object of this invention is to provide a pivot for the fuse tube which may serve as a connector and thus eliminate, as far as possible, all joints between the conductor and the fuse link.

It is also a further object to provide a novel pivotal mounting for a fuse tube comprising a connector and terminal for electrical conductors.

Other objects will become apparent as the description proceeds.

In the drawings,

Fig. 1 is a view in side elevation showing an embodiment of this invention.

Fig. 2 is a fragmentary view taken on the line 2—2 of Fig. 1.

Fig. 3 is an enlarged detailed sectional view taken on the line 3—3 of Fig. 1.

Fig. 4 is a view in perspective similar to Fig. 1 showing a modified form.

Fig. 5 is an enlarged view taken on the line 5—5 of Fig. 4 showing the parallel arms of the upper contact.

Fig. 6 is a view similar to Fig. 3 showing a modified form of pivot and connector for the fuse cartridge.

Throughout the several views, like parts are identified by like numbers.

In Figure 1 the supporting insulator 10 comprises a single cylindrical member providing spaced portions or cylindrical areas 11 and 12 on its periphery for terminal supports and an intermediate portion or cylindrical area 13 for engagement with the supporting means (subsequently described) attached to the crossarm 14. The supporting means for the insulator 10 comprises a band member 15 having a clamping bolt 16 which secures the band upon the portion 13 of the insulator, a swivel arm 18 secured by bolt 17 to the member 15, and flat bars 20, 21, and 22, the swivel arm 18 being secured between the adjacent ends of the bars 20 and 21 by means of bolt 19 for angular adjustment of the arm 18 laterally relative to the crossarm 14. The bar 22 and bolts 23 and 24 secure the bars 20 and 21 about the crossarm 14.

A lower terminal support 30 embraces the area 12 on the cylindrical insulator 10 and is secured thereto by means of a bolt 31. The terminal support is provided with a projecting portion 32 upon which is mounted a flat terminal supporting arm 33 secured thereto by means of bolt 34. The terminal supporting arm is provided at its lower end with a sleeve portion 35 receiving a tubular connector pivot 36. The connector pivot 36 serves a twofold purpose, namely, as a pivot for the fuse tube 37 and as a connector adapted to receive the ends of conductors to be clamped therein by means of the set screws 38. These set screws screw into the sleeve portion 35 and through pivot 36 to serve as means for retaining the connector pivot 36 within the sleeve portion 35 of the terminal support 33, and for engagement with the ends of electrical conductors placed in the connector pivot.

The pivotal support for the tube 37 comprises a support member 40 secured to the tube and having pivot arms 41, a pivot pin 42 supported by the arms 41, and contact arms 43 pivotally supported by the pivot pin 42 and pivotally mounted on the connector pivot 36. As will be noted, the contact arms 43 are provided with fingers 44 which hook around the connector pivot and are adapted for removal therefrom. The contact arms 43 are also provided at a point remote from the pivot 42 and connector pivot 36

with a terminal support 45 having a terminal nut 46 which clamps the flexible end 47 of the fuse link to the contact arms 43.

The other end of the fuse link is secured in the usual manner (not shown) to the upper contact 50 mounted on the tube 37, by means of a cap 51 provided with a centrally located contact pin 52 projecting upwardly between the horns 53. The pin 52, as shown, is tapered outwardly from the cap 51, thus presenting a wedge-like member acting upon the portions 55 of the horns 53 and tending to move the horns in a vertical direction as well as laterally of each other.

The horns 53 comprise a single piece of heavy wire bent to form substantially parallel portions 54 in spaced relation throughout the length of the horns, except at 55 wherein the parallel portions are bent laterally inwardly of each other to engage the pin 52 between them, and bent laterally outwardly at 56 to provide a guideway or guiding means for directing the pin 52 into the space between the horns and in contact with the horns. When the fuse tube is moved about the connector pivot 36 to close the circuit, the pin 52 will engage the portions 56 of the horns and be directed thereby into contact with the portions 55 thereof. The horns are also bent as illustrated in Figure 1 to provide an upwardly projecting portion 57 and a downwardly curved portion 58. To increase the frictional engagement of the horns with the pin 52, a clamp 60 is provided comprising a pair of plates receiving the parallel portions of the horns between them and bolted together by means of bolt 61. Thus, the length of the spreadable portions of the arms may be predetermined for the purpose of obtaining a desired tension by placing the clamp 60 properly in relation to the ends of the horns.

The position assumed by the horns after the fuse blows is illustrated in broken lines in Figure 1. This is the position which they assume when the fuse tube is in the broken line position illustrated in Figure 1, which is the position taken by the fuse tube after the fuse link has blown.

The contact horns 53 are secured to the terminal support 65 by means of a bolt 66 which passes thru the terminal support 65, between the parallel portions 54 of the horns, and through the connector plate 67. The connector plate is provided with a tubular portion 68 adapted to receive the bared ends of conductors to be clamped therein by means of the set screws 69. The terminal support 65 embraces the portion 11 on the insulator 10 and is secured thereto by means of a bolt 70.

From the foregoing descriptions it will appear that when the fuse link is severed, the tube 37 will be free to move about the pivot 42 and connector pivot 36 by reason of the fact that the flexible end 47 will be withdrawn from the tube when the contact lever 43 moves about the connector pivot 36 and the tube 37 moves about the pivot 42. This action is caused by reason of the fact that horns 53 press downwardly upon the cap 51 and thus force the tube 37 to move endwise. When the pin 52 has moved from between the horns 53, the corresponding end of the fuse tube may then drop vertically about the pivots until the several parts reach the relative positions illustrated in broken lines in Fig. 1. The wedge-like action of the pin 52 will tend to overcome the action of the horns in moving the tube 37 to open position after the fuse link 47 is severed. In other words, when the horns have moved downwardly to their limit of movement, the pressure of the portions 55 upon the pin 52 will tend to move the pin downwardly. At least, the tapered shape of the pin 52 will permit ready withdrawal of the pin from the horn.

When it is desired to re-fuse the tube, the tube may be disengaged from the connector pivot 36 by means of an appropriate tool (not shown) engageable with the tongue 76 on the support 40. The cap 51 may then be removed so that the remainder of the blown fuse may be taken from the tube and a new fuse link inserted thereinto and the cap then replaced to secure the upper end of the fuse link in position in the usual manner (not shown). The flexible portion of the old fuse may be removed from the terminal support 45 by manipulating the terminal nut 46, and the projecting end of the new fuse may then be secured to the terminal support by appropriate manipulation of the nut 46. When the flexible end of the fuse link is properly secured to the terminal support 45, the support will be brought into engagement with the tube and held there by reason of the engagement of the link as illustrated. Thus the contact arms are held against pivotal movement about the pin 42. When the fuse link has been replaced as described, the fuse may be again mounted, as illustrated, upon the connector pivot 36 and moved thereabout until the pin 52 is positioned, as illustrated, between the parallel portions of the horns.

The modified form shown in Figure 4, insofar as the drop out fuse construction is concerned, is similar to that previously described. The difference applies principally to the insulator mounting. In this modified form, two insulators 80 and 81 are provided in spaced relation and connected by means of a bolt 82 upon which is mounted a pair of nuts 83 and 84. These nuts secure the swivel arms 85 and 86 to adjacent insulators. The swivel arms contact at their intermediate portions and are spaced at their ends remote from the insulators to receive the ends of plates 20 and 21 to which they are secured by means of a bolt 87.

The lower insulator 81 is provided with a nut and bolt 90 for securing the terminal support 91 to the insulator. The terminal support 91 is like that illustrated in Fig. 1 with the exception, that the portion thereof which is secured to the insulator is changed in angle to meet the difference in insulator construction.

The upper insulator 80 is provided with a nut and bolt 92 received between the parallel portions of the horns 53 and clamping these portions to the insulator. The terminal connector or clamping plate 93 is likewise clamped to the horns and insulator. The terminal plate 93 is provided with a tubular portion 94 for receiving the bared ends of electrical conductors to be clamped therein by means of the set screws 95.

It will be noted that the horns in Fig. 1 are clamped to the terminal support 65 at their vertical portions 57, whereas in Fig. 4 the horns are clamped to the insulator 80 at the portions 96 projecting substantially vertically from the portion 57. Thus, it becomes apparent that the horns are adapted for use in connection with more than one type of insulator support without altering their structure.

Attention is particularly directed to Fig. 1 in which the vertical portions 57 of the prongs, or horns, are attached to the insulator by means of the terminal plate 67 and bolt 66 engaged with the band 65. The portions 57 may be secured to the band 65 in any one of a plurality of positions

vertically relative thereto. Thus, the pressure which the prongs exert upon the cap **51**, may be set at a value within the range of the adjustment noted. This vertical adjustment of the horns also compensates for any difference in the lengths of either the fuse tubes or the insulators which may arise during the course of their manufacture.

The modified assembly shown in Fig. 4 also permits adjustment of the horns to secure the results noted with reference to the structure shown in Fig. 1. However, the adjustment of the horns upon their support will not be as great for a given movement of the horns as in the structure shown in Fig. 1. In other words, as the portions **96** are moved longitudinally of their axes from the position shown, the contact portions of the horns **53** will be moved relatively near the pivot **36**. This adjustment will compensate for differences in either the length of the insulator or the tube.

It is again desired to direct attention to the action of the horns in latching the fuse tube **37** in position. After the fuse tube has been refused and placed upon the pivot **36**, the handle **75** will be engaged by an appropriate tool (not shown) to move the pin **52** into contact with the diverging ends **56** of the horns. Further movement of the pin will separate the adjacent portions of the horns laterally until the pin reaches the space between the horns and beyond the relatively converging portions thereof. When the pin reaches the position shown in Fig. 1, the ends of the horns will return to their normal position and retain the pin and tube against pivotal movement about the pivot **36** until the fuse blows. During the latching movement as above indicated, the prongs of the horns **53** frictionally contact the end of the cap **51** and thus produce a wiping effect upon the contacting surfaces, thereby cutting to a minimum the resistance to electric current passing thru the joint.

The modified form of the pivot pin shown in Fig. 6 comprises a rod **100** encircled by the supporting arm **33** and secured thereto by means of the set screw **38** passing thru the arm **33** and into the annular groove **101** upon the outer periphery of the rod **100**. The rod is provided at each end with axially extending arms **102** to which electrical conductors may be secured as follows: Upon the arms **102** may be mounted a connector of any suitable design adapted to engage the arm **102** and clamp thereto a conductor **103**. The connector shown in Fig. 6 is similar to that disclosed in the application of William D. Kyle and Clarence J. Lemont, Serial No. 701,764, filed December 11, 1933. The connector shown comprises a bifurcated threaded jaw member **104** to which is threaded a nut **105** which presses the clamping jaw **106** into engagement with the wire **103** to force it against the arm **102** which extends into the bifurcated jaw member **104**. The details of the connector are not, as far as the invention in the present case is concerned, of any importance, the connector shown serving only to illustrate the manner in which a conductor may be connected to the pivot pin or rod **100**.

As illustrated, the rod **100** extends beyond the support **33** to provide pivot ends **107** upon which the fingers **44** of the contact arms are mounted for pivotal movement. From the foregoing description of Fig. 6, it becomes apparent that the number of contact surfaces between the conductor **103** and the contact arms **43**, have been reduced to a minimum, thereby minimizing the resistance to the flow of electric current therethru.

I claim:

1. In a disconnecting switch, an insulating support, terminals mounted on said support, and a switch member pivotally mounted on said support for connecting said terminals, in combination with a pair of resilient contact arms in parallel relation, and a clamp connecting said arms intermediate their ends and movable relative thereto whereby the tension of said arms resisting lateral movement may be varied.

2. In a disconnecting switch, a contact terminal comprising a single piece of resilient wire bent intermediate its ends to form spaced substantially parallel arms disposed in a common plane and having a part converging toward each other in said plane and then diverging toward the ends of the wire, the diverging portions of the arms being disposed at an angle relative to the plane of said convergence.

3. In a disconnect switch including a support, a terminal contact thereon, and a switch member engageable with said contact; a pivot pin carried by said support and upon which said member is movably mounted, in combination with means on said pin for connecting an electrical conductor directly with said pin, whereby to provide a minimum number of contact joints between said conductor and switch member.

4. In a disconnect switch including a support, a terminal contact thereon; a switch member engageable with said contact in combination with a pivot pin carried by said support, a link pivotally connected with said member and movably mounted on said pin, and means on said pin for connecting an electrical conductor directly with said pivot pin.

5. In a disconnecting switch, the combination with an insulating support, of a bolt on said insulator, a contact comprising a wire bent intermediate its ends to provide substantially parallel arms receiving said bolt between them, a clamping plate apertured to receive said bolt, a nut holding said plate in clamping relation to said arms, said plate having an integral portion comprising a tubular connector portion for receiving the bared end of an electrical conductor, and clamping screws extending into said tubular connector portion transversely to the axis thereof, whereby the contact may be adjusted longitudinally of its arms.

6. In a disconnecting switch, the combination with an insulating support having a bolt and nut thereon, of a contact comprising a wire bent intermediate its ends to provide substantially parallel arms embracing said bolt, thereby to permit adjustment of said contact longitudinally of said arms a clamping plate apertured to receive said bolt and to receive the ends of electrical conductors, set screws on said plate for engaging the ends of said conductors, said plate being held in engagement with said arms.

7. In a disconnecting switch, the combination with an insulating support having a bolt and nut thereon, of a contact comprising a wire bent intermediate its ends to provide substantially parallel arms embracing said bolt, a clamping plate apertured to receive said bolt and to receive the ends of electrical conductors, set screws on said plate for engaging the ends of said conductors, said plate being held in engagement with said arms, and a clamp connecting said arms at a point remote from the insulator and spaced from the ends of the arms, said clamp being releasable

for movement lengthwise of said arms, thereby to change the tension of said arms resisting lateral spreading thereof.

8. As a new article of manufacture, a contact for disconnecting switches, said contact comprising a single piece of wire bent intermediate its ends to form substantially parallel arms disposed in a common plane, at least one of said arms having a portion converging in said plane toward the other arm and then diverging therefrom to its end the diverging portions being disposed angularly relative to the plane of convergence.

9. As a new article of manufacture, a contact for disconnecting switches, said contact comprising a single piece of wire bent intermediate its ends to form substantially parallel arms, at least one of the arms having a portion converging toward the other, and a clamp connecting said arms to hold them normally in parallel relation, said clamp being releasable for movement lengthwise of said arms, thereby to change the tension of said arms resisting lateral spreading thereof.

10. In a disconnect switch, a single piece of wire bent intermediate its ends to form substantially parallel arms, at least one of the arms having a portion converging toward the other and then diverging therefrom to its end, and a clamp connecting said arms to hold them normally in parallel relation.

11. In a disconnect switch, a single piece of wire bent intermediate its ends to form substantially parallel relatively spaced arms, said arms each having an intermediate arcuate portion and being bent at a point adjacent the arcuate portion to form a mounting section extending radially outwardly relative to the arcuate portion.

12. In a disconnecting switch having an insulating support and a movable connecting member, a pivot supporting said member from said support and comprising a tube for receiving the ends of electrical conductors to be secured therein, and clamping screws for securing the conductors therein.

13. In a disconnecting switch, the combination with a support and a movable connecting member pivotally mounted on said support, said member having a contact finger projecting from its end, of a contact comprising a pair of spaced resilient arms disposed in a common plane and frictionally engaging said finger, at least one of said arms having a portion converging in said plane toward the other arm and a portion diverging from said plane and from said parallel relationship to the end of said arm, whereby to guide said finger to a position between the arms to be latched therein.

14. In a disconnecting switch, the combination with a support and a movable connecting member pivotally mounted on said support, said member having a contact finger projecting from its end, of a contact comprising a pair of spaced resilient arms disposed in a common plane and frictionally engaging said finger, at least one of said arms having a portion converging in said plane toward the other arm, and a clamp securing said arms in given parallel relation at a point spaced from said converging portion.

15. In a disconnecting fuse switch, an insulating support, a fuse tube having a fuse link projecting therefrom, a terminal mounted on said support, said terminal including a hollow pivot pin adapted to receive the ends of electrical conductors to be clamped therein and clamping screws on said pin, said tube being pivotally supported by said pin with said fuse link in electrical connection therewith, and a second terminal mounted on said support and engageable by said tube.

16. In a disconnecting fuse switch, an insulating support, a fuse tube having a fuse link projecting therefrom, a terminal mounted on said support, said terminal including a hollow pivot pin adapted to receive the ends of electrical conductors to be clamped therein and clamping screws on said pin, a link pivotally supported by said pin and pivotally connected with said tube, said fuse link being releasably secured to said link, and a second terminal mounted on said support, and engageable by said tube.

17. In a disconnecting fuse switch including an insulating support, terminals mounted on said support, and a fuse tube having a fuse link for connecting said terminals, a pivotal mounting comprising a hollow pin on one of said terminals adapted to receive the ends of conductors to be secured therein, a link pivotally secured to said tube and pivotally mounted on said pin, said link having an arm to which the fuse link is secured.

18. In a disconnecting fuse switch including an insulating support, terminals mounted on said support, and a fuse tube having a fuse link for connecting said terminals, a pivotal mounting comprising a hollow pin on one of said terminals adapted to receive the ends of conductors to be secured therein, a link pivotally secured to said tube and pivotally mounted on said pin, said link having an arm to which the fuse link is secured, and a resilient contact on the other of said terminals urging said tube endwise toward the direction of said pin.

19. In a disconnect switch including a support, the combination with a fuse tube open at one end and closed at the other end by a cap having a pin integrally therewith projecting axially of the tube, of a pivot carried by the support and upon which the open end of the tube is mounted, and a contact carried by said support and comprising a pair of wire prongs extending substantially relatively parallel and having converging portions disposed about said pin to latch the fuse tube in circuit closing position, said wire prongs having their ends diverging to provide guiding surfaces for directing said pin past said converging portions, and said prongs being tensioned to exert pressure on said cap toward said pivot and also against the sides of said pin.

20. In a fuse switch having a pivotally mounted switch member, a pivot for said switch member, said pivot comprising a supporting arm having a tubular portion, a tube extending through said portion and providing pivot bearings for said member, and a set screw extending through said portion and through said tube, whereby to secure the tube in position and to secure the end of an electrical conductor in said tube.

21. In a fuse switch having a pivotally mounted switch member, a pivot for said switch member, said pivot comprising a supporting arm having a tubular portion, a pivot pin extending through said portion to provide pivots for said member, and means for securing said pin to said support and a conductor directly to said pin.

22. In a fuse switch, the combination with a support, of a fuse cartridge pivotally mounted on said support and having a contact surface normal to the axis of the tube, and a flexible contact frictionally engaging and pressing on said surface toward said pivot, said contact being slidably adjustable on and secured to said sup-

port for movement in a direction laterally vertical relative to said pivot, whereby to vary the frictional pressure of said contact on said cartridge.

23. In a fuse switch, the combination with a support provided with a pivot, of a switch member mounted on said pivot and having a contact surface normal to the longitudinal axis of the switch member, a flexible contact frictionally engaging said contact surface of said member and pressing on said surface toward said pivot, and means securing said contact to said supports and releasable to permit adjustment of said contacts toward said pivot, said contact having elongated spaced portions, and said means comprising a bolt extending through the space between said portions and a plate held in clamping engagement with said portions by means of said bolt, said portions extending beyond said plate laterally of said pivot to permit adjustment relative to the pivot thereby to vary the pressure of said contact on said switch member.

24. A resilient contact for disconnecting switches, said contact comprising a length of wire bent intermediate its ends to form a pair of substantially parallel relatively spaced arms, said arms having intermediate arcuate portions, clamping portions between one end of said arms and said arcuate portions disposed radially outwardly of said outward portions, and contact portions bent outwardly relative to and in a radial direction relative to said arcuate portions and converging in part relative to each other to constitute a latch.

25. In a disconnect switch, the combination of an insulating support, a tubular fuse cartridge pivotally mounted at one end on said support, a contact carried by the support and comprising a pair of spaced substantially parallel arms resiliently movable towards the pivotal mounting of said tubular fuse cartridge, a terminal cap closing the other end of said tubular fuse cartridge and having a contact pin integral therewith and projecting substantially axially of said tubular fuse cartridge to be received between said arms, said cap providing a bearing surface for said arms extending radially of the pin, said tubular fuse cartridge being supported in a vertical position and said arms pressing downwardly on the said cartridge when the cartridge is in circuit closing position.

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