March 7, 1933. T. B. BASH 1,900,687

SWITCH

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Fig. 1.

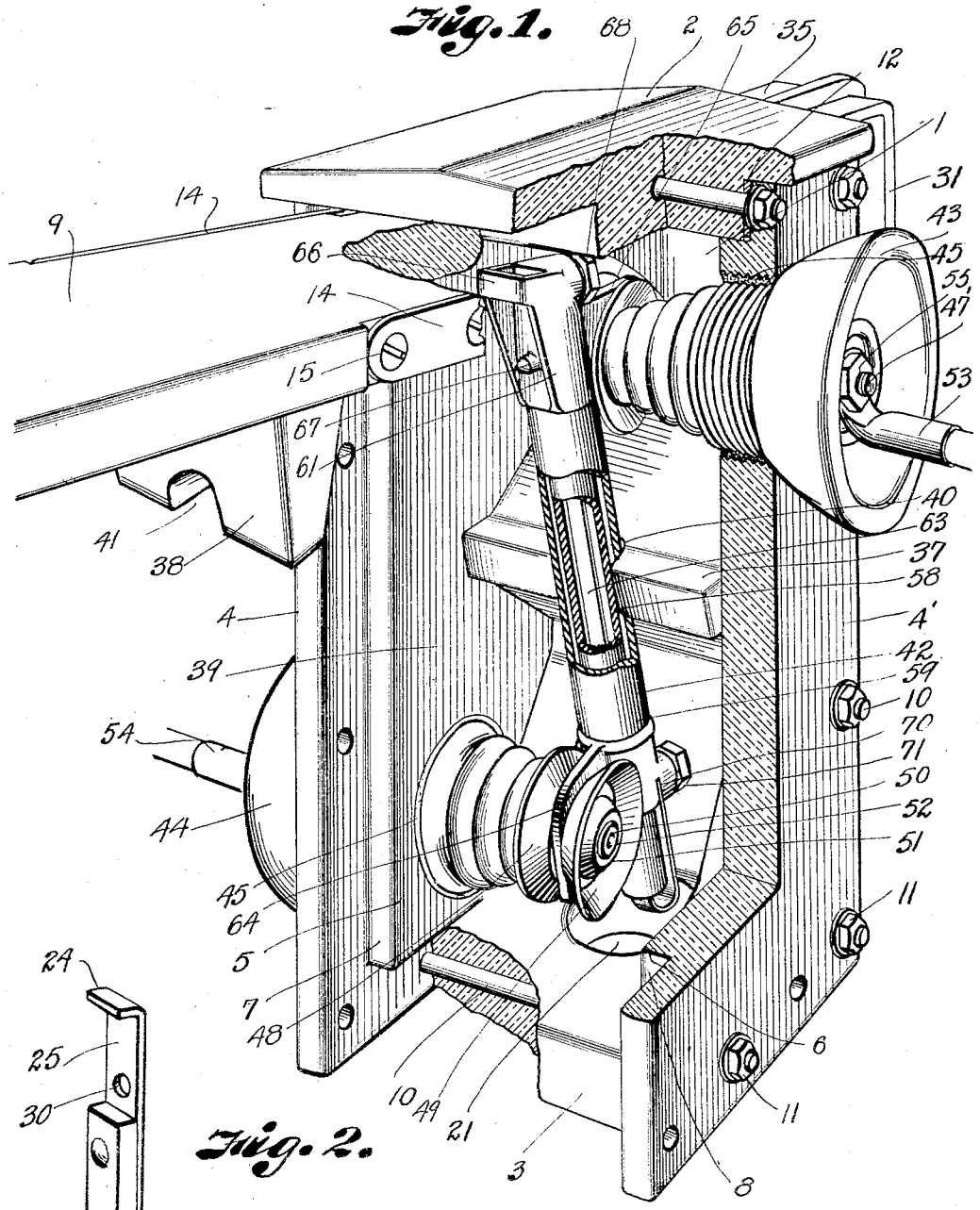


Fig. 2.

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Fig. 3.

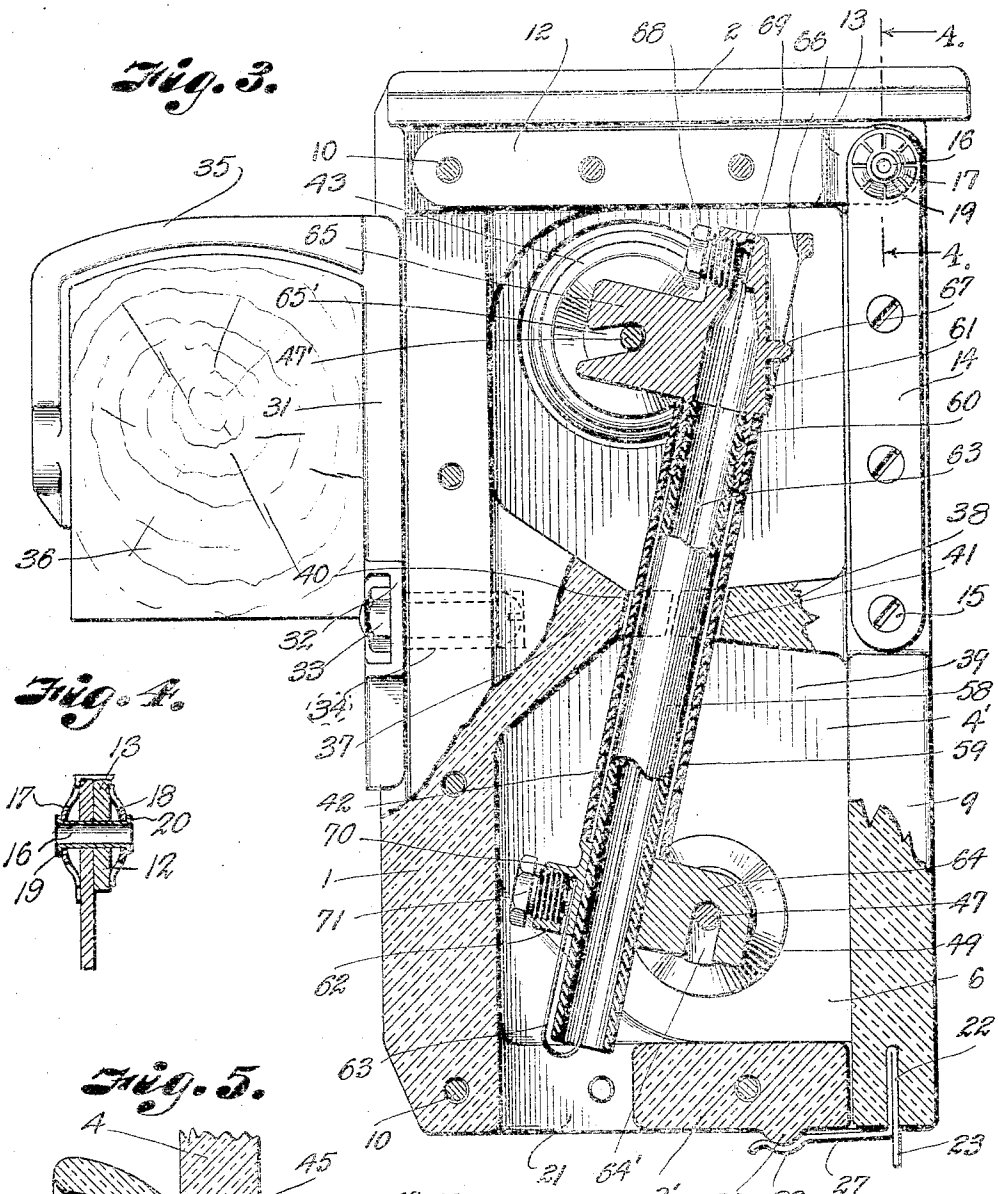
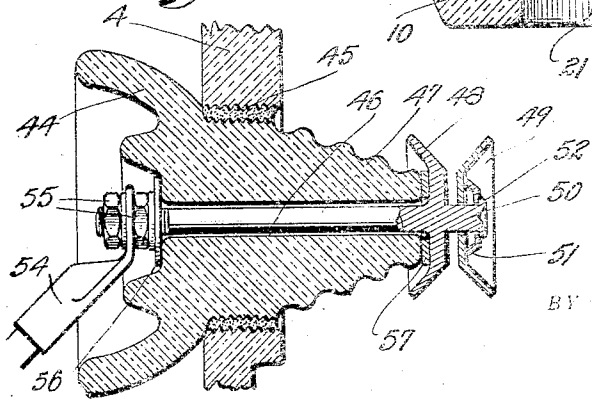


Fig. 4.

Fig. 5.



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Patented Mar. 7, 1933 1,900,687

UNITED STATES PATENT OFFICE

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SWITCH

Application filed March 16, 1925. Serial No. 15,788.

This invention relates to switches and particularly to switches used for disconnecting electrical conductors from the main line or the live side of the line.

Specifically the invention consists in a switch employing a fuse, the construction being such that the fuse element of the switch is enclosed in a box or casing. Such switches are usually constructed with wooden boxes so that when they are used outside, in connection with transformers and the like, the boxes soon deteriorate due to exposure to the elements and they afford very little protection to the switch mechanism due to the fact that they have slight resistance to passage of current after being exposed to rain or damp weather.

My invention contemplates a novel form of fuse switch in which the switch elements are enclosed in an insulated housing of poor conductivity. The housing is preferably made of porcelain or similar material which will not only afford high resistance but which will resist the elements, deterioration being practically nil and I have provided a construction of box or housing adapted to connect to the live lead-in wire from either side. The construction of the switch as a whole is such that there is practically no liability of arcing between the contact members of the fuse. The fuse is so constructed that it may easily be applied or removed as occasion demands and it is so associated with the box that when the fuse blows out the combustion gases will be discharged in the rear of the box, thus eliminating liability of injury to the operator applying or removing the fuse.

There are more or less important features incorporated in my invention. All of these will be described specifically hereinafter, reference being had to the accompanying drawings, in which

Fig. 1 is a view partly in perspective and partly in section of a switch constructed in accordance with my invention.

Fig. 2 is a fragmentary perspective view of a fuse puller stick to be used in connection with the switch.

Fig. 3 is a view partly in longitudinal section and partly in elevation of the switch.

Fig. 4 is a sectional view on the line 4—4 of Fig. 3, showing a preferred form of hinge construction, and

Fig. 5 is a sectional view through one of the bushings and one of the side walls of the box.

Referring now to the drawings by numerals of reference, 1 designates the back wall of the box having an integral top 2 and a like bottom 3′; that is the back wall, top and bottom are preferably made or formed of a single piece of moulded insulating material, preferably dry process porcelain. The separate removable side walls 4 and 4′ are provided with central offset, thickened wall portions 5 and 6, the edges of which are spaced from the edges of the side walls to provide shoulders 7 and 8 against which the back, top, bottom and the door 9 may abut, it being understood that the shoulders for the portions 5 and 6 extend around the entire rectangular contour of said portions 5 and 6. In order to secure the side walls to the back, top and bottom I provide an appropriate number of tie rods 10. These extend through the top and bottom members and through the back and they are preferably provided with heads. Each tie rod, however, has a threaded end to receive a nut 11 so that the tie rods may be taken out to permit reversal of the side walls. This will be desirable when it is expedient to connect the line lead-in wire to the right side of the box and the wire leading to the load to the left side of the box or vice versa, as will be more fully explained hereinafter.

The tie rods pass through the upper ends of the side walls and through the top, also passing through hinge bars 12, one at each side wall. The forward ends 13 of the hinge bars being slightly offset to receive complementary hinge bars 14 connected by the screws 15 which pass through the bars 14 and into sockets in the edges of the door 9, the sockets being fastened therein, in any suitable manner. Complementary bars of each set are connected together by pivots 16, see Fig. 4, which pass through them, the bars being held in frictional contact by spring washers 17 and 18 which bear against the

heads 19 and 20 of the pivots and against the respective bars 12 and 14 so that the friction is great enough to allow the door to remain in a substantially horizontal position when it is swung up on its hinge connection to permit the operator to have access to the interior of the box.

The horizontal bars 12 are, of course, secured between the side walls at the rabbeted joint formed between these members. The bottom of the box is provided with a pressure relief opening 21 near the rear wall so that in the event that the fuse blows while the operator is in the vicinity of the box the flame, if any, will be directed away from the door portion thereby eliminating danger of injury to the operator.

As above explained the door is hinged at the top of the box or casing so I have provided a clasp or latch at the bottom edge of the box. This is shown as consisting of a strip bent back upon itself to form an imbedded portion 22 in the lower edge of the door with a projecting edge 23 adapted to be engaged by the flanged end 24 of the blade 25 on the puller stick handle 26 to pull the door open. Part of the latch extends horizontally to provide a tongue 27 with a notch or groove 28 to engage the protuberance or rib 29 on the bottom of the box so that when the parts are in the position shown in Fig. 3 the door will be held against opening accidentally. The puller stick 26 is also used for the purpose of removing the fuse, therefore, the blade 25 is provided with an opening 30 spaced from the flange or lip 24, the opening being adapted to engage a projection on the fuse to be referred to hereinafter.

It is necessary to support the box in a proper manner so for that purpose I have provided a bracket 31 having an arm 32 adapted to be fastened to the back of the box by a bolt 33 which passes into a pocket or recess 34 which will preferably be cemented therein so as to prevent the bracket from separating from the box or the box from the bracket. The bracket is preferably yoke shaped, that is, it is provided with a jaw 35 adapted to engage over a cross arm 36 on the pole but obviously the bracket 31 might be designed to fit over a pin type insulator.

The back wall of the box is provided with a laterally extending, inwardly disposed wall projection 37 adapted to align with a like projection 38 on the door when the door is closed. These two projections constitute intermediate insulating walls or partitions between the ends of the fuse compartment 39 which is the space within the box. The partition thus formed by the two members 37 and 38 prevents arcing between the two contacts of the fuse, this being important because conducting vapors sometimes form in the box which tend to form an arc or short between the two terminal contacts of the fuse. The members 37 and 38 are provided with half round notches 40 and 41 to receive the fuse 42 between them. The fuse is supported by two bushings 43 and 44 cemented in the side walls 4 and 4′ of the box, the cementing material being shown at 45 in Fig. 5.

The bushings are preferably made from wet process porcelain and each bushing is shown as having a longitudinal central bore or opening 46 to receive a stud 47 of metal or other highly conductive material. On the inner end of each stud, that is on the end within the box is a clip member or head 48 in the form of a truncated cone. It is rigid on the stud. There is a similar member 49 loose on the projecting end 50 of the stud, the member 49 being urged toward the member 48 by a spring washer 51 which bears against the head 52 of the stud and against the member 49 so that there is a tendency to force the member 49 of the clip against the member 48. In order to clearly distinguish between the two studs I have designated the lower one 47 and the upper one as 47′ although both bushings may be alike, it being obvious however, that one will be a lead-in bushing and the other an outlet bushing with the fuse 42 connecting them. The bushings 43 and 44 have very high dielectric strength and since the walls of the box have high dielectric strength, though not necessarily as high as the bushings, the current can pass only through the studs which constitute the terminals for the box.

The cables, both incoming and outgoing, designated 53 and 54 are fastened to the ends of the studs by nuts 55, the inner nut bearing against a washer 56 abutting against its bushing so as to draw the head 48 against the inner end of the bushing and hold it rigid thereto. It will be observed that a washer 57 may be interposed between the head and the end of the bushing whenever desired.

The fuse is illustrated as comprising an inner tube 58 and an outer tube 59. These may be constructed of fibre and they are held in spaced relation by the tubular projection 60 on the lower end of the terminal or contact member 61. The member 61 has a complementary contact member 62 at the lower ends of the tubes. The members 61 and 62 being the contacts for the fuse ribbon 63 which passes through the inner tube 58 and which is secured to the contact members 61 and 62 in a novel manner. By reference to Fig. 3 it will be observed that the tubes 58 and 59 will bear against the body portion of the contact 61 and that the inner tube extends through the contact member 62 so that the contact member 62 is sleeved upon it. The tube 59, however, is shorter than the tube 58 and its lower end bears against the top end of the member 62 and it will be further observed that the tube passes through the opening formed by the notches 40 and 41 so

that when the door is closed the partitions 37 and 38 divide the box into an upper chamber and a lower chamber with one fuse contact in each, therefore, liability of arcing or shorts due to vapor in the box will be eliminated because each contact is segregated into its separate compartment.

The bushings have heretofore been specifically described and they form the supports for the fuse which constitutes the conductor between them so it is desirable to have a fuse which may be readily connected and disconnected from the bushings and inasmuch as the switch is adapted to be used on lines carrying dangerous voltages the fuse should be constructed so that it can be put into place and removed without danger to the operator, so I have provided a convenient means for accomplishing this result.

The means illustrated consist, in addition to that part of the fuse described, of two contact knives or blades 64 and 65 the blade 64 being on the contact member or sleeve 62 and is provided with a notch 64′ to hang over the stud 47 on the bushing 44, the knife having a wide blade so that it may contact with the members 48 and 49 and be held in proper electrical contact by the spring washer 51. The knife 65 carried by the upper contact member 61, which unlike the member 62 is in the form of a cap or head, has also a wide blade having a notch 65′ which engages over the stud 47′ and like the blade 64 it is held in intimate relation between two members like the members 48 and 49 on the upper stud 47′. The notch in the blade 64 is transversely of the blade while the notch in the blade 65 is longitudinally of the blade so that the fuse can be slipped into place in a convenient manner by hooking over the blade 64 onto the bushing 46 and pressing rearwardly on the upper end of the fuse to force the blade between the contact plates or heads 48 and 49, the notch 65′ being slightly inclined away from the longitudinal center of the blade so that it will better hold in place.

Since dangerous voltages pass through the fuse and since it is dangerous to touch the fuse with the bare hand, I have provided a socket or loop 66 on the upper end of the member 61 for the introduction of the blade 25 of a puller stick 26 shown in Fig. 2 and the wall of the loop or socket is provided with an outstanding stud 67 which may engage the opening 30 on the blade 25 of the puller stick so that the operator may introduce the blade into the socket with the flange 24 engaging over the socket and the stud 67 in the hole 30 whereby the operator may give an upward and forward pull to remove the fuse and a reverse operation to apply the fuse. It is to be understood, of course, that the handle of the puller stick is of insulated material.

The ribbon 63 may be secured in any appropriate manner but for convenience of manufacture I have shown the upper contact 61 provided with a socket 69 into which the upper end of the ribbon may be introduced and clamped against the floor thereof by a screw clamp 68. The ribbon extends through the inner tube and around the end thereof into a socket stud 70 where it is clamped by a clamping screw 71, see Fig. 3, and in this connection attention is called to the fact that the lower open end of the inner tube is adjacent to the opening 21 in the box so that in the event that the fuse blows the gases will be directed downwardly and rearwardly away from the door and away from the operator should he happen to be in the vicinity of the box at that time. By reference to the drawings it will be observed that the gases must be directed downwardly and rearwardly into the rearwardly disposed lower end of the box.

It sometimes becomes necessary or desirable to lead the live or energizing side of the line to the left hand side of the box instead of to the right hand side as illustrated. In this event it is only necessary to remove the tie rods 10 and reverse the two sides 4 and 4′ so that the lower bushing 44 will be at the top of the box and the upper bushing 43 will be at the bottom of the box. This is made possible by the fact that the two sides are symmetrical and are reversible with relation to the single co-operating member comprising the back, top and bottom and it is further due to the fact that the holes in the bottom of each side member are spaced the same distance apart. The holes in the upper portions of the sides are spaced so that the holes will register with those in the intermediate members consisting of the back, top and bottom, whether the sides are in the position shown in Fig. 1 or reversed.

There is an advantage in providing the outer tube 59 in addition to the inner tube 58 because the outer tube increases the flash-over distance between the contact members 61 and 62 in addition to which it helps to reinforce the inner tube against the pressure therein at the time of the blowing of the fuse.

It will be apparent from an inspection of the drawings that when the door is closed and held in position by the latch that danger of the fuse becoming disconnected from the studs 47 and 47′ will be eliminated because the projection or partition member 37 will act as a stop to prevent the upper end of the fuse from moving outwardly toward the opening in the door, so it will be impossible for the fuse to become disconnected while the door is closed.

I have particularly designed this invention for safety and convenience and I have elaborately illustrated the details of the preferred construction, but it is to be understood, of course, that I do not limit myself to the particular construction shown for it is ob-

vious that minor details in changes of construction can be made without departing from the spirit of the invention or sacrificing any of the advantages thereof.

What I claim and desire to secure by Letters Patent is:—

1. In a switch, a box of insulating material, bushings extending through the sides of the box in spaced relation, terminals extending through said bushings, means on the terminal members in gripping engagement with opposite ends of, and tending to reinforce the bushings, a conductor within the box, connecting the terminals, and a friction means on said terminals for holding the conductor in engagement with the terminals.

2. In a switch, a box of poor conductivity, comprising a unitary structure forming a back, top and bottom, detachable reversible sides, means connecting the sides to the back, top and bottom structure, a hinged door suspended from the top of the box, a terminal at the lower portion of one side and a terminal at the upper portion of the other side and a removable fusible conductor connecting the terminals.

3. In a switch, a box of insulating material, comprising a unitary element constituting back, top and bottom, detachable reversible sides, means connecting the sides to the unitary element, a hinged door suspended from the top of the box, a terminal at the lower portion of one side and a terminal at the upper portion of the other side, a removable fusible conductor connecting the terminals, and means on the inside of the door for holding the conductor in engagement with the terminals when the door is closed.

4. In a switch, a box of poor conductivity, comprising a back having integral top and bottom portions, removable reversible sides, means connecting the sides to the back, top and bottom portions, a hinged door suspended from the top of the box, a terminal at the lower portion of one side and a terminal at the upper portion of the other side, a removable fusible conductor connecting the terminals, and co-operating means on the back and door forming a transverse partition when the door is closed to divide the box into an upper compartment and a lower compartment with the conductor extending through the partition.

5. In a switch, a box of poor conductivity, comprising a back having integral top and bottom portions, removable reversible sides, means connecting the sides with the back, top and bottom portions, a hinged door suspended from the top of the box, a terminal at the lower portion of one side and a terminal at the upper portion of the other side, a removable fusible conductor connecting the terminals, and a transverse partition in the box separating the terminals through which the conductor passes.

6. A switch, comprising a box of poor conductivity having vertically reversible sides, bushings carried by opposite end portions of the respective sides, the bushings consisting of material having appreciable dielectric strength, metallic electric terminal stud members carried by the bushings, friction means on the stud members located within the box and a removable fusible element having ends engageable by the friction means to connect the two terminals.

7. A switch, comprising a box of poor conductivity having detachable vertically reversible sides, bushings carried by opposite end portions of the respective sides, the bushings consisting of material having appreciable di-electric strength, metallic electric terminal stud members carried by the bushings, friction means on the stud members located within the box, a removable fuse having ends engageable by the friction means to connect the two terminals, said friction means comprising two members one of which has movement relative to the other and blades carried by the respective ends of the fuse receivable between the members.

8. A switch, comprising a box of poor conductivity having detachable vertically reversible sides, bushings carried by opposite end portions of the respective sides, the bushings consisting of material having appreciable di-electric strength, metallic electric terminal stud members carried by the bushings, friction means on the stud members located within the box, a removable fuse having ends engageable by the friction means to connect the two terminals, said friction means comprising two members one of which has movement relative to the other, blades carried by the respective ends of the fuse receivable between the members, each blade having a notch engageable over one of the studs.

9. A switch, comprising a box of poor conductivity having vertically reversible sides, bushings carried by opposite end portions of the respective sides, the bushings consisting of material having appreciable di-electric strength, metallic electric terminal stud members carried by the bushings, friction means on the stud members located within the box, a removable fuse having ends engageable by the friction means to connect the two terminals, said friction means comprising two members one of which has movement relative to the other, blades carried by the respective ends of the fuse receivable between the members, each blade having a notch engageable over one of the studs, and means for connecting the ends of a fusible element electrically to said blades.

10. A switch, comprising a box having an access opening in one of its sides, a door for said opening, fixed terminal members disposed near opposite ends of said box, a fuse

cartridge, contact elements connecting said terminal members and cartridge, said elements being disposed on opposite sides and near the ends of said cartridge, said cartridge being inclined with respect to the longitudinal axis of the box, and away from said access opening.

11. A switch comprising a box of substantially rectangular section and appreciable dielectric strength, having a front opening for access to the interior, a lead-in terminal at one end of the box, an outlet terminal at the other end of the box and a hollow fuse cartridge, connectors disposed on opposite sides of the cartridge, near the ends thereof, engaging the terminals, the lower open end of the cartridge being directed downwardly and toward the rear of the box, and disposed in line with an opening adjacent the rear wall of the box, the box being provided with a door for said access opening, and means on the door for holding the fuse against accidental displacement with respect to the terminals.

12. A switch comprising a box consisting of material having appreciable dielectric strength, said box comprising a bottom, a top and a back wall connecting them, removable side walls secured to the top, bottom and back wall, hinge bars carried at the top portion of the side walls, a door, hinge bars carried by the door, means for frictionally connecting the first named bars to the second named bars and a latch carried by the door for engagement with the bottom of the box.

13. A switch, comprising a box consisting of material having appreciable dielectric strength, said box comprising a bottom, a top and a back wall connecting them, removable side walls secured at the top, bottom and back wall, hinge bars carried at the top portion of the side walls, a door, hinge bars carried by the door, means for frictionally connecting the first named bars to the second named bars and a latch carried by the door for engagement with the bottom of the box, the door having a transverse partition member aligned with the complementary member on the back wall of the box.

14. A switch comprising a box consisting of material having appreciable dielectric strength, said box comprising a bottom, a top and a back wall connecting them, removable side walls secured at the top, bottom and back wall, hinge bars carried at the top portion of the side walls, a door, hinge bars carried by the door, means for frictionally connecting the first named bars to the second named bars and a latch carried by the door for engagement with the bottom of the box, the door having a transverse partition member aligned with the complementary member on the back wall of the box, the bottom member being provided with an opening at the rear wall of the box.

15. A switch comprising a box having a lead-in terminal and an outlet terminal, a fuse for connecting the terminals, said fuse including a pair of spaced tubes, a terminal engaging cap at the upper end of the tubes, the cap having means for maintaining the tubes in position, a terminal engaging member at the lower ends of the tubes, said member embracing the inner tube and having a portion against which one end of the outer tube bears, a fusible element connection to the terminal engaging means for the tubes and means for clamping the fusible element into the terminal engaging means.

16. A switch comprising a box having a back wall, side walls, top and bottom and a door closing an opening thereto, a lead-in terminal carried by one wall of the box, an outlet terminal carried by the other wall of the box, a fuse connecting the terminals, the fuse being inclined within the box so that the lower end is in line with an opening in the bottom of the box adjacent said back wall.

17. A switch comprising a box having a lead-in terminal, an outlet terminal and a fuse connecting them, said fuse comprising a plurality of tubes in spaced relation, the inner tube carrying a cap at one end for connection to the inlet terminal and a contact member at its lower end for connection with its outlet member, a fusible element for connecting the terminals and passing through the inner tube, a socket member formed on the cap having a projection from its wall to engage an opening in a puller stick insertable in the socket member.

18. A switch comprising a closed box, having a partition extension transversely thereof between the upper and lower ends, the box having an opening in its bottom near the back wall thereof, a lead-in terminal near the front wall of the box, an outlet terminal near the opposite wall of the box, a fuse connecting them, the fuse extending through the partition and having a hollow portion closed at its upper end and open at its lower end, the lower end being in line with the opening in the bottom of the box.

In testimony whereof I affix my signature.

THOMAS B. BASH.