May 10, 1927. 1,628,413

A. F. C. LOTZ

SWITCH AND FUSE

Filed April 10, 1925 4 Sheets-Sheet 1

Fig. 1.

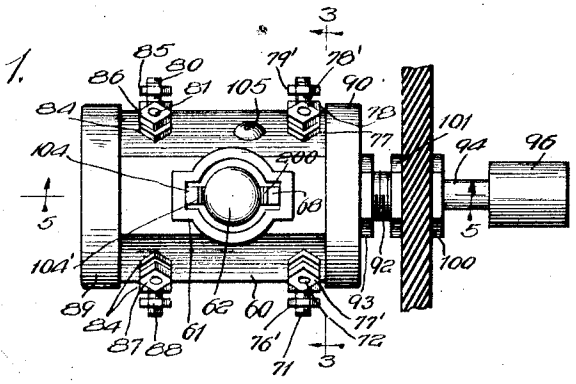


Fig. 2.

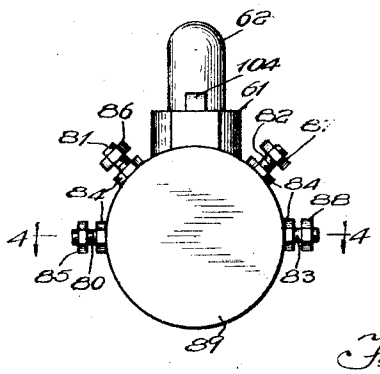


Fig. 3.

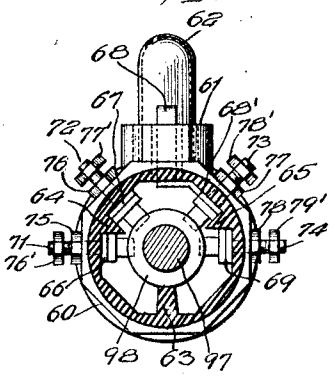
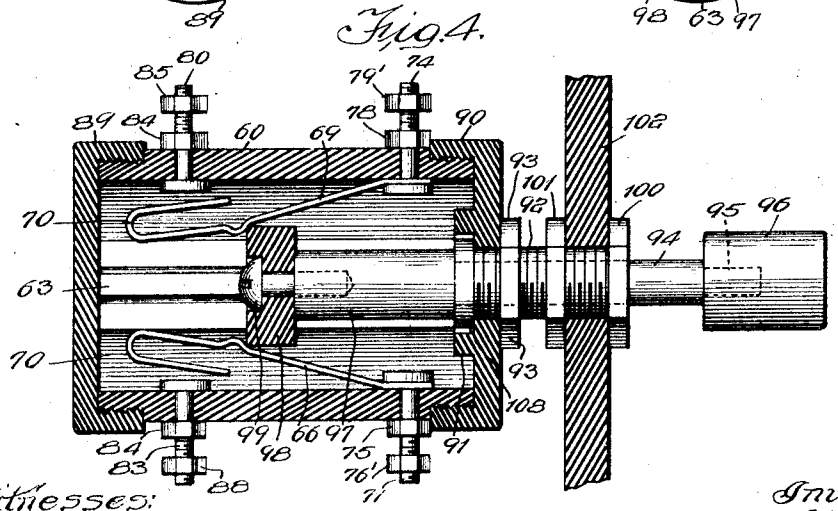


Fig. 4.



Witnesses:

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Alfred F. C. Lotz

Brown, Boettcher & Dienner

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SWITCH AND FUSE

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Fig. 5.

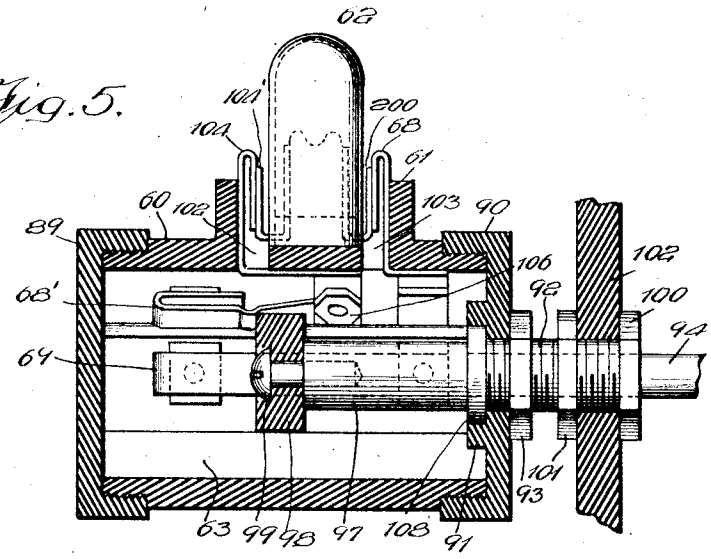


Fig. 7.

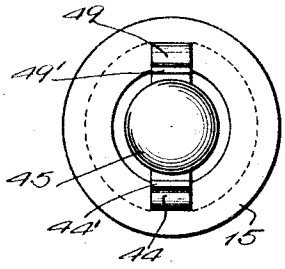


Fig. 8.

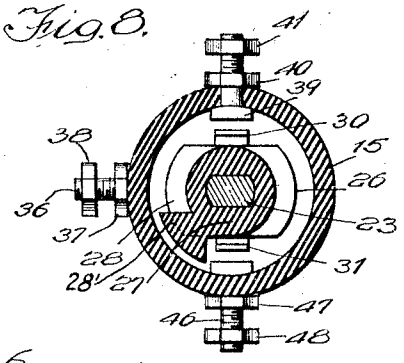
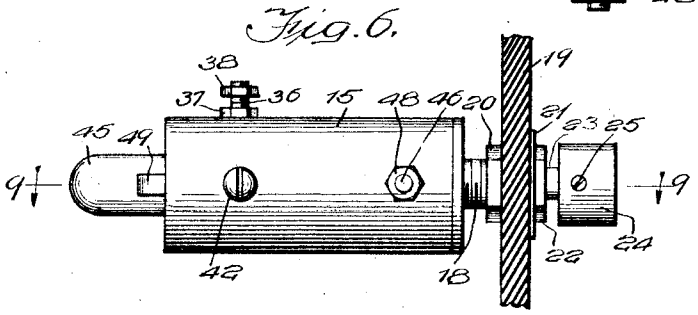


Fig. 6.



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SWITCH AND FUSE

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Fig. 9.

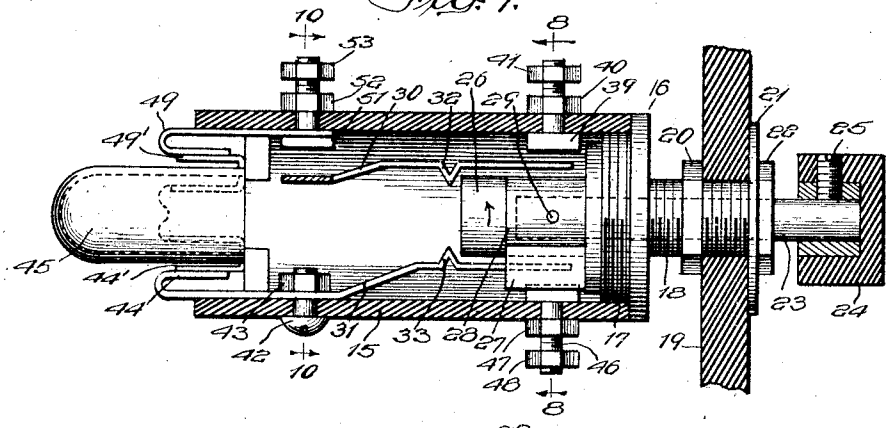


Fig. 10.

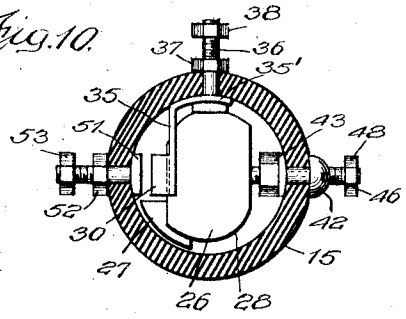
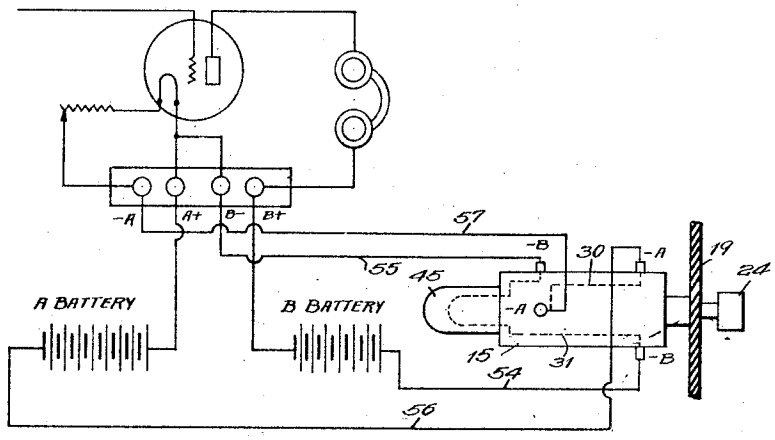


Fig. 12.



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SWITCH AND FUSE

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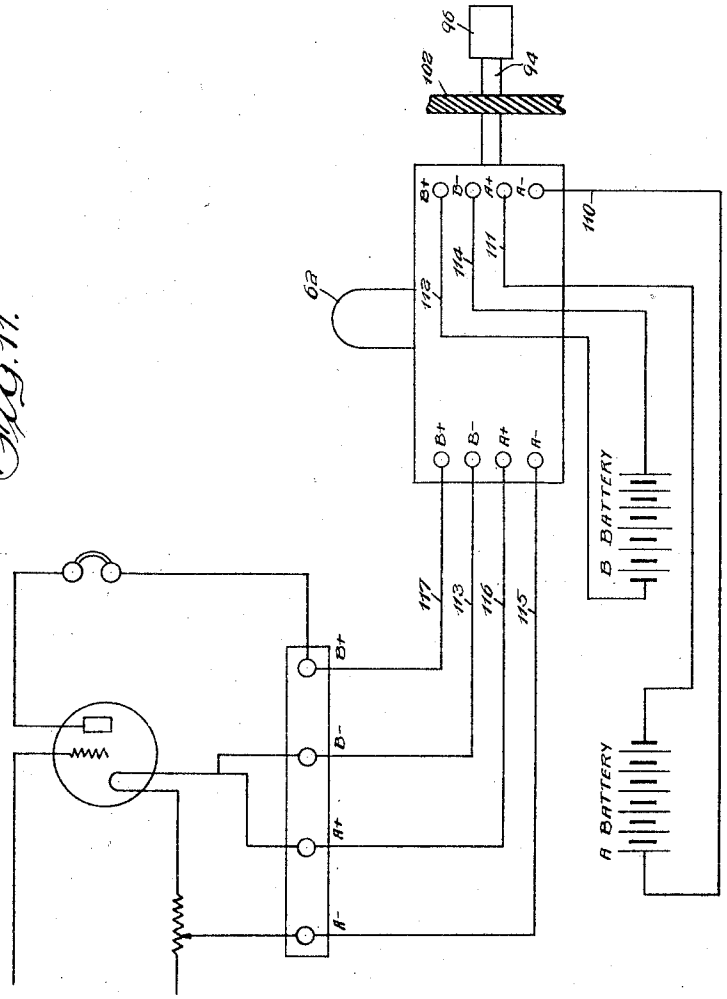


Fig. 11.

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By Attys

Patented May 10, 1927. 1,628,413

UNITED STATES PATENT OFFICE.

ALFRED F. C. LOTZ, OF CHICAGO, ILLINOIS, ASSIGNOR TO ELECTRICAL ENGINEERS EQUIPMENT COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

SWITCH AND FUSE.

Application filed April 10, 1925. Serial No. 22,027.

My invention relates to an improved switch and fuse unit, more particularly to a switch and fuse unit especially adapted for use with radio receiving instruments, although of course, it may be employed wherever found desirable.

In radio work the receiving instrument has usually been controlled by a switch in the A battery circuit only. The B battery circuit has usually been a permanently closed circuit, because of the relative inactivity of that circuit when the A battery circuit is open, and because of the extra cost, parts and operations which would have accompanied an additional switch in that circuit. Furthermore, an additional switch in the B battery circuit would usually be disregarded by the ordinary operator because of the ability to control the set without it.

However, I find that with a permanently closed B battery circuit there is a certain loss in that circuit when the A battery circuit is open. Where this circuit is always closed, there is also always the possibility of accidentally short circuiting it and burning out the tubes.

The objects of my present invention are the provision of a generally improved, simplified and inexpensive device for opening and closing the B battery circuit with the opening and closing of the A battery circuit without an additional separate switch in the B battery circuit and without additional parts and operations, also a device which will assure opening of the B circuit whenever the A circuit is opened and without the necessity of the operator remembering to open it each time.

The switch of my present invention is adapted to secure the foregoing in a simple, expeditious, and inexpensive manner. It is compact, comprises few parts, is easily operated, and is adapted for mounting upon a panel, or otherwise as desired in this class of work.

I also provide a novel mounting and combination of the fuse or other protective device with the switch for protecting the B battery circuit and the tube filaments.

To acquaint those skilled in the art with the manner of practicing my invention, I shall now describe certain particular embodiments of the invention in connection with the accompanying drawings, in which:

Figure 1 is a side elevational view of one embodiment of the invention, showing it mounted upon a panel;

Fig. 2 is a rear end view of the device shown in Fig. 1;

Fig. 3 is a transverse section on line 3—3 of Fig. 1;

Fig. 4 is a longitudinal section on line 4—4 of Fig. 2;

Fig. 5 is a longitudinal section on line 5—5 of Fig. 1;

Fig. 6 is a view similar to Fig. 1 of another embodiment of the invention;

Fig. 7 is an enlarged end view of the device shown in Fig. 6;

Fig. 8 is a transverse section taken on line 8—8 of Fig. 9;

Fig. 9 is a longitudinal section taken on line 9—9 of Fig. 6;

Fig. 10 is a transverse section on line 10—10 of Fig. 9;

Fig. 11 is a wiring or circuit diagram of the embodiment shown in Figs. 1 to 5; and

Fig. 12 is a circuit diagram of the embodiment shown in Figs. 6 to 10.

Referring first to the embodiment shown in Figs. 6 to 10, inclusive, I provide a sleeve or hollow shell 15 which may be of bakelite, fibre, hard rubber, or the like. One of the open ends of the sleeve 15 is smoothly finished, while the other end has internal threads which are adapted to co-operate with the external threads of a guide member 16. The guide member 16 comprises a cap portion 17 which has an annular flange part adapted to fit over the adjacent end of the sleeve with its edge flush with the outer surface thereof, and a tubular externally threaded guide sleeve 18 is screwed into an opening provided for it in the central portion of the cap 17. The guide sleeve 18 passes through an opening provided for it in the panel or other supporting member 19. It is securely held in place in the panel by means of the back nut 20, a front finishing and panel protecting plate 21 and a front nut 22. Drawing of the nuts 20 and 22 together binds the switch supporting sleeve firmly in place, and by threading said nuts both along the sleeve the spacing of the switch from the panel may be varied, and the outer end of the sleeve may even be extended thereby from the outer face of the nut 22, should that be desirable. The guide sleeve 18 is provided with a central bore which is smoothly finished and serves

as a bearing surface for the shaft 23. The shaft 23 projects from the forward nut 22 and carries an operating knob 24. The knob 24 may be of bakelite, or the like, having a metallic inset and a screw 25 secures the knob rigidly on the shaft 23.

The opposite end of the shaft 23 extends beyond the inner end of the cap member 17 and carries a cam member 26. The cam member 26 comprises a stop portion 27 and a cam portion proper 28. The cam portion 28 has a central opening in which the inner end of the shaft 23 is fixedly secured by a transverse pin 29.

The cam portion 28 has a pair of relatively semi-circular ends which are joined together by a pair of relatively flat sides. The stop portion, on the other hand, is relatively circular in shape except for a sector 28′ which extends out laterally from one side thereof and which acts as the stop proper. By turning the shaft 23 by means of the knob 24, the cam portion 28 actuates a pair of springs 30 and 31, which may be of phosphor bronze or other suitable material. Each is provided with an outwardly projecting or hump portion 32 and 33, respectively, which may limit the insertion of the cam member 26 in the sleeve 15 and properly align the parts.

The spring 30 is provided at one end with an integral lateral leg or extension 35 turned at relatively right angles thereto, as shown in Fig. 10, this extension having a second angular leg 35′ anchored to the sleeve 15 by means of a contact screw 36 and nut 37. The screw 36 has electrical contact with the anchored end of the spring 30 and it may be provided with an additional nut 38 for binding the conductor which leads from the negative A battery terminal of the radio set to the terminal screw 36. The opposite end of the spring 30 is free and self biased into position, spaced from the head of a contact screw 39, secured in the sleeve 15 by means of a nut 40, and adapted to have the negative A battery conductor bound thereon by means of a nut 41, the conductor to one of the screws 39, 36, leading from the negative side of the A battery and the conductor from the other screw continuing on in the same line.

The spring 31 is provided with an opening intermediate its ends through which, and a similar opening in the sleeve 15, passes the screw member 42. A nut 43 threads on the screw member 42 and serves to securely hold the spring 31 in position within the sleeve 15. One end of the spring 31 is bent back on itself to form the U portion 44, the edges of which are slightly flared upwardly, so as to receive and guide the contact portion 44′ of the fuse unit 45. The opposite end of the spring 31 is free and self biased into position, spaced from the head of a contact screw 46, secured in sleeve 15 by means of a nut 47, and adapted to have the negative lead of the B battery bound thereto by means of a nut 48.

A generally U-shaped spring 49, which may also be of phosphor bronze, serves to electrically connect opposite side or contact 49′ of the fuse unit 45 with the contact screw 51. The base of the spring 49 is firmly secured to the sleeve 15 by means of a screw 51 which makes contact therewith and engages externally of the sleeve in a nut 52. The other negative B battery conductor is bound upon the screw 51 by means of a binding nut 53, the separation of the free end of the spring 31 from the contact screw 46 opening the negative side of the B battery, and the engagement of it with the screw 46 closing the same and connecting the protective fuse 45 in series therewith.

In operation, the knob 24 is grasped and turned, turning with it the shaft 23 and the cam member 28. With the switch in open position, as shown in Fig. 9, turning of the cam 28 in the direction indicated by the arrow brings the opposite arcuate edges of the cam into co-operation with the free ends of the contact springs 30 and 31 and forces said springs into contact with the internal contact heads of the screws 39 and 46, respectively. This closes the negative side of the A battery through the contact spring 30 and contact or terminal screws 39 and 36, and simultaneously the negative side of the B battery through the contact spring 31, screws 46 and 51, and fuse or protective element 45.

As the springs 30 and 31 are brought into complete contact with their respective screws, one of the radial faces of the stop segment 27 comes into lateral engagement with one side edge of the spring 30 and limits or prevents further turning of the cam 28 in this direction. By turning the cam member 28 in the opposite direction, the opposite arcuate cam surfaces thereof disengage the springs 30 and 31, permitting the free ends of said springs to separate themselves by their own self biasing action from contact with their respective contact screws 39 and 46. This opens the negative side of the A battery and simultaneously with it the negative side of the B battery. The B battery circuit is thereby opened without an additional switch and without any additional operation. Opening of the B battery circuit is assured whenever the A battery circuit is opened without further thought and without requiring the operator to remember to do it, and the losses heretofore incident to a closed B battery circuit when the A battery circuit is open are avoided.

At the limit of the turning of the cam in its opening movement, the opposite radial face of the stop sector 27 engages one side

edge of the spring 31 and prevents further turning of the cam in this direction. The switch may thereby be turned on or off in approximately ninety degrees of movement of the knob 24 and the turning of the operating element is positively limited at the opposite limits of its movement.

By reference to Fig. 12 it will be seen that when the switch is turned "on" the negative lead 54 from the B battery is directly connected to the lead 55, leading from the radio set to the switch, through the fuse unit 45 and the spring member 31. Also, the negative lead 56 from the A battery to the switch is connected to the lead 57 from the negative terminal of the set to the switch by means of the spring 30.

The tubular post or sleeve 18 lends itself to any panel or other desired mounting and provides the journal for the operating element and the mounting of the fuse, and manner of connecting it into the B battery circuit, also the provisions for opening the B lead with the opening of the A battery circuit are simple and effective.

The embodiment shown in Figs. 1 to 5, inclusive, differs from the one described in that a push-pull arrangement is provided for turning the switch "on" or "off". Another distinction is that it is possible, by this construction, to cut out or in both sides of the A and B battery circuits.

In this embodiment a sleeve or shell member 60 is provided which is generally octagonal in form. It is provided with a lateral cup shaped portion 61 on one side, which is adapted to receive the fuse unit 62. The sleeve unit 60 itself may be made of bakelite, fibre, or hard rubber, and has a hollow internal portion which is generally octagonal in form. Integral with the bottom side of the hollow portion of the sleeve is a guide member 63 which is relatively rectangular in form and extends throughout the entire length of the sleeve. A pair of angular integral portions 64 and 65 project inwardly from opposite spaced inner portions of the sleeve and also extend throughout its entire length. The members 64 and 65 serve to properly separate the contact springs from each other and to maintain a proper spaced relationship between them at all times. The contact springs referred to are designated by the numbers 66, 67, 68′, and 69, each of which has a generally U-shaped contact end 70. Each of the springs 66, 67 and 69 is preferably made of phosphor bronze and has at the end opposite the U-shaped portion 70, an opening by means of which it may be secured to the inner wall of the sleeve, as by the contact screws 71, 72 and 74. The contact screws 71, 72 and 74 are each held permanently in position by means of the nuts 75, 76 and 78.

The spring 68′ has an opening opposite its U-shaped portion which co-operates with a similar opening in a spring member 104, so as to permit both of these springs to be secured to the member 60 by the screw 105 and its co-operating nut 106. The U-shaped portion of the spring 104 extends through an opening 102 through the base of the cup 61 and along one side of the interior of the cup, and is adapted to co-operate with one contact 104′ of the fuse unit 62. A generally U-shaped spring 68 is provided with an opening at one end by means of which, and the contact screw 73 and its co-operating nut 77, it is securely held to the sleeve member. The U-shaped portion of spring 68 also fits through an opening 103, which is similar to and diametrically opposite the opening 102 in the member 60. This permits it to engage with the opposite contact 200 of the fuse unit 62.

To the contact screws 71 and 72 are fastened the leads from the A battery, as by the nuts 76′ and 77′. The nuts 78′ and 79′ serve to secure the leads from the B battery to the contact screws 73 and 74, respectively. Contact screws 80, 81, 82 and 83 are fitted into openings provided for them in the member 60 and are adapted to engage the U portions of the contact springs 66, 67, 68′ and 69, respectively. Each of these contact screws is provided with a nut 84, which securely fastens it to the member 60. Contact screws 80 and 81 are also provided with the nuts 85 and 86 by means of which the conductors leading to the B battery terminals on the radio set may be fastened. Likewise, contact screws 82 and 83 are provided with the nuts 87 and 88 so that the conductors leading to the A battery terminals of the radio set may be similarly connected. One end of the sleeve member 60 is threaded to permit a cap 89 to be mounted thereon. The cap 89 may be of metal or of suitable insulating material. The opposite end of the nmeber 60 is similarly threaded. A cap 90, which may be of metal or of some insulating material similar in nature to that of which the sleeve 60 is made, has threads which are adapted to co-operate with the threads on the sleeve so as to permit the cap to be mounted thereon. Projecting outwardly from the inner face of the cap 90 is an annular rib 91. The hollow portion formed by the rib 91 surrounds a central opening into which is threaded a sleeve 92. The sleeve 92 is provided with an integral collar portion 108 which fits into the hollow portion formed by the annular rib 91. The cap is locked or tightly secured in the member 90 by a nut 93.

The central longitudinal opening in the sleeve 92 is adapted to receive the shaft 94 which is reciprocable therein. The shaft 94 has an end portion 95 which is threaded and is slightly smaller in diameter, to which is fitted a knob 96 which rests against the

edge formed by making the portion 95 of smaller diameter than the portion 94. The opposite end of the shaft 94 is enlarged at 97, and has an operating head 98 which may be of insulating material secured thereon, as by the screw 99 which threads into the end of the shaft 97. When the switch is in the "off" position, the shaft 94 is as shown in Fig. 4, where it is seen that the portion 97 which is adjacent to the portion 94 bears against the outer surface of the collar portion of the sleeve 92.

To turn the switch "on" the operating element is pushed axially inwardly, causing the head 98 to engage the diverging U-shaped ends of the contact springs 66, 67, 68′ and 69, and force or spread same out into engagement with their respective contact screws, closing the A and B battery circuits simultaneously. When the switch is "on" the knob 96 may bear against the outer nut 100 which, together with the nut 101, serves to hold the switch by means of the sleeve 92 securely to the panel 102. When the operating element is pulled out into its outer position, the contact springs separate from the contact screws at their free contact ends by their own self biasing action, and as before when closed the fuse 62 is connected in series in the B circuit.

From the wiring diagram shown in Fig. 11, considered in view of the above description it will be understood that both sides of both the A and B battery circuits are opened and closed together without separate provisions and operations for each. The fuse unit 62 is in the negative side of the B battery, although it may be otherwise inserted if found desirable and, when the switch is "on", this branch of the circuit is completed from the radio set to the negative side of the B battery by means of the conductor 113, the springs 68′ and 68, and the conductor 114. The conductors 115, 116 and 117 serve to connect the negative and positive A battery terminals of the set with the switch and the positive B battery terminals of the set with the switch, respectively. The conductors 110 and 111 serve to connect the A battery with the switch, while the conductor 112 connects the positive side of the B battery with the switch.

I do not intend to be limited to the details shown and described.

I claim:

1. In combination, an enclosing sleeve, contact springs mounted in said sleeve and each having a terminal opening through the sleeve, terminal contacts mounted in said sleeve for contact with said springs, an operating element for said contact springs, and a fuse mounted in the sleeve and connected between one contact spring and its terminal.

2. In combination, an insulating sleeve, means secured in one end of the sleeve for mounting the same, contact springs mounted within the sleeve, terminals for said springs, and an operating element for said contact springs mounted in said sleeve mounting means, said sleeve having a socket with adjacent contacts in circuit between one of said springs and the terminal therefor such circuit including a fuse member mounted in said socket and having contact means for engagement with adjacent first contacts.

3. In combination, a tubular shell of insulating material, a cam member adapted for rotary movement within said shell, the axis of said member being disposed longitudinally of said shell, a plurality of spring members actuated by said cam member, said spring members being also disposed longitudinally of said shell and having outwardly extending hump portions for limiting the movement of said cam member inwardly of the shell.

4. In combination, a tubular shell of insulating material having a cap at one end thereof, an axially extending sleeve fitted in said cap having a shaft mounted therein, a cam member at one end of said shaft having a cam portion and an integral stop portion, a plurality of spring members longitudinally mounted within said shell said stop portion being adapted to cooperate with said springs for limiting the rotary motion of said cam member.

5. In combination, a tubular shell of insulating material having a plurality of spring members longitudinally mounted therein, one end of said spring members being generally U-shaped, a plurality of contact screws, an axially mounted cam member within said shell adapted to actuate said spring for bringing them into contact relation with said contact screws, said springs being brought into contact relation with said contact screws by being moved outwardly and away from each other by the cam member.

In witness whereof, I hereunto subscribe my name this 31st day of March, 1925.

ALFRED F. C. LOTZ.