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ANTENNA SELECTOR SWITCH

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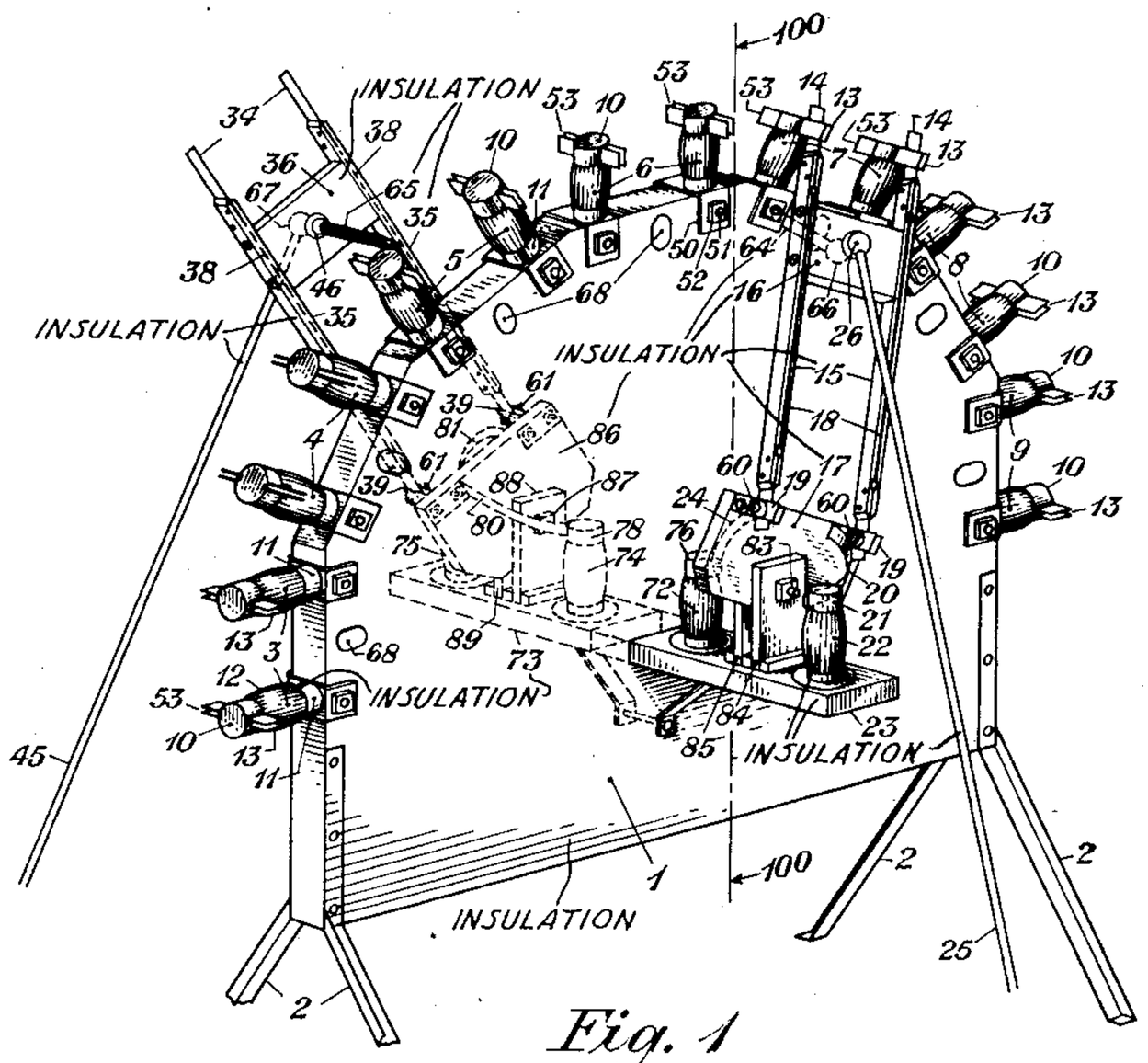

Fig. 1

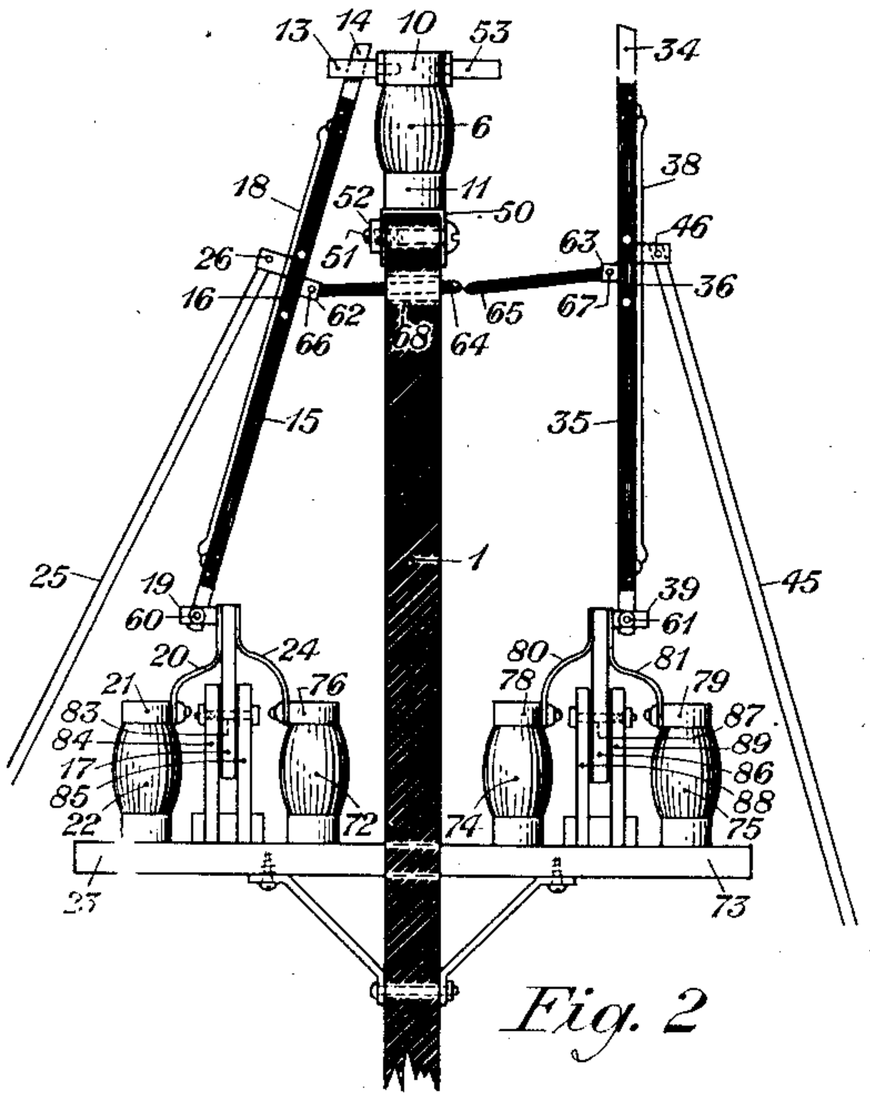

Fig. 2

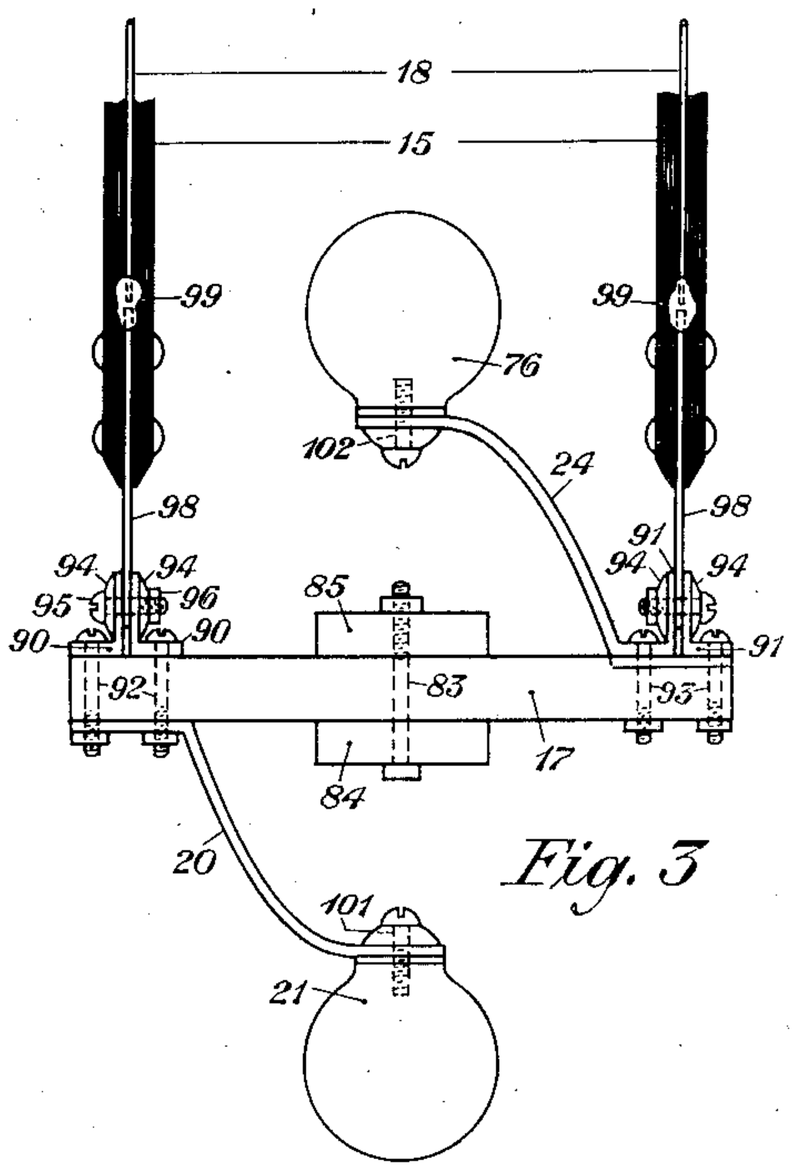

Fig. 3

INVENTOR
Robert R. Talley
BY William R. Ballard
ATTORNEY

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ANTENNA SELECTOR SWITCH

Robert Roark Talley, Beachwood, N. J., assignor to American Telephone and Telegraph Company, a corporation of New York

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5 Claims. (Cl. 200—5)

This invention relates to switches of the type employed in electrical circuits. More particularly, this invention relates to switches suitable for the connection of radio transmitters with antenna circuits.

At radio transmitting stations having a plurality of antennae and two radio transmitters which are to be connected to any two of the various antennae, transmission lines are often wired from the various antennae to a point near the radio transmitters so that switching operations may be performed to interconnect the various devices as desired. These switching operations are usually performed whenever it is desired to connect or change the connection of one of the radio transmitters with some one or another antenna and for connecting or changing the connection of the other of the radio transmitters with one or another of the remaining antennae. Each such transmission line generally consists of two conductors which connect to the two terminals of each antenna circuit.

Previously, switches were employed which often required two operators to perform the switching operations. One operator connected one of the output terminals of one of the radio transmitters to one of the conductors of a particular transmission line and the other operator connected the other output terminal of the same transmitter to the other conductor of the desired transmission line. A similar series of steps was followed in connecting or changing the connection of the other of the radio transmitters with another of the remaining transmission lines. In these operations a non-transparent board separated the two operators so that neither could learn whether the other operator made his connections correctly until after the switching functions were completed.

It is clear that the switching practices heretofore employed were subject to considerable chances of error. Moreover, if but one operator made the necessary connections, the time lost in traveling from one side of the switchboard to the other and thus establishing the desired connections was somewhat costly and the practice inefficient. The prior switching arrangements also required the exercise of considerable care to avoid the connection of the output circuit of one of the radio transmitters with the output circuit of the other radio transmitter—a condition which, if it occurred, might result in the impairment or destruction of some of the expensive equipment.

The difficulties and hazards of the prior switching apparatus are fully overcome by the apparatus of the present invention.

One of the primary objects of this invention is to provide a simple, efficient and relatively inexpensive arrangement for switching a plurality of radio transmitters between a plurality of transmission lines each of which extends to an individual antenna circuit.

Another of the objects of this invention is to provide an arrangement for connecting any two of a plurality of transmission lines to two radio transmitters in such a way as to prevent the splitting of the two conductors of any one of the transmission lines between the two transmitters.

A still further object of this invention is to prevent the simultaneous connection of both of the transmitters to the same antenna circuit.

Other and further objects of this invention will be apparent from the detailed description hereinafter following when read in connection with the accompanying drawing in which Figure 1 represents a perspective of the antenna selector switch of this invention; Fig. 2 shows a side view, partly in section, of the antenna selector switch; and Fig. 3 illustrates a plan view of a portion of the arrangement shown in Figs. 1 and 2.

Fig. 1 shows the perspective of the selector switch of this invention as already stated. The switchboard 1 of insulating material such as Micalex is permanently mounted on and fastened to the metallic legs 2. The four legs 2 may be seated on the cabinet of a radio transmitter (not shown). All four legs are positioned above the radio cabinet, so that the various contacts of the switching arrangement will be remote from the hands of passers-by.

Seven pairs of insulators 3 to 9 are permanently mounted on the outer edge or periphery of the board 1. Each of these insulators includes a metal piece 10 at the top and a metal piece 11 at the bottom, the insulation itself, designated 12, separating the two metal pieces 10 and 11. The metal pieces 10 of each pair of insulators are connected to a transmission pair or line which is connected to the two terminals of an antenna circuit (not shown). Thus, the seven pairs of insulators 3 to 9 are connected in orderly arrangement to seven transmission pairs or lines, each of which is connected to its individual antenna circuit.

The metal top 10 of each of the insulators 3 to 9 includes a pair of metallic jaws 13 made of resilient material, the jaws being spaced a short distance from each other, the spacing being such

as to receive conveniently a switch blade and establish good electrical contact therewith. The switch blades are designated 14 and they are permanently mounted in insulation side members 15. The insulation side members 15 are preferably made of a material such as Micalex and they are fixedly spaced from each other by a spacing block 16 which is also of a similar insulating material. The side members 15 are adjustably mounted on a rotary support block 17 as will be described more fully hereinafter.

The two switch blades 14 are respectively soldered to a pair of metallic wires 18 which are of a gauge suitable to conveniently carry the antenna currents. The other ends of the wires 18 are soldered to copper or brass metal pieces 19 which are permanently mounted on the rotatable support block 17, the latter block being also made of insulating material such as Micalex. The blades 14 as well as the insulation side members 15 and the spacing block 16 are rotatable as a unit through a small angle about an axis perpendicular to and in the plane of both of the side members 15, the rotation being utilized for moving the switch blades 14 into the receiving jaws 13 associated with the pair of insulators such as 7, or for removing the blades 14 from the jaws 10, whichever may be found necessary.

A conductor 20 of large cross-section connects the metal piece 19 at the right with the metallic top 21 of the insulator 22. The insulator 22 is similar in construction to the other insulators of the pairs 3 to 9 already referred to. The base of insulator 22 is seated on a platform 23, the platform 23 being made of insulating material such as Micalex and permanently and immovably supported by the board 1 in any well known manner. The insulator 22 is but one of two insulators positioned in front of board 1, the second insulator numbered 72 being positioned behind the insulator 22. The top 76 of the other insulator is connected to the metal piece 19 at the left by means of a conductor 24 shown in dotted lines. The conductors 20 and 24 are of course greatly insulated from each other and are also electrically connected to the output terminals of a radio transmitter (not shown).

An operating handle 25 is supported at hinge 26 which is attached to the insulating spacing block 16. The operator may grip the handle 25 whenever he wishes to remove the blades 14 from the jaws 13 of the insulators 7, for example, and thereafter insert the blades 14 into the receiving jaws of any other pair of insulators, for example, the jaws of insulators 8. In performing this operation, the side members 15 and the spacing block 16 will be rotated through a small angle about an axis in the plane of, and perpendicular to both of the side members 15, that is, away from the board 1 and toward the operator, then the elements 15 and 16 as well as the rotatable support block 17 will be rotated clockwise until the blades 14 are opposite the receiving jaws of insulators 8, and finally the elements 15 and 16 will be rotated toward the board 1 and away from the operator until the blades 14 are firmly gripped by the jaws 13 of insulators 8. Thus, the radio transmitter above referred to will be switched from the transmission line extending between insulators 7 and therefore, from the corresponding antenna circuit to the transmission line extending between insulators 8 and their individual antenna circuit.

Most of the apparatus already described is positioned in front of the board 1 or at its periphery. However, it will be observed that a spacing block 36 separates two side members 35 which support two additional switch blades 34 and that the latter blades are electrically connected to conductors 38, respectively, the conductors 38 extending to metal pieces 39 supported by the rotatable block 86, which is shown in dotted lines. These parts just referred to are all positioned on the opposite side of board 1, and they are shown somewhat disproportionately in the drawing for the sake of clarity, thereby to simplify the understanding of the invention. The operating handle 45 which is also located on the opposite side of board 1 is hingedly fixed to the spacing block 36, the switch blades 34 being now shown removed from electrical connection with any of the various pairs of peripheral insulators.

The spacing of either pair of the blades 14 or 34 is such as to allow their connection only to the two conductors of some one transmission line or pair. Neither of the pins 64 or 65 may be inserted into one of the various apertures 68 unless both blades of either of the pairs 14 or 34 are properly centered over a pair of the switch points associated with the same aperture. It is thus impossible to connect one of these blades to one of the conductors of the line connected to one of the insulators, such as 7, and the other blade of the same pair to one of the conductors of a different line connected, for example, to the insulators 6. This is important for the reason that it prevents the splitting of the connections from one of the radio transmitters between two transmission lines.

With the construction shown, the conductive elements inserted between a radio transmitter and the various transmission lines do not have to cross each other. Thus there will be a notable absence of cross-talk and singing effects. Also, the distributed capacity between these conductive elements will always be maintained below a very small but tolerable value, and the distributed capacity due to the switching device itself will be practically negligible.

Fig. 2 shows a view partly in section, of certain important features of the antenna switch of this invention, the section being taken along a directional line 100 shown in Fig. 1, to the right of the insulators 6 of Fig. 1. One of the two insulators designated 6 is shown mounted at the periphery of the board 1, the lower metal piece 11 of the insulator 6 being permanently fastened to an angular member 50 which is clamped to the board 1 by means of a bolt 51 and nut 52, as shown. The upper metal piece 10 of insulator 6 carries the receiving jaws 13 and 53 which are also shown in Fig. 1. The jaws 13 may be contacted by the blades 14 at the left of board 1 and the jaws 53 may be similarly contacted by the blades 34 at the right of board 1, but as will be seen more clearly hereinafter, the blades 14 and 34 cannot contact the jaws 13 and 53 of any one pair of insulators, respectively, at the same time.

The blades 14 and 34 are shown aligned with the side members 15 and 35, respectively, and the spacing blocks 16 and 36 carry hinges 26 and 46 about which the operating handles 25 and 45 may be respectively revolved. The blades 14 and 34 are also conductively connected to the metallic pieces 19 and 39, the latter metal pieces bearing pivots 60 and 61 about which the side members 15 and 35 respectively may be rotated either clockwise or counter-clockwise through some small angle such as 15° or 20°. For example, the

handle 25 may be moved so as to rotate the side members 15 in a counter-clockwise direction to separate and electrically disconnect the blades 14 from the jaws 13; or the handle 45 may, if desired, be manipulated so as to rotate the side members 35 in a counter-clockwise direction to bring the blades 34 into electrical contact with the jaws 53.

The spacing blocks 16 and 36 have tubular members 62 and 63 fastened thereto within which are pivotally mounted the ends of protector pins 64 and 65, respectively. The pins 64 and 65 are made of an insulating material such as hard rubber and are pointed at their forward terminals as shown. The pins 64 and 65 are rotatable through small angles, the rotations occurring about hinges 66 and 67 which traverse the member 62 and 63, respectively. The pin 64 is shown inserted in an aperture 68 within the board 1, this aperture being slightly below and midway between two insulators such as 6 (see Fig. 1).

When the pin 64 is inserted into a particular aperture as shown in Fig. 2, it is then impossible to insert the other pin 65 into the same aperture. The pointed terminal of pin 65 will allow the pin 65 to be deflected away from the pin 64 and from the aperture 68. It is, therefore, impossible for the blades 34 to contact the receiving jaws 53 while the blades 14 are inserted within the respective jaws 13 of any one pair of peripheral insulators. Thus it becomes impossible to connect the transmission line extending to insulators 6, for example, to the pairs of conductors running to both radio transmitters at the same time.

The insulators 22 and 72 are both supported by the platform 23. The platform 73 similarly supports the insulators 74 and 75. The (two) blades 14 are electrically connected to the metal tops 21 and 76 by conductive elements including the wires 20 and 24, the metal pieces 21 and 76 being also connected to the two terminals of one of the radio transmitters (not shown). The blades 34 are likewise electrically connected to the metal pieces 78 and 79 by conductive elements including the wires 80 and 81, respectively, the metal pieces 78 and 79 being similarly connected to the termini of the other radio transmitter (not shown).

The rotary support block 17 is pivoted about a bolt 83 which is held in position between two supports 84 and 85, the latter supports being fixedly held by the platform 23. A similar rotary support block 86 is pivoted about a bolt 87 which is also held in position between two supports 88 and 89 which are immovably affixed to the platform 73. The rotary block 17 is under the control of the operator's handle 25 and may be rotated, together with the blades 14 and the mountings therefor, through more than 180°, this rotation being utilized whenever the blades 14 are to be connected to the receiving jaws 13 of any selected pair of insulators 3—9 (shown in Fig. 1). The block 86 is similarly rotatable through a large arc to connect the blades 34 with any two of the receiving jaws 53 of any one of the pairs of insulators 3—9. Thus, the blocks 17 and 86 are independently rotatable about the pivots 83 and 87, and the pairs of blades 14 and 34, together with their supports, are independently rotatable about pivots 60 and 61, respectively, the axes of both sets of pivots for each pair of blades being 90° apart.

Fig. 3 shows one form of construction suitable for rotating the switch blade mechanism illustrated in Figs. 1 and 2. Here the rotatable support block 17 is shown supported by the bolt or pivot 83, the bolt or pivot 83 having bearing surfaces in the supports 84 and 85. Although the drawing shows the supports 84 and 85 closely adjacent to the rotatable block 17, there are however small spaces therebetween to enable the block 17 to freely rotate about the pivot 83 whenever desired.

It will be observed that the conductors 20 and 24 are each fastened at one end to the metallic angle members 90 and 91, respectively, which are bolted by the machine screw members 92 and 93 to the support block 17 in a well known manner. The other ends of conductors 20 and 24 are electrically connected by screws 101 and 102 to the tops 21 and 76 of the insulators 22 and 72, respectively (shown also in Figs. 1 and 2).

The angle members 90 are electrically connected to each other and to conductor 20 by the metallic screws 92. The spring washers 94 and bolt 95 and nut 96 are employed to hold the metal piece 98 (at the left) in position between the angle members 90 and at the same time the conductor 20 is connected electrically to the switch blade 14 (shown in Fig. 1) or rather to the wire 18 extending to the switch blade 14, the wire 18 being soldered at 99 to the wire 18 above the side member 15 as will be apparent from the description of Fig. 1. Similarly the conductor 24 is electrically connected to the switch blade 14 (shown at Fig. 1) by means of the metal piece 98 (at the right) and the wire 18 to which it is soldered at 99.

The arrangement shown in Fig. 3 is located on one side of the board 1 (see Fig. 2). It will be obvious that a similar arrangement is set up on the opposite side of the board 1.

The switch above described may be employed to connect either of two radio transmitters (not shown) with any desired transmission line and the other radio transmitter (not shown) with any one of the remaining transmission lines, but both transmitters are unable to be connected to the same transmission line at the same time.

The accompanying drawing shows schematically the construction employed for carrying out the general principles of the invention. Some of the unimportant details have been omitted so as to avoid confusion and make the invention more readily understandable.

While this invention has been shown and described in certain particular arrangements merely for the purpose of illustration, it will be understood that the general principles of this invention may be applied to other and widely varied organizations without departing from the spirit of the invention and scope of the appended claims.

What is claimed is:

1. An electrical switch comprising a board, a plurality of pairs of insulators mounted at the periphery of said board, two pairs of jaws of conductive material positioned at opposite sides of each insulator, two pairs of metallic blades, means for inserting both pairs of blades into the jaws of two different pairs of insulators so that two independent circuits may be completed at the same time, and means for preventing one of the pairs of blades from being inserted into the jaws associated with any other of said pairs of insulators when the latter jaws are in contact with a pair of blades, said means including two insulating members associated respectively with the two pairs of blades, said insulating members contacting each other before both blades can be inserted into a common pair of jaws.

2. An electrical switch comprising a board, two

pairs of blades, the two pairs of blades being positioned on opposite sides of said board, a plurality of pairs of conductive members mounted on said board, each pair of blades being contactable only with one pair of conductive members at a time, and means for preventing one of the pairs of blades from contacting any individual pair of said conductive members already in contact with the other pair of blades, said means including two insulating members associated respectively with the two pairs of blades, said insulating members contacting each other before said pairs of blades may be inserted into a common pair of conductive members.

3. An electrical switch comprising a board having a plurality of apertures therein, a plurality of pairs of terminals, one pair of said terminals being positioned on either side of the board adjacent to each aperture, two pairs of blades, two supports one for each pair of blades, two pins one carried by each support and insertable into any one of the apertures, means for moving either pair of blades into contact with a selected pair of terminals on one side of the board, the support carrying the latter pair of blades having its pin inserted into the corresponding aperture to prevent the other pin from entering the same aperture, means for deflecting said other pin as it contacts the first-mentioned pin when the latter pin is inserted in an aperture, whereby the other pair of blades will be unable to contact the terminals on the opposite side of the board associated with the same aperture while said pin remains inserted therein.

4. An electrical switch comprising two pairs of blades, two holders each supporting one of the pairs of blades, two pins each mounted on one of the holders so as to stand perpendicular to the associated holder, a board supporting the two holders on opposite sides thereof, the board having a plurality of apertures each suitable to receive only one of said pins at a time, a plurality of electrical terminals arranged in pairs, one pair of said terminals being positioned on the board adjacent to each aperture and so spaced that when one of the pins is inserted into the aperture the two blades associated with the same pin will contact the two terminals corresponding to the same aperture, means for deflecting one of said pins as it contacts the other pin when the latter pin is inserted in an aperture, means for rotating either holder about an axis perpendicular to said board so that the blades carried thereby may be caused to contact any desired pair of said terminals on the same side of said board, means for rotating either holder about an axis parallel to the board to change the position of the associated blades with respect to all of the terminals.

5. An antenna selector switch comprising two pairs of blades, two holders one for each pair of blades, a board upon the opposite sides of which the two holders are mounted so as to be rotatable about an axis perpendicular to the board, a plurality of apertures in said board, said apertures being equidistant from said axis, a plurality of electrical terminals arranged in pairs, two pairs of said terminals being adjacent to each aperture and being fastened to said board on opposite sides thereof, two pins each approximately of the cross-sectional area of said apertures and each carried by one of said holders perpendicular to said board, each holder being adjustable so that its two blades may contact any pair of terminals on the same side of the board and so that its associated pin may be inserted into the corresponding aperture, each holder being also adjustable about an axis parallel to the board to allow the associated pin to be inserted into or removed from the corresponding aperture and the two blades to be connected with or disconnected from the two terminals associated with the same aperture on the same side of the board, means for deflecting one of said pins as it contacts the other pin when the latter pin is inserted in an aperture.

ROBERT ROARK TALLEY.