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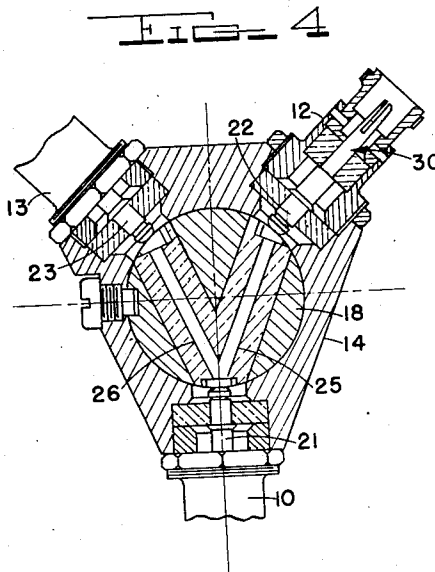
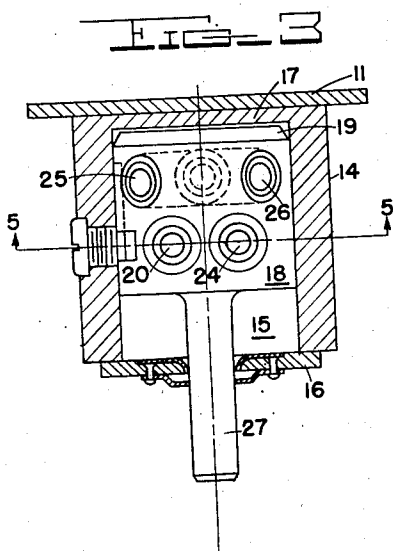
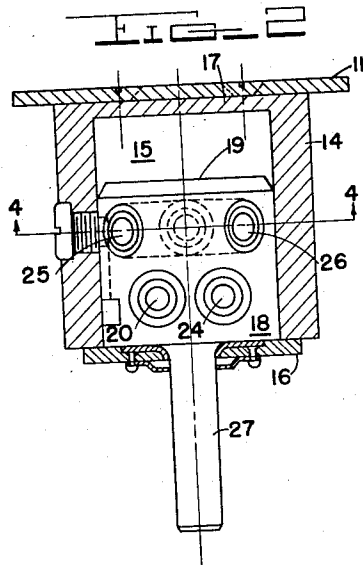
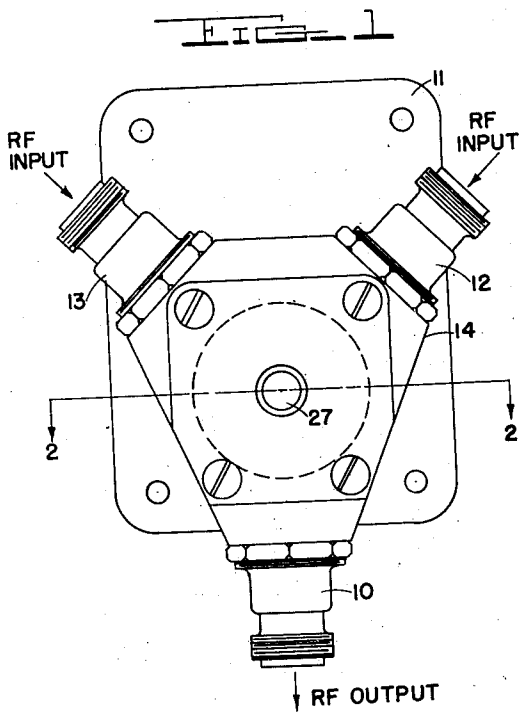
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ULTRA HIGH FREQUENCY SWITCH

2 Sheets-Sheet 1

Filed June 13, 1945



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2 Sheets-Sheet 2

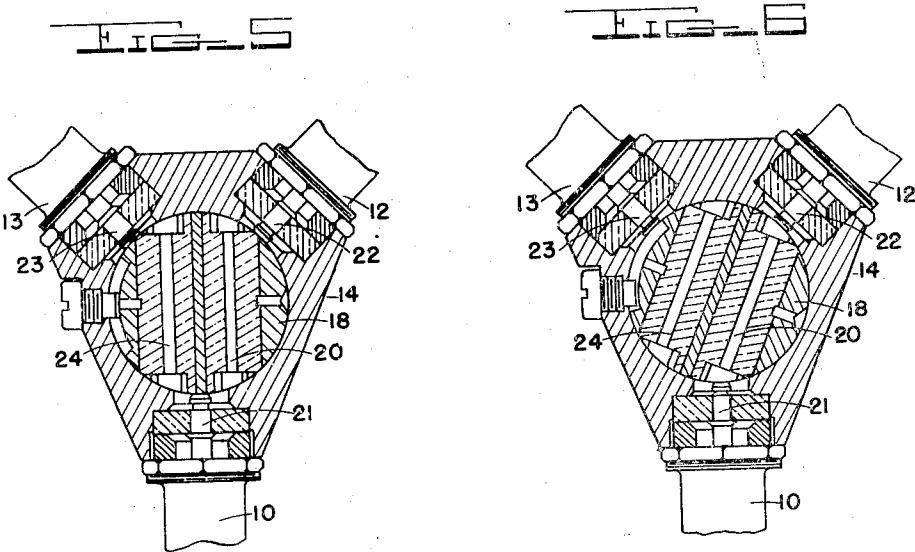
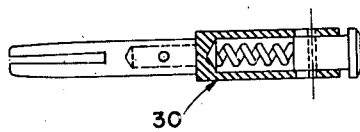


FIG. 7



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ULTRA HIGH FREQUENCY SWITCH

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This invention relates in general to ultra-high frequency radio apparatus and, more particularly to a novel arrangement of ultra-high-frequency switch for use in selectively coupling a pair of radio frequency transmission lines either singly or jointly, as desired, to a third and common radio frequency transmission line.

One object of the present invention is the alternate connection of either of two fixed radio frequency transmission lines to a third and common fixed radio frequency transmission line by rotation of the switching element through a slight angle in either direction and the joint connection of said pair of transmission lines to said common transmission line solely by axial movement of the switching element.

Another object of the invention is to provide a switching means capable of rotary motion in one plane for changing the connection of a common radio frequency transmission line from one to the other of a pair of radio frequency transmission lines, the switching means being arranged for reciprocation into a second and parallel plane to effect joint connection of said pair of transmission lines with the common transmission line.

Another object of the invention is to provide a multiple-action switch of the foregoing character in a single unit capable of making rapid changes in the aforesaid selective connection of a plurality of radio frequency coaxial transmission lines of the type used with ultra-high frequencies.

Other objects, features and advantages of the invention will be apparent from the following description of a particular embodiment thereof made with reference to the accompanying drawing, in which:

Fig. 1 is an end view of one practical form of switch assembly showing the generally Y-arrangement and disposition of the input and output radio-frequency transmission lines;

Fig. 2 is a longitudinal sectional view of the switch assembly of Fig. 1, taken substantially along the line 2-2 of Fig. 1, showing the movable switching member positioned at one end of the housing recess;

Fig. 3 is a section similar to Fig. 2 taken through the switch substantially along the line 2-2 thereof showing the movable switching member positioned at the other end of the housing recess;

Fig. 4 is a transverse section through the switch taken substantially along the line 4-4 of Fig. 2;

Fig. 5 is a partial section taken substantially along the line 5-5 of Fig. 3;

Fig. 6 shows the switching member of Fig. 5 rotated into operative position connecting one in-

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put line to the common output transmission line; and

Fig. 7 is a longitudinal sectional view of one of the plunger contact connector assemblies.

Referring now in detail to Figs. 1 and 2 of the drawing, there is shown a switch assembly disposed on a support 11, the switch device having three coaxial transmission line terminals 10, 12 and 13 respectively arranged in a generally Y-formation around the periphery of its metallic housing 14. As illustrated, the transmission line terminals 10, 12 and 13 each are disposed in a radial fashion with respect to the central cylindrical recess or chamber 15 of the housing 14 and leaving the housing substantially in one plane perpendicular to the common axis of the housing and the recess 15 midway between the planar end members 16 and 17 enclosing the recess. As shown in Figs. 4, 5 and 6, the three transmission line terminals in addition to being arranged radially about a common axis have their inwardly directed ends terminating at the circumference of a circle having its center on said axis.

Movably positioned within the recess 15 is the switching member in the form of a cylindrical metallic block 18 of shorter length than the cylindrical recess 15 of the housing. The block 18 is constructed and arranged for separate rotary and axial reciprocable movement relative to the recess 15 by means of shaft 21, the operation and purpose of which will be hereinafter described in greater detail, the position of the switching block 18 shown in Fig. 2 being that obtained when it is retracted axially of the recess 15 in an operative position for effecting joint connection of the pair of transmission line terminals 12 and 13 with the common transmission line terminal 10. Sliding movement of the block 18 to bring the chamfered end 19 of the block substantially into abutting engagement with the inner end 17 of the recess 15 also will serve to axially shift the block 18 bodily into its second operating position, as shown in Fig. 3. When it is in this innermost position, the block 18 also may be rotated by means of the shaft 21 through a limited angle such as, for example, 20 degrees in either direction to effect separate connection of input terminals 12 or 13 with output terminal 10. Thus, clockwise rotation of the block 18 will bring the conductor 20 (Fig. 5) into position for establishing an electrical connection between the inner conductors 21 and 22 of transmission line terminals 10 and 12, as shown in Fig. 6. Conversely, counterclockwise 20 degree rotation of the block 18 will serve to move the conductor 24 of the block into operative

position to connect conductors 21 and 23 of the transmission line terminals 10 and 13. It should be noted that when the block 18 is in the position shown in Fig. 2, the conductors 25 and 26 are, as shown in Fig. 4, in position for connecting the inner conductor 21 of transmission line terminal 10 simultaneously with the inner conductors 22 and 23 of the transmission line terminals 12 and 13. The positions to which the movable block may be shifted are predetermined by a detent mechanism comprising a screw projecting through the housing 14 into a plurality of slots in the movable block 18.

The conductors 20, 24, 25 and 26 carried in the movable switch block 18 are insulatingly supported and substantially centered within four straight-through passages and end openings which lie in a plane which is at right angles to the longitudinal axis of the block. Conductors 20 and 24 are within passages and end openings whose axes are essentially parallel. The conductors 25 and 26 lie within passages which diverge from a common opening on one side of the block 18 to two openings which are separated widely on the other side of the block, as shown in Figs. 2 and 4.

In accordance with the foregoing description, it will be seen that the cylindrical switch block 18 presents two sets of transmission line passages therethrough opening at two different levels, the passages at one level being parallel with their ends opening at opposite sides of said block while the transmission line passages at the second level are angularly disposed with respect to each other and converge into communication with a common opening at the opposite side of said block from the location of the individual openings of the respectively angularly arranged passages.

It is to be understood that the ends of the inner conductor mounted in each of the transmission line terminal connectors will be provided with resilient connector means (see Fig. 7) for making good electrical contact with the conductors carried by the movable block 18. For example, the ends of the transmission line inner conductors 21, 22, and 23 may be provided with spring biased contact plunger assemblies 30, one of which is shown in detail in Fig. 7, to assure a satisfactory electrical connection of the transmission lines with the connecting conductors 20, 24, 25 and 26.

The switch above described is generally useful in connecting a transmission line to any one or to all of a plurality of other transmission lines, and it also has special application and is particularly useful in connecting a radio receiver of the type used in radio direction finding equipment to either one or both of two receiving antennas which characterize one type of direction finding system.

While there has been described a preferred embodiment of the invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the spirit of the invention, and it is therefore, to be distinctly understood that no limitations are intended other than are imposed by the scope of the appended claims, as limited by the prior art.

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

What is claimed is:

1. An ultra-high frequency switch comprising, 75

a housing, a plurality of terminals attached to said housing for connecting thereto a plurality of radio frequency transmission lines, a movable switching member within said housing, a plurality of short sections of radio frequency transmission line carried by said switching member and arranged so as to connect at least a selected pair of transmission line terminals in each of several positions which said movable switching member may occupy, said switching member being constructed and arranged so as to be capable of independent rotary and reciprocable motion into selected positions for effecting the desired modification of electrical connecting of the plurality of transmission lines, and releasable connector means between said transmission line terminals and said switching member for establishing electrical connecting therebetween in any of the selected and adjusted positions of the switching member.

2. An ultra-high frequency switch comprising, a housing having a cylindrical recess therein, a plurality of terminals attached to said housing for connecting thereto a plurality of coaxial transmission lines, switching means including a movable cylindrical block within the recess of said housing, a plurality of short sections of coaxial transmission line within said block and movable therewith to connect at least a selected pair of transmission line terminals in each of several positions to which said movable block may be moved, said block being constructed and arranged so as to be capable of separate rotary and reciprocable motion to predetermined positions for effecting the desired modification of connecting of the plurality of transmission lines, and releasable contact means for establishing electrical connecting between said transmission line terminals and said switching means.

3. A switch for connecting a plurality of coaxial transmission lines either singly or simultaneously with a common coaxial transmission line, comprising a movable block presenting two sets of transversely disposed cylindrical passages connecting one side of the said block with another, the passages of one set being in one plane and extending straight through the block in substantially parallel relationship, the other set of passages extending straight through the block and diverging from a common end opening on the one side to widely separated end openings on the other side, coaxial line conductors movable with said block and disposed within said transverse passages of said block, and support means including terminal connectors for maintaining said coaxial transmission lines in cooperating relation to said movable coaxial line conductors, said block being arranged for both rotary and reciprocal motion.

4. A switch comprising a housing, a block rotatable and axially shiftable therein, said block having transverse passages therethrough, electrical conductors mounted in said passages and insulated from the block, said passages being straight through the block with their axes lying in a plane perpendicular to the axis of rotation of said block, two conductors being in one plane with their axes substantially parallel, another two being in a second plane longitudinally displaced from the first plane and divergent from a common point at one side of said block to points widely separated from each other at the opposite side of said block, support means for mounting the terminals of at least three transmission lines

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a correct operating position for contacting the ends of said conductors in the various positions said block may occupy, and means for rotating or axially shifting said block relative to said housing to effect connection of said transmission lines either singly or jointly.

5. In a switch, the combination of at least three electrical conductors arranged radially about a common axis and terminating at one end at the circumference of a circle having its center on said axis, and movable electrical conductor means arranged in cooperating relation to said three electrical conductors adapted to connect selectively two of said conductors either alternately or simultaneously with the third conductor, said movable conductor means being constructed and arranged to connect one of said conductors with the other two conductors alternately upon rotary movement of said movable conductor means about its axis, and to connect simultaneously one conductor with the other two of said conductors upon reciprocal movement of said movable conductor means along said axis.

6. A switch for connecting a plurality of transmission lines either singly or simultaneously with a common transmission line comprising, a cylindrical block formed with two sets of transmission line passages therethrough opening at two different levels, the passages at one level being parallel with their ends opening at opposite sides of said block, the passages at the second level being angularly disposed with respect to each other and converging into communication with a common opening at the opposite side of said block from the location of the individual openings of the respective angularly arranged passages.

7. An electric switch comprising, a housing with a cylindrical recess, electrical terminals disposed around the periphery of said housing, a movable block of shorter length than that of said recess permitting longitudinal movement of said block

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axially of said recess, means for insulatingly supporting two pairs of conductors extending transversely through said block substantially in a plane at right angles to the axis thereof, the first pair of said conductors being contained within straight passages whose axes are substantially parallel, the other pair of said conductors being contained in passages extending from a common opening on one side of the block to widely spaced openings on the other side thereof, the connecting passages being straight through, and means operatively arranged for moving said conductors into selective or conjoint cooperating relation with said fixed electrical terminals.

8. In a switch, the combination of at least three electrical conductors each with an end grouped cylindrically about a common axis and extending radially therefrom and movable electrical conductor means cooperating with and adapted to selectively connect two of said cylindrically grouped conductors either alternately or simultaneously with the third conductor, said movable conductor means being constructed and arranged to alternately connect one of said cylindrically grouped electrical conductors with the other two conductors of said group upon rotary movement about said common axis, and simultaneously connect the common cylindrically disposed conductor with the other two conductors of said group upon axial movement longitudinally with relation to said axis.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,721,286	Sweetman	July 16, 1929
2,360,286	Goddard	Oct. 10, 1944