April 3, 1962 R. F. MORRISON 3,028,563

COAXIAL TRANSFER SWITCH

Filed June 29, 1959 2 Sheets-Sheet 1

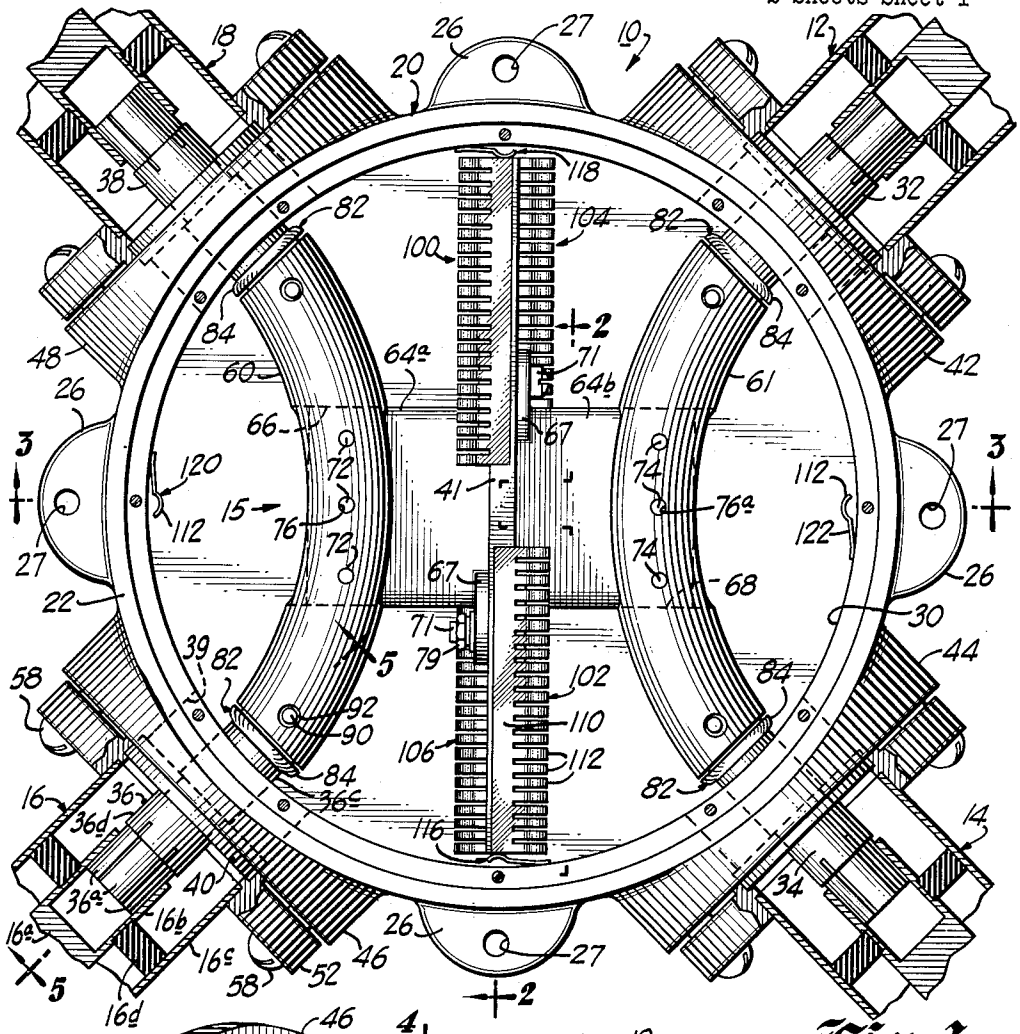


Fig. 1

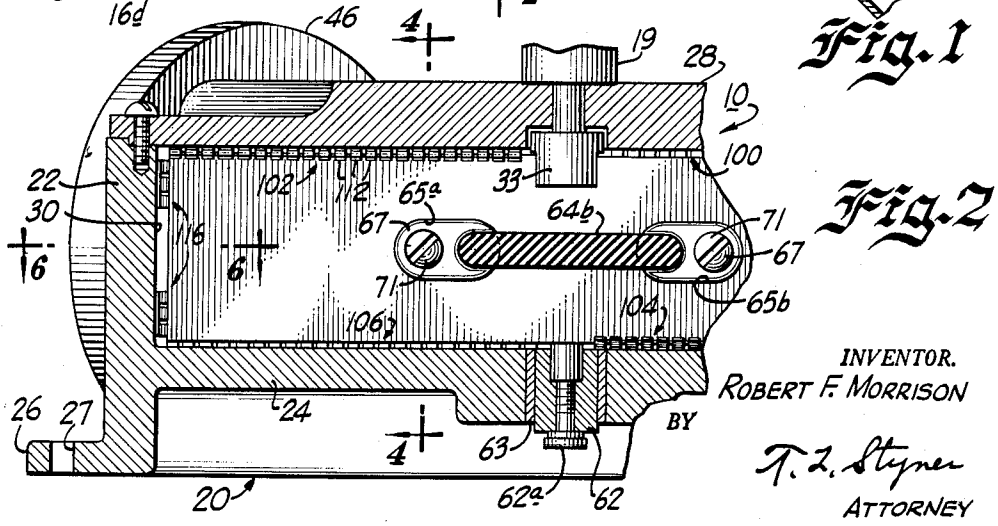


Fig. 2

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Fig. 3

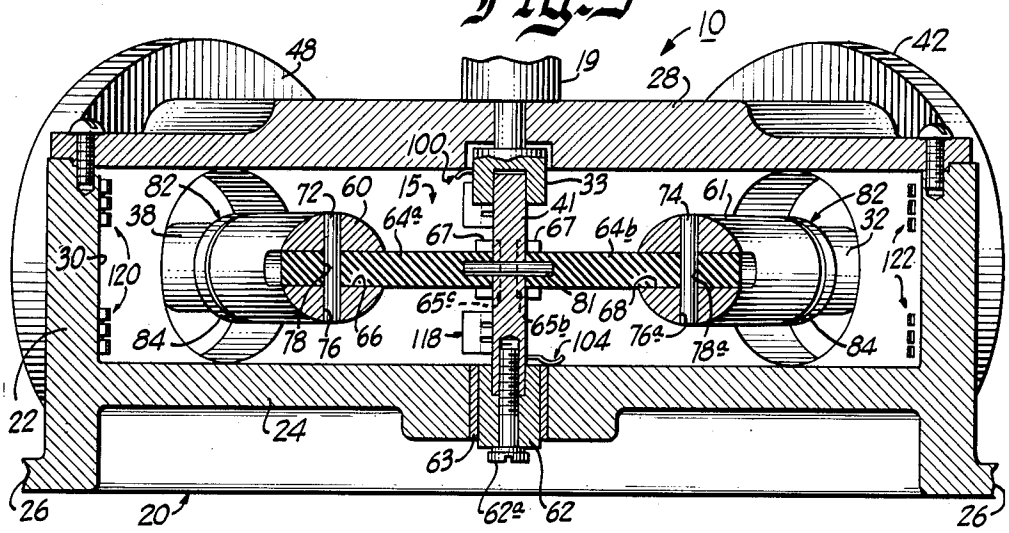


Fig. 5

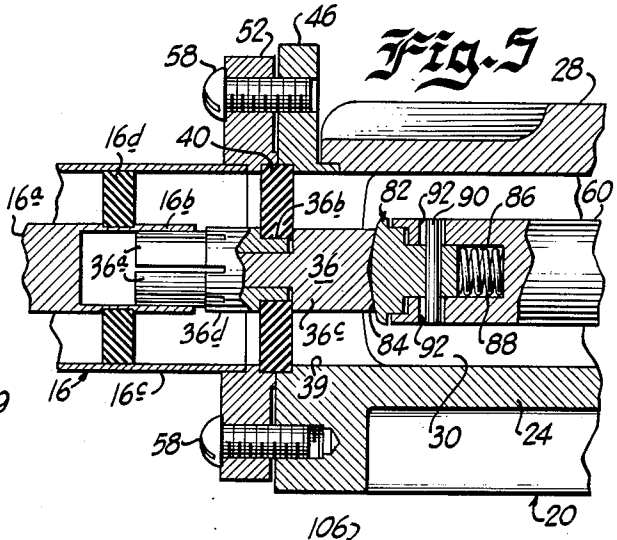


Fig. 4

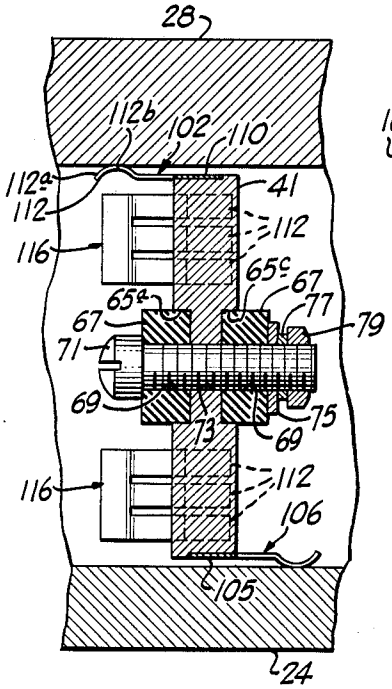
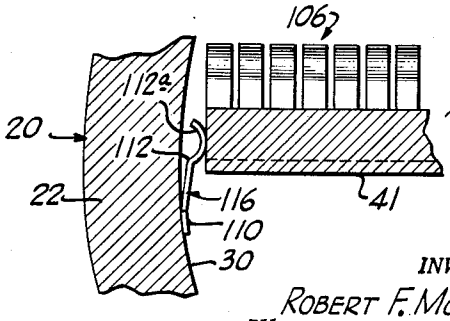


Fig. 6



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COAXIAL TRANSFER SWITCH

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8 Claims. (Cl. 333—7)

The present invention relates to coaxial transfer switches and, more particularly, to switches for simultaneously interconnecting a plurality of different pairs of coaxial transmission lines.

Coaxial transfer switches of prior design possess a number of disadvantages which seriously impair their operation particularly when they are used to transfer high frequency signals between transmission lines. Thus, for example, many such switches employ one or more sliding contacts which give rise to arcing and the attendant disadvantages with respect to heating and burning of the switch parts. In other cases coaxial switches of prior design provide insufficient shielding between the different signals to be transferred and, as a consequence, these signals tend to interact or interfere with one another, a condition which is aggravated by the use of high frequency signals.

It is an object of the present invention to provide a new and improved coaxial switch movable between different operating positions in order to transfer signals between different pairs of transmission lines with little or no interaction between the signals being transferred.

It is yet another object of the present invention to provide a new and improved transfer switch including a common, stationary housing serving as the outer conductor for a coaxial section used in connecting pairs of transmission lines with the conductive paths through the coaxial section being isolated from one another to prevent interaction between the signals being transferred.

It is still a further object of the present invention to provide a new and improved coaxial transfer switch which minimizes the possibility of power losses, heating and leakage arising from arcing due to poor electrical connection between contacting portions of the movable inner and outer switch conductors.

It is another object of the present invention to provide a new and improved transfer switch which avoids the undesirable effects of arc producing sliding switch contacts or air gap spacings.

A further object of the invention is to provide a good high frequency seal between the switch rotor and the casing of the switch, thereby assuring optimum transfer of electrical energy through the switch.

The above and other objects are realized, in accordance with the present invention, by providing a new and improved transfer switch for selectively interconnecting first and second pairs of coaxial transmission lines. Briefly, the transfer switch includes a casing carrying a plurality of spaced apart connectors each accommodating one end of a transmission line. Each connector includes concentric, inner and outer electrical conductors respectively connected to the inner and outer conductors of its associated transmission line. The outer electrical conductors of all of the connectors are electrically connected to the casing of the transfer switch, while the inner electrical conductors are selectively engageable with a pair of rotor conductors mounted on a switch rotor. The rotor is movable by suitable driving means between different operating positions wherein the rotor conductors interconnect different pairs of the transmission lines. In accordance with a feature of the present invention, the rotor conductors are spaced apart and are electrically insulated from one another to provide a high frequency seal between the casing and the rotor. This construction minimizes electrical

interaction between the electrical energy passing through the switch casing and the rotor conductors. The use of the casing as a common electrical conductor for all of the transmission lines eliminates the problem of switch contact resistance or air gap spacing and, hence, avoids the possibility of arcing with its attendant power loss, heating and leakage.

Other objects and advantages of the present invention will become apparent from the ensuing description in the course of which reference is had to the accompanying drawings wherein:

FIG. 1 is a top plan view of a coaxial transfer switch characterized by the features of the present invention, illustrated with its lid or cover removed;

FIG. 2 is a fragmentary sectional view taken along a line substantially corresponding to line 2—2 in FIG. 1;

FIG. 3 is a sectional view taken along a line substantially corresponding to line 3—3 of FIG. 1;

FIG. 4 is an enlarged, fragmentary, sectional view taken along a line substantially corresponding to line 4—4 of FIG. 2 assuming, of course, that the latter shows the entire structure;

FIG. 5 is a fragmentary sectional view taken along a line substantially corresponding to line 5—5 of FIG. 1; and

FIG. 6 is an enlarged, fragmentary, sectional view taken along a line corresponding substantially to line 6—6 of FIG. 2 again assuming that the latter shows the entire structure.

Referring now to the drawings and particularly to FIG. 1, a coaxial transfer switch **10** is there illustrated embodying the features of the present invention. The transfer switch **10** is electrically connected, as described more fully below, to a plurality of pairs of coaxial transmission lines with four such transmission lines being illustrated in the drawings as indicated by the reference numerals **12, 14, 16** and **18**. The switch **10** includes a rotor assembly **15** which is illustrated in one of its operating positions wherein it is effective to interconnect the transmission lines **12** and **14** and also to interconnect the transmission lines **16** and **18**. A suitable drive motor (not shown) or the like is operably connected to a rotor shaft **19** (FIG. 3) in order to rotate the rotor **15** in a clockwise direction as viewed in FIG. 1 from the position illustrated to a second operating position wherein it becomes effective to interconnect transmission lines **12** and **18** and, at the same time, to interconnect the transmission lines **14** and **16**.

As shown in FIGS. 1, 2 and 3, the transfer switch **10** comprises a generally cylindrical casing or housing **20** having a side wall **22** formed integral with a floor or base **24** spaced from the bottom of the wall **22**. At the bottom of the wall **22** a plurality of spaced apart mounting flanges **26** extend radially of the casing to provide suitable means for mounting the switch. Each of the flanges includes an opening **27** (FIGS. 1 and 2) for accommodating a mounting bolt. As is best shown in FIG. 3, the wall **22** and the floor **24** cooperate with a lid or cover **28** to define a generally cylindrical chamber **30** housing the rotor assembly **15**. The lid **28**, the wall **22** and the floor **24** are formed of a suitable electrically conducting metal.

The transmission lines **12, 14, 16** and **18** are electrically connected to the switch **10** at equidistantly spaced positions respectively defined by fixed bosses **42, 44, 46** and **48** formed on the wall **22**. Since the electrical connections for the transmission lines are identical only one, namely that for the line **16** shown in FIG. 5, need be considered in detail. The inner conductor **16***a* of the transmission line **16** includes a sleeved end portion **16***b* spaced from the outer conductor by means of a dielectric disc **16***d*. The sleeve portion accommodates conducting fingers **36***a* formed on a connector **36** extending inwardly within

a bore 39 in the boss 46. The connector 36 is centrally located within the bore and is held in position by an insulating block or ring 40 seated at its inner edge within an annular groove 36*b* formed in the connector. To define the latter groove, the connector 36 may be of two piece construction with the two pieces 36*c* and 36*d* being drive fitted together to form a rigid structure. The inner end of the piece 36*d* is recessed to form the groove 36*b*. The outer peripheral edge of the block 40 is clamped between the switch housing and a conducting flange 52 secured to the outer conductor 16*c* of the transmission line 16. Suitable recesses may be provided in the adjacent portions of the housing and the flange 52 to define an annular groove for receiving the block 40. The flange 52 is secured to the wall 22 of the housing by means of a plurality of screws 58, thereby forming an electrical connection from the outer conductor 16*c* to the switch housing 20. The spring fingers 36*a*, of course, engage the sleeve portion 16*b* to form an electrical connection from the inner conductor 16*a* to the connector 36. The inner end of the connector 36 protrudes into the chamber 30 and is curved or contoured to coact with the ends of rotor conductors 60 and 61 described more fully below. As indicated above, similar connecting arrangements are employed for the remaining transmission lines 12, 14 and 18 and the inner conductor connectors associated with these lines have been identified by reference numerals 32, 34 and 38.

Considering now the rotor assembly 15 in greater detail, it will be observed that this assembly includes a barrier or wall 41 which is pivotally supported near the center of its top for movement upon the lid 28 and is further supported near the center of its bottom for pivotal movement upon the floor 24. More specifically, as is best shown in FIG. 3, the bottom of the center portion of the barrier is fixedly secured by a fastener 62*a* to a bearing block 62 which, in turn, is mounted for rotation within a bushing 63 seated at the center of the floor 24. The top of the center portion of the barrier 41 is suitably secured to a yoke 33 which is connected to the end of the shaft 19 extending downwardly through an opening in the lid 28. As was indicated previously, the shaft 19 is driven by a motor or the like preferably through a gear reduction mechanism and, when this motor is operated, the shaft 19 and the yoke 33 are driven in order to turn the rotor 15 within the chamber 30.

The barrier 41 is formed of electrically conductive material, has a thin, rectangular configuration and is dimensioned to extend across substantially the entire diameter of the chamber 30 and also to extend through substantially the entire height of the chamber. The barrier 41 is sufficiently thick to provide the sole support for the pair of rotor conductors 60 and 61 referred to above. More specifically, the rotor conductors 60 and 61 are respectively secured to insulated support members 64*a* and 64*b* which are suitably fastened to the opposite sides of the center portion of the barrier 41. As is best shown in FIGS. 2 and 4, one side of the barrier 41 is recessed, as indicated at 65*a* and 65*b*, to accommodate enlarged feet 67 formed integrally with the insulated support 64*a* while the other side of the barrier 41 is provided with a similar pair of recesses 65*c* (FIG. 4) respectively aligned with the recesses 65*a* and 65*b*. A bolt 71 extends through aligned openings 69 in the feet 67 of both supports 64*a* and 64*b* and through an opening 73 defined in the barrier 41 in order to secure the supports to the barrier. Suitable washers 75, lock washers 77 and nuts 79 are threaded on the end of the bolts 71 to complete the assembly. As is best shown in FIG. 3, a pin 81 is located in suitable aligned openings in the barrier 41 and in the insulated supports 64*a* and 64*b* to further interlock the barrier and the supports, thereby assuring that the rotation of the barrier 41 is imparted to the insulated supports and, hence, to the rotor conductors 60 and 61.

The rotor conductor 60 and 61 comprise generally arcuate, rod-like members formed of electrically conductive material and are so supported from the insulated supports 64*a* and 64*b* that their ends are oriented adjacent to but spaced slightly inward from the inner periphery of the casing wall 22. Longitudinally extending slots 66 and 68 (FIG. 3) are defined in the inwardly facing sides of the conductors 60 and 61 for respectively receiving the edge portions of the insulated supports 64*a* and 64*b*. To complete the assembly of the conductor 60 upon the support 64*a*, a plurality of pins 72 are respectively inserted through aligned openings 76 and 78 defined in the conductor 60 and in the support 64*a*. A similar set of pins 74 is inserted through aligned openings 76*a* and 78*a* to secure the conductor 61 to the support 64*b*.

To provide for a biased electrical connection between the rotor conductors 60 and 61 and the inner conductor connectors 32, 34, 36 and 38, the two ends of each of the conductors 60 and 51 are provided with resilient contact means 82. These contact means 82 are identical in construction and, to simplify the description, only the contact means on the end of the rotor conductor 60 coacting with casing connector 36 will be described in detail. As shown in FIG. 5, the latter contact means 82 comprises a somewhat spherically headed contact stub 84 mounted for axial movement within a recess 86 extending inwardly from the end of the rotor conductor 60. A coiled spring 88 is seated within the recess 86 for the purpose of urging the contact stub 84 radially outwardly so that the contact firmly engages the inner conductor 36 when the rotor 15 is in the position illustrated in FIG. 1. The spherical contact stub 84 is retained within the recess by the coaction between a guide pin 90 secured to the contact stub 84 and a pair of slots 92 formed in the rotor conductor 60. The slots 92 are dimensioned to permit limited axial movement of the contact stub 84 but they prevent the stub from turning or rotating. When the switch 10 is in one of its operative or connector engaging positions good electrical connection between the rotor conductors 60 and 61 and the inner conductor connectors 32, 34, 36 and 38 is assured by the pressure exerted by the springs 88 on the contact stubs 84. It should further be apparent that when the switch 10 is moving between its switch positions and while the rotor 15 is turning within the chamber 30, the contact stubs 84 are urged outwardly but the slots 92 are so dimensioned that the contacts do not engage the casing wall 22. When the rotor 15 approaches one of its switch positions, the contact stubs 84 are deflected inwardly against the action of the springs 88 by engagement with the inner conductor connectors, thereby permitting the contact stubs 84 to ride over these connectors. The spherical ends of the contact stubs 84 are then seated within the concave ends of the connectors under the pressure applied by the springs 88.

It will be appreciated that since the outer conductors of the transmission lines 12, 14, 16 and 18 are electrically connected to the casing of the switch, it is unnecessary that movable conductors, similar to rotor conductors 60 and 61, be provided to coact with the outer transmission line conductors. The use of the stationary casing of the switch as the outer conductor eliminates leakage, power loss and arcing normally encountered as a result of mating contacts, employed to establish the outer conductor circuit. Furthermore, since only the inner transmission line conductors are movable only a single rotor conductor is required for each pair of coaxial lines to be interconnected. Since the transmission line outer conductors are connected to the casing 20, it should be apparent that the electrically conductive paths between the pairs of transmission lines are provided by the casing and, hence, it is important that these electrically conductive paths be separated from one another to prevent interaction between the energy to be transferred between the different pairs of transmission lines. Thus, in accordance with an

important feature of the present invention, the barrier **41** which essentially divides the rotor chamber **30** in half is electrically connected to the floor **24**, to the wall **22** and to the lid **28**.

The above described electrical connection between the barrier **41** and the lid **28** is established by a pair of electrically conductive combs **100** and **102** made of Phosphor bronze or similar resilient, conductive material. These combs have generally rectangular bodies **110** (FIG. 1) secured by soldering or the like to the upper edge of the barrier **41** and a plurality of outwardly extending teeth **112** resiliently urged into engagement with the under surface of the lid **28**. The comb **100** is slightly shorter than half the length of the barrier **41** and extends from the upper end of the barrier **41** (as viewed in FIG. 1) to a point adjacent one side of the yoke **33**. The teeth of the comb **100** extend laterally to the left of the barrier **41** as viewed in FIG. 1. The comb **102** is likewise shorter than half the length of the barrier **41** and extends from the lower end of the barrier (FIG. 1) to a point adjacent the other side of the yoke **33**. The teeth of the comb **102** extend laterally to the right of the barrier as viewed in FIG. 1. In a generally similar manner, combs **104** and **106** also made of Phosphor bronze or the like material and including generally rectangular bodies **105** (FIG. 4) are secured by soldering or the like to the lower edge of the barrier **41**. The comb **104** is slightly longer than the comb **100** and extends from the upper end of the barrier **41** to a point adjacent the bearing block **62**. The teeth of the comb **104** extend in the opposite direction from those of the comb **100** or to the right of the barrier **41** as viewed in FIG. 1. Similarly, the comb **106** is slightly longer than comb **102** and extends from the lower end of the barrier **41** to a point adjacent the bearing block **62**. The teeth of the comb **106** extend in the opposite direction from those of the comb **102** or to the left of the barrier as viewed in FIG. 1.

The combs **100**, **102**, **104** and **106**, which extend generally horizontally, are identical in construction and have a configuration best seen in FIGS. 1 and 4. To simplify the description only the comb **102** will be described in detail. As shown in FIG. 4, the comb **102** comprises a flat body portion **110** having integrally formed thereon a plurality of spaced apart, generally parallel spring fingers or teeth **112**. The teeth **112** terminate in curved end portions **112***a* (FIG. 4) defining lid engaging surfaces **112***b*. The electrically conductive Phosphor bronze material has inherent resilient properties so that the teeth **112** are resiliently urged into engagement with the lower surface of the lid **28** and this engagement persists even when the rotor **15** is being moved between its switch positions. The use of a large number of teeth electrically connected in parallel, of course, severely reduces the total effective gap or constant resistance.

To provide a good high frequency seal between the ends of the barrier **41** and the casing wall **22**, there are provided a plurality of vertically extending, electrically conductive combs **116**, **118**, **120** and **122** soldered or otherwise secured to the inner surface of the casing wall **22** at points intermediate the connectors **32**, **34**, **36** and **38**. Specifically, the comb members **116**, **118**, **120** and **122** are located 90 degrees apart so that when the rotor **15** is in one of its switch positions, the ends of the barrier **41** are in engagement with the teeth of a diametrically opposed pair of combs, thereby electrically connecting the barrier **41** to the casing wall **22**. Thus, the combs **116**, **118**, **120** and **122** cooperate with the combs **100**, **102**, **104** and **106** to connect the upper surface, the lower surface and the two ends of the barrier **41** to the casing **20**. The combs **116**, **118**, **120** and **122** are identical in construction to the previously described combs **100**, **102**, **104** and **106** and each includes a plurality of spring fingers or teeth **112** extending laterally from its rectangular body **110**. It will be appreciated that the curved end portions **112***a* of the combs **116**, **118**, **120** and **122** are spaced slightly from the wall of the casing so as to seat firmly against the ends of the barrier **41** when the rotor **15** is in one of its switch positions.

Although the rotary switch **10** has been described as having the combs **116**, **118**, **120** and **122** mounted on the wall of the casing **20**, it will be appreciated that instead of using four spaced apart casing combs, a pair of combs could be mounted on the opposed ends of the barrier **41**. However, if this alternative construction is employed, a resilient mounting means must be included to permit the combs to move past the connectors **32**, **34**, **36** and **38** without obstructing or impairing the movement of the rotor **31**.

In accordance with another feature of the present invention, the spaced apart rotor conductors **60** and **61** are electrically isolated from one another. To this end, the combs **100**, **102**, **104**, **106**, **116**, **118**, **120**, **122** coact with the barrier **41** to divide the rotor chamber **30** in half and to provide an electrical barrier between the rotor conductors **60** and **61**. Accordingly, with a good high frequency seal provided between the barrier **41** and the casing **20**, the chamber **30** is split in half and each half is isolated from the other half irrespective of the position of the rotor **15**. This construction eliminates electrical interaction between the signals carried by the rotor conductors **60** and **61**.

With the rotor **15** in the position illustrated in FIG. 1, the conductor **61** interconnects the transmission lines **12** and **14** while the conductor **60** interconnects the transmission lines **16** and **18**. Specifically, an electrical circuit between the inner conductors of the coaxial transmission lines **12** and **14** is established through the inner conductor connector **32**, the contact means **82**, the rotor conductor **61**, and the inner conductor connector **34**. A second electrical circuit is established between the outer conductors of the coaxial lines **12** and **14** through the casing wall **22**, the lid **28** and the floor **24**. The other coaxial transmission lines **16** and **18** are electrically connected together in the same general manner with the outer conductors being electrically connected through the casing **20**. As was mentioned above, the conductive paths for the outer transmission line conductors through the casing follow paths extending along the floor **24** and the lid **28** adjacent to the rotor conductors **60** and **61**.

While the spacing between the floor **24** and the lid **28** is illustrated in the drawings as being equal to the inside diameter of the outer conductor of the transmission line, this condition is not essential. The switch must be capable of providing good energy transfer without introducing reflections or standing waves in the lines and, to satisfy these requirements, the impedance of the transmission line within the switch must be equal to the impedance of the mating transmission line. This impedance relationship can be achieved by appropriate selection of the switch parameters to conform to the following relationship:

$$Z_0 = 138 \log_{10} \frac{4h}{d}$$

where Z_0 is the characteristic impedance desired, h is the spacing between the floor **24** and the lid **28** and d is the diameter of conductors **60** and **61**. Thus, by proper selection of the conductor diameters and of the dimensions of the chamber **30**, a characteristic impedance can be obtained to match the impedance of any coaxial line used and, when this condition is satisfied, reflections or standing waves will be eliminated or minimized.

In order to interconnect the coaxial transmission lines **14** and **16** and, at the same time, to interconnect the coaxial transmission lines **12** and **18**, the rotor **15** of the transfer switch **10** is rotated 90 degrees in a clockwise direction from the position shown in FIG. 1 by driving the shaft **19**. During this 90 degree rotation, the contact stubs **84** at the ends of the rotor conductors **60** and **61**

first move out of engagement with their associated connectors **32**, **34**, **36** and **38** and then are extended by the coiled springs **88**. As is shown in FIG. 3, small spaces are provided in the combs **116**, **118**, **120** and **122** to permit the passage of contacts **82**. During the described rotation, the teeth of the combs **100** and **102** slide along or wipe the lid **28** while the teeth of the combs **104** and **106** wipe the casing floor **24**.

As the rotor **15** approaches its next switch position, the connectors **32**, **34**, **36** and **38** deflect the contact stubs **84** inwardly, whereupon the coiled springs **88** urge the contact stubs **84** into contact with the ends of the inner conductor connectors.

When the rotor **15** is displaced 90 degrees in a clockwise direction from the position illustrated in FIG. 1, the transmission lines **12** and **18** are interconnected by the rotor conductor **60** and the transmission lines **14** and **16** are interconnected by rotor conductor **61**. At this time, the opposed ends of the barrier **41** respectively engage the vertically extending combs **120** and **122** to provide a good high frequency seal between the barrier **41** and the casing **20**. Each 90 degree rotation of the rotor **15** operates the transfer switch from one switch position to another and the rotor shaft **19** may, therefore, be driven to establish the desired connections between the coaxial lines.

From the foregoing description, it will be evident that the coaxial transfer switch embodying the features of the present invention is characterized by having relatively low current and power losses and that this significant advantage is achieved by using portions of the stationary casing as electrically conductive paths for the interconnected transmission lines. The switch of the present invention is further characterized by having substantially no interaction between the interconnected transmission lines because of the spaced apart and isolated relationship of the rotor conductors.

While the present invention has been shown and described in conjunction with an illustrative embodiment thereof, many modifications will occur to those skilled in this art, and it is, therefore, contemplated by the appended claims to cover any such modifications as fall within the true spirit and scope of the invention.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. A coaxial switch for interconnecting different pairs of coaxial transmission lines each of which includes an outer conductor and an inner conductor, said switch comprising a casing including walls defining an enclosed, cylindrically shaped chamber, means connecting the outer conductors of all of said lines to a side wall of said casing, a fixed contact connected to the inner conductor of each line and extending through said side wall and into said chamber for a predetermined distance, said fixed contacts being uniformly spaced about the cylindrical wall of said chamber, a rotor mounted for rotation within said chamber between different switch positions, said rotor including a straight, rigid, electrically conducting barrier extending across said chamber and dividing it into two halves, the length of said barrier being such that its opposed ends are spaced from the cylindrical wall of said chamber by an amount sufficient to permit it to rotate past said fixed contacts, insulating support means secured to said barrier and including portions respectively extending into said chamber halves, first and second rotor conductors respectively mounted upon said portions of said support means and respectively disposed within said chamber halves, each of said rotor conductors having at each end thereof a movable contact for engaging said fixed contacts, a spring acting upon each of said movable contacts and urging it outwardly from said rotor conductor and towards the cylindrical wall of said chamber, means limiting the outward movement of each movable contact, each of said rotor conductors and its associated movable contacts being effective to provide a connection between one pair of the fixed contacts whenever the rotor is in one of said switch positions, electrically conducting combs respectively mounted upon the top and bottom of the barrier and respectively engaging the top and bottom walls of said chamber, and a plurality of electrically conducting wipers uniformly spaced apart along and mounted in fixed position upon the cylindrical wall of said chamber, each wiper being disposed intermediate one pair of the fixed contacts, whereby each of the two opposed ends of the barrier engages one of said wipers whenever the rotor is in one of said switch positions, thus providing an electrical connection from the barrier to the cylindrical wall of said chamber.

2. The switch defined by claim 1 wherein the rotor conductors and the chamber are dimensioned to satisfy the relationship:

$$Z_0 = 138 \log_{10} \frac{4h}{d}$$

where d is the diameter of each conductor, h is the height of the chamber from the bottom wall to the top wall and Z_0 is the characteristic impedance of said transmission lines.

3. A coaxial switch for interconnecting different pairs of coaxial transmission lines each of which includes an outer conductor and an inner conductor, said switch comprising a casing including walls defining an enclosed, cylindrically shaped chamber, means connecting the outer conductors of all of said lines to a side wall of said casing, a fixed contact connected to the inner conductor of each line and extending through said side wall and into said chamber for a predetermined distance, said fixed contacts being uniformly spaced about the cylindrical wall of said chamber, a rotor mounted for rotation within said chamber between different switch positions, said rotor including an electrically conducting barrier extending across said chamber and dividing it into two halves, the length of said barrier being such that its opposed ends are spaced from the cylindrical wall of said chamber by an amount sufficient to permit it to rotate past said fixed contacts, insulating support means secured to said barrier and including portions respectively extending into said chamber halves, first and second rotor conductors respectively mounted upon said portions of said support means and respectively disposed within said chamber halves, each of said rotor conductors being effective to provide a connection between one pair of the fixed contacts whenever the rotor is in one of said switch positions, electrically conducting combs respectively mounted upon the top and bottom of the barrier and respectively engaging the top and bottom walls of said chamber, and a plurality of electrically conducting wipers uniformly spaced apart along and mounted in fixed position upon the cylindrical wall of said chamber, each wiper being disposed intermediate one pair of the fixed contacts whereby each of the two opposed ends of the barrier engages one of said wipers whenever the rotor is in one of said switch positions, thus providing an electrical connection from the barrier to the cylindrical wall of said chamber.

4. The switch defined by claim 3 wherein the rotor conductors and the chamber are dimensioned to satisfy the relationship:

$$Z_0 = 138 \log_{10} \frac{4h}{d}$$

where d is the diameter of each conductor, h is the height of the chamber from the bottom wall to the top wall, and Z_0 is the characteristic impedance of said transmission lines.

5. A coaxial switch for interconnecting different pairs of coaxial transmission lines each of which includes an outer conductor and an inner conductor, said switch comprising a casing including walls defining an enclosed,

cylindrically shaped chamber, means connecting the outer conductors of all of said lines to a side wall of said casing, a fixed contact connected to the inner conductor of each line and extending through said side wall and into said chamber for a predetermined distance, said fixed contacts being uniformly spaced about the cylindrical wall of said chamber, a rotor mounted for rotation within said chamber between different switch positions, said rotor including an electrically conducting barrier extending across said chamber and dividing it into two halves, the length of said barrier being such that its opposed ends are spaced from the cylindrical wall of said chamber by an amount sufficient to permit it to rotate past said fixed contacts, insulating support means secured to said barrier and including portions respectively extending into said chamber halves, first and second rotor conductors respectively mounted upon said portions of said support means and respectively disposed within said chamber halves, each of said rotor conductors being effective to provide a connection between one pair of the fixed contacts whenever the rotor is in one of said switch positions, and a plurality of electrically conducting wipers uniformly spaced apart along and mounted in fixed position upon the cylindrical wall of said chamber, each wiper being disposed intermediate one pair of the fixed contacts whereby each of the two opposed ends of the barrier engages one of said wipers whenever the rotor is in one of said switch positions, thus providing an electrical connection from the barrier to the cylindrical wall of said chamber.

6. The switch defined by claim 5 wherein the rotor conductors and the chamber are dimensioned to satisfy the relationship:

$$Z_0 = 138 \log_{10} \frac{4h}{d}$$

where d is the diameter of each conductor, h is the height of the chamber between the bottom wall and the top wall, and Z_0 is the characteristic impedance of said transmission lines.

7. A coaxial switch for interconnecting different pairs of coaxial transmission lines each of which includes an outer conductor and an inner conductor, said switch comprising a casing including walls defining an enclosed, cylindrically shaped member, means connecting the outer conductors of all of said lines to a side wall of said casing, a fixed contact connected to the inner conductor of each line and extending through said side wall and into said chamber for a predetermined distance, said fixed contacts being uniformly spaced about the cylindrical wall of said chamber, a rotor mounted for rotation within said chamber between different switch positions, said rotor including a straight, rigid, electrically conducting barrier extending across said chamber and dividing it into two halves, insulating support means secured to said barrier and including portions respectively extending into said chamber halves, first and second rotor conductors respectively mounted upon said portions of said support means and respectively disposed within said chamber halves, each of said rotor conductors having at each end thereof a movable contact for engaging said fixed contacts, a spring acting upon each of said movable contacts and urging it outwardly from said rotor conductor and towards the cylindrical wall of said chamber, means limiting the outward movement of each movable contact, each of said conductors and its associated movable contacts being effective to provide a connection between one pair of the fixed contacts whenever the rotor is in one of said switch positions, electrically conducting combs respectively mounted upon the top and bottom of the barrier and respectively engaging the top and bottom walls of said chamber, and means electrically connecting each of the two opposed ends of the barrier and the cylindrical wall of said chamber.

8. The switch defined by claim 7 wherein the rotor conductors and the chamber are dimensioned to satisfy the relationship:

$$Z_0 = 138 \log_{10} \frac{4h}{d}$$

where d is the diameter of each conductor, h is the height of the chamber from the bottom wall to the top wall, and Z_0 is the characteristic impedance of said transmission lines.

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