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COAXIAL SWITCH

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Fig. 1

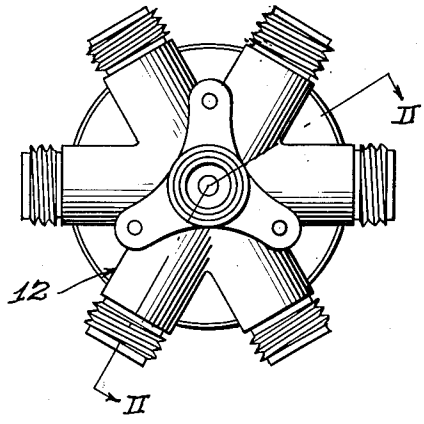


Fig. 3

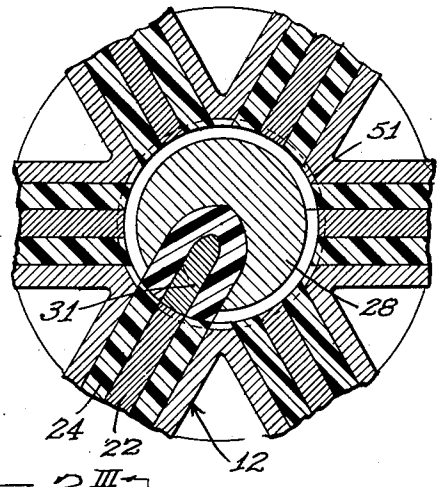
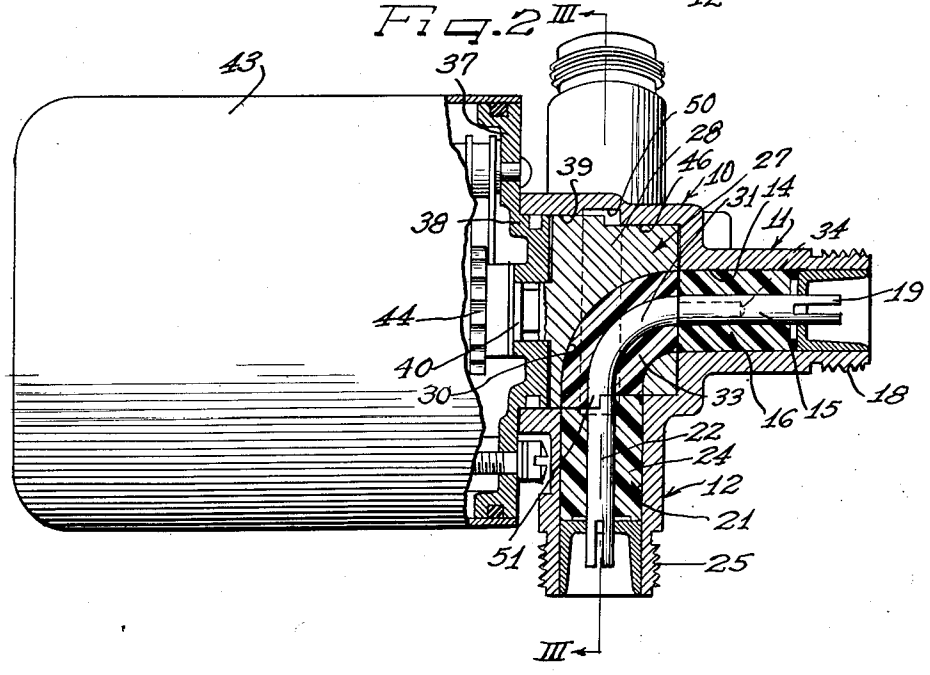


Fig. 2



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COAXIAL SWITCH

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This invention relates to a coaxial switch, and more particularly to a novel coaxial switch rotor and housing therefor.

It is an important object of the present invention to provide a novel coaxial switch rotor and housing assembly wherein the rotor contact is not shorted to the housing during movement of the rotor between switching positions.

It is a further important object of the present invention to provide a novel coaxial switch head for rotatably receiving a coaxial switch rotor wherein the housing will be spaced from the rotor inner conductor during actuation of the switch between switching positions so as to provide an open circuit between the inner and outer conductors of the rotor within the switch.

Other and further important objects of the present invention will be apparent from the disclosures in the specification and accompanying drawings.

On the drawings:

Figure 1 is an end elevational view of a coaxial switch rotor and housing assembly according to the present invention;

Figure 2 is a longitudinal sectional view taken substantially along the line II—II of Figure 1; and

Figure 3 is a fragmentary transverse sectional view taken substantially along the line III—III of Figure 2.

As shown on the drawings:

In Figures 1 and 2 is illustrated a single pole, six position switch which embodies the novel features of the present invention.

The switch of the present invention comprises a rotor housing **10** having a main terminal **11** and a plurality of generally radially extending branch terminals such as **12**. The main fitting **11** provides an internal wall **14** defining an outer conductor and has centrally disposed therein an inner conductor **15** mounted by means of an insulating sleeve **16**.

The terminal **11** has an externally threaded outer end as indicated at **18** for receiving a coaxial cable in threaded connection therewith. The coaxial cable is provided with an inner conductor prong for interengagement with the split end **19** of the inner conductor **15** of the terminal **11**. Similarly the branch terminal **12** provides an outer conductor **21**, an inner conductor **22** and an insulating sleeve **24**, and is exteriorly threaded as indicated at **25** to receive a further coaxial cable for interconnection with the cable attached to the main fitting **11** by means of a rotor **27**.

The rotor **27** may comprise a generally cylindrical metallic plug **28** having an elbow passage therein whose wall **30** defines an outer conductor for registry with the main outer conductor **14** and for selective registry with the branch outer conductors such as **21**. The rotor also carries an elbow conductor **31** coaxially of the outer conductor **30** and retained within the plug by means of insulation **33**. The elbow conductor **31** may have a pin **34** rotatably carried within a recess in the main inner conductor **15**. By this means, since the pin **34** extends centrally of the rotor housing and in alignment with the axis of rotation of the rotor, the rotor **27** may be rotated within the housing **10** while maintaining continuous electrical continuity between the inner conductor **31** of the rotor and the inner conductor **15** of the main terminal. Likewise, since the outer conductor **30** of the rotor adjacent the outer conductor **14** of the main terminal **11** is coaxial with the axis of rotation of the rotor, electrical continuity is maintained between the outer conductor **14** and the rotor outer conductor **30** during rotation of the rotor.

Connected with the rotor housing **10** and closing the open end thereof is a closure plate **37** having a boss **38** telescoping within the enlarged diameter portion **39** of the rotor chamber. The closure plate **37** is provided with a central aperture for receiving the rotor shaft **40** which extends from the rotor into an actuating housing **43**. The housing **43** encloses the mechanism for selectively positioning the rotor **27**. As indicated in Figure 2, this actuating mechanism may include a detent gear **44** which may cooperate with spring rollers (not shown) to precisely establish the six switching positions of the rotor.

As seen in Figure 2, the rotor plug **28** may have an enlarged diameter portion for snugly fitting within the enlarged diameter portion **39** of rotor chamber provided by the housing **10**, and may have a reduced diameter portion snugly fitting within a reduced diameter portion **46** of the rotor chamber. For establishing electrical continuity with the branch inner conductors such as **22**, the adjacent portion of the inner conductors **22** and **31** may be provided with complementary notches to afford an overlapping engagement between the inner conductors of the branch terminals and the rotor. As the rotor is rotated between branch terminals such as **12**, it will be seen that the outer conductor **30** will be in electrical continuity with the interior walls of the rotor chambers **39** and **46**. However, to prevent short circuiting between the outer conductor **30** and the inner conductor **31** during rotation of the rotor **28** between switching positions, the housing **10** is grooved as indicated at **50** to provide clearance for the notched end **51** of the inner conductor **31** of the rotor as it travels between branch terminals. It will be observed that the axial extent of the recess **50** is greater than the diameter of the inner conductor **31** and that the axially extending annular wall of the recess **50** is spaced radially from the end of the inner conductor terminal portion **51**, so as to provide clearance in all directions between the rotor housing **10** and the inner conductor **31**.

This provision of means for maintaining an open circuit between the rotor and inner and outer conductors during a switching operation has been found to greatly improve the characteristics of the switch for many applications, and avoids the necessity for any complicated arrangement for opening the coaxial circuit to the main terminal **11** during switching operations.

It will be understood that modifications and variations may be effected without departing from the scope of the novel concepts of the present invention.

I claim as my invention:

1. A coaxial switch comprising a metallic housing having a generally cylindrical rotor chamber therein and having a generally axially extending main terminal and a plurality of generally radially extending branch terminals providing inner and outer conductors communicating with said rotor chamber, said branch terminals inner conductors terminating in arcuately spaced relation about the interior periphery of said rotor chamber, and a coaxial switch rotor rotatably mounted in said chamber and having inner and outer conductors for con-

tinuous continuity with the inner and outer conductors of the main terminal and for selective continuity with the respective branch terminal inner and outer conductors, the rotor inner conductor having one end terminating adjacent the arcuate face of said rotor for selective electrical continuity with the branch inner conductors, and said housing interior walls defining said rotor chamber being provided with an annular recess extending between adjacent stations and providing a substantial air space between the rotor inner conductor terminal portion and the interior walls of said housing as the rotor inner conductor is moved between adjacent switching stations, said rotor inner conductor being in electrical open circuit relation to said housing during switching operations, and said recess being of relatively shallow radial extent in comparison to the diameter of the outer conductors of the branch terminals to minimize the physical discontinuity caused by the recess in the outer conductors of the branch terminals.

2. A coaxial switch comprising a housing having a rotor chamber including an enlarged diameter portion and a reduced diameter cylindrical portion, a rotor having an enlarged diameter cylindrical portion snugly fitting within the enlarged diameter cylindrical portion of the chamber and having a reduced diameter cylindrical portion connecting with the enlarged diameter cylindrical portion of the rotor on a radially extending annular shoulder and snugly fitting within the reduced diameter cylindrical portion of the chamber, said housing having a plurality of coaxial conductors disposed about the periphery of said chamber including inner conductors overlapping said shoulder for electrical continuity therewith, said rotor having coaxial conductor means at the periphery thereof for selective continuity with said housing coaxial conductors and including an inner conductor having a contact surface generally flush with said rotor annular shoulder for continuity with said housing inner conductors, said shoulder serving to short circuit the housing inner conductors not in registry with said rotor coaxial conductor means.

3. A coaxial switch comprising a housing having a rotor chamber including an enlarged diameter portion and a reduced diameter portion, a rotor having an enlarged diameter portion snugly fitting within the enlarged diameter portion of the chamber and having a reduced diameter portion connecting with the enlarged diameter portion of the rotor on a radially extending annular shoulder and snugly fitting within the reduced diameter portion of the chamber, said housing having a plurality of coaxial conductors disposed about the periphery of said chamber including inner conductors overlapping said shoulder for electrical continuity therewith, said rotor having coaxial conductor means at the periphery thereof for selective continuity with said housing coaxial conductors and including an inner conductor having a contact surface generally flush with said rotor annular shoulder for continuity with said housing inner conductors, said shoulder serving to short circuit said housing inner conductors not in registry with said rotor coaxial conductor means, and said housing having a recess at the region between said enlarged diameter and said reduced diameter portions of said chamber and providing a substantial space between the rotor inner conductor and the interior wall of said chamber, said rotor inner conductor being in open circuit relation to said housing in all positions thereof.

4. A coaxial switch comprising a housing having a rotor chamber including an enlarged diameter portion and a reduced diameter portion, a rotor having an enlarged diameter portion snugly fitting within the enlarged diameter portion of the chamber and having a reduced diameter portion connecting with the enlarged diameter portion of the rotor on a radially extending annular shoulder and snugly fitting within the reduced diameter portion of the chamber, said housing having a plurality of coaxial conductors disposed about the periphery of said chamber including inner conductors overlapping said shoulder for electrical continuity therewith, said rotor having coaxial conductor means at the periphery thereof for selective continuity with said housing coaxial conductors and including an inner conductor having a contact surface generally flush with said rotor annular shoulder for continuity with said housing inner conductors, said shoulder serving to short circuit said housing inner conductors not in registry with said rotor coaxial conductor means, and said housing providing an access aperture for said rotor at the enlarged diameter portion of said chamber, whereby said rotor may be inserted into and removed from said chamber without disturbing said housing coaxial conductors, and said housing having a recess at the region between said enlarged diameter and said reduced diameter portions of said chamber providing a substantial space between the rotor inner conductor and the interior wall of said chamber, said rotor inner conductor being in open circuit relation to said housing in all positions thereof, and said recess being of shallow radial extent in comparison to the diameter of the outer conductors in said housing to minimize the physical discontinuity in the outer conductors in the housing caused by said recess.

5. A coaxial switch comprising a housing having an interior rotor chamber with a plurality of coaxial switching stations arcuately spaced about the periphery of said chamber, each station including an inner and outer coaxial conductor, and a coaxial switch rotor rotatable in said chamber and including an inner conductor at the periphery thereof for selective alignment with the inner conductors of said stations, said housing having an annular recess extending about the periphery of said rotor chamber between adjacent stations with the wall of said recess being of conducting material and being substantially spaced from the rotor inner conductor, said rotor inner conductor being in electrical open circuit relation to said housing as the rotor is moved between switching positions, and said recess being of relatively shallow radial extent in comparison to the diameter of the outer conductors of the coaxial switching stations to minimize the physical discontinuity caused by the recess in the outer conductors of the switching stations.

6. A switch comprising a housing having a rotor chamber therein defined by an interior electrically conductive wall with a plurality of switching stations adjacent said chamber, and a rotor mounted in said chamber and having a rotor inner conductor at the periphery thereof for selectively establishing continuity with the switching stations, said housing having a groove therein about the periphery of said chamber between switching stations with the walls of the groove being substantially spaced from the rotor inner conductor, said rotor inner conductor being substantially spaced from the walls of the groove and the interior wall of the housing in all directions by a distance sufficient to effectively prevent transfer of high frequency electrical energy from the rotor inner conductor to the walls of the groove and the interior wall of the housing as the rotor is moved between switching stations, the rotor inner conductor thereby being maintained in electrical open circuit relation to the housing in moving between switching stations.

7. A switch comprising a housing having a rotor chamber therein defined by an interior electrically conductive wall with a plurality of switching stations adjacent said chamber, and a rotor mounted in said chamber and having a rotor inner conductor at the periphery thereof for selectively establishing continuity with the switching stations, said housing having a groove therein about the periphery of said chamber between switching stations with the walls of the groove being substantially spaced from the rotor inner conductor, said rotor inner conductor being substantially spaced from the walls of the groove and the interior wall of the housing in all directions by a dis-

tance sufficient to effectively prevent transfer of high frequency electrical energy from the rotor inner conductor to the walls of the groove and the interior wall of the housing as the rotor is moved between switching stations, the rotor inner conductor thereby being maintained in electrical open circuit relation to the housing in moving between switching stations, the rotor inner conductor having a minimum spacing from the walls of the groove in the direction axially of the rotor inner conductor substantially equal to the minimum spacing of the rotor inner

conductor from the groove walls and housing interior wall in all directions to minimize the physical discontinuity caused by the recess.

References Cited in the file of this patent

UNITED STATES PATENTS

2,360,219	Goddard	Oct. 10, 1944
2,426,186	Dow	Aug. 26, 1947
2,427,940	Ayres	Sept. 23, 1947
2,702,877	Noon	Feb. 22, 1955