Aug. 16, 1960 D. L. HOLZSCHUH ET AL 2,949,586

MICROWAVE ANTENNA SWITCH

Filed Oct. 15, 1958

2 Sheets-Sheet 1

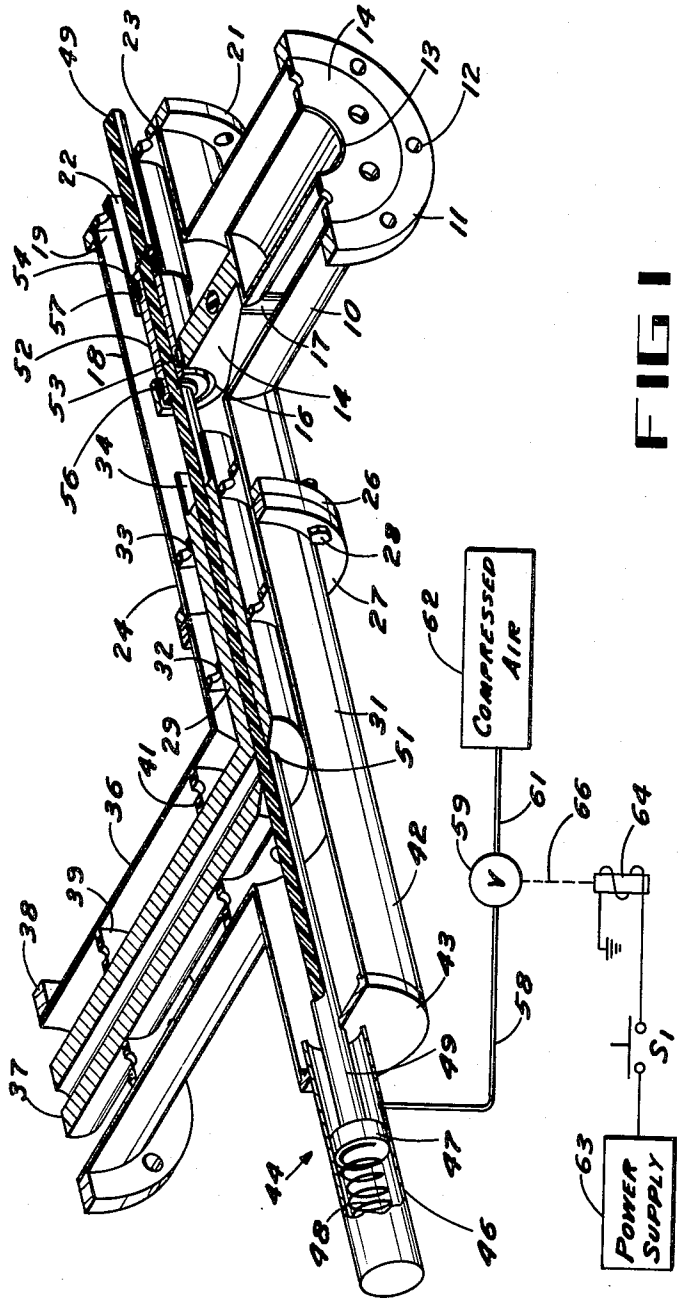


FIG 1

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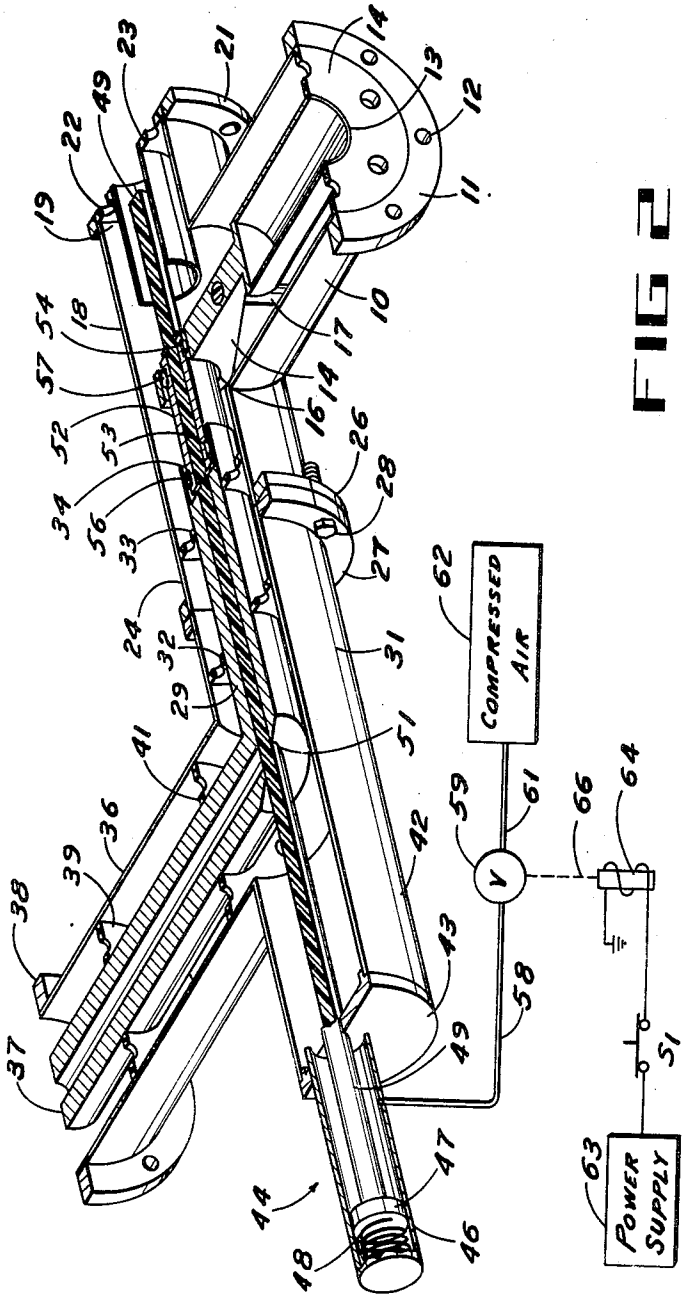


FIG 2

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MICROWAVE ANTENNA SWITCH

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1 Claim. (Cl. 333—7)

This invention relates in general to a switching mechanism, and in particular to apparatus for rapidly switching a first coaxial conductor between one of a pair of conductors.

It is often desirable to switch an antenna from a transmitter to a receiver as alternate use of the antenna is made for reception and transmission.

It is an object of this invention, therefore, to provide a simple and positive switch capable of connecting a first circuit to one of a pair of circuits.

A feature of the invention is found in the provision for a coaxial switch with a movable plunger which electrically connects a first circuit to one of a pair of circuits.

Further features, objects, and advantages of the invention will become apparent from the following description and claim when read in view of the drawings, in which:

Figure 1 is a cutaway drawing showing the switch in a first position, and

Figure 2 is a cutaway drawing showing the switch in a second position.

With reference to Figure 1, a first coaxial section comprises an outer hollow cylindrical conducting portion **10** which is formed with a flange **11** that has suitable openings **12** for connecting it to another coaxial cable section not shown. Mounted within portion **10** is a center conductor **13** which is supported by insulating disc **14** from the inner wall of the outer conductor **10**. Inner conductor **13** has an inner extension **14** which is formed with an opening **16**.

A structural insulating pin **17** extends through the outer conductor **10** and the portion **14** so as to maintain the inner conductor in a predetermined spatial relationship.

A second outer conductor **18** forms a T with the outer conductor **10**. The inner end of portion **14** extends within the confines of the outer conductor **18**. One end **19** of outer conductor **18** terminates in a flange **21** which may be connected to a suitable connecting waveguide portion. An inner conductor **22** is mounted within the outer conductor **18** by means of an insulating disc **23**. Conductor **22** is hollow and terminates a short distance from the portion **14**. The opening **16** formed through the portion **14** is in alignment with the opening through the inner conductor **22**. The other end **24** of the outer conductor **18** has a flange **26** which joins to a flange **27** by suitable holding means, as for example, bolts **28**. A hollow center conductor **29** is supported within conductors **31** and **18** by means of insulating discs **32** and **33**. The end **34** of inner conductor **29** is formed with an opening of the same size and in alignment with the opening **16**.

An outer conductor **36** forms a T-joint with the conductor **31** and has an inner conductor **37** which is electrically connected to the inner conductor **29**. A flange **38** on the outer end of conductor **36** is provided for making a suitable joint with another coaxial conductor,

not shown. Insulating spring washers **39** and **41** support the inner conductor **37** within the confines of the outer conductor **36**. An extension **42** is formed on the outer conductor **31** and terminates in an end plate **43** upon which a hydraulic valve **44** is mounted. Valve **44** has a cylinder **46** and a piston **47**. A spring **48** is mounted between the outer end of the cylinder **46** and piston **47** to urge the piston to the right relative to Figure 1. Piston **47** is connected to a shaft **49** of insulating material which extends within the confines of conductor **31** and through an opening **51** in the center conductor **29** and on through the center conductor **29** and the opening **16** of the center conductor **22**.

An electrical contact member **52** is mounted on the insulating shaft **49**. It is generally cylindrical in shape and is formed with a pair of grooves **53** and **54** in which are mounted coiled wires of conducting material **56** and **57**. The coiled wires of conductive material **56** and **57** extend beyond the confines of the body portion **52** and are adapted to make good electrical contact with the inner diameters of conductor **34**, opening **16**, and conductor **22**. The body portion **52** of the switching member is made of conducting material and coiled wire **56** and **57** is in good electrical contact therewith.

A fluid line **58** is connected to the cylinder **46** on the right side of the piston **47** relative to Figure 1. The line **58** is connected to a valve **59** which is connected by a line **61** to a tank of compressed air **62**. A switch S_1 connects power supply **63** to a solenoid **64** which has a mechanical linkage **66** to the valve **59**.

In operation, when the switch S_1 is closed, the solenoid **64** will be energized by the power supply **63** and the mechanical linkage **66** will open the valve **59** so that the compressed air from the tank **62** will be passed through the line **61** to the cylinder **46**. This will cause the piston **47** to move to the left relative to Figures 1 and 2, thus drawing the shaft **49** to the left relative to Figures 1 and 2 and causing the switch member **52** to move from the position shown in Figure 1 to the position shown in Figure 2.

It is to be noted that the switch member **52** moves from a first position where coil **56** is in engagement with the member **14** to a second position where it is in engagement with the inner conductor **29**. At the same time the coil **57** moves from engagement with conductor **22** to engagement with member **14** as shown in Figure 2.

When the switch S_1 is opened the valve **59** will close. Pressure within the cylinder **46** is then released so as to allow the spring **48** to move the piston **47** to the right to the position shown in Figure 1. This moves the shorting member **52** to the position shown in Figure 1. Thus the coaxial conductor comprising members **10** and **13** is alternately switched to outer and inner conductors **18** and **22** and outer and inner conductors **18** and **29**.

It is seen that this invention provides a positive means of switching between a first and second coaxial conductor in a fashion such that positive electrical contact is insured.

Although the invention has been described with respect to a particular embodiment thereof, it is not to be so limited, as changes and modifications may be made therein which are within the full intended scope of the invention as defined by the appended claim.

What is claimed is:

A coaxial waveguide switch comprising first, second, and third coaxial waveguides having inner and outer conductors, the inner conductors of the first and second coaxial waveguides in axial alignment with each other and terminating adjacent each other, the inner conductor of the third coaxial waveguide formed with a central opening which is in alignment with the first and second inner conductors and spaced therebetween and transverse with respect to the longitudinal dimension of the third

coaxial waveguide, an electrical contact member engageable with the third inner conductor and movable within the opening formed therein from a first position electrically connecting the third inner conductor and the first inner conductor to a second position electrically connecting the third inner conductor and the second inner conductor, the first inner conductor formed with a longitudinal opening, the second inner conductor formed with a longitudinal opening, said second coaxial waveguide having a first portion in axial alignment with the first inner conductor and a second portion out of alignment with the first inner conductor, an opening formed in the second waveguide at the junction between the first and second portions and the central opening of the third coaxial waveguide in alignment with the longitudinal

opening in the second inner conductor, an insulating shaft connected to the electrical contact member and extending through the longitudinal opening in the first inner conductor, the opening at the junction of the first and second portions of the second inner conductor, and the longitudinal opening in the second inner conductor, a piston attached to said insulating shaft, said piston mounted in a cylinder, and actuating means connected to said cylinder to move the piston.

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