June 23, 1953 J. W. SHAW 2,643,294

ADJUSTABLE COAXIAL ATTENUATOR ASSEMBLY

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FIG. 1.

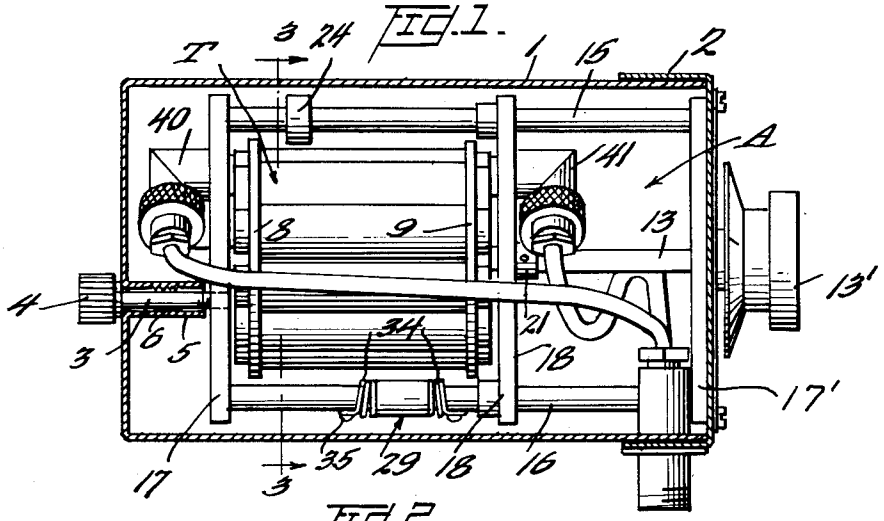


FIG. 2.

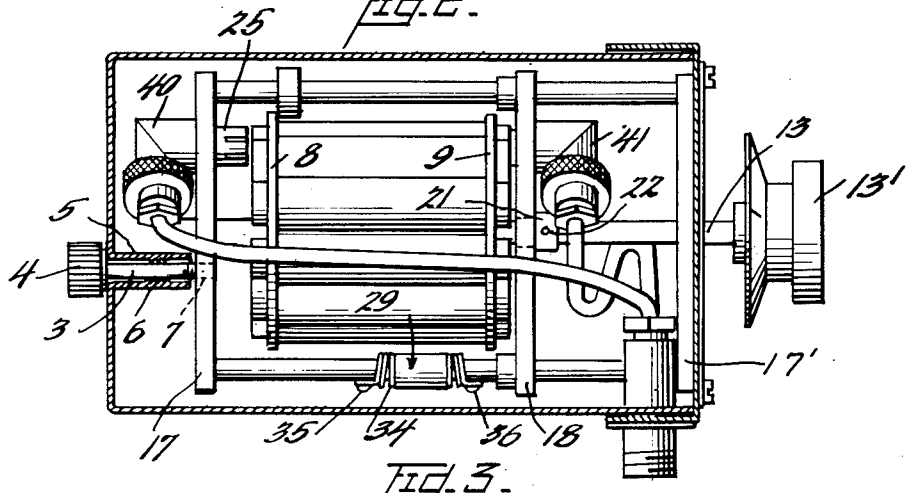
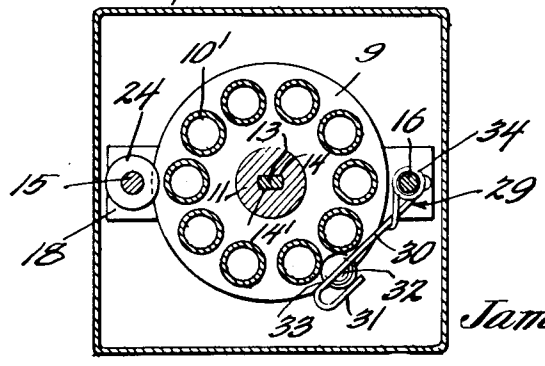


FIG. 3.



INVENTOR

James W. Shaw,

BY

ATTORNEY

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FIG. 4.

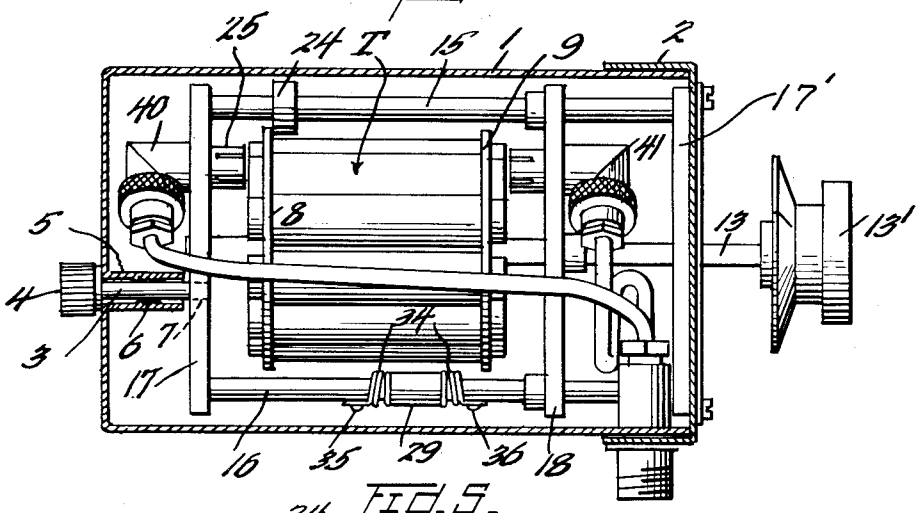


FIG. 5.

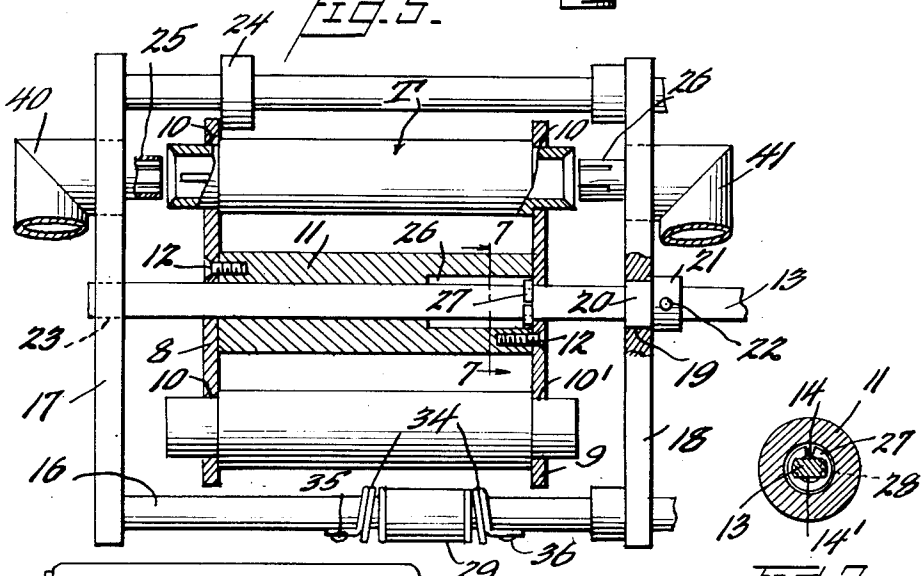


FIG. 7.

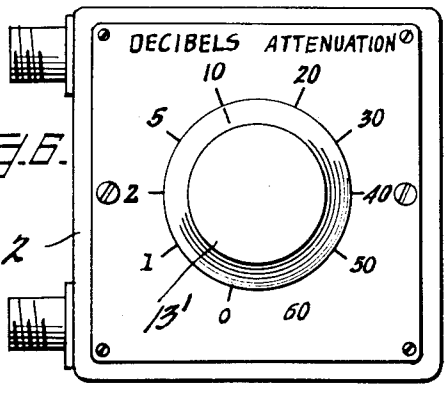


FIG. 6.

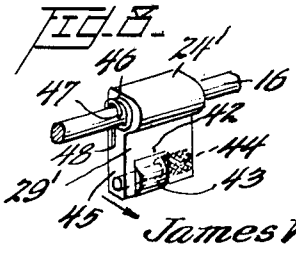


FIG. 8.

INVENTOR

James W. Shaw,

BY

ATTORNEY

Patented June 23, 1953

2,643,294

UNITED STATES PATENT OFFICE

2,643,294

ADJUSTABLE COAXIAL ATTENUATOR ASSEMBLY

James W. Shaw, Los Angeles, Calif., assignor to Stoddart Aircraft Radio Company, Los Angeles, Calif.

Application July 10, 1950, Serial No. 172,811

9 Claims. (Cl. 178—44)

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This invention relates in general to attenuator switches and more particularly to a coaxial cable switching device.

Heretofore, circuit selector switches in common use either for direct current or low frequency circuits have been provided with a plurality of circuit terminals arranged at points about a circle the axis thereof carrying a rotatable contact arm. In this manner, desired circuits are made operative by rotating the arm to an appropriate contact. Needless to say the contact carried by the rotating arm is wiped over each of the terminals and although this arrangement is satisfactory for use at low operating frequencies it is not suitable for use with extremely high frequencies.

Coaxial attenuator switches of the present type are relatively new in the art, the necessity for construction such as this having arisen as a result of the need for a device which could not be met by the conventional switches aforementioned. The improved device is designed particularly for use with coaxial cables which embody shielded outer tubular conductors and inner coaxial conductors, whereby it is possible to quickly connect adjacent ends of a telescopic coaxial cable and thereby attain a predetermined selection of any value of attenuation.

While the constructions which have been developed and may be found in the prior art are satisfactory, it is believed that the present improvement provides the ultimate in simplicity of operation.

The primary object of the invention is to provide a coaxial attenuator switching device wherein it is merely necessary to pull the control knob outwardly from the housing; rotate the knob to the decibels attenuation desired and thereafter project the same toward the housing consequently making the necessary telescoping connections in succession at adjacent ends of the attenuator pads.

Another object is to provide a simplified rotating switch constructed and arranged to make telescopic junction in succession with several fixed attenuator portions.

Another object of this invention is to provide the ultimate in accuracy and low standing wave ratios and also to have attenuation values remain constant with frequencies up into the thousands of megacycles.

Still another object of this invention is to provide an improved circuit loss varying means in the form of an improved attenuator unit.

With these objects in view, the coaxial attenuators may be packaged in any form suitable to meet the requirements of the particular coaxial cable use, are made available in single steps of attenuation for "in the line" service and also in a special switching turret featuring "Pull-Turn-Push" action to select any value of attenuation, the latter means being the subject of the present application.

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These and other objects and advantages of the invention will be apparent from the following description when considered in connection with the accompanying drawings, in which;

Figure 1 is a plan view of the coaxial cable attenuator showing the turret and attenuator pad connected to the terminals;

Figure 2 is also a plan view showing the knob partially withdrawn and the turret having been sufficiently retracted to break the left contact;

Figure 3 is a section on line 3—3 of Figure 1 showing the spring detent for positioning the turret against accidental rotation;

Figure 4 is another plan view of the device showing the knob fully retracted and the attenuator pad completely disengaged from the connections;

Figure 5 is a longitudinal section through the switch clearly showing the means by which the switch is reciprocated;

Figure 6 is an elevation of the front of the housing showing the control knob and the decibel indications;

Figure 7 is a section on line 7—7 of Figure 5; and,

Figure 8 is a perspective view of a modified embodiment of the invention wherein the stop and detent have been combined.

As shown in Figure 1 the completely assembled attenuator is positioned within a rectangular housing or container of metal or any other suitable material which is provided with a cover 2 carried by the assembly, generally indicated as A, said assembly being inserted into the housing from the right, as viewed in the drawings, and secured therein by means of the screwthreaded bolt shank 3 the opposite end of which is provided with a knurled head 4. A tubular or sleeve-like member 5 is fastened to this housing in any suitable manner, said member being partially internally threaded as at 6 to prevent the bolt 3 from being accidentally lost or misplaced on occasion of the assembly being removed from the housing, the tubular member also functioning as a centering means to facilitate the insertion of the threaded shank 3 into aperture 7 provided in plate 17.

It is to be understood, that, although the drawings illustrate a unit comprising 10 attenuator pads this is not to be construed as a limitation since a switch assembly may be provided with any number desired for a particular installation, the object being to readily select various fixed values of attenuation in a coaxial circuit.

The switch, generally indicated as T, comprises a pair of disc members 8 and 9 which are provided with a plurality of apertures 10, 10' to accommodate the attenuator pads, the discs being spacedly arranged relative to each other by hub 11 (Figure 7) which is secured to the discs by screws 12. The switch comprising the attenuators, the hub and discs are axially slidable as a unit on a shaft 13. This shaft has flattened areas as at 14, 14' for a purpose which will become apparent as the description progresses.

Affixed to and extending outwardly from the cover 2 are a plurality of cylindrical guide arms 15 and 16 the opposite ends of which are attached to plates 17, 17'. Disposed between the switch and the cover is a relatively movable plate 18 slidably positioned on the aforesaid arms, the center portion of said plate 18 being apertured as at 19 and adapted to receive a bushing 20 carried by collar 21 which is secured to one of the flattened areas of shaft 13 by means of a recessed set screw 22. The center portion of plate 17 is also apertured as at 23 thereby slidably positioning the opposite end of shaft 13. Cylindrical guide arm 15 is provided with a stop 24 positioned a predetermined distance from plate 17 and this stop element functions to limit the outward movement of the disc element 8 and the turret immediately after the attenuator unit is disengaged from connector 25. With reference to Figure 7 it is to be noted that hub 11 is suitably counterbored at 26 to provide clearance for a C-type washer 27 which fits snugly into groove 28 provided on shaft 13, said washer cooperating with the innermost wall of disc 9 to move the turret away from the telescopic connector 25, when the decibel indicator knob is retracted. However, this washer performs no further function in so far as the counterbore is concerned when the shaft 13 is moved to the left, as by pushing inwardly on the decibel indicator knob 27. The inward movement imparted to the shaft by the knob and the resulting translatory motion of the switch is accomplished by the predetermined positioning of bushing 20 and collar 21 relative to the shaft. The elbowed connector 41 is mounted in plate 18 directly in line with connector 40, see Figures 1, 2, 4 and 5, and when connector 41 is advanced toward the attenuator unit by movement of the knob, shaft and plate, both telescopic contacts are completed in succession, first 40 and, thereafter, 41, or the sequence may be 41—40, depending on whether 40 or 41 has the greatest friction to the pad.

Any tendency of the switch to become misaligned with respect to the telescopic connectors is eliminated by means of the spring urged detent indicated at 29 which comprises a strap-like element 30 one end of which is wound about arm 16. The opposite end of this element is bent back upon itself as at 31 and forms a seat for a ball bearing 32 which projects through an aperture 33 in element 30 and rests between cylindrical surfaces of adjacent attenuator units thereby preventing their accidental misalignment. A spring 34 is placed around arm 16, as shown, and secured thereto by means of screws 35 and 36. The free end of said spring is U-shaped in configuration and positioned to straddle the strap member 30 and thereby urge this member upwardly and consequently ball 32 between the attenuator pads of the switch.

In Figure 8 is shown a modified form of a spring urged detent 29' which has been combined with a stop 24'. This embodiment is P-shaped, the upper portion thereof being adapted to receive shaft 16'. The front of the P shaped leg is slotted as at 42 and arranged to hold an apertured roller 43 which is secured therein by means of a knurled pin 44 that is introduced into the apertured side of the leg 45. The spring 46 is formed by inserting the wire into an aperture 47 in shaft 16' thereafter winding it about the shaft sufficiently to obtain resiliency and inserting it in an aperture 48 provided in leg 45 for this purpose. It will be noted that the combined detent and stop is arranged to be urged in the direction of the arrow and maintain itself between two of the attenuator pads which are indicated as X and Y, respectively.

Various changes and modifications are considered to be within the principle of the invention and the scope of the following claims.

I claim:

1. A coaxial cable switch, including two support members in relatively fixed spaced relation, one of said members being provided with a first connector means, means carrying a second connector means in predetermined axial relation to said first connector means and axially movable relatively thereto, a switch assembly comprising a switch member axially slidable between said connector means and carrying a plurality of switch elements arranged in a successive series for individual presentation between and axially of said connector means, means for effecting relative axial movement of said connector means and means for optionally presenting individual switch elements between and in axial alignment with said connector means.

2. A coaxial cable switch as claimed in claim 1, wherein the means for providing relative axial movement of said connector means include a lost motion connection between said switch member and the means for carrying said second connector means thereby to permit relative axial movement therebetween.

3. A coaxial cable switch as claimed in claim 1, wherein the means for carrying the axially movable connector means include arms carried by said first named member and upon which said second connector means are movable in predetermined axial relation to said first connector means.

4. A coaxial cable switch as claimed in claim 3, wherein one of said arms carrying a resiliently actuated detent means engaging the switch member serves to positively position said switch member in optionally selected circumferential adjustment for axial sliding movement relative to said connector means.

5. A coaxial cable switch as claimed in claim 3, wherein one of said arms carries stop means serving to limit sliding travel of said switch in one direction of its movement relative to said connector means.

6. A coaxial cable switch as claimed in claim 1, wherein the switch assembly includes a plurality of similar attenuator pads circumferentially arranged between a spaced pair of carrier discs and axially fixed with respect thereto, said switch assembly being rotatable and axially movable for

optional presentation of said attenuator pads relative to said connector means.

7. A coaxial cable switch as claimed in claim 6, wherein the switch assembly includes an axially apertured hub member disposed between said discs, and operating means for said switch assembly including a shaft extending through said hub.

8. A coaxial cable switch as claimed in claim 7, wherein a member on the operating means is axially slidable in the apertured hub disposed between the discs of said switch member.

9. A coaxial cable switch as claimed in claim 3, wherein one of said arms carries combined stop and resiliently actuated detent means comprising a member fixed against axial movement and resiliently biased for movement normally thereof into engagement with the switch member.

JAMES W. SHAW.

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