

**June 22, 1948.**

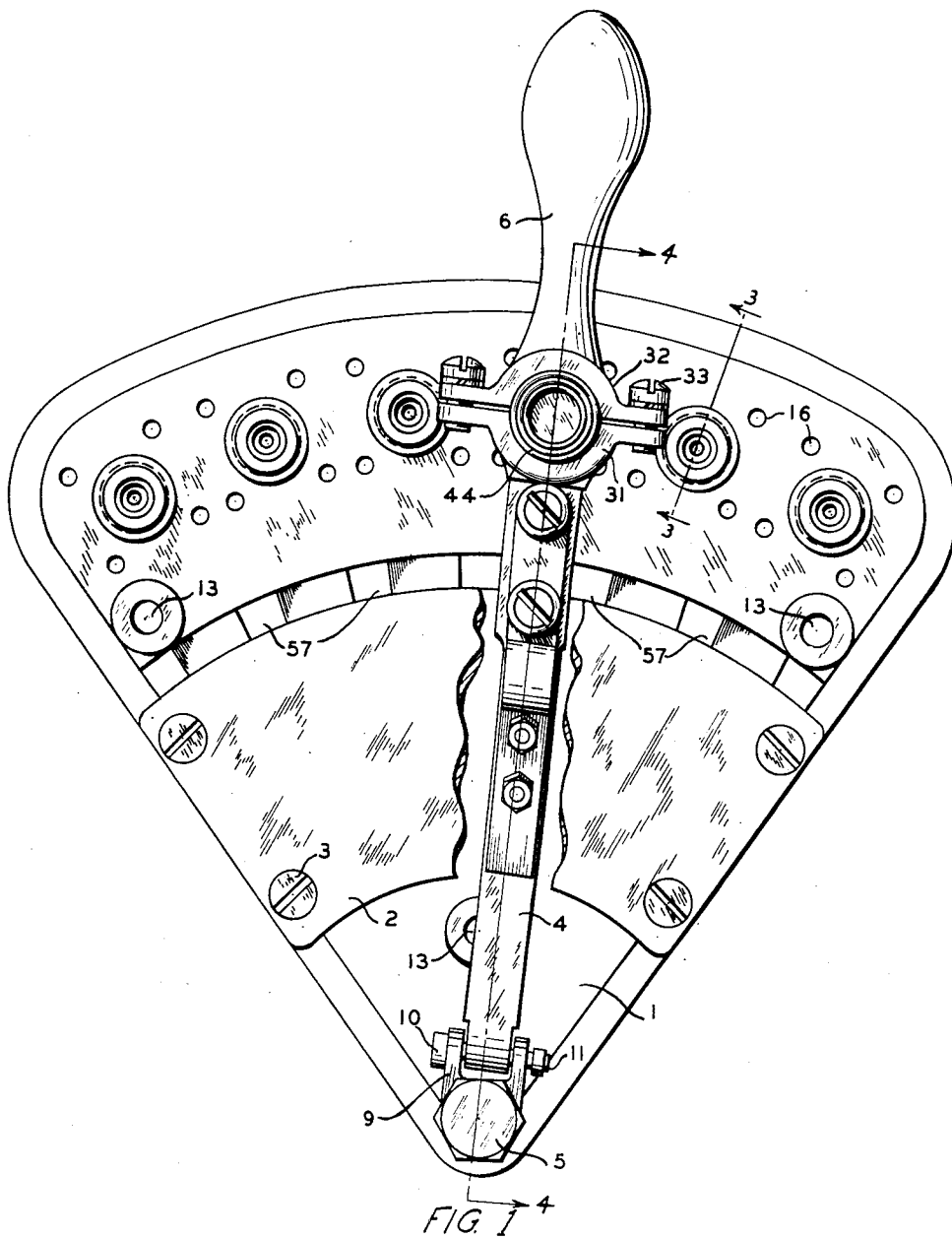
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**2,443,635**

# RADIO-FREQUENCY SWITCH ASSEMBLY

Filed June 7, 1944

4 Sheets-Sheet 1



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RADIO-FREQUENCY SWITCH ASSEMBLY

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4 Sheets-Sheet 2

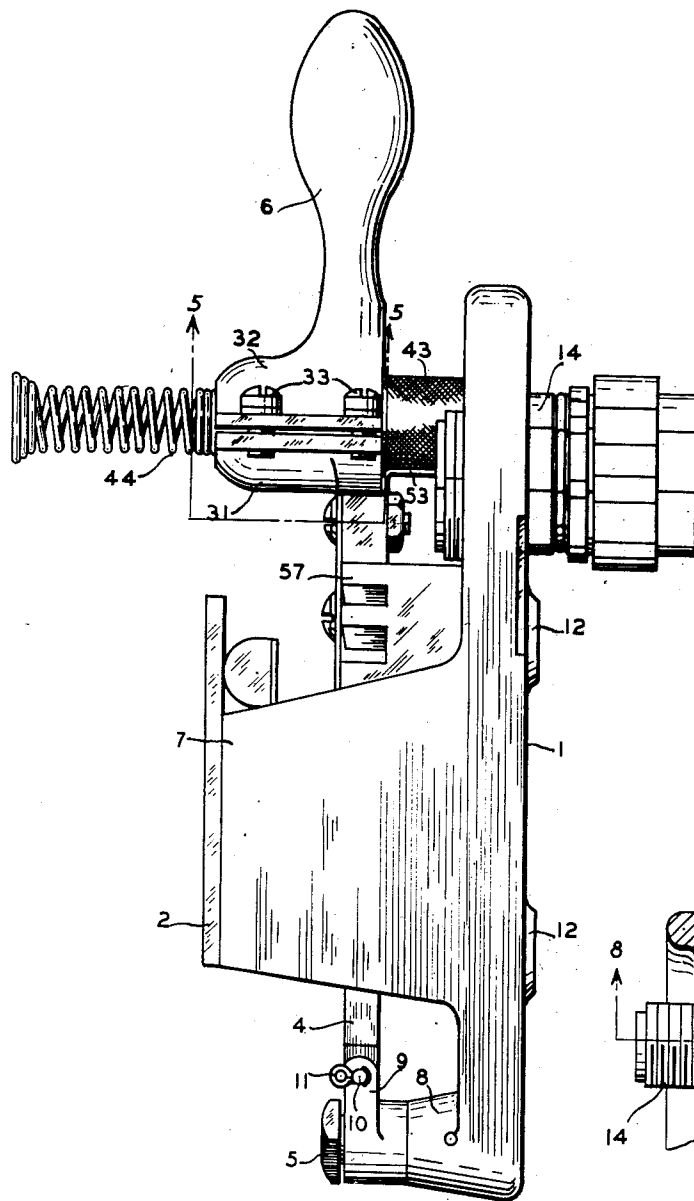


FIG. 2

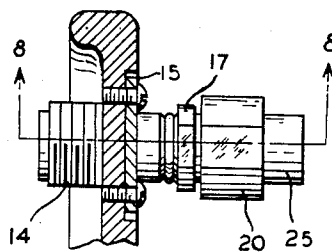


FIG. 3

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4 Sheets-Sheet 3

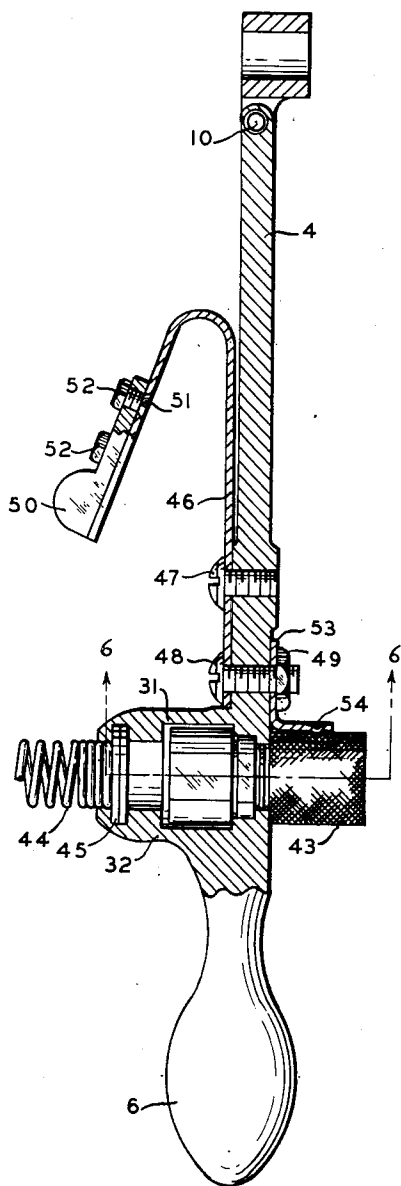


FIG. 4

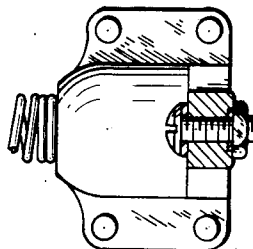


FIG. 5

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4 Sheets-Sheet 4

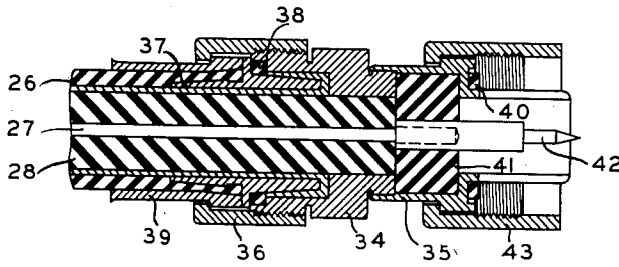


FIG. 6

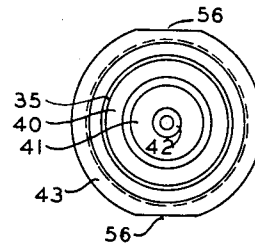


FIG. 7

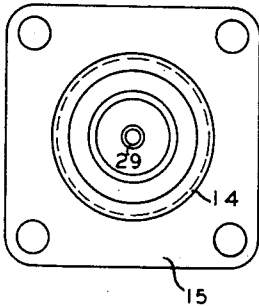


FIG. 9

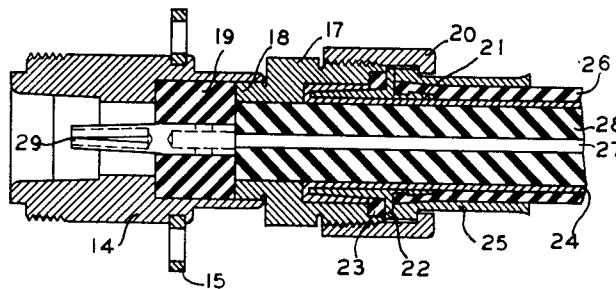


FIG. 8

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## UNITED STATES PATENT OFFICE

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## RADIO-FREQUENCY SWITCH ASSEMBLY

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Dayton, Ohio

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3 Claims. (Cl. 200-4)

(Granted under the act of March 3, 1883, as  
amended April 30, 1928; 370 O. G. 757)

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The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to us of any royalty thereon.

This invention relates to radio switches and more particularly to a radio frequency switch assembly wherein an arm that carries one contact between the ends thereof has one end pivoted to an uninclosed switch box in which a plurality of contacts are mounted for selective engagement by the contact carried by the switch arm.

The objects of the present invention include the provision of an improved multiple contact switch of the box type that is adapted for a rapid and secure connecting of a plurality of high frequency circuits in a selective manner with a minimum ratio of reflected to transmitted energy; a switch mounting a plurality of coaxial contacts capable of individual switching at either high or ultra high radio frequency; a switch selectively mounting a plurality of connectors that maintain a constant uniform line through the switch and providing optimum characteristics in radio connections; a switch adapted for the installation of a desired number of connectors for providing a considerable range of adaptations; a switch containing a plurality of highly efficient connectors that are easily and simply installed, removed and repaired; a switch that is adapted for providing a desired number of releasable contacts for connecting one or more power and control circuits to a plurality of electrical devices; and a selector switch for both radio frequency as well as for control and power circuits and that may be depended upon for efficient operation with the material conservation in the weight of wire necessary to make multiple contacts where a common source of power or control is to be selectively applied to one device at a time.

With the above and other objects in view, which will be apparent to those who are familiar with the problems involved in the selective joining of a plurality of contacts in radio work, an illustrative two pole six-throw embodiment of the present invention is shown in the accompanying drawings wherein—

Fig. 1 is an elevational view of the device wherein a retaining plate is partly broken away to provide a better view of a switch arm part thereof;

Fig. 2 is an edge elevation of the radio switch assembly that is shown in Fig. 1;

Fig. 3 is a fragmentary portion of the back plate in section taken along the line of 3-3 in

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Fig. 1, showing a jack mounted in the back plate of the device;

Fig. 4 is a partly sectioned elevation along the mid-line of the switch arm with a cable supporting spring part thereof partly broken away;

Fig. 5 is a sectional view taken along the line 5-5 in Fig. 2;

Fig. 6 is an enlarged sectional view of the plug carried by the switch arm;

Fig. 7 is an elevational view of the open end of the plug that is shown in Fig. 6;

Fig. 8 is an enlarged sectional view of the jack that is mounted in the back plate of the switch assembly taken along the line 8-8 in Fig. 3; and

Fig. 9 is an elevational view of the open end of the jack that is shown in Fig. 8.

The radio switch that forms the subject matter of the present invention comprises a back plate 1 to which a retaining or cover plate 2 is secured by means of screws 3. A switch arm 4 is pivotally attached to the lower end of the back plate 1 by suitable means such as a pin 5 and moved by grasping a hand grip 6. The switch arm 4 carries a contact plug that is adapted for being movably connected selectively with any one of a plurality of contact jacks that are mounted in the back plate 1.

The back plate 1 has a pair of spaced flanges 7 extending outwardly from the lateral edges thereof. The outer edges of the flanges 7 are tapped and threaded for the reception of the screws 3 that attach the cover plate to the flanges 7 of the back plate 1. The back plate 1 has a boss 8 that extends outwardly from the lower end thereof and that also is tapped and threaded for the reception of the pin 5. A yoke 9 is journaled upon the pin 5 and carries a bolt 10 extending between its prongs. The attached end of the switch arm 4 is journaled upon the bolt 10 for movement toward and away from the back plate 1. The bolt 10 is secured in place by suitable means such as by a cotter pin 11 or the like. The back plate 1 is adapted for being mounted upon a wall and may be provided with a plurality of spacer bosses 12 that preferably are disposed at the bases of the mounting holes 13. The back plate 1 is also apertured for the mounting therein of a desired plurality of circuit connector jack fittings 14.

Each connector jack 14 that is mounted in the back plate 1 is provided with an attaching plate 15 that extends outwardly from the jack fitting 14 and is apertured for the disposition of attaching screws that thread into apertures 16 in the back plate 1. Each connector jack fitting 14

is threaded at one end. The wall thickness at the opposite end of each jack fitting 14 is decreased to provide a radially inwardly pressed clamping edge as shown for attaching an adapter 17 thereto. The hollow tubular adapter 17 has an outwardly extending flange 18 at its attached end that is disposed within and clamped by the attached end of the jack 14. An insulating washer 19 is disposed inwardly of and spaced from the threaded end of the jack fitting 14 and clamped axially between a radially extending shoulder in the bore of the jack fitting 14 and the inner end of the adapter 17. The outer edge of the adapter 17 is threaded externally for the removable reception of an internally threaded radially end flanged nut 20 that is adapted for being rotatably mounted upon the outer end of the adapter 17. The outer surfaces of both the adapter 17 and the nut 20 are preferably provided with wrench lands so that they may be rotatably secured together firmly. A splicer 21, that has a radially outwardly projecting flange 22 between its ends is disposed inwardly of the assembly. A washer 23 is positioned against the flange 22. The inner end of the splicer 21 makes contact with a coaxial cable outer contact copper braid 24 that is looped around the end thereof and clamped firmly against a shoulder in the bore of the adapter 17 by the tightening of the nut 20. An end flanged clamping sleeve 25 is also secured by the nut 20, to minimize the localized flexing of the coaxial cable that is disposed therein. An insulating cover 26 is interposed between the copper braid 24 and the sleeve 25. A copper conductor 27 is disposed inwardly of the insulation 26, extends centrally of the coaxial cable and terminates in a central contact sleeve 29 that is supported in and by the insulation washer 19.

A plug assembly is mounted in the switch arm 4 in any desired manner so that the plug assembly is adapted for mating selectively with any one of the jack assemblies that are mounted in the back plate 1. Preferably the plug assembly is mounted between an expanded or flared clamp 31 part of the switch arm 4 and a mating flared clamp 32 that continues in the handle 6. The clamps 31 and 32 are secured together by suitable means such as by screws 33 or the like.

Each plug assembly comprises an adapter 34 that is threaded externally at one end and that is externally grooved at its opposite end. A thin chamfered edge of a body portion 35 is rolled into the groove in the adapter 34 to connect the adapter 34 and the plug body portion 35 firmly together. An internally threaded end flanged nut 36 turns upon the threaded end of the adapter 34 to clamp a splicer 37, washer 38 and clamping sleeve 39 upon an end of a coaxial cable mounted therein as previously described for the jack assembly union with its coaxial cable. The free end of the plug body portion 35 is radially offset with respect to the remainder of the body portion and axially split so that it is adapted for making a close wiping electrical contact against the conical inner face of the open bore of the fitting 14 to perfect an optimum electrical connection therebetween. A cushioning washer 40 for being engaged by the edge defining the open bore of the fitting 14 is mounted on the offset shoulder of the body portion 35. An insulating washer 41 is mounted within the body portion 35 and is centrally apertured for mounting therein a pointed central contact 42 that is adapted at its free end for forming an electrical connection with the central contact sleeve 29. The plug

central contact 42 is secured at its opposite end to an end of the central copper conductor 27 in the co-axial cable on the end of which the plug assembly is mounted. An end flanged connecting nut 43 has ample free movement axially of the plug assembly so that it may be threaded upon the fitting 14 for a permanent connection, or not for a temporary connection, as preferred. Resilient cable supporting means, such as a spiral spring 44 or the like is secured to the switch arm 4 by having one or more expanded turns 45 abutting the free end of the clamping sleeve 39 and clamped between the switch arm expanded clamp 31 and the handle portion expanded clamp 32 or otherwise, as preferred.

The switch arm 4 is preferably yieldingly urged at all times toward the back plate 1 in any suitable manner, as by the use of a flat spring 46, or the like, that is suitably mounted upon the switch arm 4 by means of a screw 47 and a bolt 48 and nut 49. A friction member 50 is mounted in any desired manner, as by bolts 51 and nuts 52 or the like, on the unattached end of the spring 46. The friction member 50 has any preferred form of engagement surface for making sliding contact against the inner face of the cover plate 2, as for example the curved surface shown.

Where a plurality of temporary connections are to be made and it is desired to maintain the nut 43 in its retracted position against the switch arm 4, a nut engaging flat spring 53, that is secured in place by the nut 49 on the bolt 48, carries a projection 54 that is adapted for being yieldingly seated in a dimple in a wrench land 55 on the connecting nut 43. The curved surface of the connecting nut 43 is preferably knurled as shown to provide an advantageous finger grip thereon.

The front face of the back plate 1 is also provided with a plurality of stops 57 that extend upwardly from the surface thereof and are spaced from each other in pairs a suitable distance for the snug reception of the switch arm 4 therebetween, thereby positioning the plug assembly carried by the switch arm 4 in accurate registration with each jack fitting that is mounted in the back plate 1.

In the operation of the device, with a plurality of coaxial cables or other form of electrical conducting means connected with the mating plug assembly and with the jack fittings, when it is desired to make a particular connection, the handle 6 of the switch is grasped and drawn toward the operator against the yielding force of the flat spring 46. The lower end of the switch arm 4 rotates upon the pin 10. The switch arm 4 is then moved across the front face of the back plate 1 to a desired jack fitting 14, where it is advanced toward the back plate 1 and the plug assembly mounted in the switch arm 4 enters into accurate registration with the desired jack fitting 14. The switch arm 4 seats between a pair of the stops 57 that project from the front side of the back plate 1 to insure accuracy of registration.

Where it is desired that the connection remain fixed for a substantial length of time, the connecting nut 43 is grasped between the fingers and drawn away from the switch arm 4 so that the projection 54 on the flat nut spring 53 is unseated from its position in a dimple in the wrench land 55 on the connecting nut 43, and turned firmly on the jack fitting 14. When another connection is to be made, the connecting nut 43 is unthreaded from the jack fitting 14 and returned to

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its former engagement with the spring 13 in which position the switch arm can be moved toward the operator and then to the right or left as desired.

It is to be understood that the various parts as well as the general assembly of the device that is disclosed herein may be altered and modified for particular adaptations or for the securing of advantageous benefits therefrom without departing from the present invention as defined by the appended claims.

What we claim is:

1. A radio switch comprising in combination a back plate, a pair of spaced flanges projecting from said back plate, a cover spaced from said back plate and secured to said flanges at their free ends, a switch arm having one end attached to said back plate and having a handle portion at its unattached end, a spring interposed between said switch arm and said cover plate for yieldingly urging said switch arm toward said back plate, an electrical connection plug carried by said switch arm, a plurality of electrical connection jacks mounted in said back plate and selectively registerable by said switch arm carried plug, and means for assisting in the accuracy of the registration between said plug and said jack.

2. A radio switch comprising in combination a back plate having a pair of upwardly extending flanges on the lateral edges thereof, a cover plate connecting said flanges, a switch arm pivoted at one end to said back plate and having a handle at its unconnected end, means in said switch arm to which an end of a coaxial cable may be attached, a plurality of means registerable with said switch arm means and mounted in said back plate and

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to which ends of coaxial cables may be attached, spring means yieldingly urging said switch arm toward said back plate, and means for insuring the accuracy of selective registration between said switch arm means and said back plate means.

3. A switch for use with radio frequency energy circuits, comprising in combination supporting means, connector jack fitting means carried by said supporting means and including an inner conductor insulated from an outer conductor as parts thereof, a switch arm means movably associated with said supporting means, and plug means carried by said switch arm, said plug means including an inner conductor adapted to releasably engage said jack fitting inner conductor and an outer conductor adapted to releasably engage said jack fitting outer conductor.

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