July 23, 1929. W. B. LUCAS 1,721,702

RADIOAERIAL

Filed July 2, 1925

Fig. 1.

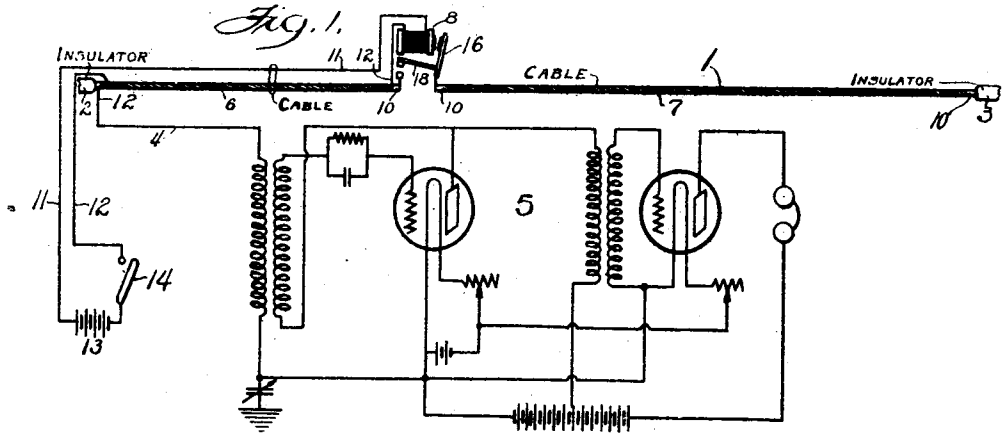


Fig. 2.

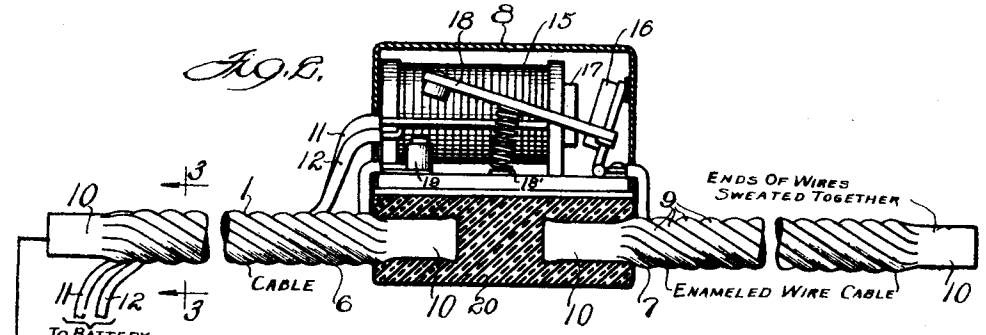
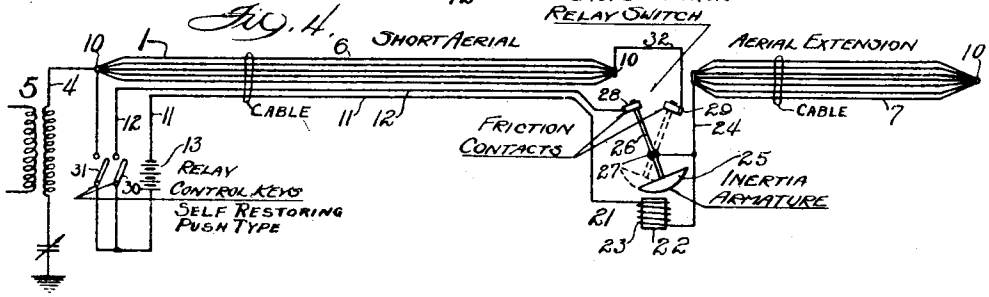


Fig. 3.

Fig. 4.



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UNITED STATES PATENT OFFICE.

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RADIOAERIAL.

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This invention relates mainly to radio receiving devices and especially to the aerial or antenna member. It has been found that short distance reception is well accommodated by short aerials and that long distance reception is better accommodated by relatively long aerials. For instance, a short aerial of about twenty-five to fifty feet in length is preferable for reception from local stations, whereas a longer aerial of about one hundred twenty-five feet gives the best results for long distance reception.

It often occurs that radio receiving operators are mainly interested in getting local matter in the earlier part of the evening, but are also interested in picking up distant stations after the locals have signed off for the night. Moreover, on account of the wide range of variety in transmitting wave lengths, and the desirability of providing suitable or corresponding effective lengths of aerials respectively, various well known means have been resorted to for meeting this need, as for instance by the use of condensers, inductance coils and other compensating devices in the receiving devices. At best, such means are a source of energy loss and inefficiency at a most vital point in a radio system.

With the foregoing in view, the main objects of this invention are to provide a common aerial of wide adaptability range; to provide a universal aerial adapted for ready adjustment and control by the receiving operator; to provide for readily changing or adjusting the effective length of the aerial; to provide in a sectional aerial a switch or relay disposed intermediately of its length for cutting off the remote section when a short aerial is desired; to provide remote control relay switching means for this purpose; to provide for utilization of part of a stranded aerial or cable antenna as part of an electrical circuit for controlling such switch or relay, subject to the will of the operator; and to provide such a control device and circuit therefor adapted to consume current only at the instant of shifting the adjustment.

An illustrative embodiment of this invention is shown in the accompanying drawing in which:—

Figure 1 is a conventional diagram of a two section aerial and a receiving set connected thereto.

Fig. 2 is mainly an enlarged view of the main parts of the device to which this invention relates, including especially the aerial switch or relay shown in Fig. 1.

Fig. 3 represents a cross section of the stranded aerial at the line 3—3 on Fig. 1.

Fig. 4 is a diagram of a modified form of relay and connections.

In the construction shown in the drawings, the aerial 1 is understood to be disposed in an elevated position as customary in the best radio practice. The ends of this aerial are supported by insulators 2 and 3 respectively and the inner end is electrically connected by a lead 4 extending to the receiving set 5.

Said aerial, referring now especially to Figs. 1 to 3, includes two sections 6 and 7 mechanically connected by a remote control switching device or relay 8 adapted for making and breaking electrical contact between said sections at the will of the receiving operator, particular reference now being had to Figs. 1 to 3.

The aerial 1 as a whole is composed of insulated conductor strands 9, as understood in the art, enameled wires being most suitable. In order to operate the remote control feature through the inner section 6 of the aerial cable, part of the strands are electrically connected together at their ends respectively, as at 10, to serve as an aerial proper, and certain other strands 11 and 12 are used substantially as part of an independent circuit for carrying the relay control current which is derived from any suitable source 13, convenient of access for this purpose, whereby the operator, by means of a switch 14 preferably located on the receiving set cabinet, may readily vary the length of aerial to be actually connected for service.

Referring further to Figs. 1 to 3, the operation will now be explained.

Assuming first that a short aerial is desired, the connections are permitted to remain as shown, the relay switch 8 being open. Whenever a long aerial is desired, the operator closes the switch 14, whereupon coil 15 of said relay is energized by current flowing thereto through cable conductors 11 and 12, which are in series with the battery 13 and switch 14. This causes the armature 16 to be drawn to the magnet core 17, thus closing the switch arm 18 against the contact 19. This serves to connect the aerial extension section 7 through switch 18 directly to the section 6.

When a short aerial is again desired, the switch 14 is opened, thereby deenergizing the relay 8 and so disconnecting the section 7, the armature 16 and switch arm 18 being swung back or restored to the open position by means of the spring 18'.

Referring to Fig. 2, it is apparent that the adjacent ends of these cable sections 6 and 7 are rigidly connected mechanically by means of the insulator 20, which however prevents any electrical connection when the relay is open. It should also be noted that the relay control circuit is arranged non-inductively relative to the aerial section 6, by reason of the wires 11 and 12 being disposed substantially as a twisted pair wound in with the rest of the cable.

Referring now to the modified construction and arrangement shown in Fig. 4, the relay 21 is very different in construction and operation, though it serves to effect substantially the same ultimate result, but in a more efficient manner. Here the relay core 22 is provided with an energizing coil 23, one side of which is connected through the conductor 11 to one side of the battery 13 and the other side is connected through conductor 24 to the adjacent ends of the remote aerial section 7. The armature 25 is carried on one end of a switch lever 26 which is pivoted medially at 27, so as to swing from side to side across the inner end of said core, the opposite end of the lever arm, as it swings from side to side, makes sliding friction contact with the switch terminals 28 and 29 respectively. The terminal 28 is connected through the short cable conductor 12 to a manual control switch 30 mounted preferably at or adjacent to the receiving set. The other terminal 29 is connected through the short aerial section 6 to another manual control switch 31. These manual switches 30 and 31 are of any desired self-restoring type and may be in the form of push buttons adapted to remain normally open. The relay armature and switch arm, on which it is mounted, constitute and operate as an inertia switch, by reason of the fact that whenever one of the switches 30 or 31 is closed, the magnet 22 is energized; thereby quickly pulling the armature 25 closely adjacent to its face; but in so doing the energizing circuit is broken, for instance at 28, so as to permit the momentum or inertia of the armature to carry the switch arm past the neutral point and close the opposite contact, for instance at 29.

Assuming now, for the purpose of describing the operation more in full, that a short aerial is desired, the connections as shown in Fig. 4 meet this condition. Here the aerial circuit extends from the receiving set 5 through the lead 4 to the adjacent end 10 of the short aerial 6, the opposite end of aerial 6 being dead-ended at the open contact 29 of relay 21.

When a long aerial is desired, the switch 30 is momentarily closed by the operator. This permits battery current to flow through the lead 11 to the winding 23 and thence back through the lead 24', switch 26, contact 28 and lead 12 to switch 30, and thence to the other side of the battery. As soon as the coil 23 is energized, the armature 25 is impelled abruptly to the left, but as soon as the contact is broken at 28, coil 23 is deenergized and the armature swings by inertia to the position shown by the dotted lines, whereby the switch is closed at contact 29. This connects the outer aerial 7 through the lead 24 to switch arm 26, contact 29 and connection 32 to the short aerial section 6 which is connected by wire 4 to the receiving set as shown. When a short aerial is again desired, the other manual switch 31 is pressed, whereupon current flows through lead 11, winding 23, lead 24', switch arm 26, contact 29, connection 32 and short aerial 6 to the switch 31, and thence to the opposite side of the battery. This causes the armature to swing abruptly to the right and so close the switch arm 26 against the contact 28, whereupon the short aerial is ready for use.

By this arrangement great economy of control current is attained, for the relay 21 utilizes only brief impulses of current from battery 13 and automatically opens the control circuit as soon as switch arm 26 moves.

Although but two specific embodiments of this invention are herein shown and described, it is to be understood that no attempt has been made to show all practical and useful embodiments and that numerous details of the constructions shown may be altered or omitted without departing from the spirit of this invention as defined by the following claims.

I claim:

1. An aerial including two sections disposed end to end, in combination with a remote control relay to make and break the mutual electrical connection of the sections, one of said sections constituting part of a cable, and relay control wires included in said cable.

2. An aerial including two sections disposed end to end, in combination with a remote control relay to make and break mutual connection thereof, one of said sections constituting part of a cable, and relay control current conductive means included in said cable.

Signed at Chicago this 29th day of June, 1925.

WILLIAM B. LUCAS.