May 9, 1961 M. SPIRT 2,983,917

CABINET-TYPE ADJUSTABLE AND TUNABLE INDOOR DIPOLE ANTENNA SYSTEM

Filed May 19, 1958 2 Sheets-Sheet 1

FIG. 1

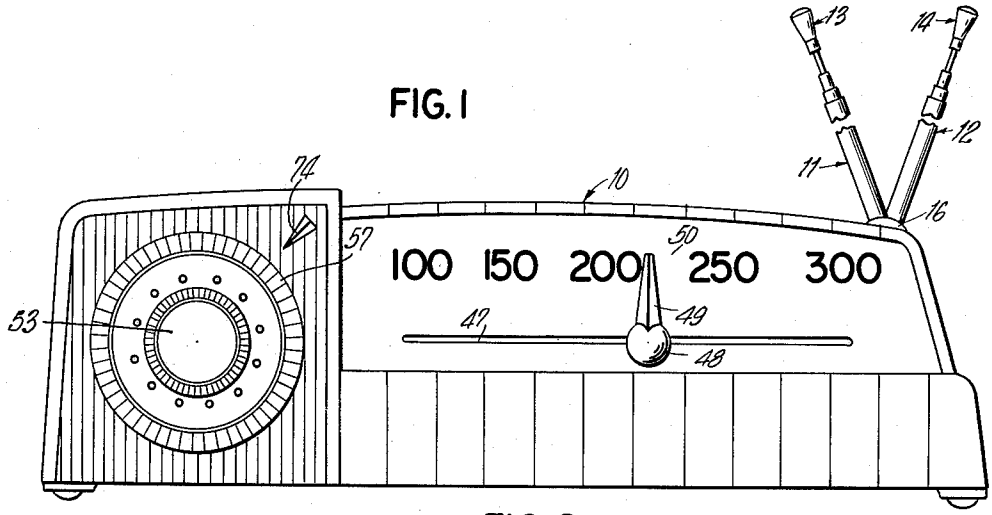
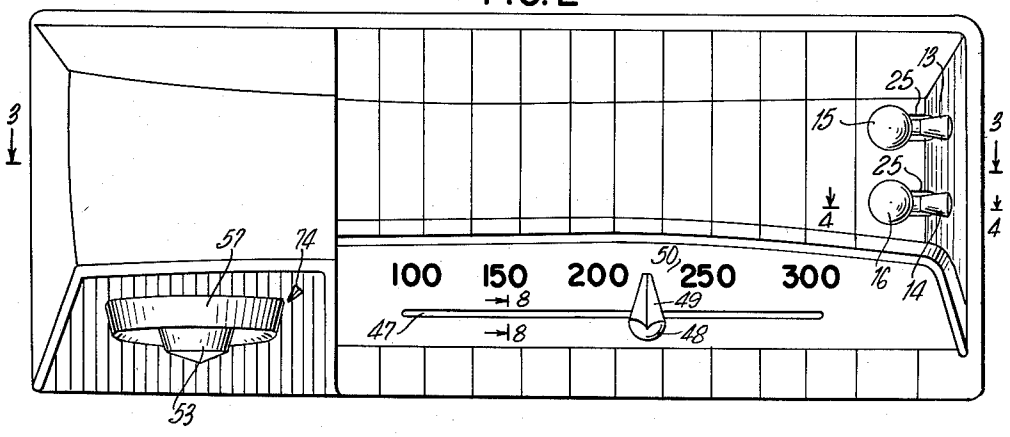


FIG. 2



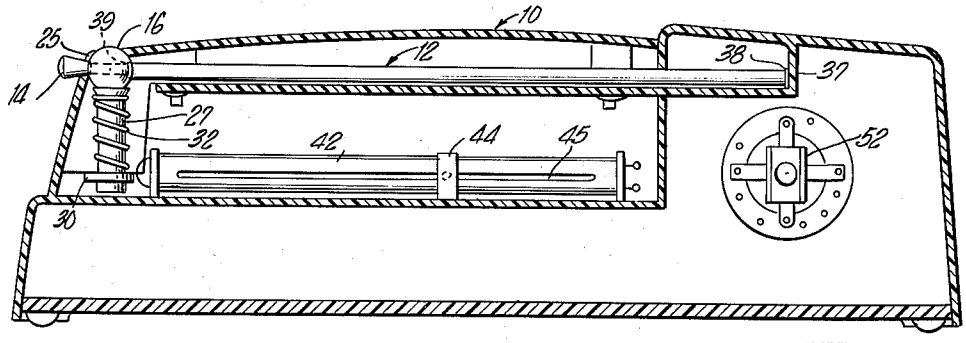


FIG. 3

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FIG. 4

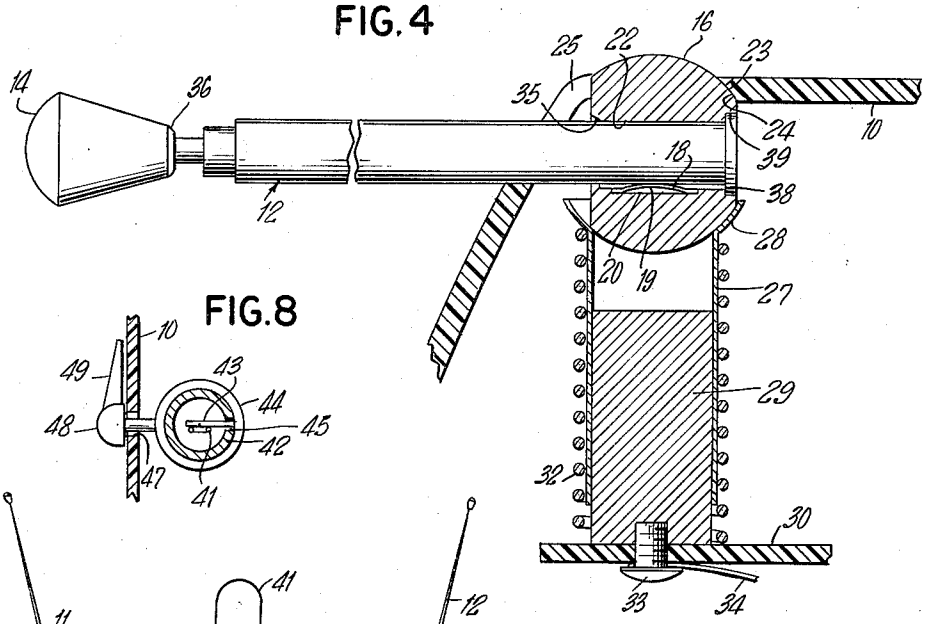


FIG. 8

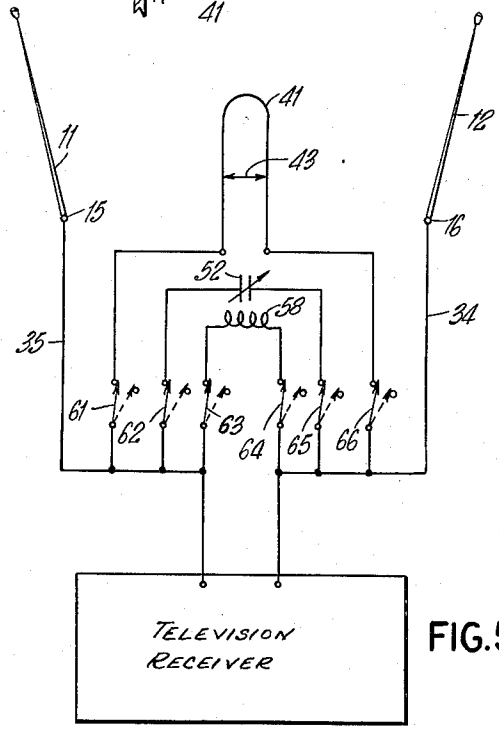
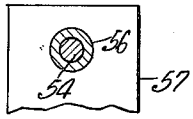


FIG. 5

FIG. 7



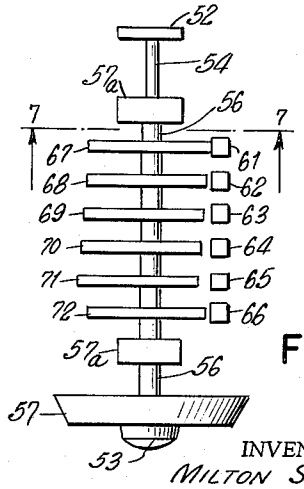


FIG. 6

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CABINET-TYPE ADJUSTABLE AND TUNABLE INDOOR DIPOLE ANTENNA SYSTEM

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3 Claims. (Cl. 343—745)

The present invention relates to an adjustable indoor antenna system of the dipole type suitable for use with radio and television receivers.

The antenna system according to this invention comprises a cabinet, a pair of ball swivels mounted in the cabinet, a dipole element longitudinally slidably mounted in each ball swivel so that the dipole elements may be concealed within the cabinet when not in use or withdrawn therefrom at will, a manually adjustable impedance matching stub for the dipole elements, a wave trap inductor, an adjustable trimmer capacitor and a manually operable multi-position switch for selecting various circuit combinations of the several circuit elements and the dipole elements, for connection to the receiver.

An object of the invention is to provide an antenna housed in a cabinet which may be placed on top of a television receiver or in a convenient adjacent location with the plane of the dipole elements continuously adjustable by means of the individual ball swivels through a full range of 360 degrees without moving the antenna cabinet.

A further object of the invention is the provision of a full complement of adjustable tuning elements for matching the antenna to the receiver, together with a manually operable switch for selecting the tuning elements in various combinations to obtain the best performance.

Various additional objects, features and advantages of the invention will become apparent upon reading the following specification together with the accompanying drawings forming part thereof.

Referring to the drawings:

Fig. 1 is a front elevational view of an antenna embodying the invention with the dipole elements extended for use.

Fig. 2 is a plan view of the antenna of Fig. 1 showing the dipole elements concealed within the cabinet when not in use.

Fig. 3 is a rear view in sectional elevation taken along the line 3—3 of Fig. 2, looking in the direction of the arrows.

Fig. 4 is an enlarged fragmentary sectional view in elevation showing details of construction of one of the ball swivel mountings for the antenna dipole elements.

Fig. 5 is a schematic circuit diagram of the antenna of Figs. 1 to 3.

Fig. 6 is a diagrammatic plan view of a manually operable multi-position switch for the selective control of switch elements shown in Fig. 5.

Fig. 7 is a broken cross-sectional detail as on line 7—7 of Fig. 6.

Fig. 8 is an enlarged broken cross-sectional detail as on line 8—8 of Fig. 2.

Referring to Fig. 1, the antenna comprises a cabinet designated generally as **10**, and a pair of dipole elements individually designated generally as **11** and **12**, respectively. The cabinet **10** is formed of electrically insulative material. Each of the dipole elements **11** and **12** is of

conventional telescopic construction permitting its effective length to be individually adjusted to the optimum one-quarter wave length value at the frequency of the signal which is being received. Ordinarily, a compromise intermediate length adjustment will give satisfactory results. Generally, careful adjustment of dipole length is required only for unusually weak signals. The dipole elements **11** and **12** are provided with enlarged tips **13** and **14**, respectively, which may be conveniently grasped for pulling the dipole elements to withdraw them from the cabinet **10** or for extending their lengths after they have been withdrawn.

Each of the dipole elements **11** and **12** is longitudinally slidably mounted in an electrically conductive swivel ball **15** and **16**, respectively. Each dipole element is frictionally held against longitudinal movement in its swivel ball as by a leaf spring **18**, Fig. 4. The leaf spring **18** is bowed intermediate its ends at **19**. The ends of the leaf spring **18** associated with dipole element **12** are secured against longitudinal and lateral movement by being seated in a lateral recess **20** formed in the side of the central diametrical passage **22** in the wivel ball **14**.

In the top wall of the cabinet **10** there is a circular aperture **23** having bevelled edges **24** which engage a zone of the upper surface of the swivel ball **14**. At is periphery, the aperture **23** communicates with a vertically downwardly extending slot **25** formed in the wall of cabinet **10**. The lower end of the slot **25** terminates in horizontal alignment with the center of the swivel ball **14** and thus permits the dipole element **12** to be swivelled into a horizontal position for longitudinal movement into or out of the cabinet **10**. The other swivel ball **15** is similarly arranged in all respects and does not need to be described in detail.

The ball **16** is received in the top of a vertically movable sleeve **27** formed of electrically conductive material. At its upper end, the sleeve **27** has a rounded edge **28** which engages the lower side of the ball **16**. An upright electrically conductive post **29** is slidably enclosed by the sleeve **27**. The post **29** is mounted on a fixed supporting bracket **30**. A helical compression spring **32** surrounds the sleeve **27**. The lower end of the spring **32** bears against the bracket **30** and its upper end presses upwardly against the rounded edge **28** of the sleeve **27**, thus supporting the ball **16** and pressing it upwardly and firmly into frictional engagement with the bevelled edge **24** of the circular aperture **23**. At its lower end, the post **29** is provided with a terminal **33** to which a conductor **34** is connected. A conductor **35** is similarly arranged to provide a connection to the other dipole element **11** through ball **15**. The outer end of the passage **22** in ball **16** is shown chamfered at **35** for receiving the tapered base **36** of the tip member **14** when the dipole element **12** is fully inserted in the cabinet **10**. Inward movement of the dipole elements **11** and **12** is limited by a depending stop wall **37** (Fig. 3) integrally formed with the cabinet **10**. Outward movement is limited by a collar **38** fixed to the inner end of dipole element **12** and which is received in a circular recess **39** formed in the swivel ball **16** as shown in Fig. 4.

When extended, each dipole element is permitted by its associated swivel ball to move throughout a conical zone having a vertical axis. Thus, the two dipole elements may be aligned in a common vertical plane directed toward the transmitter from which a signal is to be received, regardless of the position of the cabinet with respect to the transmitter.

A U-shaped impedance matching stub **41** disposed in a tubular housing **42** is mounted within the cabinet **10**. The stub **41** is provided with an adjustable shorting bar **43** which slidably engages and directly interconnects the parallel leg portions of the U-shaped stub **41**. The short-

ing bar 43 is secured to a longitudinally movable ring member 44. The tubular housing 42 has a longitudinally extending slot 45 formed therein which permits the shorting bar 43 to be secured to the longitudinally movable ring member 44. The front of the cabinet 10 has a horizontally extending slot 47 formed therein and adjustment knob 48 at the front of the cabinet 10 is connected to the ring member 44 through the slot 47. The shorting bar 43 may be adjusted along the impedance matching stub 41 by horizontal displacement of the knob 48 at the front of the cabinet 10. The knob 48 is provided with an index pointer 49 which cooperates with a calibrated scale 50, so that the shorting bar 43 may quickly be brought to any desired previously predetermined position by reference to the pointer 49 and scale 50.

An adjustable trimmer capacitor 52 is disposed within the cabinet 10. The capacitor 52 is connected to an adjustment knob 53 by an inner shaft 54 which is coaxial with an outer hollow shaft 56 journaled in bearing supports 57*a*. The capacitor adjustment knob 53 is mounted exteriorly of the cabinet 10 in front of a switch control knob 57, the switch knob 57 being fixed to the outer shaft 56.

A choke coil or wave trap inductor 58, Fig. 5, is also provided for connection to the antenna circuit whenever desired.

There is a group of six single pole single throw control switches 61 to 66 which permit the connection of the circuit elements 41, 52 and 58 to the antenna conductors 34 and 35 in any desired combination by means of control cams 67 to 72 fixed to the hollow shaft 56.

Because of stray capacitance effects, certain channels may be tuned more sharply by connecting only a single terminal of one of the circuit elements 41, 52 and 58 to one of the antenna conductors 35 or 36. There is a total of 26 or 64 possible combinations of circuit connections which may be established by the six switches 61 to 66. In practice, however, the effects of some of the sixty-four combinations may be duplicated by other combinations. Moreover, some of the switches may be omitted and be replaced by direct connections, thus further reducing the total number of switching combinations which are actually needed. In the embodiment illustrated in the drawing, only twelve switch positions are used. The positions of the knob 57 are numbered consecutively from 1 to 12 and the desired switch position may be identified by reference to fixed index mark 74 on the front of the cabinet 10.

In operation, the two dipole antenna elements 11 and 12 are withdrawn from the cabinet 10 by grasping and pulling on the tips 13 and 14 until the collars 38 are seated in the recesses 39 in the swivel balls 15 and 16. The antenna elements 11 and 12 are then elevated through the slots 25 to their partially erect operating positions. Each of the dipole elements may be individually moved in a conical zone which is limited by the size of the circular apertures 23 in the top of the cabinet 10. Each dipole element will be frictionally held in any desired position of adjustment by the action of the compression springs 32. Phase reversal may be easily effected by merely reversing the relative positions of the dipole elements 11 and 12. The most effective combination of circuit elements 41, 52 and 58 is selected by rotation of the switch control knob 57. If the impedance matching stub 41 is connected for use, it may be adjusted for optimum performance by horizontal movement of the knob 48. If the trimmer capacitor 52 is connected for use, fine tuning may be effected by means of the knob 53.

The operator will ascertain that a certain set of adjustments will produce the best results for a particular channel and the antenna may be quickly adjusted to predetermined settings appropriate for each channel. In this manner, the need for a broadly tuned antenna system is avoided and sharply selective adjustments may be used for each channel. This sharp selectivity permits reception of distant stations and permits the indoor antenna of the present invention to be used in fringe areas with unusually excellent results.

While I have shown what I believe to be the best embodiment of my invention, it will be apparent to those skilled in the art that various modifications may be made therein without departing from the spirit and scope of the invention as defined in the appended claims.

What is claimed is:

1. An antenna system comprising a pair of dipole antenna elements, a cabinet in which said elements may be received when horizontally positioned, individually adjustable supporting means in said cabinet, said elements being mounted in said supporting means, an antenna circuit connected to said elements, an adjustable trimming capacitor in said cabinet, a selector switch for selectively connecting said capacitor to said antenna circuit, two concentric knobs disposed exteriorly of said cabinet, and two coaxial shafts individually connecting said knobs to said selector switch and to said capacitor.

2. An antenna system according to claim 1, further comprising an adjustable impedance matching stub connected to said antenna circuit through said selector switch, and a knob disposed exteriorly of said cabinet and connected to said stub for adjusting the same.

3. A dipole antenna system for indoor use comprising a cabinet, said cabinet having a pair of circular apertures formed in the top thereof, a pair of swivel balls mounted in said cabinet, the upper portions of said swivel balls engaging said circular apertures, a pair of fixed posts each disposed below the center of one of said swivel balls, an upwardly spring pressed sleeve mounted on each post and each engaging the lower portion of one of said swivel balls, a telescopic antenna element slidably extending through the center of each swivel ball, friction means carried by each swivel ball for retaining each antenna element in any desired position of longitudinal adjustment in its swivel ball, said cabinet having downwardly extending slots formed therein each of which communicates at one end with one of said circular apertures and which terminates at its lower end in horizontal alignment with the center of one of said swivel balls, each slot being adapted to receive one of said antenna elements therein, and means defining a space within said cabinet for receiving both of said antenna elements when said elements are horizontally positioned and moved inwardly through said swivel balls and the lower ends of said slots.

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