Oct. 27, 1964 D. W. TAYLOR 3,154,785

TELEVISION RECEIVER CABINET WITH PIVOTED VERTICAL MONOPOLE MOUNTED THEREON

Original Filed March 27, 1957 2 Sheets-Sheet 1

Fig. 1.

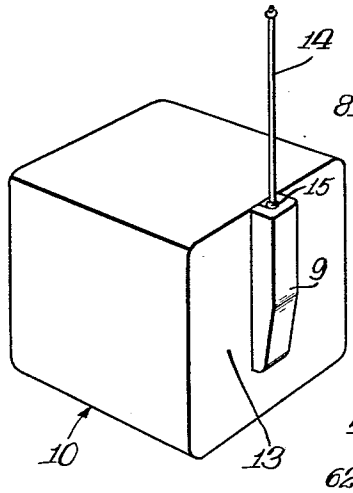


Fig. 2.

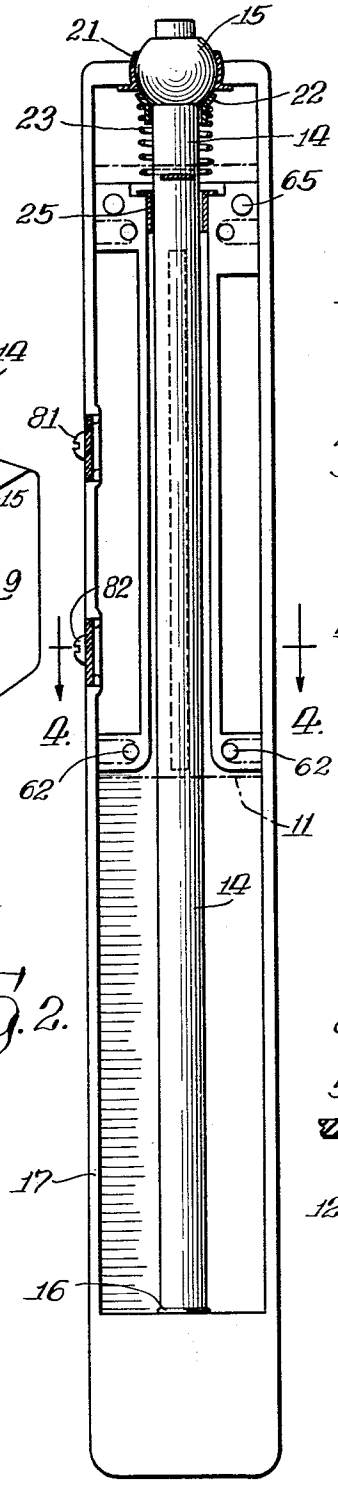


Fig. 3.

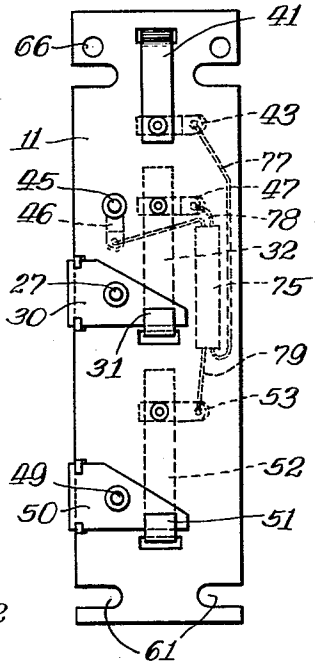
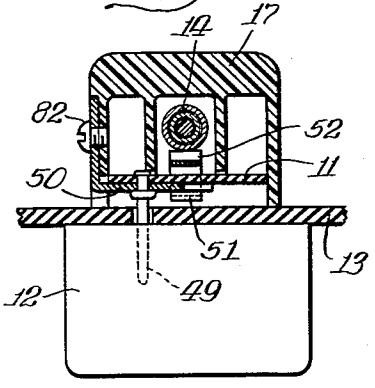


Fig. 4.



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Fig. 5.

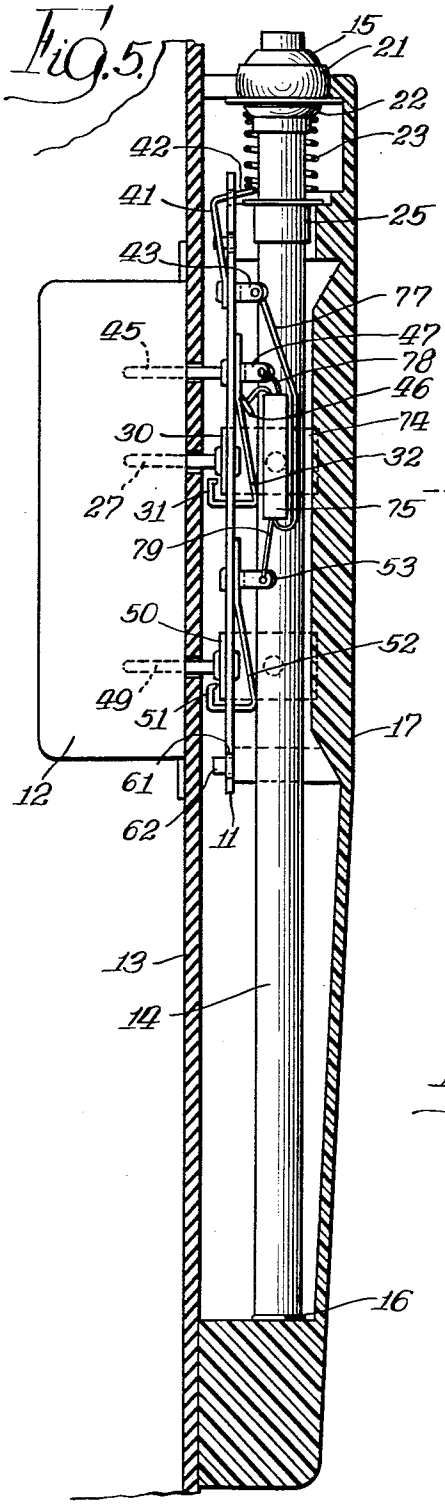


Fig. 6.

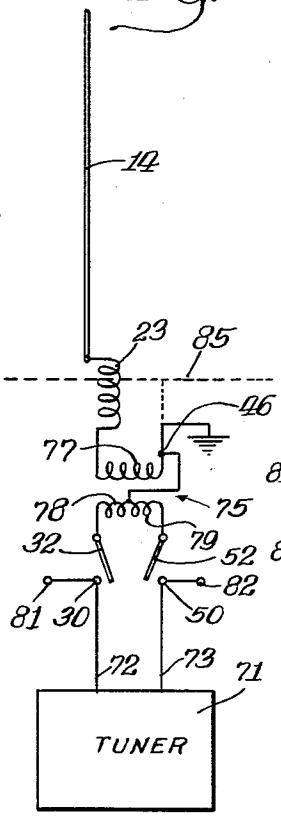


Fig. 8.

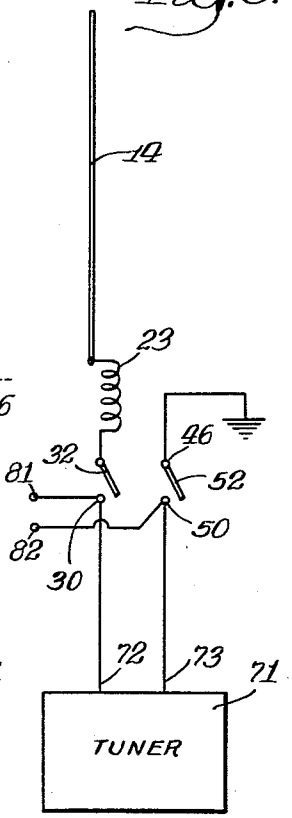
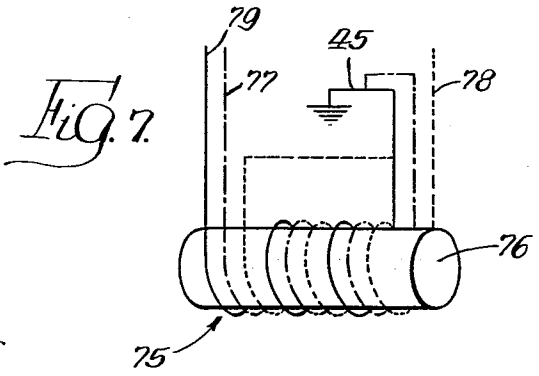


Fig. 7.



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TELEVISION RECEIVER CABINET WITH PIVOTED VERTICAL MONOPOLE MOUNTED THEREON

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Continuation of abandoned application Ser. No. 648,835, Mar. 27, 1957. This application Feb. 13, 1963, Ser. No. 259,477

4 Claims. (Cl. 343—702)

This invention relates to antenna systems and more particularly to antenna systems for portable television receivers. This application is a continuation of application Serial No. 648,835, filed March 27, 1957, now abandoned.

In antenna systems for portable television receivers dipole extensible antennas have been provided in the past, some of which have been fastened permanently to the cabinets of the receivers. Such dipole antenna systems when used with metal cabinet type portable receivers do not operate efficiently due to mismatch caused by the impedance lowering effect of the metal cabinet on the dipole antenna. Also, such antennas have required considerable room to position the two antenna poles for best signal pickup.

An object of the invention is to provide new and improved antenna systems for television receivers.

Another object of the invention is to provide an antenna system for a portable television receiver which is of simple construction and light weight.

A further object of the invention is to provide a television receiver antenna system having only one pole.

A still further object of the invention is to provide a convenient, inexpensive, and effective antenna system for a portable television receiver.

A feature of the invention is the provision of an antenna system including a single extensible pole which cooperates with a conducting ground plane, with the pole being pivotally mounted with respect to the ground plane so that it may be positioned to provide optimum pickup of waves having various angles of polarization. The ground plane may be formed by a conducting television receiver cabinet.

A further feature of the invention is the provision of a single extensible antenna pole mounted on a base including a plug designed to fit into a jack on the television receiver cabinet to mount the antenna on the receiver and also connect the antenna electrically to the receiver. The pole may be mounted on a ball which rests in a socket with a compression spring providing pressure against the ball for connecting thereto, and the spring may also form a loading coil for the pole.

A further feature of the invention is the connection of the single pole and the conducting cabinet to a balun transformer coupling the antenna system to the balanced input of the tuner. The balun may include three coils parallel wound on a permeable core in closely coupled relationship.

FIG. 1 in the drawings is a perspective view of a portable television receiver having an antenna system forming one embodiment of the invention;

FIG. 2 is a vertical plan view of the antenna system shown in FIG. 1;

FIG. 3 is a view of the terminal plate of the antenna system;

FIG. 4 is a cross-section view of the antenna assembly along the lines 4—4 of FIG. 2;

FIG. 5 is a vertical cross-section view of the entire antenna;

FIG. 6 is a schematic view of an electrical circuit of the antenna system;

FIG. 7 is a perspective view of the balun forming a portion of the antenna system; and

FIG. 8 is a schematic view of an alternate circuit of the antenna system.

The invention provides an antenna system for a portable television receiver in which there is a single extensible pole mounted telescopically in a housing by a ball and socket connection which permits the pole to be pivoted to any desired angle above the cabinet. The single pole or monopole cooperates with a conducting television receiver cabinet to form the active elements of the antenna system. The housing is mechanically supported by a terminal plate having plug pins projected therefrom and designed to enter a jack on the cabinet of the receiver to mount the antenna on the receiver cabinet and connect the pole to the receiver. There also may be provided a compression spring which serves to press the socket of the ball and socket joint against the ball to frictionally hold the ball in any desired adjusted position thereof. The spring may provide an electrical connection from the pole to one of the terminals on the terminal plate so that the spring acts as an extension or loading coil of the pole. The telescoping pole may operate a switch to disconnect the antenna when not being used.

In one embodiment of the invention the monopole is connected to a coil of a balun which also includes two other coils wound parallel with the first coil on a core. The other end of the first coil is connected to ground and to the one end of each of the other two coils which have their other ends connected to the input terminal of the tuner, so that the balun forms an unbalanced to balanced coupling from the antenna system to the tuner.

In an alternate embodiment of the invention, the monopole is connected directly to a terminal of a balanced input tuner of the receiver and the other terminal of the tuner is connected to a ground plane formed by the conducting receiver cabinet to in effect form a balanced input to the tuner even though there is only a single pole used in the circuit.

There is shown in FIG. 1 a portable television receiver 10 on the back of which an antenna 9 is supported. The receiver has a back cover 13 which supports the mounting plate 11 and the housing 17 of the antenna (FIG. 5). The antenna includes a pole 14 comprising several telescoping sections and the pole is slidable in a ball 15 (FIG. 2). A flange 16 on the antenna abuts the ball 15 when the antenna is fully extended or pulled out of the frame-like housing 17 for use. When the antenna is moved out of the housing 17, the ball 15 may be pivoted in a socket 21 to any desired angle within a substantial range, and is held at such an angle by a lower section 22 of the socket which is pressed by a metallic compression spring 23 firmly against the ball 15 to frictionally hold the ball. The upper end of the spring 23 is connected electrically through the lower section 22 of the socket to the ball which is connected electrically to the lower end of the pole 14, and the lower end of the spring is electrically connected to terminal strip 41. The lower end of the spring 23 is mounted on a spring seat 25 of sufficient internal diameter to permit the flange 16 to pass therethrough. The section 22 of the socket also has an internal diameter such that the flange 16 will pass therethrough. The lower section 22 of the socket may move downward by compressing the spring 23 to permit pivotal movement of the antenna rod.

The mounting plate 11 also forms a terminal and switch plate for the antennna. The terminal strip 41 connected to compression spring 23 is mounted on this plate and includes a terminal lug 43 for connection to the end of one winding 77 of the balun transformer 75. A ground terminal 45 is provided on the plate 11 and is connected by lug 46 to the balun 75. The terminal 45

is a pin which is adapted to make connection to the jack **12** of the receiver. The ends of windings **78** and **79** of the balun are connected to conducting strips **32** and **52** respectively. Each of these strips is in the form of a leaf spring with an inturning portion adapted to engage a contact plate mounted on the base **11**. Terminal **27** is connected to contact plate **30** and terminal **49** is connected to contact plate **50** and these are in the form of pins which extend into the receiver cabinet to engage the jack **12**. The internal portions **31** and **51** of the springs **32** and **52** are held out of engagement with the plates **30** and **50** when the rod **14** is telescoped within the housing **17**. When the rod is withdrawn, the springs **32** and **52** spring inwardly so that the ends **31** and **51** thereof engage plates **30** and **50**. This connects the output leads of windings **77** and **78** of the balun **75** to connecting pins **27** and **49**.

The plate **11** is provided with slots **61** designed to fit over pins **62** (FIG. 2) of the housing **17** and is secured to the housing by rivets passing through holes **65** and **66** in the housing **17** and the plate **11** respectively. The terminal pins **27**, **45** and **49** may project into the jack **12** which has sockets (not shown) designed to grip the pins frictionally and support the entire antenna on the back cover **13** of the receiver. The jack **12** serves to connect the pin **27** to a tuner **71** having input terminals **72** and **73** (FIG. 6) which tuner is of a type well known in the television art and is designed to have a balanced input. It is to be pointed out that the antenna may be mounted on the receiver cabinet and connected in the receiver circuit in other ways.

FIG. 6 shows the circuit arrangement with the antenna **14** connected to the spring **23** which is in turn connected to the winding **77** of the balun **75**. The windings **78** and **79** form the balun output which is selectively connected through spring contacts **32** and **52** to the contact plates **30** and **50** which are in turn connected to the tuner input. Terminals **81** and **82** are provided for connecting an external antenna to the tuner and when the antenna rod **14** is telescoped within the housing the connections through spring contacts **32** and **52** are broken, so that the rod antenna will not affect the operation of the external antenna.

The balun **75** is shown in FIG. 7 and includes first, second, and third windings **77**, **78** and **79** provided on a permeable core **76**. The antenna rod **14** is connected to the winding **77** which has its other end grounded. Adjacent ends of the windings **77** and **79** are connected together with the opposite end of the winding **78**, and the three leads are connected to the terminal pin **45** which is connected to ground. The other end of the winding **77** is connected to the compression spring **23** which, as described above, is connected to the extensible antenna pole **14**. The two ungrounded ends of the windings **78** and **79** are connected to the terminals **47** and **53** which are connected to the terminal pins **27** and **49** respectively. The pole **14** and the ground connection to the coil **77** form an unbalanced input to the balun **75** which has a balanced output through the coils **78** and **79**. The coils **78** and **79** may each have as many turns as the coil **77** to provide a 2-to-1 step up in the voltage applied to the receiver. Other turns ratios may be provided as required in a particular application.

Considering now the operation of the antenna, as previously stated the rod **14** works in cooperation with a ground plane formed by the conducting housing of the television receiver. The conducting ground plane is represented by the dotted line designated **85** in FIG. 6. The ground plane may be formed by the receiver housing or any other conducting member such as the chassis of the receiver. Metal housings as have been used in portable television receivers form a satisfactory ground plane. In a receiver having a plastic or other insulating housing, a conducting coating can be used on the housing to form the ground plane. Although television signals

when radiated are horizontally polarized, the polarization changes as the signals are reflected and transmitted through buildings. Accordingly, the waves in a building may have various different angles of polarization. In many locations the waves have strong vertical components, and the single antenna pole extending vertically from the cabinet will be very effective in picking up such waves. The antenna pole **14** can be tilted to various angles and by tilting the pole, effective pickup of waves having polarizations other than vertical is obtained.

The operation of this monopole antenna is to be contrasted to the operation of a dipole antenna wherein the conducting cabinet is effective to load the antenna and may adversely effect the operation thereof, particularly when the dipole arms are positioned close to and substantially parallel to the cabinet. Also, as stated above, the monopole antenna operates extremely well with vertically polarized waves whereas a dipole antenna as commonly used has the disadvantage that when the arms are vertical and thereby quite close together, very little pick-up is obtained.

In the circuit shown in FIG. 8 which forms an alternate embodiment of the invention, the pole **14** is connected through the compression spring directly to the switch contact **32** and the balun **75** is omitted. As previously stated, the spring **23** may form a loading coil to effectively extend the antenna. The ground connection is made directly to the switch contacts **52**. Contacts **81** and **82** for an external antenna are also provided as in FIG. 6. This direct unbalanced connection of the pole **14** to the tuner **71** can be satisfactorily used in many applications. It may not be as effective as when coupled through a balun transformer for converting the unbalanced input to a balanced signal and also providing step-up of the applied signal.

The antenna in accordance with the invention has been found to be very effective to pick up signals within rooms in which a portable receiver might be used. Since there is only one pole it may be adjusted through a wide range of angles in a relatively small space. The construction is simple and the antenna does not add substantially to the weight of portable receivers.

I claim:

1. In a receiver for television signals which are radiated as horizontally polarized signals and become repolarized prior to reception, the combination of a structure for supporting and for enclosing a television receiver circuit assembly and a single conductive rod device cooperating with said structure to form a receiver-mounted-monopole antenna which is manually adjustable for optimum signal reception on each television channel with the receiver in fixed position for viewing, said structure including exterior walls and including an electrically conductive portion at least substantially as large as an exterior wall dimension of the enclosing structure and forming a reference ground for said television receiver, said rod device including a plurality of electrically conductive telescoping sections, means for mounting said rod device upon said structure including a swivel device positioned adjacent to, and substantially in the plane of, said electrically conductive portion, said swivel device supporting said rod device so that it extends above said structure and so that it is positioned at various selected angles of tilt with respect to said electrically conductive portion for optimizing signal reception of repolarized television signals, said rod device being adjustable as to length and cooperating with said electrically conductive portion of said structure for interception of television signals, said swivel device being constructed to permit collapsing movement of said rod device during nonuse relative to the top of said structure, and means for impedance matching said monopole antenna to the television receiver including a pair of conductors in the television receiver for connection to an antenna, a first circuit for coupling said rod device to one of said con-

ductors, and a second circuit for coupling said electrically conductive portion to the other of said conductors.

2. In a receiver for television signals, the combination of housing means for enclosing a television receiver circuit assembly which is normally maintained in a fixed position while being viewed and a single conductive rod device cooperating with said housing means to form an antenna for receiving television signals, said housing means including a substantially horizontal electrically conductive upper portion forming a reference ground for said receiver, said rod device including a plurality of electrically conductive telescoping sections, means for mounting said rod device upon said housing means including a ball and socket structure positioned adjacent to and substantially in the plane of said conductive upper portion, with said rod device being adjustable in said telescoping sections as to length and being adjustable in said ball and socket structure as to the angle of tilt thereof with respect to said conductive upper portion thereby to cooperate with said conductive upper portion for interception of television signals at various angles of polarization of said signals with said receiver in said normally fixed position for viewing, said ball and socket structure having provision therein to accommodate the telescoping of said rod device into said housing means during nonuse, a pair of conductors in the television receiver for connection to an antenna, a first circuit for coupling said rod to one of said conductors and a second circuit for coupling said conductive portion to the other of said conductors, said first and second circuits including means for disconnecting said rod device and said conductive portion from said pair of conductors and means for connecting a further antenna to said television receiver.

3. In a receiver for television signals which are radiated as horizontally polarized signals and become repolarized prior to reception, the combination of electrically conductive housing means for mounting and enclosing television receiver components and a single, conductive telescoping rod device cooperating with said housing means to form an antenna for said receiver, said housing means including a back portion and a top portion, said housing means having an electrically conductive surface forming a reference ground for said receiver, means for mounting said rod device upon said back portion including conductive ball means secured to said rod device, socket means secured to said back portion substantially adjacent the plane of said electrically conductive surface, and spring means for pressing said socket means into gripping engagement with said ball means for supporting said rod device so that it extends above said housing means at various angles with respect to said top portion for optimizing reception of repolarized television signals

at the location of the television receiver, said rod device being adjustable in said telescoping sections as to length and being adjustable in said ball means and socket means as to the angle of tilt thereof with respect to said electrically conductive surface to cooperate therewith for intercepting television signals, a pair of conductors in the television receiver for connection to an antenna and including disconnectable terminals on said back portion, a first circuit connected to said ball means for coupling said rod device to one of said terminals, and a second circuit for coupling said conductive surface to another of said terminals.

4. In a receiver for television signals which are radiated as horizontally polarized signals, the combination of electrically conductive housing means for enclosing the television receiver and a single conductive telescoping rod device cooperating with said housing means to form an antenna for said television receiver, said housing means including a back portion and a top portion, said top portion having a substantially horizontal electrically conductive surface forming a reference ground for said television receiver, means for mounting said rod device upon said back portion including conductive ball means secured to said rod device, conductive socket means secured to said back portion substantially in the plane of said conductive surface, and conducting spring means for pressing said socket means into gripping engagement with said ball means for supporting said rod device so that it extends above said housing means at various angles with respect to said top portion, said rod device being adjustable as to length and as to the angle of tilt thereof with respect to said surface thereby to cooperate with said top portion for intercepting television signals, a pair of conductors in the television receiver for connection to an antenna and including disconnectable terminals on said back portion, and circuit means including a first coil for connection to said terminals and a second coil coupled to said first coil and connected between said spring means and said conductive surface of said top portion.

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