

July 19, 1949.

J. B. WALKER

2,476,469

ADJUSTABLE ANTENNA

Filed April 30, 1945

3 Sheets-Sheet 1

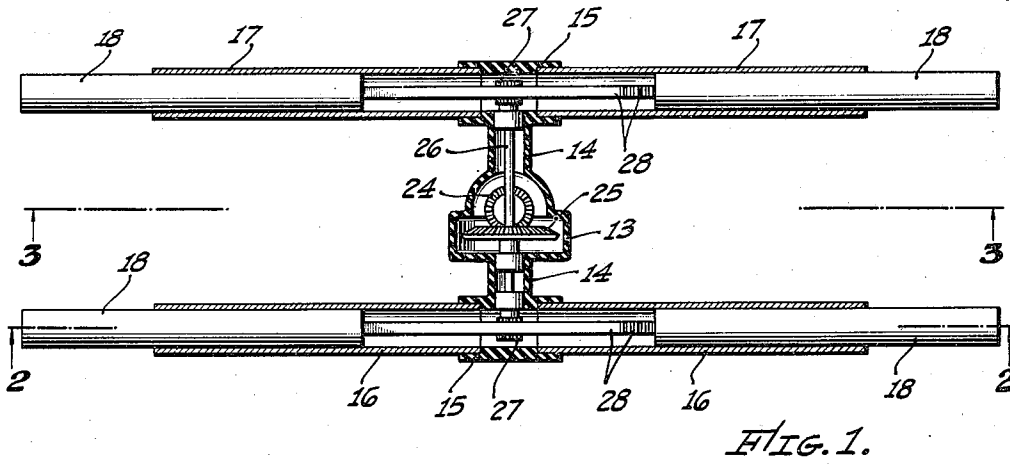


FIG. 1.

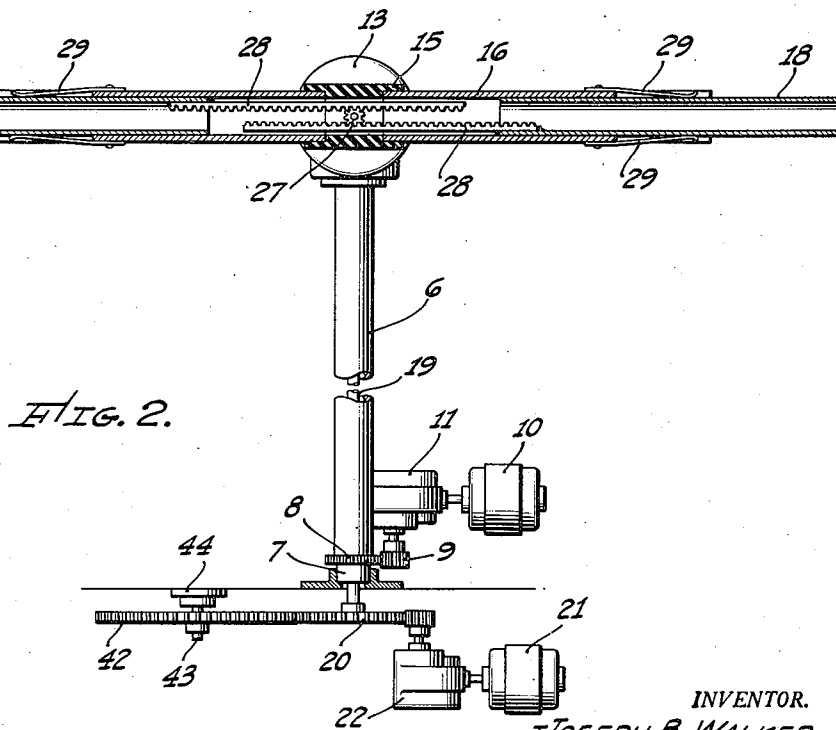


FIG. 2.

INVENTOR.
JOSEPH B. WALKER,
BY
Westall & Westall
ATTORNEYS.

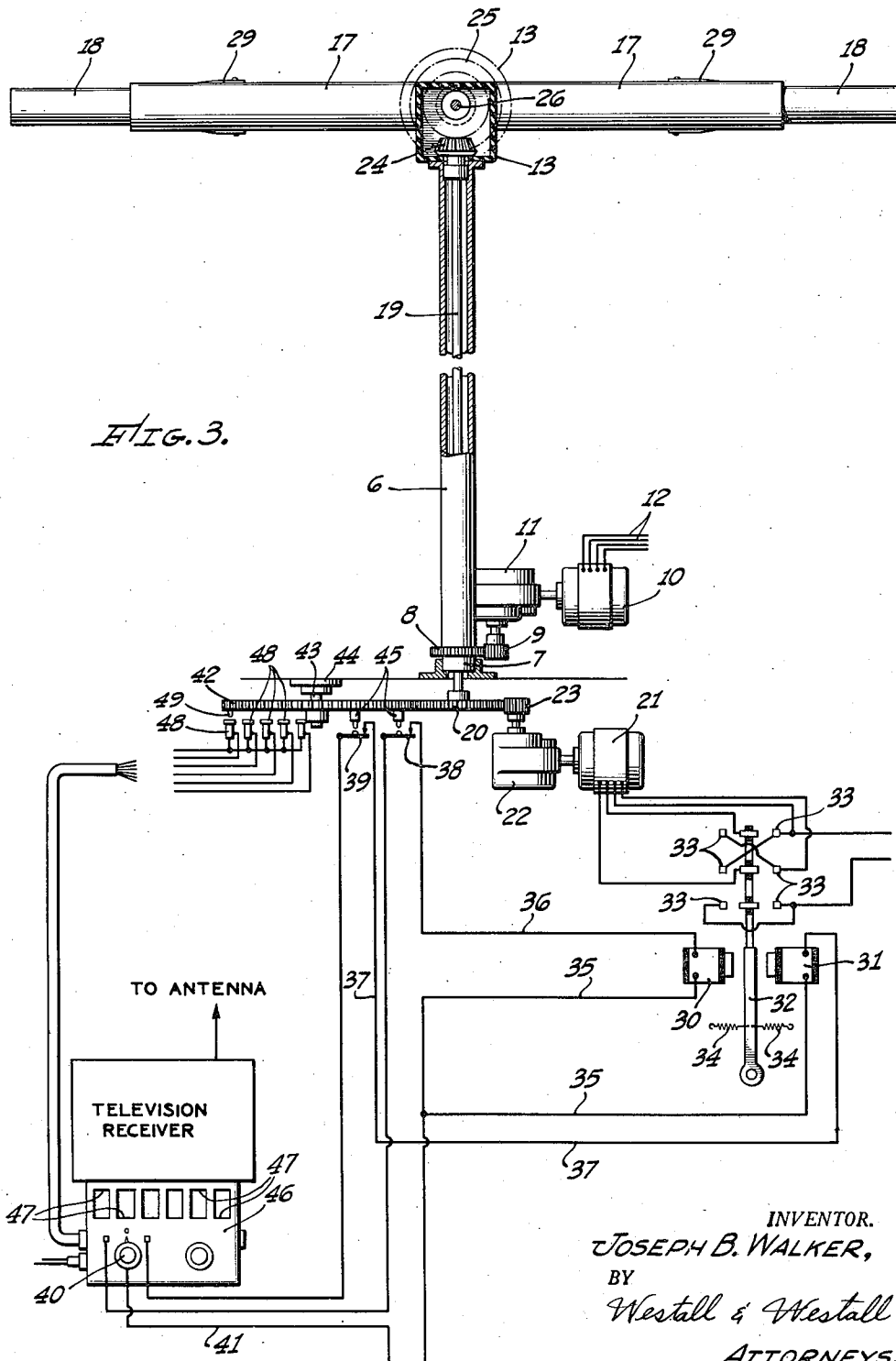
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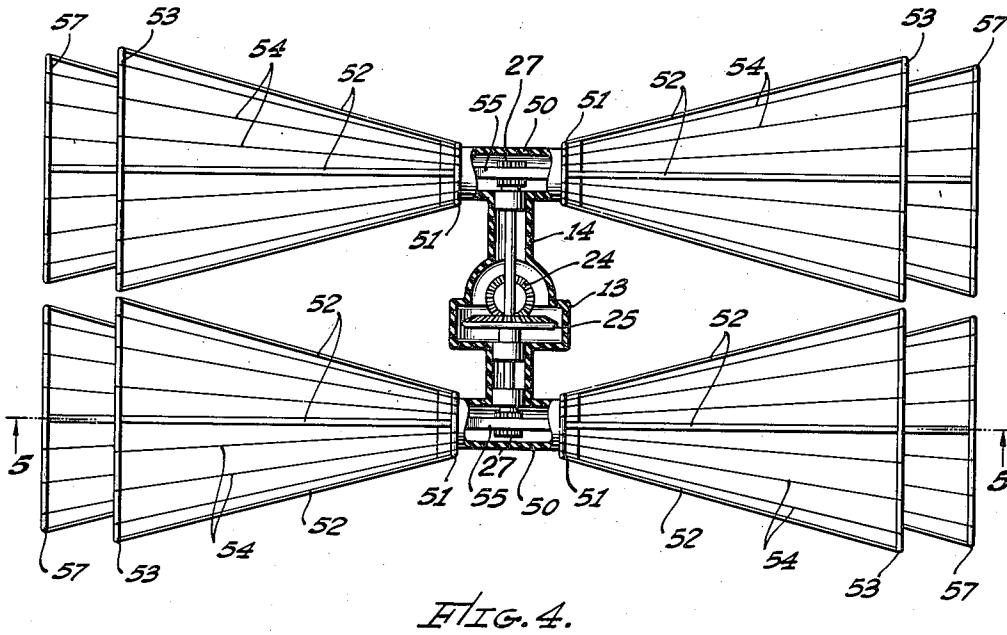


FIG. 4.

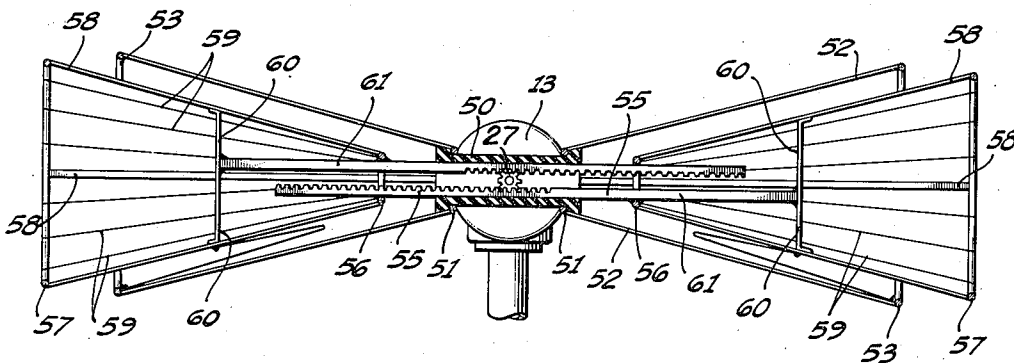


FIG. 5.

INVENTOR.
JOSEPH B. WALKER,
BY
Westall & Westall
ATTORNEYS.

UNITED STATES PATENT OFFICE

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ADJUSTABLE ANTENNA

Joseph B. Walker, Hollywood, Calif.

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1 Claim. (Cl. 250—33)

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This invention relates to adjustable antennas having particular application to television receiving sets, and contemplates more specifically rotatable and extensible antenna and director or reflector assemblies, in combination with means for controlling the adjustment of the same.

A common form of television antenna proved to be satisfactory under most conditions is a horizontal "half-wave" dipole which is of a length slightly less than one-half wave length of the radiation to be received. It has been found that such an antenna should be arranged broadside to the transmitter, i. e., with the antenna axis forming a right angle with the direction from which the signals radiate.

Reflection of the signal often results in distortion or blurring of the image or in production of "ghost" pictures. The solution of such problems occasionally necessitates variations in the prescribed formula of antenna adjustment, which are peculiar to specific installations; but in general the desirability of the above-indicated arrangement and construction has been well established. In the art prior to my invention it is necessary, therefore, that a skilled engineer be employed to install receiver antennas in order to overcome objectionable reflective conditions encountered at the point of intended reception. It will therefore be appreciated that in adapting television antenna assemblies for the reception of signals of different wave lengths, transmitted from different directions, these difficulties are multiplied many-fold, and that, as a result, conventional antenna apparatus is inadequate.

It is a principal object of the present invention to provide an extensible dipole antenna which may be controlled at the receiving set for critically adjusting its length for most favorable reception of any of a plurality of signals emanating from different transmitters, operating on different wave lengths.

Another object is to provide an antenna assembly comprising one or more extensible dipole antennas with complementary directors or reflectors, rotatable in fixed relationship as a unit whereby the antennas may be arranged angularly with respect to the radiation from the transmitter for most effective utility.

Another object is the provision in an extensible and rotatable antenna assembly of mechanism whereby the extension and rotation thereof may be independently effected and controlled, in combination with signal means, associated with the receiving set, for visibly or audibly indicating the adjustment.

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Numerous objects and corresponding advantages, such, for example, as simplicity of construction, economy of manufacture, facility in obtaining tuning perfection by enabling adjustments to compensate for distortion or blurring of the image due to reflection and related influences, will be apparent from an examination of the following description read in the light of the accompanying drawings in which:

Fig. 1 is a view in plan and section of an antenna and director or reflector assembly, embodying one feature of my invention;

Fig. 2 is a view in section and elevation of the assembly depicted in Fig. 1, taken on lines 2—2 of Fig. 1, and illustrating particularly the means by which the antenna and reflector may be rotated and extended or contracted;

Fig. 3 is an elevation of the complete assembly, taken on lines 3—3 of Fig. 1;

Fig. 4 is a plan view of a modified form of antenna and reflector assembly;

Fig. 5 is a vertical section of the embodiment of Fig. 4, taken on lines 5—5 of Fig. 4.

Referring more particularly to the drawings, the numerals of which indicate similar parts throughout the several views, 6 designates a vertically-disposed receiving-antenna tubular support which may be of any required length and is adapted for disposition on a roof top or other mounting favorable to the reception of television signals emanating from several transmitters with which the receiving set is to be selectively tuned. Support 6 is journaled in one or more bearings, of which bearing 7 is illustrative, to permit its rotary motion in response to motivation by means about to be described. A spur ring gear 8 is keyed or secured by welding or the like to the lower end of tubular support 6, and is driven by a pinion 9 rotated at a slow speed by a reversing motor 10 through reduction gearing, generally indicated at 11. Motor 10 is connected with a source of electric power through wires 12 and controlled by switches of the type hereinafter described. At the upper end of support 6 a gear housing 13, composed of plastic or other dielectric material, is rigidly secured. Oppositely projecting horizontal branches 14 of the gear housing each terminate in lateral, coaxially-aligned tubular retainers 15. A pair of antenna tubes 16 are fitted into opposite ends of one of retainers 15, and in a like manner reflector or director (projector) tubes 17 are carried by the other of said retainers. Thus, each pair of antenna and reflector elements 16 and 17, respectively, carried by retainers 15 are spaced apart

by the retainers to insulate them from one another, and the pair of reflector elements 17 are rigidly mounted in spaced, parallel relation with the antenna elements 16, the distance between antenna and reflector being predetermined by the length of branches 14 to be most suitable for greatest utility of the reflector. Each tube 16 and 17 houses in telescopic relation a sliding tube 18 which is adapted to be extended and contracted in unison with the other sliding tubes 18 by means about to be described. To this end, a shaft 19 extends through the tubular support 6 and carries a spur gear 20 on its lower end. Rotary motion is imparted to gear 20 and shaft 19 from a reversing motor 21 through reduction gearing 22 and a pinion 23. The upper end of shaft 19 terminates in gear housing 13 and is provided with a miter gear 24 with which a second miter gear 25, keyed upon a horizontal shaft 26 suitably journaled in the housing, is in mesh. Shaft 26 projects through the oppositely-disposed branches 14 of the housing, with the ends thereof extending into the tubular retainers 15, respectively. Each end of the shaft carries a pinion 27 which is operatively engaged with a pair of gear racks 28, composed of plastic or other suitable dielectric, extending longitudinally through retainers 15 above and below pinion 27. Racks 28 in each retainer are connected to the sliding antenna and reflector tubes 18, respectively, whereby rotation of the pinions 27 imparted from the vertical shaft 19 through gears 24 and 25 and the horizontal shaft 26 is effective to extend or contract the telescopic assemblies.

The coaxially aligned antenna tubes 16 are provided with spring contacts 29 on their outer ends which are operable to bear radially against the sliding tubes 18 telescopically associated therewith. Thus, each electrically connected tube assembly 16-18 comprises one pole of a dipole antenna. The respective poles are connected to the receiver in a conventional manner not illustrated, e. g. by a coaxial cable, by twisted wires, or in parallel, as will be understood by those of skill in the art. It will be appreciated that the other dual tube assembly functions either as a director (projector) or reflector, depending upon its disposition with respect to the antenna and transmitter from which radiations are being received. It will thus be seen that by energization of motor 21 in one direction the outer antenna and director tubes may be projected outwardly to the ends of their telescopic movement, and that by reversing the motor the antenna and reflector assemblies may be contracted, enabling prompt mechanical adjustment in the ratio between the length of the antenna and the wave length of the transmitter from which radiations are to be received. By rotating tubular support 6, incident to energization of motor 10, the antenna and reflector or director assemblies may be positioned broadside to any of several transmitters, i. e., at right angles to the direction of radiation received from any transmitters within the range of the receiver.

The wiring and control of each motor 10 and 21 may be accomplished by separate identical mechanism, incorporating a visual indicator, about to be described. The control device for the mechanism and the indicator is preferably assembled with the receiver unit adjacent the viewing screen (not shown).

As hereinabove indicated, the motor 21 is of the reversing type and has associated therewith a magnetic control switch, comprising a pair of

magnets 30 and 31 adapted upon alternate energization to tilt a pivoted contact lever 32 into electrical engagement with two series of contacts 33, respectively, connected to the windings of the motor and source of electricity, as will be obvious to those of skill in the art without specific description. It will suffice to point out that with neither of magnets 30 or 31 energized, the contact lever 32 will assume a neutral position in response to the equal tension of a pair of springs 34, and accordingly all electrical circuits to the motor will remain open. One wire 35 of each magnet 30 and 31 is connected to a source of current. The other wires 36 and 37 of the magnets 30 and 31 are connected, respectively, to normally-closed cut-out switches 38 and 39 which are arranged in series with different terminals of a manually-operated switch indicated by the numeral 40. A third wire 41 connected to switch 40 is connected to the source of current for completion of the dual circuits. It will be observed that with both of the cut-out switches 38 and 39 closed the circuits through either magnet 30 and 31 may be closed by actuation in an obvious manner of the manually-controlled switch 40. For example, by turning switch 40 to close the circuit through magnet 31 and cut-out switch 39, motor 21 will be energized to turn shaft 19 in one direction so as to extend the antenna and director or reflector tubes 18 outwardly. Upon reaching the desired degree of extension, the adjustment of tubes 18 may be maintained by again opening the switch, whereupon the circuit through motor 21 is broken by springs 34, returning the contact lever 32 to a neutral inoperative position. Contraction of the antenna and director may be effected in a like manner by closing the circuit through magnet 30 and cut-out switch 38 which is effective to close the motor circuit through the opposite windings of motor 21 and reverse the direction of rotation of the antenna and reflector activating mechanism. The cut-out switches 38 and 39 are automatically actuated to open the closed circuit through the energized magnets 30 and 31 whenever the antenna assembly reaches the corresponding end of its telescopic movement without switch 40 having been opened manually, to prevent injury to the antenna and reflector mechanism. To this end, I provide a spur wheel 42 carried on a shaft 43 journaled in suitable bearings 44 above cut-out switches 38 and 39. Wheel 42 is formed with gear teeth on its periphery which are in mesh with the gear 20 carried by the end of shaft 19. On the underside of wheel 42 are a pair of pins 45 spaced apart radially and offset circumferentially several degrees. Each pin 45 is positioned to contact the switch 38 and 39 located in its arc of movement whenever the tubes 18 reach the end of its telescopic movement activated by the closing of the circuit in which said cut-out switch is arranged. It will thus be seen that with the pins 45 spaced circumferentially but a few degrees, the wheel 42 will have a range of movement equal to nearly a full revolution which corresponds with the movement of tubes 18 from fully extended to fully contracted position. Thus, by actuating switch 40 to close the circuit through magnet 30 and switch 38, the motor will be energized to shift the antenna and director assemblies in a direction depending upon windings of the motor 21, and such movement will be continued, if the operator permits switch 40 to remain closed, until the wheel 42 is rotated to a degree causing one of pins 45 to engage and open

switch 38, whereupon magnet 30 will be de-energized and the motor stopped. This will occur when the antenna reaches the end of the movement imparted by motor 21 when energized through the reversing switch contacts 33 controlled by magnet 30. Reverse movement of the telescoping antenna and director elements may be effected by throwing switch 40 to close the circuit through the magnet 31 and switch 39. As hereinabove indicated, movement of the antenna elements in the reverse direction may be stopped at any time in intermediate position by returning switch 40 to a neutral position so as to open the circuit through the energized magnet. In the event the operator fails to open switch 40, cut-out switch 39 will be opened by the pin 45 of the wheel, as hereinabove described with reference to cut-out switch 38 when the limit of the antenna movement in that direction has been reached.

In order that the operator may determine the degree of extension of the antenna and reflector at all times, I provide a visual indicator adapted for association with the receiver unit comprising a panel 46 having a series of windows 47, carrying symbols or legends indicating different transmitters with which the receiver may be tuned. A lamp (not shown) located behind each window 47 in the panel is electrically energized through a separate circuit controlled by an individual normally-open switch 48. Thus, if there are five transmitting stations within the range of the receiver, five of the windows in the panel will be equipped for illumination controlled by five separate switches 48 which are located beneath the spur wheel 42, each in a position to be actuated, by a pin 49 depending from the wheel, coincident with the degree of contraction or extension of the antenna and reflector assemblies appropriate to most favorable reception of the radiation from the transmitter indicated by the legend on the window adapted for illumination by the lamp controlled by the switch. Accordingly, the switches 48 are all arranged in an arc having a center on the axis of the wheel, whereby the pin 49 will contact and close said switches successively as the appropriate antenna adjustment is effected, in response to the operation of the reversing motor 21, as hereinabove described.

The wiring of the reversing motor 10 by which the entire antenna unit is turned is preferably identical with that above described and illustrated in Fig. 3 of the drawing for motor 21 and an indicating means similar to the lamp and switch assembly referred to may be provided to facilitate the desired rotary adjustment of the antenna assembly.

In Fig. 4 I have illustrated another embodiment of telescoping antenna and reflector unit, comprising a housing 13 in which the miter gears 24 and 25 are enclosed. Each lateral branch 14 of the housing is formed with a pair of integral diametrically-opposed flanged retainers 50 on which are secured end rings 51 of conical antenna and reflector assemblies, about to be described. The ends of a plurality of reinforcing antenna rods 52 are secured in spaced relation to each of rings 51. The rods diverge outwardly for connection at their outer ends to a ring 53 of greater diameter. A plurality of wires 54, having their ends soldered or otherwise secured to the rings 51 and 53, respectively, supplement rods 52 as a means for receiving transmitted television signals. A pair of gear racks 55, composed of dielectric material, slidably extend through each pair of

aligned lateral retainers 50 of the housing for operative engagement with the upper and lower arcs of the adjacent pinion 27. Telescopically received within each antenna and reflector cone assembly described, is a reciprocable cone assembly, comprising an inner ring 56 and a larger outer ring 57 connected by diverging reinforcing rods 58 and interposed wires 59. A third reinforcing ring 60, intermediate and parallel with rings 56 and 57, is provided for a purpose about to be described. Each gear rack 55 is formed with an integral toothless extension 61, and the extensions of each pair of antenna and reflector gear racks 55 project in opposite directions into respective inner cones, where they are attached to the inner and intermediate rings 56 and 60 of the reciprocable cone assemblies, respectively, to actuate and afford support for the latter and thereby maintain the telescopically associated antenna and reflector units in coaxial alignment. As hereinabove indicated, the rods 58 and wires 59 of each reciprocable antenna cone are connected electrically to the intermediate ring 60 thereof, which is in turn connected to the outer ring 53 of the antenna cone with which the reciprocable cone is telescopically associated. The lead wires (not shown) from the antenna to the receiving set are connected to the innermost rings 51 of the respective poles of the antenna and may extend downwardly inside or outside of the support 6 in any desired relationship for connection to the set.

It will thus be seen that, as in the embodiment of Figs. 1-3, the housing 13 insulates the respective antenna and reflector cones from one another, and the gear racks 55, being composed of a dielectric material, preserve the insulating effect of the housing. The operation of the apparatus of the embodiment of Fig. 4 is substantially the same as that described for the tubular antenna and reflector structure of Fig. 1. The entire antenna and reflector unit is turned in response to actuation of motor 10 to form the preferred angle of usually 90° between the axes of the coaxially-aligned reflector and antenna units with the line of direction of the radiations from the transmitter to which the set is desired to be tuned. The reciprocable antenna and reflector cones, supported in coaxial alignment with the inner cones connected to the housing, are actuated by gear racks 55, lateral movement of which is resisted by the pinions 27 and the bore of retainers 50 through which they extend, respectively. With the ends of rods 58 secured to the rings 56 and 57 of the outermost antenna and reflector cones, the latter are reciprocated to telescopically extend or contract, selectively, the dipole antenna and reflector in accordance with the operation of the drive mechanism activated by motor 21 as hereinabove described. It will be understood that the rotary control and indicator mechanism may be identical to that described in connection with the embodiment of Figs. 1-3 inclusive.

It will thus be seen that I have provided a rotatable and extensible dipole antenna and reflector or director assembly adapted for television receivers, permitting adjustment to enable most favorable reception of signals radiated from any of a plurality of transmitters within the range of the receiver regardless of the direction from which the signals are transmitted or the wave lengths upon which the respective transmitters operate, in combination with elec-

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trical mechanism for controlling, with facility, and coincidentally indicating the adjustment.

It will be understood that while I have illustrated and described but two embodiments of the antenna and director assembly with a single control and indicator by which each of the principal adjustments are accomplished, numerous changes in size, design, shape and number of the various parts may be made, and, particularly, antennas or reflectors other than the type specifically alluded to may be substituted for those shown, and further that various apparatus for effecting the desired adjustments may be utilized, and that the visual indicator is merely illustrative of various conventional devices which may be employed in lieu thereof, all without departing from the spirit of my invention as defined in the appended claim.

What I claim and desire to secure by Letters Patent is:

In television equipment of the character described, an antenna comprising telescopically extensible and contractible sections, a vertical shaft rotatably supporting said antenna, a motor to rotate said shaft and antenna, power transmission mechanism comprising a shaft coaxially related with said first-named shaft for extending and contracting said antenna, a motor to actuate said power transmission mechanism, a television receiving unit connected to said antenna

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comprising means to translate signals received by said antenna into visual reproductions thereof, and separate controls for said motors both located adjacent said receiving unit to selectively energize said motors and thereby selectively extend and contract or rotate said antenna, said controls being in such proximity to said receiving unit that the results of such adjustments of said antenna may be observed in the visual reproductions of such signals coincident with said adjustments.

JOSEPH B. WALKER.

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