Sept. 1, 1959 W. E. FOSTER 2,902,688

RETRACTABLE ANTENNA

Filed Feb. 9, 1956 2 Sheets-Sheet 1

Fig. 1

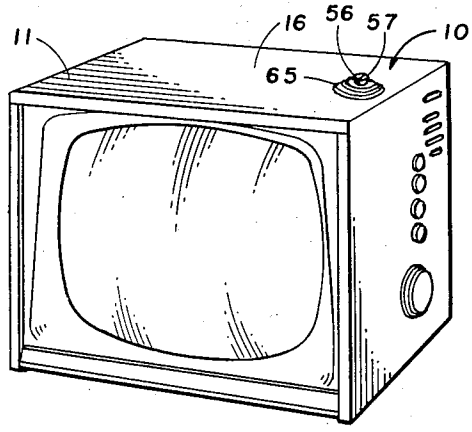


Fig. 2

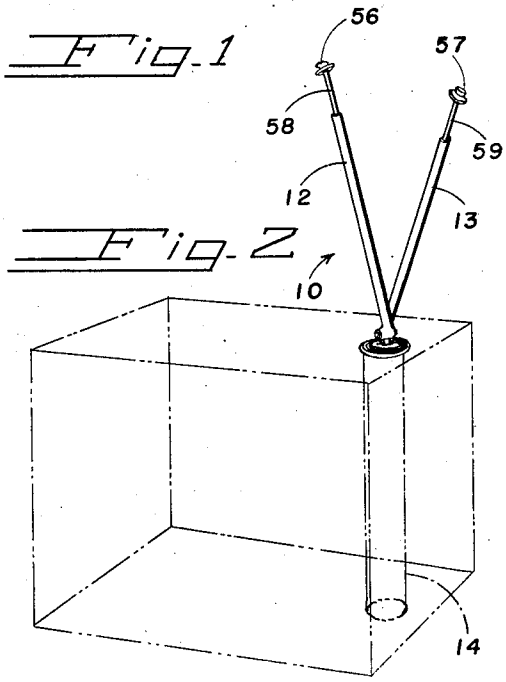


Fig. 3

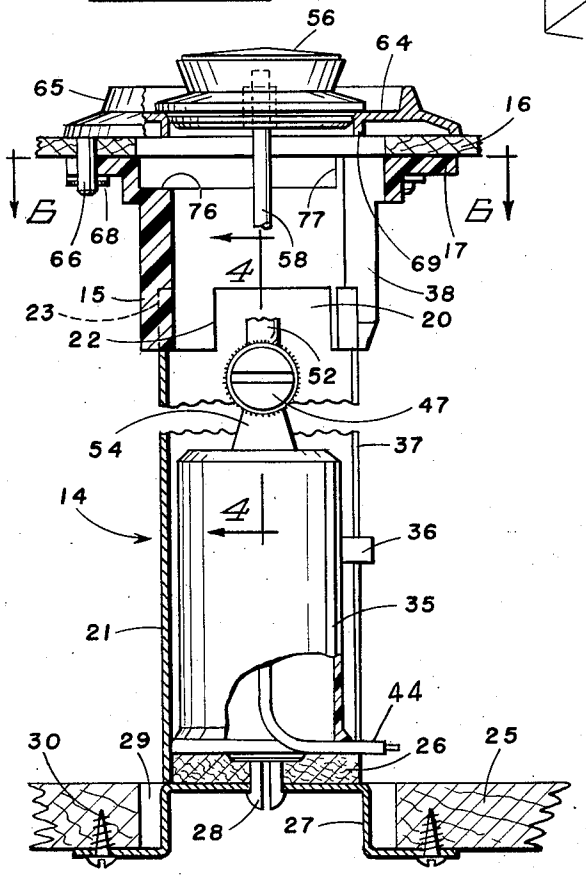
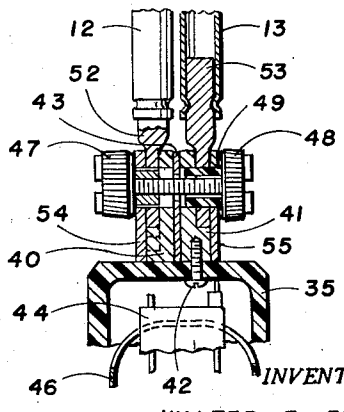


Fig 4



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RETRACTABLE ANTENNA

Filed Feb. 9, 1956 2 Sheets-Sheet 2

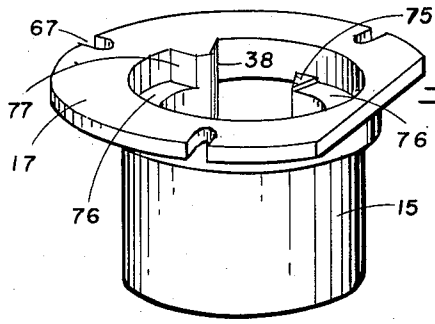


Fig. 5

Fig. 6

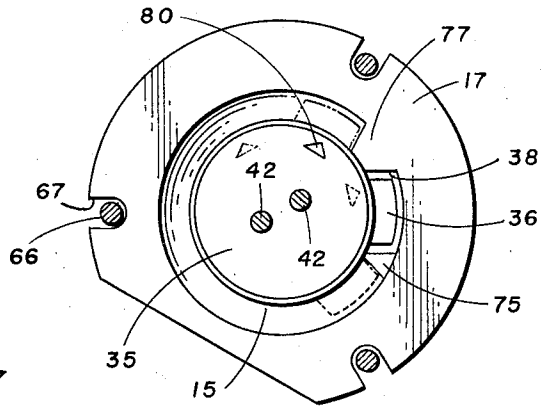


Fig. 7

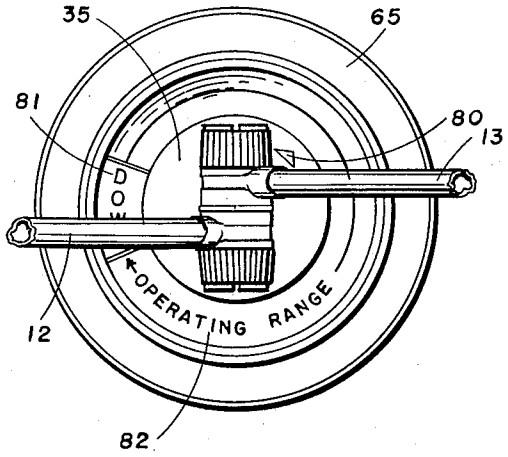
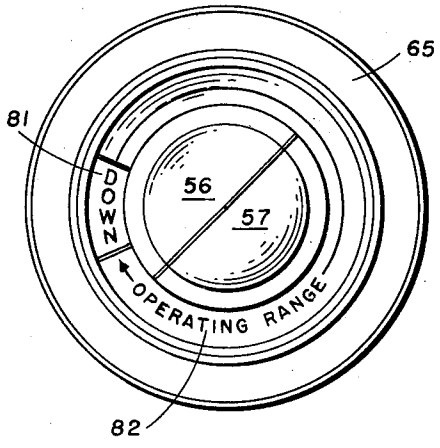


Fig. 8



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United States Patent Office 2,902,688 Patented Sept. 1, 1959

2,902,688

RETRACTABLE ANTENNA

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Application February 9, 1956, Serial No. 564,395

18 Claims. (Cl. 343—702)

This invention relates to a retractable antenna of the dipole type which may be retracted within the cabinet or enclosure of a radio or television set when the apparatus is not in use or when the antenna is not needed. In this way, a permanent and efficient type of antenna installation is provided without detracting from the appearance or portability of the radio or television set.

In the past, it has been customary for owners of television sets not having outdoor antennae to use a "rabbit ear" antenna placed on top of the television cabinet in order to improve the reception of local programs. This type of indoor antenna is quite effective and is easily adjusted for best reception by changing the length of the telescoping dipole elements in accordance with the wave length of the signal being received, and by rotating the entire unit on the cabinet to make the azimuth setting of the dipole correspond with the direction of the incoming signal. Polarization of the incoming signal may be compensated for by adjusting the "spread" and/or angular positions of the dipole elements.

This type of antenna, however, suffers from the disadvantage that it is somewhat unwieldy and subject to tipping on its base so that it is apt to be knocked over when the dipole elements are extended. In the past, it has not been thought feasible to install a "rabbit ear" antenna permanently on the cabinet or enclosure of the television apparatus since it is often desirable to remove the antenna entirely therefrom as when transporting the set from one location to another. Also, in the event that an outdoor antenna is erected, the need for the indoor antenna is thereby eliminated and its continued presence on the cabinet will serve no useful purpose.

It is the purpose of the present invention, therefore, to provide a permanent dipole antenna installation on a radio or television set which will afford all of the advantages of this type of installation while avoiding the above-noted disadvantages thereof. This is accomplished by providing a well in the radio or television enclosure into which the antenna may be retracted when the set is not in operation or when the antenna is not required. In this way, the appearance and portability of the set is not interfered with by the presence of the antenna. The retraction mechanism which I have designed for this purpose is characterized by extreme simplicity and ease of operation in withdrawing the antenna from the enclosure or replacing it therein.

It is an object of the present invention, therefore, to provide a retractable dipole antenna which may readily be installed on a radio or television set of conventional construction.

Another object of the invention is to provide a dipole antenna unit for a radio or television set which can be pulled out of the enclosure or cabinet of the set and adjusted in the ordinary manner for best reception, and thereafter returned to its position within the enclosure or cabinet when the need therefor no longer exists.

Another object of the invention is to provide a retractable dipole antenna which is positively retained in its extended or operative position until released by a simple manipulation whereupon it may be returned to its position inside the enclosure.

Another object of the invention is to provide finger-pieces on the distal ends of the dipole elements which serve as a means for pulling the antenna out of the enclosure and also as a means for closing the opening provided therein for the retractable antenna.

With these and other objects in view, which will become apparent from the following description, the invention includes certain novel features of construction and combinations of parts, the essential elements of which are set forth in the appended claims and a preferred form or embodiment of which will hereinafter be described with reference to the drawings which accompany and form a part of this specification.

In the drawings:

Fig. 1 is a perspective view of a table model television set showing the antenna in its retracted position.

Fig. 2 is a phantom view of the television set shown in Fig. 1 but with the antenna shown in its operative position.

Fig. 3 is a cross-sectional elevation of the antenna unit with the antenna shown in its retracted position.

Fig. 4 is a cross-sectional view taken along the line 4—4 in Fig. 3.

Fig. 5 is a perspective view of the bushing which mounts beneath the top of the cabinet.

Fig. 6 is a sectional view taken along the line 6—6 in Fig. 3.

Fig. 7 is a plan view showing the antenna in its operative position.

Fig. 8 is a plan view showing the antenna in its retracted position.

As heretofore mentioned, my improved form of television or radio antenna unit is adapted to be mounted in the cabinet or enclosure of a television or radio set so as to permit the antenna to be housed therein when it is not being used. The antenna unit **10** is shown in Fig. 1 as it appears when it is retracted into the enclosure **11** in which the television set is housed. In Fig. 2 the antenna is shown in its raised position with the dipole elements **12** and **13** suitably adjusted as to position and length for best reception of a signal. The well provided within the enclosure for receiving the antenna when it is retracted is shown in phantom outline in Fig. 2 where it is indicated by reference numeral **14**.

The detailed construction of the antenna unit **10** is best shown in Figs. 3, 4 and 5 of the drawings. As shown in Fig. 3, the well **14** includes a bushing **15** (see also Fig. 5) which is mounted on the underside of the top panel **16** of the enclosure **11**. The bushing is generally cylindrical in shape and is provided at its upper end with a flange **17** which is adapted to seat against the bottom face of the panel **16**. The shape of the bushing **15** is somewhat complex so that this part is preferably formed of a material which can be cast or molded, such as a synthetic resin having the required strength and dimensional stability. The interior wall of the lower part of the bushing **15** is recessed to receive a plurality of tongues **20** formed on the upper end of a cylindrical tube **21**. The notches **22** on the tube **21**, lying between adjacent tongues **20**, cooperate with unrecessed portions **23** of the interior wall of the bushing. In this manner, a sliding, interlocking fit of the upper end of the tube **21** into the lower end of the bushing is provided. The tube is preferably of light, thin-walled construction as indicated in Fig. 3 and may be formed of a plastic or fiber type of material.

The length of the tube **21** is preferably such that its lower end lies flush with the upper face of the bottom

panel 25 of the enclosure 11 and the lower end of the tube is held against sidewise movement by a washer 26 formed of resilient material which fits inside the bottom end of the tube. The washer 26 is mounted on top of a U-shaped bracket 27 where it is held in place by a snap fastener 28. As shown in Fig. 3, the bracket 27 is received in an aperture 29 provided therefor in the bottom panel 25 to which the bracket is secured by screws 30. The tube 21 is thereby held at both ends and is maintained firmly in place within the enclosure 11.

Mounted for sliding movement within the tube 21 is a carrier 35 which is in the form of a hollow cylinder with a closed top (see Fig. 4). The carrier may advantageously be made of molded plastic construction and has formed on the side thereof a lug 36 which protrudes through a longitudinally extending slot 37 formed in the tube 21. The slot 37 extends the full length of the tube and has a width slightly greater than that of the lug 36 so as to permit free sliding movement of the lug within the slot. The bushing 15 is provided with a slot 38 which is aligned with the slot 37 and has a corresponding width so as to permit the lug 36 to continue its travel up through the bushing when the carrier is raised.

The dipole antenna is mounted on top of the carrier 35, the carrier serving as a means for guiding the antenna into and out of the well. The means for supporting the antenna on top of the carrier includes a pair of pivot blocks 40 and 41 (Fig. 4) each of which is fastened to the carrier by a screw 42 passing through a hole provided therefor in the top of the carrier. The blocks are insulated from one another by a partition 43 of insulating material and each is connected by screws 42 to one wire of a twin line 44. The transmission line 44 may pass from the radio frequency stage of the receiver through the bottom of the slot 37 where it then enters the bottom of the carrier 35 and is supported therein by a retainer 46.

The block 40 is apertured to receive a nut 47 which is threaded to receive a screw 48 which passes through and aperture provided in the block 41. The aperture in the block 41 is of sufficient diameter to receive an insulating bushing 49 placed on the screw 48 so that the screw will be electrically isolated from the block 41 by the bushing and by an insulating washer placed under the head of the screw 48.

The telescoping dipole elements 12 and 13 are pivotally supported on nut 47 and screw 48 by means of tips 52 and 53 which are provided with flattened terminal portions that are apertured to receive the shank of the nut 47 and the insulating bushing 49. Pressure is applied by the nut 47 and screw 48 on the tips 52 and 53 through plate washers 54 and 55 which lie beneath the heads of the nut and screw and bear against the outer faces of the blocks 40 and 41.

The dipole elements 12 and 13 may be of conventional telescopic construction and may be extended by means of finger pieces 56 and 57 screwed onto the upper ends of rod elements 58 and 59. As best shown in Fig. 8, the fingerpieces 56 and 57 are each semi-circular in shape so that together they form a circular knob for pulling the antenna out of its well. As shown in Fig. 3, when the antenna is retracted, the fingerpieces are adapted to seat upon an annular shelf 64 provided on an escutcheon plate 65 which mounts on the upper face of the top panel 16 of the enclosure. The escutcheon plate is provided with pins 66 which pass through holes in the panel 16 and through slots 67 provided in the flange 17 of bushing 15. The assembly is held together by fasteners 68 (Fig. 3) which are received on the lower ends of the pins 66.

The antenna is raised out of the well to its operative position by pulling upwardly on the fingerpieces 56 and 57 which causes the carrier 35 to slide upwardly within the sleeve 21, the lug 36 traveling within the slots 37 and 38 (Fig. 3). Upward movement of the carrier 35 is limited by engagement of the top of the lug 36 with the lower edge 69 (Fig. 3) of a rim formed around the inner edge of the shelf 64 of the escutcheon plate. In this position, the lug 36 lies above the top of an abutment 75 (Fig. 5) formed at one end of an annular shelf 76 formed in the bushing 15.

Upon turning the carrier 35 clockwise, by means of the fingerpieces 56 and 57, the lug 36 may be brought above the ledge 76 onto which it may then be lowered by releasing the fingerpieces. The carrier and the antenna will thereby be retained in their raised, operative positions, as shown in Fig. 7, until such time as it is desired to return the antenna to its retracted position within the enclosure. While in the raised position, the antenna and carrier may be rotated to adjust the azimuth setting of the antenna for best reception, the lug 36 sliding along the shelf 76 as the antenna is revolved. Clockwise rotation of the antenna is limited by a lug 77 (Fig. 5) which will prevent further rotation of the carrier upon engagement of the lug 36 therewith. This will prevent the carrier from dropping back into the well by inadvertent alignment of the lug 36 with the slot 38. Also, the shorter lug 75 will prevent the lug 36 from moving over the slot 38 when the antenna is turned in a counterclockwise direction, the edge of the lug 36 engaging against the edge of the lug 75 on the bushing and stopping further rotation of the carrier. When it is desired to return the antenna to its retracted position, the antenna is lifted so as to cause the lug 36 to clear the top of the lug 75 whereupon the lug 36 may be moved into alignment with the slot 38 by further counterclockwise rotation thereby permitting the antenna to be lowered into the well.

The top of the carrier 35 is provided with a triangular-shaped indicia 80 which is adapted to co-operate with legends inscribed on the shaft 64 of the escutcheon plate 65 to facilitate retraction of the antenna into the well. As shown in Fig. 7, by rotating the antenna and carrier counterclockwise until the indicia 80 approaches the "Down" inscription 81 and then lifting the antenna to clear the lug 75, the antenna may be lowered into the well. So long as the indicia 80 occupies the position covered by the inscription "Operating Range" 82, the lug 36 will ride on the shelf 76 and maintain the antenna in its operative position. In Fig. 6, the indicia 80 is shown in the position it occupies when the lug 36 lies in registry with the slot 38 which corresponds with the "Down" position shown in Fig. 7. Dotted outline positions of the indicia 80 and lug 36 are also shown in Fig. 6 to indicate the relative positions of these elements at each end of the operating range.

After the antenna has been raised to its operative position as shown in Fig. 2, the dipole elements 12 and 13 may be extended to whatever length is necessary for best reception of the station selected. Likewise, the antenna may be rotated as is necessary to improve the signal, and the elements 12 and 13 may be spread apart or brought closer together to improve the picture. To return the antenna to its retracted position, the dipole elements are brought together and the sections telescoped into one another, after which the antenna is turned counterclockwise toward the "Down" position. Rotation of the antenna will be stopped when the lug 36 engages against the lug 75 on the bushing 15. However, by lifting the carrier slightly by means of the fingerpieces 56 and 57, counterclockwise rotation may be continued until the lug 36 strikes the edge of abutment 77 whereupon the lug 36 will be in alignement with the slots 38 and 37 and the antenna may be dropped into the well. After the antenna is fully retracted, the fingerpieces 56 and 57 will, as shown in Fig. 3, seat against the shelf 64 of the escutcheon plate and thereby close the upper end of the well and prevent the entry of dirt and dust therein.

While I have described my invention in connection with one possible form or embodiment thereof and, have used, therefore, certain specific terms and language herein, it

is to be understood that the present disclosure is illustrative rather than restrictive and that changes and modifications may be resorted to without departing from the spirit or scope of the claims which follow.

Having thus described my invention, what I claim as new and useful and desire to secure by United States Letters Patent, is:

1. A dipole type antenna unit adapted to be retracted inside an enclosure when not in use and extended through an aperture in a wall of said enclosure when in use, said unit comprising a carrier, a pair of electrically isolated telescoping dipole elements pivotally supported on said carrier, electrical connecting means for said dipole elements, and a tubiform casing supported from said wall at said aperture within said enclosure for receiving said carrier and dipole elements therein and for guiding them in and out of the enclosure through said aperture when the antenna is retracted therein or extended therefrom, said tubiform casing also providing a bearing means for supporting said carrier and for permitting rotation of said carrier when said antenna is extended.

2. The antenna unit of claim 1 wherein said bearing means comprises a bushing secured to the wall of said enclosure for receiving said carrier when the antenna is moved into its extended position.

3. The antenna unit of claim 2 wherein said carrier is provided with a lug projecting laterally therefrom, and wherein said casing and bushing are slotted to receive said lug so as to maintain said carrier in an oriented position within said casing.

4. The antenna unit of claim 3 including a circumferential shoulder on said bushing coinciding with the upper end of the slot for engaging under said lug when the carrier is turned to prevent retraction of the carrier and thereby maintain the antenna in its operative position.

5. The antenna unit of claim 4 including an abutment on said shoulder co-operating with said lug to limit the turning movement of said carrier in said bushing.

6. The antenna unit of claim 5 wherein said abutment is located adjacent to one edge of the slot formed in the bushing.

7. A dipole antenna unit adapted to be retracted into or extended out from an enclosure, said unit comprising a carrier, a pair of electrically isolated telescoping dipole elements pivotally supported on said carrier, electrical connecting means for said dipole elements, a lug projecting laterally from said carrier, a longitudinally slotted tubiform casing within said enclosure for receiving said carrier and dipole elements, said lug being positioned in the slot of said casing whereby said carrier may be guided within said slot into and out from said enclosure when said antenna is retracted or extended therefrom, said slotted tubiform casing including a slotted bushing secured to a wall of said enclosure, a circumferential shoulder on said bushing coinciding with the outer end of said slot for engaging said lug and supporting said carrier in its extended position, an abutment on said shoulder adjacent one edge of said slot in said bushing, and a second abutment on said shoulder adjacent the other edge of said slot in said bushing, said abutments cooperating with said lug to limit the rotation of said carrier on said shoulder to less than 360 degrees of rotation.

8. The antenna unit of claim 7 wherein said abutments project different distances beyond said shoulder, and including means for limiting the movement of said carrier and said bushing when the antenna is moved to its operative position so as to permit said lug to clear one of said abutments but not the other.

9. The antenna unit of claim 1 including fingerpieces on the distal ends of said dipole elements for pulling the antenna out of the enclosure.

10. The antenna unit of claim 4 including an annular escutcheon plate lying over said bushing on the exterior face of said enclosure, the central opening in said plate being of approximately the same size as said carrier whereby the slot in said bushing and the lug on said carrier are covered by said plate.

11. The antenna unit of claim 10 including indicia on said escutcheon plate and an index on said carrier for indicating the position to which said carrier must be turned in order to align said lug with the slot in said bushing.

12. A dipole type antenna adapted to be retracted inside the cabinet of a television receiver when not in use and adapted to be extended through an aperture in a wall of said cabinet when in use, said antenna comprising a carrier, a pair of dipole elements pivotally supported on said carrier, electrical connecting means for said dipole elements, means on the distal end of each of said dipole elements for pulling the antenna out of the cabinet through said aperture, said means together forming a closure for said aperture when said antenna is retracted, and a tubiform casing within said cabinet for receiving said carrier and dipole elements therein and for guiding them in and out of the cabinet when the antenna is retracted therein or extended therefrom.

13. In an antenna unit comprising a pair of electrically isolated dipole elements adapted for use with a receiver which is mounted in an enclosure, said dipole elements having electrical connecting means for connection to said receiver, the combination comprising: an aperture in said enclosure; a carrier mounted within said enclosure, means for longitudinally moving said carrier to the surface of said enclosure at said aperture; means for pivotally supporting said dipole elements on said carrier; and means for rotating said carrier at the surface of said enclosure for directionally orientating said dipole elements.

14. For use with a receiver mounted with an enclosure, an antenna of the dipole type including a pair of adjustable arms and a carrier therefor, said adjustable arms having electrical connecting means for connection to said receiver, each of said arms including an elongated conducting tube pivotally secured at one end thereof to said carrier, and at least one conducting member telescoped within said conducting tube and in electrical contact therewith; an aperture in said enclosure; mounting means for selectively positioning said carrier in an inoperative position within said enclosure and in an operative position at the surface of said enclosure at said aperture, said mounting means permitting longitudinal movement of said carrier from its said inoperative position to its operative position, and permitting rotational movement of said supporting means when in its operative position for directionally orientating said dipole elements.

15. The invention as defined in claim 14, wherein said mounting means comprises a tubular casing having a bushing at one end secured to said surface of the enclosure for receiving said carrier when in its operative position, said tubular casing and said bushing each being provided with an aligned longitudinal slot, said carrier being provided with a lug adapted to ride in said slot to guide the longitudinal movements of said carrier from its inoperative position in said tubular casing to its operative position in said bushing.

16. The invention as defined in claim 15 wherein said bushing includes a circumferential shelf adapted to receive said lug to permit rotation of said carrier.

17. The invention as defined in claim 16 wherein means are provided for limiting the rotation of the carrier to less than 360 degress but more than 180.

18. A dipole type antenna unit adapted to be retracted inside an enclosure when not in use, said unit comprising a carrier, a pair of electrically isolated telescoping dipole elements pivotally supported on said carrier, and a tubiform casing within said enclosure for receiving said carrier and dipole elements therein and for guiding them into and out from the enclosure when the antenna is retracted therein or extended therefrom, said tubiform casing including a bushing having an aperture and being secured to the wall of said enclosure for receiving said car-

rier when said antenna is moved into its operative position, and finger pieces on the distal ends of said dipole elements for pulling the antenna out of the enclosure through said aperture and wherein the said aperture is circular in shape and said finger pieces are semicircular in shape and together form a round knob somewhat larger than said aperture so as to provide a circular closure for said aperture when said antenna is retracted.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 2,902,688 September 1, 1959

Walter E. Foster

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 3, line 39, for "and aperture" read -- an aperture --; column 4, line 35, for "shaft 64" read -- shelf 64 --; line 67, for "alignement" read -- alignment --; column 6, line 33, for "with" read -- within --; line 65, for "degress" read -- degrees --; same line 65, for "180." read -- 180 degrees. --.

Signed and sealed this 23rd day of February 1960.

(SEAL)
Attest:
KARL H. AXLINE
Attesting Officer

ROBERT C. WATSON
Commissioner of Patents