Oct. 2, 1951 E. C. HAMEL ET AL 2,569,810

FOLDED DIPOLE ANTENNA

Filed April 2, 1949

Fig. 1

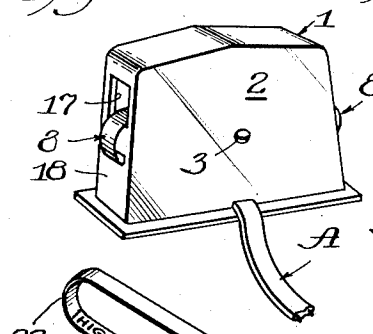


Fig. 7

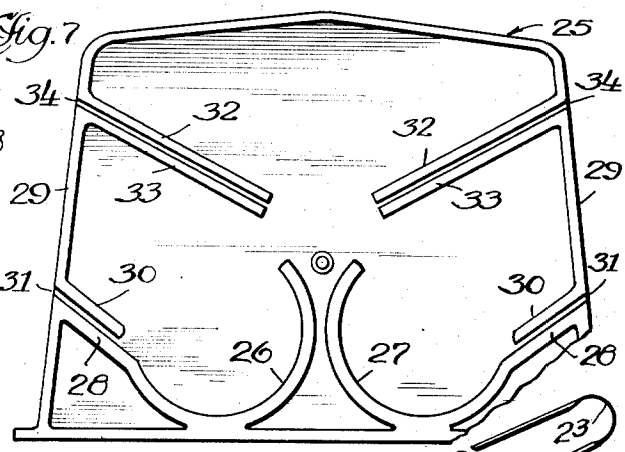


Fig. 2

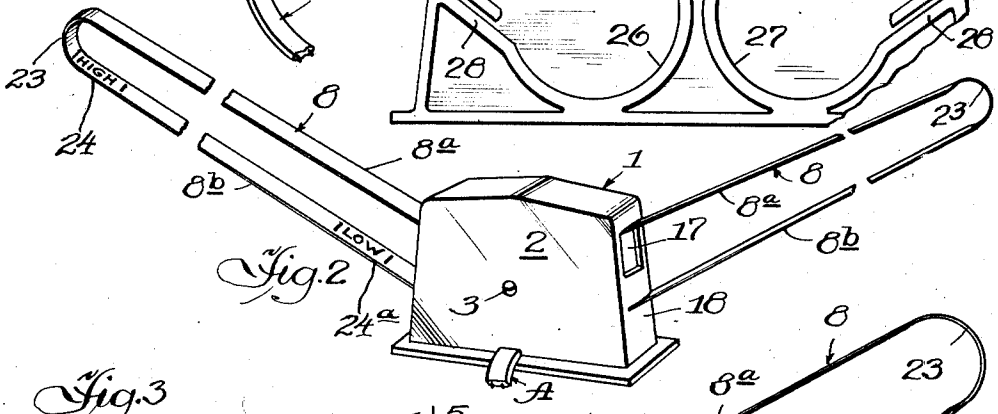


Fig. 3

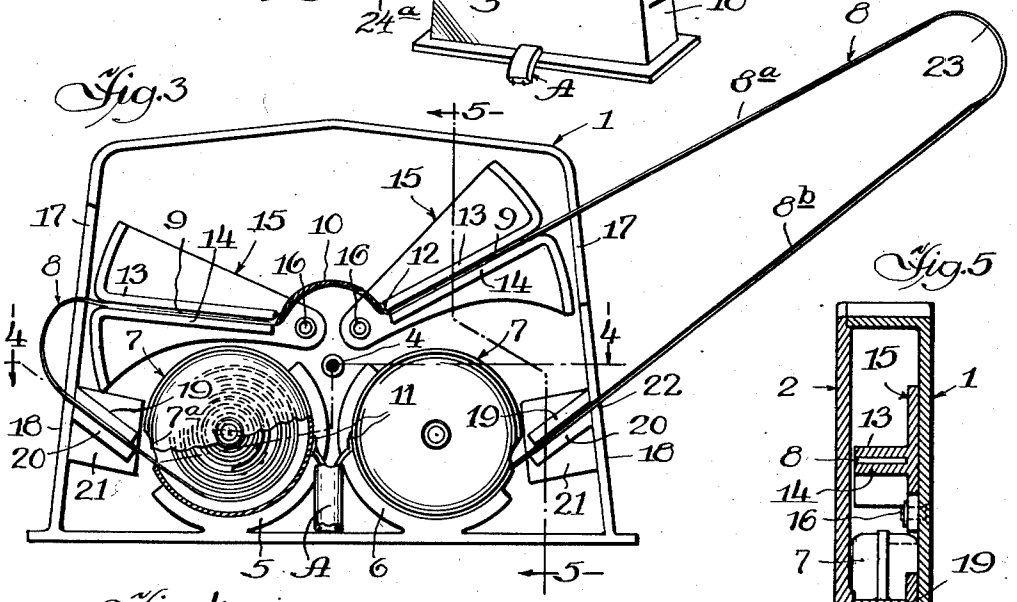


Fig. 5

Fig. 4

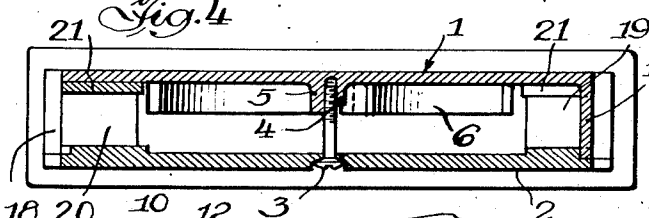
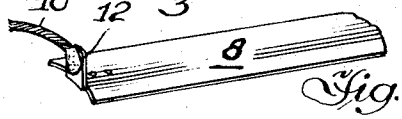


Fig. 6



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UNITED STATES PATENT OFFICE

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FOLDED DIPOLE ANTENNA

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10 Claims. (Cl. 250—33.51)

1

The present invention relates to an antenna for the reception or transmission of radio waves, and more particularly to an antenna especially adapted for the reception of television and frequency modulated signals.

Due to the difficulty in obtaining a satisfactory signal for television or frequency modulated radio receivers without resorting to elaborate and expensive outdoor antennae, and also because in many areas such outdoor antennae are not permitted by reason of various restrictions, many homes and apartments are without such receivers. Furthermore, such outdoor antennae have been quite expensive to install and as they require care and experience in their installation on the roof or other generally inaccessible place as well as in their upkeep, such cost and difficulty of installation have deterred many from the purchase of receivers for the reception of television or frequency modulated signals.

It is therefore an important object of the present invention to obviate the difficulties above noted, and to provide a novel type of antennae that requires no outdoor installation, is inexpensive to manufacture and easy to install by one with no previous experience.

Another and very important object of the present invention is the provision in an indoor antenna of a more uniform amplitude response over a wide range of frequencies than possible with prior commercial types of indoor antenna, and which response compares very favorably with the expensive and elaborate outdoor antennae now employed.

Another important object of the present invention is the provision of a novel folded di-pole antenna having an impedance closely approximating the input impedance of standard television receivers. The novel antenna of the present invention is so designed and constructed as to provide broad frequency response, a condition highly desirable for the proper reception of television signals and not possessed by any prior type of indoor or portable antennae.

The present invention further comprehends the provision of a novel antenna that may be disposed closely adjacent the receiver, requiring a minimum of space, and one that is quickly and easily adjusted for most effective reception. When not in use, the novel antenna forms a compact assembly that may be collapsed into a small space and mounted on the receiver or in any inconspicuous place, but an antenna is instantly available for reception when the receiver is to be operated. By reason of the novel construction,

2

combination and arrangement embodied in the present antenna, reception of the standard television receiver is greatly enhanced, a condition not found in prior types of antennae available for indoor use.

The invention further comprehends the provision of a novel di-pole antenna comprising a pair of connected spring-loaded, concave tapes formed of a substantially rigid conducting metal, and which tapes may be readily adjusted to a desired length for optimum reception of television signals in a prescribed or available channel.

In the preferred embodiment, the novel antenna comprises a pair of coils of conducting material, each coil being in the form of a concaved and semi-rigid, tempered steel tape mounted in a non-conducting housing in such manner that the steel tapes may be uncoiled and withdrawn any designated amount for the effective reception of signals in a prescribed or designated channel, and when so withdrawn forming a folded di-pole antenna. These tapes when folded in the manner intended, are self-supporting at whatever length is withdrawn from the housing.

Further objects are to provide a construction of maximum simplicity, efficiency, economy and ease of assembly and operation, and such further objects, advantages and capabilities as will later more fully appear and are inherently possessed thereby.

The invention further resides in the construction, combination and arrangement of parts illustrated in the accompanying drawing, and while there is shown therein a preferred embodiment, it is to be understood that the same is susceptible of modification and change, and comprehends other details, arrangements of parts, features and constructions without departing from the spirit of the invention.

In the drawing:

Figure 1 is a view in perspective of the novel antenna assembly with the tapes retracted to inoperative position.

Fig. 2 is another view in perspective of the novel antenna assembly but with the tapes withdrawn to form two angularly arranged and self-supported antenna elements.

Fig. 3 is an enlarged view in rear elevation of the novel assembly with the rear panel removed to disclose the interior, one of the antenna elements being shown in retracted position and the other partially withdrawn, and the casing for one of the elements or tapes being broken away to show the tape coiled within the casing.

Fig. 4 is a cross-sectional view taken on the irregular line 4—4 of Fig. 3, but omitting the tapes and casings.

Fig. 5 is a view in vertical cross section taken on the irregular line 5—5 of Fig. 3.

Fig. 6 is a fragmentary view in perspective of the inner end of an antenna element or tape.

Fig. 7 is a fragmentary enlarged view in rear elevation of an alternate construction of housing for receiving the tapes.

Referring more particularly to the drawing and to the illustrative embodiment shown in Figs. 1 to 5, inclusive, there is disclosed a housing 1 formed or molded of a non-conducting material such as a suitable plastic composition having sufficient rigidity, inherent strength and insulating characteristics as to provide a casing for the reception and mounting therein of the antenna members. This housing is preferably formed integral and provided with a closure 2 by which the interior and enclosed mechanism may be protected but to which access may be quickly had by removal of a screw or securing means 3 adapted to be received in a threaded boss 4 disposed on the interior of the housing.

The interior of the housing is further provided with opposed arcuate flanges or ledges 5 and 6 each so contoured as to receive and support in fixed position a metallic casing 7 containing an antenna member or element 8. Each antenna member or element 8 comprises a spring-loaded, semi-rigid and concaved conducting tape preferably formed of tempered steel which may be coated or plated with a conducting surface covering.

The outer end 9 of each tape is withdrawn through an opening 7^a in the casing 7, and the portion between this end and the portion coiled within the casing is bent back to form a folded di-pole with the antenna members projecting outwardly and upwardly in angular relation and the sections 8^a and 8^b of the tape disposed in spaced relation. The opposed ends 9 of the two antenna members are joined together by a flexible connection 10. The tape 8 within each casing 7 is electrically connected to its casing by its sliding contact therewith where the tape emerges, and each casing 7 in turn is electrically joined at 11 to a conductor or cable A connecting the antenna to thereby transmit the energy intercepted by the antenna to the receiver.

To prevent the outer ends 9 from being withdrawn from the housing 1, the extreme ends thereof are formed with a lateral projection 12 that prevents withdrawal of the end of the tape from between a pair of closely spaced, parallel flanges or ribs 13 and 14 formed upon or carried by an arm 15 freely pivoted at 16 at its inner reduced end. These flanges or ribs are of substantial length and spaced apart just sufficient to receive therebetween the folded, convex, outer end 9 of each tape or antenna and with the adjacent portion of the tape extending outwardly through an elongated notch or slot 17 in the opposite side or end walls 18, 18 of the housing 1. Due to the pivotal mounting of these arms 15, they move from one extreme position shown at the left of Fig. 3 and in which position an antenna or tape 8 is retracted or withdrawn into its casing 7, to the other extreme position shown at the right of Fig. 3 and in which position an antenna or tape 8 is in one of its extended or withdrawn positions. When extended to any one of its numerous receptive positions, the folded tape is self-supported and spaced apart to such an extent as to assure most effective operation.

The lower or concaved section 8^b of the tape 8 that is withdrawn or returned to the casing 7, passes between parallel flanges or ribs 19 and 20 mounted upon a base plate 21 and through an aligned slot 22 in the housing. These flanges or ribs are spaced apart an amount just sufficient for the concaved tape to pass freely therethrough, but of such length as to rigidly and effectively hold the tape therebetween in any desired extended position in which the folded end 23 of the tape is spaced at a predetermined distance from the housing 1, and the folds or sections 8^a and 8^b of the tape 8 are in their spaced apart relation. To facilitate accurate adjustment and location of the tapes or antenna members or elements 8 to the proper adjusted length and at the proper location for the reception of the television signals in a desired channel, the tape is provided with spaced designations or markings 24 and 24^a designating the high and low frequency band whereby the operator may quickly and manually withdraw the lower fold or section 8^b of each tape until the desired or prescribed reading appears on the tape as it emerges from the slot 22 in the housing 1.

Fig. 7 discloses another form of housing 25 for receiving the casings 7 containing the antenna members or tapes 8. In this illustrative embodiment, the housing is provided with arcuate flanges 26 and 27 for the mounting of the casings 7 and with the outer, flat projections 28 of each merging with the side or end walls 29 of the housing and disposed in spaced relation with a flange or rib 30 disposed parallel with the end 28. As in Fig. 3, these flanges or ribs 30 and the flat projections 28 are spaced apart just enough to receive and permit the tape 8 to slide freely in or out through a slot 31 in the walls 29 of the housing, but at the same time rigidly and effectively hold the tape in its adjusted position during use.

Rather than provide the pivotal arms 15 of Fig. 3, the form shown in Fig. 7 provides a pair of diagonally disposed or inclined flanges or ribs 32 and 33, with the space therebetween aligned with a slot 34 in the end walls 29 of the housing 25. The flanges or ribs 32 and 33 are spaced apart sufficiently to receive and retain the outer end 9 of each tape. As these flanges or ribs are fixed in position and not pivotally mounted as in Fig. 3, the ends 9 of the tapes 8 need not be flexibly connected but may be fixedly joined together in any suitable manner.

From the above description and the disclosure in the drawing, it will be apparent that the present invention comprehends a novel indoor antenna and antenna system for the reception of radio waves, and especially an antenna admirably adapted for the reception of television and frequency modulation signals. As the disclosed antenna has a terminal impedance matching or closely approximating the input impedance of standard television and radio receivers now available, it greatly enhances the reception of such standard receivers and gives a relatively broad band response, a condition highly desirable for the proper reception of television signals and not available with prior types of indoor antennae.

Furthermore, by reason of the novel design, construction and arrangement of the present novel antenna, the assembly provides a highly compact unit that may be easily transported and during inactive periods stored in a minimum of

space. For example, the illustrative embodiment disclosed requires an external housing approximately six inches long, four to five inches high and having an overall width or thickness of slightly more than one inch. Thus it will be seen that the inactive, assembled antenna may be easily stored or carried about. Although we have stressed the use of the present antenna as being employed for the reception of television and F. M. signals, it will be readily appreciated that this novel antenna is equally adapted for the transmission of signals.

Having thus disclosed the invention, we claim:

1. A folded di-pole antenna adapted to be connected to a receiver, comprising a non-conducting housing, a pair of metal casings mounted in the housing, a coiled semi-rigid metallic tape mounted in each casing in such manner that any desired length of tape may be selectively withdrawn or returned to its casing at will, the inner end of each tape being anchored in its casing and its outer end withdrawn and anchored in the housing and forming a fold outside the housing, means for electrically connecting the outer ends of the pair of tapes, and a conductor connected to the casings for transmitting the energy intercepted by the effective length of the antenna to the receiver, the folded portion of the tape being manually withdrawn to any predetermined length for reception of the desired signals.

2. An indoor antenna comprising a housing of non-conducting material having its opposite end walls slotted, a pair of metallic casings secured within the housing in opposed relation and a spring-loaded, semi-rigid, concave metallic tape coiled within and adapted to be withdrawn from each casing or returned thereto, the outer end of each tape being withdrawn from its casing through the slot in the end wall of the housing and with the outer end of the tape returned to and secured in the housing whereby each tape provides an adjustable loop projecting outside the housing and forming a folded di-pole.

3. An adjustable antenna unit comprising a housing of non-conducting material, a pair of metallic casings located within the housing and a coiled metallic tape carried in each casing with the inner end anchored in the casing and the outer end projected through the housing to the exterior and then back into the housing, means for electrically connecting the outer ends together in the housing, and means for anchoring the outer ends in the housing whereby the portion of each tape intermediate the outer end and that portion coiled in the casing provides a folded di-pole projecting outside the housing, said folded di-pole being adjustable by withdrawal of a variable length of tape from the casing.

4. An adjustable indoor antenna unit for a receiver comprising a housing of non-conducting material, a pair of metallic casings mounted within the housing in opposed relation, a coiled metallic tape provided in each casing with the outer end of each tape withdrawn from its casing and projecting through the adjacent end of the housing and folded back into the housing with the end of the tape anchored in the housing, whereby to provide a folded di-pole at the two opposite ends of the housing, means for electrically connecting the ends of the tapes in the housing, and a conductor electrically connected at one end to the casings and at its other end to the receiver.

5. In an adjustable indoor antenna for the reception of radio waves, a housing therefor of non-conducting material, a metallic casing enclosed within the housing, a metallic spring-loaded, semi-rigid concave tape coiled within the casing with its outer end projecting outside the casing, and means for anchoring the outer end in the housing with the tape between said outer end and the casing being looped outside the housing and adapted to be withdrawn from the casing to form a folded di-pole antenna that is adjustable in length and self-supported.

6. In an indoor antenna for the reception of television and frequency modulated signals, a housing and support therefor of non-conducting material, a spring-loaded metallic tape coiled in said housing with the outer end of the tape anchored in the housing and said tape forming an adjustable and self-supporting loop projecting outside the housing to provide an adjustable folded di-pole antenna, and means for connecting the ends of the loop to transmit the energy intercepted by the antenna to a receiver.

7. In an antenna unit for radio waves including television and frequency modulated signals, a pair of coiled and extensible metal tapes, a non-conducting housing in which said coiled metal tapes are mounted, and means for electrically connecting and anchoring the outer ends of these tapes within the housing with the portion of each tape between the coil within the housing and the outer end thereof extending outside the housing and thereat forming an extensible loop manually adjustable for the desired signal.

8. In an indoor antenna unit for the reception of television and frequency modulated signals, a pair of coiled and extensible, semi-rigid and concave metal tapes, a non-conducting housing for receiving the coiled portion of the tapes and provided with vertically spaced slots at its opposite ends for the passage therethrough of the spaced sections of each of the tapes as they are withdrawn from the coils, means for connecting together the outer ends of these coils, and means for anchoring the connected ends in the housing, the portion of these tapes between the anchored ends and the coiled portion in the housing forming a self-supporting and extensible loop outside and at each end of the housing and being adjustable to form upwardly and outwardly projecting folded di-poles.

9. An indoor antenna comprising a housing of non-conducting material having its opposite end walls slotted, a pair of metallic casings secured within the housing in opposed relation, a spring-loaded, semi-rigid, concave metallic tape coiled within and adapted to be withdrawn from each casing or returned thereto, the outer end of each tape being withdrawn from its casing through the slot in the end wall of the housing and with the outer end of the tape returned to and secured in the housing whereby each tape provides an adjustable loop projecting outside the housing and forming a folded di-pole, and spaced flanges for receiving the spaced sections of the folded tapes as they emerge from and enter each end wall of the housing, the flanges being spaced apart just sufficient for the reception and passage of the tapes and of such length as to maintain the tapes in their proper spaced and adjusted relation.

10. An adjustable indoor antenna unit for a receiver comprising a housing of non-conducting material, a pair of metallic casings mounted within the housing in opposed relation, a coiled metallic tape provided in each casing with the outer end of each tape withdrawn from its casing and projecting through the adjacent end of the

housing and folded back into the housing with the end of the tape anchored in the housing whereby the extensible loops outside the housing provide a folded di-pole at the two opposite ends of the housing, means for electrically connecting the ends of the tapes in the housing, spaced elongated flanges for receiving the tapes as they emerge from the opposite ends of the housing, other flanges for receiving the folded and anchored ends of the tapes within the housing, means for pivotally mounting the last mentioned flanges, and a conductor electrically connected at one end to the casings and at its other end to the receiver.

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