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V. TREBULES ET AL

2,542,884

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Filed Dec. 14, 1948

2 Sheets-Sheet 1

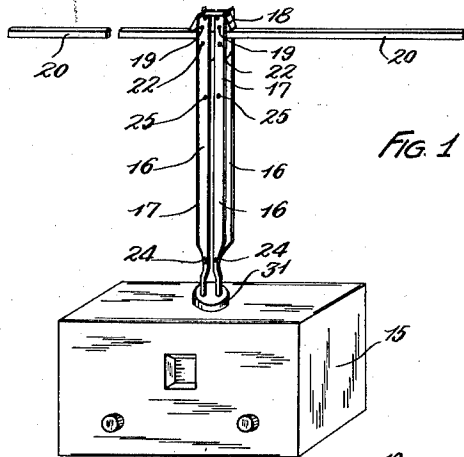


FIG. 1

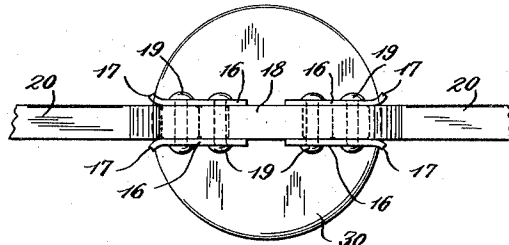


FIG. 3

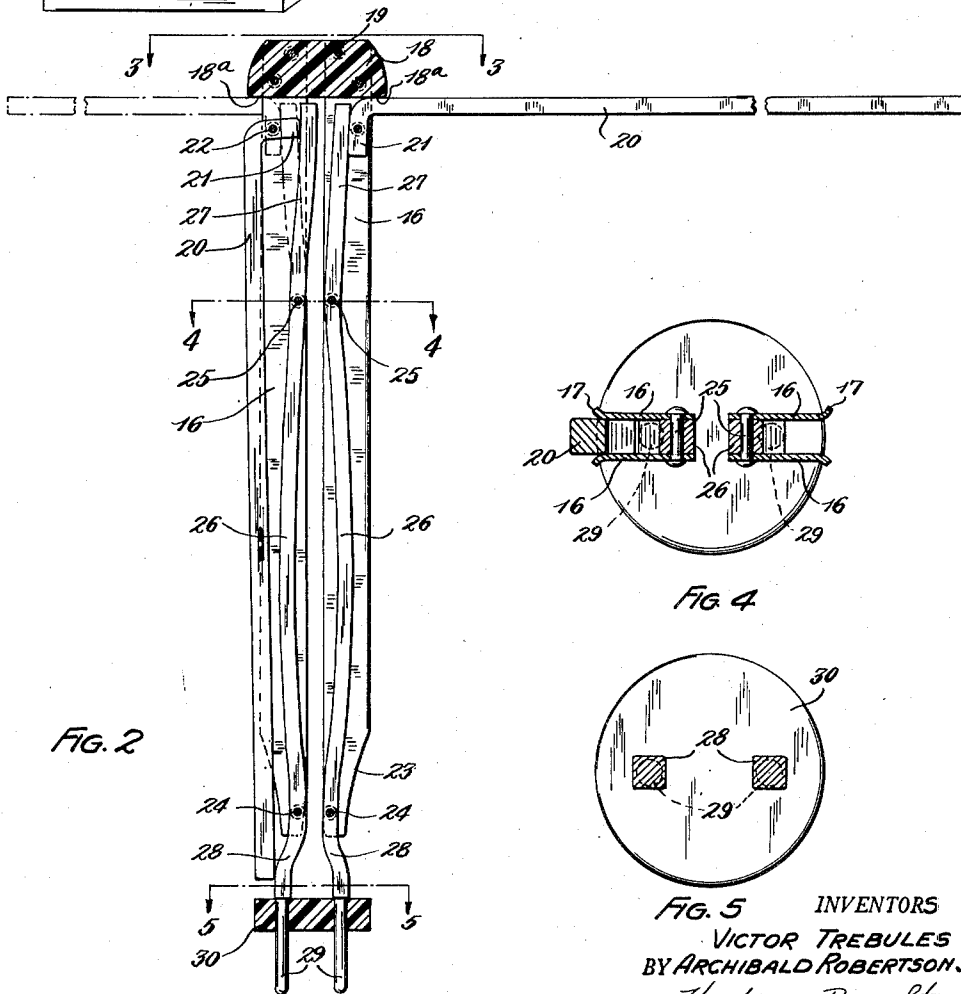


FIG. 2

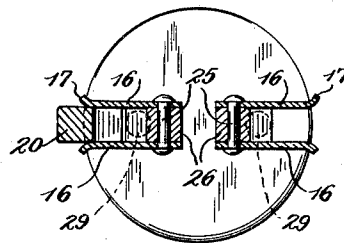


FIG. 4

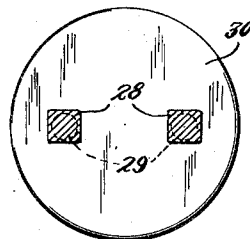


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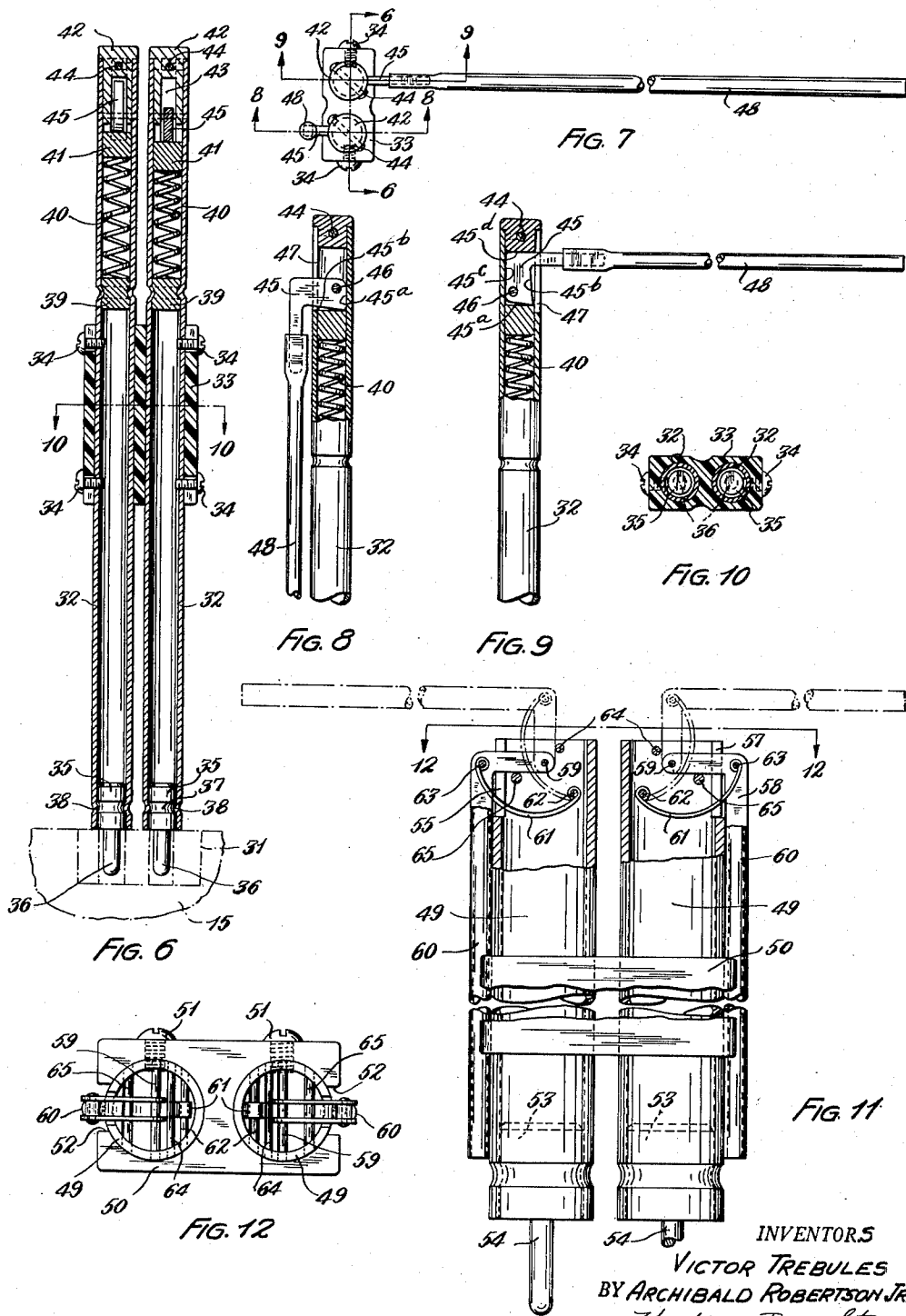
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UNITED STATES PATENT OFFICE

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This invention relates to an antenna and particularly to an antenna of the dipole type especially adapted to be used with a small portable radio transmitter and/or receiver used for transmission and/or reception of horizontally polarized radio waves.

An object of the invention is to provide an antenna for a small portable radio transmitter and/or receiver and which antenna can be quickly attached in operative relationship to the transmitter and/or receiver and includes movable antenna arms which can be moved to an extended operative position when the antenna is attached or can be moved to a compact, non-extended, non-operative position when desired and in such latter position are located closely together so that the antenna is of relatively small size and configuration and can be easily and conveniently packed in a container or moved from place to place.

A further object is to provide an antenna as referred to in the last named object and which is so constructed that the arms of the antenna when moved thereto will be maintained in their extended operative position or in their non-extended, non-operative position.

A further object is to provide an antenna as referred to in the previous objects and wherein the antenna arms are pivoted and spring means is provided to maintain said arms in either their extended operative position or in their non-extended non-operative position as the case may be.

A still further object is to provide an antenna as specified in the previous objects and which is so constructed that the supporting elements for the antenna arms are compact, while said antenna arms when in non-extended non-operative position extend parallel and closely adjacent to said supporting elements, wherefore the whole antenna structure is compact and can be readily and easily transported from place to place and when required can be quickly connected to the transmitter and/or receiver and its arms extended to operative position.

Another object of the invention in one of its aspects is to provide an antenna such as has been previously referred to and wherein the spring means for holding the antenna arms extended or non-extended also functions as the transmission or lead-in line from the antenna arms.

Another object of the invention in another of its aspects is to provide an antenna of the type referred to and wherein the supporting elements for the movable antenna arms function as the

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transmission or lead-in line from the antenna arms to the transmitter and/or receiver.

A further and general object is to provide an antenna of the character referred to which is simple in construction, may be economically and readily manufactured and is particularly adapted for its intended use with a portable radio transmitter and/or receiver.

Further and additional objects and advantages not hereinbefore referred to will become apparent hereinafter during the detailed description of several embodiments of the invention which is to follow.

Referring to the accompanying drawings,

Fig. 1 is a perspective view showing one form of antenna embodying the invention, with the antenna applied in operative position to a small portable radio transmitter and/or receiver and with the antenna arms extended.

Fig. 2 is a view on a larger scale than Fig. 1 and shows the antenna in longitudinal section with certain parts in elevation and with the antenna separate from the radio transmitter and/or receiver, one of the antenna arms being shown extended in full lines and the other extended in dot and dash lines and non-extended in full lines.

Fig. 3 is a fragmentary plan view taken substantially from line 3—3 of Fig. 2 looking in the direction of the arrows.

Figs. 4 and 5 are sectional views taken, respectively, on lines 4—4 and 5—5 of Fig. 2 looking in the direction of the arrows.

Fig. 6 is a longitudinal sectional view through an antenna embodying the invention but differing in form from the antenna of Figs. 1 to 5 inclusive; the antenna of Fig. 6 being shown mounted in operative position on a radio transmitter and/or receiver that is indicated by dot and dash lines.

Fig. 7 is a top plan view of the antenna shown in Fig. 6 with one of the antenna arms shown in extended position and the other in non-extended position.

Figs. 8 and 9 are partial longitudinal sectional views taken, respectively, on lines 8—8 and 9—9 of Fig. 7 looking in the direction of the arrows.

Fig. 10 is a transverse sectional view taken on line 10—10 of Fig. 6 looking in the direction of the arrows, and

Fig. 11 is a view of a still different form of antenna embodying the invention and is a partial longitudinal sectional view and partial elevational view, with the antenna arms shown in non-ex-

tended position by full lines and in extended position by dot and dash lines, and

Fig. 12 is a plan view of the antenna shown in Fig. 11 and is taken from line 12—12 of Fig. 11 looking in the direction of the arrows.

Referring first to the antenna shown in Figs. 1 to 5 inclusive, a portable radio transmitter and/or receiver of the type referred to with which the antenna may be used is indicated at 15. This transmitter and/or receiver may be of any known small portable type provided it has a fitting or socket to receive the plug pins of the antenna. The antenna comprises spaced pairs of parallel strips 16 formed of metal and with the strips of each pair spaced apart in a transverse direction to accommodate therebetween elongated spring members later to be referred to.

The strips 16 have their outer longitudinal edges outwardly flared as indicated at 17. The outer or upper ends (as viewed in the drawings) of the strips 16 are interconnected by block 18 formed of insulating material which may be a suitable plastic material. The block 18 extends between the strips 16 of each pair of strips and is secured in position by any suitable means such as the rivets 19. The opposite ends of the block extend outwardly of the longitudinal edges of the strips 16 and are shown as curved while the under side of the block adjacent its opposite ends constitutes straight co-planular stop surfaces 18a, the purpose of which will soon become apparent.

A pair of similar antenna arms 20 of suitable length and shown, in this instance, as rectangular in cross-section are provided at their inner ends with short angular portions 21 bent from the arms to extend substantially perpendicular to the longitudinal axes of the arms. The short angular portions 21 of the arms are located between the strips 16 of each pair of strips and are pivotally connected to the strips by means of rivets 22 or other suitable means that extend through the strips 16 and the angular portions 21 and on which said portions and the arms 20 pivotally swing. The antenna arms can be swung about the pivots 22 to an extended operative position as indicated in one instance by full lines and in another instance by dot and dash lines in Fig. 2 and wherein the upper sides of the arms are in engagement with the co-planular stop surfaces 18a of the block 18 and thus the arms are located in their maximum extended position wherein they are longitudinally aligned and extend horizontally and substantially perpendicularly with respect to the strips 16.

The antenna arms 20 can be swung on their pivots from the extended position referred to into a non-extended position wherein they are substantially parallel to the strips 16 and are located between the strips 16 of each pair of strips with those portions of the arms adjacent their free ends being substantially housed between the strips and extending beyond or below the lower ends of the strips as viewed in the drawings.

The strips 16 adjacent their lower ends are cut away on a curvature as indicated at 23 to facilitate the grasping of the free ends of the antenna arms 20 when it is desired to swing the arms from their non-extended toward their extended position.

The elongated spring elements previously referred to will now be described. These elements are shown as located between the strips 16 of each pair of strips and as extending beyond the lower ends of the strips as viewed in Fig. 2. Each

spring element is secured in position between the strips 16 of each pair of strips and adjacent the lower ends of the strips by means of rivets 24. The spring elements also are rigidly connected with the strips of each pair of strips and between the same by rivets 25 substantially spaced from the rivets 24 and with the portions of the spring elements between the rivets 24 and 25 bowed as indicated at 26. The spring elements beyond the rivets 25 have spring end portions 27, the free ends of which portions 27 cooperate with the short angular portions 21 of the antenna arms 20.

Referring to Fig. 2 and to the antenna arm 20 shown in its non-extended position by full lines, it will be noted that the portion 27 of the spring element bears against the free end of the angular portion 21 of the antenna arm and exerts a spring load or force thereon in a direction such as to rock the arm on the pivot 22 toward and to maintain it in its non-extended position until moved therefrom by a force sufficient to overcome the action of the spring portion 27.

Now by reference to the spring portion 27 that is shown in engagement with the angular portion 21 of the extended antenna arm 20 of Fig. 2, it will be noted that the spring portion 27 contacts a side of the portion 21 and exerts a force or spring load thereon acting to rock the arm on its pivot 22 toward and to maintain it in its extended position and against the stop surface 18a of the block 18. In fact, in moving the antenna arm from its non-extended position to its extended position the portion 21 of the arm will move in contact with and flex the spring portion 27 until the free end of the angular portion 21 passes out of contact therewith and the side of the portion 21 contacts the spring. As the antenna arm moves from non-extended position toward extended position it reaches a point where the spring portion 27 so acts on the portion 21 of the antenna arm as to continue under the force of the spring portion the upward swinging or extended movement of the antenna arm until it abuts the surface 18a of the block 18.

The pivots 22 for the antenna arms are so located and the spring portions 27 are so arranged and positioned with respect to the portions 21 of the antenna arms 20 that the spring portions 27 act on the portions 21 in an off-center manner such that the arms are maintained extended or non-extended by spring tension.

The spring elements are shown as substantially rectangular in cross-section for the major portion of their length. The spring elements below the rivets 24 and where they extend beyond the lower ends of the strips 16 have outwardly bowed portions 28 which terminate in straight rounded pin portions 29. The pin portions 29 extend through and are secured in an insulating block or disk 30 formed of suitable material as for instance plastic. The pin portions 29 of the spring elements below the disk or block 30 act as a connecting plug for the antenna and can be inserted into the receiving openings of a suitable socket or fitting 31 of the radio transmitting and/or receiving set, wherefore the spring elements will be connected to the circuit of the set and said elements act as the transmission or lead-in line from the antenna arms which are in electrical contact with the spring elements due to the spring pressure contact of the portions 27 of the elements against the angular portions 21 of the antenna arms.

It will be seen that when the antenna arms are extended as indicated in Fig. 1 and the antenna is connected to the radio set by the insertion of the pin portions 29 into the socket or fitting 31, then the radio arms constitute straight dipoles insulated from each other and connected to the set circuit by the spring elements.

It will be noted that the antenna can be quickly connected to the set by inserting the pin portions 29 into the socket or fitting 31, after which the antenna arms can be easily swung from their non-extended position to their extended position and held in such position under spring tension.

It will also be observed that the antenna arms may be swung easily and quickly from extended position into non-extended position wherein they are maintained under spring tension until again manually moved from such position.

When the antenna arms are in non-extended position they are substantially housed between the pairs of strips 16 and the antenna presents a compact structure which may be readily removed or disconnected from the set by disengaging the pin portions 29 from the socket or fitting 31. When the antenna is thus disconnected it may be readily handled and transported due to its compact size.

The form of antenna construction embodying the invention and shown in Figs. 6 to 10 inclusive will now be described. In this form of construction the antenna comprises two parallel metal spaced tubes or supporting elements 32. These tubes are held in proper spaced relation and electrically insulated from each other by means of an insulator block 33 formed of any suitable material as for instance, plastic material. The block 33 is provided with parallel bores or openings through which extend the tubes 32. The block 33 is located substantially midway of the ends of the tubes 32 and the tubes are secured in position in the block bores or openings by suitable means, such as the set screws 34.

The lower ends of the tubes 32, as viewed in Fig. 6, have mounted therein end plugs 35 which are provided with pins 36 for insertion into the socket or fitting 31 of the set 15. The end plugs 35 are provided with annular grooves 37 and are secured in position in the ends of the tubes 32 by rolling portions 38 of the tubes into the grooves 37.

The tubes 32 beyond the insulator block 33 mount spring abutment plugs 39 which are shown as secured in position in the tubes by rolling the latter into grooves formed in the circumferences of the plugs 39 although it will be understood that the plugs might be secured in position in the tubes in other ways.

Coil springs 40 are mounted in the tubes 32 and abut the plugs 39 and blocks 41 which slide in the tubes in electrical contact therewith and are formed of suitable electrically conductive material. The outer ends of the tubes as viewed in Fig. 6 are provided with caps 42 that close the ends of the tubes 32 and extend into said tubes and are provided on their inner ends with a longitudinally extending slot 43 that in effect produces forked portions on the inner ends of the caps. The caps 42 are secured in position in the tubes 32 by suitable means such as the rivets or pins 44. The caps 42 preferably are formed of suitable electrically conductive material, such as brass or the like, and are therefore electrically connected to the tubes 32.

Angle shaped cam members 45 are located in the slots 43 of the caps 42 and are pivotally con-

nected to the forked portions on the inner ends of the caps by means of pivot pins 46 that extend through the tines of said forked portions and through the cam members 45.

The cam members 45 project outwardly of the tubes 32 through slots 47 formed in said tubes and aligned with the slots 43 in the caps 42. The free ends of the L-shaped cam members are of reduced cross-sectional area and extend into the ends of tubular antenna arms 48 and are permanently secured in the ends of such antenna arms by suitable means such as by solder.

The cam members 45 have curved end surfaces 45a which when the antenna arms are in extended position have their high points in engagement with the slidable block 41 as clearly indicated in Fig. 9. When the antenna arms 48 are in non-extended position, the said curved surfaces 45a contact the interiors of the tubes 32 as indicated in Fig. 8. The cam members 45 also are provided with inclined surfaces 45b which join the surfaces 45a to form the high point of the cam members. When the antenna arms are extended the sliding blocks 41 engage the cam members 45 at the junctions of the surfaces 45a and 45b, i. e., the high points of the cams and the action of the springs 40 on the blocks 41 maintains the antenna arms in extended position with the straight surfaces 45c and 45d of the cam members 45 in engagement, respectively, with the interiors of the tubes 32 and with the caps 42 at the base of the slots 43. At this time the antenna arms are in horizontal position and are maintained in such position by the action of the springs 40.

When the antenna arms are swung from the position shown in Fig. 9 toward the position shown in Fig. 8 the curved surfaces 45a of the cam members 45 depress the sliding plugs 41 against the action of the springs 40 until the junctions between the surfaces 45a and 45b are reached, and thereafter the continued downward swinging movement of the antenna arms causes the surfaces 45a to move out of contact with the sliding plugs 41 and the surfaces 45b to come into contact therewith, with the result that the spring pressed sliding plugs acting on the high points of the surfaces 45b complete the downward swinging movement of the antenna arms and maintain the same in the position shown in Fig. 8.

In the antenna construction illustrated in Figs. 6 to 10 inclusive it will be seen that the antenna arms 48 are maintained under spring tension in either their extended or non-extended position, due to the action of the sliding spring pressed plugs 41 on the pivoted cam members 45 which are connected to the antenna arms and in effect form parts thereof. Inasmuch as the antenna arms and cam members 45 are electrically connected to the tubes 32 and the latter are electrically connected to the plugs 35 the said tubes act as the lead-in line for the antenna. It will be seen that this form of construction similar to the previously described form has the attributes of compactness, simplicity, ease of connection to the radio set and facility in moving the antenna arms of the same from non-extended position to extended position and vice versa.

The form of antenna construction embodying the invention and shown in Figs. 11 and 12 will now be described. This construction comprises spaced parallel metal tubes 49 which extend through parallel openings formed in a spacer and insulating block 50 of suitable material as for

instance plastic. The block 50 is secured in position on the tubes 49 by setscrews 51 or by other suitable means carried by the block. The block 50 on its opposite ends is provided with aligned openings 52 which communicate with the openings through which the tubes 49 extend.

The lower ends of the tubes 49 as viewed in Fig. 11 have secured therein end plugs 53 which mount connecting pins 54 that can be inserted into the socket or fitting 31 of the radio set 15. The plugs 53 are secured in the tubes 49 by rolling the tubes into annular grooves formed in the plugs intermediate the ends of the latter.

The tubes are open at their opposite or outer ends and are provided with longitudinally extending slots 55 and through which slots may project one of the arms of L-shaped members 58. The inner ends of these arms of the L-shaped members are pivoted to the tubes 49 on pivot pins 59 mounted in the tubes just below their open outer ends and extending through the arms of the L-shaped members. The other arms of the L-shaped members 58 are secured to the inner ends of tubular antenna arms 60 and similar to the tubular antenna arms 48 previously described.

Mounted in the open or outer ends of the tubes 49 are half round or bowed springs 61 which project through the slots 55 of the tubes when the antenna arms 60 are in non-extended position and have one end connected to pins 62 carried by the tubes 49 and the other end to pins 63 located at the junction of the two arms of the members 58. Because of the distance between the pins 62 and 63 being greater than the distance represented by a line passing from the pins 62 through the pivot pins 59 and a point on the arc through which the pins 63 travel during the movements of the arms, it will be apparent that the springs 61 always have a tendency to maintain the antenna arms under spring tension in either arm extended position as indicated by dot and dash lines in Fig. 11 or in non-extended position as indicated by full lines in said figure.

The movement of the antenna arms to extended position is limited by stop pins 64 carried by the tubes 49 and to non-extended position by stop pins 65 also carried by the tubes. The pins 64 are so located that the antenna arms will be maintained under spring load in horizontally extended position while the pins 65 are so located that the antenna arms when non-extended will be positioned under spring load in the slots 52 formed in the opposite ends of the insulating and spacing block 50.

From the foregoing description it will be seen that the form embodying the invention and shown in Figs. 11 and 12 possesses the advantages stated before with respect to the previously described forms in that the antenna arms are held in extended or non-extended position under spring tension, may be readily and easily swung from either position to the other, can be quickly and easily connected to the radio set, at which time the tubes 49 act as the transmission or lead-in line, and finally it is compact and simple in construction.

Although several embodiments of the invention have been illustrated and described herein it will be understood that the invention is susceptible of various modifications and adaptations within the scope of the appended claims.

Having thus described our invention, we claim:

1. An antenna of the character described comprising rigid supporting elements, means mechanically interconnecting said elements in

spaced fixed parallel relationship but electrically insulating them from each other, antenna arms including angular portions, means pivotally connecting said angular portions to said elements whereby said arms may be swung to an extended position wherein they are substantially horizontal and perpendicular to said elements or to a non-extended position wherein they are located closely adjacent and substantially parallel to said elements, spring means carried by said elements and operatively associated with said angular portions of said arms and acting to maintain the arms in either extended or non-extended position under spring load, and means operatively associated with said elements and electrically connected to said arms for connecting the antenna to a radio set.

2. An antenna as defined in claim 1 and wherein there is a pair of said supporting elements each of which has an antenna arm pivotally connected thereto adjacent the outer end of the elements while means is operatively associated with each element for separately and electrically connecting the arm carried by each element to the radio set.

3. An antenna as defined in claim 1 and wherein each of said supporting elements is provided with stop means engageable by a respective antenna arm when in extended substantially horizontal position, said spring means acting to maintain said arm in engagement with said stop means.

4. An antenna as defined in claim 3 and wherein said supporting elements each includes a pair of spaced parallel strips, while said antenna arms have end portions extending between the strips of said elements adjacent the outer ends thereof, and means pivotally connect said end portions of said antenna arms to said elements wherefore said arms can swing to an extended position substantially horizontal and perpendicular to said elements or to a non-extended position wherein they are closely adjacent to said elements and in part are located between the strips of the respective elements, said spring means carried by said elements acting on said end portions of said arms to maintain the arms under spring load in either extended or non-extended position.

5. An antenna as defined in claim 4 and wherein in said end portions of said arms are angularly disposed with respect to the arms and are pivotally connected to said pairs of strips forming the supporting elements intermediate the ends of said portions while said spring means act on a side of said end portions to maintain the arms in extended position and on the free ends of said end portions to maintain the arms in the non-extended position.

6. An antenna as defined in claim 4 and wherein the means which mechanically interconnects said elements and said strips includes an insulating block extending between the strips of each element and secured thereto and having its inner surface located to act as a planular stop surface engageable by said arms when in extended position.

7. An antenna as defined in claim 4 and wherein said spring means includes elongated bars one of which is located between said pairs of strips of each of said elements and is secured thereto intermediate the ends, the outer and free ends of its bars constituting spring arms acting on said end portions of said antenna arms, said bars at their other ends extending beyond said strips and being provided with pin portions

adapted to be inserted in a suitable socket of a radio set to electrically connect the antenna to said set, and an insulating member mounted on said pin portions and maintaining the same in spaced parallel rigid relationship.

8. An antenna of the character described comprising a pair of tubes of electrically conductive material and provided at one end with means for connecting the tubes to a radio set and at the other end with longitudinally extending slots, a member mounted on said tubes and formed of insulating material and maintaining said tubes in spaced parallel relationship, antenna arms having angular portions movable in said tube slots, means pivotally connecting said angular portions to said tubes so that said arms can swing to an extended position wherein they are substantially horizontal and perpendicular to said tubes or to a non-extended position wherein they are located closely adjacent to said tubes, and spring means carried by said tubes and operatively associated with said angular portions of said arms and acting to maintain said arms in either extended or non-extended position under spring tension.

9. An antenna as defined in claim 8 and wherein said tubes are provided with stop means engageable by said arms when in extended position.

10. An antenna as defined in claim 8 and wherein said spring means include blocks slidable in said tubes and formed of electrically conductive material and engageable with said angular portions of said antenna arms, and springs in said tubes and acting on said slidable blocks to maintain the latter always in engagement with said angular portions under spring load.

11. An antenna as defined in claim 8 and wherein said tubes have electrically conductive blocks slidable therein and engageable with said angular portions of said antenna arms, plugs fixedly mounted in said tubes in spaced relation to said slidable blocks, and coil springs in said tubes intermediate said plugs and said blocks and acting to maintain the latter in engagement under spring tension with said angular portions.

12. An antenna as defined in claim 8 and wherein said angular portions of said antenna arms are provided with camming surfaces, while said tubes mount blocks slidable therein, and springs maintaining said blocks at all times in contact with said camming surfaces under spring load.

13. An antenna as defined in claim 8 and wherein said tubes at their slotted ends have secured therein cap members extending into the tubes and provided with forked portions with the space between the tines of the fork aligned with said slots, and wherein said angular portions of said antenna arms are pivoted to said forked portions between the tines thereof while

said tubes slidably mount blocks, and springs acting on said blocks to maintain the latter always in contact under spring tension with said angular portions, said end caps cooperating with said angular portions to locate said arms in extended substantially horizontal position.

14. An antenna as defined in claim 8 and wherein said tubes at their slotted ends are open while said angular portions of said antenna arms extend through the slots in said tubes when said arms are in non-extended position and through the open ends of said tubes when said arms are in extended position.

15. An antenna as defined in claim 14 and wherein said tubes mount bowed springs one end of which is fixed to said tubes and the other end of which is fixed to said arms at the junction of the angular portions, while said means which pivotally connects the arms to the tubes is located adjacent the free ends of said angular portions.

16. An antenna of the character described comprising a pair of rigid supporting elements, means mechanically interconnecting said elements in spaced fixed parallel relationship but electrically insulating them from each other, antenna arms including angular portions, means pivotally connecting said angular portions to said elements adjacent one end of the latter whereby said arms may be swung to an extended position wherein they are substantially horizontal and perpendicular to said elements or to a non-extended position wherein they are located closely adjacent and substantially parallel to said elements, spring means carried by said elements and operatively associated with said angular portions of said arms and acting to maintain the arms in either extended or non-extended position under spring load, and means operatively associated with said elements and electrically connected to said arms for connecting the antenna to a radio set and including a pair of pins with each pin fixedly secured to a respective element at the end thereof opposite to said first mentioned end of the element, said pins being adapted to be removably inserted in the sockets of a fitting carried by a radio set.

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