

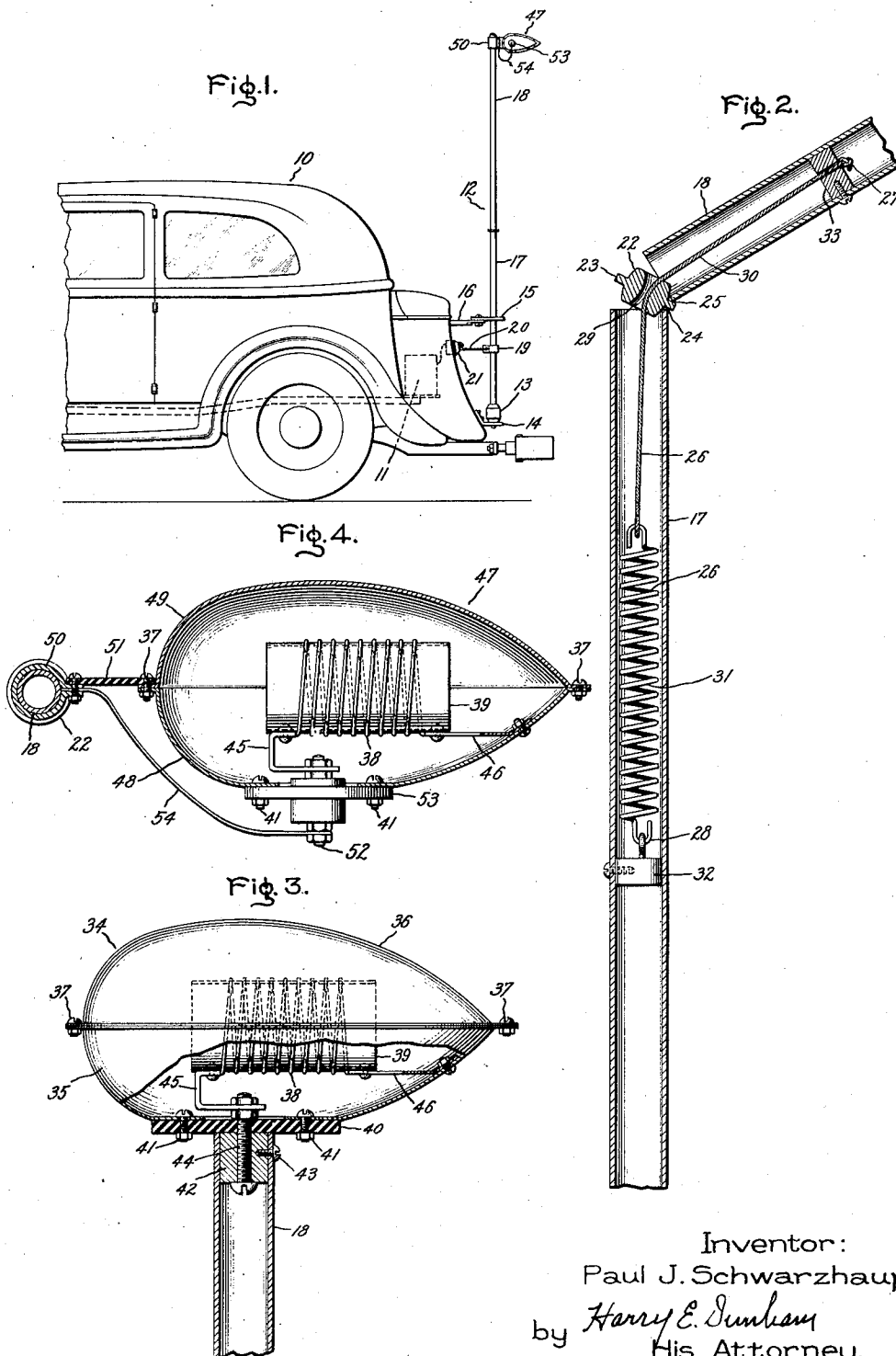
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COLLAPSIBLE ANTENNA FOR VEHICLES

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COLLAPSIBLE ANTENNA FOR VEHICLES

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8 Claims. (Cl. 250—33)

My invention relates to antenna systems for radio-equipped vehicles, particularly to antennas of the mast type for use with radio apparatus installed on motor cars, and its object is to provide an antenna of this character which is not liable to damage or impaired efficiency while the vehicle is moving at any speed.

It is common practice in radio equipped motor cars such as police prowl cars to mount a transmitting antenna at the rear of the car. Such an antenna may comprise a tubular structure or mast several feet in height, eight feet for example. A considerable portion of an antenna mast of this character therefore projects upwardly two or three feet above the roof level of the car, and the mast is endangered, during travel of the vehicle, by overhanging limbs of trees, low doorways, or other obstacles. It is desirable therefore that a flexible mounting of the mast be provided so disposed that in case a bending force due to the striking of the mast against an obstacle is exerted thereon, the mast or a portion thereof may bend and pass under the obstacle, thereafter returning immediately to normal operating position.

In accordance with my invention the projecting upper end or upper portion of the mast is flexibly mounted on a lower portion, a flexible joint being provided between the two portions, together with a spring means associated with the cooperating upper and lower mast portions to return the upper portion to normal position after being bent and to hold the upper portion thereafter rigidly in position on the lower portion. Preferably a ball member is provided which is held in position between the two portions of the mast by the spring means, which may be mounted within the mast, the ball member and the ends of the mast portions thereby forming a ball-and-socket joint.

It is further desirable in the above-described antenna systems which are designed particularly for short-wave police radio transmission, that a capacitance member or area be provided at the top of the antenna and an inductance member or coil be connected between the capacity member and the antenna proper. Important advantages may be obtained by such an arrangement of inductance coil and capacitance area, the coil and capacity being proportioned to produce desired current distribution in the radiating portion of the antenna. The arrangement of inductance coil and capacitance area per se is described and claimed in a co-pending application, Serial No. 727,409, entitled Antennae, filed on May 25, 1934

by Clifford A. Nickle, and assigned to the same assignee as my present application.

In the latter patent application the capacitance area is shown as constituted by a spherical body or by a hollow cylinder. I have found, however, that with capacitance members of such form used on the antenna of a radio equipped vehicle, the wind pressure when the vehicle is moving tends to tip the antenna and thereby to decrease its effective height. In accordance with my present invention this difficulty is overcome by making the capacitance member of streamlined form. The member is preferably hollow to enclose the inductance coil which is electrically connected between the capacitance member and the antenna mast. In its preferred form the streamlined capacitance member is so mounted on the mast as to extend rearwardly therefrom, thereby eliminating the possibility of damage or the ripping off of the member due to catching in the limbs of trees or by contact with other obstacles.

My invention will be better understood from the following description when considered in connection with the accompanying drawing and its scope will be pointed out in the appended claims.

Referring to the drawing, Fig. 1 is a fragmentary side-elevational view of a radio-equipped motor vehicle provided with a transmitter antenna in which my invention has been embodied; Fig. 2 is a fragmentary enlarged view in section of the flexible joint portion of the transmitter mast shown in Fig. 1; Fig. 3 is a side elevational view, partially in section, of a streamlined capacitance member for a radio mast, in accordance with my invention; and Fig. 4 is a top plan sectional view of a streamlined capacitance member having a modified form of mounting on the radio mast.

In Fig. 1, the numeral 10 indicates a vehicle which may be a police prowl car, equipped with radio apparatus comprising transmitter equipment 11 within the vehicle and a transmitter mast or rod antenna 12 of aluminum or other suitable tubing supported by a lower or step insulator 13 which is fastened on a bracket 14, and by an upper insulator 15 fastened on a bracket 16. The mast 12 comprises, in the present embodiment of the invention, a lower or fixed portion 17 and an upper portion 18 which is bendable with respect to lower portion 17 in a manner to be described hereinafter. Suitable connection of the mast 12 with the transmitter equipment 11 is established by a clamp 19, a lead 20 and a lead-in bushing 21. The clamp 19

may be moved up or down to obtain proper tuning of the antenna system and thereafter secured in place on the mast. The upper and bendable portion 18 of the mast is preferably formed of tubing of the same diameter as that of the lower portion 17.

Referring more particularly to Fig. 2, in order that the upper portion 18 may be bent with relation to the lower portion to any desired degree and thereafter returned to and held rigidly in normal position as shown in Fig. 1, a flexible joint means is interposed between the upper and lower mast portions. This joint means, in the present embodiment of my invention, comprises a member 22, preferably of general ball shape, which may have a flange or rim portion 23 and which is adapted to be held rockably between end members, or the ends 24 and 25 themselves, of the upper and lower mast portions 17 and 18 respectively, the rim 23 being gripped between the edges of the tube ends 24, 25. A spring means 26 is provided, which is anchored at its extremities 27 and 28 to the upper and lower mast portions 17 and 18 respectively, to maintain a spring pressure tending to hold the ends 24 and 25 against opposite sides of the interposed ball member 22. Preferably the member 22 is provided with a central aperture 29 flaring outwardly to the upper and lower surfaces of the member, through which aperture passes a portion 30 of the spring means 26. The spring means 26 is preferably constituted by a coil spring 31 housed within one of the mast portions, as in lower portion 17, and the portion 30 which may be a cable passing into the other portion of the mast.

In assembling the above-described joint means for mast 12, the lower end of the spring 31 is anchored in a plug 32 which may be secured at the proper point in mast portion 17 by any suitable means. The upper end of spring 31 is hooked to the cable 30 which passes through the opening 29 of ball member 22 and into the upper mast portion or tube 18. The cable 30 is pulled with suitable power tools thus stretching the spring 31. As soon as the tension of the spring is sufficient, the cable 30 is anchored in tube 18, as by locking, in proper position within the tube, a plug 33 to which the cable is connected.

In operation of the flexible joint means shown in Figs. 1 and 2, the tension of spring 31 holds the mast portions 17 and 18 in line in normal operation of the radio-equipped vehicle 10. If, however, the upper portion 18 encounters an obstacle, the bending force exerted on member 18 causes the latter to swing about the resilient ball-and-socket joint constituted by the ball member 22 and the ends 24, 25 of the fixed and movable mast portions 17, 18, the rounded ends of the aperture 29 in member 22 protecting the cable from damage due to short bends which might otherwise injure the cable strands. As soon as the bent over portion 18 is released from the obstacle as by passing thereunder, the pull of the spring 31 causes the upper mast portion 18 to snap back into normal position, in line with fixed lower mast portion 17.

In Fig. 3 the numeral 34 indicates a capacitance member in the form of a hollow casing having two halves 35 and 36 held together at their flanged edges as by screws 37 and enclosing an inductance coil 38 mounted on a coil form 39. It is thus possible to remove the upper half 36 of the casing and gain access to the inside of the casing. Between the lower part 35 of the casing and the upper end of mast portion 18 is

interposed an insulating member or plate 40 connected to the casing part 35 as by screws 41. To fasten plate 40 to the mast portion 18 a plug 42 is driven into the end of mast portion 18 and held in place by a set screw 43, and the plate 40 is drawn against the plug 42 and the end of mast portion 18 as by a screw 44. The screw 44 extends considerably above the insulating plate 40 and supports a bracket 45 to which one end of coil 38 and of coil form 39 respectively are fastened. Coil form 39 is fastened at its other end to the casing part 35 by a bracket 46 to which the other end of coil 38 is connected.

With the mounting means for capacitance member 34 on the upper end of mast portion arranged as above described, the capacitance member 34 is not electrically connected directly to the antenna mast. On the contrary an inductance member, coil 38, is electrically connected between the extremity of the antenna mast and the capacitance member. By properly proportioning the area of the capacitance member 34 and the inductance of the coil 38 the desired current distribution in the antenna system for optimum transmission is obtained. For further description of the operation of the antenna system comprising such a capacitance area and inductance as shown herein, reference is made to the hereinbefore mentioned application, Serial No. 727,409.

It will be observed that in practice a capacitance member mounted on the top of a transmitting antenna such as herein described must provide considerable area. Further, it is desirable, in order to protect the coil and to provide an assembly as compact as possible, to mount the inductance coil within the capacitance member. The capacitance member is, therefore, necessarily of considerable size. But since this member is mounted at the top of the antenna mast, the bending force due to the presence of this relatively large area of the capacitance member, which is acted on by wind pressure when the vehicle is in motion, tends to overcome the restoring force of spring 31, and to rock the upper mast portion 18 out of line with the fixed mast portion 17, thereby decreasing the effective height of the antenna. In order to overcome the tendency to bending of the mast by wind pressure acting on the capacitance member and at the same time to permit the use of a capacitance member of relatively large area at the top of the mast, I have provided that the casing 34 constituting the capacitance area be of streamline form, the casing being formed, for the purpose of providing an approximately true streamline shape, in substantially ellipsoidal form but having a pointed end rearwardly of the mast, as shown in Fig. 3.

In Fig. 4 I have shown an alternative means for mounting the capacitance member on the radio mast 12. As in the arrangement shown in Fig. 3, the capacitance member, designated by the numeral 47, is in the form of two halves 48, 49 held together at their flanged edges. In Fig. 4, however, the streamlined casing 47 is supported at its leading end on one side of the upper end of the mast by a clamp 50 and an insulation member 51. One end of the coil 38 in Fig. 4 is electrically connected through the coil-form-supporting bracket 46 to one section of the casing as in Fig. 3, but the other end of the coil in Fig. 4 is connected through supporting bracket 45, stud 52 insulated from the casing by insulator 53, and lead 54 to the clamp 50 which is electri-

cally connected to the upper portion 18 of the mast. Therefore in the form of the capacitance area and inductance coil mounting shown in Fig. 4, since the casing 47 is connected behind the mast and projects rearwardly therefrom as shown in Fig. 1, the casing cannot be damaged or ripped from the mast by being caught in the limbs of trees or by contact with other like obstacles when the vehicle is in motion.

My invention has been described herein in particular embodiments for purposes of illustration. It is to be understood, however, that the invention is susceptible of various changes and modifications, and that by the appended claims I intend to cover any such modifications as fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. The combination with a radio equipped vehicle, of an antenna extending in normal operation a substantial distance above said vehicle, said antenna comprising two portions and having a joint between said portions and spring means connected across said joint whereby the upper portion of said antenna is bendable from its normal position upon application of a bending force thereto and returnable to said normal position upon discontinuance of said bending force.

2. The combination with a radio equipped vehicle, of an antenna mast comprising an upper portion and a lower portion, means providing a flexible joint between adjacent ends of said portions, and resilient means connected between said portions, whereby said upper portion is bendable from its normal position upon application of a bending force thereto and whereby said upper portion is returned to and maintained rigidly in normal position upon discontinuance of said bending force.

3. An antenna mast comprising only two sections, each of said sections functioning throughout its length as an antenna, a ball-and-socket joint interposed between adjacent ends of said sections, and spring means connected to said sections whereby said mast is maintained in normal position until changed from said position by application of a bending force to the upper one of said sections.

4. An antenna mast comprising two hollow sections only, each of said sections functioning

throughout its length as an antenna, and means whereby one section is bendable from its normal position with respect to the other section, said means including a perforated ball member having a rim portion, said ball member being interposed between adjacent ends of said sections and forming with said ends a ball-and-socket joint, except for said rim portion said ball member being completely enclosed within said mast in normal position of said sections, and a resilient means within said sections anchored at its opposite extremities to said sections respectively and having a portion passing through said perforated ball member.

5. The combination with a radio-equipped vehicle, of an antenna comprising a jointed antenna mast bendable upon application thereto of a bending force and a capacitor substantially of ellipsoidal shape connected to said mast at the upper end thereof, the entire body of said capacitor extending rearwardly of said mast.

6. The combination with a radio-equipped vehicle, of an antenna apparatus comprising an antenna mast having its upper portion exposed to wind pressure and a capacitance member of substantially ellipsoidal shape connected to said upper portion of said mast, the entire body of said capacitance member extending rearwardly of said mast.

7. The combination with a radio-equipped vehicle, of an antenna apparatus comprising an antenna mast extending upwardly from said vehicle and a hollow capacitance member of substantially ellipsoidal form connected to said mast at a point adjacent the upper end thereof, the entire body of said capacitance member extending rearwardly of said mast.

8. An antenna apparatus for a radio-equipped vehicle comprising, an antenna mast bendable upon application thereto of a bending force, an inductance coil connected at one extremity thereof to the upper end of said mast, and a hollow capacitance member of substantially ellipsoidal form enclosing said coil, said capacitance member being mechanically connected to said upper end of said mast and electrically connected to the other extremity of said coil, the entire body of said capacitance member extending rearwardly of said mast.

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