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EXTENSIBLE ANTENNA

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FIG. 1

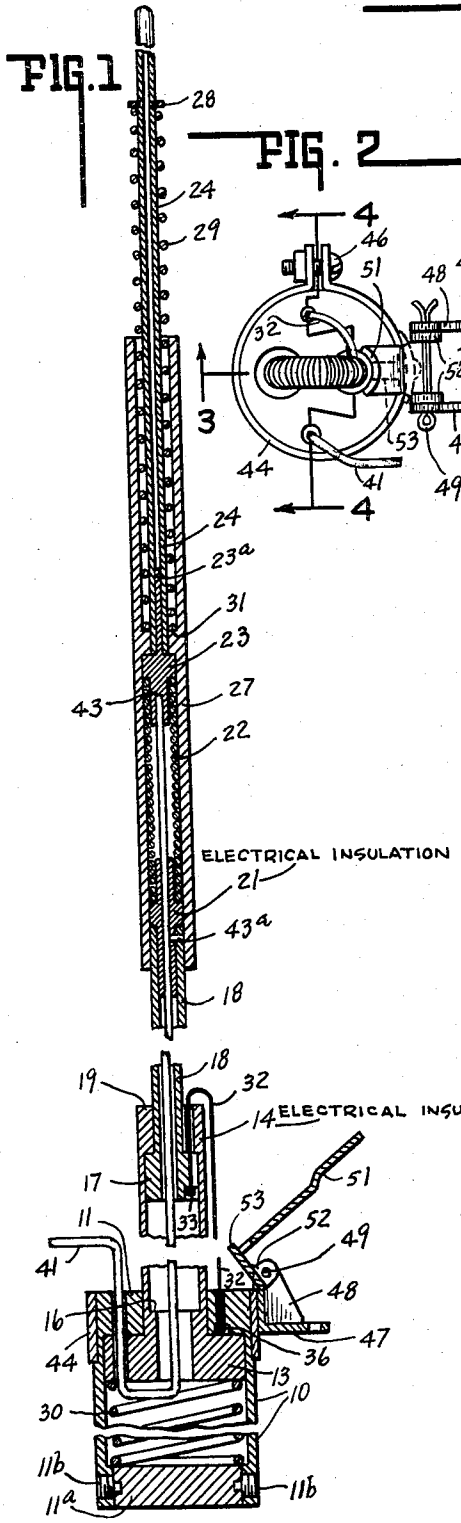

FIG. 2

FIG. 3

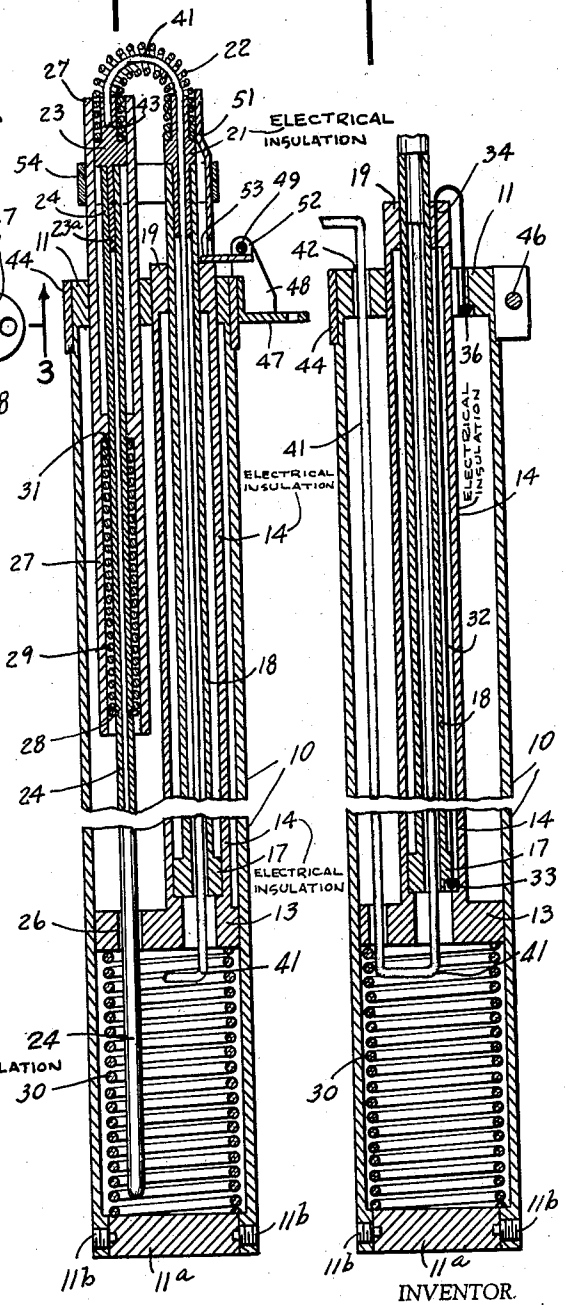

FIG. 4

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EXTENSIBLE ANTENNA

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9 Claims. (Cl. 189—26)

This invention relates generally to extensible antennas for communication equipment, and in particular to telescoping, extensible, dipole antennas which can be triggered or released for movement to extended position.

For use with communication equipment, particularly that of the mobile type, it has become conventional to provide antennas capable of being stored in or folded into a housing having a length which is considerably smaller than the extended length of the antenna. A copending application of Woodrow P. Kirby et al., Serial No. 677,603, filed August 12, 1957, now Patent No. 2,866,198, issued December 23, 1958, entitled "Telescoping Dipole Antenna," and assigned to the assignee of the present invention, discloses and claims an extensible dipole antenna which can be stored in a housing whose length is approximately one-fourth of the extended length of the antenna.

The present invention is a modified version of the antenna disclosed and claimed in the above identified copending application. The antenna assembly embodying the present invention incorporates a means for providing the force necessary to extend or erect the antenna, this force being held in check by a triggering means or releasable latch. The antenna assembly of the present invention thus may be distinguished from the device of the above-identified application in that the means for extending the antenna is incorporated within the antenna assembly. The device herein described finds particular use in providing the necessary antenna for marking buoys, and for such use the triggering means may be held in place by a water soluble member. Thus, upon release of a buoy into water, the water soluble member releases the trigger, causing the antenna to erect or extend itself.

A further object is to provide an extensible antenna assembly which can be released to extended position upon subjection of the antenna assembly to predetermined ambient conditions, such as the presence of water or the existence of a predetermined temperature.

A further object of the present invention is to provide an extensible antenna which is spring biased into extended position, but is held in retracted position by a trigger mechanism which releases the antenna for movement into extended position when the trigger mechanism is immersed in water.

The full nature of the invention will be understood from the accompanying drawings and the following description and claims:

Fig. 1 represents a side sectional view of an antenna embodying the present invention, the antenna being shown in extended position.

Fig. 2 represents a top plan view of the antenna in retracted position.

Fig. 3 is a sectional view taken generally along the line 3—3 of Fig. 2.

Fig. 4 is a sectional view of a portion of the antenna taken generally along the line 4—4 of Fig. 2.

Referring initially to Figs. 2, 3 and 4, there is shown an elongated tubular housing **10** having a closure member

11 at its outer end and a closure member **11***a* at its opposite end held in place by appropriately positioned screws **11***b*. An outer tube **14**, formed of suitable electrical insulating material, is carried by a header member **13** slidably received within the housing. The outer tube **14** extends beyond the housing through an appropriate opening in the closure member **11**. The header member and the outer tube may be formed integrally, the operational requirement being that the tube **14** be formed of electrical insulating material.

Adjacent to its inner end, the tube **14** is provided with an annular internal shoulder **16** (Fig. 1) which serves to seat the enlarged or flanged end **17** of an inner tube **18** nested or telescoped within the outer tube. The tube **18** extends slidably through an appropriately sized opening in the outer end **19** of the tube **14**. A coupling member **21**, having reduced end sections, and formed of suitable electrical insulating material, extends for a portion of its length within the outer end of the tube **18** and is rigidly secured thereto. The other reduced end of the coupling member accommodates and secures the convolutions of the tightly wound erection spring **22** which, as may be seen in Fig. 3, initially is stressed into a U-shape and received onto the reduced end of a second coupling member **23**. The coupling member **23** is similar in configuration to the member **21**, but is formed, however, of electrically conductive material. The opposite reduced end **23***a* of the member **23** is received within the central bore of a rod **24** and rigidly secured therein.

The rod **24** extends through the housing and is slidably received within an opening **26** in the header member **13**. A sleeve **27**, formed of suitable insulating material, surrounds the upper section of the rod **24** and slidably extends through an appropriately sized opening in the housing closure member **11**. A snap washer **28**, extending around a groove in the rod **24**, serves to seat a compression spring **29** which extends between the washer and a shoulder formed by an internal flange **31** on the sleeve **27**. As shown in Fig. 3, with the antenna in retracted position, the sleeve will thus be urged outwardly on the rod, its position being established by engagement with the coils of the erecting spring **22**.

From the foregoing it will be evident that the telescoped tubes **14** and **18** are accommodated within the housing in side-by-side relation to the rod **24**, with the stressed resilient member, formed by the spring **22**, providing an articulated joint between the rod and the tube **18**.

The means for providing the force necessary to extend the antenna from the housing is provided by a compression spring **30** which extends between the lower housing closure member **11***a* and the underside of the header member **13**. As may best be seen in Fig. 4, a flexible draw-cord or cable **32** is suitably anchored at **33** to the inner end of the tube **18** and is brought out through an appropriate opening **34** in the closed end **19** of the tube **14** and is anchored at **36** to the upper housing closure member **11**.

The antenna lead cable **41** enters the housing through an opening **42** in the closure member **11**, extends through an opening in the member **13**, and is accommodated within the central bore of the tube **18**. As may best be seen in Fig. 3, the coupling member **21** has an opening therethrough accommodating the antenna lead cable which further extends through the spring **22** and is electrically connected at **43** by soldering or other suitable means to the coupling member **23**. It will be understood that the lead cable is conventionally formed of insulated coaxial conductors with the inner conductor being connected to coupling member **23** and the outer conductor being connected as at **43***a* (Fig. 1) to the tube **18**. The

tube 18 and the rod 24 thus form the two insulated sections of the dipole antenna structure.

With the telescoping tubes and the rod 24 in retracted position, as shown in Fig. 3, the spring 30 will be compressed and will exert an upward force upon the header member 13. This upward force is held in check by means of a trigger mechanism now to be described. The outer end of the housing carries a collar 44, held in place by means of a bolt 46. The collar supports a sidewardly extending tongue 47 provided with upstanding flanges 48. A cotter pin 49, extending through the flanges 48, serves to pivotally support an upwardly-extending trigger 51 by means of spaced ears 52 carried by the trigger. As may best be seen in Fig. 3, with the tubes in retracted position the shank portion of the trigger extends generally parallel to the adjacent tube 18. When so positioned, an inwardly extending tongue 53 of trigger 51 is disposed in overlying relation to the outer end member 19 of the tube 14. A band or ring 54, encircling the trigger 51 and the adjacent end of the sleeve 27, serves to hold the trigger in upright position, thus positioning the tongue 53 so as to hold the antenna in retracted position against the force exerted by spring 30. The band 54 may be formed of a gelatinous, water soluble material so that the band will rupture when subjected to sufficient moisture to dissolve or partially dissolve it.

In operation, with the antenna sections in retracted position, as shown in Figs. 3 and 4, upon rupture of the releasing band 54, the spring 30 will expand, pushing the trigger mechanism to its released position of Fig. 1 and driving the header member 13 and tube 18 to the outer end of the housing 10, thereby extending or unsheathing the nested tubes from the housing. This movement of the member 13 will continue until it engages the inner face of the housing closure member 11, and during such movement, as the cord 32 slides over the end 19 of the tube 14, the tube 18 will be withdrawn from nested relation with the tube 14 and will concurrently withdraw the rod 24 from the opening 26 in the header 13 and outwardly of closure member 11.

As the rod is freed from the closure member, the spring 22 will snap it into upright position above the tube 18, as shown in Fig. 1. As the rod and tube assume a linear, end-abutting relation, the sleeve 27 will be moved by the spring 29 into a position spanning the gap between the opposed ends of the rod and tube and enclosing the spring 22, its position being established by engagement of the flange 31 with the central enlarged portion of the coupling member 23. As will be evident from Fig. 1, the erection of the spring 22 and the subsquent enclosure thereof by sleeve 27 serves to make rigid or lock the joint between the rod and the tube as the rod is freed from the housing.

The trigger mechanism is described above as being released by rupture of the water soluble band, and it will be evident that this form of trigger release has particular utility where the antenna is incorporated into a marking buoy to be released into water. It will be understood that by forming the band of a temperature sensitive material, the rupture of the band and the subsequent expansion of the antenna could take place upon the occurrence of some predetermined ambient temperature. It may be thus seen that the present invention provides an extensible antenna which incorporates a means for providing the force necessary to extend the antenna and provides a triggering mechanism for holding the extending force in check until the existence of some predetermined ambient condition.

The features and advantages herein referred to may be retained in modified forms of the present invention. The scope of the invention is therefore to be limited only by the appended claims.

The invention claimed is:

1. A telescoping dipole antenna adapted to be actuated to extended position comprising an elongated storage housing accommodating in nested relation an outer first tube and an inner second tube, cooperating stop means carried by the outer end of the first tube and the inner end of the second tube to prevent complete withdrawal of the second tube from said first tube, a header member carried by the inner end of the first tube cooperating with the housing to prevent complete withdrawal of the first tube therefrom, an elongated member accommodated within said housing in side-by-side relation to said tubes, connecting means comprising a stressed resilient member joining the adjacent ends of said second tube and said elongated member adapted to snap the tube and member into end-opposed relation upon freeing of the elongated member from said housing, a locking sleeve carried by said elongated member adjacent said connecting means, a spring extending between said sleeve and said elongated member for urging the sleeve into a position spanning said connecting means when said tube and said member assume end-opposed relation, means for extending the antenna comprising a flexible cable attached to the inner end of said second tube and extending therethrough to be attached to said housing, a compression spring within said housing urging said tubes therefrom, a trigger member carried by said housing and extending into engagement with said first tube for retaining said tubes within said housing, and means for holding said trigger in said retaining engagement including a water soluble member, whereby upon rupture of said member said compression spring initially withdraws the nested tubes from said housing and thereafter withdraws said second tube from said first tube and frees said elongated member from said housing.

2. A telescoping antenna adapted to be actuated to extended position comprising an elongated storage housing accommodating in nested relation an outer first tube and an inner second tube, cooperating stop means carried by the outer end of the first tube and the inner end of the second tube to prevent complete withdrawal of the second tube from said first tube, a header member carried by the inner end of the first tube cooperating with the housing to prevent complete withdrawal of the first tube therefrom, an elongaged member accommodated within said housing in side-by-side relation to said tubes, resilient connecting means joining the adjacent ends of said second tube and said elongated member adapted to snap the tube and member into end-opposed relation upon freeing of the elongated member from said housing, means for extending the antenna comprising a flexible cable attached to the inner end of said second tube and extending therethrough to be attached to said housing, a compression spring within said housing urging said tubes therefrom, a trigger member carried by said housing and extending into engagement with said first tube for retaining said tubes within said housing, and means for holding said trigger in said retaining engagement including an ambient condition responsive member, whereby upon response of said member to the existence of said ambient condition, said compression spring initially withdraws the nested tubes from said housing and thereafter withdraws said second tube from said first tube and frees said elongated member from said housing.

3. A telescoping antenna adapted to be actuated to extended position comprising an elongated storage housing accommodating in nested relation an outer first tube and an inner second tube, cooperating stop means carried by the outer end of the first tube and the inner end of said second tube to prevent complete withdrawal of the second tube from said first tube, a header member carried by the inner end of the first tube cooperating with the housing to prevent complete withdrawal of the first tube therefrom, an elongated member accommodated within said housing in side-by-side relation to said tubes, resilient connecting means joining the adjacent ends of said second tube and said elongated member adapted to snap the tube and member into end-opposed relation

upon freeing of the elongated member from said housing, means for extending the antenna including biasing means within said housing urging said tubes therefrom, a trigger member carried by said housing and extending into engagement with said first tube for retaining said tubes within said housing, and means for holding said trigger in said retaining engagement, whereby upon release of said last-mentioned means said biasing means initially withdraws the nested tubes from said housing and thereafter withdraws said second tube from said first tube and frees said elongated member from said housing.

4. A multi-section dipole antenna extensible from a housing, said antenna including two nested tubes and a rod accommodated side-by-side within the housing, an articulated joint between the adjacent ends of said inner tube and said rod, said joint being biased to position said rod and said inner tube in end-opposed relation upon freeing of the rod from said housing a compression spring within said housing urging said tubes and said rod from said housing, a trigger member carried by the housing and cooperating with said nested tubes to retain said tubes and said rod within the housing against the force exerted by said compression spring, and means including a water soluble member for releasing said trigger to free said tubes and said rod from the housing, whereby said antenna is extended upon water immersion of said member.

5. A multi-section antenna extensible from a housing, said antenna including two nested tubes and a rod accommodated side-by-side within the housing, an articulated joint between the adjacent ends of said inner tube and said rod, said joint being biased to position said rod and said inner tube in end-opposed relation upon freeing of the rod from said housing, biasing means within said housing urging said tubes and said rod from said housing, a trigger member carried by the housing and cooperating with said nested tubes to retain said tubes and said rod within the housing against the force exerted by said biasing means, and means including a water soluble member for releasing said trigger to free said tubes and said rod from the housing, whereby said antenna is extended upon water immersion of said member.

6. A multi-section antenna extensible from a housing, said antenna including two nested tubes and a rod accommodated side-by-side within the housing, an articulated joint between the adjacent ends of said inner tube and said rod, said joint being biased to position said rod and said inner tube in end-opposed relation upon freeing of the rod from said housing, biasing means within said housing urging said tubes and said rod from said housing, a trigger member carried by the housing and cooperating with said nested tubes to retain said tubes and said rod within the housing against the force exerted by said biasing means, and means responsive to a predetermined ambient condition for releasing said trigger to permit extension of said antenna by said biasing means.

7. A multi-section dipole antenna extensible from a housing, said antenna including two nested tubes and a rod accommodated side-by-side within the housing, an articulated joint between the adjacent ends of said inner tube and said rod, said joint being biased to position said rod and the inner tube in end-opposed relation upon freeing of the rod from said housing, and means for extending said tubes and freeing said rod from said housing including a compression spring anchored on said housing and urging said tubes and said rod therefrom, and a retaining member carried by said housing and cooperating with said tubes for preventing their withdrawal from said housing, said retaining member being adapted to be released upon the occurrence of a predetermined condition to thereby permit extension of said antenna by said spring.

8. A multi-section antenna extensible from a housing, said antenna including two nested tubes and a rod accommodated side-by-side within the housing, an articulated joint between the adjacent ends of said inner tube and said rod, said joint being biased to position said rod and the inner tube in end-opposed relation upon freeing of the rod from said housing, and means for extending said tubes and freeing said rod from said housing including a compression spring anchored on said housing and urging said tubes and said rod therefrom, and a member carried by said housing and cooperating with said tubes for releasing said spring.

9. A multi-section antenna extensible from a housing, said antenna including two nested tubes and a rod accommodated side-by-side within the housing, an articulated joint between the adjacent ends of said inner tube and said rod, said joint being biased to position said rod and the inner tube in end-opposed relation upon freeing of the rod from said housing, and means including a compression spring extensible within said housing for urging said tubes and said rod therefrom.

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