(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 201 645**
A2

(12) # EUROPEAN PATENT APPLICATION

(21) Application number: **85307842.6**

(51) Int. Cl.[4]: **E 04 H 12/18**

(22) Date of filing: **30.10.85**

(30) Priority: **10.05.85 US 733236**

(43) Date of publication of application:
20.11.86 Bulletin 86/47

(84) Designated Contracting States:
BE DE FR GB IT NL SE

(71) Applicant: **CHU ASSOCIATES INC**
Whitcomb Avenue Box 387
Littleton Massachusetts(US)

(72) Inventor: **Creaser, Charles W.**
183 South Merrimack Road
Hollis Massachusetts(US)

(72) Inventor: **Reichert, Charles F.**
63 Valley Road
Norwood Massachusetts(US)

(74) Representative: **Allsop, John Rowland**
Rowland Allsop & Co. Black Boy Yard 15 High Street
West Wycombe High Wycombe, Bucks. HP14 3AE(GB)

(54) **Telescoping lightweight antenna tower assembly and the like.**

(57) A lightweight extended aluminum or similar telescopic equilateral triangular tubular mast or tower with coaxially disposed inner triangular sections and cable elevating and lowering drive apparatus for controlling rolling telescopic movement.

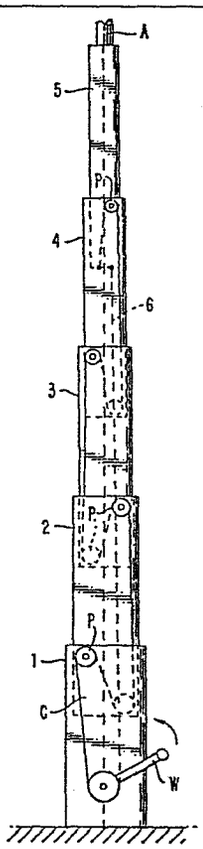

FIG. 1B.

EP 0 201 645 A2

TELESCOPING LIGHTWEIGHT ANTENNA TOWER ASSEMBLY AND THE LIKE

0201645

The present invention relates to antenna tower assemblies or masts and the like, being particularly directed to lightweight structures of the telescoping type, readily raised and lowered in a portable manner.

Various types of telescoping antenna rods and mast structures have been used in various fields to take advantage of the portability of relatively short structures which may, on site, be extended into relatively long or high structures. The problem of providing a very lightweight, but structurally strong, telescoping tower for an antenna or similar rig that may be erected and collapsed in a portable manner has not, however, been satisfactorily addressed in terms of each of weight, numbers of different types of parts (and consequent complexity and cost), simplicity of erection and lowering, and stability, particularly for tall structures, and guy wire requirements.

An object of the present invention is to provide a novel telescoping antenna tower assembly and the like that in large measure obviates the above-discussed problems and

provides a lightweight, structurally sound tower or mast assembly embodying many common or identical lightweight parts and simple raising and lowering mechanism, enabling portability and ease of operation.

Another object is to provide a novel aluminium or similar telescoping mast or tower structure of more general utility, also.

Other and further objects are explained hereinafter and are more particularly delineated in the appended claims.

In summary, from one of its broader aspects, the invention embraces a light-weight telescoping antenna tower assembly having, in combination, a plurality of coaxially mounted hollow equilateral triangular aluminium tubular sections enclosing successively diminishing areas, one nested within the other(s) in parallel longitudinal relationship, roller means disposed between the adjacent corners of the successive tubular sections to permit sliding longitudinal axial relative movement,pulley means mounted on the tubular sections, and winch means disposed near the bottom of the outer tubular section and connected with cables longitudinally harnessed over the pulley means to permit raising and lowering of the tubular sections by the

cable in order to erect and lower the tower. Best mode and preferred embodiments and details are later presented.

The invention will now be described with reference to the accompanying drawings Figs. 1A and 1B of which are side elevational views of an antenna tower constructed in accordance with the invention in collapsed or retracted position and elevated position, respectively;

Figs. 2A and 2B are isometric views of successive sections of the tower, upon an enlarged scale, with preferred equilateral triangular tubular elements;

Fig. 3 is a transverse section near the bottom of the mast;

Fig. 4 is a fragmentary top elevation of the telescoped mast of Figs. 2A and 2B, upon a larger scale; and

Fig. 5 is an isometric view, partly broken away, illustrating an alternate cable pulley mounting arrangement.

Referring to Figs. 1A and 1B of the drawing, the mast or tower structure of the invention is shown constructed of a plurality of hollow equilateral triangular aluminum or similar thin-walled tubular sections 1, 2, 3, 4, 5, etc., enclosing successively diminishing areas (for structural rigidity), one nested within the other(s) in parallel

longitudinal successive coaxial relationship. To achieve light weight and component or part similarity or identity, portability, and easy assembly and disassembly, the tubes are preferably formed of similar aluminum sheet sections S, Fig. 4, bolted, swedged or otherwise edge-secured at B to similar extruded aluminum corner brackets 5'; but the embodiment of Figs. 2A-B, 3 and 5 are shown for illustrative purposes as having extruded integral tubular sides.

At or near the corners or vertices of successively adjacent tubes 1, 2, 3, 4, etc., are pairs of externally mounted upper and lower pulley wheels P, more particularly shown in Figs. 2A and 2B, receiving a cable harness C from a winch W (Figs. 1B and 3) preferably disposed at the bottom of the outer tube 1 for ready hand, foot-pedal or other operation. The cable harness is designed to enable the tubular sections to be elevated one within the other, along rollers R in the corner, Figs. 3 and 5, for erection of the tower, and also for positive cable control in lowering the same.

A suitable cable harness arrangement is shown schematically in Fig. 1B, and portions in Figs. 2A and 2B.

With the mast assembly fully retracted as shown in Fig. 1A, and with winch W, Fig. 1B, hand cranked by the operator, a tension is developed within the cable of the harness arrangement which tension, due to the low frictional resistance of the sheaves, is the same throughout the system. This cable tension is transmitted first from the winch drum affixed to the side of outermost section 1 upward to and around the sheave affixed near the upper edge of this outermost section. It then continues downward to and around the sheave affixed near the lower end of the next inner section 2, then upward to and around a sheave affixed near the upper end of section 2. This connective means is continued through the successively inwardly located mast sections until the cable is finally terminated by means of a fixed connection to the lower end of the innermost (top) mast section.

As the tension in the cable is increased, all mast sections remain stationary until sufficient tension is developed to raise the lightest, innermost mast section 5 in Fig. 1B. This section extends upward, out of the next innermost section 4, until it reaches the limit of its travel and becomes locked in section 4. As the cable tension is increased and becomes sufficient to raise the combined

weights of sections 5 and 4, this sequence is repeated, with section 4 extending upward, out of section 3; and so on.

An alternate cable harness arrangement for hoisting is shown in Fig. 5. In this arrangement, a cable is affixed to the upper end of one mast section 1, in Fig. 5, extends upward to and over a sheave near the upper end of the next inner mast section 2, and then downward, where it is affixed to the lower end of the next inward mast section 3. When the outer mast section 1 is fixed and the middle mast section 2 is raised, the upward motion of the inner section will cause the simultaneous raising of the innermost mast section 3. A hoist cable from the winch W attached to the side of lowermost mast section 1 extends upward to and over a sheave affixed to the upper end of the lowermost sectin. This cable extends downward to the lower end of mast section 2. When the hoist cable is retracted by the winch, the middle section 2 is raised relative to mast section 1, which causes mast section 3 to raise relative to mast section 2 as just described. This cable arrangement between mast sections is repeated, making all mast sections thus serially connected. The net result is that all mast sections extend simultaneously upon activation of the wench instead of extending singularly.

Winding in the winch W will thus cause successive elevation of the tubular sections 2, 3, 4, etc., with the uppermost section (shown as 5) internally carrying the antenna A, which is raised above the mast section 5. The sections are held in elevated position by the taught cable and are lowered by the cable, as well, to prevent slippage.

When the rotation of the winch is reversed, the lower mast section 2, Fig. 1B, will retract into section 1 under the influence of gravity, and when fully seated, mast section 3 will retract into section 2, etc., until all sections are nested as shown in Fig. 1A. However, when the winds are sufficienly strong, frictaion between the mast sections can prevent the smooth and orderly retraction just described. To avert the undesirable consequences resulting from such a situation, a retraction cable 6, Fig. 1B, is provided. This consists of a cable connected from the lower end of the uppermost section 5, extending directly downward to a sheave in the base of lowermost section 1, and thence to a drum on the winch W.

A satisfactory telescoping, mast or tower of this type has been constructed with the following section dimensions:

Length, Retracted	70 IN.
Length, Fully Extended---(NOT INCL. ANTENNA	--23 Ft. 6 IN.
Width, Triangular, each side dimension	7.8 IN.
Total Weight, Operating	40 LBS.
Total Weight, Transport	46 LBS.
Max. Cable Tension, To Extend	44 LBS.
Max. Guy Tension, 90 M.F.R. Wind,	
Upper Guy	300 LBS.
Lower Guy	120 LBS.

For light weight construction, the sheet walls of the triangular tubular members may be apertured as by punched holes H, the inner punching of which adds structural reinforcement, or by other perforations or lattice structures.

If desired, the inner tubular sections may initially be raised together before telescopically raising the successive inner tubes to successively higher elevation, and further modifications will also occur to those skilled in this art, and such being considered to fall within the spirit and scope of the invention as defined in the appen

CLAIMS

1. A light-weight telescoping antenna tower assembly having, in combination, a plurality of hollow equilateral triangular aluminum tubular sections bounding successively diminishing areas, one nested within the other(s) in parallel longitudinal coaxial relationship, roller means disposed in and between the adjacent corners of the successive tubular sections to permit sliding longitudinal axial relative movement, pulley means mounted on the tubular sections, and winch means disposed near the bottom of the outer tubular section and connected with cables longitudinally harnessed over the pulley means to permit raising and lowering of the tubular sections by the cable in order to erect and lower the tower.

2. An antenna tower assembly as claimed in claim 1 and in which the tubular sections are formed of similar thin planar aluminum sheets edge-mounted in similar extruded aluminum corner sections.

3. An antenna tower assembly as claimed in claim 2 and in which said sheets are perforated for low weight and structural reinforcement.

4. An antenna tower assembly as claimed in claim 1 and in which said pulley means comprises a pair of upper and lower pulleys mounted near a corner externally of the tubular section.

5. An antenna tower assembly as claimed in claim 1 and in which the cable harness is arranged to permit initial simultaneous elevation of the inner tubes and then successively higher elevation of the successive inner tubes, and the converse on lowering.

6. An antenna tower assembly as claimed in claim 1 and in which the cable harness is arranged to permit successively higher elevation of the successive inner tubes and the converse on lowering.

7. An antenna tower assembly as claimed in claim 1 and in which an antenna is disposed within the innermost tube to be raised and lowered therewith.

8. A light-weight telescoping antenna tower assembly having, in combination, a plurality of hollow equilateral triangular tubular sections bounding successively diminishing areas, one disposed within the other(s) in parallel longitudinal coaxial relationship, roller means disposed adjacent corners of the successive tubular sections to permit sliding longitudinal axial relative movement, pulley means mounted on each tubular section, and means operable at the outer tubular section and provided with elevating and lowering means to permit raising and lowering of the tubular sections to erect and lower the tower.

9. An antenna tower assembly as claimed in claim 8 and in which the tubular section are formed of similar thin planar sheets edge-mounted in similar corner sections.

FIG. 1A.

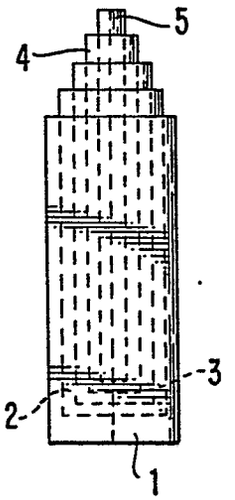

FIG. 1B.

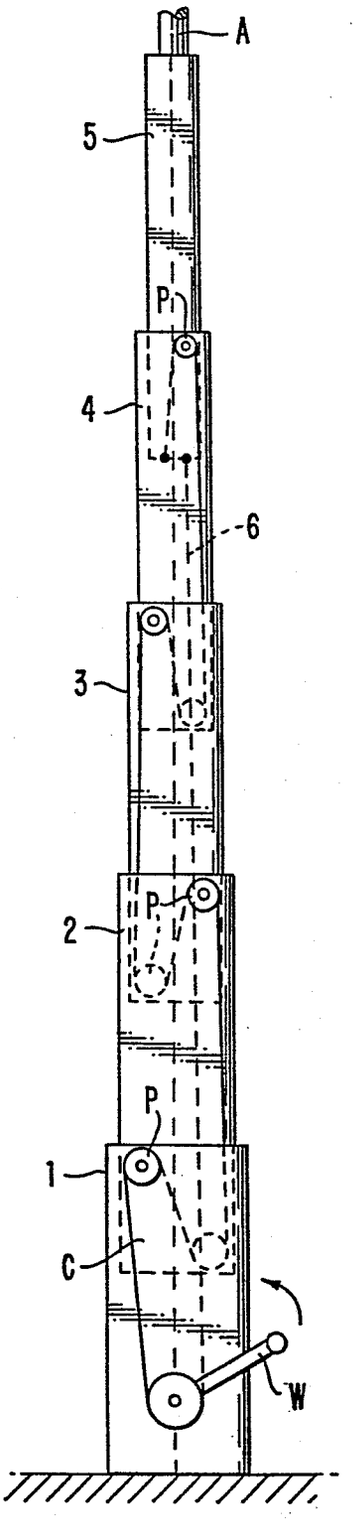

FIG. 4.

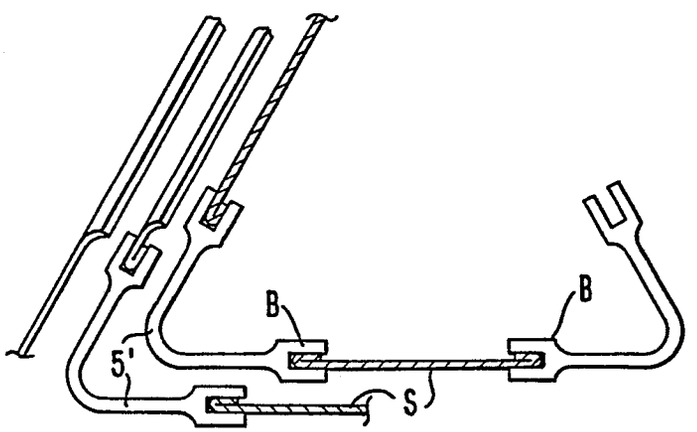

FIG. 2A.

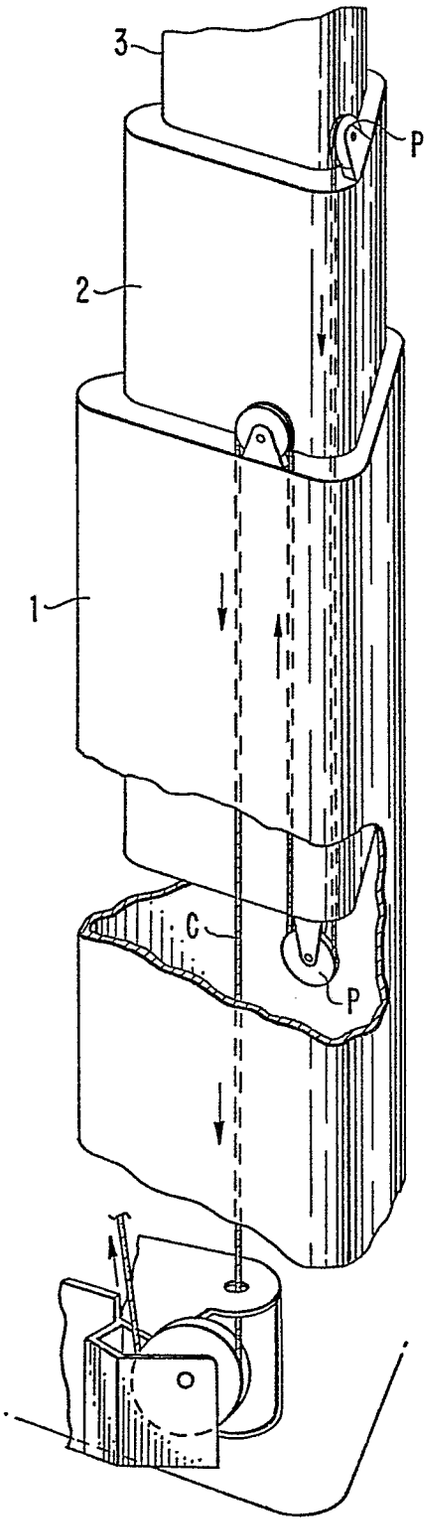

FIG. 2B.

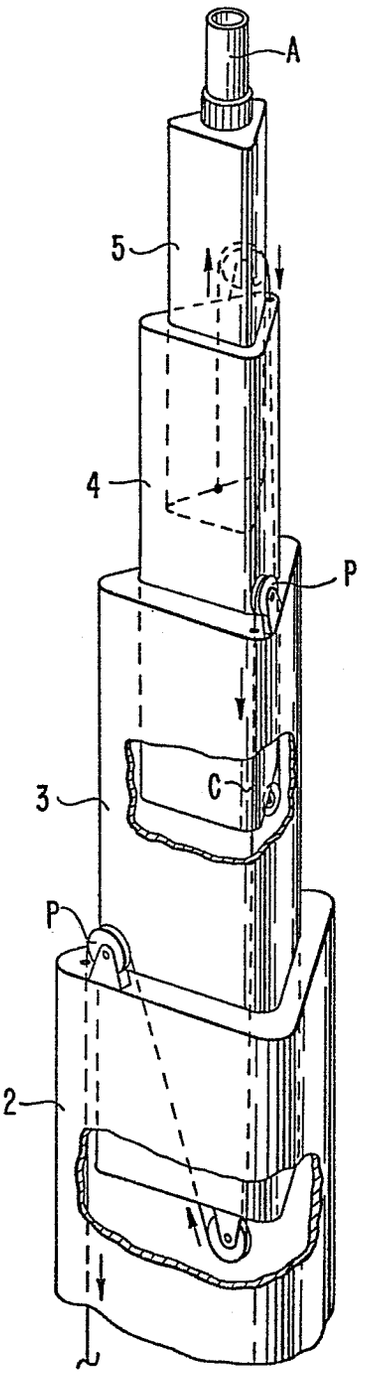

FIG. 3.

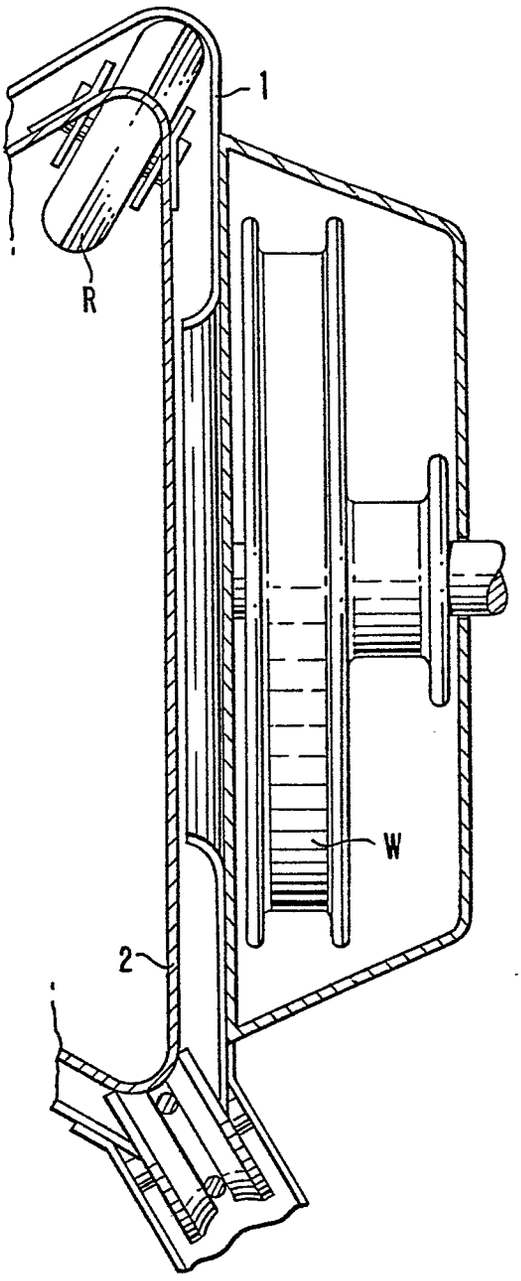

FIG. 5.