Jan. 10, 1967 L. N. GOODMAN 3,296,757

EQUIPMENT MAST ARRANGEMENT

Filed June 23, 1965 4 Sheets-Sheet 1

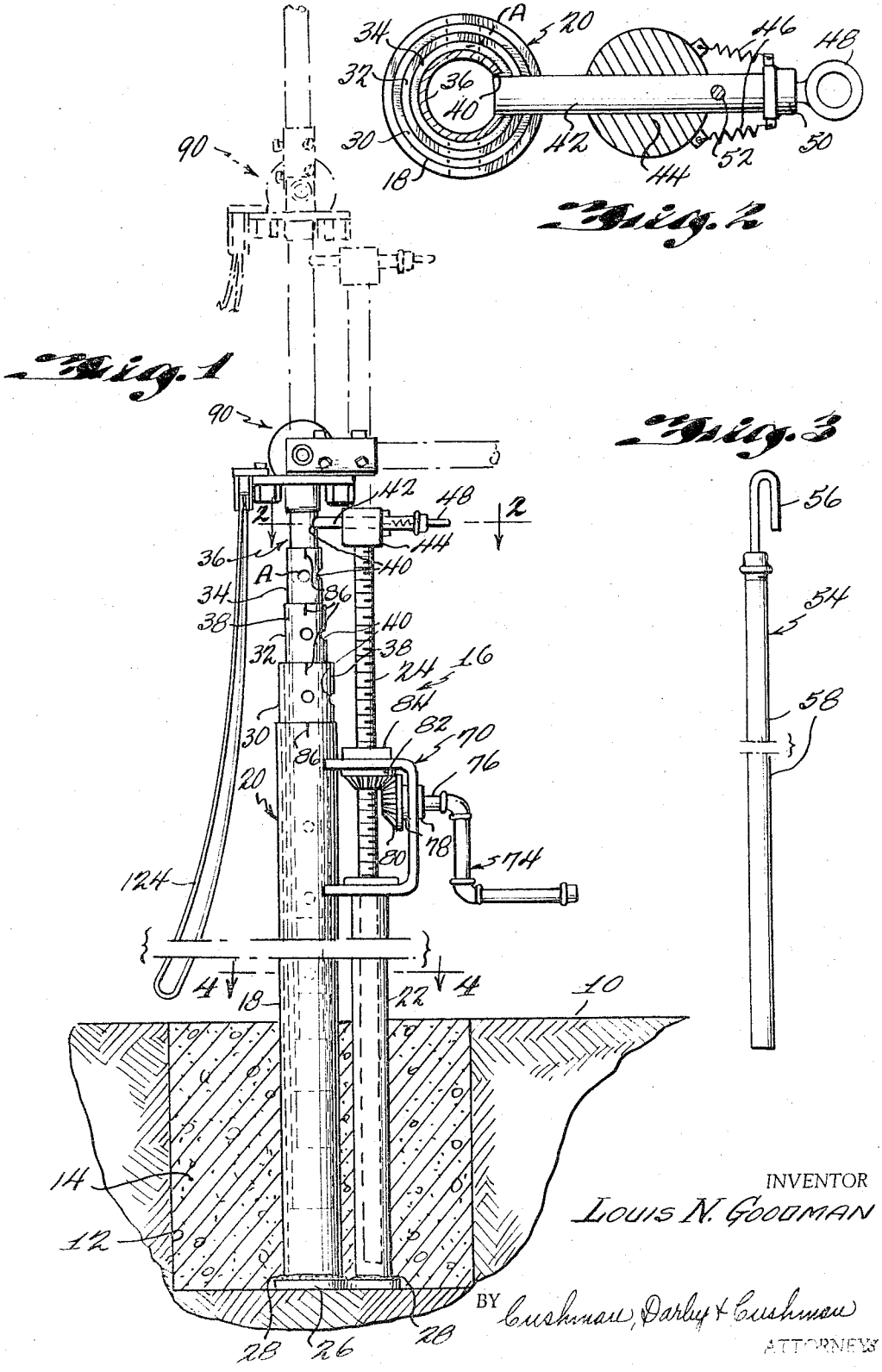


Fig. 1

Fig. 2

Fig. 3

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Fig. 4

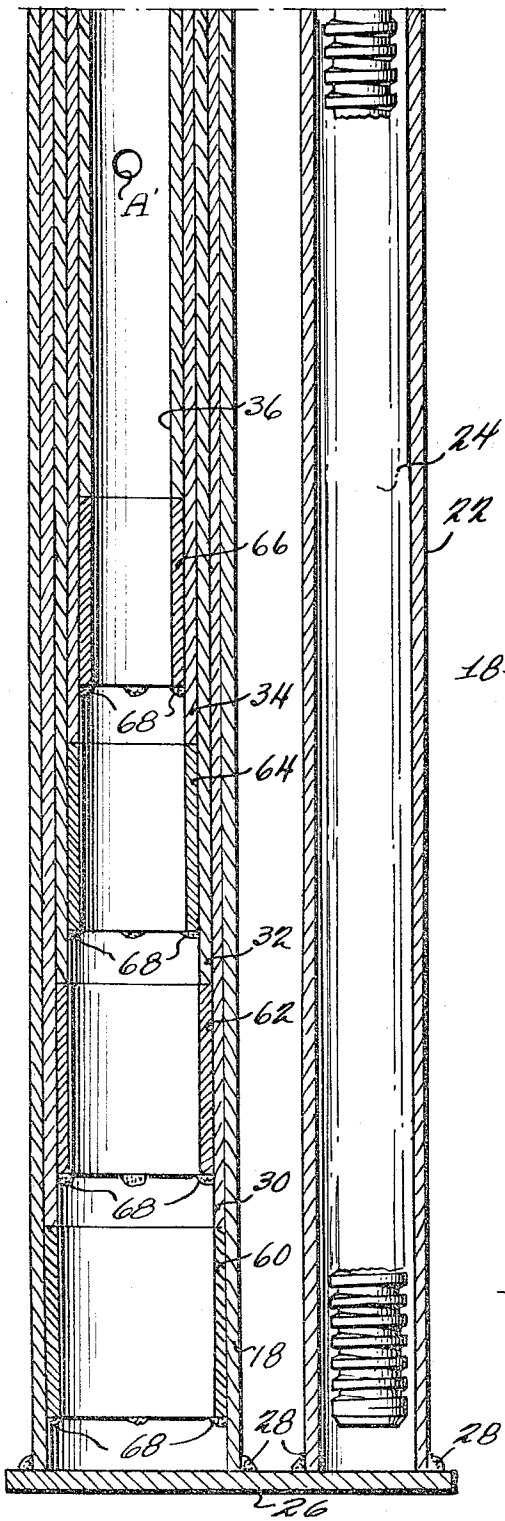
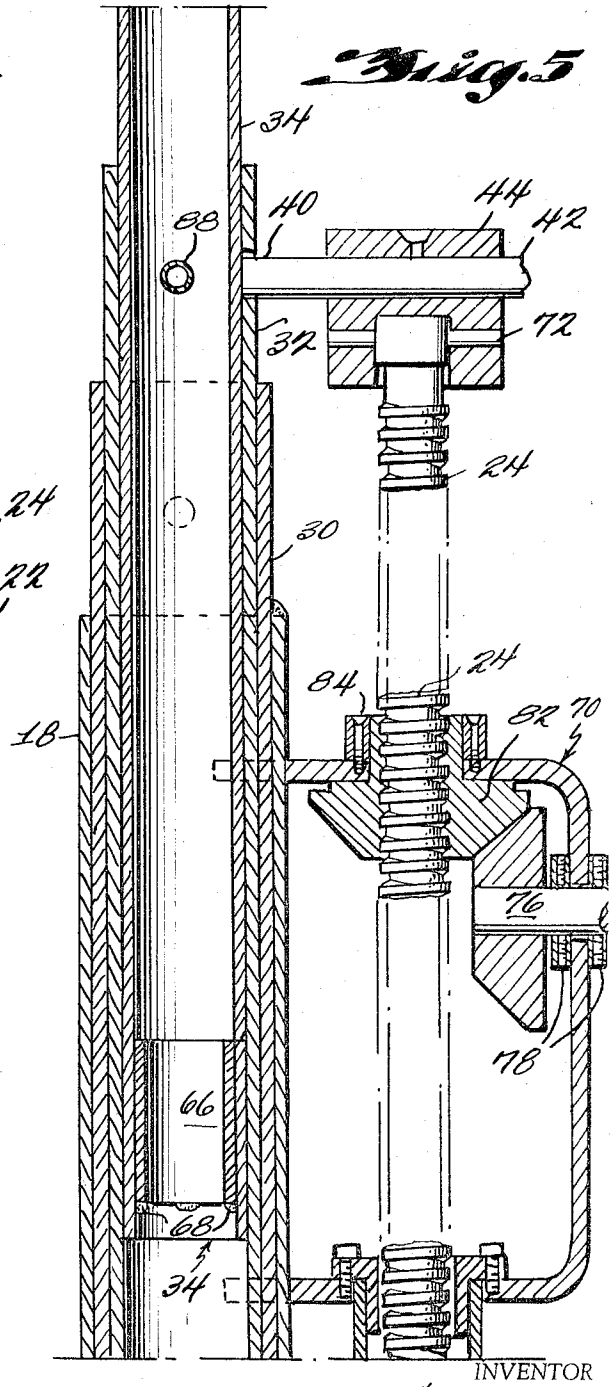


Fig. 5



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EQUIPMENT MAST ARRANGEMENT

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Fig. 6

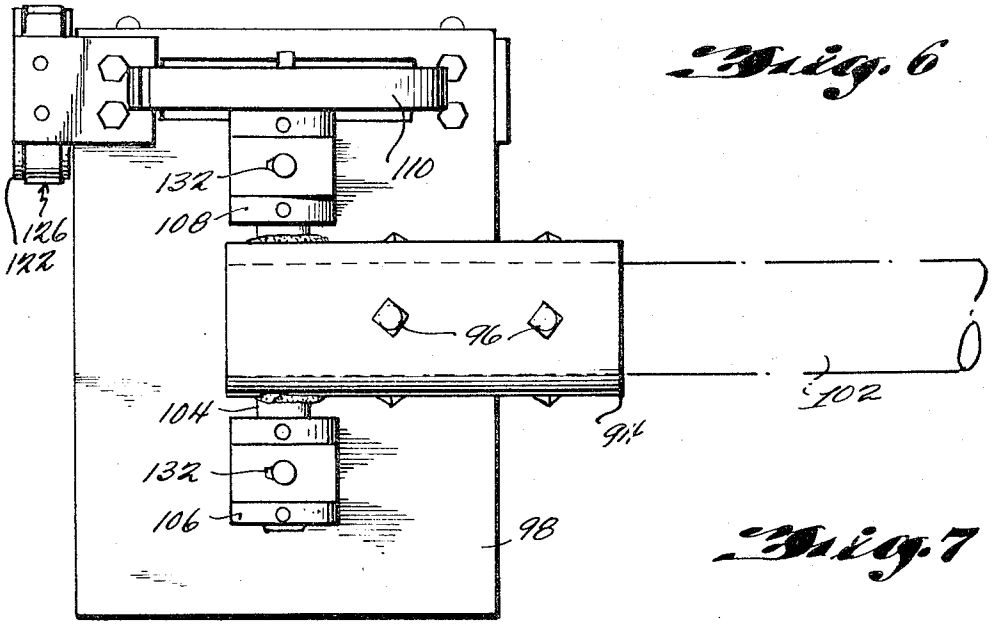


Fig. 7

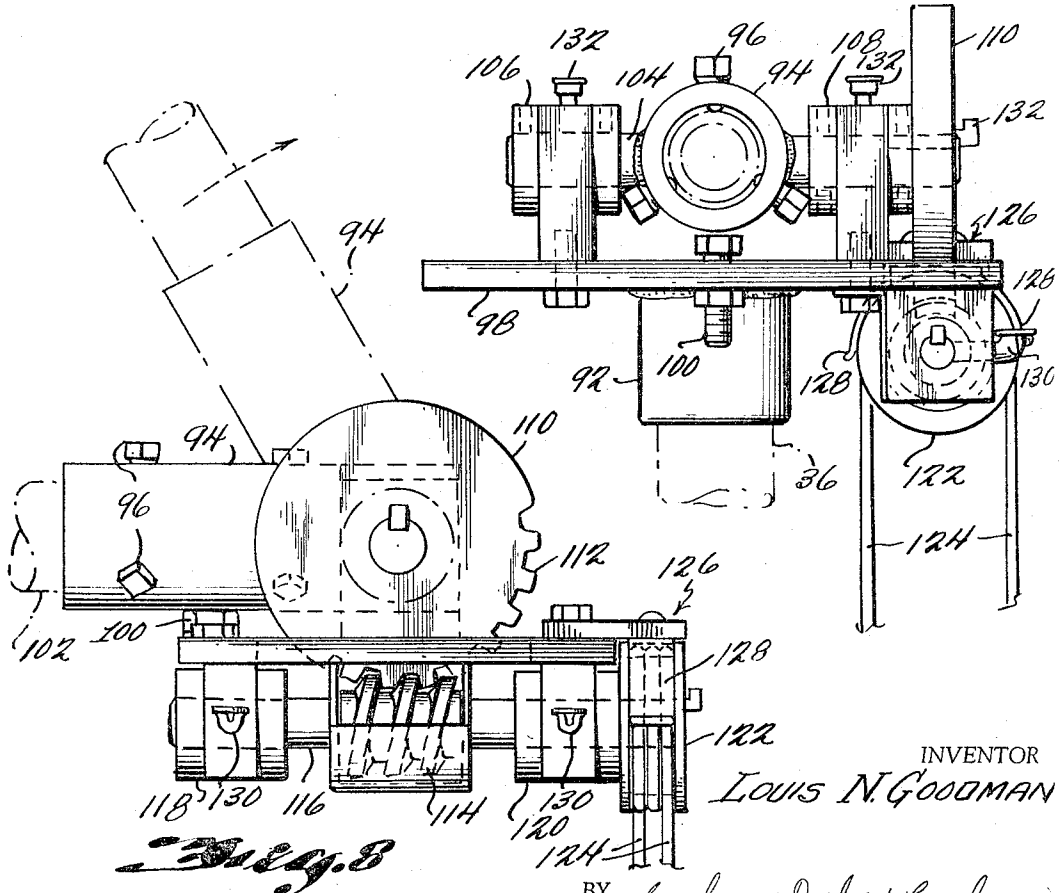


Fig. 8

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EQUIPMENT MAST ARRANGEMENT

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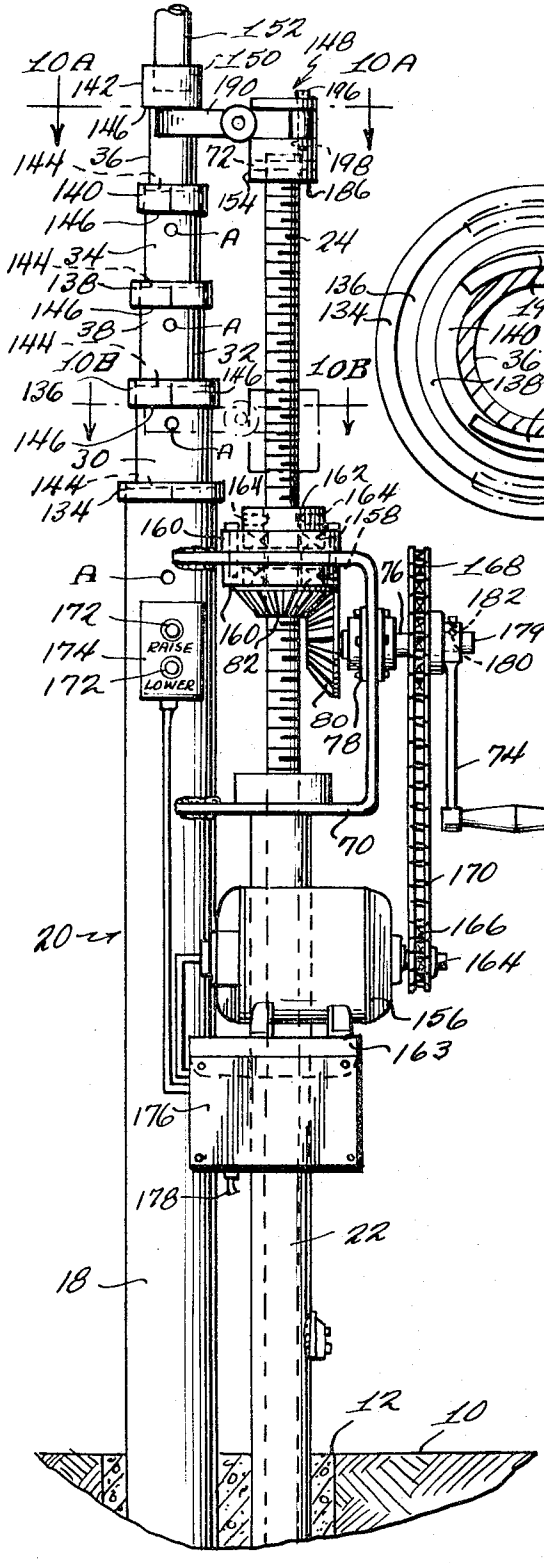


Fig. 9

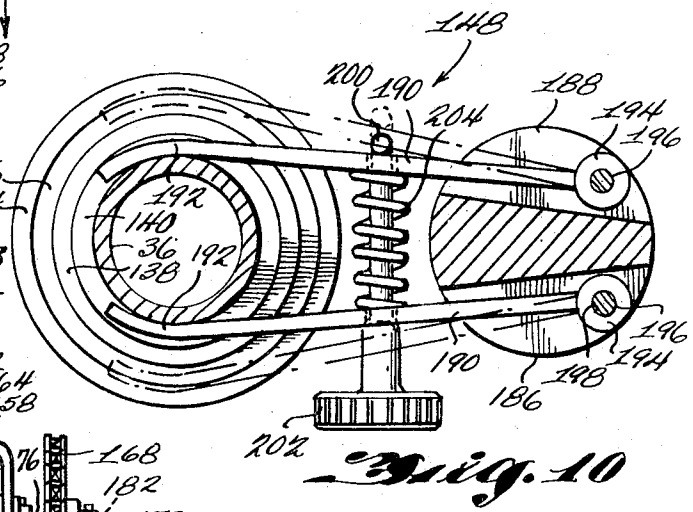


Fig. 10

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3,296,757

EQUIPMENT MAST ARRANGEMENT

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Filed June 23, 1965, Ser. No. 469,052
14 Claims. (Cl. 52—111)

This application is a continuation-in-part of my copending application Serial No. 345,619, filed February 18, 1964 and now abandoned.

This invention relates to an antenna mast, and particularly to a beam-antenna mast which is self-supporting, requiring no guying.

There are many crank-up and tilting antenna towers on the market today, but the crank-up towers lower the beam antenna no closer than 20 feet from the ground, while the tilting towers bring it all the way down to an approximate vertical plane, but require a large amount of available space in which to accomplish the job.

It is therefore an object of the present invention to improve crank-up beam antenna masts in various ways, including the feature of having a tiltable holder positioned atop the inermost section of the telescopic mast-type antenna whereby the antenna may be installed on a mast while it is in an upright, closed position without requiring exceptional space.

The many presently available self-supporting towers are rather large at the base, very heavy to handle during installation, and must be climbed for initial installation of the antenna and for further service and handling. These are disadvantages which the present invention overcomes as another of its objects.

A further object of the present invention includes the provision, in a telescopic, antenna mast of the type described, of motor means for extending and retracting the mast and of an improved lifting head arrangement for selectively associating the motor means with the individual mast sections.

Other objects and advantages of this invention will become apparent to those of ordinary skill in the art upon reading the appended claims and the following detailed description of the invention, in conjunction with the drawing, in which:

FIGURE 1 is a side elevational view of the overall antenna mast system of this invention according to a first embodiment thereof, showing parts in closed up position in solid line, and in extended position in dash lines;

FIGURE 2 is a cross-section of the equipment taken along lines 2—2 of FIGURE 1;

FIGURE 3 is a separate tool which may be employed in operating the biased lifting pin of FIGURES 1 and 2;

FIGURE 4 is a longitudinal cross-sectional view of the portion of the mast and lead screw arrangement which lies below the lines 4—4 of FIGURE 1;

FIGURE 5 is a cross-sectional view of a portion of the FIGURE 1 arrangement with the two innermost sections fully lifted and showing the lifting pin operating on the next intermediate section;

FIGURES 6, 7 and 8 are illustrations of the tilting table, respectively, in plan, side elevational and front elevational view;

FIGURE 9 is a fragmentary side elevational view, similar to FIGURE 1 of a second embodiment of the system of the invention; and

FIGURE 10 is a transverse cross-sectional view taken substantially along the lines 10A—10A and 10B—10B of FIGURE 9.

Preferably, parts of this invention are generally made of aluminum or such other material as desired, to effect a lightweight arrangement which may be assembled and

operated by hand quite readily. Though materials and dimensions are mentioned in this specification, it is to be understood that limitation thereto is not intended, representations being given for exemplary purposes only.

For instance, although the sections of the telescopic mast to be described are shown and described as being of cylindrical tubular construction, they may be constructed of concentric tubes having square or other non-circular cross-sectional shape.

In FIGURE 1, ground level is indicated by line 10. A large hole 12 in the ground is filled with cement or other concrete material 14 so as to support the antenna mast system 16 suitably. This mast system includes two main elements in the ground, these being the other section 18 of a five section telescopic tube 20, and a casing 22 for a lead screw 24. As illustrated, casings 18 and 22 rest on a base element 26, to which they are welded as indicated at 28. In a manner described below, the respective intermediate and inner telescopic sections 30, 32, 34 and 36 are set one within the next at predetermined minimum heights so that each has a respective upper portion 38 which protrudes above the end of the next larger section below it. In these protruding sections are respective apertures 40 into which a lifting pin 42 may be disposed, see FIGURE 2. This pin passes through a lifting head or block 44 which is secured to the upper end of lead screw 24, and is biased leftward by springs 46. At the outer end of the lifting pin 42 is an eye bolt 48 which is screwed into a pipe cap 50, that is in turn threaded onto the outer end of lifting pin 42. A vertically disposed pin 52 prevents further leftward or inward movement of lifting pin 42, than that illustrated in FIGURE 2, by being stopped by the lifting head or block 44.

In FIGURE 3, there is illustrated a tool 54 for changing the horizontal position of lifting pin 42 by catching hook 56 in the eye bolt 48 and manually pulling on the shank 58. Need of this hooking tool will become more apparent below.

As illustrated in FIGURES 1 and 4, each of the intermediate and inner sections is supported in its minimum height position by a respective nippel 60, 62, 64 and 66. As indicated at points 68, these nipples are welded to the respective adjacent telescopic sections, and this holds them in place to determine the lowermost position of the telescopic section which rests thereupon. For example, nipple 60 is welded to the outer section 18, and that nipple determines the lowermost position of the next telescopic section 30.

As representative of practical dimensions, each of these nipples 60–66 may be 4 inches in length, spaced one inch above the lower end of the telescopic section to which it is welded. Each telescopic section itself is preferably 10 feet long, and outer section 18 is in the ground approximately 6 feet. The notches or apertures 40 in the upper portions of the intermediate and inner sections may be centered 2½ inches below the upper ends of the respective sections and have a drilled diameter sufficient to receive a one inch lifting pin 42 with a loose fit. The 10 foot telescopic sections for the mast may have inner diameters differing by ½ inch, beginning at 4 inches for example, for the largest. Of course, the exteriors of the intermediate and inner sections are of easy sliding fit relative to the next larger section, and any required machining of those exteriors may be accomplished as needed to effect concentricity and the like.

As shown in FIGURES 1 and 5 there is secured, as by welding, to the outer telescopic section 18 a U-shaped frame 70, the upper and lower legs of which may have an arcuate cut-out for fitting the outer surface of section 18. The upper end of lead screw 24 is secured in the lifting head 44 by a pin 72, and this lifting head is moved

upwardly and downwardly by rotation of a crank **74**. Shaft **76**, which carries that crank, extends through bearings **78** to a bevel gear **80**. A second bevel gear **82** cooperates therewith and is internally threaded to mate with the threads on lead screw **24**. Bevel gear **82** is secured to the U-shaped frame **70** by collar **84**. Therefore, in operation, whenever crank **74** is rotated in one direction the consequent rotation of bevel gear **82** causes lead screw **24** to move in an upward direction, while the reverse direction on rotation of crank **74** causes the lead screw to move downwardly.

Before proceeding to discuss how the respective mast sections are extended, it should be noted that the sections are initially aligned as to azimuth, with the five vertical alignment marks **86** (FIGURE 1) on the respective sections being in vertical alignment.

Then, the crank arm is turned with the lifting pin **42** being in the aperture **40** of the innermost section **36**. This lifts the innermost section to a desired height, for example and preferably full height, at which point a pin such as pin **88** in FIGURE 5 is inserted through the aperture A in the upper portion of section **34** when that aperture is in alignment with the corresponding aperture A' (FIGURE 4) in the lower end of section **36**. The inserted pin may be a nipple of desired diameter, threaded at both ends for receiving caps after insertion.

To raise the next section, the tool of FIGURE 3 is first employed so as to release pin **42** from the aperture of raised section **36**, and crank arm **74** lowers the lead screw to a point where the lifting pin **42** may be inserted into aperture **40** of section **34**. This section is then lifted and similarly secured by a pin through an aperture at its lower end and an aperture at the upper end of section **32**. The process is repeated then until all sections are fully elevated.

While a flat base rotator table may be used atop the innermost mast section alone or in conjunction with a so-called tilting table **90** such as illustrated in FIGURES 6, 7 and 8, only the latter is shown as a preferred feature of this invention. The purpose of the tilting arrangement, which is secured by coupling **92** atop the innermost mast section **36**, is to give the advantage of being able to install the conventional boom support or mast of a beam antenna itself, into boom socket **94** at ground level with the antenna elements in a vertical position. Yet the antenna may be changed to a horizontal position or some other angle if desired, when the mast sections are fully extended. This provides the very great advantage of requiring a relatively small amount of ground room to install the antenna.

As shown in FIGURES 6, 7 and 8, the tilting table further includes a flat platform **98** which is secured to the upper end of coupling **92** such as by welding. The head of bolt **100** operates as a rest and horizontal stop for boom socket **94**. This socket, which holds the antenna by its boom support **102** with set screws **96**, is itself secured on a transversely extending shaft **104**. This shaft is journaled in one end in a bearing block **106**, and at its other end passes through a bearing block **108** and into a gear **110**. As shown more clearly in FIGURE 8, this gear has teeth **112** along its periphery for a distance of only approximately 150° or less in order to give at least a 90° pivot ability to boom socket **94**. These teeth cooperate with a worm gear **114** which is disposed on a shaft **116** journaled in bearing blocks **118** and **120**. In addition, shaft **116** is secured to a drum **122**, which may be rotated by a pulling force on one or the other sides of the endless rope **124**. In FIGURE 1, it will be noted that this rope extends toward the ground sufficiently to be operated even when the mast is fully extended. A rope retainer **126** with spring clips **128** pressing against the rope in the recess of the drum **122** is employed. Suitable grease retainers **130** and oil cups **132** may be employed as required.

With this arrangement, it is apparent that the beam antenna situated on support **102**, when at its uppermost elevation (telescopic mast fully extended) may be positioned at any desired angle between horizontal and vertical, to produce a desired radiation pattern, for example to influence the reflection angle from the ground and from the ionized layers of the upper atmosphere. This can be used, therefore, to regulate the "skip distance" of transmission by the antenna.

From the foregoing, it will be apparent that the telescopic mast itself requires only a small area, for example, a hole in the ground 12 inches in diameter and 6 feet deep. The ground area required to raise an antenna is also relatively small. Consider, for example, a 20 meter beam antenna with antenna elements 32 feet long disposed on a 16 foot boom which is supported at center by a support or mast **102** two feet or so in length. If the antenna is set with support **102** horizontal so that the antenna elements are perpendicular to the ground and in a vertical plane with one end thereof at ground level, the projected ground area required would be about 4 feet by 16 feet. Under such conditions, the tilting table **90** would be cranked up to about 16 feet above ground, which is not too high for servicing from a 12 foot stepladder.

On the other hand, if such an antenna is to be raised in a similar vertical plane but with the antenna elements parallel to the ground so that one side is at ground level, the projected ground area needed would be about 4 feet by 32 feet. In this case, the tilting table **90** would need to be cranked up only about 8 feet above ground and servicing could easily be done then from a 4 or 6 foot stepladder. Being able to raise a beam antenna in such a small space has application, of course, in areas congested at ground level by relatively low buildings that would allow the antenna to be brought into a horizontal plane after the mast is extended its full height.

If ground space is available, however, to take the antenna up or bring it down with the antenna elements in a horizontal plane, it is possible for the antenna to be only 7 feet from the ground, when 10 foot telescopic sections are used, which make it readily reachable for servicing.

Referring now to FIGURES 9 and 10 a modification of the mast arrangement is shown having the following principal differences from the embodiment of FIGURES 1–5. The addition of electric motor means to supplement the manual cranking means, the latter being retained for precision end point adjustment; the modification of the lifting head to include a pair of tube clamping arms positionable to raise selected mast sections by adjustment of a spring loaded clamping bolt with a knurled adjusting knob, and the addition of annular collars on the upper ends of all mast sections to serve as stops for the clamping arms and as lubricant receiving and retaining means.

Substantially all other parts of the embodiment of FIGURES 9 and 10 are materially identical to the corresponding parts of the embodiment of FIGURES 1–5 and are correspondingly numbered.

In FIGURE 9, the ground level is indicated by a line **10**. The outer casing **18** of the five section telescopic tube **20** and lifting screw casing **22** are received therein in the hole **12** therein as described in regard to the embodiment of FIGURES 1–5. The telescopic tube **20** comprises casings **18**, **30**, **32**, **34** and **36**, proceeding from the outside inwardly. The respective intermediate and inner telescopic sections **30**, **32**, **34** and **36** are set one within the next at predetermined minimum heights so that each has a respective upper portion **38** which protrudes above the upper end of the next larger section below it, as described hereinbefore.

Adjacent the top end of each section **18**, **30**, **32**, **34** and **36**, an annular collar **134**, **136**, **138**, **140** and **142** is fastened for instance by tack welding through radially directed holes (not shown) pre-formed in the collars, so that each collar **134–142** circumscribes the section on which it is mounted and each collar **134–136–138–140**

protrudes upwardly about one-fourth inch beyond the upper end of the section on which it is mounted. By way of example, the collar **134** may be formed of one-fourth inch thick aluminum, having a length of three-fourths of an inch and the collars **136–140** may be formed of aluminum, having a thickness of three-eighths of an inch and a length of one and one-fourth inches. Accordingly, each of the collars **134–140** defines a lubricant receiving cup **144** between its inner peripheral surface and the upper end of the section to which it is secured, and defines a downwardly facing radially outwardly directed annular shoulder **146** at its lower extent.

Grease or a greased packing and a grease retainer (not shown) may be placed in the cavities or cups **144**, especially in order to facilitate lowering of the telescoped sections after they have been extended and subjected to the weather for a long time.

The shoulders **146** allow raising and lowering of the sections **30–36** with the lifting head **148** which will be more completely described hereinafter.

The uppermost collar **142**, three-eighths inch thick and about two and one-quarter inches long, preferably includes internal threads **150** along a portion of its length, thus facilitating the coupling of accessories such as the rotator (see page nine herein) and tilting table of FIGURES 6–8 to the telescopic mast via a short pipe nipple **152** or the like.

As shown in FIGURE 9, a U-shaped telescopic frame **70** is secured at the upper and lower legs thereof as by welding to the outer telescopic section **18**. The upper end of lead screw **24** is secured in the block of the improved lifting head **154** by a pin **72** and the lifting head is moved upwardly and downwardly by actuation of electric motor means **156** or rotation of a crank **74** both of which are shown operatively coupled to a shaft **76**. The shaft **76** extends through bearings **78** in the frame **70** to a bevel gear **80**. A second bevel gear **82** cooperates therewith and is internally threaded to mate with the threads on the lead screw **24**. Bevel gear **82** is secured to the U-shaped frame via bearing means which includes races **158**, retainers **160** and a collar **162**, secured to the gear **82** by set screws **164** or the like. Therefore, in operation, whenever crank **74** is rotated in one direction the consequent rotation of bevel gear **82** on bearings **158, 160** causes the lead screw **24** to move upwardly without rotating and whenever crank **74** is rotated in the reverse direction, the consequent rotation of bevel gear **82** causes the lead screw to move downwardly.

The drive motor **156** is preferably a totally enclosed reversible capacitor type, single-phase **120** volt A.C. having 1200 r.p.m. no-load speed and arranged to produce a vertical travel of the lead screw **18** of approximately six feet per minute. Obviously, similar motors having somewhat varied characteristics could be used. The motor **156** is shown mounted on a channel member **163** secured, as by welding, to the outside of the mast section **18** near ground level, for instance about one and one-half feet above ground level. The output shaft **164** of the motor has a sprocket **166** secured thereon which is operatively coupled to a sprocket **168** on the shaft **76** by a sprocket chain **170**. Alternatively, other conventional power transmission means such as grooved pulleys and V-belts could be used to couple the motor output to the shaft **76**. The controls for the motor **156** may typically include two momentary-contact, single-pole normally open, weatherproof push button operated switches **172** having name plates inscribed "RAISE" and "LOWER." The switches **172** could be located in an appropriate receptacle **174** on the mast section **18**. The switches **172** are connected to the motor **156** via two 120 volt A.C. motor reversing relays interlocked so that both cannot be energized simultaneously and one single-pole thermally-tripped line circuit-breaker with an overload trip coil set for a low percentage overload trip so that quick trip-out will be accomplished should the lifting head **154** be accidentally jammed at either end of travel, all of the latter being located in the weatherproof cabinet **176** mounted on the mast section **18** below the motor. Electrical service **178** to the cabinet **176** can be provided by a permanent underground cable or conduit carried conductors or by a portable power cord. The particular motor controlling elements just described are exemplary and should therefore not be understood in a limiting sense.

The outer end **179** of the shaft **76** is preferably squared and includes a detent at **180**. Accordingly, the crank **74** which has a spring loaded detent ball **182** in the central hub **184** thereof can be easily inserted on and removed from the shaft **76** as needed. To more efficiently accomplish raising and lowering of the telescopic mast sections, the crank **74** is used instead of the motor for bringing the sections the last few inches to final pinning position when raising and for bringing the lifting head the last few inches to abutment with the collar shoulders **146** preparatory to lowering. As a safety precaution, the crank **74** is preferably removed when the motor is being used to raise or lower the telescopic mast since the crank if not removed would rotate at about 300 r.p.m.

The improved lifting head **148** of FIGURES 8 and 9 comprises a body or block **186** formed of aluminum rod or the like, oriented so that its longitudinal axis extends vertically. Two approximately diametrically opposed, laterally outwardly opening grooves **188** are formed in the block **186** near the upper end thereof and a clamping arm **190** is pivotally secured in each groove **188** near one end of the groove. As shown each of the two arms **190** has an elongated portion of strap metal or the like concave toward the other at **192** and an enlarged, slotted, pin receiving portion at **194**. The pivot pins **196** are received through the slots in the portions **194** and through vertically extending, upwardly opening sockets **198** in the block **186**, intersecting the grooves **188**. Thus the arms **190** project laterally from one side of the block **186** toward the mast and are pivotable toward and away from one another to vary the space between their concave portions **192**. Preferably the curvature of the portions **192** matches that of the exterior of the largest movable mast section **30**. Between their pivoted ends and free ends the arms **190** are associated with one another by a T-headed bolt **200** which passes through openings in each arm **190**. A knurled adjusting nut **202** is threadably received on the opposite end of the nut **202** from the T-head and facilitates limiting of the maximum distance of the arm curved portions **192** from one another. A compression spring **204** received about the bolt **200** between the two arms **190** urges the arms respectively against the bolt T-head and nut **202**. To raise and lower the mast sections **30–36** the clamp arms are adjusted so that they are abuttingly subjacent the respective shoulders **146** and raised or lowered using the lead screw **24** as described hereinbefore. Preferably, the arms **190** are sufficiently spaced from one another during raising and lowering of the mast sections that they are easily slidable with respect to the outer peripheral surface of the section being raised or lowered, being just sufficiently close to one another to ensure that the collar shoulder **146** will be engaged. A pin similar to pin **88** of FIGURE 5 placed in the holes A, A′ of adjacent mast sections when desired extension has been reached, the pin is removed prior to the lowering of the sections.

To raise the mast of FIGURE 9 from a completely lowered condition, the clamping arms of the lifting head are positioned against the underside of the collar on the section **36** using the hand crank **74** to accomplish abutment with the shoulder **146**. The crank is then removed by pulling it off the shaft **76** and section **36** is then lifted to a few inches short of its pinning position by depressing the "RAISE" button of the motor. Indication of near complete extension could be provided by a color stripe

(not shown) near the lower end of each movable section 30–36. The last inch or so of elevation is preferably accomplished by releasing the "RAISE" button, replacing the crank 74 and rotating it until the pinning position is reached, at which point a pin 88 (FIGURE 5) is inserted. The lifting head is then lowered by pushing the "LOWER" button of the motor after having removed the crank 74, until the clamp arms are just above the collar of the tube 34. The arms are adjusted so as to pass over the last-mentioned collar, then the crank 74 is replaced, used to lower the clamp arms 190 to below the collar of the tube 34 and the clamp arms 190 are readjusted to abut the last-mentioned collar. The section 34 is then raised and pinned similarly to section 36 as just discussed. In like manner sections 32 and 30 are raised and pinned.

Lowering of the mast involves a reversal of the procedure just described wherein the motor is energized to bring the clamp arms to a supporting relationship with the collar of the section 30, the last inch or so of travel having been accomplished using the crank 74. The pin pinning section 30 to section 18 through opening A is then removed and the "LOWER" button of the motor pushed to telescope the section 30 into the section 18, the last inch or so of travel being accomplished using the crank 74. The clamp arms are adjusted apart by turning the knurled nut enough so that the clamp arms will clear the collar of the section 30. The lifting head is raised above the last-mentioned collar then the clamp arms are readjusted so that they well slide with respect to the exterior of the section 32 but will engage the collar on the section 32 when it is reached. Raising of the lifting head then recommences. These steps are repeated in succession on sections 32, 34 and 36 until the mast is completely lowered.

One significant feature of the improved lifting head is that the clamp arms 190 can always be adjusted to engage the desired collar from a point convenient to the ground both during the raising of the mast and the lowering of the mast thus avoiding the necessity in the embodiment of FIGURES 9 and 10 of an instrument comparable to the one shown in FIGURE 3.

It should be apparent that on more expensive versions of the mast shown in FIGURES 9 and 10, having more elegant control means, it would be within the purview of the present invention to eliminate the manual crank entirely by providing means such as limit switches for automatically controlling the electric motor in response to the sensation of proximity to an end point, i.e. complete extension or complete retraction.

From the foregoing, it is apparent that this invention has provided for the objects and advantages herein mentioned. Still further objects and advantages of this invention, and even modifications thereof, will become apparent to those of ordinary skill in the art upon reading this disclosure. However, it is to be understood that this disclosure is exemplary and not limitative the scope of the invention being defined by the appended claims.

What is claimed is:

1. An antenna mast comprising:
- a plurality of telescopic tubular sections including an outer section and at least one inner section,
- means for mounting said outer section for holding said inner section at a position of minimum height so that a portion of the inner section protrudes above said outer section,
- said inner section being slidably movable upwardly in said outer section to a desired position therein,
- means secured above ground to said outer section, including an axially movable lead screw extending into the ground and having at its upper end a means for holding onto said protruding inner section portion, for lifting said inner section to said desired position,
- means for releasably securing said inner and outer sections together at said desired position, and
- means atop the innermost one of said telescopic sections for receiving an antenna when said sections are closed up and for holding the antenna in correct position when the said telescopic sections are fully extended.

2. An antenna mast as in claim 1 wherein said antenna receiving means atop the innermost telescopic sections includes means for positioning said antenna between horizontal and vertical planes.

3. An antenna mast as in claim 2 wherein said antenna positioning means includes means operative from the ground at any height of said telescopic sections.

4. An equipment mast comprising:
- a plurality of telescopic tubular sections including outer, inner, and intermediate sections slidable relative to each other,
- means for mounting said outer section vertically in the ground a substantial distance,
- means on the inside of each of said outer and intermediate sections for supporting the next smaller intermediate and inner sections at a position of minimum height so that only a portion thereof protrudes above the supporting section,
- each smaller section being slidably movable upward from its said minimum height position in the next larger section to a desired position therein,
- means secured above ground to said outer section, including an axially movable lead screw extending into the ground and having at its upper end a means for holding onto each of said protruding portions at different times, for lifting and lowering said inner and intermediate sections successively to and from their said desired positions respectively,
- means for releasably securing said inner, intermediate and outer sections respectively together at said desired positions, and
- means atop said inner section for receiving an equipment element when said sections are closed up and for holding the equipment element in correct position when the telescopic sections are fully extended.

5. An equipment mast as in claim 4 wherein each of said inner and intermediate sections has an aperture near its upper end in the said protruding portion thereof and wherein said protruding portion holding means includes a releasable pin biasingly held in one of said apertures for effecting contact between said lead screw and the respective telescopic section.

6. An equipment mast as in claim 4 wherein said means atop said inner section for receiving an equipment element comprises an antenna receiving and holding means atop said inner section which includes means operative from the ground for rotating an antenna between horizontal and vertical planes, whereby an antenna may be installed in said vertical plane while said sections are closed up and then may be rotated toward a horizontal position when said sections are fully extended by operation of said lifting means.

7. An equipment mast as in claim 4 wherein the adjacent ones of said sections have apertures which match in height when the innermost section thereof is at its uppermost desired position, said releasable securing means being respective pins for said aperture.

8. An equipment mast as in claim 4 further including electric motor means for axially moving said lead screw.

9. An equipment mast as in claim 8 further including manual crank means for axially moving said lead screw whereby said electric motor means can be used to move said lead screw to within a few inches of the extremes of the path of travel thereof and the manual crank means can be used to move said lead screw said few inches.

10. An equipment mast as in claim 9 wherein said manual crank means is disengageable from said lead screw.

11. An equipment mast as set forth in claim 4 wherein said means for holding onto each of said protruding portions at different times comprises an expansible-contractile clamp.

12. An equipment mast as set forth in claim 11 wherein said clamp comprises a pair of arms pivotable with respect to one another about a vertical axis, resilient means biasing said arms away from one another and threaded means for urging said arms toward one another a selected distance against the action of said resilient means.

13. An equipment mast as set forth in claim 12 further comprising an annular collar secured to each of said telescopic tubular sections adjacent the upper end of each of said telescopic tubular sections, each collar having an exterior diameter larger than that of the tube to which it is secured; said clamp being selectively abuttingly engageable with the lower extent of each collar on said inner and intermediate sections to raise and lower said inner and intermediate sections.

14. An equipment mast as set forth in claim 13 wherein each collar extends significantly above the upper end of the tubular section to which it is secured, defining a lubricant receiving well with said upper end.

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