Dec. 11, 1951 H. W. RONFELDT 2,578,151

MAST TURNING GEAR MECHANISM

Filed Sept. 19, 1950

Fig. 1.

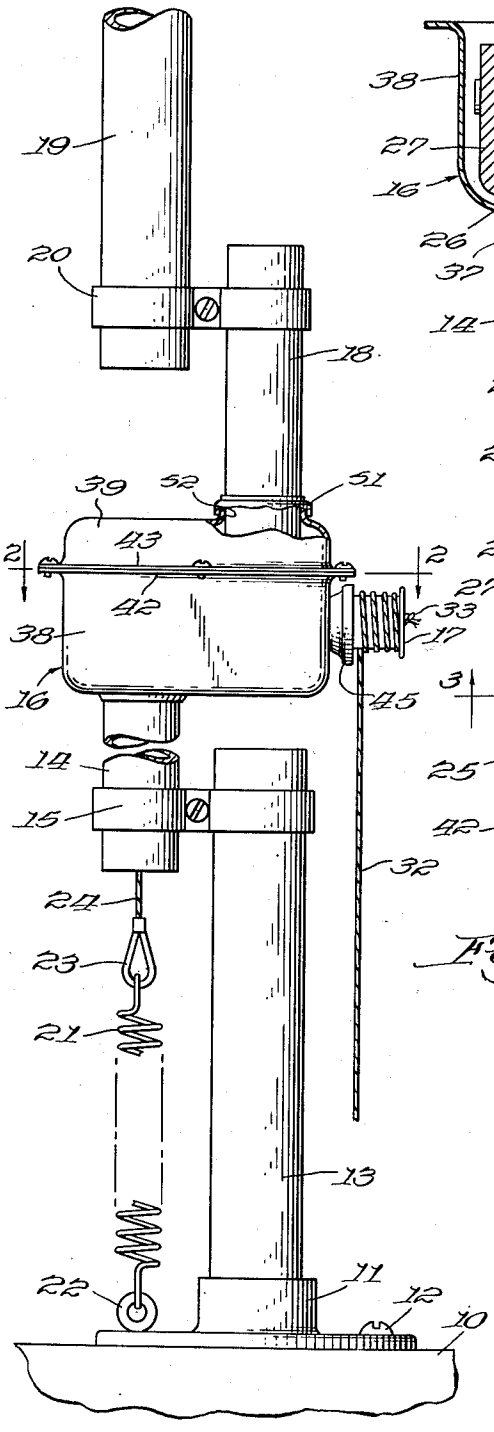


Fig. 3.

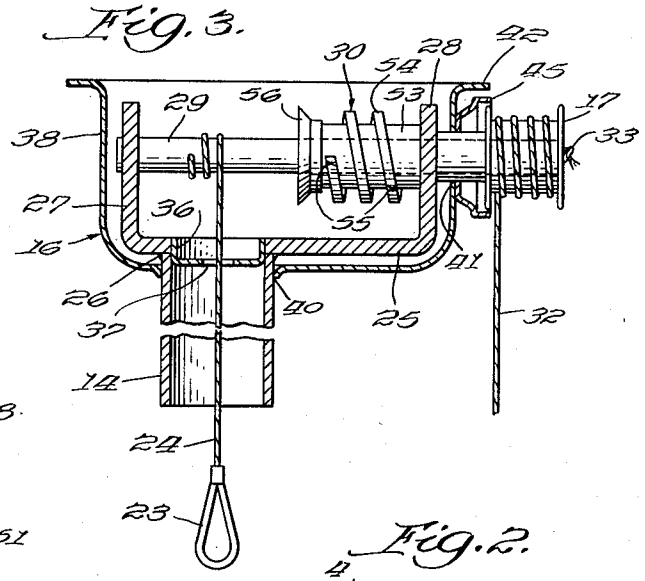


Fig. 2.

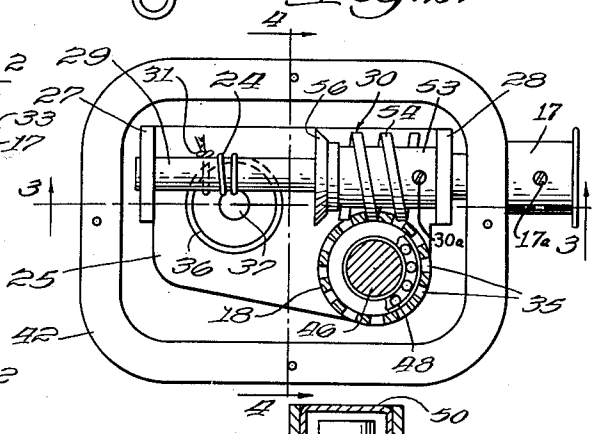
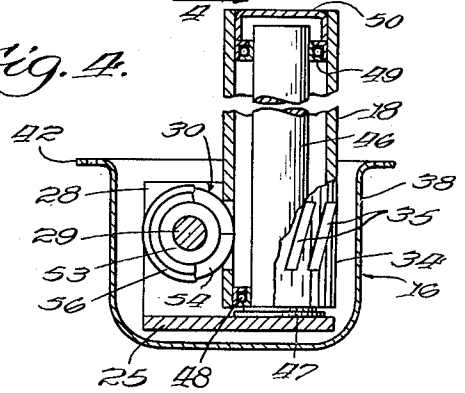


Fig. 4.



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MAST TURNING GEAR MECHANISM

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14 Claims. (Cl. 74—425)

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This invention relates to a new and improved mast turning gear mechanism.

An important object of this invention is to provide a gear mechanism capable of effectively rotating an antenna.

Another important object of this invention is the provision of a gear device for manually rotating an antenna and automatically locking the antenna against unwarranted rotation by wind or the like.

A further important object of this invention is to supply a fabricated worm gear drive mechanism for a mast turner.

A still further object of this invention is the provision of means for remotely operating a gear mechanism for rotation in either direction through at least a range of 360°.

Another and further important object of this invention is to provide a gear mechanism for use as a mast turner for television antennas and readily adaptable for insertion in and with the mast of a regular television antenna.

Another and still further important object of this invention is the means for fabricating an economical self locking gear reduction mechanism having a rigid supportng structure and an outer enclosing housing shielding the gear mechanism against the natural elements of rain and snow.

Still another object of this invention is the simple and economical fabricating of a worm gear and a worm wheel.

Other and further important objects of this invention will become apparent from the disclosures in the following specification and accompanying drawings.

In the drawings:

Figure 1 is an elevational view showing the adaptation of the mast turning gear mechanism of this invention.

Figure 2 is a sectional view taken on the line 2—2 of Figure 1.

Figure 3 is a sectional view taken on the line 3—3 of Figure 2.

Figure 4 is a sectional view taken on the line 4—4 of Figure 2.

As shown in the drawings:

The reference numeral 10 indicates generally a house roof or the like having a base socket 11 fastened thereto by means of screws or the like 12. A short post 13 is fixed in a relatively vertical position in the base socket 11 and it is this structure that remains stationary and about which a mast may be rotated.

With the advent of frequency modulation radio

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and television transmission there has arisen the necessity of having outside antennas and preferably antennas which may be beamed directly to the transmitting station in order to facilitate the best reception of the transmitted waves. The present day antennas are rather large in size and rotation thereof presents a serious problem. It is the purpose of the present invention to provide a gear mechanism which may be inserted into and with the existing mast of present antennas to accomplish rotational movement of the mast for directing of the antenna to any desired rotated position. In order to mount the gear mechanism of this invention into an existing antenna mast that mast must necessarily be cut at some location intermediate its top and bottom leaving the base and short stationary post 13 as shown in Figure 1. The mast turning gear mechanism of this invention is provided with a stationary tubular post 14 positioned closely adjacent the fixed post 13 which was previously the bottom of the antenna mast. A clamp 15 is provided for joining the two posts 13 and 14 so that the tubular member 14 is fixed relative to the stationary post 13 and thus constitutes the basic support for the gear mechanism of this invention.

A gear housing 16 is carried on the stationary tubular post 14 and by means of a cable winch 17 the device may be remotely operated to effect rotational movement of a post 18 projecting upwardly out of the gear housing 16 at a position spaced from and parallel to the downwardly projecting stationary post 14. The upper portion and now the main mast of the antenna to be rotated is designated by the numeral 19 and a clamp 20 joins the mast 19 with the rotatable post 18 which forms a part of the gear mechanism. An extension spring 21 is attached to a screw eye 22 engaging the roof 10 and at its other end is attached to an eye means 23 on the end of a cable 24 projecting downwardly through the tubular stationary post 14.

As best shown in Figures 2, 3 and 4 a supporting plate 25 is welded as shown at 26 to the stationary tubular supporting post 14. The plate 25 is equipped with laterally spaced and aligned upstanding posts or arms which form a journal support for a shaft 29 in the upper ends thereof. A worm 30 is fixed to the shaft 29 between the arms 27 and 28. The cable 24 is shown attached to the shaft 29 at 31 and it is thus apparent that the extension spring 21 supplies the rotational spring tension to the shaft 29. A cable for the purpose of effecting operation of the device is shown fastened to the cable winch 17 at 33. It

is of course obvious that the cable 32 may be routed to some remote position such as some place within the house located adjacent the television or radio receiver where it is desired to manipulate the rotational movements of the remotely positioned outside antenna. Pulling of the cable 32 will effect rotational movement of the winch 17 and thus also rotational movement of the shaft 29 as the winch is fixed thereto by a set screw 17a. The worm gear 30 is fastened to the shaft 29 by a set screw 30a and thus has concurrent movement with the winch 17.

The bottom portion 34 of the rotatable tubular post 18 constitutes a worm gear. A plurality of elongated slots 35 in the rotatable tubular post substantially vertically disposed and slightly inclined are annularly spaced at regular intervals about the tubular member 18. These slots are adapted to receive threads of the worm gear and thus rotation of the worm 30 effects rotational movement of the worm gear 34 and thus also the mast rotation member 18.

A cup 36 is press fitted into an opening in the plate 25 in alignment with the tubular stationary post 14 and the cup is equipped with a restricted aperture 37 in the bottom thereof. The aperture 37 is of such a size that the cable eye 23 may not pass therethrough. Thus as the cable 32 is pulled to unwind the initial winds placed on the winch 17 the winch is rotated causing the shaft 29 to rotate and simultaneously causing the cable 24 to be wound on the shaft 29 and the spring 21 extended. As spring 21 extends its tension increases, causing the shaft 29 to be urged in an opposite rotational direction. Thus when the cable 32 is "payed" out at a remote station the spring 21 will assist in the cable winding up on the winch 17 and the shaft 29 will rotate in a direction opposite to the direction of rotation occasioned by a pulling of the cable 32. With the assistance of the spring 21 and its association with the shaft 29 the gear device of this invention becomes a two-way operating mechanism. The mast turning rotatable post 18 may thus be rotated in either direction through a full range of 360 degree movement. The cable 24 is sufficiently long so that the eye 23 will not reach the restricted aperture stop 37 until the shaft 29 has been rotated sufficiently to cause more than the desired 360° of movement of the rotatable post 18

The gear housing 16 includes two portions, the lower portion 38 and an upper portion 39. The lower portion 38 is provided with an opening in the bottom thereof designated by the numeral 40 permitting passage of the stationary post 14. Similarly a side opening 41 permits passage of an extension of the shaft 29 which carries the cable winch 17 laterally outwardly of the housing 16. The lower portion 38 of the housing 16 is provided with an outwardly extending peripheral flange 42 and similarly the upper portion 39 of the housing is provided with a mating outwardly extending peripheral flange 43. The flanges 42 and 43 are placed in opposing position with respect to each other and are fastened together by means of screws 44 which hold the housing 16 as an integral unit. A bell shaped shield 45 is fastened to the lower portion 38 of the housing around the side opening 41 for the purpose of shielding the cable winch 17 from the flanges 42 and 43 and also to prevent the cable 32 from winding on that portion of the shaft 29 between the housing 16 and the winch 17.

A guide post 46 is formed integrally with the supporting plate 25 and extends upwardly into the combination rotatable post 18 and worm gear 34. A stepped base 47 is provided adjacent the post 46 and a ball bearing member 48 which is press fitted into the tubular post 18 is adapted to rest on the base 17 and maintain spacing and provide for frictionless rotation of the post 18 around the guide member 46. A second ball bearing unit 49 is spaced above the first bearing 48 and similarly assists in the easy rotation of the post 18. A cap 50 is positioned in the top of the rotatable tubular post 18 to keep the inside of the post dry and free from rain or snow. The cap 50 is press fitted within the post to make it integral therewith. A ring like hood 51 is press fitted over the post and is closely positioned over an opening 52 in the upper housing part 39 to shield the space between the rotatable post 18 and the housing 16 from the weather.

As best shown in Figure 3 the worm 30 comprises a core 53 which is fastened to the shaft 29 by any suitable means. Several convolutions of a helical spring designated by the numeral 54 are welded as shown at 55 to the worm core 53 and constitute the threads of the worm. A flange radially extending outwardly from the core 53 at one end thereof is designated by the numeral 56 and provides a shield preventing the cable 24 from becomnig entangled with the worm 30.

In operation the antenna mast turner is positioned in the regular mast of an antenna in such a manner that the stationary tubular post member 14 is clamped to the roof engaging bottom 13 of the regular mast and the rotatable post 18 is clamped to the upper portion of the antenna mast as shown at 19. The cable 32 may be pulled to rotate the cable winch 17 in one direction or may be let out to wind up on and rotate the winch 17 in the other direction by reason of the spring 21 acting on the shaft 29. The spring 21 is put under an initial tension so that the mast may be immediately rotated in both directions. Rotation of this winch 17 causes a concurrent rotation of the worm 30 and a similar rotation of the rotatable operating post 18. The principle of worm gearing provides that the worm shall be relatively easily rotatable, whereas the driven worm gear shall not of itself be rotatable but through rotation of the worm. Thus the worm gearing employed in this mast turner is ideal inasmuch as the wind or other external forces acting upon the antenna and urging the rotation of the mast will be halted due to the critical angle of the worm gear slots 35. Operation of the cable 32, that is a pulling or a letting out, causes rotation of the cable winch 17 and thus also rotation of the worm 30. Inasmuch as the post 18 and mast 19 are associated directly with the worm gear they will be held in locked position wherever the worm 30 is halted. In other words the employment of a worm type gearing insures a self-locking of the antenna in any desired directed position.

Numerous details of construction may be varied throughout a wide range without departing from the principles disclosed herein, and I therefore do not propose limiting the patent granted hereon otherwise than as necessitated by the appended claims.

What is claimed is:

1. A mast turning device comprising a supporting structure, said supporting structure having a plate, laterally disposed aligned upstanding arms formed integrally with said plate, a shaft journally mounted in said upstanding arms

for free rotation, a stationary cylindrical upstanding post integral with said plate, said post spaced outwardly from said shaft, a worm fastened to said shaft, a worm gear journally mounted on said stationary cylindrical upstanding post, means joining said worm gear to said mast, and means for rotating said shaft.

2. A device as set forth in claim 1 in which the means for rotating the shaft includes a cable winch fastened to said shaft.

3. A device as set forth in claim 2 in which a spring means is associated with said shaft and arranged to normally urge the return of the shaft to its original position.

4. A mast turning device comprising a main supporting plate, said plate having a pair of spaced apart aligned upstanding arms, a shaft journaled in said arms, a stationary post integral with said plate and positioned adjacent said shaft, a rotatable tubular post journally mounted on said stationary post, said rotatable tubular post having an annular ring of spaced slots substantially vertically disposed in an end of the rotatable tubular post lying adjacent said shaft, a worm fastened to said shaft and cooperatively engaging the slots of said rotatable tubular post, and means for rotating said shaft whereby the worm causes rotation of said rotatable tubular post in the manner of a worm gear.

5. A device as set forth in claim 4 in which the means for rotating the shaft includes a cable winch.

6. A device as set forth in claim 5 in which a spring means is associated with the shaft spaced from the cable winch whereby the cable winch will operate in either direction.

7. A device as set forth in claim 6 in which the spring means includes a cable fastened to said shaft, a spaced apart stationary support, and an extension spring fastened to said stationary support and said cable.

8. A device as set forth in claim 7 in which the supporting plate has an opening therethrough, said cable movable through said supporting plate opening, and means associated with said cable for limiting passage of said cable through said opening.

9. A device as set forth in claim 8 in which the means associated with the cable includes an eye on said cable to receive said extension spring.

10. A mast turning device comprising a stationary tubular post, a plate fixed to said stationary tubular post, a pair of laterally spaced arms on said plate, a shaft journaled on said arms, a worm fastened to said shaft, a stationary post integral with said plate and located adjacent said worm parallel to and spaced from said stationary tubular post, a worm gear journally mounted on said stationary post and cooperatively engaging said worm, and cable winch means mounted on said shaft spaced outwardly of said pair of laterally spaced arms for rotating said worm.

11. A device as set forth in claim 10 in which the worm gear includes an upwardly extending elongated tubular rotatable member.

12. A device as set forth in claim 11 in which an extension spring means is in cooperative engagement with said shaft and projects downwardly through said stationary tubular post.

13. A device as set forth in claim 12 in which an enclosing housing is provided over the plate and associated worm and worm gear, said housing having openings for the downward passage of said stationary tubular post, the shaft carrying the cable winch, and the upwardly extending elongated tubular rotatable member.

14. A device as set forth in claim 13 in which the housing includes two pieces each having peripheral flanges and screw means joining the flanges together.

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