

June 17, 1958

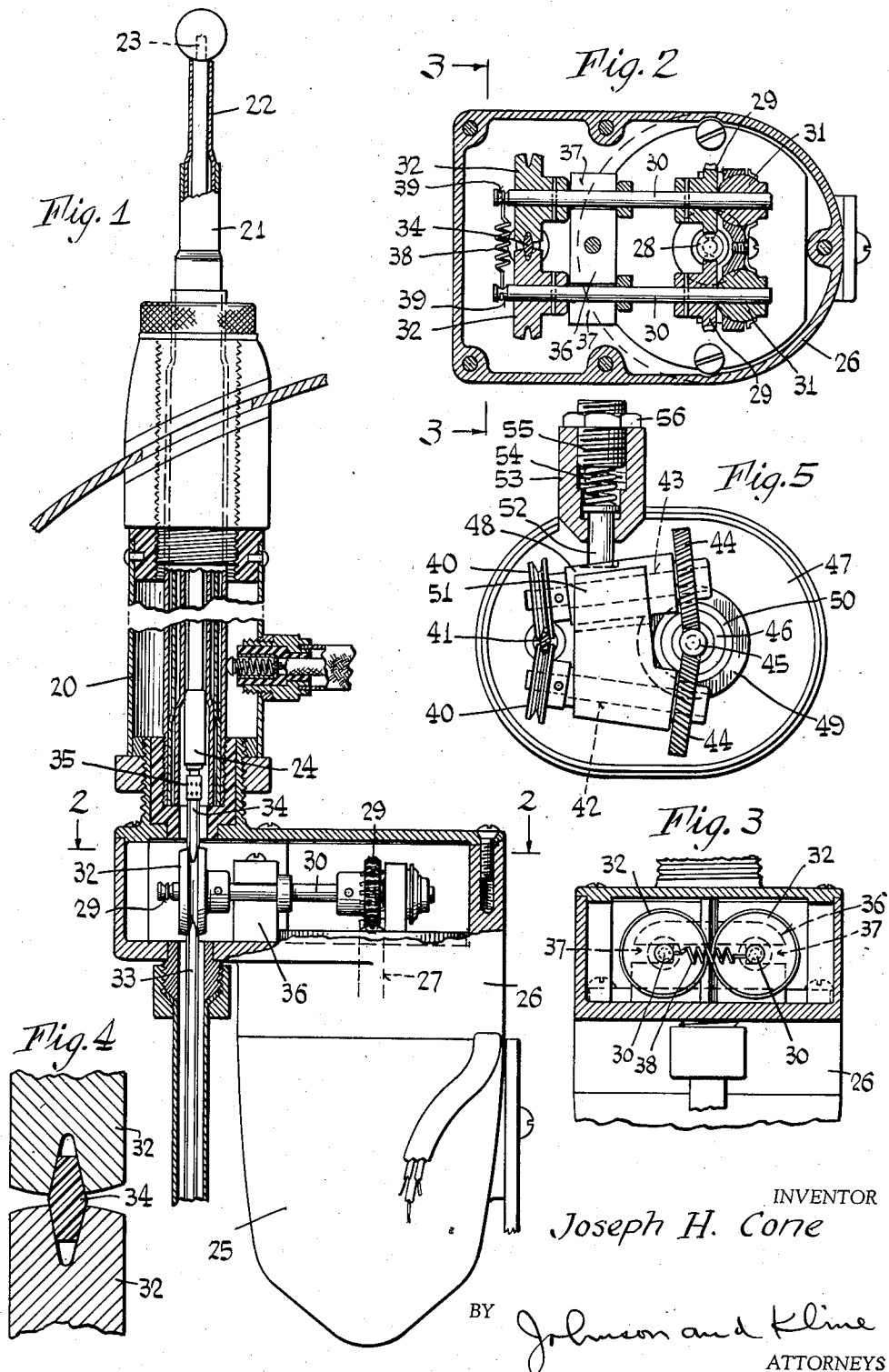
J. H. CONE

2,838,953

POWER-OPERATED RADIO ANTENNA

Filed Oct. 8, 1953

3 Sheets-Sheet 1



June 17, 1958

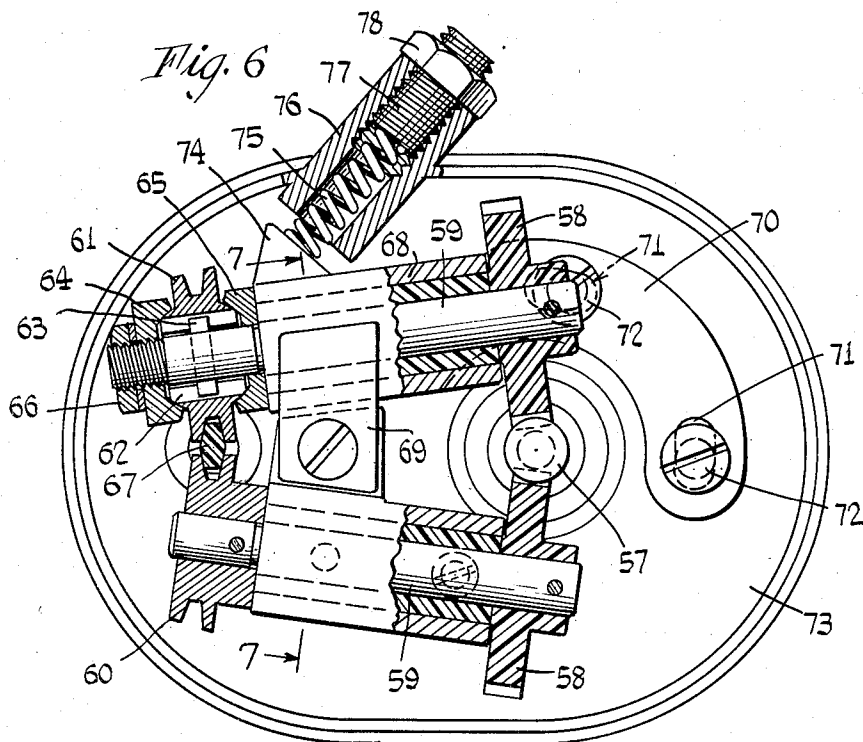
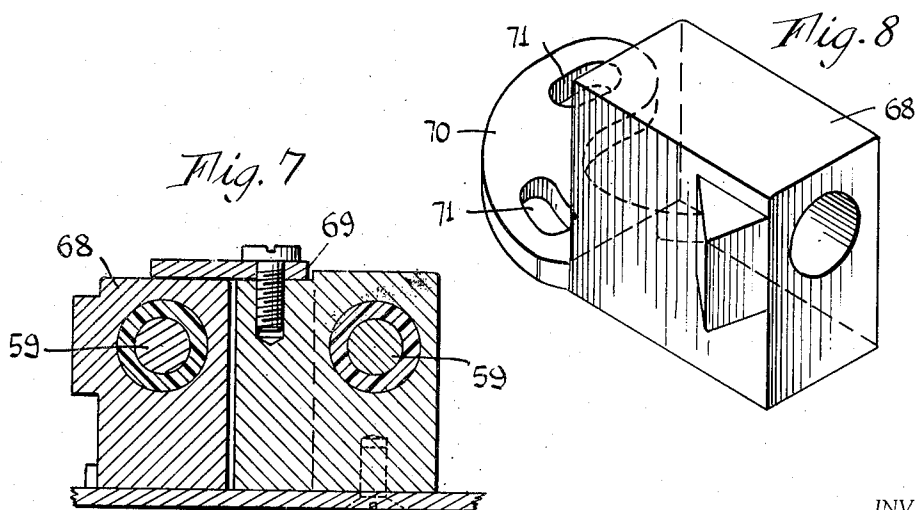
J. H. CONE

2,838,953

POWER-OPERATED RADIO ANTENNA

Filed Oct. 8, 1953

3 Sheets-Sheet 2



INVENTOR

Joseph H. Cone

BY

Johnson and Kline
ATTORNEYS

June 17, 1958

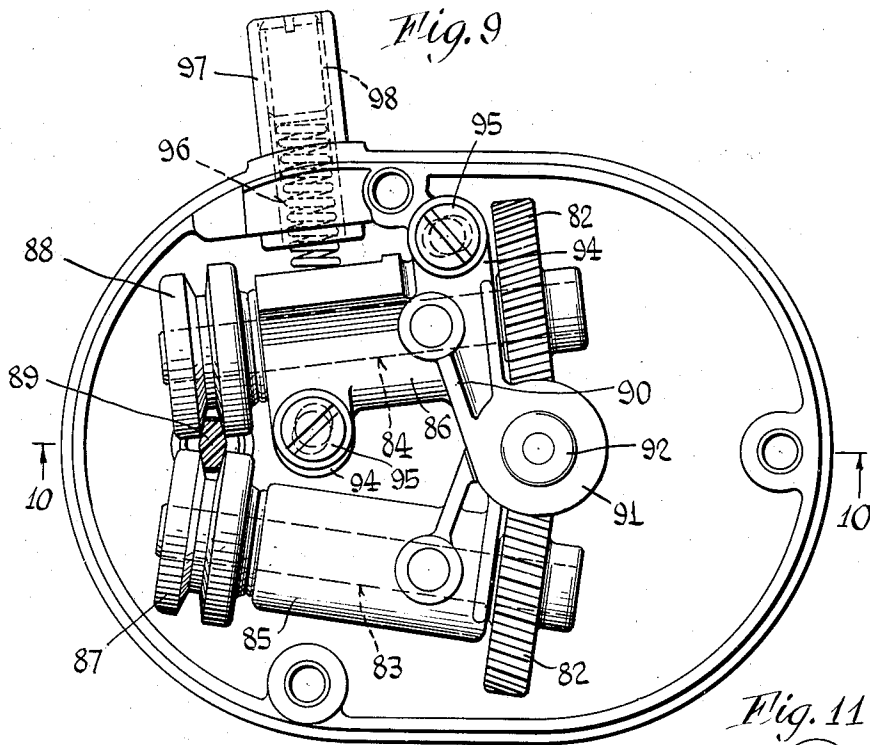
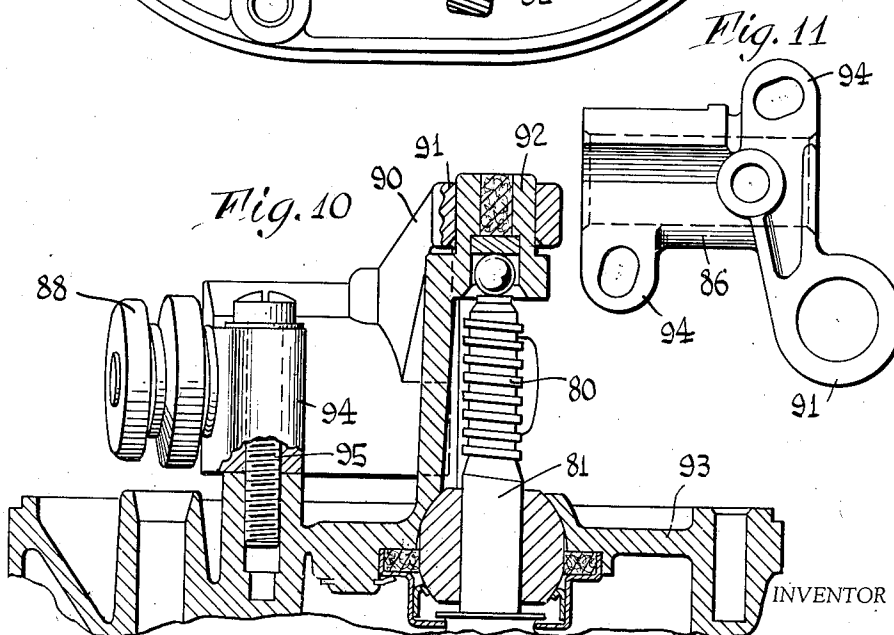
J. H. CONE

2,838,953

POWER-OPERATED RADIO ANTENNA

Filed Oct. 8, 1953

3 Sheets-Sheet 3



INVENTOR

Joseph H. Cone

BY

Johnson and Kline
ATTORNEYS

1

2,838,953

POWER-OPERATED RADIO ANTENNA

Joseph H. Cone, Bridgeport, Conn., assignor to Casco Products Corporation, Bridgeport, Conn., a corporation of Connecticut

Application October 8, 1953, Serial No. 384,823

12 Claims. (Cl. 74—501)

This invention relates to retractable and extendible telescopic radio antennas, and more particularly to power-operated antennas of this type, such as are used in automobiles and the like.

This application is a continuation in part of my copending application, Serial No. 18,253, filed March 21, 1948, now Patent No. 2,695,957, granted November 30, 1954. In this copending application there is shown a telescopic radio antenna in which the antenna sections or rods are actuated by a flexible, elongate driving strip which passes between a pair of juxtaposed friction driving wheels to be frictionally advanced and retracted thereby. To satisfy various space requirements, the driving strip is housed in a hand-bendable tubular metal sheath when the antenna sections are in retracted positions, the sheath being bendable into various shapes as might be required for different installation. The elongate driving strip is preferably of insulating plastic material such as nylon (synthetic fiber-forming polymeric amide) whereby the capacity-to-ground of the antenna sections may be kept at a desirable low figure. By virtue of the friction drive, the use of limit switches and the like to automatically shut off the power when the antenna sections are fully extended or retracted is obviated, since slippage may intentionally occur between the friction wheels and the driving strip without harm to the apparatus.

In one form of the invention disclosed in my aforesaid copending application, the friction drive wheels are spring-urged toward the driving strip and held in engagement therewith under spring pressure, thereby effecting a predetermined friction and controlling the slippage of the wheels on the strip, and an object of the present invention is to provide an improved spring-charged friction driving mechanism for a power-operated antenna, whereby a predetermined desired friction may be readily established and maintained in the drive, regardless of variations in the manufacture of the component parts.

Another object of the invention is to provide an improved frictional antenna drive as above set forth, in which the friction may be readily changed or regulated after the antenna has been installed, to suit different conditions of use and/or compensate for wear.

Yet another object of the invention is to provide an improved frictional antenna drive in which adjustment of the friction may be quickly and easily accomplished without dismantling parts or requiring any complicated or lengthy servicing operation.

A feature of the invention resides in the provision of an improved frictional antenna drive wherein the adjusted friction will normally be maintained substantially constant throughout the period of use of the antenna.

A still further object of the invention is to provide an improved frictional antenna drive in accordance with the above, which is simple in construction and economical to fabricate, and reliable in operation at all times.

Other features and advantages will hereinafter appear.

In the accompanying drawings:

Figure 1 is a fragmentary side view of the improved

2

telescoping antenna and friction drive of the invention, some of the components being shown in elevation and other components in vertical section.

Fig. 2 is a horizontal section taken on line 2—2 of Fig. 1.

Fig. 3 is a fragmentary vertical section taken on line 3—3 of Fig. 2.

Fig. 4 is an enlarged fragmentary horizontal sectional view taken through the flexible driving member and the friction wheels engaging the same.

Fig. 5 is a view like Fig. 2, but showing a modification of the invention wherein one friction driving pulley is spring-charged or urged against the flexible driving strip.

Fig. 6 is a view, enlarged, like Figs. 2 and 5 but showing another modification of the invention wherein a different spring arrangement and bearing mounting is provided.

Fig. 7 is a fragmentary vertical sectional view taken on line 7—7 of Fig. 6.

Fig. 8 is a perspective view of the movable bearing block of Fig. 6.

Fig. 9 is a view like Figs. 2, 5 and 6 but illustrating yet another modification of the invention wherein a friction drive has spring force applied to one of the driving wheels.

Fig. 10 is a view partly in vertical section and partly in elevation of the friction drive, the section being taken on line 10—10 of Fig. 9.

Fig. 11 is a top or plan view of the movable bearing block of Figs. 9 and 10.

The improved power-operated antenna shown in Figs. 1—4 comprises an elongate upright tubular housing 20 in which are retractably mounted telescoping antenna sections 21, 22 and 23, the section 21 being outermost and the section 23 innermost. As is well understood, the sections 21, 22 and 23 may be extended upward from the retracted position shown in Fig. 1, to provide maximum signal pickup for the antenna, such movement being effected by application of upward force on the lower end 24 of the innermost section 23.

Power means for applying such force comprises an electric motor 25 mounted on a casing 26 which is secured to the lower end of the tubular upright housing 20. The motor 25 has a drive shaft 27 provided with a worm 28 engaging worm wheels 29 rigidly carried on shafts 30, the latter being supported in self-aligning bearings 31 secured in the casing 26. The shafts 30 rigidly carry opposed friction wheels 32 engaging opposite sides of a flexible elongate driving strip 33 of nylon or equivalent, the driving strip 33 at its upper end 34 being connected to the lower end 24 of the antenna section 23 by a coupling 35. Raising of the driving strip 33 will extend the antenna sections 21, 22 and 23, and lowering of the driving strip 33 will retract the antenna sections.

In accordance with the present invention, in conjunction with the dual drive involving the shafts 30, the latter are mounted for relative movement toward and away from each other and are spring-charged or urged towards each other to provide a predetermined controlled friction between the friction drive wheels 32 and the driving strip 33. To accomplish this a bearing block 36 is provided in the casing 26, having slot 37, Fig. 3, to accommodate the shafts 30, and a helical extension spring 38 is provided, having its ends carried in annular grooves 39 formed in the end portions of the shafts 30. The extension spring 38 is formed to have a uniform, closely-controlled length between its ends, and when the spring is placed on the ends of the shafts 30 it will charge the friction wheels 32 and maintain a predetermined, substantially constant force between the wheels and the

3

driving strip 33. This force will be substantially independent of manufacturing tolerances and small variations in the dimensions of the drive wheels 32 and the driving strip 33, since such variations account for a difference in spacing of the shafts 30 on the order of only several thousands of an inch, and the spring force will not vary materially with such small differences of position.

The provision of such a predetermined force between the drive wheels of the driving strip is of considerable advantage in a power-operated antenna, since it enables the operation of the antenna to be uniform and reliable and obviates the necessity for limit switches and other devices to shut off the power when the sections become either fully extended or fully retracted. For such extended and retracted positions of the antenna sections, slippage will occur between the friction wheels 32 and the drive strip 33, and the motor 25 may therefore continue to turn without damage to the apparatus. Moreover, by the provision of the proper friction between the drive wheels 32 and driving strip 33 variations in the load represented by the antenna sections will not normally result in failure of the antenna to operate when being extended or retracted. Dirt or other foreign matter which might become deposited on the antenna sections, resulting in a greater load, will ordinarily not be sufficient to overcome the friction between the drive wheels 32 and the driving strip 33, and the same applies for snow, sleet, etc. Therefore reliability in the operation of the antenna is had with a minimum of components or parts. The tension of the spring 38 on the shafts 30 may be predetermined at the time of assembly of the antenna, and will remain substantially constant during the use of the device.

Under certain circumstances it will be found desirable to adjust or vary the frictional force between the drive wheels and driving strip of the antenna, and also where it is desired to facilitate initial adjustment and re-adjustment of the tension during fabrication of the antenna, an adjustable tension device may be provided, as illustrated in Fig. 5. With the embodiment of the invention shown in this figure, the entire antenna may be assembled prior to adjustment of the friction of the driving mechanism, and this obviates the necessity of dismantling parts if initial adjustment should for some reason inadvertently change or be incorrect. As shown, the adjustable friction drive in Fig. 5 comprises friction wheels 40 engaging opposite sides of a flexible elongate driving strip 41, the wheels being carried on divergent shafts 42 and 43, said shafts in turn mounting worm wheels 44 engaging a worm 45 driven by a motor 46 mounted on a casing 47.

The shaft 43 is carried in a bearing sleeve 48 having secured to a side wall and laterally projecting therefrom a collar 49. The collar 49 fits around and bears on a ring 50 which is rigid with the motor 46, and such mounting enables the bearing sleeve 48 to have an arcuate movement about the worm 45 as a center. The bearing sleeve 48 moves in a bifurcated guide member 51 secured to the casing 47, and is spring-charged by engagement with a plunger 52 carried in a tubular member 53 rigid with the casing 47. Within the member 53 there is a helical compression spring 54 engaging at one end the plunger 52 and at its other end an adjusting screw 55 threaded in the member 53 and locked by a nut 56. The spring 54 thus charges the bearing sleeve 48 and the upper one of the friction drive wheels 40, and maintains both the drive wheels 40 in pressing engagement with the driving strip 41. Adjustment of the frictional force existing between the friction wheels 40 and the driving strip 41 is accomplished by setting the adjusting screw 55 in either deeper or shallower positions in the tubular member 53, and such adjustment may be readily effected from outside of the casing 47, after the antenna has been completely assembled. The amount of friction may be readily gauged by the simple operation of connecting a scale to the antenna sections and running the motor 46

4

to cause slippage of the drive wheels to occur. The scale reading is then noted, and the desired pull obtained by turning the adjusting screw 55.

A modified form of adjustable friction drive made in accordance with the invention is shown in Figs. 6, 7 and 8. The operation of this form is generally similar to that just described for the structure of Fig. 5, but the one friction wheel is made self-aligning to prevent binding, and the structures of the parts are somewhat different. In Figs. 6 through 8 a motor driven worm 57 drives worm gears 58 mounted on divergent shafts 59 carrying friction drive wheels 60 and 61. The drive wheel 61 has a ball-shaped hub 62 keyed to the shaft 59 by splines 63, the hub 62 being carried in a two-part socket comprising socket halves 64 and 65 and the assembly being maintained by a nut 66 threaded on the end of the shaft 59. The nut 66 may be secured against turning by any suitable means, such as staking the end of the shaft, etc. By the ball and socket mounting of the friction wheel 61, the wheel can within limits align itself properly with respect to the driving strip 67, thereby to avoid binding or other stresses which might impair smooth operation of the friction drive.

The shaft 59 carrying the wheel 61 is rotatable in a bearing sleeve 68 movable in a bifurcated guide 69 and carried by an arcuate extension 70 having slots 71 receiving posts 72 in the form of screws upstanding from the casing 73.

The bearing sleeve 68 has a sloping-faced lug 74 engaged by a helical compression spring 75 carried in a tubular member 76, the compression spring 75 being backed by an adjusting screw 77 secured by a lock nut 78.

The arcuate extension 70 and the bifurcated guide 69 enable the bearing sleeve 68 to have arcuate movement, and enable the friction wheel 61 to be moved toward or away from the driving strip 67; the compression spring 75 normally holds the friction wheels 60 and 61 in pressing engagement with the driving strip 67. Adjustment of the friction force on the driving strip 67 is effected by changing the setting of the adjusting screw 77, and such change may be effected from outside of the casing 73 and after assembly of the antenna.

Another modification of the invention is shown in Figs. 9 through 11. In these figures a worm 80 carried on a motor shaft 81 drives worm gears 82 mounted on shafts 83 and 84, said shafts being rotatably carried respectively in bearing sleeves 85 and 86 and having friction wheels 87 and 88 engaging opposite sides of a driving strip 89.

The bearing sleeve 86 has an upward and angularly extended arm 90 provided with a collar 91 surrounding and bearing on a bearing post 92 secured to a motor casing 93. The bearing sleeve 86 has slotted guides 94 on its opposite sides, receiving posts 95 in the form of screws mounted on the casing. By this organization the bearing sleeve 86 is enabled to have limited arcuate movement about the axis of the worm 80. The bearing sleeve 86 is spring-charged by a helical compression spring 96 carried in a tubular member 97 having an adjusting screw 98 threaded into it. Adjustment of the frictional force existing between the drive wheels 87, 88 and the driving strip 89 is effected by screwing in or out the adjustment screw 98, which varies the force of the compression spring 96. The three point mounting of the bearing sleeve 86 comprising the slotted guides 94 and the collar 91 provide for smooth movement of the bearing sleeve and enable the spring 96 to effectively control the friction of the drive wheels 87 and 88, and contributing to this is the disposition of the collar 91, said collar being out of the plane of and offset upward with respect to the slotted guides 94. The movement of the bearing sleeve 86 will be free of binding, and will respond to variations in the dimensions of the drive wheels 87, 88 and driving strip 89.

Variations and modifications may be made within the

scope of the claims and portions of the improvements may be used without others.

I claim:

1. An antenna having an elongate, longitudinally extendible and retractable section and a uniformly thick driving strip connected to said section to actuate the same, a pair of juxtaposed drive wheels engaging opposite sides of the strip to drive the strip axially; shafts driving said wheels respectively; worm wheels driving the shafts respectively; a single worm extending between and engaging the worm wheels for turning the latter and the drive wheels in opposite directions whereby driving force is applied to opposite sides of the driving strip to raise and lower the antenna sections; means located adjacent said worm wheels for mounting said shafts for movement toward or from each other while the worm wheels and worm remain engaged; and resilient means, normally urging the shafts and drive wheels carried thereby toward each other, causing the driving strip to be frictionally engaged by said drive wheels under a predetermined constant pressure enabling intentional slippage between said strip and wheels to occur when a predetermined load on the strip is exceeded.

2. An antenna having an elongate, longitudinally extendible and retractable section and a uniformly thick driving strip connected to said section to actuate the same, a pair of juxtaposed drive wheels engaging opposite sides of the strip to drive the strip axially; shafts driving said wheels respectively; worm wheels driving the shafts respectively; a single worm extending between and engaging the worm wheels for turning the latter and the drive wheels in opposite directions whereby driving force is applied to opposite sides of the driving strip to raise and lower the antenna sections; means located adjacent said worm wheels for mounting said shafts for movement toward or from each other while the worm wheels and worm remain engaged; resilient means, normally urging the shafts and drive wheels carried thereby toward each other, causing the driving strip to be frictionally engaged by said drive wheels under a predetermined constant pressure enabling intentional slippage between said strip and wheels to occur when a predetermined load on the strip is exceeded; and means located adjacent the drive wheels for guiding said shafts in their movements toward or away from each other.

3. In a friction drive mechanism for an antenna of the type having an elongate longitudinally extendible and retractable antenna section, an elongate uniformly thick driving strip adapted to be connected to said section to actuate the same; a pair of juxtaposed, rotatable, friction drive wheels engaging opposite sides of the driving strip to move the strip axially; means mounting one of said drive wheels for movement transversely of its axis in directions toward and away from the driving strip; spring means acting on said mounting means, continuously holding the latter in a position charging said one drive wheel and maintaining the same in frictional engagement with said drive strip under a predetermined constant continuous force enabling intentional slippage between said strip and wheels to occur when a predetermined load on the strip is exceeded; and means for adjusting said spring means to vary the force exerted by it on said mounting means.

4. The invention as defined in claim 3 in which there is a worm wheel rigidly connected to the spring-charged drive wheel for driving the latter, in which there is a worm driving said worm wheel, and in which there are bearing means mounting said drive wheel and worm wheel for rotation, said bearing means being arcuately movable through an arc having its center substantially at the axis of the worm and comprising the means mounting the said one drive wheel for translational movement.

5. The invention as defined in claim 4 in which there is a shaft carrying the worm, in which the bearing means comprises a bearing sleeve having a collar attached to it and projecting laterally from it, said collar extending around the axis of the said shaft.

6. The invention as defined in claim 5 in which the spring means comprises a helical coil compression spring having one end operatively connected with the bearing sleeve and in which there is an adjusting screw operatively connected to the other end of the coil spring, to adjust the compression thereof.

7. The invention as defined in claim 4 in which the bearing means comprises a bearing sleeve having a lateral extension projecting therefrom, provided with slots lying in a circle, and in where there are means engaged in the slots of said extension, mounting the sleeve for said arcuate movement.

8. The invention as defined in claim 4 in which the bearing means comprises a bearing sleeve having a collar projecting from a side wall of the sleeve, in which there is a bearing post passing through said collar with its axis aligned with the worm to provide for arcuate movement of the bearing sleeve, and in which there is a slotted guide on said bearing sleeve and a post extending into the slot of the guide to provide additional support for the bearing sleeve.

9. The invention as defined in claim 4 in which the bearing means comprises a bearing sleeve having a collar projecting from a side wall of the sleeve, in which there is a bearing post passing through said collar with its axis aligned with the worm to provide for arcuate movement of the bearing sleeve, and in which there are slotted guides on the bearing sleeve, and posts extending through the slots of the guides, providing additional support for the sleeve.

10. The invention as defined in claim 9 in which the slotted guides are disposed on opposite sides of the bearing sleeve, and in which the collar is disposed at one of said sides of the sleeve and is offset with respect to the slotted guide at said one side.

11. The invention as defined in claim 3 in which there is a casing, said driving strip and friction wheels being mounted in the casing, and in which the means for adjusting the spring means comprises a movable member exposed for actuation at the exterior of the casing.

12. An antenna having an elongate, longitudinally extendible and retractable section and an elongate uniformly thick driving strip connected to said section to actuate the same; a pair of juxtaposed friction drive wheels engaging opposite sides of the driving strip to move the strip axially, one of said drive wheels being shiftable transversely of its axis towards and away from the driving strip; spring means yieldably holding said one drive wheel in engagement with said driving strip under a predetermined constant continuous force enabling intentional slippage between said strip and wheels to occur when a predetermined load on the strip is exceeded; and means for adjusting said spring means to vary the force exerted by it on said drive wheel.

References Cited in the file of this patent

UNITED STATES PATENTS

297,407	Jenkins	Apr. 22, 1884
871,110	Comings	Nov. 19, 1907
1,703,613	De Von	Feb. 26, 1929
1,764,665	Wennerberg	June 17, 1930
1,788,861	Crawford	Jan. 13, 1931
1,877,765	Jeffreys	Sept. 20, 1932
2,294,362	Brach	Sept. 1, 1942
2,351,535	Oakley et al.	June 13, 1944
2,384,631	Mace	Sept. 11, 1945
2,590,484	Youhouse	Mar. 25, 1952