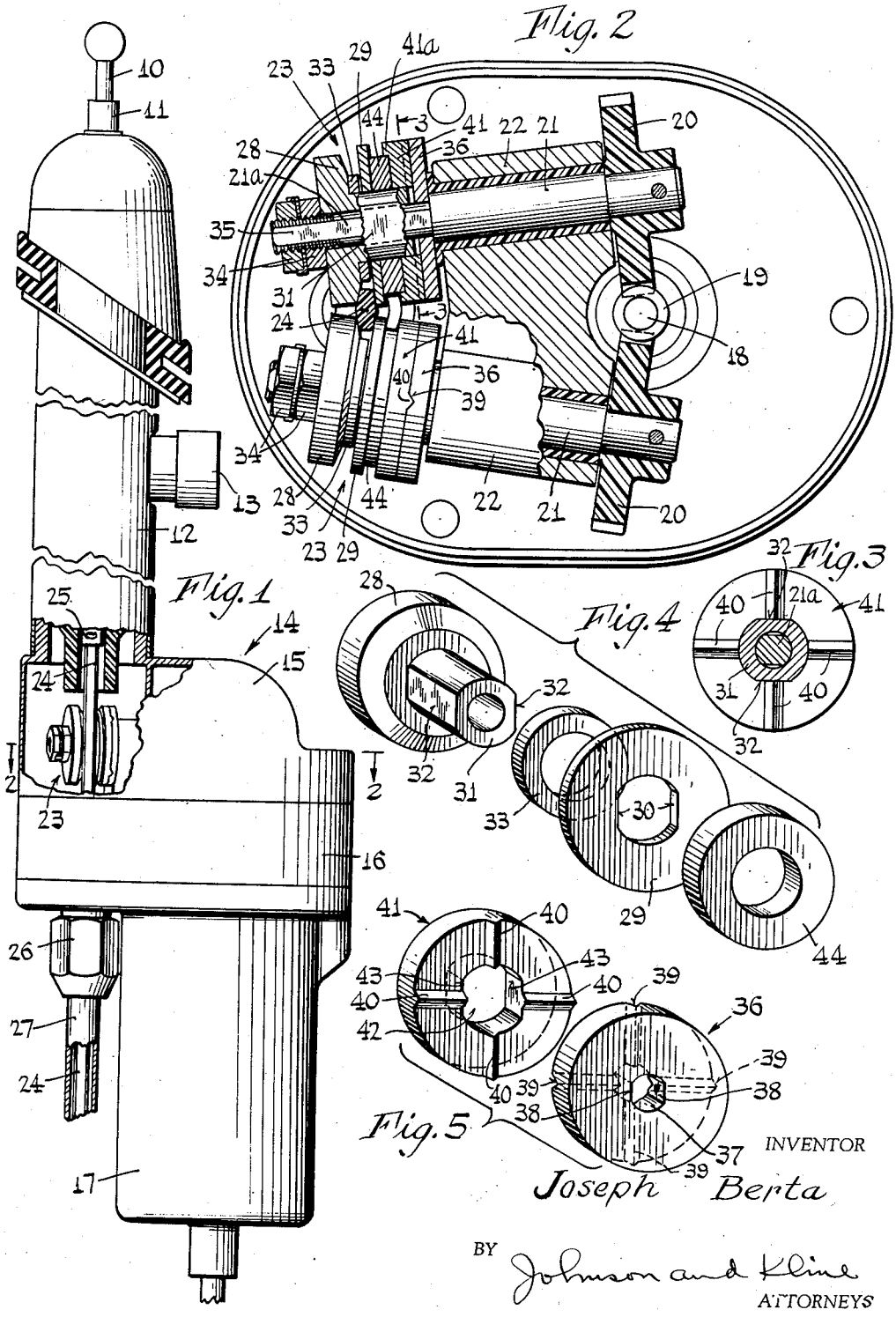
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EXTENDABLE ANTENNA

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EXTENDABLE ANTENNA

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This invention relates to extendable and retractable antennas for receiving radio waves and the like, and more particularly to antennas of this type which are actuated by a friction driving mechanism.

Friction driven antennas having telescopic sections are now in common everyday use in automobiles and other conveyances; one such antenna utilizes a flexible driving rod of plastic insulating material such as nylon (synthetic fiber-forming polymeric amide) connected to the movable antenna sections, said rod being driven by opposed friction wheels located on opposite sides of the rod.

I have found that when such atennas are first put in use the frictional drive is adequate to take care of the load imposed by the friction and weight of the antenna sections, but that the effect of weather or other adverse conditions may cause a substantial increase in the frictional load of the telescoping sections whereby the driving friction is insufficient to properly operate the antenna. For example, frost on the sliding surfaces of the antenna sections, or foreign matter such as dirt, dust, gum, etc., will increase the load and the resistance to movement to a point where the friction drive is no longer properly adjusted to effectively move the antenna sections.

An object of the present invention is to provide an improved friction drive for an extendable antenna, which is so constituted that increased loading or resistance of the antenna sections to movement will result in increased friction of the driving mechanism, thereby to enable the drive to effectively move the antenna sections under widely varying load conditions.

In accomplishing the above object I provide an improved antenna drive comprising opposed movable members engaging the plastic driving strip of the antenna, and comprising means which automatically increases the pressure or force exerted by the members on the driving strip in accordance with increases in the load imposed on the drive by the antenna sections. The movable members are preferably drive wheels, and may be either hand-powered or motor-driven, the latter method being illustrated and described herein.

In the specific embodiment of the invention illustrated herein each driving wheel is formed of two relatively movable halves engaging opposed surfaces of the driving strip, and a cam arrangement is provided which reduces the spacing between the movable halves as the resistance to turning of the driving wheel increases, thereby to cause the driving wheel to more forcefully grip the driving strip. The cam means comprises a pair of disks provided with grooves and ribs having sloping engaging surfaces by which relative rotary movement between the disks is accompanied by relative axial separating movement, one of said disks being operatively connected with one pulley half to shift the latter axially toward the other pulley half.

A further object of the invention is to provide an improved friction drive with automatically controlled friction as above set forth, which is simple and economical

in its construction, and effective and reliable in operation.

A feature of the invention resides in the provision of simplified pulley and cam components which are telescoping and are keyed together to enable both halves of each pulley to apply the variable driving force to the driving strip as controlled by the cam means.

Other features and advantages will hereinafter appear.

In the accompanying drawings:

Figure 1 is a fragmentary side elevational view of an improved power-driven telescoping mast antenna made in accordance with the invention, portions of the antenna being broken away and/or shown in section for the purpose of clarity of illustration.

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

Fig. 3 is a fragmentary sectional view taken on line 3—3 of Fig. 2.

Fig. 4 is an exploded perspective view of a pulley assembly.

Fig. 5 is an exploded perspective view of the camming disk assembly.

The antenna shown in Fig. 1 comprises telescoping antenna sections **10** and **11** mounted in a tubular casing **12** having electrical terminal means **13**, the casing **12** being attached to a housing **14** having an upper housing portion **15** and a lower housing portion **16**, the latter including a depending extension **17** in which an electric motor (not shown) is carried.

Referring to Fig. 2, the antenna drive has a motor shaft **18** carrying a worm **19** engaging a pair of worm wheels **20** which drive shafts **21** mounted in sleeve bearings **22** of the housing portion **16**. The shafts **21** mount opposed friction wheels or sheaves **23** which engage a driving strip **24**, preferably formed of nylon, the strip **24** being connected by a coupling **25** with the antenna section **10** for the purpose of raising and lowering the latter.

The lower casing portion **16** has a fitting **26** to which a tubular sheath **27** is secured, the fitting and sheath being arranged to receive and house the driving strip **24** when the antenna is in retracted position as shown in Fig. 1.

Each of the friction drive wheels **23** comprises a pair of relatively axially movable halves **28** and **29**, the half **29** being in the form of a washer having flats **30** in its bore. The pulley half **28** includes an axially-extended shank **31** which passes through the bore of the washer **29** and has flats **32** engaging the flats **30** of the washer whereby the latter is keyed to the pulley half **28**. A spacing washer **33** is carried on the shank **31** to space the pulley half **29** from the pulley half **28**. The shafts **21** of the drive are threaded and carry lock nuts **34** by which the pulleys or wheels **23** are secured to the shafts.

In accordance with the present invention means are provided by which the pulley halves **28** and **29** are made to grip the friction drive strip **24** more forcefully when the resistance of the strip to movement increases, as would be occasioned by increased load imposed by the telescoping antenna elements **10** and **11**. Such increased load might be due to the formation of frost on the antenna elements, or a depositing of dirt, gum or other foreign matter which would increase the friction normally existing in the telescoping sections.

Referring to Fig. 2 the shafts **21** have reduced portions **21***a* on which the drive wheels **23** are carried, said reduced portions having flats **35** and carrying driving and camming disks **36** having bores **37** with flats **38** by which the disks are keyed to the reduced shank portions **21***a*. The disks **36** have V-grooves **39** which receive sloping-faced ribs **40** of cam disks **41** which are carried by the shanks **31** of the pulley halves **28**. The camming disks **41** have bores **42** provided with flats **43** by which the disks are keyed to the shanks **31** so as to drive the pulley halves **28** and **29** thereby.

Interposed between each cam disk **41** and pulley half **29** is a washer **44** which may be of metal or fiber, or of resilient rubber. The washer **44** transmits force axially from the cam disk **41** to the pulley half **29**, and normally prevents separation of the pulley halves **28** and **29** a distance greater than that shown in Fig. 2 when the antenna is operating under normal load conditions. For such conditions a predetermined frictional force exists between the pulley halves **28**, **29** and the friction driving strip **24**, such friction being sufficient to operate the antenna section **10** when raising or lowering the antenna. If for any reason the antenna sections should have their relative movement impeded as by the formation of frost, gum, foreign matter, etc., which increases the friction between the sections, then the driving strip **24** would more strongly resist the driving force of the pulleys **23**. This will cause relative angular movement between the pulleys and cam disk **41** on the one hand, and the driving cam disk **36** on the other hand, and due to the camming action of the ribs **40** and grooves **39** the disk **41** will be forced axially to the left as viewed in Fig. 2, thereby causing the pulley halves **29** to increase their pressure on the driving strip **24**. Thus greater driving force will be imparted from the motor spindle **18** to the driving strip **24**, and I have found that such greater force is adequate to take care of increased loads on the antenna section as set forth above. In consequence, the operation of the antenna will be reliable even under the adverse conditions of use.

Moreover, the construction set forth above comprising the camming disks **36** and **41** and the pulley halves **28** and **29**, together with the flatted and telescoping parts, is extremely simple and rugged, and will withstand severe usage. If the force-transmitting washer **44** be made of resilient rubber, then it is preferred that the cam disk **41** have a peripheral flange **41***a* to contain the washer **44**. A somewhat yielding action is obtained by making the washer **44** resilient, which is advantageous when variations in the thickness or cross section of the drive strip **24** are encountered.

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. In an extendable and retractable antenna, a friction drive comprising a longitudinally movable strip; a pair of opposed, spaced, movable members engaging between them and under continuous force oppositely disposed surfaces of said strip for advancing and retracting the strip; actuating means connected to one of said members; and means responsive to increased resistance to movement of the strip, for causing the movable members and strip to more forcibly engage each other so as to prevent slippage therebetween during operation of said actuating means.

2. In an extendable and retractable antenna, a friction drive comprising a longitudinally movable strip; a pair of opposed, spaced, movable members engaging between them and under continuous force oppositely disposed surfaces of said strip for advancing and retracting the strip; actuating means connected to one of said members; and means responsive to increased resistance to movement of the strip, for bringing said members closer to each other to increase the force of their engagement with the movable strip so as to prevent slippage thereon during operation of said actuating means.

3. In an extendable and retractable antenna of the type having telescoping sections, a friction drive for actuating said sections comprising a longitudinally movable driving strip connected with a movable antenna section; a pair of opposed, spaced, movable members engaging between them under continuous force oppositely disposed surfaces of said strip for advancing and retracting the strip; actuating means connected to one of said members; and means responsive to increased resistance to movement of the driving strip, for causing the movable members and strip to more forcibly engage each other so as to prevent slippage therebetween during operation of said actuating means.

4. The invention as defined in claim 2 in which the spaced movable members comprise relatively axially movable parts of a friction wheel, and in which the means for bringing the members closer to each other comprises a pair of cams, one cam being connected to drive one wheel part and the other cam being connected to the said actuating means.

5. The invention as defined in claim 4 in which the cams comprise disks having sloping, engaging surfaces, and in which the actuating means includes a drive shaft carrying said disks and friction wheel.

6. The invention as defined in claim 1 in which both of said opposed members are connected with the actuating means to be moved thereby.

7. The invention as defined in claim 1 in which there is a second pair of opposed, spaced, movable members engaging a second set of oppositely disposed surfaces of the driving strip under continuous force, one of said members being connected to said actuating means, and in which there is a second means responsive to increased resistance to movement of the driving strip for causing the second pair of members and strip to more forcibly engage each other during operation of the said actuating means.

8. The invention as defined in claim 7 in which all four of the opposed, movable members are connected with the actuating means to be moved thereby.

9. The invention as defined in claim 8 in which the pairs of opposed members comprise parts of two opposed friction driving wheels, and in which the means causing the said more forcible engagement comprises pairs of camming shoulders rotatable with the wheels, one shoulder of each pair being connected with the said actuating means and the other shoulders of the pairs being connected respectively with the friction drive wheels.

10. In a friction drive for an extendable and retractable antenna of the type having a longitudinally movable strip by which the antenna is actuated, a composite, friction drive wheel engaging said strip, said wheel having an elongate shank part and having a flange part engaging said movable strip and fixed to the shank part; a pair of disks axially movable on and keyed to the shank part, one disk constituting a part of said friction wheel and being spaced from and mounted for movement toward the flange part, said one disk engaging the movable strip and said strip extending between said flange part and one disk; a resilient washer on said shank part, interposed between and engaging said disks and transmitting force therebetween, the other of said disks having a cam means; a driving shaft coaxial with said other disk; and a cam fixed to the driving shaft, engaging the cam means of said other disk for shifting the latter against the resilient washer and forcing said washer against said one disk, thereby to move said one disk toward the flange part and increase the force of engagement of the friction wheel with the movable strip when the resistance of the strip to movement increases during turning of the driving shaft.

11. In a friction drive for an extendable and retractable antenna of the type having a longitudinally movable strip by which the antenna is actuated, a composite, friction drive wheel engaging said strip, said wheel having an elongate shank part and having a flange part engaging said movable strip and fixed to the shank part; a second flange part movable axially on and keyed to said shank part, said flange parts being spaced from and movable toward each other and said strip extending between said flange parts; a driving shaft coaxial with said friction wheel; a cam means connected between said driving shaft and said second flange part for shifting the latter toward the first flange part in response to turning force applied to the driving shaft, thereby to cause the friction wheel

to forcibly engage the movable strip and drive the same with a minimum of slippage.

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