July 28, 1959 J. F. ULRICH 2,896,870

CLUTCHING MECHANISM

Filed April 4, 1955 2 Sheets-Sheet 1

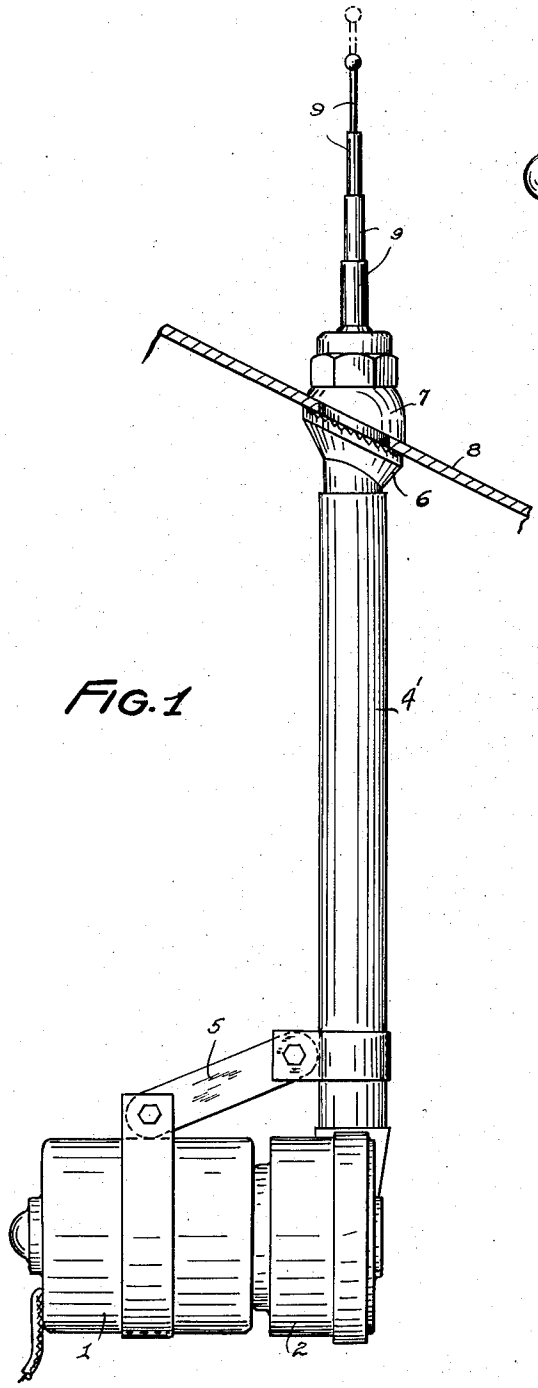


FIG. 1

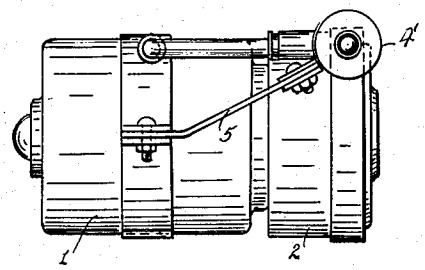


FIG. 2

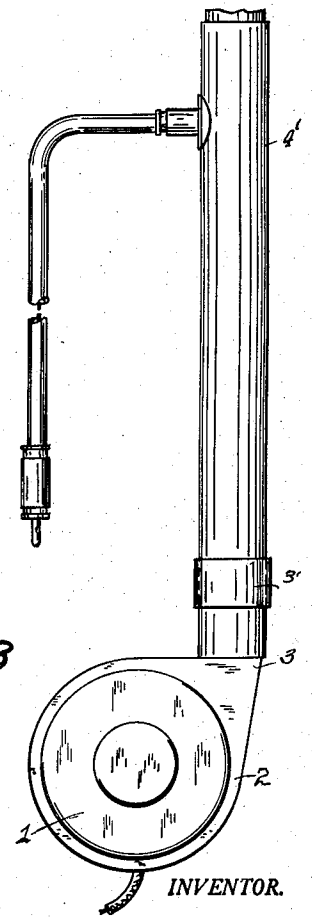


FIG. 3

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CLUTCHING MECHANISM

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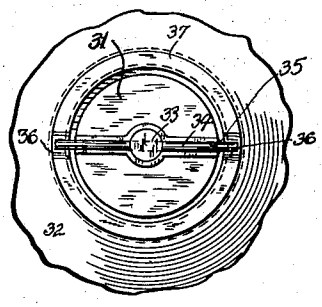


FIG. 5

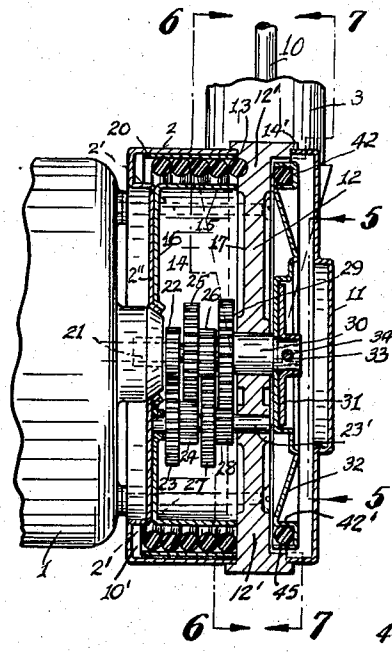


FIG. 4

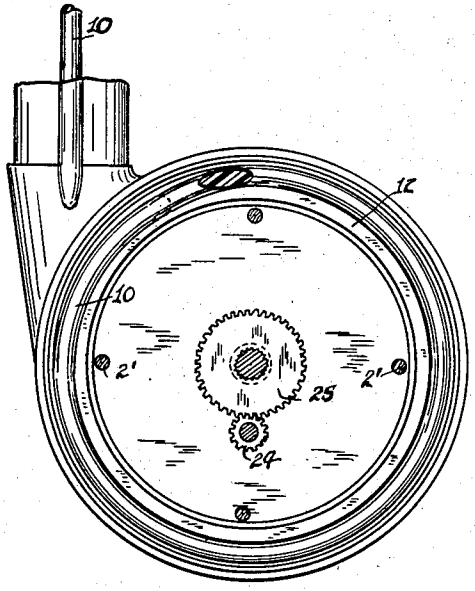


FIG. 6

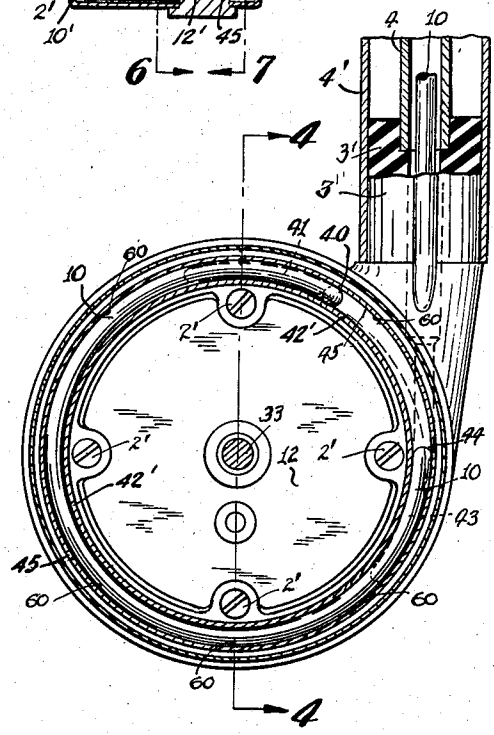


FIG. 7

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United States Patent Office 2,896,870 Patented July 28, 1959

2,896,870

CLUTCHING MECHANISM

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Application April 4, 1955, Serial No. 498,985

6 Claims. (Cl. 242—54)

My invention is an improvement in reeling and unreeling devices and more particularly relates to a mechanism which is operable in reverse directions to feed and retract a flexible elongate driving or actuating means coiled within the device.

This invention, while capable of many applications in use, is particularly useful as an effective means for projecting and retracting radio antenna of the type applied to vehicles and having two or more relatively slidable sections.

One of the objects of this invention is a power operated feeding and retracting means for collapsible radio antenna elements although such means is capable of manual operation if desired.

Another object of the invention is a positive reversible power driven clutching device for coiling and uncoiling a driving element such as may be used in projecting or retracting the several relatively movable sections of an automobile radio antenna.

A further object of the invention is a device of this type which is positive in operation in either direction throughout the limits of sliding movement of the antenna sections.

A still further object of the invention is an easily assembled and disassembled drive for telescopic members which is characterized by simplicity of construction and operation.

Another object is to prevent binding of the convolutions of the flexible driving element in coiling and storing the same in a storage compartment, due to looping or lapping tendencies, such as would prevent freedom of operation of the device.

Another object is to provide in a device of this character a rotatable torsional overload release clutching means having a driving element receiving channel in which the side walls of the channel are formed to clutch the driving element when such means is rotated in either direction.

Other objects and advantages of this invention will become more apparent as the following description of an embodiment thereof progresses, reference being made to the accompanying drawing in which like reference characters are employed to designate like parts throughout the same.

In the drawings:

Figure 1 illustrates an electrically driven radio antenna embodying my invention and shows one method of mounting the same;

Figure 2 is a top plan view of the device shown in Figure 1;

Figure 3 is a front elevation of the device shown in Figure 1;

Figure 4 is a vertical section through the housing for the driving element, having a storage compartment for the coiled portions of the driving member, a compartment for a reduction gear transmission from the motor shaft to the rotatable clutching means and also showing a ramped partition in the casing through which the flexible driving member is threaded and guided to and from its coiled position as the clutching means is rotated in one direction or the other;

Figure 5 is a fragment view taken on line 5—5 of Figure 4;

Figure 6 is a section taken on line 6—6 of Figure 4; and

Figure 7 is a vertical section taken on line 7—7 of Figure 4.

Referring now more particularly to the drawings in which I have illustrated one embodiment of the invention, I have shown the same as a power means for projecting and retracting a sectional radio antenna of the telescoping type although the friction coupling clutching mechanism forming a part of the power means and the driving means are capable of many other applications in use.

Referring first to Figs. 1, 2 and 3, I have shown therein the device in use as a power means for projecting and retracting a sectional auto radio antenna, the prime mover consisting of a reversible electric motor 1 whose shaft extends at one end into the transmission and coil storage housing 2 attached to the adjacent end or bell of the motor casing by means of the screws 2'. The housing 2 is provided with an open neck 3 into which is fitted an insulator 3' having a seat 3'' for receiving the lower end of the lower antenna section 9. An external tube 4' is supported on the insulator 3' and is braced to the motor housing by means of clamps and a brace 5. The outer tube 4' terminates at its upper end in a portion which supports a clamping member 6 forming, together with the complementary part 7, the means by which the device may be removably secured to a wall of an automobile body, such as a fender or the like indicated at 8. Such clamping means may be of conventional form. The radio antenna sections are indicated at 9, and are fitted on the angularly adjusted support 6 and 7 in the usual fashion. The tube 4 forms a path or bore through which the flexible driving member 10 may extend, thus connecting the coiled portion of the member 10 within the storage casing 2 with the innermost antenna section, there being sufficient clearance in the tube 4 to permit free lineal movement of the driving member 10 therealong without buckling or distortion. The member 10 is preferably a length of a suitable plastic material such as nylon of circular cross section. Any suitable anchoring means between antenna sections and the free end of the flexible driving member 10 may be employed so that when the driving member 10 is driven outwardly of its housing and upwardly through the tube 4, the antenna sections will be extended in turn and, conversely, when the power means is actuated to withdraw the flexible driving member 10, the antenna sections will be caused to telescope one within the other to the limit of nesting, as indicated in Fig. 1.

Referring now more particularly to Figs. 4 through 7, I will proceed to describe in detail the construction and operation of the embodiment of my invention illustrated in these figures.

The coil storage housing includes a cylindrical cup-shaped body 2 having an end wall 2'', an annular portion of which projects rearwardly toward the motor 1, said housing opening outwardly and forwardly. Within the housing 2 and spaced from the peripheral wall thereof, I provide a cup-shaped cylindrical body opening outwardly and having a rear wall 16 abutting the rear wall 2'' of the housing 2. The annular space thus formed between the housing peripheral wall 2 and the wall 15 provides a storage space 10' for the coiled portion of the driving member 10.

As will be seen in Fig. 4, the outer edges of the cylindrical walls 2 and 15 abut and are seated against a mem-

ber 12 having a rim portion 12' bridging the circumferential edges of the walls 2 and 15 and a medial portion 12 separating the storage and transmission compartments 10' and 14, respectively. The portion 12' is provided with ramped portions for guiding the driving member 10 as it passes to and from the storage space to a rotatable torsional overload clutching means disposed on the opposite side of the wall 12. The wall 2 is seated in an annular recess 13 in the member 12, while the opposite side of the member 12 is provided wtih an annular recess or seat 14' for receiving the inturned peripheral flange of the cover 11.

It will be noted that the peripheral coil storage space within the housing 2 between the circumferential wall 15 and the circumferential wall of the housing 2 forms a space within which the flexible driving member may be helically coiled. A floating ring or band 20 is provided within this space and is free to float axially as well as radially within the outer circumferential wall of the storage housing 2 forming a broad outer bearing surface against which the convolutions of the coiled member 10 come into contact. This floating ring serves also to guide the member 10 while it is being coiled or uncoiled in this space and prevents buckling or misalignment of the convolutions.

The reduction gear transmission chamber 14 is formed by the annular wall 15 and the back wall 16, together with the inner face 17 of the medial portion 12. The back wall 16 of the transmission housing may be secured to the end wall 2'' of the housing 2 by any suitable means, so that the transmission chamber and the housing 2 together form a housing unit if desired.

Within the transmission chamber 14 there is provided a suitable reduction gearing, the power take off from the motor shaft 21 being through a spur gear 22 which is meshed with a larger gear 23 of a coupled pair 23, 24 idly carried on a shaft 23'. The gear 24 is meshed with a large gear 25 of the coupled pair 25, 26 idly carried on the shaft 33 carried in a bearing 30 in the member 12. The inner end of the shaft 33 is rotatably supported in an axial rearwardly directed bore in the end of the motor shaft 21. The gear 26 is in turn in mesh with a large gear 27, of a coupled pair 27, 28 idly carried on the shaft 23'. Finally the smaller gear 28 which is in mesh with the gear 29 keyed to the shaft 33 completes the reduction ratio of the motor shaft to the gear 29 and shaft 33. The outer end of the shaft 33 extends beyond the member 12 and into the hub portion of the clutching or driving member 32 which, as illustrated, is on the outer side of the partition 12.

The rotatable clutching and driving means which is indicated generally at 32 is carried on the shaft 33 by means of an elongated resilient pin 34 which passes through an opening in the shaft and lies within the diametrically opposed grooves or depressions formed in the hub 31 which is separable from the member 32, as indicated more clearly in Fig. 5. This hub is also mounted on the shaft 33 and removably secured by the pin 34. The ends of the pin 34 extend radially beyond the hub 31 to overlie the ends of the diametrically opposed seats or depressions 35 and the relatively raised annular surfaces 37 between the opposed depressions 36 formed in this annular portion 37 of the driving member 32.

The pin 34, when its ends are supported on the raised surfaces 37, is flexed outwardly but when these ends in rotation of the shaft 33 and hub are brought into register with the depressions 36 the flexing will be released and the pin ends will lie in the depressions. In such position, rotation of the shaft 33 in either direction will rotate the clutching and driving means 32 and the hub 31 until the pin no longer has the ability to overcome a torsional overload imposed upon it as when the antenna sections have reached their limits of relative movement in either direction or as when the sections might freeze due to corrosion or the like. Under such overload conditions, the pin ends will ride up an inclined side wall of the depressions 36 under an increasing flexing force to the surface 37 and thus permit relative rotational movement between the driving member 32 and the hub driving shaft 33 of the transmission, thus preventing damage to the unit or to the motor.

The rim portion 12' of the member 12 is provided with an opening 40 as illustrated in Fig. 7 leading from the storage chamber 10' within the housing 2 through the member 12 and communicating with a helically disposed groove or ramp 41 extending from the opening 40 in a counterclockwise direction through the thickness of the rim 12', to guide the flexible member as it passes therealong from the storage chamber 2 to the drive member 32. The clutching drive member illustrated in Fig. 4 comprises the body 32 terminating peripherally in an annular channel 42 defined by the inner and outer spaced annular walls 42' and 45, respectively, and opening toward the outer side face of the wall 12' to receive therein the flexible driving member 10 as it passes from the ramp 41, as indicated in Fig. 7. The flexible driving member 10 lies within this peripheral side opening channel and extends therearound short of a complete convolution in a counterclockwise direction until it passes along the inclined wall or ramp 43 formed in the outer face of the rim portion 12' where the groove communicates with an opening 44 through which the driving member 10 may pass on its way up or down through the neck 3.

It will be noted that the outer annular wall 45 of the channel 42 is provided with inwardly directed detents 60 spaced apart around the wall to frictionally engage the driving element 10 in the channel thus allowing a certain amount of tolerance between the outer surface of the element 10 and the inner surface of the said outer annular wall 45.

When power operated and the motor is energized to drive the shaft 30 through the transmission and thus to rotate the clutch driving element 32 in a counterclockwise direction of rotation, it will be understood that a pushing stress exerted on the member 10 will progressively increase the frictional engagement of the member 10 against the detents 60 to drive the flexible member 10 in a direction to extend it through the neck and thus to extend the antenna. As the clutching and driving member 32 is rotated in a clockwise direction of rotation, a pulling stress is exerted on the member 10 to progressively increase the frictional engagement of the member 10 with the inner wall 42' of the channel 42, as in Fig. 7, to retract the member 10 and cause it to be fed into the storage compartment and coiled therein, as is illustrated clearly in Fig. 4. Conversely, if the driving member is caused to rotate in a counterclockwise direction, the flexible driving member 10 for the antenna sections will be uncoiled from its coiled position, as shown in Fig. 4, and fed through the rim portion 12' and thence upwardly through the neck 3, as explained above.

Thus, it will be seen that by this construction, a very effective and a positive torsional overload releasing clutching means is provided for actuating the flexible driving member which may be coiled and uncoiled at will within a storage compartment to retract or extend an object, such as an auto radio antenna attached to the free end of the flexible driving member 10, and that should overload occur while operating the driving member in either direction of rotation, such overload will be released by the novel means illustrated in Fig. 5, as described above.

As an alternative structure to that shown in Fig. 5, I may provide raised cams in place of the depressions 36 so that the ends of the pin 34 will be caused to abut and ride over the cams when overload occurs.

In either construction, the clutch and drive element 32 will be subjected to an impulse each time the torsion on the pin ends is released either to cause them to enter

the slots 36 to complete the driving connection from the shaft 33 to the element 32, or in the alternative form, when the torsional stress is imposed on the pin ends when they engage the cams to complete the driving connection.

Various changes may be made in the details of construction and arrangement of parts of the invention without departing from the spirit thereof or the scope of the appended claims.

I claim:

1. In a device of the character described, a coil storage chamber, an elongate flexible driving element having one end connected with an object to be moved, and having a portion thereof coiled within said chamber, rotatable element gripping means adjacent said chamber for coiling and uncoiling said element in said chamber, and a wall separating said storage chamber from said rotatable means, said wall having a helically arranged ramp or opening therethrough for guiding said element in its movement in either direction to and from said storage chamber.

2. In a device of the character described, a coil storage housing, an elongate flexible driving element having one end connected with an object to be moved, and having a portion thereof coiled within said housing, rotatable element gripping means adjacent said housing for coiling and uncoiling said element in said housing, and a driving element supporting wall between said storage housing and said rotatable means, said wall having a helically arranged ramp or opening therethrough for guiding said element in its movement in either direction with respect to the storage housing, said rotatable element gripping means comprising an annular element receiving channel open circumferentially in the direction of said wall for receiving and driving less than one complete convolution of said element during rotation of said means in either direction.

3. In a device of the character described, a housing, a drive shaft extending into said housing, an annular storage compartment in said housing, an elongate flexible driving element adapted to be helically coiled in said compartment, a floating guide band interposed between said element and a wall of said compartment, a clutching and driving member actuated by said drive shaft for imparting linear movement to said element in either direction, a wall separating said storage compartment from said clutching and driving member, said driving member having an annular channel for gripping said elongate element, the channel opening toward one side of said wall, said wall having a helically arranged passage through which said elongate element may pass into and from said storage compartment to the channel in the driving member.

4. In a device of the character described, a housing, a drive shaft extending into said housing, an annular storage compartment in said housing, an elongate flexible driving element adapted to be helically coiled in said compartment, a floating guide band having limited radial and axial movement in said compartment and interposed between said element and a wall of said compartment, a clutching and driving member actuated by said drive shaft for imparting linear movement to said element in either direction, a wall separating said storage compartment from said clutching and driving member, said driving member having an annular channel for gripping said elongate element, the channel opening toward one side of said wall, said wall having a helically arranged passage through which said elongate element may pass into and from said storage compartment to the channel in the driving member, and torsional overload releasing means connecting said shaft and said clutching and driving means, said overload releasing means including a hub member on the outer end of said shaft, a resilient pin extending through said hub and said shaft, said pin extending radially beyond the hub, said clutching and driving member having deformed portions engageable with the outwardly extending ends of the pin whereby a releasable driving connection is established between the shaft and the clutching member, said driving connection being automatically released when the torsional stresses amount to an overload.

5. In a device of the character described, a housing, a drive shaft extending into said housing, an annular storage compartment in said housing, an elongate flexible driving element adapted to be helically coiled in said compartment, a floating guide band interposed between said element and a wall of said compartment, a clutching and driving member actuated by said drive shaft for imparting linear movement to said element in either direction, a wall separating said storage compartment from said clutching and driving member, said driving member having an annular channel for gripping said elongate element, the channel opening toward one side of said wall, said wall having a helically arranged passage through which said elongate element may pass into and from said storage compartment to the channel in the driving member, a coupling carried by the housing for attaching an antenna comprising telescopic sections to said housing, said coupling having a passage for receiving said flexible driving element, said wall having a second helically arranged passage through which said elongate element may pass into and from the channel of said clutching member.

6. In a device of the character described, a housing, a drive shaft extending into said housing, an annular storage compartment in said housing, an elongate flexible driving element adapted to be helically coiled in said compartment, a clutching and driving member actuated by said drive shaft for imparting linear movement to said element in either direction, a wall separating said storage compartment from said clutching and driving member, said driving member having an annular channel for gripping said elongate element, the channel opening toward one side of said wall, said wall having a helically arranged passage through which said elongate element may pass into and from said storage compartment to the channel in the driving member.

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