Dec. 30, 1969 S. F. HODAY 3,486,712

REWIND CONTROL MECHANISM WITH DOUBLE PAWL-TRACK

Filed June 14, 1968 3 Sheets-Sheet 1

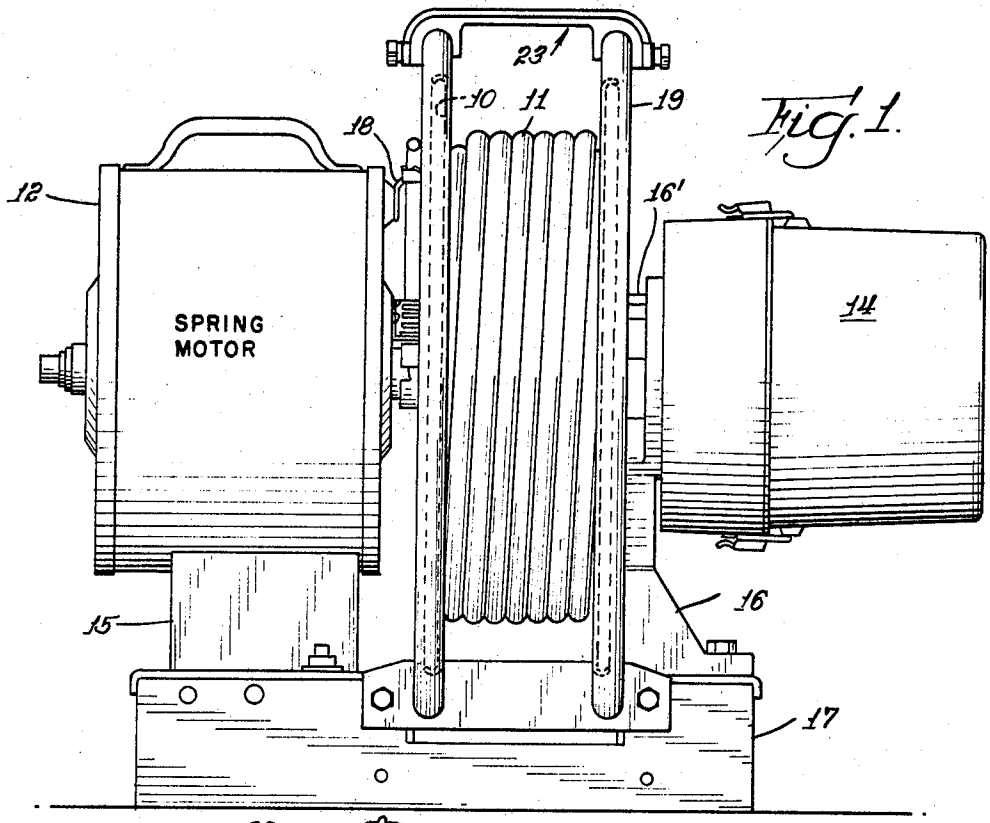


Fig. 1.

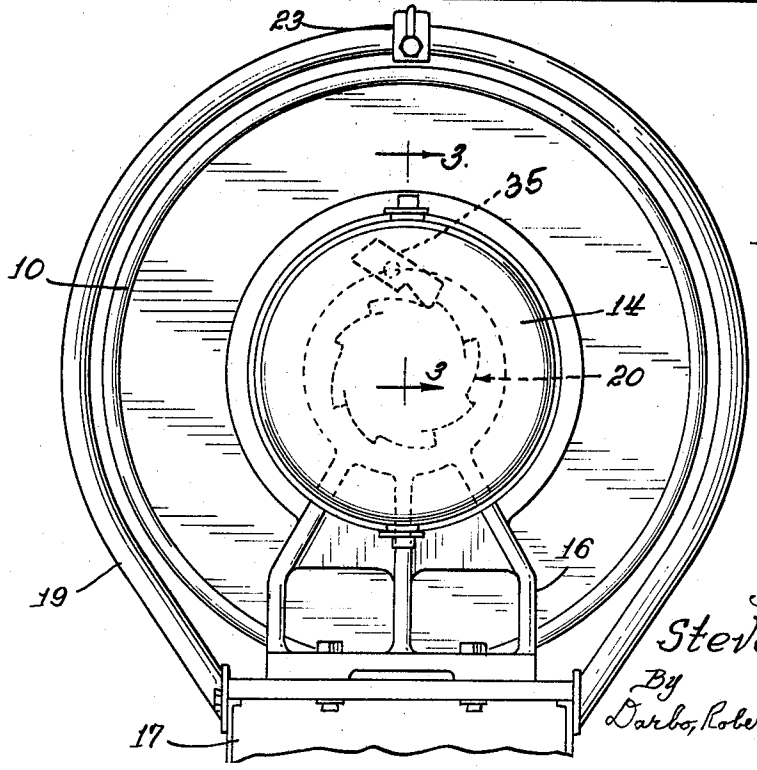


Fig. 2.

Inventor
Steve F. Hoday
By
Darbo, Robertson, & Vandenburgh
Att'ys

Dec. 30, 1969 S. F. HODAY 3,486,712

REWIND CONTROL MECHANISM WITH DOUBLE PAWL-TRACK

Filed June 14, 1968 3 Sheets-Sheet 2

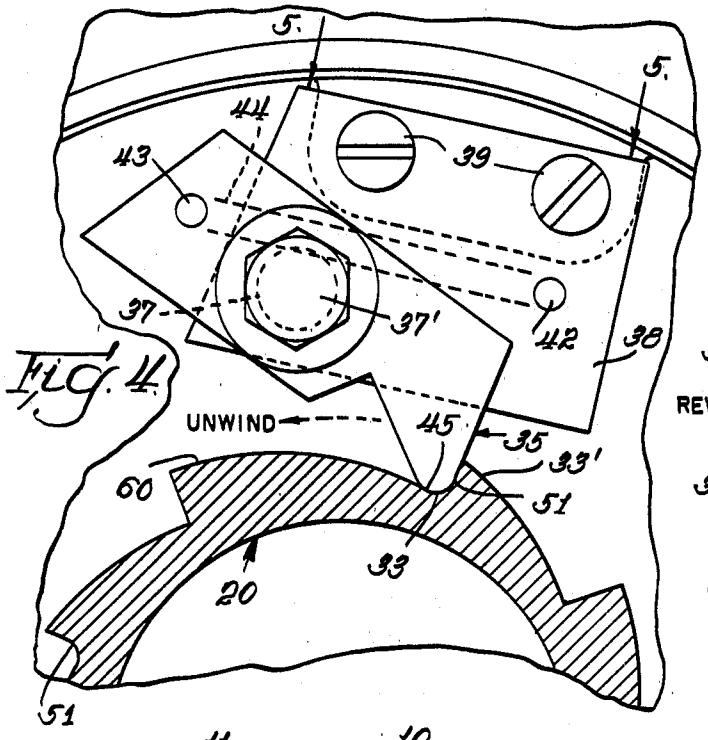


Fig. 4.

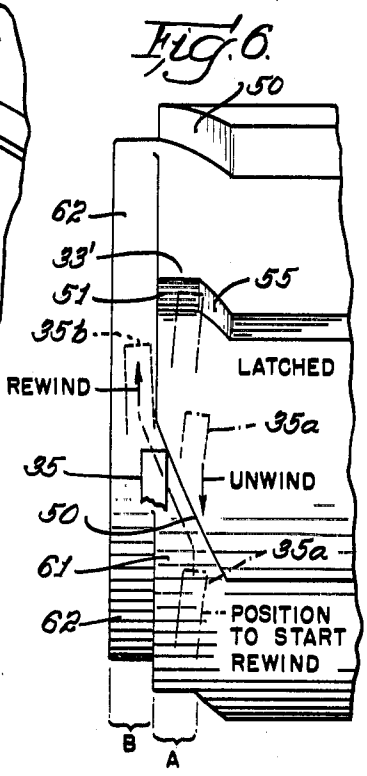


Fig. 6.

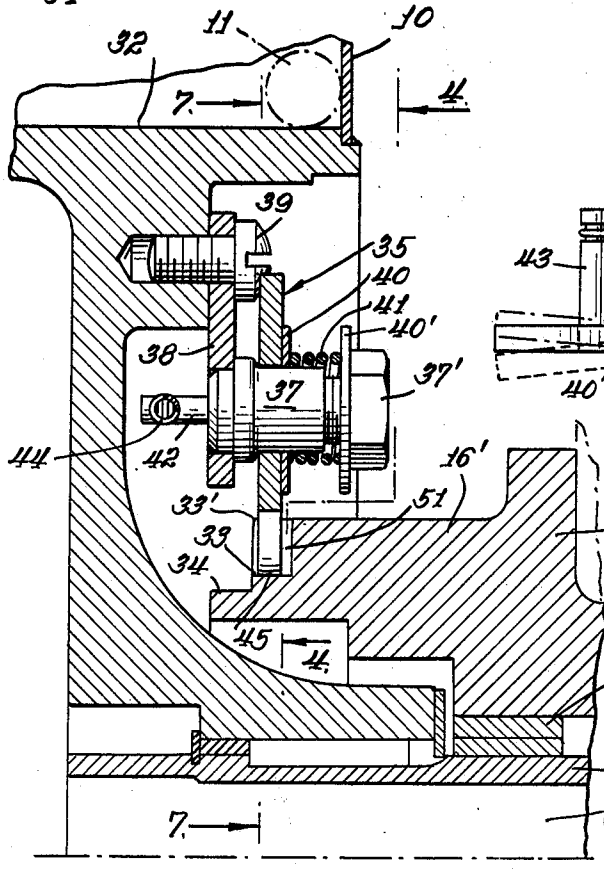


Fig. 3.

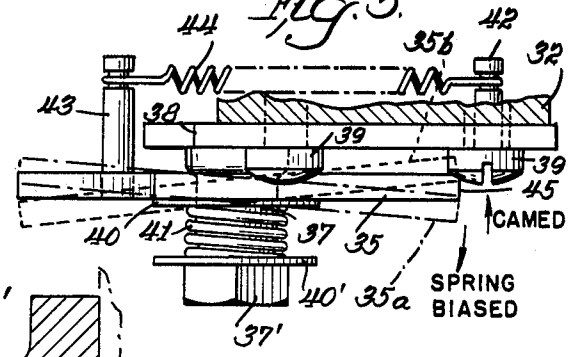


Fig. 5.

Inventor
Steve F. Hoday
By
Darbo, Robertson, & Vandenburgh
Attys.

Dec. 30, 1969 S. F. HODAY 3,486,712

REWIND CONTROL MECHANISM WITH DOUBLE PAWL-TRACK

Filed June 14, 1968 3 Sheets-Sheet 3

Fig. 7.

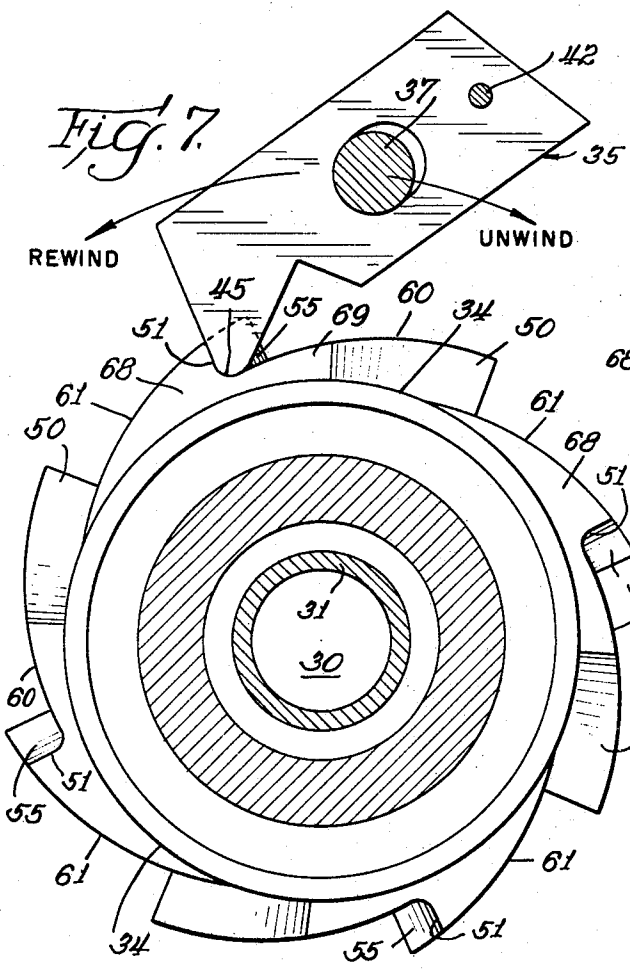
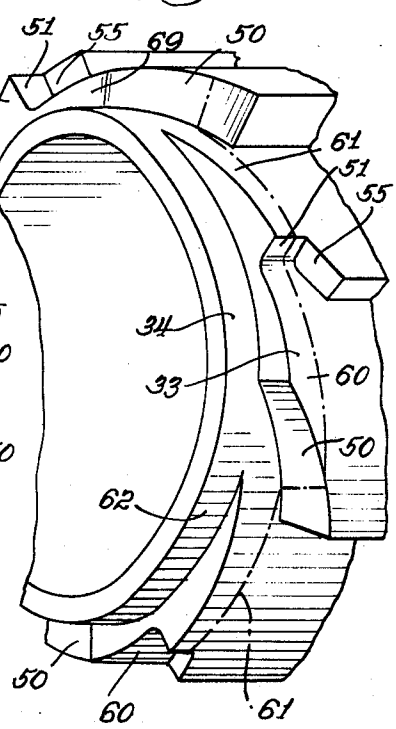


Fig. 9.



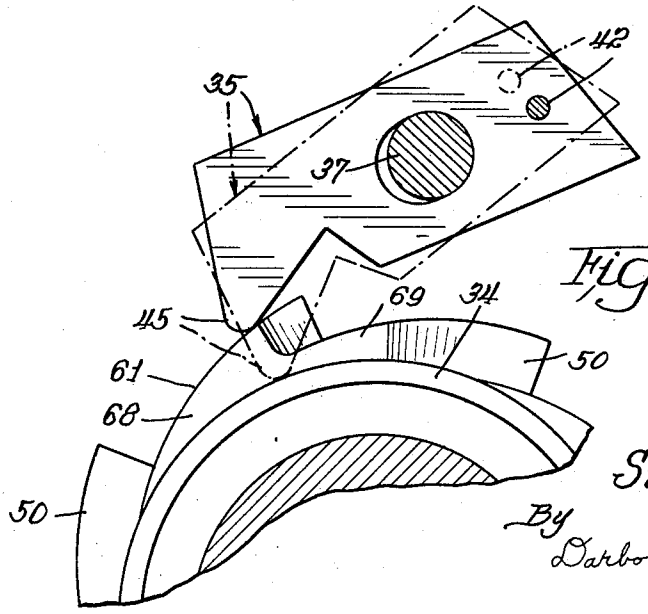


Fig. 8.

Inventor
Steve F. Hoday

By Darbo, Robertson & Vandenburgh
Att'ys.

United States Patent Office

3,486,712
Patented Dec. 30, 1969

3,486,712

REWIND CONTROL MECHANISM WITH DOUBLE PAWL-TRACK

Steve F. Hoday, Elk Grove Village, Ill., assignor to Appleton Electric Company, Chicago, Ill., a corporation of Illinois

Filed June 14, 1968, Ser. No. 737,153
Int. Cl. B65h 75/38; G05g 5/18
U.S. Cl. 242—107.7 6 Claims

ABSTRACT OF THE DISCLOSURE

A rewind control mechanism to permit stop-go control of rewinding motion of a spring driven reel. The mechanism consists of a pawl and ratchet adapted so that the pawl can travel on two paths: a first path during unwind rotation of the reel; a different path during rewind rotation of the reel. Shunt means are provided to transfer the pawl from one path to the other on reversal of winding direction. Rewind rotation can be stopped by reversing direction to transfer pawl to the unwind track, then engaging rewind stop means located in a portion of the unwind path.

Background of the invention

Storage reels for electrical cable, water hose, air hose, static discharge grounding wire and other elongated articles are in wide use. Of particular value are those reels which permit unwinding of the elongated article when the article is pulled from the reel, which lock the storage reel against rewinding during the time of use of the elongated article, and which permit rewinding of the article onto the reel after its use. This invention provides a rewind control mechanism for locking the reel during use of the withdrawn elongated article, and for providing stop and go control of the rewinding motion of the reel. Preferably this invention is used with a reel which utilizes a spring for rewind. Energy is stored in the spring during the unwinding of the reel and the action of the spring drives the reel in the rewind direction.

This invention provides a rewind control mechanism which is not gravity responsive, which provides completely free rotation in one direction and provides stop and go control over rotation in the opposite direction.

Summary of the invention

A ratchet wheel and pawl is adapted so that the pawl can move on two paths. It moves on a first path during the unwind rotation of the storage spool, and on a second, different path during the free rotation of the spool in the rewind direction. In accordance with this invention, shunts transfer the pawl from one path to the other on reversal of winding direction. Means are also provided to keep the pawl in the second path during free rewinding rotation. The reel can be temporarily locked to prevent rewind rotation by withdrawing a portion of the elongated article. This transfers the pawl to a portion of the unwind track which permits free passage of the pawl in the unwind rotation direction but which has rewind stop means located thereon to prevent rotation of the reel in the rewind direction while the pawl is in that portion of the unwind path. Then slight rewind rotation causes locking. When the reel is temporarily locked against further rewinding, the extended elongated article can be further rewound by first withdrawing a small length of the elongated article thus transferring the pawl from a first portion of the unwind path to a second portion of the unwind path which permits free passage of the pawl during rotation in the unwind direction but also contains a shunt which transfers the pawl to the second or rewinding track during rotation of the mechanism in the rewind direction. Hence, when the rewind motion starts while the pawl is in the second portion of the first track, the reel can be freely rewound.

Designation of the figures

FIG. 1 is a front view of a spring-driven rewindable electrical cable reel of the type in which this invention is advantageously used.

FIG. 2 is a side view of the reel shown in FIG. 1 as viewed from the right hand side of that figure.

FIG. 3 is an enlarged fragmentary cross-sectional view taken approximately along the line 3—3 in FIG. 2.

FIG. 4 is an enlarged fragmentary view taken approximately along the line 4—4 in FIG. 3.

FIG. 5 is an enlarged view of the pawl mechanism viewed approximately along the lines 5—5 in FIG. 4.

FIG. 6 is a fragmentary side view of a ratchet wheel which has a double pawl path in accordance with this invention.

FIG. 7 is a cross-sectional view taken approximately along the line 7—7 in FIG. 3 showing the entire wheel and pawl.

FIG. 8 is an enlarged fragmentary cross-sectional view taken as in FIG. 7 illustrating various positions of the pawl during operation of the invention.

FIG. 9 is a perspective fragmentary view of a ratchet wheel, having the double pawl track in accordance with this invention.

Description of the preferred embodiment

Although the following disclosure offered for public dissemination in return for the grant of a patent, is detailed to ensure adequacy and aid understanding, this is not intended to prejudice that purpose of a patent which is to cover each new inventive concept therein no matter how others may later disguise it by variations in form or additions or further improvements. The claims at the end hereof are intended as the chief aid toward this purpose; as it is these that meet the requirement of pointing out the parts, improvements, or combinations in which the inventive concepts are found.

In FIG. 1 the spool **10** on which electric cable **11** is wound is driven in the rewind direction by a spring motor (not shown) in housing **12**. Electrical connections between the cable **11** and the supply conduit (not shown) are provided by collector rings (not shown) in housing **14**. The details of the construction of the spring motor assembly and the collector ring assembly will not be included in this discussion insofar as they are conventional and do not constitute part of the subject matter of this invention. The spring motor housing **12**, spool **11** and collector ring housing **14** are supported by frames **15** and **16** mounted on base support **17**. The spring (not shown) located within spring motor housing **12** is attached to the spool

10 by suitable means 18 so that unwinding a portion of the electrical cable 11 by pulling the cable not only causes spool 11 to rotate in the unwinding direction but also causes the spring to be tightened, thereby storing energy in the spring. Release of tension on the cable permits the energy stored in the spring to rotate the spool 10 in the reverse direction, i.e. in the rewind direction. Guard rails 19 protect the spool 10 from damage. Tie rod 23 adds to the protection.

Frame component 16 is cast metal having as an integral part of that element a collar 16' at the extremity of which is the double track ratchet provided in accordance with this invention. Frame element 16 as viewed from the right side of FIG. 1 is shown in FIG. 2 beneath the housing 14 of the collector ring assembly. The relative position of the ratchet wheel generally 20 and the pawl 35 is indicated by the dashed outline shown in FIG. 2.

FIG. 3 is an enlarged cross-sectional view taken approximately along the line 3—3 of FIG. 2. It illustrates a portion of the ratchet mechanism and pawl and other structures of the reel from the middle of the cable channel 30 in shaft 31 to the bottom of the bed 32 of spool 10 in which electrical cable 11 is stored. The collar portion 16' extends inwardly from frame 16 towards spool drum 10. The innermost extreme of frame collar 16' forms the ratchet wheel 20 in which are two pawl tracks 33 and 34. The circumferential surface 33' of the collar 16' represents another portion of the path 33 along which pawl 35 moves in the course of its rotation along the path around the ratchet wheel in the unwind direction. The shaft 31 is freely rotatable and is supported by frame 16 and suitable bearing means 36. Fixed on shaft 31 is spool 10.

Ratchet pawl

Ratchet pawl 35 is mounted on drum 32, and hence rotates with shaft 31 and spool 10. Pawl 35 is loosely mounted on post 37 which is fixed to pawl mechanism mounting 38. Mounting 38 is secured to spool drum 32 by bolt 39. Pawl 35 is held on post 37 by means of a loosely fitting washer 40, spring 41, a second loosely fitting washer 40' and cap screw 37'.

Spring post 42 is fixed to pawl mechanism mounting 38, and a second spring post 43 is fixed to pawl 35. An elongated spring 44 is attached to posts 42 and 43. The line between posts 42 and 43 lies well above the center of rotation of pawl 35 around post 37. Tension on the elongated spring tends to draw spring post 43 toward fixed post 42. This tends to rotate pawl 35 around post 37 in a clockwise direction as viewed in FIG. 4. Therefore tension on elongated spring 44 causes the ratchet engaging surface 45 of pawl 35 to press against the circumferential surfaces 33, 33' and 34 of wheel 20. The spring tension also forces the ratchet wheel engaging end 45 of pawl 35 to cock away from spool drum 10 and towards frame 16; thus towards the position illustrated at 35*a* in FIG. 5. The dotted lines in FIG. 5 illustrate the degree of cocking movement to which pawl 35 is subject.

Ratchet wheel

Ratchet wheel 20 has alternating circumferential structures. Stop portions 51 alternate with shunt surfaces 50. Pawl 35 freely moves in the direction indicated in FIGS. 4 and 6 as the unwind direction, falling alternately over the shunt and stop configurations, i.e. downward in the path 33, from 33' to 60 to 61, directly above the region marked A in FIG. 6. Hence as the spool drum 10 revolves around frame collar 16 in an unwind direction, the spool is completely free-wheeling, the pawl 35 idly falling over alternating stop surfaces 51 and shunt surfaces 50. However, if the unwind rotation of the spool drum 10 is stopped (by discontinuing withdrawal of the electrical cable) while the pawl is in the general region 60 of track 33 between the stop 51 and shunt surface 50 then a reversal of drum rotation causes pawl 35 to strike stop 51. This locks the mechanism against further rewinding

of the drum 32, although the drum can be rotated in the unwind direction. If the drum is then rotated in the unwind direction, from the locked position, e.g. by pulling on the cable 11, pawl 35 moves along the path 33 over the region 60 on the ratchet wheel until it falls over vertical surface 50 into the region 61. By then permitting the spool drum 32 to rotate in the rewind direction while pawl 35 is in region 61, pawl 35 contacts the shunt surface 50 and is shunted onto the track 34. Thus, the pawl moves along the dotted line marked rewind in FIG. 6 from position marked 35*a* to the position indicated at 35*b*. The circumferential path 34 of the ratchet wheel, immediately above the region marked B in FIG. 6, provides an unobstructed path for the movement of the pawl when the spool drum 32 is revolving in the rewind direction, i.e. upwards in FIGS. 6 and 9.

However, when the pawl is in the free-wheeling rewind path, a reversal of direction of movement of the drum causes the pawl to shift into the path 33. This makes it possible to lock the mechanism against movement in the rewind direction as soon as the pawl 35 falls over a stop tooth 51.

Due to the fact that the pawl 35 can cock laterally, i.e. towards and away from the frame 16, I prefer to provide a vertical cam surface 55 adjacent the stop tooth 51. This ensures that when the pawl 35 is moving in the rewind direction along path 33 it moves into stop 51 and prevents its further lateral movement when it rests in the lock position.

FIG. 7 illustrates that every portion of the path of the pawl when it moves along track 33 is substantially above the free-wheeling rewind track 34. Thus there is a wall 68 in which the shunt region 61 of the rewind track 33 rises above the rewind track 34. There is a wall 69 at which the region 60 of track 33 rises above track 34. These walls plus shunt surface 50 prevent pawl 35, when riding on track 34, from moving off the free-wheeling rewind path onto track 33 while the pawl is moving in a rewind direction. However, when the path is in track 34 and spool drum 32 moves in the unwind direction, pawl 35 will move along shunt surface 50 as a result of the force brought to bear by tension of spring 44. Thus the pawl reenters path 33 when rotation is reversed from rewind to unwind direction. Continued movement of the drum in the unwind direction results in pawl 35 moving along path 33 until it drops over stop 51. Thereafter movement of the drum in the rewind direction results in pawl 35 engaging stop 51 to lock the drum in position.

In FIG. 8 the position of pawl 35 indicated by the dotted lines illustrates the position of the pawl during free-wheeling rewind rotation, i.e., movement in track 34, as the pawl rotates in the rewind direction in track 34 the tip 45 of the pawl strikes shunt surface 50. Thereafter reversal of rotational direction of movement of the pawl causes pawl 35 to rise onto surface 61 to the point illustrated in full lines. At this point reversal of the rotational direction to the "rewind" direction (indicated by the dotted arrow) will again cause the pawl to strike shunt surface 50 and reenter the free-wheeling rewind track 34. However if the pawl is in the position indicated by the solid lines in FIG. 8 and it is caused to rotate further in the unwind direction, i.e., clockwise, it will immediately drop to the position shown in FIG. 7 thus locking against rotation in the rewind direction.

FIG. 9 shows the several unique features of the ratchet of this invention in a perspective view. The dotted line 65 in FIG. 9 represents the extreme to which pawl 35 can move by reason of the cocking of the pawl. It is noted that the surfaces shown in FIG. 9 give the impression of complexity. However it will be appreciated by those skilled in the art that such complex services are readily incorporated into the frame collar 16' during the casting operation by which the frame 16 is fabricated. Therefore in spite of the apparent complexity of the

mechanism of this invention its fabrication is extremely simple. Its operation is equally simple. Hence the combination of this invention provides free-wheeling rotation in the unwinding direction, yet permits temporary locking against rewind by simply permitting a small movement in a rewind direction. If that movement in a rewind direction does not cause locking, the elongated article **11** is simply pulled out until a click occurs, in which case the reel is immediately locked against rewinding. Also, when the reel is in the temporarily locked condition it can be unlocked for rewinding by simply pulling the elongated article **11** until the first click occurs thus unlocking the reel permitting free-wheeling rewinding thereof.

Therefore I claim:

1. A rewind control mechanism for controlling the rewind action of a reel rotatably mounted for rotation in winding and rewinding directions, said reel having a frame, storage spool, a rewind spring motor having a motor output, an interacting pair of members comprising a ratchet wheel and a pawl mechanism, one of said members being fixed with respect to said frame, the other of said members being fixed with respect to said spool, the rewind spring motor output being connected to the spool to provide sufficient force to rewind an elongated article for storage on the spool, said pawl mechanism including a ratchet wheel-engaging portion, said rewind control mechanism comprising: a pawl mechanism including means for driving the ratchet wheel-engaging portion radially towards the center of the ratchet wheel, and means for driving the ratchet wheel-engaging portion axially with respect to the center of the ratchet wheel; a ratchet wheel having a first and second track upon which the ratchet wheel-engaging portion of the pawl can ride, the first track having a first section which includes stop means thereon for preventing movement of the pawl when the pawl engages the stop means when the reel is revolving in the rewind direction, said first track also having a section which includes shunt means for moving the pawl out of the first track and onto said second track when the reel is rotating in the rewind direction, said shunt means being spaced apart from said stop means, said second track providing unobstructed movements of the pawl thereon when the pawl is on the second track and when the reel rotates in the rewind direction, said second track having second shunt means for moving the pawl from the second track to the first track when the reel is rotated in the unwind direction; whereby the pawl freely moves on the entire second track when the reel revolves in the rewind direction, but is shunted onto the first track when the reel rotates in the unwind direction, and whereby the pawl strikes said stop means when rewind is started when the pawl is on the first track between the stop means and the first shunt means, and whereby the pawl is shunted onto the second track when the rewind motion starts when the pawl is at a point on the first track between the shunt means and the stop means when the pawl is moving in an unwind direction.

2. A rewind mechanism as in claim **1** in which said ratchet is cast into the frame, and in which the pawl mechanism is mounted on the storage spool.

3. A reel as in claim **1** in which the ratchet mechanism is cast in the revolving drum and in which the pawl mechanism is fixed to the stationary frame.

4. In a ratchet and pawl mechanism for permitting complete freedom of rotation in a first direction and for permitting stop and go control of rotation in a second direction the improvement comprising: a track on the ratchet upon which the pawl rides said track having a first and second track portion, said second track portion extending 360° around a point which is central with respect to said ratchet; means for maintaining the pawl in said track; said first track portion having therein stop means for preventing movement of the pawl past the stop means when the pawl is in said first portion during rotation in said second direction; first shunt means for transferring said pawl from said first portion to said second portion during rotation in said second direction; said second track portion having means for retaining said pawl on said second track portion when said pawl is an on said second track portion during rotation in said second direction; second shunt means for shunting said pawl onto said first track portion during rotation in the first direction.

5. In a ratchet mechanism as in claim **4** in which the second track portion is a circular circumferential surface and the first track portion is a circumferential region immediately adjacent thereto and in which said first track portion starts with a first radial plane in said first track portion which is perpendicular with respect to the path of the pawl, said first radial plane dropping the path of the pawl to another portion of said first track portion which is elevated with respect to the radius of the second track portion, said first track portion being ended by a second radial plane which is on the bias with respect to the path of the pawl, said second plane being continuous with the surface of the second track portion, said second radial plane being part of said first shunt means, and part of said second shunt means.

6. In an apparatus for holding an elongated article such as an electric cable, a hose or the like in which the apparatus comprises a frame member, a reel member for holding the article and mounted for rotation about an axis on the frame member for movement with respect to the frame in an article unwinding direction and in a rewinding direction, a motor interconnecting the frame member and the reel member to urge the reel member toward rotation in the rewinding direction, and a rewinding control mechanism to releasably lock the reel against movement in the rewinding direction at a given position of rotation, the improvement wherein said mechanism comprises:

a ratchet wheel and a pawl with the pawl moving over the ratchet wheel in a given direction when the reel is moving in the rewinding direction, said wheel being affixed to one of said members and concentric with said axis, said wheel having a rewinding track and an unwinding track, said tracks extending about the periphery of said wheel adjacent each other, said rewinding track being unobstructed, said unwinding track having a stop extending in a radial direction to engage said pawl when the reel is moving in the rewinding direction, said unwinding track having a first surface extending from said stop in the direction that is the reverse of said given direction, said first surface being above the level of the rewinding track so that there is a wall between the rewind track and the unwinding track in the area of said first surface, said first surface and wall terminating in a shunt surface which is an extension of said wall and which angles away from said rewinding track, said unwinding track having a second surface which at the base of said shunt surface is at the level of the rewinding track, said second surface gradually rising above the level of the rewinding track in the reverse of said given direction to define a second wall between the rewind track and the unwind track, and mounting means attached to said other member and securing said pawl to said other member, said pawl having a nose extending onto said tracks, said mounting means affording said nose two degrees of freedom of movement, one toward and away from said wheel and the other axially of the wheel from one track to the other, said mounting means resiliently urging said nose axially of the wheel toward said unwinding track; whereby with said nose on the rewinding track and the reel moving in the rewinding direction said nose will be held on the rewind track by said walls and said shunt surface so that the motor can freely rewind said object, with said nose on the rewinding

track and the reel moving in the unwinding direction said mounting means will move the nose onto the unwinding track when the nose reaches the base of said shunt surface, with said nose on the unwinding track and the reel moving in the unwinding direction said nose will move freely along the unwinding track, with said nose on the first surface of the unwinding track and the reel moving in the rewinding direction the nose will move against said stop to block further movement of the reel, and with said nose on the second surface of the unwinding track and the reel moving in the winding direction said nose will be deflected onto the rewinding track by said shunt surface.

References Cited

UNITED STATES PATENTS

2,563,714	8/1951	Foster	242—107.7
2,969,932	1/1961	Becker	242—107.7

FOREIGN PATENTS

151,352	12/1950	Australia.

STANLEY N. GILREATH, Primary Examiner

WERNER H. SCHROEDER, Assistant Examiner

U.S. Cl. X.R.

74—575; 242—86