Feb. 13, 1962 R. F. BECKER 3,021,090

SIGNAL LOCK

Filed June 30, 1958

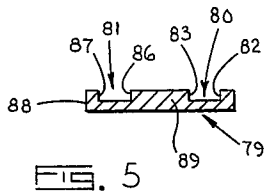


FIG. 5

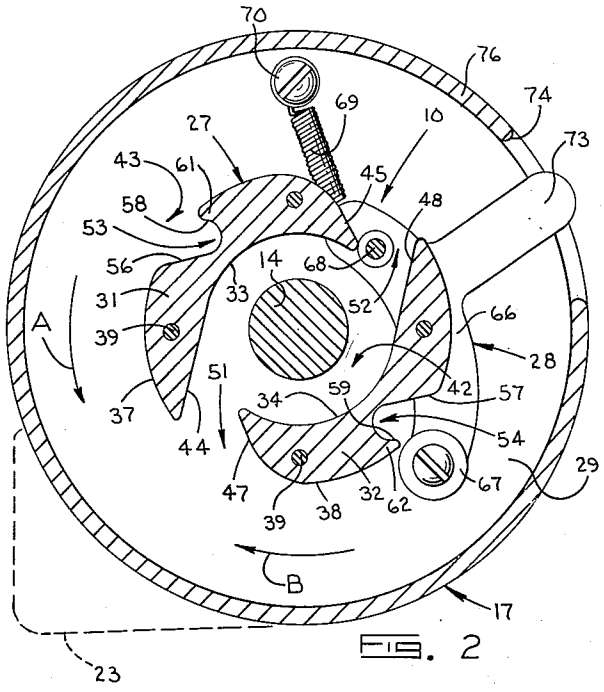


FIG. 2

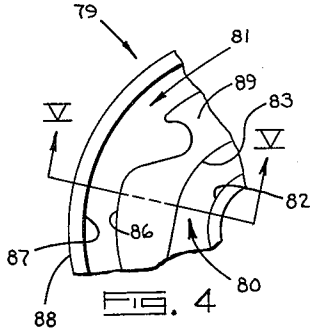


FIG. 4

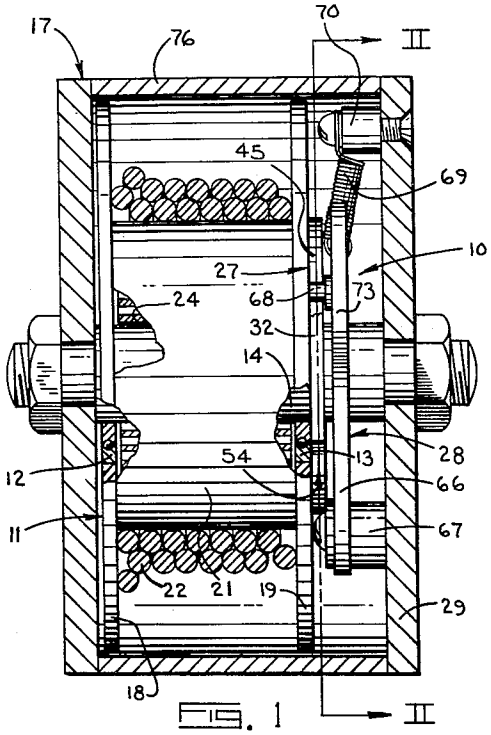


FIG. 1

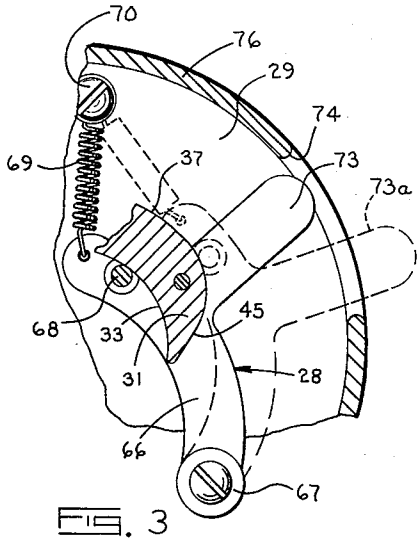


FIG. 3

INVENTOR.
RODGER F. BECKER

BY

Woodhams Blanchard & Flynn

ATTORNEYS

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SIGNAL LOCK

Rodger F. Becker, Kalamazoo, Mich., assignor to Aero-Motive Manufacturing Company, Kalamazoo, Mich., a corporation of Michigan

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This invention relates in general to ratchet structure adaptable for use with a spring biased cord reel and, more particularly, to a type thereof having one path of relative movement between a ratchet and pawl during an unwinding operation of said reel, another path of relative movement between the ratchet and pawl during a winding operation, and signal means for indicating the path in which said pawl is disposed.

Many efforts have been made over a long period of years to provide a completely satisfactory control mechanism for a spring biased cord reel wherein the spring continuously urges the reel in a winding direction. Where ratchets have been employed, the primary problem has involved the proper control of the associated pawl so that it releases and engages the ratchet quickly and automatically, when desired. My Patent No. 2,698,146 discloses a ratchet structure which has successfully overcome a substantial part of this primary problem in that it reduces to a minimum the number of movable parts required to provide a performance which is more accurate and more reliable than the performance of any devices known to exist and previously used for this purpose.

In a continuing effort to improve upon this ratchet structure, it was found that by making certain changes therein, not suggested by the prior art, the performance of my patented ratchet structure could be materially improved. More specifically, by revising the arrangement of and communication between the two concentric paths formed by the ratchet for the pawl and by providing a signal device associated with said pawl, it has become possible to determine more accurately by sound, vision and feel whether and when the pawl is disengaged or about to be engaged by said ratchet.

Accordingly, a primary object of this invention has been the provision of an improved ratchet and pawl construction having a minimum of moving parts, a maximum of simplicity in operation, and mechanism for detecting by sound, by feel and by vision, the location of the pawl with respect to the ratchet.

A further object of this invention has been the provision of a ratchet and pawl construction for a cord reel, as aforesaid, which will operate successfully with the cord reel in any position or attitude, which is not affected by the speed with which the cord reel is rotated in either an unwinding or rewinding direction, and which will operate equally effectively regardless of the amount of cord which is unwound from the reel at any given time.

A further object of this invention has been the provision of a pawl and ratchet construction, as aforesaid, which can be fabricated as strongly as its intended use necessitates, which is positive in operation, which requires little or no maintenance and which, by comparison with existing devices for the same or similar purposes, is inexpensive and relatively easy to fabricate.

Other objects and purposes of this invention will become apparent to persons familiar with this type of equipment upon reading the following specification and examining the accompanying drawings in which:

FIGURE 1 is a partially broken, central cross sectional view of a cord reel including a ratchet and pawl construction embodying the invention.

FIGURE 2 is a sectional view taken along the line II—II of FIGURE 1.

FIGURE 3 is a fragment of FIGURE 2 shown in a different position of operation.

FIGURE 4 is a fragment of a modified construction embodying the invention.

FIGURE 5 is a sectional view taken along the line V—V of FIGURE 4.

For the purpose of convenience in description, the terms "inner," "outer" and derivatives thereof will have reference to the geometric center of the ratchet and pawl construction and parts, including the cord reel, associated therewith.

General description

The objects and purposes of the invention including those set forth above, have been met by providing a ratchet and pawl construction wherein the ratchet is comprised of means secured to a cord reel and defining a pair of circular, concentric paths radially spaced from each other and coaxial with said cord reel. The two paths are interconnected by a pair of diametrically disposed channels which are substantially tangent to the inner path and extend from their respective points of tangency in the same rotational direction to the outer path. A pawl or follower is pivotally supported upon means fixed with respect to the means rotatably supporting said cord reel for movement between said paths. A signal device is connected to said pawl which is also engaged by resilient means urging said pawl into a position between said paths. Equally spaced pawl engaging means are provided in the outer path whereby rotation of said ratchet with said reel is positively prevented in one rotational direction only.

Detailed construction

The ratchet and pawl construction **10** (FIGURES 1 and 2), is for illustrative purposes only, disclosed in association with a cord reel **11** which is rotatably supported by means, such as the bearings **12** and **13** upon the shaft **14** which is rigidly and non-rotatably secured to and within the housing **17**. The reel **11** is comprised of a pair of spaced, circular and coaxial side plates **18** and **19** between which the drum **21** is coaxially secured, said drum being of substantially less diameter than said side plates. A cord **22**, which may or may not be of an electrically conductive type, is wrapped around the drum **21** in a substantially conventional manner and may extend through guide structure **23** supported upon the periphery of the housing **17**. Resilient means, such as the coil spring **24**, is disposed between and secured at its opposite ends to the shaft **14** and the drum **21** in a substantially conventional manner for the purpose of resiliently urging rotation of the reel **11** with respect to the shaft **14**.

The above description relates primarily to a cord reel and its supporting structure, which may be subcstantially conventional and, therefore, is illustrative of only one type of cord reel with which my improved ratchet and pawl construction can be used.

Referring specifically to the ratchet and pawl construction **10** (FIGURE 1), the ratchet **27** is rigidly secured to and is rotatable with the side plate **19** of the reel **11**, and the pawl or follower **28** is pivotally supported upon the adjacent end wall **29** of the housing **17**. However, it will be recognized as the description proceeds that the ratchet **27** may be mounted upon the end wall **29** and the pawl pivotally supported upon the side plate **19**, thereby reversing their positions, without materially changing the effective operation of the ratchet and pawl construction **10**.

The ratchet **27** (FIGURE 2) is comprised in this embodiment of a pair of substantially identical, arcuate segments **31** and **32** of a circular ring defined by the radially

inner edges 33 and 34 and radially outer edges 37 and 38 of the segments 31 and 32, respectively. The segments 31 and 32 are secured by any convenient means, such as the rivets 39, to the outer surface of the side plate 19 so that their inner and outer circular edges are concentric with the rotational axis of the reel 11.

The inner edges 33 and 34 of the segments 31 and 32 (FIGURE 2) define the radially outer edge of an inner path 42, the inner edge of which is defined by the surface of the shaft 14. The inner edge of a circular outer path 43 is defined by the radially outer edges 37 and 38 of the segments 31 and 32, respectively. The end surfaces 44 and 45 of the segment 31 are spaced from the corresponding end surfaces 47 and 48 of the segment 32, thereby defining a pair of channels 51 and 52 which communicate between the inner path 42 and the outer path 43. The end surfaces 44, 45, 47 and 48 are preferably tangent to the outer edge of the inner path 42, which is defined by the inner edges 33 and 34 of said segments 31 and 32. Also, said end surfaces extend from their points of tangency in the same rotational direction with respect to said shaft. Where, as here, the ratchet is mounted upon the reel, the end surfaces will extend in that rotational direction in which the reel is rotated by the urging of the spring 24, which is indicated by the arrow "A" in FIGURE 2. Thus, arrow "A" indicates the rewinding direction of rotation and arrow "B" indicates the unwinding direction of rotation of the reel 11 with respect to the shaft 14. Accordingly, the channels 51 and 52 are divergent radially outwardly from the inner path 42. The end surfaces 44 and 48 taper into the outer edges 37 and 38, respectively, at acute angles and the end surfaces 45 and 47 taper into the inner edges 33 and 34, respectively, also at acute angles.

The outer edges 37 and 38 (FIGURE 2) of the segments 31 and 32 are provided with recesses 53 and 54, respectively, preferably approximately midway between their peripheral ends. The leading side walls 56 and 57 of the recesses 53 and 54, respectively, lie along tangents to the outer edge of the inner path 42 extending in said direction "A." The trailing sidewalls 58 and 59 are curved into said direction of rotation "A" to provide hooks 61 and 62, respectively.

A pawl 28 (FIGURES 2 and 3) is comprised of an arm 66 pivotally supported upon the post 67 which is rigidly secured to the end wall 29 of the housing 17. The arm 66 extends from said post in a direction parallel with and adjacent to a plane defined by those surfaces of the segments 31 and 32 opposing the end wall 29. A pawl pin 68 is secured to the arm 66 at a point spaced from the post 67 so that it penetrates said plane defined by the segments 31 and 32. The arm 66 is arranged and mounted so that the pin moves through said channels 51 and 52 along a path which is substantially radially disposed with respect to the shaft 14. The end of the arm 66 remote from the post 67 is engaged by one end of a resilient means, such as the spiral spring 69, the other end of which is secured to the end wall 29 by means of the mounting post 70.

The pivot post 67, the arm 66 and the mounting post 70 are positioned so that they will not interfere in any way with the freedom of rotation of the ratchet 27 with the reel 11. The mounting post 70 is also arranged and positioned so that the spiral spring 69 will continuously tend to urge the pin 68 into a position, as appearing in FIGURE 2, located approximately midway between the inner and outer paths 42 and 43, respectively.

A signal flag or finger 73 (FIGURES 2 and 3) is secured to the arm 66 and preferably extends radially outwardly therefrom with respect to the shaft 14. An opening 74 is provided in the peripheral wall 76 of the housing 17 through which the flag 73 can slidably extend. The length of the flag 73 is preferably such that it does not extend beyond the periphery of the wall 76 when the pin 68 is in engagement with one of the inner edges 33 and 34 of the segments 31 and 32, as shown in solid lines in FIGURE 3. However, when said pin 68 is in engagement with one of the outer edges 37 and 38 of said segments 31 and 32, respectively, the outer end of said flag 73 will protrude through the opening 74 and extend a substantial distance beyond the peripheral wall 76, where it can be easily seen.

Operation

In order to prevent the spring 24 from rotating the reel 11 in direction "A" (FIGURE 2), the pawl pin 68 must be in one of the recesses 53 and 54. Accordingly, for the sake of convenience in describing the operation of the invention, it will be assumed that the pin 68 is lodged in the recess 53, for example, when the operation commences. In such case, only that portion of the cord 22 unwound from the drum 21 will be available for use.

If it becomes desirable to rewind the cord 22 (FIGURE 1) upon the drum 21, the operator pulls on the cord 22, thereby rotating the ratchet 27 in direction "B" (FIGURE 2) until he feels or hears the pin 68 move off of the segment 31 and, under the urging of the spring 69 strike the end surface 47. This movement of the pin 68 into the position substantially as shown in FIGURE 2 can also be detected by watching the finger 73 which will move from its broken line position 73*a* in FIGURE 3 to the solid line position shown in FIGURE 2. When this movement occurs, regardless of how it is detected, the cord 22 is released and the spring 24 then rotates the ratchet 27 and reel 11 in direction "A." It will be observed that as the spring 24 rotates the ratchet 27 in the "A" direction, the pin 68 on the pawl 28 will alternately move along the inner edge 33 of the segment 31 and the inner edge 34 of the segment 32 until the cord 22 is completely wound upon the drum 21. As the pin 68 moves from one inner edge to the other, of the segments 31 and 32, a clicking sound will be detected.

If it becomes desirable to use the cord 22 at a point before it is completely rewound, the movement of the cord 22 is stopped and the cord is moved outwardly away from the housing 17 until two clicks are head or felt as they vibrate through the cord 22, or until the finger 73 is observed to move first into its broken line position 73*a* and then into a solid line position, about as shown in FIGURE 2. The first click that is heard or felt occurs when the pin 68 strikes one of the end surfaces 45 and 47 as said ratchet 27 is rotated in the direction "B." The second click is heard or felt when the pin 68 drops into the corresponding recess 53 and 54 associated with the segment having the end surface causing the first click. The second click is caused as the pin 68 drops over the hook 61, by way of example, and strikes against the leading sidewall 56 under the urging of the spring 69. The tension on the cord 22 may now be released and the cord will remain as is. It will be seen that even though the second click is overrun slightly, the pin 68 will still move back into the recess 53 if such overruning has not been materially in excess of 60° of a rotation in this particular embodiment. However, if the second click, hence the recess 53, is overrun so that a third click is heard or felt, the operator recognizes that the pin is now disposed in the channel 52 diametrically from the channel 51 through which the pin originally passed. Accordingly, by pulling out a little more cord 22, a fourth click will be detected at which time the pin 68 drops into the recess 54. On the other hand, if the recess 53 has been missed, the operator can simply release the tension on the cord 22 until the pin 68 has returned through one of the hooks 61 and 62 by the two-click method.

The amount of cord 22 which must be pulled out of the housing 17 in order to produce two clicks will vary in accordance with the amount of cord wrapped on the drum. Thus, detection by clicks may not be convenient in all instances and especially where the operator is not able to make such detections easily. However, this operator can easily and quickly detect both the position and

change of position of the pawl pin 68 with respect to paths 42 and 43 by watching the flag 73. Furthermore, the flag 73 can be used to determine approximately the amount of cord which must be pulled out of the housing 17 under any given condition of operation to effect engagement of the pawl 28 with the ratchet 27. Accordingly, the flag 73 not only serves to indicate to the operator exactly when he can release his grip upon the cord 22, but also serves as an easy means of assisting the operator in using the structure in a substantially automatic manner after he has become acquainted with it.

It will be seen that since there is nothing in the inner path 42 to interfere with the rotation of the ratchet 27 with respect to the pin 68 in the "A" direction, rewinding of the reel 11 after the pin 68 reaches the inner path 42 can be accomplished as fast as the spring 24 is capable of effecting such rewinding. On the other hand, rotation of reel 11 in direction "B," thereby unwinding of the cord 22, can be accomplished as fast as it is possible to draw the cord 22 out of the housing 17 without reference to the path occupied by the pin 68. Moreover, such rewinding or unwinding can be effected as slowly as desired without any interference whatsoever from the ratchet and pawl construction.

In order to be able to use the full extent of the cord 22, the cord is preferably secured to the reel 11 so that when said cord 22 is fully unwound the pin 68 will be in engagement with that portion of one of the outer edges 37 and 38 disposed between the hooks 61 and 62 and the end surfaces 44 and 48, respectively. Thus, when the tension on the cord 22 is released, the reel will move but a very short distance under the urging of the spring 24 before the pin 68 will drop into one of the recesses 53 and 54.

FIGURES 4 and 5 illustrate a modification of the invention wherein the inner and outer paths 80 and 81 are both closely defined along both their inner and outer edges. That is, the inner path 80 has inner and outer edges 82 and 83 and the outer path 81 has inner and outer edges 86 and 87. This arrangement is easily accomplished by recessing said paths 80 and 81 into and concentric with a circular member 88, which member can then be mounted in any convenient manner upon and concentric with the side plate 19 shown in FIGURE 1. The raised portion 89 between the inner and outer paths 80 and 81 may have substantially the same form as the two spaced segments 31 and 32, shown in FIGURE 2, according to the teachings of this invention. The operation of the alternate ratchet 79 will be substantially identical with the operation set forth above with respect to the ratchet 27.

Although particular preferred embodiments of the invention have been set forth above in detail for illustrative purposes, it will be understood that variations or modifications of such disclosure, which lie within the scope of the appended claims, are fully contemplated.

I claim:

1. In a ratchet structure for a cord reel rotatably supported upon a shaft and having spring means urging rotation of said reel in one direction with respect to said shaft, the combination comprising: means defining inner and outer circular paths concentric with each other and with said shaft; a follower alternatively positionable within said inner and outer paths; one of said follower and said means defining said inner and outer paths being mounted on said reel and the other being fixed with respect to said shaft; stop means along said outer path engageable with said follower when same is substantially within said outer path to prevent relative movement between said follower and said means defining said inner and outer paths in said one rotational direction; a flag movable in response to movement of said follower between said inner path and said outer path to indicate the path in which said follower is located.

2. In a ratchet structure for a cord reel rotatably supported upon a shaft within a casing and having spring means urging rotation of said reel in one direction with respect to said shaft, the combination comprising: means defining a substantially circular inner path concentric with said shaft and disposed between a pair of planes substantially perpendicular to said shaft; means defining a substantially circular outer path spaced radially outwardly from and substantially concentric with said inner path and disposed between said planes; wall means defining channel means between said paths, said wall means extending substantially tangentially from said inner path in said one rotational direction; a follower extending through at least one of said planes; mounting means supporting said follower for movement between said inner and outer paths, one of said mounting means and said means defining said inner and outer paths being mounted upon said reel and the other of said mounting means and said means defining said inner and outer paths being fixed with respect to said shaft; stop means along said outer path engageable with said follower when same is adjacent said outer path to prevent relative movement of said follower with respect to said means defining said inner and outer paths in the direction opposite to said one rotational direction; resilient means urging said follower into a position between said inner and outer paths; means defining an opening through said casing; and a flag movable by movement of said follower between said paths and extending through said opening whereby said flag indicates the position of said follower with respect to said paths.

3. In a control mechanism for a cord reel rotatably mounted upon a support structure and having spring means urging rotation of said reel in one direction with respect to said structure, the combination comprising: a pair of circumferentially spaced, arcuate segments arranged in a circle and rigidly secured to said reel, said segments having radially inner and outer edges defining, respectively, inner and outer, substantially circular paths substantially concentric with the axis of rotation of said reel, each segment having a first wall portion extending tangentially in the one rotational direction from the circle defined by said inner edges and merging at its inner end with said inner edge, said first wall portion extending to the outer edge of its segment, and each segment having a second wall portion opposed to and spaced from the first wall portion of the other segment whereby two substantially diametrically opposed channels are provided between said segments, said second wall portion extending tangentially from the path defined by said inner edges and curving circumferentially to merge with the path defined by said outer edges; a follower and means supporting said follower upon said support structure for movement through said channels between a position in said inner path and a position in said outer path; a stop means fixed with respect to each segment adjacent the outer path, said follower being engageable with said stop means as said follower moves along the outer path in the direction opposite to said one direction; resilient means constantly urging said follower toward a position between said inner and outer paths whereby, when said reel is rotated in said opposite direction, said follower is moved radially and abruptly inwardly from said outer path as it passes said stop means and said channels to engage a portion of a segment and thereby cause a detectable sound.

4. In a ratchet structure for a cord reel rotatably supported upon a shaft and having spring means urging rotation of said reel in one direction with respect to said shaft, the combination comprising: means defining a substantially circular inner path concentric with said shaft and disposed between a pair of planes substantially perpendicular to said shaft; means defining a substantially circular outer path spaced radially outwardly from and concentric with said inner path and disposed between said planes; wall means defining a pair of substantially diametrically opposed channels between said paths, said wall means of each channel extending substantially tangentially from

said inner path in the same rotational direction; a follower extending through at least one of said planes; mounting means supporting said follower for movement between said inner and outer paths, one of said mounting means and said means defining said paths being mounted upon said reel and the other of said mounting means and said means defining said paths being supported upon said shaft; a pair of stop means along said outer path and spaced from said channels, one of said stop means being located on each side of a straight line connecting said channels, said stop means preventing movement of said follower along said outer path in one direction; resilient means urging said follower into a position between said inner and outer paths; and a flag secured with respect to said follower and extending radially outwardly therefrom with respect to said shaft.

5. In a ratchet structure for a cord reel rotatably supported upon a shaft and having spring means urging rotation of said reel in one direction with respect to said shaft; the combination comprising: means defining a substantially circular inner path concentric with said shaft and disposed between a pair of planes substantially perpendicular to said shaft; means defining a substantially circular outer path spaced radially outwardly from and concentric with said inner path and disposed between said planes; wall means defining a pair of substantially diametrically opposed channels between said paths, said wall means of each channel extending substantially tangentially from said inner path in the same rotational direction; a follower extending through at least one of said planes; mounting means supporting said follower for movement between said inner and outer paths, one of said mounting means and said means defining said paths being mounted upon said reel and the other of said mounting means and said means defining said paths being supported upon said shaft; a pair of stop means along said outer path and spaced from said channels, one of said stop means being located on each side of a straight line connecting said channels, said stop means preventing movement of said follower along said outer path in one direction; resilient means urging said follower into a position between said inner and outer paths; a finger secured to said follower and extending substantially radially outwardly therefrom with respect to said shaft when said follower is in one of said paths and said channels, and wherein said shaft is supported upon and within a casing having a peripheral wall substantially encircling said reel, said mounting means being secured to said casing and said wall having an opening through which said finger extends when said follower is in said outer path, said finger being within said casing when said follower is in said inner path.

6. In a ratchet structure for a cord reel rotatably supported upon a shaft and having spring means urging rotation of said reel in one direction with respect to said shaft, the combination comprising: means defining a substantially circular inner path substantially concentric with said shaft and disposed between a pair of planes substantially perpendicular to said shaft; means defining a substantially circular outer path spaced radially outwardly from and concentric with said inner path and disposed between said planes; wall means defining a plurality of spaced channels between said paths, said wall means of each channel extending substantially tangentially from said inner path in said one rotational direction; a follower extending through at least one of said planes; mounting means supporting said follower for movement through said channels between positions in said inner and outer paths, one of said mounting means and said means defining said inner and outer paths being mounted upon said reel and the other of said mounting means and said means defining said inner and outer paths being fixed with respect to said shaft; a plurality of stop means, one stop means being fixed with respect to said means defining the circular outer path adjacent said outer path and between each pair of adjacent channels, said follower being engageable with said stop means as said follower moves relative to and along said means defining said outer path in the direction opposite to said one rotational direction; resilient means constantly urging said follower toward a position between said inner and outer paths, whereby, when said follower moves along said outer path in said one rotational direction, said follower is moved radially and abruptly inwardly from said outer path as it passes said stop means and said channels to engage a portion of said means defining said outer path and said wall means, respectively, and thereby cause a detectable sound.

7. The structure of claim 6 wherein said inner and outer paths and said channels are defined by the edges of circumferentially spaced, semicircular segments arranged in a circle, said edges being disposed substantially between said planes; and said stop means includes a notch in the radially outer edge of each of said segments approximately midway between the circumferential ends thereof, each notch having substantially parallel side walls extending substantially tangentially with respect to said inner path in said one rotational direction.

8. In a control mechanism for a cord reel rotatably mounted upon a support structure with first resilient means urging rotation of said reel in one direction with respect to said structure, the combination comprising: a plurality of spaced, elongated and arcuate members arranged substantially in a circle and rigidly secured to one of said reel and said structure, said members each having a pair of arcuate and radially spaced, lengthwise edges defining first and second, substantially circular and radially aligned paths substantially concentric with the rotational axis of said reel, said members having circumferential end walls arranged substantially tangentially with respect to the inner one of said first and second paths and extending therefrom in the same rotational direction to define a plurality of spaced channels extending between said first and second paths; a follower element and means supporting said follower element upon the other of said reel and said structure for movement relative to said members along said first and second paths and through said channels between said paths; stop means fixed with respect to each member and located at a point spaced from the ends thereof and adjacent the first path, said stop means being engageable by said follower element to oppose relative rotation between said reel and said structure when, and only when, said reel is being urged to rotate in said one direction with respect to said structure, and said follower element is in said first path; and second resilient means urging said follower element into a position between said first and second paths, whereby, when said reel is rotated in the direction opposite to said one direction, said follower is moved substantially radially and abruptly from said first path toward said second path as said follower moves past said stop means and said channels to engage a portion of a said member and thereby cause a detectable sound.

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