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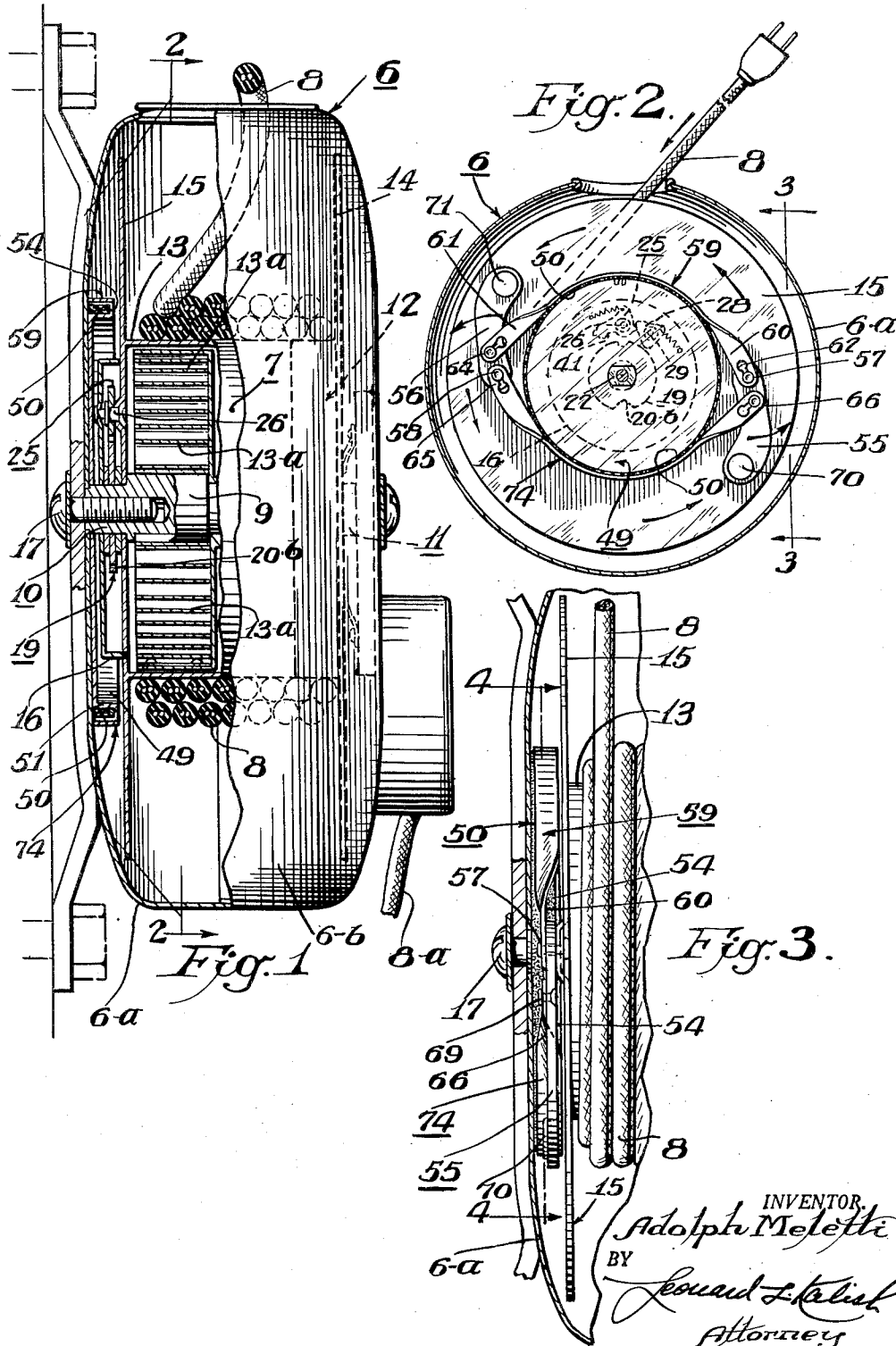
A. MELETTI

2,521,178

AUTOMATIC BRAKE FOR SPRING-TENSIONED TAKE-UP REELS

Filed March 22, 1946

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Fig. 4.

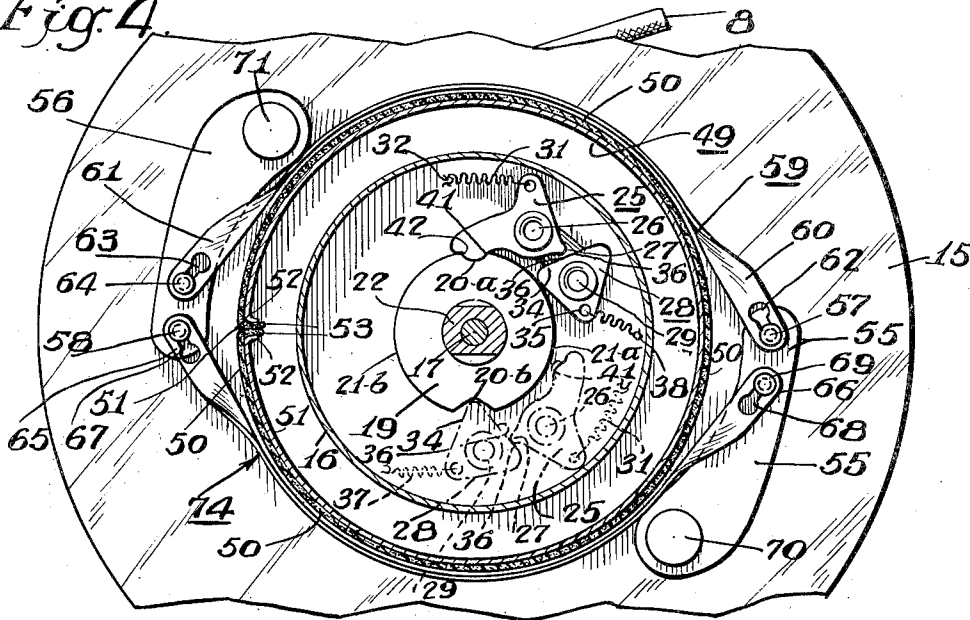
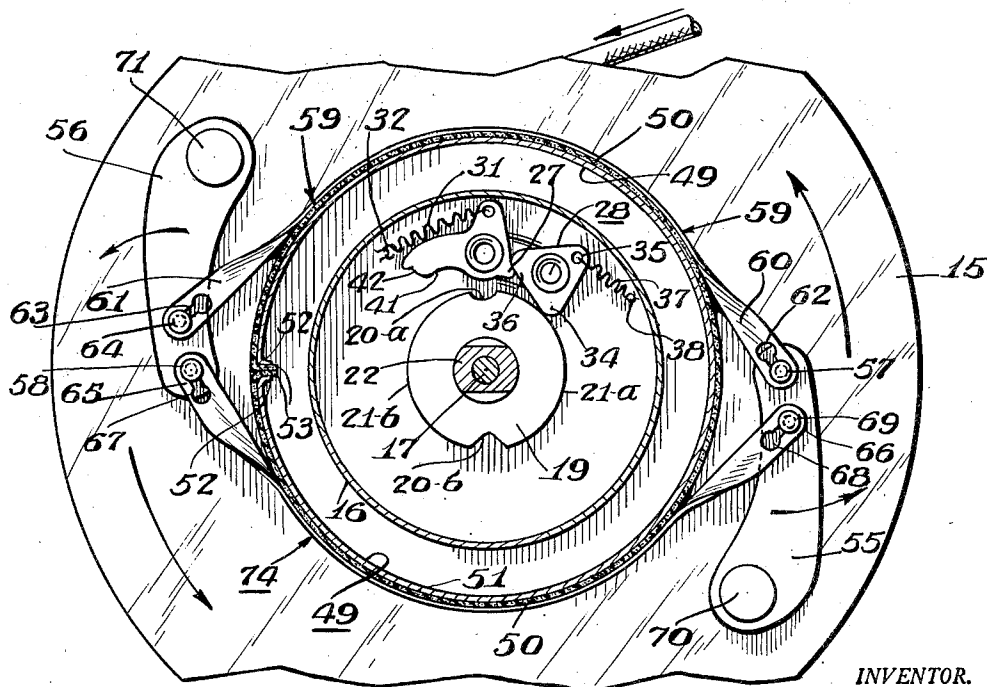


Fig. 5.

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AUTOMATIC BRAKE FOR SPRING-TENSIONED TAKE-UP REELS

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5 Claims. (Cl. 242—107)

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The present invention relates to certain improvements in spring-tensioned and other take-up reels and it relates more particularly to novel automatic braking mechanism for spring-wound cord-controlled take-up reels.

An object of the present invention is to provide a new and improved construction for spring-tensioned and other take-up reels or the like. An additional object of the present invention is to provide novel braking mechanism for spring-wound cord-controlled take-up reels or the like. Still another object of the present invention is to provide automatic braking mechanism for spring-wound cord-controlled take-up reels or the like whereby the braking force is proportional to the wind-up speed of the reel thereby to prevent excessive speed of rotation of the reel during the wind-up operation. A further object of the present invention is to provide automatic centrifugally-actuated braking mechanism for a reel or the like.

Other objects and advantages of the present invention are apparent in the following detailed description, appended claims and accompanying drawings.

In my Patent 2,391,840, I have disclosed a novel spring-wound cord-controlled take-up reel for electric cords or the like whereby the cord can be manually unwound, to any suitable extent from a spring tensioned reel provided with latching mechanism which will hold the cord in its extended position but which can be released by a slight outward pull on the cord so as to permit the reel to be turned by its spring continuously to re-wind the cord.

While the construction shown in my Patent 2,391,840 has proven highly satisfactory in use, it has been found that, under certain circumstances requiring strong spring-action or great cord-length, the reel tends to re-wind at excessive speeds. When this occurs, there is some danger of the operator being struck by the plug or other connection at the free end of the cord, if he is not careful.

Accordingly, the present invention contemplates a further improvement upon a reel construction (either of the sort disclosed in my Patent 2,391,840 or of any other spring-tensioned or other type of reel) whereby automatic braking means are provided to prevent excessive speed of rotation of the reel during the rewinding operation.

To this end, the present invention contemplates the provision on a spring-tensioned or other type of reel construction of a brake means

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centrifugally-actuated by the speed of rotation of the reel, so as to apply a restraining force when the speed of the reel becomes excessive; the braking force varying directly with the speed of rotation of the reel.

For the purpose of illustrating the invention, there is shown in the accompanying drawings one form thereof which is at present preferred, although it is to be understood that the various instrumentalities of which the invention consists can be variously arranged and organized and that the invention is not limited to the precise arrangements and organizations of the instrumentalities as herein shown and described.

Referring to the accompanying drawings in which like reference characters indicate like parts throughout:

Figure 1 represents a view, partly in elevation and partly in cross-section, of one embodiment of the present invention.

Figure 2 represents a reduced vertical cross-sectional view generally along the line 2—2 of Figure 1.

Figure 3 represents an enlarged fragmentary side elevational view looking generally in the direction of the arrows 3—3 of Figure 2.

Figure 4 represents a cross-sectional view generally along the line 4—4 of Figure 3 showing the reel-latching mechanism in locking position and showing the brake mechanism in non-braking position.

Figure 5 represents a view generally similar to that of Figure 4 but showing the position of the parts while the reel is rewinding against the restraint of the brake.

In the embodiment of Figures 1 to 5, I have shown a reel, generally similar to that disclosed in my Patent 2,391,840, which includes a central drum hub 7 upon which an insulated electric cord 8 is wound. The hub 7 is revolubly mounted upon a central shaft 9 having two outer terminal trunnion-like portions 10 and 11, whereby the shaft is non-revolubly mounted in any suitable stationary housing 6 (which may be formed of front and rear separable half-sections 6b and 6a). The hub 7 may be formed of two hollow chamber-forming portions 12 and 13 respectively. Chamber-portion 12 houses electrical collector rings and brushes (not shown) similar to those disclosed in my Patent 2,391,840 for maintaining electrical connection between the inner end of the cord 8 and the fixed electrical cord 8a which leads to any suitable electrical motor or the like being supplied with electric current by the reel assembly.

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The hub-portion 13 houses a flat spiral take-up spring 13a which is anchored at its inner end to the stationary shaft 9 and is operatively connected, at its outer end to the interior of the hub-portion 13.

The hub-portion 12 may be provided with a thin flat integrally-formed flange 14 adjacent its outer edge while the hub portion 13 may be provided with a similar flange 15.

On one side of the reel, as for instance on the outer side of the flange 15, a shallow-dished sheet-metal housing 16 is provided; the housing 16 being affixed, by any suitable fastening means, to the flange 15.

Within the housing 16, there is provided a ratchet-disc 19 having formed thereon one or more peripheral notches, as for instance, notches 20a and 20b, and corresponding dwells 21a and 21b. The ratchet disc is keyed to the non-circular end 22 of the shaft 9 so that it is held in non-revoluble relationship to said shaft.

A pawl 25 is pivotally mounted, as at 26, upon the outer side of the flange 15; the pawl 25 being disposed in generally the same plane as the ratchet-disc 19 and being provided with a heel 27 extending generally on the opposite side of the pivot 26. A generally triangular cam 28 is pivotally mounted, as at 29, upon the flange 15 in operative juxtaposition to the heel 27.

The pawl 25 is tensioned by a spring 31 so that it will be constantly urged in the direction of the ratchet-disc 19; the other end of the spring 31 being anchored to the flange 15 by a member 32.

The triangular cam 28 is provided with a pawl-retracting shoulder 36 which is in operative juxtaposition to the heel 27 of the pawl 25. The cam 28 is tensioned by a spring 37 which is connected at one end to the ear 35 of said cam and, at its other end, to an anchorage member 38 formed on the flange 15.

The anchorage member 38 is so disposed in relation to the pivot 29 of the cam 28 that the spring 37 will, at all times, urge the camming shoulder 34 of the cam 28 against the ratchet-disc 19. That is, when the pawl 25 and the cam 28 are in the "locked" position shown in Figure 4, the spring 37 urges the cam 28 counterclockwise to maintain the cam shoulder 34 in contact with the ratchet-disc 19. When the pawl 25 and the cam 28 are in the "unlocked" position shown in Figure 5, the spring 37 urges the cam 28 clockwise to maintain the camming shoulder 34 in contact with the ratchet-disc 19.

As more fully described in my Patent 2,391,840, the locking and unlocking operation of the reel is as follows:

If the cord 8 is pulled out manually a short distance, in Figure 4, the hub 7 and the flange 15 are rotated clockwise in Figure 4. This rotational movement of the flange 15 (as well as of the pawl 25 and the cam 28 which are mounted upon the flange) first causes the pawl 25 to be "kicked" out of the notch 20a because of the gradual inclination of the surface 41 which is at an acute angle to the radius from the pivot 26 of the pawl 25 (whereas the opposite pawl surface 42 is approximately at a right angle to this radius) thereby lifting the pawl onto the dwell 21a, and, as the pawl 25 further recedes from the notch 20a, the camming shoulder 34 of the cam 28 moves toward, and finally drops into, notch 20b in something less than a half revolution after the pawl 25 has been "kicked" out of the notch 20a. This intermediate position of the pawl 25 and cam 28 is shown in dash-dot lines in Figure 4.

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If the operator then releases cord 8, the spring 13a rotates the hub 7 and the flange 15 counterclockwise in Figure 4 to wind-up the extended or "payed-out" portion of the cord 8.

During the first portion of this counterclockwise rotation of the flange 15, the camming shoulder 34 of the cam 28 will be rotated counterclockwise so as to bring the pawl-retracting shoulder 36 against the heel 27 of the pawl 25 as indicated in Figure 5, so as to retain the pawl 25 in the "unlocked" position so long as the hub 7 and the flange 15 are rotating counterclockwise to wind-up the "payed-out" portion of the cord 8; there being a series of audible "clicks" during this re-winding operation, each click resulting from the momentary entry of the camming shoulder 34 of the cam 28 into one of the notches 20a and 20b.

When it is desired to stop the re-winding of the cord 8 and to lock the reel with the cord in a partially re-wound position, the operator manually grasps the "payed-out" portion of the cord 8 so as frictionally to bring it to a halt. He then pulls the cord outward a slight distance which results in clockwise rotation of the flange 15 from the position shown in Figure 5 until the camming shoulder 34 of the cam 28 enters the notch 20b as evidenced by a "click." If the cord were simply released at the sound of this first "click" flange 15 would move back to the position shown in Figure 5 and the reel would continue to rewind as described above.

If, however, the cord is pulled out a little bit beyond the point at which the first "click" is heard, there will be a second "click" evidencing the dropping of the pawl 25 upon the dwell 21a under the action of the spring 31 (the pawl-retracting shoulder 36 having been moved to non-engaging position relative to the heel 27 during this additional rotation).

If the cord 8 is then released the flange 15 rotates counterclockwise in Figure 4 until the pawl 25 engages within notch 20a as shown in solid lines in Figure 4 so as to lock the reel against further rewind.

From the foregoing, it is evident that the reel can be manually adjusted to unwind, lock, release, and re-wind as desired, in generally the same way as described in my Patent 2,391,840.

The novel braking mechanism of the present invention will now be described as applied to the above-described reel-mechanism.

A brake-drum 49 is fixedly mounted upon the shaft 9 adjacent the inner side of the housing half-section 6a. A brake-lining 50 is fitted about the rim 51 of the drum 49. A pair of locking ears 52 may be struck inwardly from the rim 51; the ears 52 being so positioned as frictionally to retain the free ends 53 of the one piece brake-lining 50 when said ends are inserted within the opening in the rim 51 formed intermediate the ears 52, as shown particularly in Figures 4 and 5. In this way, the brake lining 50 (which may be of any suitable rubber, asbestos and/or cork composition such as is well known in the braking art) is maintained snugly upon the rim 51.

If desired, a slight outwardly-extending annular flange 54 may be provided upon the free edge of the rim 51 to prevent the lining 50 from slipping off the rim. The housing half-section 6a abuts the outer side of the drum 49 and prevents the lining from slipping off the rim in that direction.

A pair of levers 55 and 56 are mounted upon the flange 15 by pins 57 and 58 respectively; the

pins 57 and 58 being arranged in diametrically-opposed positions on said flange 15 and being spaced somewhat radially outward of the brake-drum 49. The levers 55 and 56 extend generally clockwise, in Figures 4 and 5, from their respective pivot pins 57 and 58.

A brake-band 59 which is in the form of a thin, flat band of spring-steel or other suitable resilient material, has its ends 60 and 61 twisted to a plane generally at right angles to the plane of the main body of the band; the ends 60 and 61 being provided with slots 62 and 63. The slot 62 of the end 60 is adapted to be fitted over the enlarged head of pivot 57 of the lever 55 and to be retained thereon, as shown particularly in Figures 3, 4, and 5.

The slot 63 on the end 61 of the band 59 is adapted to be fitted over the enlarged head of a pin 64 carried by the lever 56 at a point appreciably spaced apart from the pivot-pin 58 of said lever 56.

The brake-band 59 is shaped so that it is more or less form-retaining and the relationship of the pivot pin 57 and the pin 64 is such that, when the band 59 is connected therebetween, a slight clearance is normally maintained between the brake-band 59 and the brake-lining 50 as indicated in Figure 4.

In this position, the tension of the brake-band offers slight resistance to the counterclockwise rotation of the lever 56.

As will be more fully described hereinbelow, it is desirable for best braking results that this tension be neither too great nor too small.

A similar brake-band 74 having twisted ends 65 and 66 provided with slots 67 and 68 respectively is connected intermediate the pivot pin 58 and a pin 69 carried by the lever 55; the slot 67 fitting over and being retained upon the pin 58 and the slot 68 fitting over and being retained upon the pin 69. Weights 70 and 71 may be provided at the free ends of the levers 55 and 56 respectively so as to increase the centrifugal force generated by the levers during rotation of the hub 7 and flange 15; although said weights 70 and 71 may be dispensed with where the effective moment of the lever masses is sufficient to provide adequate centrifugal force.

The operation of the novel braking mechanism of the present invention is as follows:

When the hub 7 and the flange 15 are stationary, the positions of the levers 55 and 56 are generally as shown in Figure 4 wherein there is no frictional restraint upon the brake-lining 50 and wherein there is slight tensional resistance to counterclockwise rotation of the levers 55 and 56.

When the "payed-out" cord is released however, so that the hub 7 and flange 15 start rotating counterclockwise in Figure 4, centrifugal force acting upon the levers 55 and 56 tends to rotate them counterclockwise about their respective pivot pins 57 and 58, against the relatively slight tension of the resilient brake-bands 59 and 74, so as to move the pins 69 and 64 outward from their original positions shown in Figure 4 to the positions shown in Figure 5.

This results in tightening of the brake-bands 59 and 74 against the brake-lining 50 so as frictionally to slow the rotation of the hub 7 and the flange 15 relative to the stationary drum 49.

It is desirable that the end pins holding the resilient brake-bands 59 and 74 be carefully positioned in order to obtain best braking results.

Thus, if the end pins are so positioned that the resilient brake-bands exert excessive restraining

force upon the levers 55 and 56, there will be insufficient braking action since braking would occur only when the speed of rewind becomes so great that the centrifugal force generated upon the levers 55 and 56 is adequate to overcome the excessive restraining force of the resilient brake-bands 59 and 74.

If, on the other hand, the end pins of the resilient brake-bands 59 and 74 are so positioned that insufficient restraining force is exerted upon the levers 55 and 56, there will be excessive braking action since the levers will tend to fly out too readily upon even slow rotation of the reel. As a result, the reel would rewind at extremely slow speeds and, indeed, rewinding might be brought completely to a halt.

In general, it is desirable that the resilience of the brake-bands 59 and 74 be adjusted so as just to compensate for the spring-drag during rewinding, thereby to ensure smooth rewinding at a desired rate-of-speed and without excessive or insufficient or "jerky" rewinding action.

In general, it is desirable to so adjust the resilient brake-bands 59 and 74 as to give a rewind speed of approximately five feet per second.

This prevents the electric cord from being rewound at excessive speeds and eliminates the danger of "whipping" or other similar action which may cause injury to the operator.

It is also obvious that only a single lever and brake-band could be employed (in place of the pair shown in Figures 4 and 5) or that three or four or any other number of such lever-and-band combinations could be circumferentially disposed on the flange 15 about the brake-drum 49.

If desired, the brake-drum 49 can be welded to the inner side of the housing half-section 6a so that the brake-drum and the half-section can be assembled upon the trunnion 10 together, after which the entire assembly can be locked together by the bolt 17.

While, for the purposes of illustration, my novel braking mechanism has been described in conjunction with the reel of my Patent 2,391,840, the present invention contemplates the use of this braking mechanism with other types of reels.

The present invention further contemplates the use of my novel braking mechanism to prevent excessive "pay-out" speeds as well as "rewind" speeds. That is, it is obvious that if the flange 15 were rotated clockwise in Figure 5 (that is, in the "pay-out" direction) at excessive speeds, centrifugal force generated upon the levers 55 and 56 would again cause them to rotate counterclockwise so as to tighten the brake-bands 59 and 74 against the brake-lining 50 and thereby frictionally to restrain the rotation.

In addition to reducing the danger of accidents due to "lashing" or "whipping" of the free end of the cord during excessively rapid re-winding, the novel braking mechanism of the present invention affords other important advantages.

Thus, if the braking mechanism of the present invention is not used, there will be a considerable strain placed upon the connections between the wires of the cord and the plug at the free end of the cord whenever the cord is fully wound in. That is, whenever the cord is fully rewound, its inward movement is brought to a halt when the plug strikes the outer casing of the reel. It is apparent that if the rewinding speed is excessive, there will be a very considerable stress placed upon the relatively weak connections between the individual wires of the cord and the contact posts of the plug.

As a result, after many rewindings without braking mechanism these connections tend to be weakened and eventually to fail.

With the novel braking mechanism of the present invention, on the other hand, the speed of rotation during re-winding is reduced to a point at which the electrical connections and the plug are capable of withstanding stopping stress without appreciable tendency toward failure.

Additionally, the novel braking mechanism of the present invention results in a more uniform distribution of the cord upon the reel during re-winding. That is, when the speed of re-winding is excessive, the cord tends to wind itself about the reel too loosely so that the reel becomes filled and crowded before all the cord has been re-wound. With my novel braking mechanism, on the other hand, the cord winds itself upon the reel more tightly (due to the lower re-winding speed) and thereby tends to distribute itself more uniformly upon the reel. This not only makes it certain that the long cord will be accommodated upon the reel, but also give easier and smoother "pay-out" motion.

The present invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof, and it is therefore desired that the present embodiments be considered in all respects as illustrative and not restrictive, reference being had to the appended claims rather than to the foregoing description to indicate the scope of the invention.

Having thus described my invention, I claim as new and desire to protect by Letters Patent:

1. In a reel having a housing and a cord-carrying member rotatably mounted within said housing; means for automatically braking said cord-carrying member when its speed of rotation becomes excessive, said means comprising a brake-drum fixedly mounted within said housing, a brake-lining of friction-creating material fitted upon said brake-drum, a lever pivotally mounted at one end upon said rotatable member and constructed and arranged to swing outward under the action of centrifugal force generated during rotation of said rotatable member, and a curved somewhat form-retaining brake-band of resilient ribbon steel or the like connected at one end to said lever at a point appreciably spaced from the pivot thereof and fastened at its other end to said rotatable member at a point substantially circumferentially spaced from said lever, said brake-band being constructed and arranged normally to extend arcuately in slightly radially spaced relationship to said brake-lining and to exert inward tension upon said lever, said lever being constructed and arranged to swing outward against the tension of said brake-band when the speed of rotation of said cord-carrying member becomes excessive thereby to reduce the curvature of the brake-band and to bring it into contact with the brake-lining so as to reduce the speed of rotation of said cord-carrying member; the brake-band acting to retract the lever and to return to its normal radially spaced-apart relationship relative to said brake-lining when the speed of rotation of said cord-carrying member has been reduced.

2. In a reel having a housing and a cord-carrying member rotatably mounted within said housing; means for automatically braking said cord-carrying member when its speed of rotation becomes excessive, said means comprising a brake-drum fixedly mounted within said housing in

axially-spaced relationship to said cord-carrying member, a brake-lining of friction-creating material fitted upon said brake-drum, a lever eccentrically pivoted to said rotatable member and constructed and arranged to swing outward under the action of centrifugal force generated during rotation of said cord-carrying member, said lever being positioned in generally the same radial plane as the brake-drum but substantially radially outward therefrom, and a curved somewhat form-retaining brake-band of resilient ribbon steel or the like connected at one end to said lever at a point appreciably spaced from the pivot thereof and fastened at its other end to said cord-carrying member at a point appreciably circumferentially spaced from said lever, said brake-band being constructed and arranged normally to extend arcuately in slightly radially spaced relationship to said brake-lining and to exert inward tension upon said lever, said lever being constructed and arranged to swing outward against tension of said brake-band when the speed of rotation of said cord-carrying member becomes excessive thereby to reduce the curvature of the brake-band and to bring it into contact with the brake-lining so as to reduce the speed of rotation of said cord-carrying member; the brake-band acting to retract the lever and to return to its normal radially spaced-apart relationship relative to said brake-lining when the speed of rotation of said cord-carrying member has been reduced.

3. In a reel having a housing, a cord-carrying member rotatably mounted within said housing, a helical spring operatively connected to said cord-carrying member and urging it for cord-rewinding rotation, latching-mechanism operatively connected to said rotatable member whereby the said member can be adjusted at will to lock in any predetermined cord-extended position and to unlock for continuous spring-actuated cord-rewinding rotation; means for automatically braking said rotatable member so as to prevent excessively rapid cord-rewinding rotation thereof, said braking means comprising an annular brake-drum fixedly mounted within said housing in axially spaced relationship to said cord-carrying member and having a brake-lining of friction-creating material tightly fitted thereon, a lever pivotally mounted at one end upon said rotatable member and constructed and arranged to swing outward under the action of centrifugal force generated during rotation of said rotatable member, and a curved somewhat form-retaining brake-band of resilient ribbon steel or the like connected at one end to said lever at a point appreciably spaced from the pivot thereof and fastened at its other end to said rotatable member at a point substantially circumferentially spaced from said lever, said brake-band being constructed and arranged normally to extend arcuately in slightly radially spaced relationship to said brake-lining and to exert inward tension upon said lever, said lever being constructed and arranged to swing outward against the tension of said brake-band when the speed of rotation of said cord-carrying member becomes excessive thereby to reduce the curvature of the brake-band and to bring it into contact with the brake-lining so as to reduce the speed of rotation of said cord-carrying member; the brake-band acting to retract the lever and to return to its normal radially spaced-apart relationship relative to said brake-lining when the speed of rotation of said cord-carrying member has been reduced.

4. In a reel having a housing, a cord-carrying member rotatably mounted within said housing, a helical spring operatively connected to said cord-carrying member and urging it for cord-rewinding rotation, latching-mechanism operatively connected to said rotatable member whereby the said member can be adjusted at will to lock in any predetermined cord-extended position and to unlock for continuous spring-actuated cord-rewinding rotation; means for automatically braking said rotatable member so as to prevent excessively rapid cord-rewinding rotation thereof, said braking means comprising an annular brake-drum fixedly mounted within said housing in axially spaced relationship to said cord-carrying member and having a brake-lining of friction-creating material tightly fitted thereon, a lever eccentrically pivoted to said rotatable member and constructed and arranged to swing outward under the action of centrifugal force generated during rotation of said cord-carrying member, said lever being positioned in generally the same radial plane as the brake-drum but substantially radially outward therefrom, and a curved somewhat form-retaining brake-band of resilient ribbon steel or the like connected at one end to said lever at a point appreciably spaced from the pivot thereof and fastened at its other end to said cord-carrying member at a point appreciably circumferentially spaced from said lever, said brake-band being constructed and arranged normally to extend arcuately in slightly radially spaced relationship to said brake-lining and to exert inward tension upon said lever, said lever being constructed and arranged to swing outward against the tension of said brake-band when the speed of rotation of said cord-carrying member becomes excessive thereby to reduce the curvature of the brake-band and to bring it into contact with the brake-lining so as to reduce the speed of rotation of said cord-carrying member; the brake-band acting to retract the lever and to return to its normal radially spaced-apart relationship relative to said brake-lining when the speed of rotation of said cord-carrying member has been reduced.

5. In a reel having a housing and a cord-carrying member rotatably mounted within said housing; means for automatically braking said cord-carrying member when its speed of rota-

tion becomes excessive, said means comprising a brake-drum fixedly mounted within said housing, a brake-lining of friction-creating material fitted upon said brake-drum, a pair of pins mounted upon said cord-carrying member and extending axially therefrom at generally diametrically-opposed points relative to said brake-drum, a governor lever eccentrically pivoted upon each of said pins, said levers being disposed in generally the same radial plane as said brake-drum and being constructed and arranged to swing out under the action of centrifugal force generated during rotation of said cord-carrying member, a generally curved somewhat form-retaining brake-band of resilient ribbon steel or the like fastened at one end to each of said pins and connected at its other end to the opposite lever at a point somewhat spaced from the pivot thereof, said brake-bands being constructed and arranged normally to extend arcuately in slightly radially spaced relationship to said brake-lining and to exert inward tension upon said governor levers, said levers being constructed and arranged to swing out against the tension of said brake-bands when the speed of rotation of said cord-carrying member becomes excessive thereby to reduce the curvature of said brake-bands and to bring them into contact with the brake-lining so as to reduce the speed of rotation of said cord-carrying member; the brake-bands acting to retract the governor levers and to return to their normal radially spaced relationship relative to said brake-lining when the speed of rotation of said cord-carrying member has been reduced.

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