

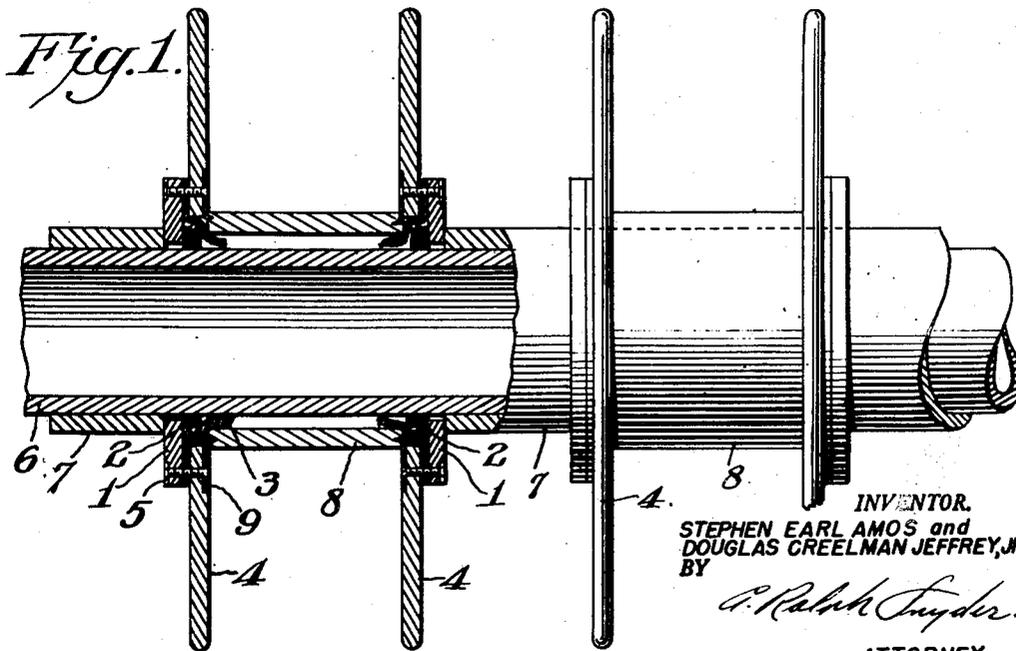
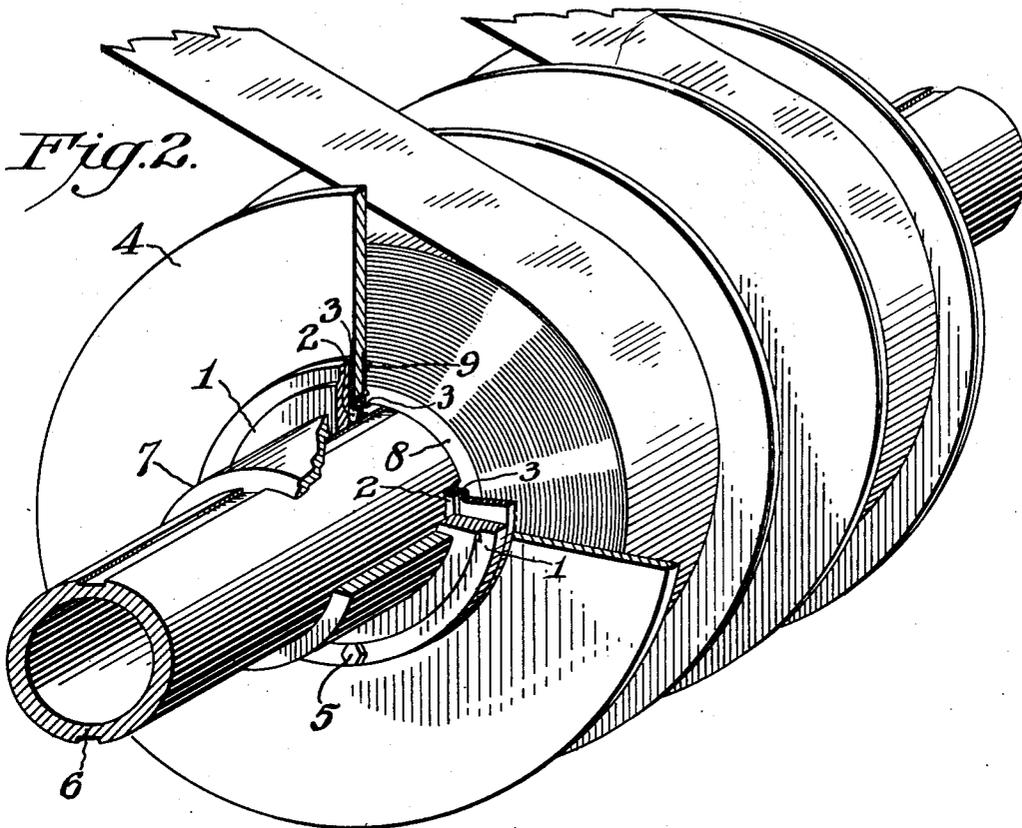
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CONSTANT TORQUE WINDING MEANS FOR SLITTING MACHINES

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CONSTANT TORQUE WINDING MEANS FOR SLITTING MACHINES

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3 Claims. (Cl. 242-75)

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This invention relates to web winding and more particularly to improvements in apparatus for winding slit film, paper and the like as it comes from a slitting machine.

In the manufacture of narrow webs of non-fibrous pellicular material such as regenerated cellulose film and of fibrous pellicular material such as paper, it is customary to carry a wide web of pellicular material past aligned slitting knives of a slitting machine and to wind the resulting narrower widths of web material on a suitable mandrel to form a package.

A windup arrangement currently used commercially in the packaging of slit film is as follows; a keyed spacing sleeve is first slipped over the surface of, and keyed to a driven wind-up mandrel or shaft. Then a paper core is slipped on the mandrel next to the spacer, followed by another keyed spacing sleeve, a second core, another sleeve etc. When the mandrel has been filled with spacing sleeves and cores, a spring-pressed abutment applies end pressure to the assemblage to regulate the pressure, and therefore the friction, between the ends of the paper cores and the sleeves. The sleeves, being keyed to the mandrel, turn at mandrel speed while only the friction makes the cores turn, which produces the wind-up tension. The chief drawback to this type of a wind-up is that as the weight of the slit roll increases, the component of torque produced by the friction between the mandrel and the core increases since the core rests directly on the mandrel, and a poor winding pattern is obtained. It has been determined that the optimum winding pattern for slit rolls results when the winding is accomplished under substantially constant torque conditions. Substantially constant torque winding minimizes bluish and distortion of the web or film at the off gauge locations, prevents excessive "buckling or starring" of the web or film next to the core, and when the roll is subjected to freezing temperatures and allowed to return to normal temperature it exhibits good resistance to telescoping. Moreover, where rolls of unequal width or weight (due to difference in diameter) are wound upon the same mandrel, it is very difficult to wind the wider or heavier roll with satisfactory film tension without imposing too great a strain on the narrower film.

An object of this invention therefore is to provide a wind-up device for slitting machines wherein the turning force on the roll of slit web is of substantially constant torque at all times during the winding of the roll and remains constant

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Another object is to provide wind-up means for slitting machines which will give uniformly wound packages irrespective of differences in width between packages wound on the same mandrel. Other objects will appear hereinafter.

These objects are accomplished by the present invention which briefly stated comprises a novel frictionless bearing mounted friction ring-edging collar assembly to be interposed between the spacers and paper core at each end of the core on the conventional wind-up mandrel. The assembly is constructed to support the paper core out of contact with the mandrel at all times, the collar at each end of the core together with the core forming, in effect, a wind-up hobbin. Referring to the accompanying drawing wherein

Fig. 1 is a front elevation, partly in cross-section, of a portion of a slitting machine winding mandrel upon which is mounted the device of this invention, and

Fig. 2 is a perspective view of a portion of a mandrel with partly wound packages thereon, parts being broken away to depict the salient features of construction in accordance with the invention.

In a preferred embodiment, the friction ring-edging disc assembly comprises a friction ring 1, an inner ball race 2, outer ball race 3, and annular edging disc 4 held together as a unitary assembly by four bolts 5 equally spaced circumferentially and passing through registering holes drilled in the friction ring, an extension on the outer ball race, and the edging disc. The inner ball race is sized to fit snugly over a conventional winding mandrel 6 provided with a full-length keyway to permit a plurality of spacing sleeves 7 to be keyed thereto in driving relationship. The inner diameters of the friction ring 1, the outer ball race 3, and the edging disc 4 are slightly greater than the diameter of the mandrel and these elements being joined by means of bolts 5 constitute a unitary assembly freely rotatable about inner ball race 2 and mandrel 6 upon which ball race 2 snugly fits. Outer ball race 3 is provided with an extension or lip parallel to, but out of contact with mandrel 6 which lip serves to support the core 8 out of contact with mandrel 6. Preferably, bolts 5 also secure plates 9 in recesses in the inner face of edging disc 4 each plate being provided with an outwardly projecting prong adapted to penetrate the end of the core whereby to provide positive driving engagement between the edging disc and package core and prevent rotation of the core

the mandrel against an end abutment thereon, the key engaging the keyway of the mandrel, then the ball bearing friction ring-edging disc assembly described hereinabove is slipped over the surface of the mandrel against the spacer, next a paper core goes on and finally another ball bearing friction ring-edging disc assembly facing in the opposite direction so that the core is supported away from the mandrel on the inner lips of the two collars and is impaled on the sharp points of the engaging prongs on the discs to prevent rotation of the core with respect to the edging discs. Thus, the core and the two edging discs are securely held together as a spool-like unit. Another metal spacing sleeve is placed next to the second disc, abutting the friction ring 1; a second core; another disc, etc. until the mandrel is filled with discs, cores, and spacing sleeves. A spring-pressed abutment of usual construction (not shown) applies end pressure to the assemblage. Thus, the torque driving the disc assembly is produced principally by the keyed spacers contacting the friction rings and to only a slight degree by the disc assembly contacting the mandrel through the ball bearings. The component of torque caused by the spacing collars is nearly constant. The ball bearing discs minimize the effect of the increasing weight of a slit roll during the winding operation since they hold the core away from the mandrel and carry the weight on the ball bearings.

The edging disc 4 is usually made slightly larger than the maximum diameter of the slit roll. This is particularly necessary when films with slippery surfaces are being slit in order to assure a uniformly wound-up edge. If the material being slit is not too slippery, the disc 4 can be of the same diameter as the friction ring 1.

Torque measurements comparing the arrangement of this invention with the heretofore described commercial prior art arrangement hereinafter termed "Old method" is shown in the table. Increase in roll radius, of course, indicates increase in roll weight, which increases as the square of the radius. The rolls were formed of cellulose acetate film 0.00088" thick wound at a speed of 200 yds./min.

Table.—Torque

Roll Radius	Pounds inches per Inch Width	
	Old Method	Ball Bearing Friction Ring-Edging Disc
1.94	1.42	1.80
2.0	1.75	1.75
2.5	1.98	1.70
3.0	2.15	1.65
3.5	2.30	1.62
4.0	2.50	1.60
4.5	2.75	1.60
4.75	2.98	1.60

In the table it is seen that as the roll radius increases, the torque, using the mold method, rises 103%, while with the ball bearing friction ring-edging disc it actually falls 10%. This constitutes a tremendous improvement and can be considered essentially constant torque.

In the foregoing preferred embodiment ball bearings are used as the frictionless bearings. However it is obvious that any other convenient type of frictionless bearing e. g., roller bearing, oil bearing, etc. could be employed with like effect. Also means other than the prong means for engaging the friction ring-edging disc assembly and core may be used as will be apparent to the skilled mechanic, and such means are within the purview of this invention.

As many widely different embodiments can obviously be made without departing from the spirit and scope of this invention it is to be understood that the invention is in no wise limited save as set forth in the appended claims.

We claim:

1. In a wind-up device for a slitting machine comprising a positively driven wind-up mandrel, a core fitted over a portion of the length of said mandrel upon which slit pellicular material is wound and a spacing sleeve fitted over said mandrel and fixed to said mandrel for rotation therewith, an end of said spacing sleeve being maintained in frictional driving relationship with an end of said core whereby rotation of said mandrel and said spacing sleeve imparts rotation to said core, the improvement which comprises annular means interposed between said spacing sleeve and said core, said annular means being supported and freely rotatable on said mandrel by means of frictionless bearings, and being further constructed to support said core out of contact with said mandrel and in fixed position with respect to said annular means.

2. The improvement of claim 1 wherein the annular means comprises a ring adapted to frictionally engage the spacing sleeve and an annular disc fixedly attached to and concentrically aligned with said ring, means associated with said ring and disc for supporting said core out of contact with said mandrel and means on said disc for positively engaging said core for rotational movement, said ring and disc being mounted on said mandrel by means of frictionless bearings.

3. The improvement of claim 2 wherein the frictionless bearings are ball bearings maintained in an outer race unitary with the ring and the annular disc and an inner race mounted on said ring and disc but freely rotatable with respect to said ring, disc and outer race and adapted to fit snugly on said mandrel.

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No references cited.

Certificate of Correction

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December 12, 1950

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It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows:

Column 3, line 57, in the table, first column thereof, for "1 $\frac{13}{16}$ " read 1 $\frac{13}{16}$ "; and that the said Letters Patent should be read as corrected above, so that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 6th day of March, A. D. 1951.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.