May 15, 1951 L. KAHN 2,553,374

TENSION DEVICE

Filed Sept. 17, 1946

Fig. 1.

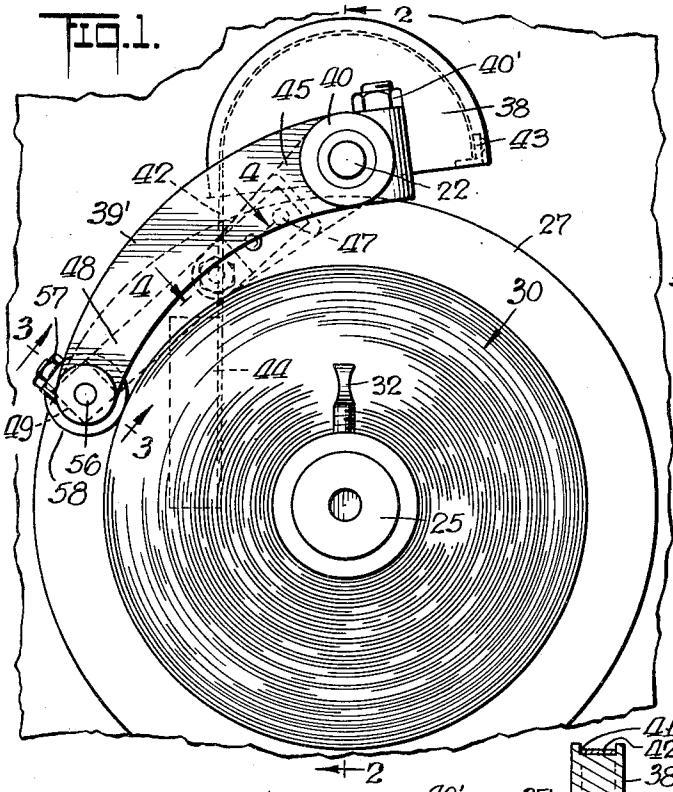


Fig. 3.

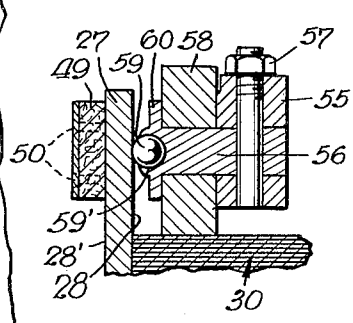


Fig. 4.

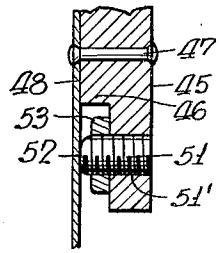
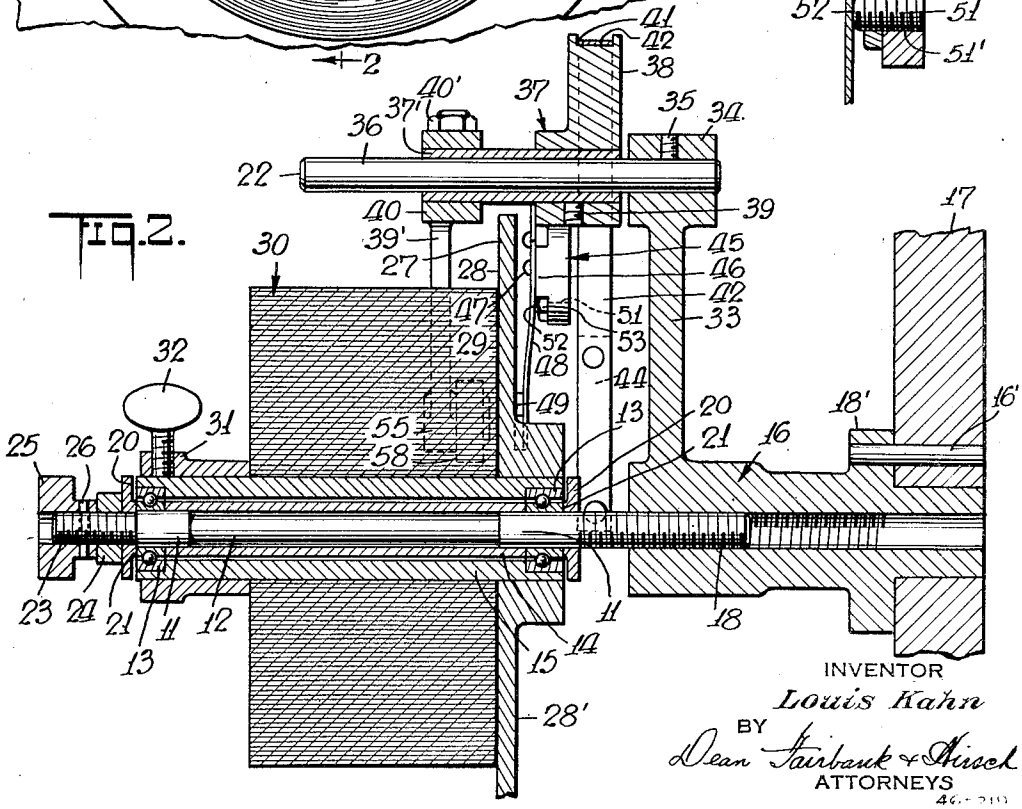


Fig. 2.



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TENSION DEVICE

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4 Claims. (Cl. 242—75)

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The present invention relates to the art of roll tension devices and while of more general application, is shown applied for automatically controlling the tension on strips of paper or foil, as they are rolled into electric capacitor sections.

As conducive to a clear understanding of the invention, it is noted that unless some braking device is provided on each paper or foil roll of a capacitor winding machine then, each time the winding of a capacitor section is completed and the rotation of the mandrel stopped, the inertia of the rotating paper or foil roll may cause overrunning and consequent slackening of the strip to such extent as to permit loosening of the wound section on the mandrel and also to preclude proper severing of the strip thus slackened.

It is apparent that as the diameter and weight of the roll becomes less with use, its mass decreases and consequently less force is needed to stop its rotation. If the brake is set to function correctly when a fresh roll of paper or foil is installed, it will obviously have too much braking effect after much of the roll has been used up, with probable rupture of the strip during operation.

Where it is attempted to adjust the friction brake manually as the diameter of the roll decreases, precise regulation of the braking friction is practically impossible regardless of the amount of supervision exercised, and results in either too much friction with likelihood of rupture of the strip or insufficient friction, with consequent overrunning and slackening of the strip and the attendant difficulties above pointed out.

It is accordingly among the objects of the invention to provide brake means for the various rolls in a winding machine of the character set forth, which admits readily of correct setting for a roll of any specifications and which once set, inherently and automatically effects delicate adjustment of the braking device as the roll on its carrier becomes progressively smaller and lighter, so that even relatively flimsy strips of foil or paper having low tensile strength may be used and maintained under desired tension between the roll and the mandrel without danger of slackening on the one hand or rupturing tension on the other.

Another object is to provide brake means of the above type which is simple, relatively inexpensive and rugged in construction, which requires no expert skill for the installation or initial setting thereof, which is thoroughly reliable under all conditions of use without likelihood of derangement, and which does not interfere in the least with the axial adjustment of the roll for setting the position of the width of the strip along the length of the mandrel on which it is to be wound and admits of such adjustment without the need for resetting of the brake or its control.

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According to the invention, a follower urged against the periphery of the paper or foil roll is interrelated with the brake, automatically to determine the radial distance of the latter from the axis of the roll as the diameter of the roll lessens.

As a feature of the invention, the brake and its control comprise a pivotally mounted yoke straddling the periphery of a braked disc on the axis of the roll. One arm of the yoke has a brake shoe riding on one face of the brake disc and the other arm has a roller, desirably aligned with said brake shoe and urged against the periphery of the roll by means such as a weight exerting leverage about the pivot of the yoke.

As another feature, the brake arm has an adjustment for regulating the pressure of the shoe against one face of the brake disc and the roller has a central anti-friction bearing such as a ball, riding on the opposite face of the brake disc, the sandwiching effect of the ball and brake shoe retaining the yoke from shifting axially along its pivot with the adjustment of the pressure of the brake shoe against the brake disc. By this arrangement, adjustment in the axial position of the roll, as for instance for correlation of the widths of the various strips along the length of the mandrel is effected without the need for manipulating the brake or its control.

In the accompanying drawings in which are shown one or more of various possible embodiments of the several features of the invention,

Fig. 1 is a side elevation of a roll incorporating the tension device,

Fig. 2 is a sectional view taken along line 2—2 of Fig. 1.

Fig. 3 is a fragmentary sectional view on a larger scale on line 3—3 of Fig. 1, and

Fig. 4 is a fragmentary sectional view on a larger scale on line 4—4 of Fig. 1.

Referring now to the drawings, the carrier for the roll comprises a horizontal sleeve 15 which mounts the roll 30 of paper or foil and rotates on anti-friction ball bearings 13 carried on an axial rod 12 which is surrounded by a bushing 14 separating the ball bearings, said bushing being supported at its ends by the enlarged extremities 11 of rod 12.

By means of screw threads at the root end 18 of horizontal rod 12, sleeve 15 is adjustably

mounted in a socket piece 16 on the frame 17 of a winding machine, the socket being keyed from turning by a pin 16' extending horizontally from the frame of the machine through the flange end 18' of socket piece 16.

Securely affixed on rod 12 near each end thereof is a retaining washer 20, each of which has a lip 21 in close juxtaposition to the corresponding ball bearing 13, thereby keeping the ball bearings 13, bushing 14 and sleeve 15 in assembled array on rod 12.

Upon the extremity 23 of rod 12 is mounted a lock nut 24 and an adjusting nut 25, the latter being securely affixed to said rod by means of retaining pin 26. By rotation of adjusting nut 25, the root end 18 of the rod may be moved inward or outward in socket piece 16, for the purpose set forth hereinafter.

Mounted as by force fit about the inner end of sleeve 15 is brake disc 27 with its smooth outer face 28 in contact with the inner face 29 of the roll 30 of paper or foil on the sleeve.

A collar 31 surrounds and is movable axially along the forward end of said sleeve 15. It is adjustably affixed thereto by means of thumb screw 32, so as to sandwich roll 30 against the outer face 28 of brake disc 27, thereby avoiding axial play on said sleeve of a roll regardless of its width.

Unitary with socket piece 16 is vertical arm 33 having an enlarged head 34 at the upper end thereof. Horizontally affixed in said head by means of set screw 35 so as to be slightly above the periphery of brake disc 27 is brake support rod 36 parallel to and having its free end 22 pointing in the direction of the extremity 23 of rod 12.

Loosely mounted so as to pivot around rod 36 is the follower assembly, which comprises a yoke 37, the arms of which straddle the periphery of the brake disc 27. In the preferred embodiment shown herein, the assembly comprises a sleeve 37' having a semi-circular pulley segment 38 at one end thereof affixed thereto by set screw 39 and the eye 40 of a curved arm 39' affixed to the other end of the sleeve by means of clamp stud 40'.

Pulley 38 has a groove 41 in the periphery thereof in which rests a tape or cord 42 affixed at one end in said groove 41 as at 43 and having a weight 44 at the free end thereof.

Unitary with pulley 38 and at right angles to the axis thereof is brake shoe arm 45 having a raised portion 46 at the middle of one side thereof. Affixed to said raised portion by rivets 47 is leaf spring 48, having a brake shoe 49, preferably of leather, affixed to the free end thereof by rivets 50 and in frictional contact with brake disc 27.

Brake shoe 49 is laterally adjustable with respect to brake disc 27 so that any desired pressure may be exerted thereon, by means of friction adjusting screw 51 which fits into threaded hole 51' near the end of brake shoe arm 45 and the end of which presses against the side of leaf spring 48 as at 52. Lock nut 53 locks screws 51 into place once it is adjusted.

Curved arm 39' has a head 55 at its free end in which horizontally mounted roller rod 56 is affixed by means of clamp stud 57. Rod 56 has a flange 60 thereon which keeps roller 58 on said rod and a ball 59 held in a seat 59' in the free end thereof engages face 28 of disc 27.

The follower assembly is adjusted so that roller 58 rides on the periphery of the roll of paper or foil carried on the sleeve on one side of the disc, while the brake shoe on the other side of the disc is aligned with said roller, thereby sandwiching the disc therebetween.

Operation

The roll 30 of paper or foil is placed on sleeve 15 so that the inner face 29 thereof is in contact with the outer face 28 of brake disc 27. Collar 31 is then placed on sleeve 15 and is securely affixed thereto by means of thumb screw 32 so that the roll is tightly sandwiched between said collar and brake disc 27.

Yoke 37 which is loosely mounted on rod 36 by means of sleeve 37' is so placed with respect to disc 27 and roll 30 that pulley 38, tape 42 and weight 44, brake shoe arm 45, leaf spring 48 and brake shoe 49 are on one side of disc 27 with the surface of the brake shoe against the inner side 28' of disc 27 and curved arm 39' with roller 58 and ball 59 are on the other side of disc 27 with roller 58 riding on the periphery of roll 30 and ball 59 in contact with the outer side 28 of said disc in alignment with the brake shoe. Weight 44 is wound around pulley 38 so as to cause roller 58 to press on the periphery of roll 30.

In order to align the strips of paper and foil for proper margins, adjusting nut 25 at the extremity of rod 12 is turned, causing the rod to move inward or outward in socket piece 16 as the case may be, thereby moving the position of the disc and roll laterally with respect to the frame of the machine. As the arms of the follower assembly sandwich disc 27, any lateral movement of the disc will also effect movement of the follower assembly in the same direction axially along rod 36 upon which it is loosely mounted.

Adjusting screw 51 is so adjusted that the pressure of brake shoe 49 on the inner side 28' of disc 27 is sufficient to prevent overrunning of a fresh roll of paper or foil when the winding tension is stopped.

As the diameter of the roll decreases in use, weight 44 moves roller 58 toward the axis of the disc in keeping it in contact with the periphery of roll 30 and will also cause brake shoe 49 correspondingly to move toward the axis of the disc since the weight is sufficient to overcome the friction of the brake shoe against the side of the disc.

As the brake shoe which is at all times aligned with roller 58, gets closer to the axis of the disc, its braking effect is progressively reduced, automatically compensating for the lessening mass of the roll, and thereby maintaining the tension on the strip constant.

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope of the claims, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

Having thus described my invention what I claim as new and desire to secure by Letters Patent of the United States is:

1. A compensating tension device for a winding machine comprising a rotatable sleeve carrying a roll, a brake disc affixed to said sleeve, a yoke having a fixed pivot mount, the arms of said yoke straddling the periphery of said brake disc, a brake shoe carried by one of said arms, riding on a face of said brake disc, an adjust-

ment for regulating the pressure of the brake shoe against said brace disc, a roller aligned with said brake shoe, carried by the other arm of said yoke and riding on the periphery of said roll, said roller having an anti-friction ball riding on said brake disc, the sandwiching effect of the ball bearing and the brake shoe thereby retaining the yoke from shifting axially along its pivot with the adjustment of the brake, and means to urge said roller and said brake shoe toward the axis of said brake disc.

2. A device for automatically controlling the tension on a roll of material on a winding machine, comprising a rotatable roll carrier, a brake disc rigid with one end thereof, a fixed horizontal brake support rod, means carried by said brake support rod for braking said brake disc and for automatically varying the braking effect of said braking means in substantial proportion to the diameter of the roll, whereby as said diameter decreases the braking effect on said brake disc will decrease, thereby automatically compensating for the lessening mass of said roll, the means carried by said brake support rod for braking said brake disc, and for varying the braking effect of said braking means on said brake disc, comprising a follower assembly which includes a sleeve loosely mounted on said brake support rod, a pulley segment affixed to an end of said sleeve having a brake shoe arm unitary therewith, said brake shoe arm being at right angles to the axis of the pulley and having a raised portion at its mid point, a resilient spring arm affixed to said raised portion, a brake shoe affixed to the free end of said spring arm in contact with a face of said brake disc, a friction adjusting screw fitting into a hole at the end of said brake shoe arm and in contact with a side of said resilient spring arm so as to move it laterally, a curved arm affixed to the other end of said sleeve, said curved arm carrying a horizontal roller rod at its free end, a roller rotatably mounted on said rod, said rod having an anti-fiction bearing at the end thereof, a tape wound around said pulley segment having one end affixed thereto, a weight at the free end of said tape urging said roller against the periphery of said roll, said brake shoe and said anti-friction bearing being in contact with opposite faces of said brake disc.

3. As an article of manufacture, a follower assembly for a compensating tension device comprising a sleeve having a pulley segment rigid with one end thereof and an arm rigid with the other end thereof, said pulley segment having a groove in the periphery thereof, a cord resting in said groove affixed at one end thereto, a weight affixed to the free end of said cord, a brake shoe arm unitary with said pulley and at right angles to the axis thereof, said brake shoe arm having a raised portion at the middle of one side thereof, a leaf spring arm affixed at one end to said raised portion, a brake shoe affixed to the free end of said spring arm, a friction adjusting screw fitting into a hole at the end of said brake shoe arm and in contact with a side of said leaf spring so as to displace it laterally, said arm rigid with an end of the sleeve having a horizontal roller rod at its free end, a roller rotatably mounted on said rod, the axis of said roller being parallel to the axis of said sleeve.

4. The combination set forth in claim 3 in which the roller and the brake shoe are aligned with each other.

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