

[54] **TENSION CONTROL DEVICE**

[76] Inventor: **David Everett Robinson**, 42 Foxhall Rd., Greenville, S.C. 29605

[22] Filed: **Oct. 13, 1971**

[21] Appl. No.: **188,721**

[52] U.S. Cl. **139/109, 66/86 A, 242/75.43**

[51] Int. Cl. **D03d 49/08, D03d 49/10**

[58] Field of Search **139/109, 110; 66/86 A; 242/75.43, 75, 75.2**

[56] **References Cited**

UNITED STATES PATENTS

420,158	1/1890	Kerr	139/109
1,783,719	12/1930	Kearsley	139/110
2,271,202	1/1942	Moessinger	139/109
376,353	1/1888	Thompson	139/109 X
2,397,914	4/1946	Blouin	139/109
2,696,094	12/1954	Schwanda et al	139/109 X
3,470,921	10/1969	Booth	139/109

FOREIGN PATENTS OR APPLICATIONS

844,429 7/1952 Germany 139/109

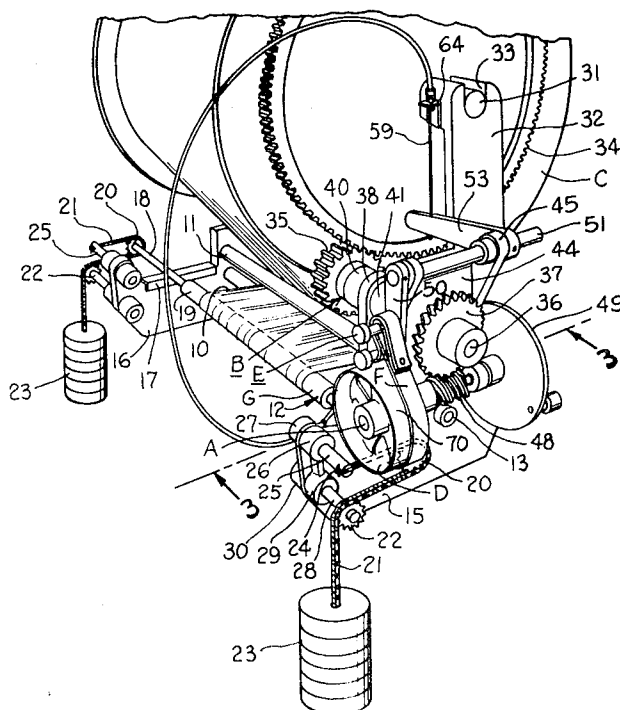
Primary Examiner—James Kee Chi

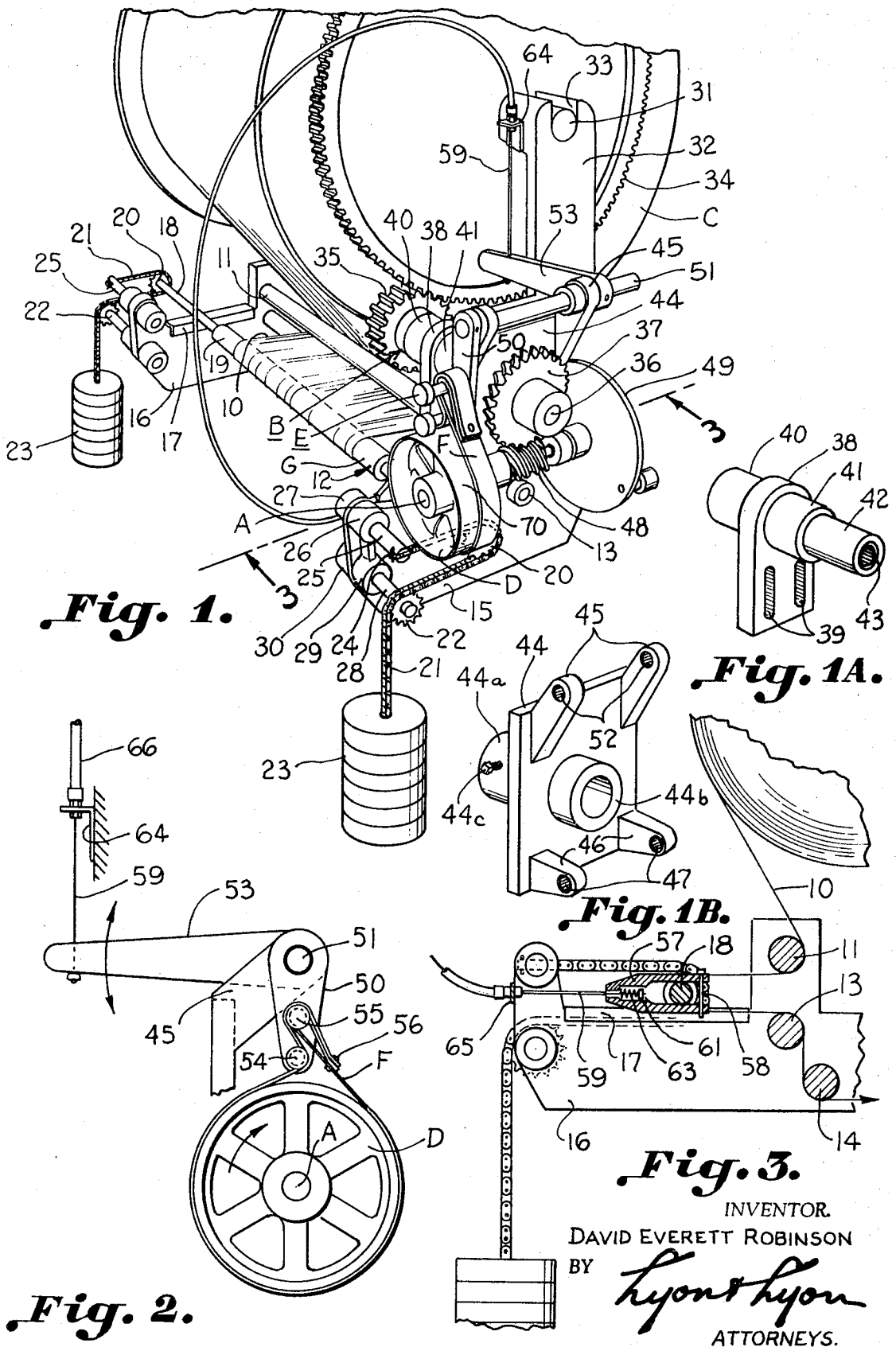
Attorney—Charles G. Lyon, William E. Thomson, Jr. et al.

[57] **ABSTRACT**

A tension control device in the form of a let-off for a loom beam or the like is disclosed for varying the speed of rotation of the beam to maintain constant tension in the warp yarn as the yarn is removed from the beam. The let-off includes a brake drum with a band extending therearound in operative association with the loom beam and a sensing means, whereby the frictional contact between the brake drum and flexible band is varied responsive to variations in tension in the warp yarn being let off the beam, which, in turn, controls the rotation of the loom beam and maintains a constant tension on the unwinding yarn.

10 Claims, 9 Drawing Figures





INVENTOR.
DAVID EVERETT ROBINSON
BY *Lyon & Lyon*
ATTORNEYS.

Fig. 4.

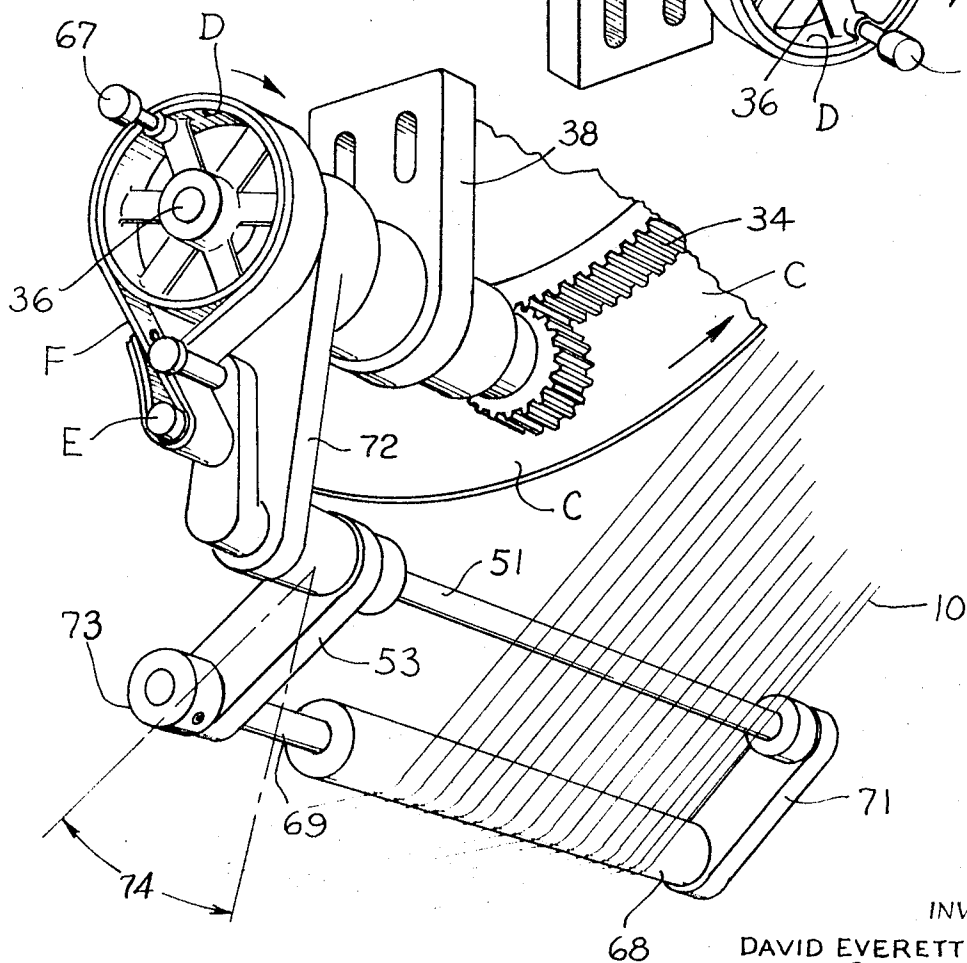
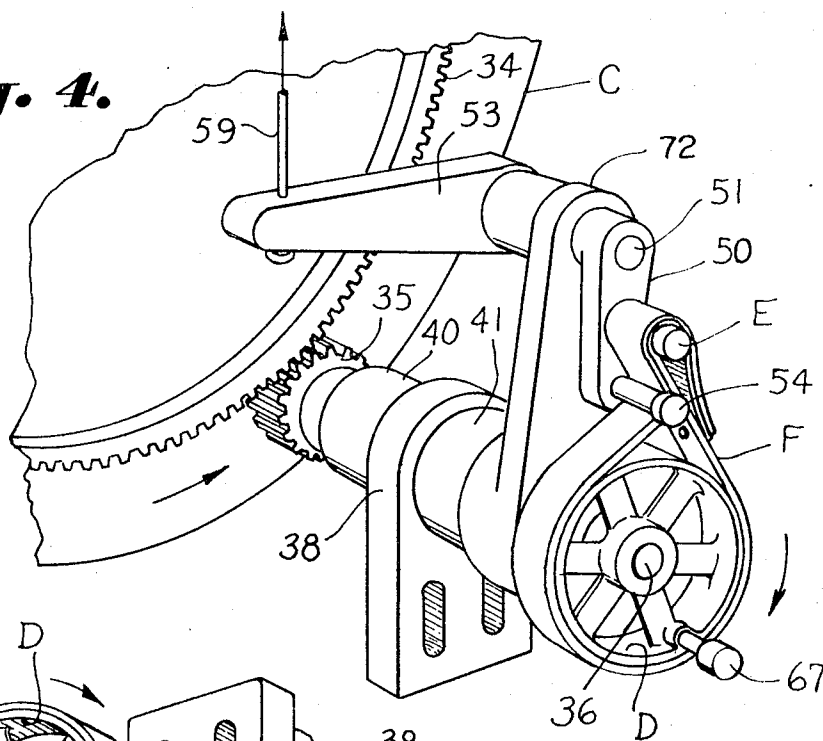


Fig. 5.

INVENTOR.
DAVID EVERETT ROBINSON
BY *Lyons & Lyons*
ATTORNEYS

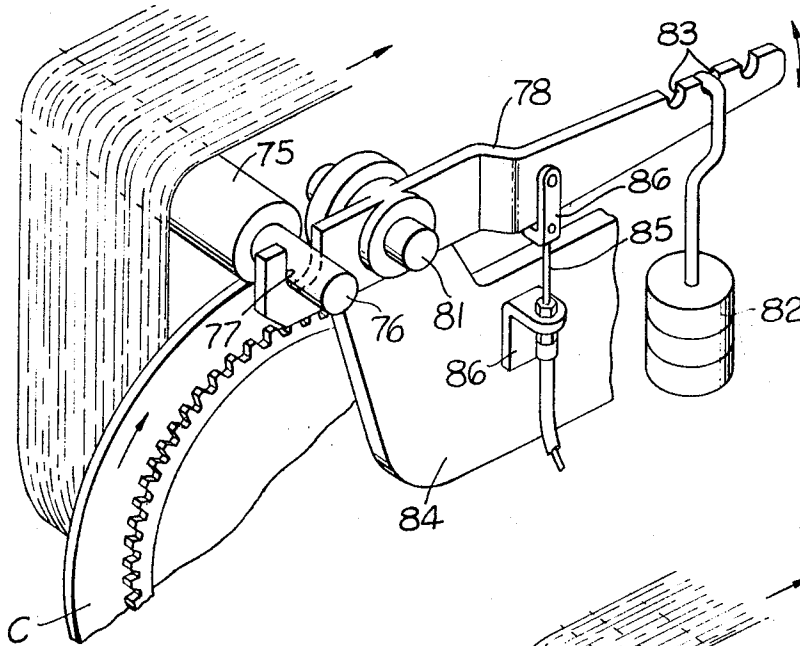


Fig. 6.

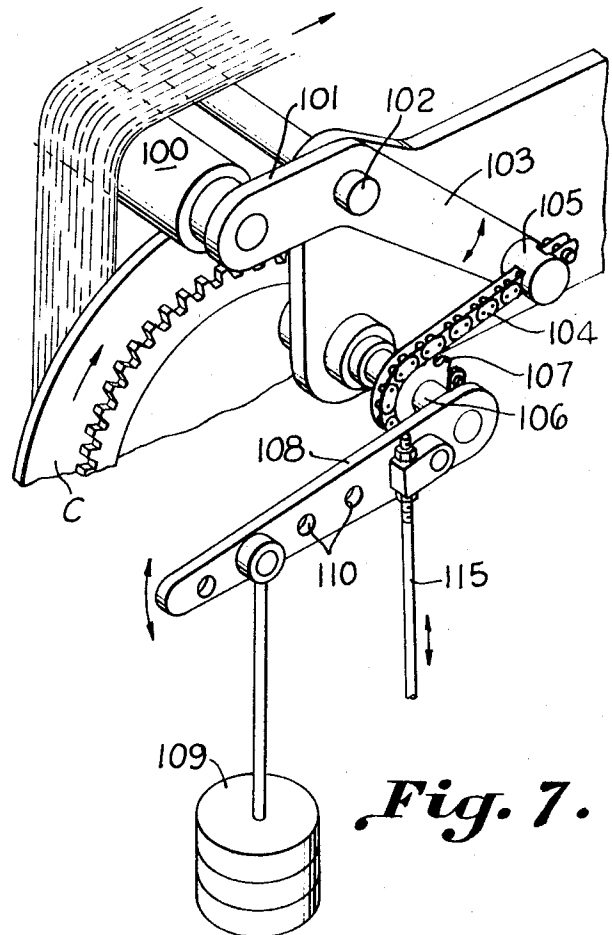


Fig. 7.

INVENTOR
DAVID EVERETT ROBINSON
BY *Lyons & Lyons*
ATTORNEYS

TENSION CONTROL DEVICE

BACKGROUND OF THE INVENTION

This invention relates to an apparatus for automatically controlling the rate of rotation of a storage roll, and more particularly to an apparatus which senses the tension in the material extending from the roll to allow the roll to rotate at a regulated speed so as to maintain constant tension in such material.

In the operation of a loom where yarn is continuously unwound from a storage roll, there is necessarily a change in speed required in feeding the yarn to the weaving area of the loom due to the reduction in diameter of the roll as the yarn is unwound. It is also highly desirable, however, to have the yarn maintained under constant tension as it is fed to the weaving area. To achieve this, it is necessary to provide means to control the roll speed in relation to yarn tension.

Apparatus for varying the speed of a storage roll, as the material is either wound or taken off, are well known, but are generally relatively complicated and also normally require independent drive mechanisms for operation. Moreover, due to their complexity, frequent adjustments in gearing mechanisms and other components forming a part thereof are required in order to maintain them in proper operating form.

One tension responsive control device previously proposed is disclosed in U.S. Pat. No. 2,775,263. This device, however, uses a plurality of belts and an independent drive source as well as a rigid linkage between a sensing roll and the let-off mechanism, which significantly affects its effectiveness.

SUMMARY OF THE INVENTION

The present invention thus provides a let-off device for a loom beam or the like which maintains constant tension on the yarn as it is unwound. The let-off includes means to sense variations in tension of the unwinding yarn and braking means operatively associated with the sensing means and loom beam to control the speed of rotation of the loom beam in response to variations in yarn tension.

DESCRIPTION OF PREFERRED EMBODIMENTS

In said annexed drawings:

FIG. 1 is a perspective view illustrating the tension controlling apparatus mounted on a loom operating as a let-off for a loom beam,

FIG. 1A is an enlarged perspective view illustrating a mounting bracket utilized by the apparatus,

FIG. 1B is an enlarged perspective view illustrating a supporting plate utilized in the apparatus illustrated in FIG. 1,

FIG. 2 is an enlarged side elevational view illustrating the braking mechanism forming a part of the let-off device and means for varying the frictional contact between the band and the brake drum which is utilized for controlling the rate of rotation of the loom beam,

FIG. 3 is an enlarged cross-sectional view taken along line 3—3 of FIG. 1, illustrating a portion of the sensing mechanism which senses the tension in the yarn being taken off of the beam,

FIGS. 4 and 5 are fragmentary perspective views illustrating modified forms of tension controlling apparatus, and

FIGS. 6, and 7 are fragmentary perspective views illustrating modified sensing mechanisms.

The drawings illustrate an apparatus for automatically controlling the rate of rotation of a storage roll responsive to variations in tension of material extending from the roll. The apparatus includes a shaft A with means generally designated by the reference character B coupling shaft A in driving relation with the storage roll C. Braking means D is carried on one end of shaft A, and a member E is positioned adjacent the circular braking member and connected to the roll C, as will be described. A band F extends from the member E around the circular braking member D in frictional contact therewith. Means, generally designated by the reference character G, sense the tension of the material extending from the storage roll C and apply a force to the band F, as will be explained in more detail hereinafter, proportional to the tension in the material to vary the frictional contact between the circular braking member D and the band in response to variations in tension in the material. Rotation of the circular braking member D and the storage roll C are thus varied according to variations in tension in the material extending from the roll.

Referring in more detail to FIG. 1 of the drawings, there is illustrated a let-off apparatus mounted on a conventional loom for maintaining constant tension in the warp yarns 10 as they extend from and are pulled off the storage roll or beam C into the weaving area of the loom. The warp yarns 10 extend from the loom beam C around a stationary roller 11 over and around a movable tension roller 12. The warp yarns then pass around rollers 13 and 14, respectively, into the weaving portion of the loom. Normally, the rollers 11, 13 and 14 are equipment on the loom. When the apparatus is mounted on a conventional loom, a pair of opposed supporting brackets 15 and 16 are bolted to the sides of the loom frame and rollers 11, 13 and 14 are journaled between the brackets 15 and 16 so that they are allowed to rotate freely. Other suitable brackets could be utilized, depending on the style and type of loom, to accommodate the rollers. One such suitable bracket is illustrated in my co-pending application, entitled ROTATIONAL SPEED CONTROL SYSTEM, Ser. No. 11,138, filed Jan. 19, 1971.

The brackets 15 and 16 have an elongated horizontal flat portion 17 upon which the tension roller 12 moves in parallel relation toward and away from the loom beam. A wear strip is carried on the horizontal portion 17. The tension roller 12 includes a shaft 18 which extends beyond the side of the brackets 15 and 16 and an enlarged diameter portion 19 over which the warp yarns 10 pass. Mounted on the opposite ends of the shaft 18 are sprockets 20 over which a chain 21 passes and is meshed therewith. The chain 21 extends outwardly from the loom and around another freely rotating sprocket 22, and has weights 23 supported on the other end by any suitable means. Weights 23 can be varied as necessary to exert the desired constant tension on the warp yarns 10 passing around the tension roller 12. The other end of the chain is secured by a pin 24 in a slotted stud 25 carried on the bracket 15. The stud 25 has an enlarged shoulder 26 on one side of bracket 15 and a threaded portion (not shown) on the inner end extending through a hole in bracket 15 so that nut 27 can be drawn tightly against the bracket to secure stud 25 thereto.

The free rotating sprocket 22 has bearings therein so that it can rotate freely on shaft 28. Shaft 28 has an en-

larged portion 29 carried adjacent the other end which abuts against the bracket 15 so that when a locking nut 30 is threaded on the end of shaft 28 and drawn tightly against the bracket, the shaft is firmly secured to the bracket. It is to be understood, of course, that there are many ways for suitably securing shafts 25 and 28 to the bracket.

The loom beam C is carried on a conventional shaft 31 which is, in turn, supported between a pair of conventional standards 32 having a bifurcated portion 33 adjacent the top thereof. The beam has a conventional beam gear 34 secured thereto, which rotates with the beam.

The means, generally designated by the reference character B, coupling shaft A in driving relation to the storage roll, or beam C, includes a pinion gear 35 which meshes with the beam gear 34. The pinion gear 35 is attached to a shaft 36 which has a worm wheel 37 fixed to the other end. Shaft 36 is supported on a bearing for free rotation in a bracket 38 which is shown in more detail in FIG. 1A. Slots 39 are provided in the lower portion of the bracket to accommodate bolts to attach the bracket to the side of the loom frame. The bracket 38 has a pair of outwardly extending shoulders 40 and 41 through which the shaft 36 passes. The shoulder 41 terminates in a reduced diameter portion 42 which has a needle bearing 43 in the end thereof.

A supporting plate 44 having a pair of opposed collars 44a and 44b (see FIG. 1B) is provided for supporting other mechanism described below. Inwardly extending collar 44a is placed on the reduced portion 42 of the bracket 38 and is secured thereto by a set-screw 44c. The shaft 36 extends through the shoulders 40 and 41 and has the worm wheel 37 secured on the outer end thereof for fixed rotation therewith. The supporting bracket has two pairs of supporting arms 45 and 46 carried adjacent the top and bottom thereof and extending outwardly therefrom. Shaft A extends through the aligned holes 47 in the supporting arms 46 and has the braking member D secured on one end thereof. A worm 48 is carried on the shaft A, and is fixed thereto by any suitable means, such as keying, and is carried in mesh with the worm wheel 37 so that the shaft A, shaft 36, and the beam gear 34 are directly coupled together for rotation in unison. A hand crank 49 is attached to the other end of a shaft A so that the shaft can be rotated by hand when it is desired to disengage the braking mechanism in order that the storage roll C can be rotated relatively freely. The lead angle of the worm 48 and the worm wheel 37, which form a worm gear, is sufficient to allow the worm wheel 37 to drive the worm 48 and shaft A thus turning the braking member D.

The braking means D includes a circular pulley having a flat braking surface 70. The member E which aids in manipulating the band F which extends around the braking member D includes an elongated arm 50. The end of the arm 50 is fixed to a shaft 51 which extends between holes 52 carried adjacent the outer end of the supporting arms 45. The shaft 51 is journaled on bearings (not shown) so that it can rotate freely in the arms 45. A lever arm 53 is fixed to the other end of the shaft 51 which extends beyond the supporting arms 45 and extends inwardly toward the loom beam. By raising and lowering the lever arm 53, the arm 50 will pivot accordingly.

Positioned on the pivotal arm 50 are inner post 54 and outer post 55. These posts are spaced radially from the center of the circular braking member D.

The band F has one end looped around the outer post 55 and extends around the braking surface 70 between the inner post 54 and the outer post and upwardly back around the outer post 55, with the ends joined by clamping member 56. The clamping member 56 extends through both ends and a portion of the band leading toward the braking member D so as to anchor the band relative to member E. The inner post 54 of the band bears against an outer surface of the band so that by pivoting the arm 50 the frictional contact between the band F and the drum can be varied to regulate the braking effect.

The means G for sensing the tension in the yarns 10 includes the tension sensing roller 12 which moves to and from the loom beam responsive to variations in tension in the yarn extending around the roller 12. A yoke 57 (FIG. 3) having a bifurcated end extends over the reduced end of shaft 18 upon which the tension roller 12 is carried and is attached thereto by a pin 58 extending between the ends of the yoke 57. The other end of the yoke 57 has a bore extending therethrough, through which a flexible cable 59 passes. A collar 61 is attached to the inner end of the cable 59 by a set-screw and a compression spring 63, which acts as a shock absorber to minimize the jerking motion produced as the yarn is beat up during the weaving operation, is positioned between collar 61 and the inner end of the yoke. Other mechanical means may also, of course, be used to secure cable 59 to the yoke 57, if desired. The flexible metal cable 59 extends upwardly adjacent the standard 32 and has its other end attached to the lever arm 53. The cable 59 passes through a hole in the lever arm 53 and is secured thereto by an enlarged collar fixed on the end thereof on the underside of arm 53 so that when the tension roller 12 moves towards the loom beam, tension will be applied to the cable and lever arm 53 will be raised. When roller 12 moves away from the loom beam, slack is formed in cable 59, whereby lever arm 53 pivots downwardly, causing arm 50 to pivot counterclockwise and create tension on band F and the circular pulley. The increased frictional contact between the band F and the pulley, of course, in turn will decrease the speed of rotation of the loom beam. The cable is supported by a bracket 65 carried on the bracket 15. Another bracket 64 carried by standard 32 positions the cable 59 directly above the lever arm 53. The cable is a conventional cable, such as a speedometer cable, and is enclosed within a flexible tubular member 66 to allow the cable to move freely in response to movement of the tension roller 12.

In operation, as the yarns are drawn off of the loom beam C they pass around the tension roller 12 prior to being fed into the weaving mechanism of the loom. The tension roller 12 exerts the desired tension on the warp yarn which can be varied by adding or removing weights 23 off of the chain 21. The tension in the warp yarn 10 causes a turning effect on the loom beam C. As the loom beam C turns, the beam gear 34, which meshes with the pinion gear 35, rotates and causes shaft 36 and the worm wheel 37 to rotate. Rotation of the worm wheel 37, in turn, causes the shaft A upon which the braking member D is carried to turn when not otherwise restricted by the frictional contact between the band F and its flat surface 70.

Normally, the turning effect of the braking means D makes the braking band F pivot arm 50 counterclockwise pressing the inner post 54 against the surface of the band, thereby producing a self-locking braking action tending to restrict the rotation of the loom beam C. When the arm 50 is pivoted in a clockwise direction as a result of the tension roller 12 moving toward the loom beam indicating more than the desired tension in the yarn, the frictional contact between the band F and the braking means D is reduced and, thus the braking means D is allowed to rotate, which, in turn, allows the beam C to rotate more freely to reduce the tension in the yarn.

FIG. 4 illustrates a modified form of the invention wherein like reference numerals apply to corresponding or identical parts as that shown in FIG. 1. The apparatus illustrated in FIG. 4 operates in the same manner as that shown in FIG. 1 except the worm gear is eliminated and the braking member C is carried directly on the end of the shaft 36. The shaft 51, upon which the pivotal arm 50 is supported, is journaled in an upwardly extending member 72. The lower end of the member 72 is supported on the reduced portion 42 of the bracket 38 and has a bore through which shaft 36 extends. Bearings may be carried in the upper end of the member 72 to enable the shaft 51 to rotate freely as the lever arm 53 is raised and lowered. The lever arm is manipulated by the sensing mechanism illustrated in FIG. 1. A hand knob is provided braking means D since the hand crank 49 has been eliminated.

Still another modified form of the invention is illustrated in FIG. 5. It operates identical to that illustrated in FIG. 4 with the exception that it is mounted more or less upside down. Instead of using a cable for manipulating the lever 53, the yarns 10 are allowed to pass directly over a sensing roller 68, which is carried on a shaft 69, one end of which passes through a hole in the outer end of lever arm 53 and is attached by a collar 73 through which a set-screw passes. The other end of the shaft 69 is journaled adjacent one end of a joining member 71. Shaft 51 is journaled adjacent the other end of the joining member 71.

In the application illustrated in FIG. 5, the degree of tension desired is established by adjusting the lever arms 53 and 71 to vary the angle 74. Minimum tension is applied to the yarn when the angle 74 approaches 0, that is when lever arms 53 and 71 are vertical, and maximum tension is applied when the lever arms are horizontal, whereby angle 74 is greater.

In summarizing the operation, when a full beam of yarn is set in place on the standards 32, the yarns are fed into the loom in the normal manner. The proper amount of weights 23 are added and the beam is cranked backward by hand wheel 49 until all of the slack in the warp yarns 10 is taken up and the tension roller 12 is about midway of its available travel on the flat portion 17. The warp tension remains constant as long as the tension roller 12 is free to move on the horizontal member 17 even though the beam is not turning. When the beam is not turning and the warp yarns 10 are being pulled by the loom take-up, the movable roller 12 advances towards the take-up end of the loom. This advancing motion of the tension roller 12 is utilized to release the self-locking action of the brake band F on braking means D, which is accomplished by the tension roller 12 causing the cable 59 to raise the lever arm thus reducing the frictional contact between

the braking band F and the braking member D, allowing more yarn 10 to be drawn off the beam C. The tension roller 12 then moves away from the loom beam C, lowering the lever arm 53, which in turn allows the inner member 54 to pivot counterclockwise to bring back into effect the self-locking braking action resulting from an increase in the friction between the band F and the braking means D to slow down the rotation of beam C. This cycle keeps repeating as the beam runs out from full to empty.

Referring now to FIGS. 6, 7, and 8, additional means for sensing the tension of the unwinding yarns are shown. In FIG. 6, the yarns are unwound from the loom beam C and passed over roller 75, which has its reduced end portion 76 supported in notch 77 of arm 78. Arm 78 is pivotally mounted on shaft 81. Conventional weights 82 are positioned on arm 78 at the end opposite pivot 81. A plurality of notches 83 are included to provide additional versatility in varying the amount of tension to be exerted against the unwinding warp yarns. The arm 78 is supported in bracket 84 affixed to the loom frame as previously described or by any other conventional means. A cable 85 is shown attached directly to arm 78, the attachment, for example, being a standard yoke and pin arrangement 86 (such as described with respect to FIGS. 1 - 3). The cable is also supported by flanged bracket 86, which is mounted on bracket 84. The opposite end of cable 85 is connected to the lever arm 53 as shown in FIG. 1.

The operation of the let-off device, when utilizing the sensing means of FIG. 6, is as follows. As the yarns unwind from the loom beam C, they pass over roller 75 which, through weights 82, exerts constant tension against the yarns. As the diameter of the yarn on the beam decreases, roller 75 and arm 78 are caused to pivot about shaft 81 in a counterclockwise direction, thereby exerting a pulling or lifting force on cable 85, which causes lever arm 53 to be raised (see FIGS. 1 and 2) and decreased friction to be applied by band F against the braking surface 70 of brake D, in the manner previously described. Due to the decreased friction, the loom beam C rotated at a faster rate of speed and weights 82 cause arm 78 and roller 75 to so pivot clockwise as to maintain constant tension on the unwinding yarns.

Referring now to FIG. 7, the sensing means comprises a roller 100 over which the unwinding warp yarns pass. The roller is supported adjacent the sides of the loom frame by arm 101, which is pivotally mounted at 102 and has a section 103 to which chain 104 is attached by a pin 105, the chain extending from section 103 to a shaft 106 which is connected to and extends laterally from the loom frame. A sprocket 107 is mounted on the shaft about which the chain is positioned. Also mounted on the shaft is an arm 108 to which conventional weights 109 are attached. Arm 108 has a plurality of openings 110 in which the weights can be attached to provide greater versatility in the amount of force which can be exerted against the unwinding yarns. A tie rod 115 is also connected to the arm 108, with the other end of the tie rod connected to lever arm 53 in the same manner as the cable shown in FIG. 1.

When the loom is operated, constant tension, of course, will be exerted against the unwinding yarns by the suspended weights. As the loom beam unwinds and its diameter decreases, the roller 100 and arm 101 are caused to rotate in a counterclockwise direction about

pivot 102 which in turn causes section 103 to pivot counterclockwise, thereby extending chain 104 and rotating sprocket 107 and arm 108 in a clockwise direction. When arm 108 is thus moved, tie rod 115 is extended, lifting lever arm 53 and decreasing friction on the brake drum in the manner previously described and assuring that the tension exerted against the unwinding yarns is constant.

Selection of a particular let-off mechanism will depend upon the type of yarn being processed by the loom. If a heavier yarn is processed, as for example yarn for fabrication of seat belt straps, a heavier duty let-off device will be used, such as that illustrated and described with respect to FIGS. 1 through 3. On the other hand, if, for example, fabric for draperies is being produced, a lighter duty let-off may be used, such as illustrated in either FIG. 4 or FIG. 5. Also, the let-off mechanism may be used with either the top or bottom beam or both on a conventional loom as desired.

I claim:

1. Apparatus for automatically controlling the rate of rotation of a storage roll responsive to variations in tension of material extending from said roll to maintain substantially constant tension on such material comprising a shaft, means associated with said shaft coupling said shaft in driving relation with a storage roll, braking means carried on said shaft, a member positioned adjacent said braking means, a band extending from said member around said braking means in frictional contact therewith, and means adapted to sense the tension of material being unwound from a storage roll and apply a force to said band proportional to the tension in such material to vary the frictional contact between said braking means and said band responsive to variation of tension in said material, whereby rotation of such a storage roll is varied according to variations in tension in material unwinding therefrom, said tension sensing means including a tension roller having the material being unwound from a storage roll coming into more than tangential contact with said tension roller, means linked to said tension roller for exerting a substantially constant force on said tension roller throughout the travel of said tension roller against the force exerted by the tension of the material being unwound from the storage roll and said band being loosened on said braking means as the tension in the material being unwound from the storage roll increases.

2. The apparatus as set forth in claim 1, wherein said member includes an elongated arm, means for pivotally supporting one end of said arm, an inner post and an outer post carried on said arm spaced radially from the center of said braking means, said band extending around said braking means and said outer post and between said inner and outer post with said inner post bearing against one surface of said band, said sensing means adapted to cause said arm to pivot responsive to variation in tension of said material causing inner post to exert pressure on said band for varying the friction contact between said band and said braking means responsive to variations in tension in material extending from a storage roll.

3. A let-off device for use in combination with a loom beam and warp yarn being drawn from the loom beam to vary the speed of rotation of said beam in response to variations in the tension of the warp yarn being removed from said beam to maintain substantially constant tension of such yarn, comprising a shaft, means

coupling said shaft to said loom beam, a braking drum mounted on one end of said shaft, a band extending about said braking drum in frictional contact with said drum, and sensing means operatively connected to said band adapted to sense the tension on said warp yarn, whereby the tension exerted by said warp yarn is transmitted to said brakedrum to vary the rotation of said loom beam in response to variations in the tension exerted against said warp yarn, said sensing means including a tension roller having the warp yarn coming into more than tangential contact with said tension roller, means linked to said tension roller for exerting a substantially constant force on said tension roller throughout the travel of said tension roller against the force exerted by the tension of the warp yarn and said band being loosened on said brakedrum as the tension in said warp yarn increases.

4. The let-off device of claim 3 in which said sensing means further includes a pivotally supported elongated arm, an inner post and an outer post carried on said arm spaced radially from the center of said braking drum, and said band extends from said outer post around said brakedrum in contact with said inner post bearing against one surface thereof, a lever arm pivotally supported with said elongated arm and constrained to move therewith, said tension roller being operatively connected to said lever arm, whereby said lever arm and elongated arm are movable in response to variations exerted against said sensing means by said warp yarn.

5. The let-off device of claim 4 in which said coupling means includes a beam gear, a rotatable shaft having a gear on one end thereof meshed with said beam gear, a worm wheel carried in fixed relationship on the other end of said rotatable shaft, and a worm gear fixed to said shaft on which said brake drum is carried, whereby as the frictional contact between said band and said brake drum varies, the force applied to said drum varies to control the rate of rotation of said loom beam to maintain substantially constant tension against said warp yarn.

6. The let-off device of claim 4 in which said sensing means further includes a flexible cable operably connected to said tension roller at one end and extending to said lever arm.

7. The let-off device of claim 3 in which said means linked to said tension roller for exerting a substantially constant force on said tension roller throughout the travel of said tension roller includes an arm connected to said roller and weight means operatively connected to said arm through a chain and sprocket, whereby said roller is forced against said unwinding warp yarn to exert a predetermined tension there against.

8. A let-off device for use in combination with a loom beam to maintain substantially constant tension on warp yarns being drawn from the loom beam, comprising a shaft rotatably mounted on the loom, means coupling said shaft to the loom beam, brake means for retarding the loom beam to maintain the substantially constant tension on the warp yarn, said brake means being positioned to operate on said shaft, a tension roller, said tension roller having the warp yarn coming into more than tangential contact therewith, means for operably mounting said tension roller on the loom, said tension roller mounting means constraining said tension roller to move along a fixed path, the force resulting on the tension roller from the tensioned warp yarn

9

tending to cause said tension roller to move along the fixed path in a first direction, sensing means, said sensing means being coupled with said tension roller to move with said tension roller along the fixed path, means linking said brake means to said sensing means to decrease the braking of the loom beam as said tension roller moves along the fixed path in the first direction, means for exerting force tending to cause said tension roller to move in a second direction opposite the first direction along the fixed path, said force exerting means being substantially constant at all positions of said tension roller along the fixed path.

9. The device of claim 7 in which said means for ex-

10

erting substantially constant force on said tension roller includes weights, a pulley, and a flexible tying means for connecting said weights to said tension roller over said pulley.

10. The device of claim 8 in which said means for exerting substantially constant force on said tension roller includes an arm pivotally mounted to the loom, weights pivotally depending from said arm, said arm including bracket means for engaging said tension roller, said bracket means constraining said arm to move with said tension roller at said bracket means.

* * * * *

15

20

25

30

35

40

45

50

55

60

65