Oct. 7, 1969 R. L. BOOTH 3,470,921

LETOFF APPARATUS FOR TEXTILE MACHINE

Filed Oct. 17, 1967 2 Sheets-Sheet 1

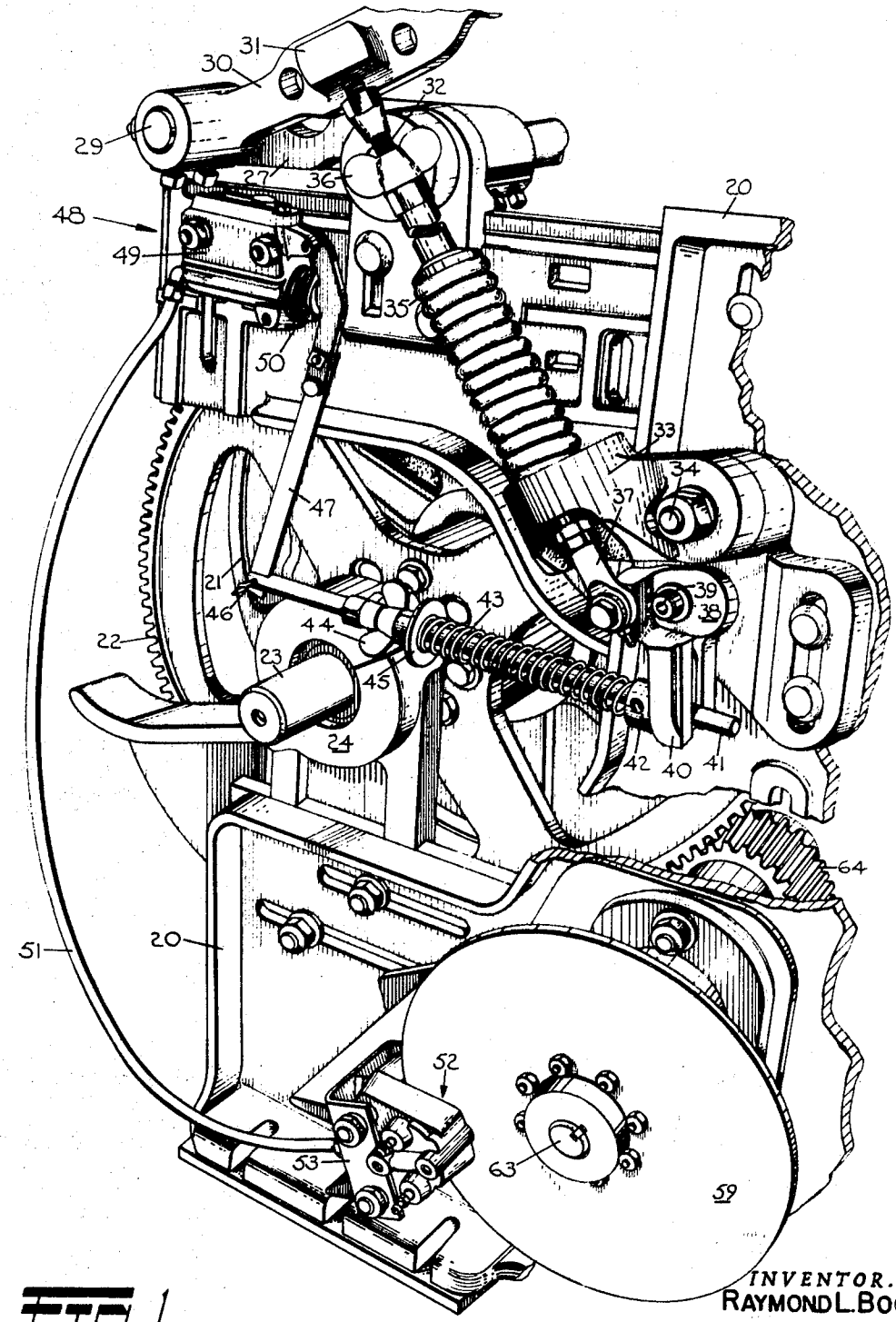

FIG. 1

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LETOFF APPARATUS FOR TEXTILE MACHINE

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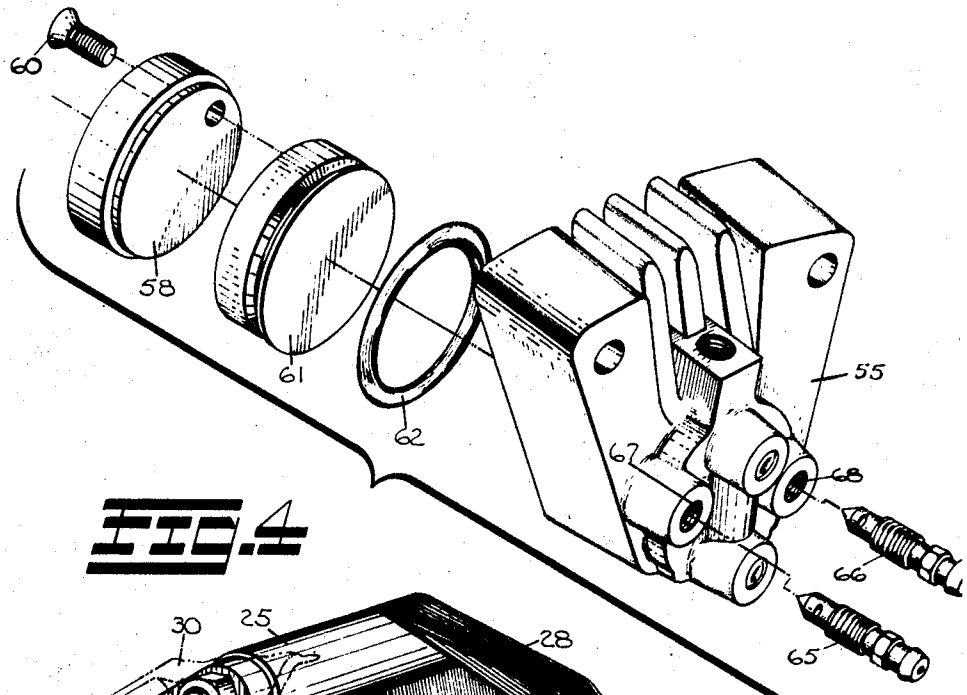

FIG. 4

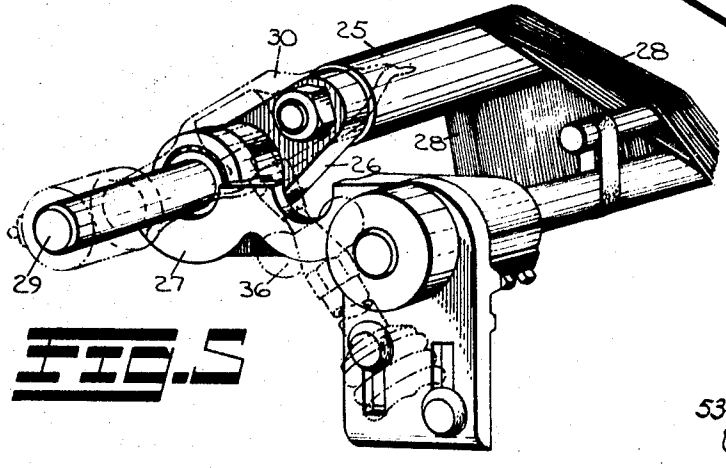

FIG. 5

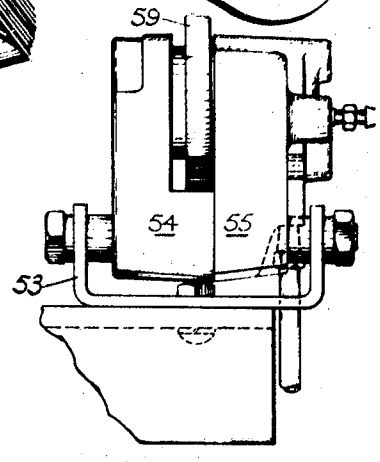

FIG. 2

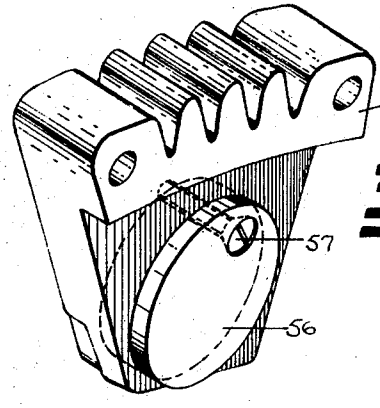

FIG. 3

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3,470,921

LETOFF APPARATUS FOR TEXTILE MACHINE

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Int. Cl. D03d 49/06; D04b 27/18
U.S. Cl. 139—109 8 Claims

ABSTRACT OF THE DISCLOSURE

An apparatus for regulating the speed of rotation of warp beams or the like to maintain a uniform tension on the threads or other sheet material being delivered therefrom. A sensitively controlled brake for permitting variations in the rotating speed of a letoff beam in response to tension changes throughout the complete full-to-empty cycle.

FIELD OF THE INVENTION

This invention relates to a tension control means for the letoff mechanism of textile machinery by which threads or other sheet or web material are delivered from a yarn beam or other wound source for further fabrication. It more particularly relates to a brake mechanism for regulating the speed of rotation of such a beam to maintain a near-constant tension upon the threads or other material.

In looms, knitting machines and other textile machines, the letoff for the yarn or sheet material must be synchronized with the take-up mechanism while maintaining a substantially constant tension on the material. Various factors combine in adversely affecting the control of tension such as the continually decreasing beam diameter and the shedding and beatup operations. Letoffs are known in the art which, by gearing and ratchet devices, intermittently release the yarn beam for a few degrees of rotation. These may in addition include mechanism for increasing the amount of rotation permitted as the beam diameter decreases. Letoffs have also employed frictional braking forces to restrain the beam rotation against the pull of the takeup mechanism. With these it has been necessary to make adjustments from time to time to overcome the variation in tension as the beam size decreases. To provide a near-constant tension, letoffs have required considerable mechanism and have been expensive to manufacture and to maintain in adjustment. This invention overcomes the disadvantages of the above stated letoff controls and discloses a means which is sensitive and responsive to tension changes and which is comparatively inexpensive and easily applied to existing machines.

SUMMARY

This invention provides a letoff controlling mechanism whereby a caliper-type disc brake permits stepless rotation in response to increases in the tension applied to the yarn feeding from a beam.

It is a general object of the invention to devise an improved letoff control which shall be less expensive to manufacture and maintain than those presently known.

It is a further object of the invention to devise a letoff controlling mechanism for maintaining a uniform warp tension from full to empty beam by means of a caliper-type disc brake actuated by either hydraulic, mechanical or pneumatic forces.

It is another object of the invention to devise a letoff control which shall be sensitive to minute changes and will restrict the beam against overrunning a preset tension level.

These and other objects of the invention will become apparent as further details are disclosed.

BRIEF DECRIPTION OF THE DRAWINGS

The invention will be described in greater detail by reference to a specific embodiment thereof as shown in the accompanying figures of drawing, wherein:

FIG. 1 is a side view in perspective of a loom having the invention applied thereon;

FIG. 2 is a plan view of the caliper-type disc brake device shown in FIG. 1;

FIG. 3 is a perspective view showing the stationary brake shoe;

FIG. 4 is an exploded view of the disc brake portion having the movable brake shoe; and

FIG. 5 is a more detailed view of a portion of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Now referring to FIGS. 1 and 5, a portion of a loomside **20** is shown with the apparatus of the invention applied at the left-hand side of a loom for weaving. It will be understood from the following explanation that the device is applicable also to a warp knitting machine or other machines where threads or sheet material are letoff from a beam or reel under controlled tension. One end of a warp beam **21** and a beam gear **22** are shown firmly fixed to a shaft **23** which is supported for rotation in a bearing **24** held by the loomside **20**.

A vibrating whip roll **25** is carried for rotation by two pivotally mounted arms **26** (one shown) supported by bracket **27** which is bolted to the loomside **20**. A plurality of warp yarns **28** is drawn over the whip roll **25** as a web in a well known manner for further fabrication and is arranged to bear upon the whip roll with a desired tension which may vary according to the fabric construction. Means for presetting the tension value will be explained below.

A stub shaft **29** which pivots the arm **26** also has keyed thereto an upwardly angled lever **30**. As viewed in FIGS. 1 and 5, it will be seen that, as tension is increased upon the yarn **28**, the roll **25** will be depressed and thus pivot the lever **30** clockwise and as the tension is decreased the reverse motion will occur. At a point **31** on the lever **30**, at a distance from the pivoting shaft **29**, is fastened one end of a shaft **32** in a position to be moved slightly longitudinally by the pivoting action of the lever **30**. The shaft **32** extends freely through a bracket **33** fixed to the loomside **20** as by a bolt **34**. A compression spring **35**, through which shaft **32** also extends, bears upon the bracket **33** with tension being applied by a thumb screw **36** threaded upon the shaft **32** allowing optimum tension to be preset by varying the location of the thumb screw **36**. The lower end of the shaft **32** has a ball-joint end **37** pivotally fastened to one arm of a bell-crank lever **38** which pivots on a screw **39** secured to the loomside **20** (FIG. 1).

The downwardly extending arm **40** of the bell-crank lever **38** is slotted to receive an end of an activating rod **41** which extends generally horizontally and whose movement will be controlled by the pivoting action of the bell-crank lever from indications of variations in tension upon the whip roll **25**. A collar **42** is slidably carried on the rod **41** rearwardly of the arm **40** and retains a compression spring **43** which encircles the rod **41** and is variably compressed by a thumb screw **44** bearing upon a collar **45**. The rearward end of the rod **41** is pivotally connected at **46** to an activating lever **47** which is supported pivotally by a master cylinder assembly, generally designated **48**. The master cylinder assembly **48** may function by mechanical or pneumatic means or may, as is shown in the preferred embodiment, contain a full supply of hydraulic brake fluid for transmitting changes in pressure. This type of assembly and others are available commercially such as those sold by H-H Products Company, Inc., of Milwaukee, Wis. The master cylinder assembly **48** in-

cludes a housing **49** with a piston **50** movably contained therein, positioned so as to be pressed and released by the activating lever **47** in its pivotal movement.

A length of tubing **51**, also containing brake fluid, is connected between the cylinder assembly **48** and a caliper-type disc brake, generally designated **52** which is securely bolted to a bracket **53**, fastened to the loomside **20** (FIG. 1). A caliper-type disc brake satisfactory for the purposes of the invention is that furnished by the H-H Products Company, Inc., set forth above. This type brake includes opposingly disposed interconnected housings **54** and **55** (FIG. 2). The housing **54** in this instance has a fixed brake shoe **56** secured in place by a screw **57** (FIG. 3). The second housing **55** includes a brake shoe **58** movable toward and away from the brake shoe **56** within the space separating the housings **54** and **55** and within which space a rotatable disc **59** is adapted to move in a position to be compressed between the faces of the brake shoes **56** and **58** (FIGS. 1 and 2). The brake shoe **58** is fastened by a screw **60** to a hydraulic piston **61** having a mounted oil seal ring **62** (FIG. 4). It will be understood that as pressure is exerted against the piston **50** a corresponding response will actuate the piston **61** which will urge the brake shoe **58** against the disc **59** and apply a frictional contact. The invention may include a disc brake having two movable brake shoes **58** and two housings **55**, in which case pressure would be exerted against the disc **59** from opposing sides.

The disc **59** is keyed to a shaft **63** which is journalled through the loomside **20** for free rotation. At the inward end of the shaft **63** is fixed a pinion **64** meshing with the beam gear **22** (FIG. 1). The shaft **63** and pinion **64** provide a positive rotating relationship between the yarn beam **21** and the disc **59**.

The housing **55** is provided with bleeder screws **65** and **66** for threading into pressure venting holes **67** and **68** for easy pressure adjustment (FIG. 4).

In operation, a desired warp tension is set upon the warp yarns **28** and counterbalanced by adjusting compression spring **35**. For pressure control, the spring **43** is adjusted to exert sufficient hydraulic pressure through the activating rod **41** and activating lever **47** to the master cylinder **48**. This should exert a clamping pressure on the disc **59** which will restrain the shaft **63** from rotational movement. Any decrease in torque at the shaft **63** will be in proportion with decreases in warp beam diameter from full to empty beam. Minute changes in warp tension will affect the load rate of the spring **35** and, through the above explained linkage, hydraulic pressure will be increased or decreased which will result in a greater or lesser torque at the disc brake **52** and disc **59**.

The instant invention achieves the objectives set forth by providing inexpensive and easily applied mechanism whereby instantaneous response to small tension variations will maintain the material being letoff from a beam at a preset tension level.

While one embodiment of the invention has been disclosed, it is to be understood that the inventive concept may be carried out in a number of ways. This invention is, therefore, not to be limited to the precise details described, but is intended to embrace all variations and modifications thereof falling within the spirit of the invention and the scope of the claims.

I claim:

1. In a means for maintaining uniform tension on material being withdrawn from a rotatable beam which includes

(a) a suspended material supporting roll pivotally movable in response to tension variations exerted by the material,

(b) means for presetting said supporting roll at an optimum tension against the material comprising a spring biased pressure adjusting rod fastened for reciprocal movement by said supporting roll,

(c) activating means for translating variations in tensions at said supporting roll comprising

(1) an activating rod disposed for longitudinal movement effected by said adjusting rod,

(2) a pressure control spring adjustably positioned upon said activating rod, and

(3) an activating lever pivotably connected to said activating rod,

(d) a pressure responsive housing for transmitting indications of tension variation as received from said activating means,

(e) a caliper-type disc brake connected for actuation by said pressure responsive housing, and

(f) a disc supported for rotation between the operating surfaces of said brake, said disc having a positive rotating relationship with said beam.

2. Apparatus as defined in claim **1** wherein said means for presetting said supporting roll further includes a compression spring through which said adjusting rod is adapted to extend, a fixed bracket for restraining one end of said compression spring, and a screw member threaded on said adjusting rod for varying the tension upon said supporting roll.

3. Apparatus as defined in claim **2** which further includes a pivotally supported bell-crank lever having a first arm fastened to said adjusting rod, and a second arm disposed for providing longitudinal motion to said activating rod.

4. Apparatus as defined in claim **1** wherein said housing comprises a fluid-containing master cylinder, and a fluid-displacing piston movable within said cylinder, movement to said piston being provided by the pivotal movement of said activating lever.

5. Apparatus as defined in claim **4** which further includes fluid-retaining tubing interconnecting said master cylinder and said disc brake, actuation of said disc brake being effected through intermittent increases and decreases in fluid pressure within said master cylinder.

6. Apparatus as defined in claim **5** wherein said disc brake includes at least one movable brake shoe, said brake shoe being actuated toward and away from said disc by means of variations in fluid pressure initiated at said master cylinder.

7. Apparatus as defined in claim **6** wherein said disc is positively driven from the rotation of said beam by means which includes a beam gear mounted on said beam, and a spur gear pinion in mesh with said beam gear and keyed to a shaft supported for free rotation, said disc being keyed to said shaft and rotatable therewith.

8. Apparatus as defined in claim **7** wherein said housing includes a hydraulic master cylinder and piston for initiating pressure variations for transmission to said disc brake.

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