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LETOFF DEVICE FOR KNITTING MACHINES

Filed Feb. 24, 1950

2 SHEETS—SHEET 1

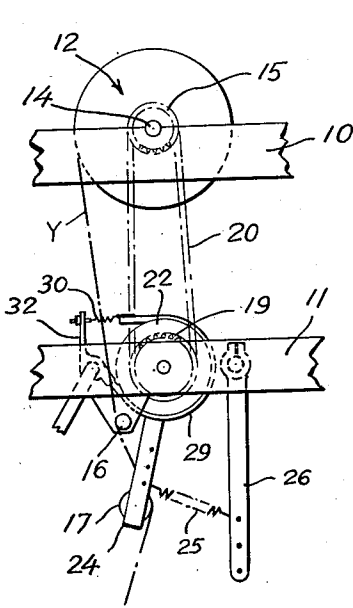


FIG. 1

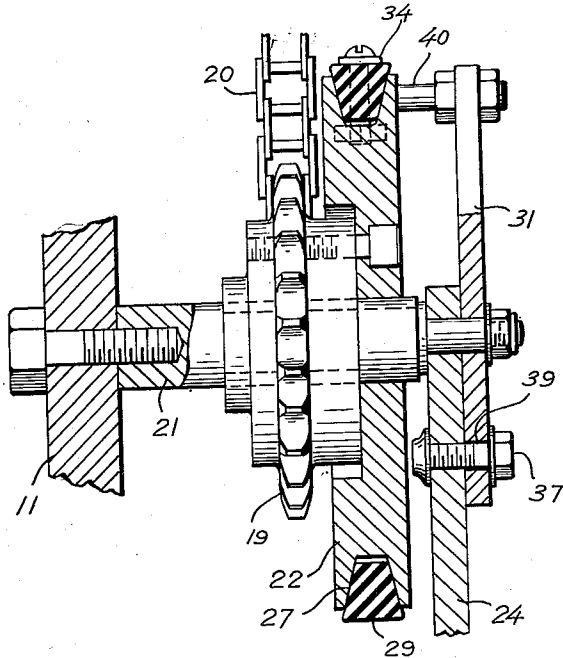


FIG. 3

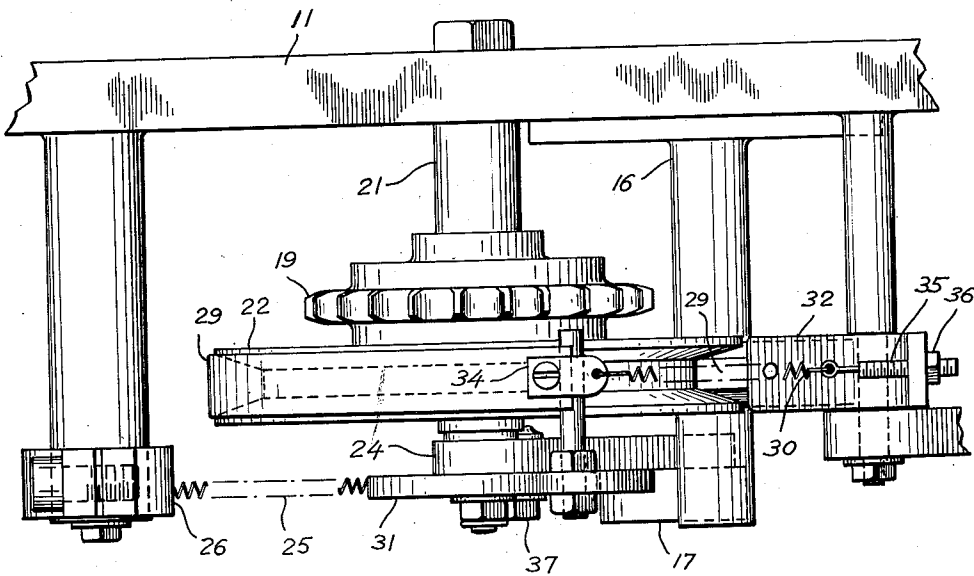


FIG. 4

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2 SHEETS—SHEET 2

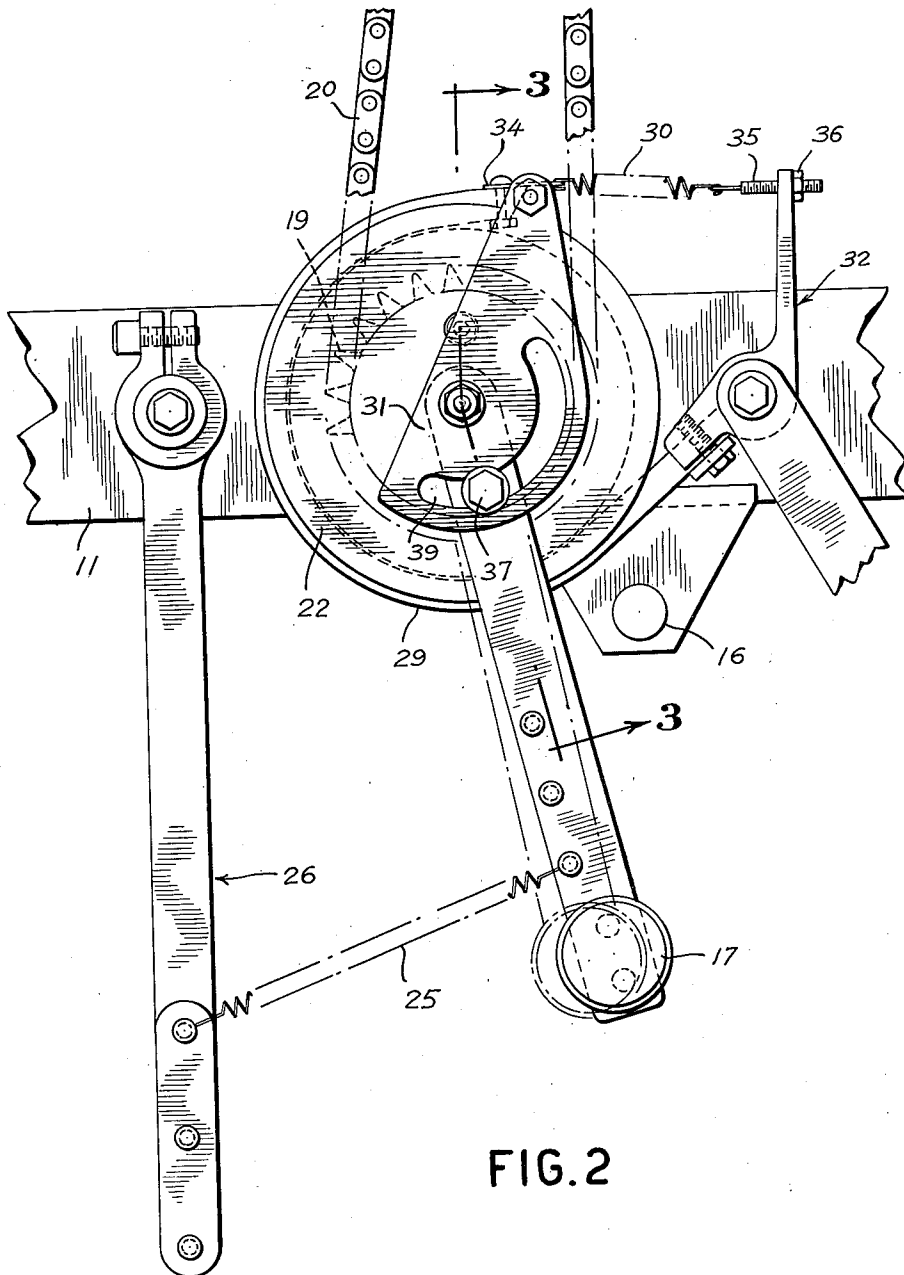


FIG. 2

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## UNITED STATES PATENT OFFICE

2,624,184

## LETOFF DEVICE FOR KNITTING MACHINES

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8 Claims. (Cl. 66—86)

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The present invention relates to knitting machines, and, more particularly, relates to a let-off device for warp knitting machines and the like.

Warp knitting machines generally comprise a rotatably mounted warp beam for furnishing a warp of yarn, needles and guide bars operated by mechanism to form fabric from the warp, a fabric take-up roll, and a tension bar over which the yarn passes to tension the warp while permitting the same to be furnished from the beam as demanded by the needles and the take-up roll.

The present invention is primarily concerned with controlling the supply of the yarn from the beam, providing the warp, in response to the demand of the needles while maintaining the yarn under a predetermined tension.

Accordingly, an object of the present invention is to provide an improved let-off device for warp knitting machines and the like which is simple in construction and reliable in operation.

Another object is to provide such a device which accurately controls the supply of yarn while maintaining the same under a predetermined tension at all times.

Another object is to provide such a device which prevents breakage of the yarn by eliminating conditions tending to cause excessive tensioning thereof and by eliminating conditions whereby the yarn becomes slack momentarily and thereafter is subjected to sudden pulls.

A further object is to provide such a device which is adapted for use in connection with practically all makes of warp knitting machines and the like, and which can be readily embodied in new machines during their construction and can be easily applied to existing machines in an economical manner.

Other and further objects of the invention will be obvious upon an understanding of the illustrative embodiment about to be described, or will be indicated in the appended claims, and various advantages not referred to herein will occur to one skilled in the art upon employment of the invention in practice.

In accordance with the invention, the foregoing objects are accomplished by providing a let-off device associated with the warp beam of a knitting machine, which device comprises a rotatably mounted brake drum connected for rotation with the warp beam, brake means for the drum such as a flexible band, resilient means for urging the brake band into engagement with the drum and a pivotally mounted arm under the control of the warp tension bar for causing

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the brake band to release the drum whereby the warp beam is free to be rotated and to supply yarn.

A preferred embodiment of the invention has been chosen for purposes of illustration and description, and is shown in the accompanying drawing, forming a part of the specification, wherein:

Figure 1 is a fragmentary schematic end elevational view of a knitting machine embodying a let-off device in accordance with the invention.

Figure 2 is an enlarged fragmentary elevational view of the let-off device shown in Figure 1.

Figure 3 is a sectional view taken along the line 3—3 on Figure 2.

Figure 4 is a fragmentary plan view illustrating a detail of the device.

Referring to the drawings in detail and more particularly to Figure 1 thereof, there is illustrated schematically a portion of one side of a warp knitting machine comprising an end frame structure of which only upper and lower horizontal supporting members 10 and 11 are shown, a warp beam 12 including a shaft 14 having one end rotatably supported by the upper member 10 (its other end being supported by a similar member at the opposite end of the machine, not shown), a sprocket 15 rotatable with the beam shaft, a fixed yarn guide bar or rod 16 supported by the lower member 11, a warp tension bar 17, and a let-off device operatively associated with the tension bar, as will be described hereinafter, including a sprocket 19 connected for rotation with the warp beam sprocket 15 by a sprocket chain 20 or the like.

As shown in Figures 2 and 3, a stud shaft or axle 21 is fixed to the supporting member 11 in horizontal position and parallel to the beam shaft 14. The sprocket 19 is rotatably mounted on this shaft and a brake drum 22 is secured to the sprocket for rotation therewith about the shaft 21. An arm 24 has its upper end pivotally mounted on the shaft 21 and has the warp tension bar 17 connected to its lower end, a similar arm supporting the other end of the bar. As will be observed, the yarn Y, in being supplied from the beam and delivered to the needles of the machine, is guided over the fixed bar 16 and the tension bar. In order to tension the strands of yarn Y constituting the warp, the tension bar supporting arm 24 is urged about its pivot in a clockwise direction (as viewed) to move the tension bar away from the needles by a spring 25 having one end attached to the arm adjacent

the lower end and having its other end attached to a depending element 26 supported at its upper end from the frame structure member 11.

The let-off device, as shown herein, includes the brake drum 22 which preferably has a generally wedged or V-shaped peripheral groove 27 formed therein, a flexible brake band 29 of generally wedge or V-shaped cross-section positioned in the groove for about three-quarters of its circumference, a spring 30 for urging the brake band into engagement with the drum, and an arm 31 under the control of the tension bar arm 24 for causing the brake band to release the brake drum in opposition to the spring 30, as will be made apparent hereinafter, so that the drum and the sprocket 19 are free to rotate and allow rotation of the warp beam.

The brake band 29 has one end fixed to a bracket 32 and has its other end secured to a buckle 34 (Figures 2 and 4). One end of the spring 30 is attached to the buckle and the other end of this spring is attached to the bracket 32 by a bolt member 35 extending through an aperture in the bracket having a nut 36 threaded thereon to vary its effective length and thereby provide for adjustment of the tension of the spring.

The arm 31 is in the form of a plate pivotally mounted on the fixed shaft 21 adjacent the tension bar arm. The arm 31 could be a part of the arm 24, but for purposes of adjustment, preferably, is a separate member connected to the arm 24 by a bolt 37 threaded into the arm 24 and disposed in an arcuate slot 38 formed in the arm 31 which extends circumferentially with respect to the center of the shaft 21 (Figure 2). The free end of the arm 31 has a pin 40 (Figures 3 and 4) in engagement with the buckle 34 whereby movement of the arm 24 in response to tension in the yarn which acts on the bar 17, rocks the arm 31 in a direction to cause the brake band to release the drum.

In operation, the warp beam is mounted on the supporting member 10 and the strands of yarn constituting the warp are passed over the fixed bar 16 and the tension bar 17 and are threaded in the needles (not shown). The spring 25 is adjusted to cause the bar 17 to tension the yarn as desired and to allow the bar to rock its arm 24 when the demand for yarn increases the tension in the warp yarn.

The arm 31 is adjusted with respect to the arm 24 so that the pin 40 is positioned to permit the spring 30 to urge the brake band 29 into the groove 27 of the brake drum 22 while the yarn is normally tensioned and to engage the buckle 34 to cause the brake band to release the drum when the yarn tension is increased beyond its desired value. The spring 30 is then adjusted to apply a force to urge the band into engagement with the drum to prevent rotation thereof.

With the parts arranged as just described, the brake drum is locked to prevent rotation of the sprocket 19 which, by reason of its connection with the sprocket 15 through the chain 20, prevents the warp beam from being rotated by the pull of the tensioned warp yarn. As the knitting machine is put into operation, the working of the needles and the fabric take-up mechanism create a demand for yarn whereby the tension in the warp yarn increases. When such increase in tension is sufficient to overcome the spring 25, the arm 24 rocks the arm 31 to cause the brake band to disengage the brake drum, whereby the drum and the sprocket 19 are free to rotate. The

sprocket 15 is now adapted to rotate whereby the pull of the warp yarn effects unwinding of the warp beam. As the beam unwinds, sufficient yarn is supplied to the warp to lower the tension thereof, whereby the spring 25 is effective to move the arms 24 and 31 into brake locking position.

The foregoing described mechanism is particularly advantageous in that a relatively light spring 30 is effective to lock the beam against unwinding. This is made possible by the flexibility of the band together with the V-shaped brake band and groove which provide a high friction force when a small load is applied by the spring 30. This spring force is easily overcome when the tension in the warp yarn exceeds its desired value whereby the brake is quickly released upon slight movement of the arms 24 and 31 to release the warp beam for unwinding. The braking force is quickly reapplied by slight movement of the arms in a return direction to almost instantaneously lock the beam against overrun, the brake in this respect being self-energizing.

While the brake drum has been shown and described as being connected for rotation with the beam by a chain sprocket arrangement or the like, it will be understood that the brake drum could be mounted at one end of the beam for rotation therewith. It also will be appreciated that some advantages of the invention may be attained by using a flat flexible brake band and a cylindrical brake drum surface, although a somewhat stronger spring would then be required to supply the braking force.

From the foregoing description, it will be seen that the present invention provides an improved let-off mechanism for knitting machines and the like which is simple and economical in construction and is practical and effective in operation.

As various changes may be made in the form, construction and arrangement of the parts herein, without departing from the spirit and scope of the invention and without sacrificing any of its advantages, it is to be understood that all matter herein is to be interpreted as illustrative and not in any limiting sense.

I claim:

1. In a warp knitting machine, the combination of a warp beam, a brake drum mounted for rotation having an annular V-shaped cross-sectioned groove in the periphery thereof, chain and sprocket means connecting said brake drum for rotation with said warp beam, a V-shaped cross-sectioned brake band in said groove extending about said drum, a spring for urging said band into engagement with said drum, yarn tensioning means including a bar adapted to be engaged by the yarn supplied from said warp beam, and means for pivotally mounting said tension bar including an arm for causing said brake band to release said brake drum.

2. In a warp knitting machine, the combination of a warp beam, a brake drum mounted for rotation, means connecting said brake drum for rotation with said warp beam, brake means for said drum, resilient means for urging said brake means into engagement with said drum, yarn tensioning means including a bar adapted to be engaged by the yarn supplied from said warp beam, an arm for pivotally mounting said tension bar, a second arm for causing said brake means to release said brake drum, and means for adjustably securing said arms including an arcuate slot in one of said arms and a set screw extending through said slot and threaded into said other arm.

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3. In a warp knitting machine, the combination of a warp beam, a brake drum mounted for rotation having an annular V-shaped cross-sectioned groove in the periphery thereof, chain and sprocket means connecting said brake drum for rotation with said warp beam, a V-shaped cross-sectioned brake band in said groove extending about said drum, a support having one end of said brake band attached thereto, a spring having one end attached to said support and having its other end attached to the other end of said brake band for urging said band into engagement with said drum, yarn tensioning means including a bar adapted to be engaged by the yarn supplied from said warp beam, an arm for pivotally mounting said tension bar, a second arm for causing said brake band to release said brake drum, and means for adjustably securing said arms including an arcuate slot in said second arm and a set screw extending through said slot and threaded into said first arm.

4. In a let-off device, the combination of an axle, a brake drum rotatably mounted on said axle having a V-shaped cross-sectioned groove in the periphery thereof, means connected with said drum for effecting rotation thereof and rotatably mounted on said axle, a brake band having a V-shaped cross-section in said groove and extending about said drum, a spring for urging said brake band into engagement with said drum, an arm pivotally mounted on said axle for causing said brake band to release said brake drum in opposition to said spring, a second arm pivotally mounted on said axle, means for adjustably connecting said second arm to said first arm, a second spring for urging said second arm in a direction whereby said first arm permits said brake band to engage said drum, and means carried by said second arm adapted to be engaged by yarn to cause said second arm to move said first arm to cause said brake band to release said drum in response to tension in the yarn adapted to overcome said second spring.

5. In a let-off device, the combination of an axle, a brake drum rotatably mounted on said axle, means connected with said drum for effecting rotation thereof, a brake band extending about said drum, a spring for urging said brake band into engagement with said drum, an arm pivotally mounted on said axle for causing said brake band to release said brake drum in opposition to said spring, a second arm pivotally mounted on said axle, means for adjustably connecting said second arm to said first arm, means for urging said

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second arm in a direction whereby said first arm permits said brake band to engage said drum, and means carried by said second arm adapted to be engaged by yarn to cause said second arm to move said first arm to cause said brake band to release said drum in response to tension in the yarn.

6. A device according to claim 5, wherein said means for adjustably connecting said second arm to said first arm include an arcuate slot in one of said arms and a set screw extending through said slot and threaded into said other arm.

7. In a yarn let-off device, the combination of a brake drum mounted for rotation having an annular V-shaped cross-sectioned groove in the periphery thereof, chain and sprocket means connected with said brake drum for effecting rotation thereof, a V-shaped cross-sectioned brake band in said groove extending about said drum, a spring for urging said band into engagement with said drum, yarn tensioning means including a bar adapted to be engaged by the yarn, and means for pivotally mounting said tension bar including an arm for causing said brake band to release said brake drum.

8. In a yarn let-off device, the combination of a brake drum mounted for rotation, means connected with said brake drum for effecting rotation thereof, brake means for said drum, resilient means for urging said brake means into engagement with said drum, yarn tensioning means including a bar adapted to be engaged by the yarn, an arm for pivotally mounting said tension bar, a second arm for causing said brake means to release said brake drum, and means for adjustably securing said arms including an arcuate slot in one of said arms and a set screw extending through said slot and threaded into said other arm.

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