March 26, 1957 J. O. HUNT 2,786,491

LET-OFFS

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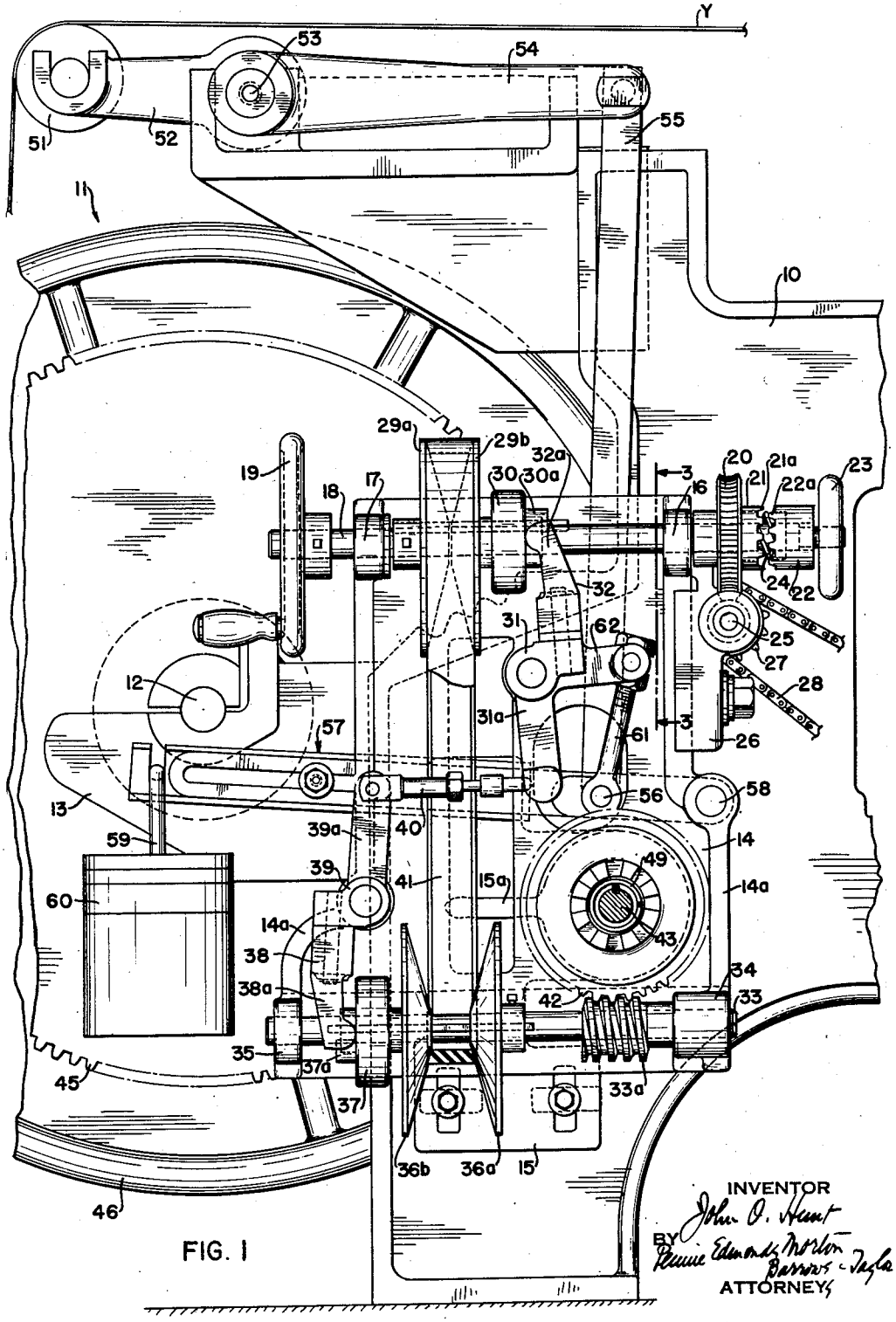


FIG. 1

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FIG. 6

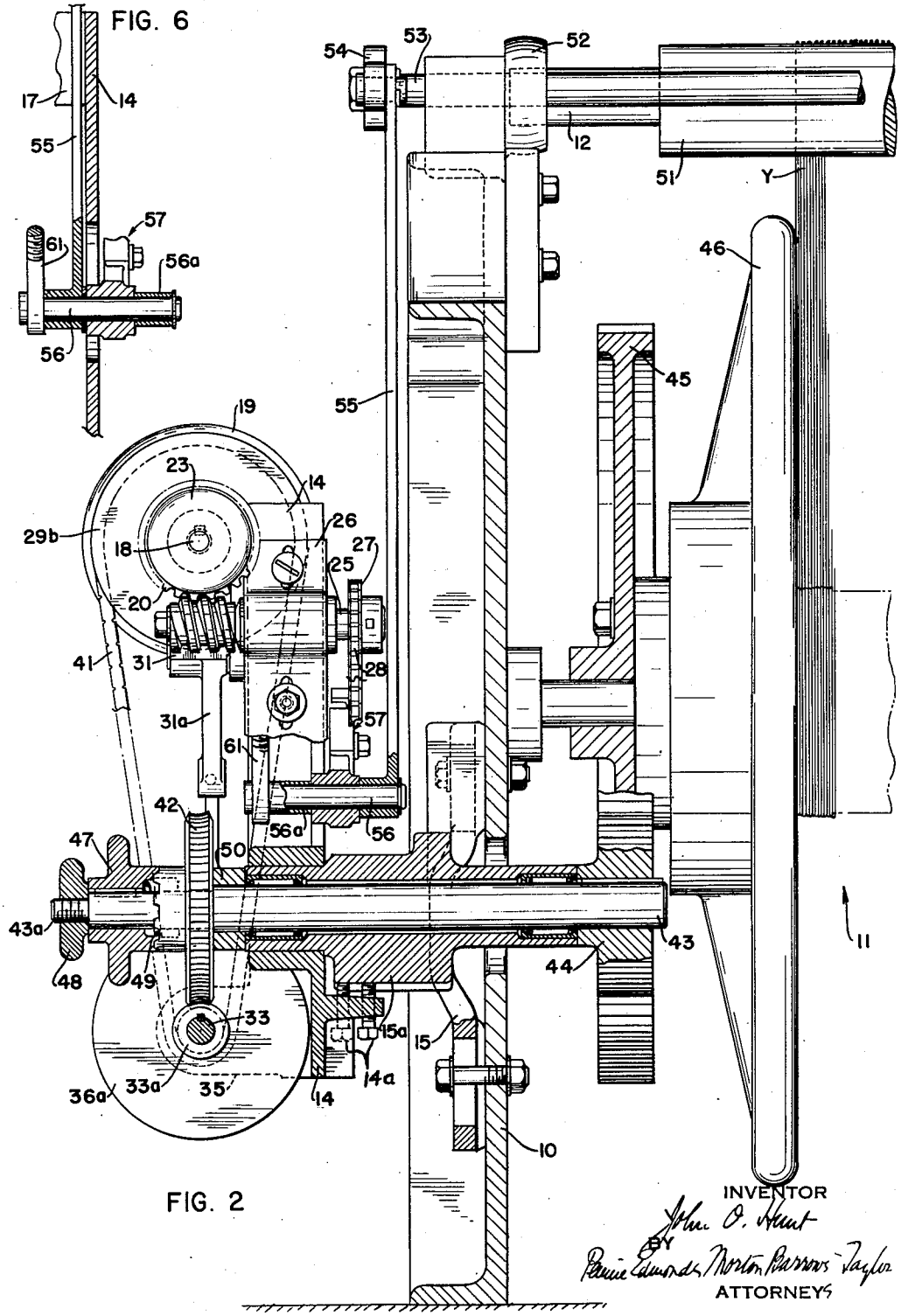


FIG. 2

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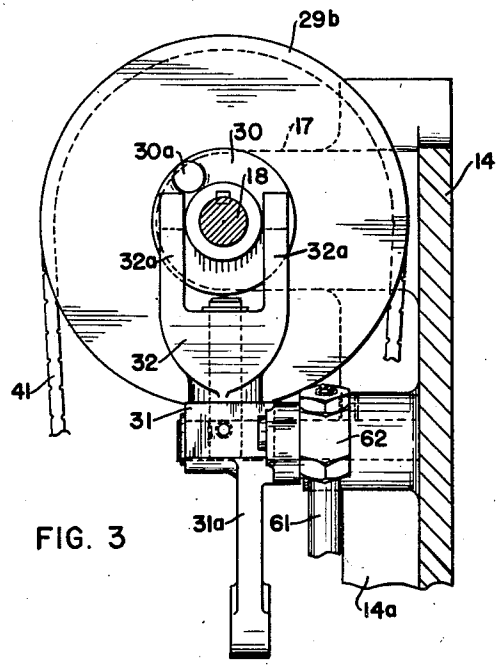


FIG. 3

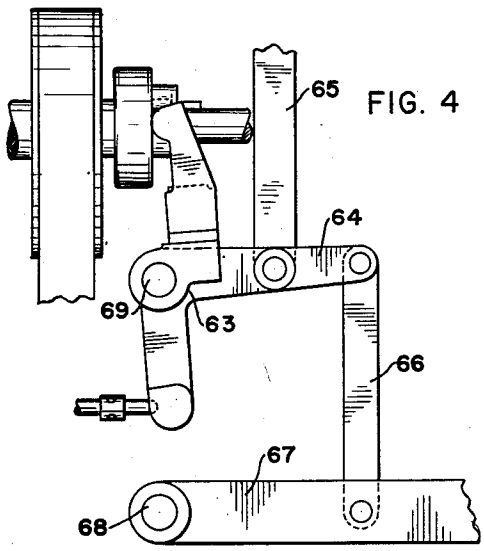


FIG. 4

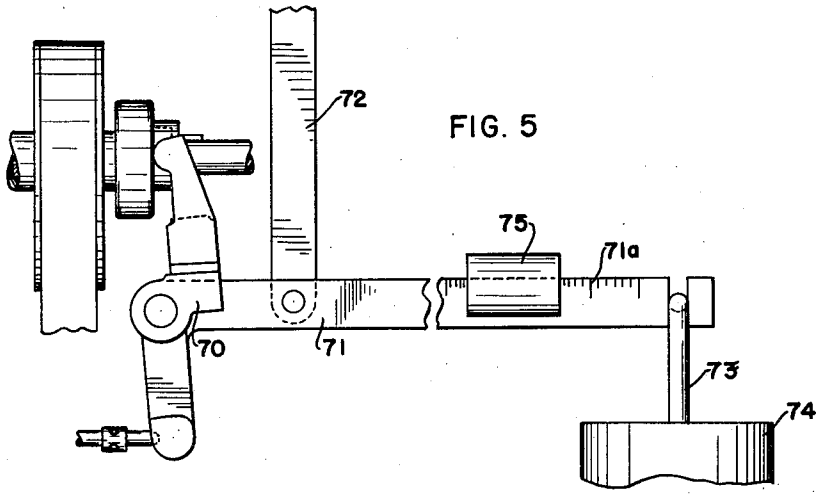


FIG. 5

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LET-OFFS

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Application March 2, 1956, Serial No. 569,013

12 Claims. (Cl. 139—110)

This invention relates to let-off mechanisms for feeding strand and web material of indefinite length and is concerned more particularly with a novel let-off of the positive type, which operates to feed the material from a wound supply thereof continuously at a substantially constant linear velocity and under a substantially constant tension selected from within a considerable range. The new let-off is useful in various applications, and, since it offers especial advantages, when employed in textile machines, such as looms and warp knitting machines, for feeding warp yarns from a beam, a form of the new let-off as employed with a loom will be illustrated and described in detail for purposes of explanation.

Positive let-offs are in common use on looms and, in one widely used form of such mechanism, the warp beam is advanced stepwise and the length of the steps of the beam movement is varied in response to variation in the tension on the warp yarns and also in accordance with the decreasing size of the warp supply on the beam. The weaving of cloth of the highest quality, particularly with yarns of continuous filamentary synthetic material, requires that the warp yarns be fed from the beam at a constant linear velocity and under constant tension, in order that each unit of length of the fabric may contain the same number of picks of filling. Let-offs, in which the beam is rotated step by step, are inherently incapable of meeting the stated requirements for feeding warp yarns and cloth produced on looms with such let-offs is likely to contain undesirable variations in construction, which become more apparent after the fabric is dyed, because of the unevenness in color of sections of the fabric containing different numbers of picks of filling per unit length.

The present invention is, accordingly, directed to the provision of a let-off, which functions to feed strand and web material from a wound supply thereof continuously and with a substantially constant linear velocity and under a substantially constant tension. The new let-off is of simple, relatively inexpensive construction and its working parts are readily accessible, so that it can be easily maintained in proper operating condition. In addition, it is adjustable, so that the tension, which it applies to the material being fed, can be varied within a relatively wide range, and such adjustments can be made without stopping the machine, on which the let-off is installed.

For a better understanding of the invention, reference may be had to the accompanying drawings, in which—

Fig. 1 is a view in front elevation with parts removed, broken away, and shown in section of a let-off embodying the invention and mounted on a loom;

Fig. 2 is a view of the new let-off in end elevation with parts broken away and shown in section;

Fig. 3 is a fragmentary sectional view on the line 3—3 of Fig. 1;

Figs. 4 and 5 are simplified front elevational views of modified features of the let-off of Fig. 1; and

Fig. 6 is a side elevational view with parts broken away of a modified construction.

As shown in Figs. 1–3, incl., the let-off is mounted on one of the sides **10** of a loom adjacent the loom beam **11**, which is supported between the sides with the ends of its arbor **12** seated on brackets attached to the sides, one of the brackets being shown at **13**. The let-off includes a plate **14**, which has ribs **14***a* along its vertical edges and has an opening for receiving the cylindrical end section of a projection **15***a* forming part of a bracket **15**, which is bolted to the loom side **10**. The plate **14** is secured in the desired angular relation to the bracket by screws **14***a* extending through a flange on the plate and bearing against the under side of projection **15***a* and the plate is provided near its upper end with ears **16**, **17** containing bearings for an input shaft **18** having a hand wheel **19** rigidly secured thereto at one end. At its other end, a worm gear **20** is mounted loosely on the shaft and the gear has a hub **21**, which is provided with teeth **21***a* adapted to mesh with teeth **22***a* on a sleeve **22** splined to shaft **18** and movable along the shaft by a screw operated by hand wheel **23**. A spring **24** encircling the shaft between hub **21** and sleeve **22** urges gear **20** toward the adjacent ear **16** on plate **14**. The hub **21** with teeth **21***a* and sleeve **22** with teeth **22***a* form the elements of a clutch, by which gear **20** can be secured to shaft **18** to rotate therewith. Gear **20** is in continuous mesh with a worm pinion on a shaft **25** mounted in bearings on a bracket **26** adjustably secured to one rib **14***a* of plate **14** and shaft **25** has a sprocket wheel **27** connected by a chain **28** to a sprocket wheel on the cam shaft of the loom. Shaft **25** thus runs continuously throughout the operation of the loom. When the speed range of the let-off is to be varied, the worm gear **20** is replaced by one of different diameter and bracket **26** is adjusted accordingly to cause the new gear to mesh with the pinion on shaft **25**.

A pair of coned discs **29***a*, **29***b* are mounted on shaft **18** with disc **29***a* secured fast to the shaft and disc **29***b* splined to the shaft, so that it is movable toward and away from disc **29***a* but rotates with the shaft at all times. A ball thrust bearing **30** encircles the shaft and lies in contact with the hub of disc **29***b*. A lever **31** is pivotally mounted on plate **14** and is provided at one end with a yoke **32**, which is mounted adjustably on a pin carried by the lever. The legs **32***a* of the yoke lie on opposite sides of shaft **18** in position to engage the thrust bearing **30** and the bearing has a pin **30***a*, which is engageable with one of the legs of the yoke to prevent the bearing from turning with shaft **18**.

An output shaft **33** is mounted in bearings in ears **34**, **35** on plate **14** and the shaft carries coned discs **36***a*, **36***b*. Disc **36***a* is fast to shaft **33**, while disc **36***b* is splined to the shaft, so that it can be moved toward and away from disc **36***a*, but rotates with the shaft at all times. A ball thrust bearing **37** encircles shaft **33** in position to engage the hub of disc **36***b* and the bearing is engaged by the ends of the legs **38***a* of a yoke **38** adjustably mounted on a pin carried by one end of a lever **39** pivoted on the plate **14**. A pin **37***a* on thrust bearing **37** is engageable by one of the legs of yoke **38** to prevent rotation of the bearing with shaft **33**. The other end **39***a* of the lever carries a link **40** adjustable in length and the end of the link engages the end **31***a* of lever **31** opposite to yoke **32**. The discs **29***a*, **29***b* form an adjustable driving pulley, which is connected by belt **41** to the adjustable driven pulley formed by discs **36***a*, **36***b*.

Shaft **33** is provided with a worm **33***a* meshing with a worm wheel **42** loosely mounted on a let-off shaft **43**, which is mounted in bearings within projection **15***a* of bracket **15**. Shaft **43** carries a pinion **44** meshing with a

gear 45 secured to the flange 46 at one end of beam 11. The gear 42 is loose on shaft 43 and has a hub formed with teeth 42*a* adapted to mesh with teeth on a sleeve 47 splined to shaft 43 and movable lengthwise on the shaft by a hand wheel 48 on a threaded extension 43*a* of the shaft. A spring 49 between sleeve 47 and the hub of gear 42 tend to force the gear against a spacer 50 interposed between the gear and the end of projection 15*a* on bracket 15. The gear hub with teeth 42*a* and sleeve 47 with its teeth form a clutch by which gear 42 may be connected to and disconnected from let-off shaft 43 as desired.

The sheet of warp yarns Y leaving beam 11 pass upwardly and over a whip roll 51 mounted in arms 52 on a shaft 53 having an arm 54 rigidly attached thereto. The free end of the arm is connected by a tension link 55 to a pivot pin 56 carried by a scale beam 57 pivoted on plate 14 at 58. The beam may be of one piece construction or it may be made of two overlapping parts having a slot and bolt connection, so that the overall length of the beam can be varied as desired, and, at its outer end, the beam has a hanger 59 supporting a group of weights 60. A link 61 is connected to the scale beam 57 preferably by being mounted on pivot pin 56 and the free end of link 61 is connected adjustably to a tail 62 on lever 31.

In the operation of the let-off, the parts of the scale beam 57 are preliminarily adjusted to provide a beam of the desired length and a number of weights suitable for applying the desired tension to the warp sheet are mounted on hanger 59. The weights tend to swing the scale beam counterclockwise, as seen in Fig. 1, and the beam acts through tension link 55 and arm 54 to rock the shaft 53 clockwise, so that the whip roll 51 presses upward against the yarns to apply tension thereto. The scale beam 57 also acts through link 61 to swing lever 31 clockwise, so that yoke 32 is moved away from thrust bearing 30 and disc 29*b* may be moved away from its companion disc 29*a* by belt 41. Lever 31 also acts through link 40 to urge the second lever 39 in a counterclockwise direction, so that its yoke 38*a* tends to move coned disc 36*b* toward its companion disc 36*a* and to force belt 41 toward the peripheries of the disc. Such a movement of the belt tends to move it inward between discs 29*a*, 29*b*. The action of the weights thus tends to adjust the driving and driven pulleys for the lowest speed of operation.

When the loom is to be started, hand wheels 23 and 48 are rotated to clutch worm wheel 20 to the input shaft 18 and worm wheel 42 to the let-off shaft 43, so that the continuously operating shaft 25 rotates the input shaft and that shaft drives the output shaft 33 through the driving discs 29*a*, 29*b*, belt 41, and the driven discs 36*a*, 36*b*. If the warp yarns are not fed at the proper linear speed by this rate of beam rotation, the tension on the yarns will cause the whip roll 51 to move downward and arm 54 to rise. As a result, the scale beam will be raised, the first lever 31 will be swung counterclockwise to move disc 29*b* toward disc 29*a*, and the second lever 39 will be swung clockwise to permit disc 36*b* to separate from disc 36*a*. The belt will thus adjust itself between the discs to effect an increase in speed of the output shaft and the adjustment will continue until the tension on the warp yarns becomes uniform and the whip roll shaft remains stationary.

As the supply of warp yarns on the beam decreases in diameter, the angular velocity of the beam must increase in order to maintain the desired constant linear velocity of the warp yarns. This adjustment of the coned discs is again effected by the variations in tension of the warp sheet causing the whip roll to swing to change the position of the scale beam and vary the position of the belt with reference to the driving and driven discs.

The let-off is illustrated in Fig. 1 with the belt and discs in the proper positions for maximum speed of beam rotation and the condition illustrated occurs when the warp supply on the beam has almost run out.

In the construction illustrated in Figs. 1–3, inclusive, the tension link 55 lies to the rear of the scale beam and behind the plate 14 and the beam extends to the left as seen in Fig. 1. In some looms, it may be necessary to mount the link on pivot pin 56 in front of the scale beam and plate 14 and, for this purpose, the link may be disconnected from the pivot 56 and the spacer 56*a* removed. The lower end of link 55 may then be slipped on the pivot between link 61 and the scale beam to take the place of the spacer and the spacer may be placed at the inner end of the pivot pin. With the parts in the condition described, the link 55 lies in front of both the scale beam and the plate 54. The parts are illustrated in the condition described in Fig. 6.

In some looms, it may be desirable to have the scale beam extend to the right, as shown in Fig. 4, instead of to the left. For this purpose, the first lever 31 may be replaced by a lever 63 having a tail 64 connected to the tension link 65. The free end of tail 64 is connected by a link 66 to the scale beam 67 pivoted on and extending to the right from a pin 68 lying directly beneath the pin 69, on which lever 63 swings.

In Fig. 5, there is shown an alternative construction, which is somewhat simpler than those described. In this construction, the first lever 31 is replaced by a lever 70 having the scale beam 71 integral therewith. The beam is connected to the lower end of the tension link 72 and is provided with a hanger 73, on which weights 74 are mounted. The beam 71 is formed with a scale 71*a*, along which is movable a weight 75 for fine adjustment of the weighting of the beam and of the tension applied to the warp yarns thereby. If desired, scale beams 57 and 67 may be provided with scales similar to scale 71*a* and with weights movable along the scales for fine adjustment of the yarn tension.

In all forms, the new let-off is easy to maintain in proper operating condition, since most of the working parts are in front of plate 14 in readily accessible condition. By changing the weights, the let-off can be operated within a considerable range of adjustment and new ranges can be made available by replacement of worm gear 20 by others of different size. The transmission consisting of the driving discs 29*a*, 29*b*, the belt 41, and the driven discs 36*a*, 36*b* responds and adjusts itself to small changes in tension on the warp sheet and, when the loom is at rest, the belt cannot change its position relative to the discs and the tension applied by the weights to the warp sheet remains constant. The new let-off may, of course, be used with new looms and the modifications in its construction described make its application to existing looms a simple matter.

The let-off embodying the present invention has features in common with the let-offs disclosed in my applications Ser. No. 357,744, filed April 27, 1953, and Ser. No. 384,889, filed October 8, 1953, now Patent No. 2,755,824.

I claim:

1. A let-off for use on a textile machine having a beam supplying yarns, a roll engaging the yarns leaving the beam, a rockable support for the roll urged in one direction by the tension of the yarns acting on the roll, and a machine shaft operating continuously throughout the operation of the machine, which comprises a plate, means for mounting the plate on a fixed part of the machine, an input shaft and an output shaft mounted for rotation on the plate, means for connecting the input shaft to the machine shaft to be driven by the latter, a let-off shaft connected to the beam and rotatable to rotate the beam to let off yarns therefrom, means for connecting the output shaft to the let-off shaft, a pair of coned driving discs on the input shaft, a pair of coned driven discs on the output shaft, one disc of one pair and the opposite disc of the other pair being fast on their shafts and the remaining discs of the pairs being axially movable on their shafts but connected to the shafts for rotation therewith, a belt connecting the driving and driven discs, a scale beam

pivotally mounted on the plate, means for connecting the scale beam and the rockable support, weight means urging the scale beam to act through the connecting means and support to press the roll against the yarns, a lever mounted on the plate and having a yoke end engageable with the axially movable driving disc, a connection between the lever and scale beam, through which the scale beam urges the lever to swing its yoke end away from the axially movable driving disc to permit the latter to move away from its companion disc, a second lever mounted on the plate and having a yoke end engageable with the axially movable driven disc, and a connection between the levers, through which the first lever urges the second to swing its yoke end to force the axially movable driven disc toward its companion disc.

2. The let-off of claim 1, in which the scale beam is connected to the rockable support by a link and to the first lever by a second link and the links are pivotally mounted on the same pivot on the scale beam.

3. The let-off of claim 1, in which the scale beam is connected to the rockable support by a link lying to the rear of the plate.

4. The let-off of claim 1, in which the connection between the levers is adjustable.

5. The let-off of claim 1, in which the means for connecting the machine shaft to the input shaft includes a clutch.

6. The let-off of claim 1, in which the means for connecting the output and let-off shafts includes a clutch.

7. The let-off of claim 1, in which the yoke ends of the levers are provided by separate yokes adjustably mounted on the levers.

8. The let-off of claim 1, in which the scale beam is made of two parts, which are relatively adjustable to vary the overall length of the scale beam.

9. The let-off of claim 1, in which the scale beam is rigidly attached to the first lever to swing with the latter on the same pivot.

10. The let-off of claim 1, in which the first lever has a tail extending laterally from the lever adjacent the pivot of the lever, the scale beam pivot lies vertically beneath the lever pivot, the scale beam extends laterally from its pivot in the same direction as the tail from the lever pivot, and the tail is connected to the scale beam by a link.

11. The let-off of claim 1, in which the means for mounting the plate on a fixed part of the machine is a bracket adapted to be bolted to the fixed part, the bracket has an outward projection entering an opening in the plate to support the latter, and the plate is angularly adjustable on the projection and has means for securing it in the desired position of adjustment.

12. The let-off of claim 11, in which the projection on the bracket is hollow and carries bearings, in which the let-off shaft is mounted.

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