July 24, 1956 J. O. HUNT 2,755,822

RESISTANCE LET-OFFS

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FIG. 1

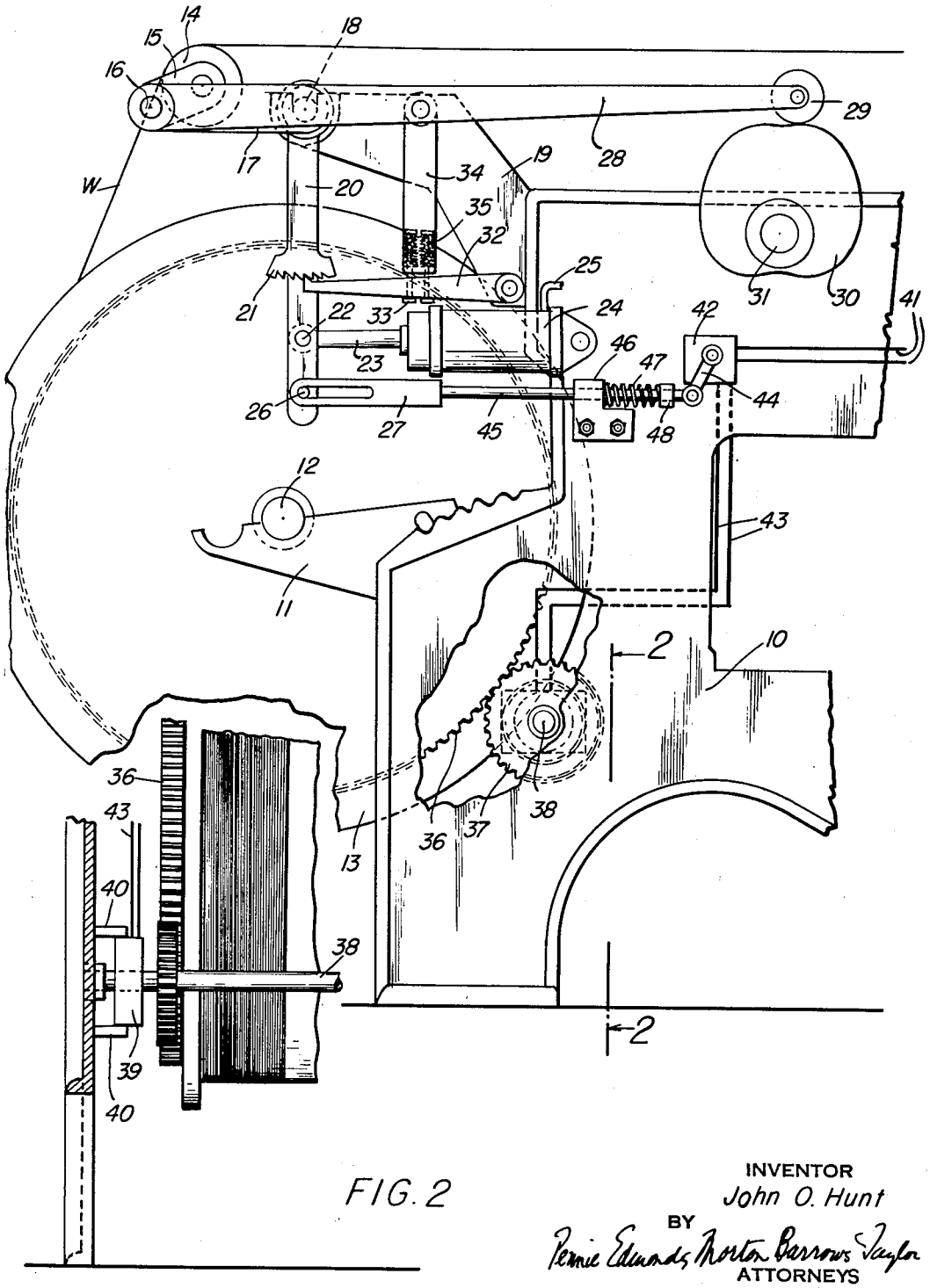



FIG. 2

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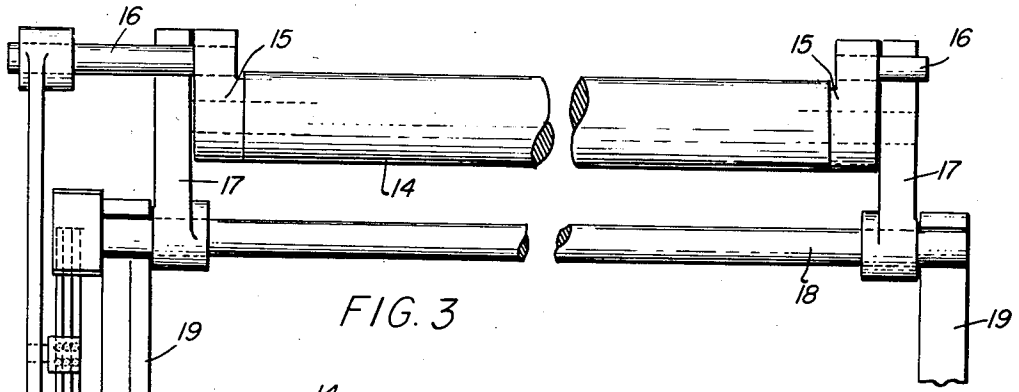



FIG. 3

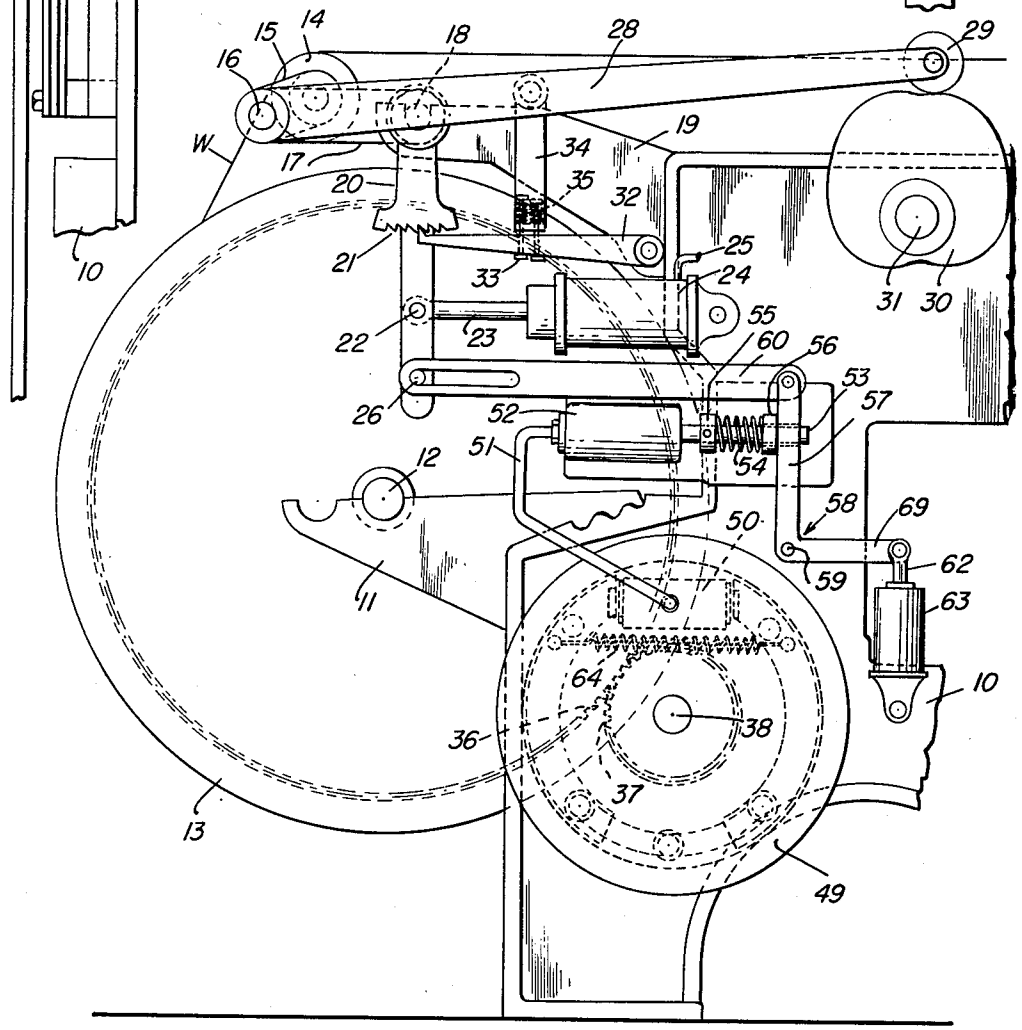



FIG. 4

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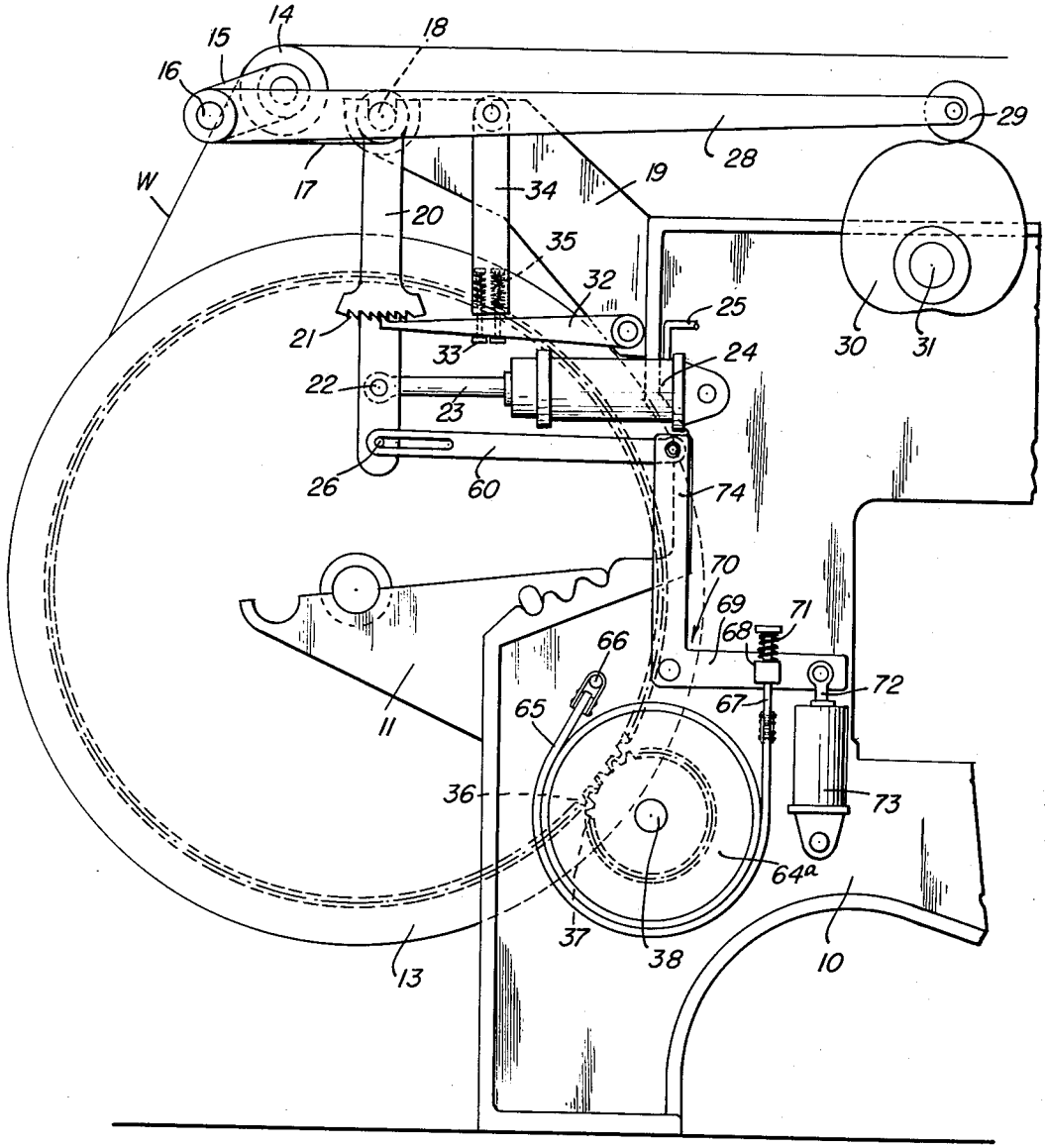



FIG. 5

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# RESISTANCE LET-OFFS

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3 Claims. (Cl. 139—109)

This invention relates to let-off mechanisms used for controlling the rate at which a web of material is unwound from a supply roll, and thereby determining the tension imposed upon the web, as it is subjected to various operations and finally taken up. More particularly, the invention is concerned with a novel let-off of the type, in which the supply roll is unwound by the pull applied to the web by take-up, feeding, or similar means, and the tension on the web is controlled by braking means resisting the rotational movement of the roll.

Let-offs, which control the tension on the web being unwound by resisting the rotation of the web supply roll, may, for convenience, be referred to as "resistance" let-offs to distinguish them from those of the positive type, which include means for rotating the roll. Such resistance let-offs have been used in looms for many years and have commonly included a friction brake made effective by weights. In the use of such let-offs, the weighting of the brake should be changed continuously as the size of the warp supply on the beam decreases, so that, in practice, it is impossible to obtain uniform braking of the beam and the tension on the warp yarns varies within considerable limits. Also, the amount of tension employed depends wholly upon the judgment of the weaver.

Let-offs of the positive type used on looms provide a closer control of the tension on the warp yarns than friction let-offs. However, positive let-offs as heretofore constructed are quite complicated and some positive let-off mechanisms include an element, which bears upon the warp yarns on the beam and sometimes damages the yarns and causes marks in the fabrics.

The present invention is directed to the provision of a novel let-off, which is of simple construction and provides a close control of the tension on the web being unwound from the supply roll. The new let-off includes brake means for resisting the rotation of the supply roll by a pull applied to the web, and the effectiveness of the brake is varied in accordance with variations in the tension on the web. The brake means employed in the new let-off may be of any of the usual types, and the action of the brake is controlled by means, including a roller engaging the web, as it leaves the supply roll. The roller is carried in a support, which is urged in one direction by yielding means and is movable in the opposite direction by an increase in tension on the web acting on the roller. The movements of the support in response to variations in the tension of the web are then employed to control the operating means for the brake.

For a better understanding of the invention, reference is made to the accompanying drawings in which:

Fig. 1 is a view in side elevation of a loom provided with one form of the new let-off;

Fig. 2 is a sectional view on the line 2—2 of Fig. 1;

Fig. 3 is a fragmentary plan view showing the whip roll support of the let-off of Fig. 1;

Fig. 4 is a view in side elevation of a loom equipped with a modified form of the new let-off; and



Fig. 5 is a view in side elevation of a loom equipped with another modified form of the new let-off.

The different forms of apparatus shown have parts in common and such parts are identified by the same reference characters throughout the drawings.

One form of the new let-off is illustrated in Fig. 1 as applied to a loom having sides 10, from which project brackets 11 supporting the journals 12 of a beam 13. The sheet of warp yarns W is led from the beam over a whip roll 14, the shaft of which is mounted in arms 15 fast on pins 16. The pins are mounted in arms 17 fast on a shaft 18, which is mounted in bearing sockets in brackets 19 attached to the loom sides. Shaft 18 has an arm 20 extending downwardly therefrom and carrying a ratchet bar 21. The arm 20 is connected by a pin 22 to the rod 23 of a piston within a cylinder 24 pivotally mounted on one loom side 10 and having an inlet, to which air under pressure is supplied through a line 25. Below pin 22, arm 20 carries a pin 26, which enters a slot in a link 27. An arm 28 fast on one of the pins 16 is provided with a roller 29, which bears against a cam 30 on the crank shaft 31 of the loom. A plurality of pawls 32 are pivotally mounted on bracket 19 and are adapted to engage the ratchet bar 21. Each pawl is supported on a bolt 33 extending through a flange on the lower end of an arm 34 pivotally depending from arm 28. A spring 35 encircling each bolt tends to hold its pawl yieldingly against the lower end of arm 34.

The heads on the beam are provided with the usual gears 36 and one of the gears is in mesh with a pinion 37 on a shaft 38 mounted in bearings on the loom sides. The rotation of shaft 38 is controlled by a brake 39, which is illustrated as of the electro-magnetic type and as having a housing connected by arms 40 to the adjacent loom side 10. Power for energizing the brake is supplied by lines 41 leading to a control device 42 connected through lines 43 to the brake. The control device has an operating arm 44, to which is attached one end of a rod 45 having its other end connected to link 27. Rod 45 is mounted in a bracket 46 on the loom side and a spring 47 encircling the rod and bearing at one end against the bracket and at the other against a collar 48 on the rod urges the rod to move arm 44 to decrease the effectiveness of the brake.

In the operation of the loom equipped with the take-off shown in Fig. 1, the pull of the take-up means on the sheet of warp yarns W causes rotation of beam 13, and the rate of rotation and, consequently, the tension on the warp yarns are controlled by the brake 39. The warp yarns acting on the whip roll 14 tend to rock shaft 18 and arm 20 counter-clockwise, so that spring 47 can move rod 45 and arm 44 of the control device 42 to decrease the effectiveness of the brake. Such movement of arm 20 is resisted by the air supplied to cylinder 24, which urges the piston to move rod 23 out of the cylinder and swing arm 20 clockwise. Any suitable means, such as a spring, may be employed in place of the cylinder 24, but the cylinder is preferred, since, when it receives compressed air from a large supply tank, it applies uniform force to arm 20, regardless of the position of the piston within the cylinder.

Throughout the operation of the loom, the whip roll is swung about the axis of pins 16 in timed relation to the lay by cam 30 acting on arm 28 through roller 29. At the time of the beat-up, the cam is in the vertical position shown in Fig. 1, so that the whip roll is raised and the maximum tension is being applied to the yarns by the whip roll. The raising of arm 28 to its extreme upper position by cam 30 causes the pawls 32 to engage the ratchet bar 21, so that, at the time of the beat-up, the whip roll cannot be moved by the yarns. In all other positions of cam 30, the pawls 32 are depressed,

so that their ends are disengaged from the ratchet bar 21. Accordingly, if the shuttle should be trapped within the shed and heavy tension applied to the warp yarns as the reed engages the shuttle and forces it toward the fell of the goods, the whip roll support comprising arms 17 and shaft 18 can be quickly rocked counter-clockwise to relieve the tension. In such movement of arm 20, the pin and slot connection between the arm and link 27 permits the arm to move without producing a corresponding movement of link 27, rod 45, and arm 44. However, as pin 26 moves away from the outer end of the slot in link 27, spring 47 acts to move arm 44 to reduce the braking effect on the beam.

In the form of the let-off shown in Fig. 4, the gear 36 on the end of the beam meshes with a pinion 37 on a shaft 38, the rotation of which is controlled by a conventional hydraulic brake 49 having an operating cylinder 50 supplied with fluid through a line 51 from a master cylinder 52. Cylinder 52 contains a piston connected to a piston rod 53 encircled by a spring 54 having one end seated against a collar 55 fast on the rod and its other end engaging a collar 56 loosely encircling the rod. Rod 53 extends through an opening in one arm 57 of a bell-crank 58 pivoted at 59 on the loom side 10. The free end of arm 57 is attached to a link 60 having a slot receiving pin 26 on arm 20. Arm 20 is fast on shaft 18 which, with arms 17 fast thereon, provides a support for whip roll 14 mounted in arms 15 having pins 16 received in recesses in arms 17. The other arm 69 of the bell-crank 58 is connected to the plunger 62 of a dashpot 63 mounted on the loom side 10. The dashpot is of the adjustable type and constructed for slow downward movement of plunger 62 at an adjustable rate and fast upward movement of the plunger.

The operation of the let-off shown in Fig. 4 is similar to that of Fig. 1, in that an increase in tension on the warp yarns at any time other than at the time of the beat-up causes arm 20 to swing counter-clockwise, so that spring 54 can move rod 53 out of cylinder 52 and thus lower the pressure in operating cylinder 50 and reduce the braking effect. Such movement of rod 53 is at a rate controlled by the action of dashpot 63. If the tension on the warp yarns decreases, the air pressure within cylinder 24 acts upon rod 23 to move arm 20 clockwise and this causes a counter-clockwise movement of bell-crank 58. As the vertical arm 57 of the bell-crank so moves, it acts through spring 54 to move rod 53 into the master cylinder 52, so that fluid is applied to the operating cylinder 50 and the brake is applied. At the time of the beat-up, cam 30 is in the vertical position illustrated and arm 28 raises pawls 32, so that they engage the ratchet bar 21 and prevent the whip roll support from being moved by the warp yarns.

If the shuttle is trapped in the shed, the whip roll support may be quickly rocked counter-clockwise, since, with the slot and pin connection between arm 20 and link 60, the dashpot 63 does not restrict the movement of arm 20. With no force applied to the master cylinder to supply fluid to the operating cylinder, the brake is released by its own spring 64.

The form of the let-off shown in Fig. 5 includes a pinion 37 mounted on shaft 38 and meshing with a gear on the adjacent head of the beam 13. Shaft 38 carries a brake drum 64*a*, which is partially encircled by a band 65 attached at one end to a pin 66 on the loom side 10. The other end of the band is attached to a headed pin 67 extending through a clip 68 mounted on one arm 69 of a bell-crank 70 pivoted on the loom side 10. A spring 71 encircling pin 67 bears at one end against the head of the pin and at the other against the clip 68. Arm 69 of the bell-crank is attached to the plunger 72 of a dashpot 73 mounted on the loom side, the dashpot permitting bell-crank 70 to be rapidly rocked counter-clockwise to tighten the band 65 on the brake drum 64*a*, but retarding clockwise movement of the bell-crank to release the brake.

The let-off includes the whip roll 14 having its shaft mounted in arms 15 attached to pins 16 supported in arms 17 fast on a shaft 18 mounted in brackets 19 attached to the loom side. An arm 20 fast on shaft 18 is provided with a ratchet bar 21 and the arm is connected by a pin 22 to a rod 23 attached to a piston within a cylinder 24 mounted on the loom side and supplied with air under pressure through line 25. Arm 20 also carries a pin 26 entering a slot in a link 60 connected to the vertical arm 74 of bell-crank 70. An arm 28, which is fast on one of the pins 16, has a roller 29 bearing against a cam 30 on the crank shaft 31 of the loom and arm 28 carries an arm 34 having bolts 33, which support a plurality of pawls 32 pivoted on bracket 19. The bolts are supported on the arm by springs 35.

The let-off shown in Fig. 5 operates in the same manner as the let-off shown in Fig. 4, in that the air pressure on the piston within cylinder 24 tends to swing arm 20 clockwise and thereby rock bell-crank 70 counter-clockwise. In this movement of the bell-crank, its horizontal arm 69 acts through spring 71 on the brake band 65 to tighten the band on the drum 64*a*. When the tension on the warp yarns increases at any time other than at the time of the beat-up, arm 20 is moved counter-clockwise and pin 26 moves along the slot in link 60, so that no force is applied to the brake. However, the dashpot restricts the clockwise movement of bell-crank 70 and thus causes the brake to be released slowly. In the event of the trapping of the shuttle, the whip roll support can be moved rapidly in a counter-clockwise direction by reason of the slot and pin connection between arm 20 and link 60, so that damage to the warp yarns is prevented. At the time of the beat-up, the pawls 32 are in engagement with the ratchet bar 21 on arm 20 and the whip roll is held against movement by the yarns.

I claim:

1. A let-off for use in a loom having a lay beating up inserted picks of filling for controlling the rate, at which the warp yarns are drawn from a beam, which comprises a beam having the warp yarns wound thereon, a support holding the beam for rotation, a whip roll engaging the sheet of warp yarns being drawn from the beam, a pair of arms carrying the roll, a movable support for the arms, yielding means urging the movable support in one direction, means operating in timed relation to the lay for oscillating the whip roll arms, means operating in timed relation to the lay for holding the movable support against movement by the yarns at the time of the beat-up, a brake resisting rotation of the beam, means responsive to movements of the movable support for varying the action of the brake, and means for controlling the rate of release of the brake.

2. A let-off for use in a loom having a lay beating up inserted picks of filling for controlling the rate, at which the warp yarns are drawn from a beam, which comprises a beam having the warp yarns wound thereon, a support holding the beam for rotation, a whip roll engaging the sheet of warp yarns being drawn from the beam, a pair of arms carrying the roll, a movable support for the arms, yielding means urging the movable support in one direction, means operating in timed relation to the lay for oscillating the whip roll arms, means operating in timed relation to the lay for holding the movable support against movement by the yarns at the time of the beat-up, a brake resisting rotation of the beam, means responsive to movements of the movable support for varying the action of the brake, and a dashpot controlling the rate of release of the brake.

3. A let-off for use in a loom having a lay beating up inserted picks of filling for controlling the rate, at which the warp yarns are drawn from a beam, which comprises a beam having the warp yarns wound thereon, a support holding the beam for rotation, a whip roll

engaging the sheet of warp yarns being drawn from the beam, a pair of arms carrying the roll, a movable support for the arms, yielding means urging the movable support in one direction, means operating in timed relation to the lay for oscillating the whip roll arms, means operating in timed relation to the lay for holding the movable support against movement by the yarns at the time of the beat-up, a shaft geared to the beam, an electromagnetic brake operable through the shaft to resist the rotation of the beam, and means responsive to movements of the support for the arms for varying the action of the brake.




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