Oct. 30, 1928. 1,689,506

K. TOYODA

LET-OFF MOTION IN WEAVING LOOMS

Filed Nov. 24, 1926 2 Sheets-Sheet 1

Fig. 1.

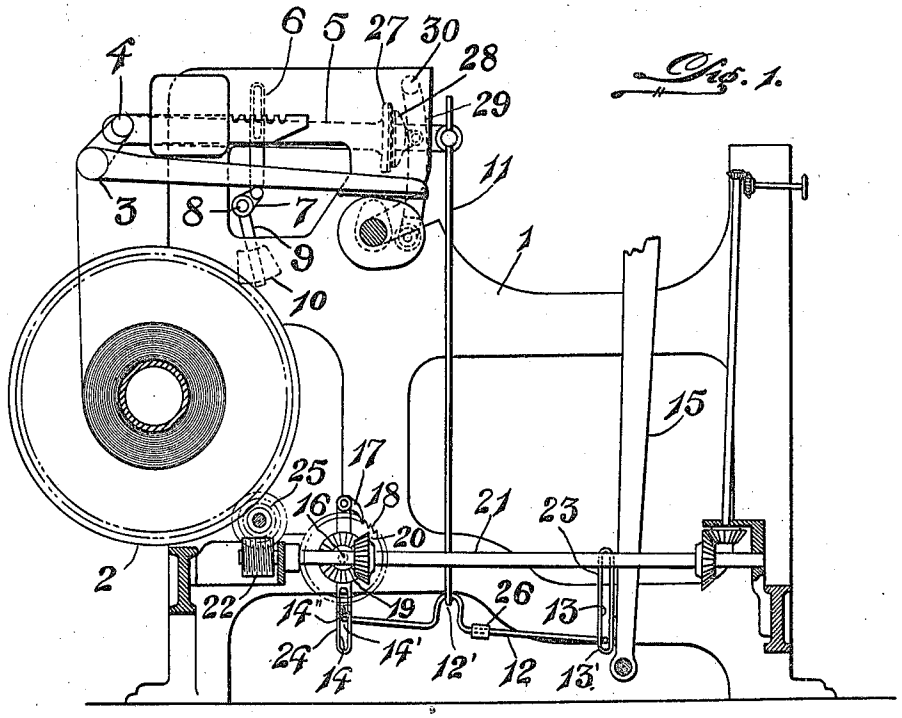
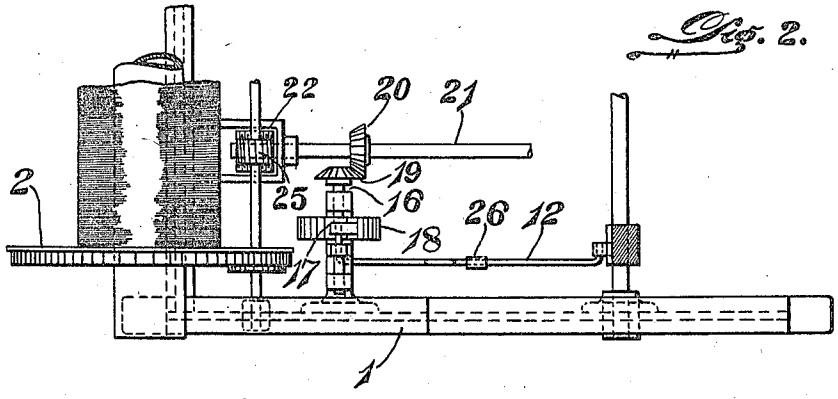


Fig. 2.



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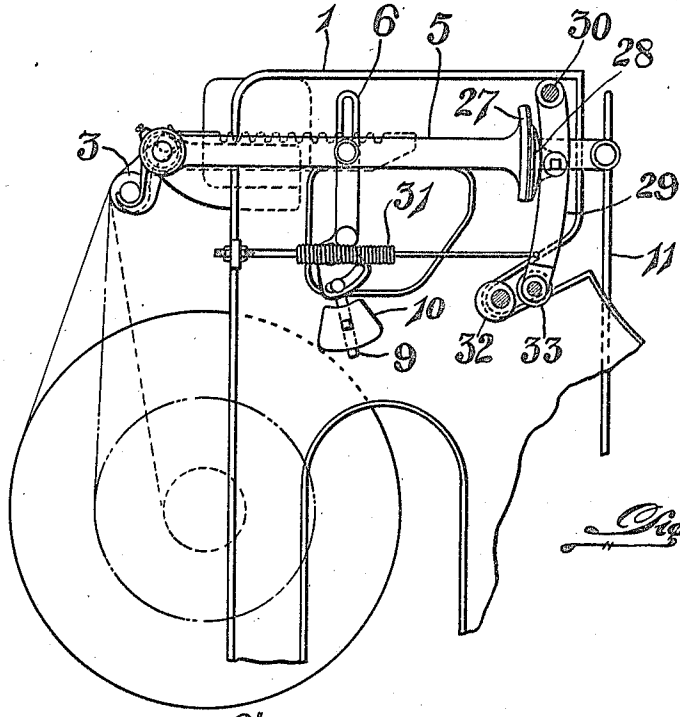


Fig. 3.

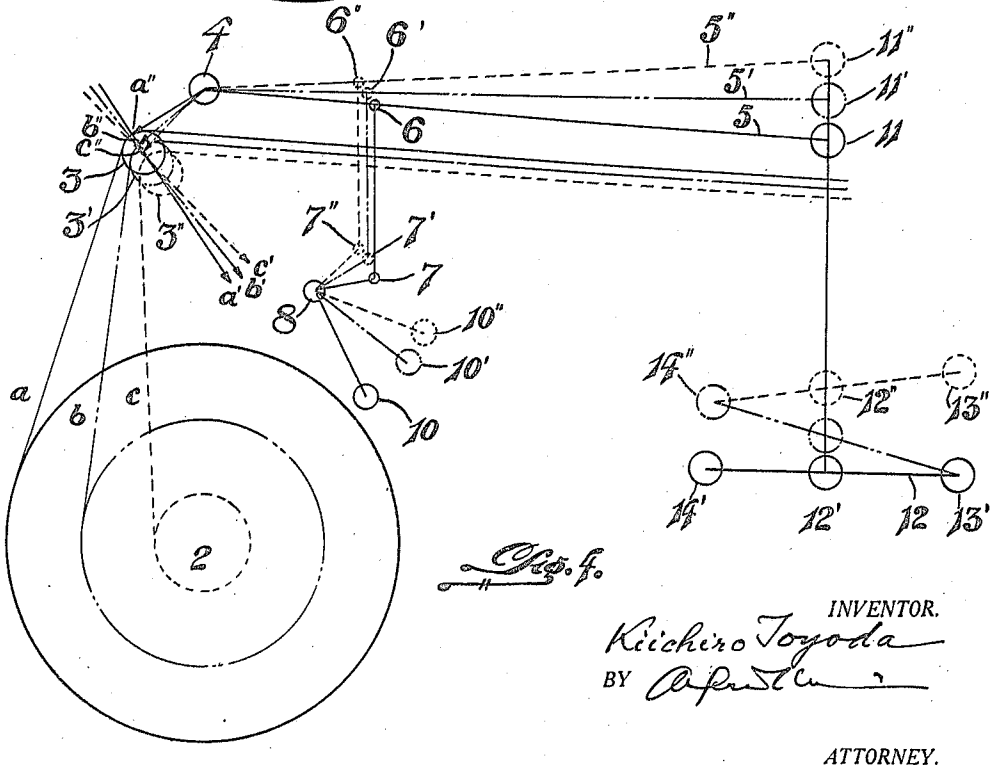


Fig. 4.

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UNITED STATES PATENT OFFICE.

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LET-OFF MOTION IN WEAVING LOOMS.

Application filed November 24, 1926. Serial No. 150,437.

This invention relates to a let-off motion in a weaving loom of the type in which a weight is employed to maintain a fixed tension upon the warp threads after they leave a beam.

The object of the invention is to provide a let-off device capable of maintaining a uniform tension upon the warp threads irrespective of the change of the diamenter of the warp beam in a simple and reliable manner.

With the above mentioned object in view, according to this invention a lever carrying the weight is pivoted to the frame in an inclined position and is operatively connected to an arm influenced by the back rest, so that the momentum of the weight is automatically varied by varying the angular position of said lever according to the change of the position of the back rest.

Another feature of the invention resides in the warp delivering mechanism which is automatically regulated as the diameter of the warp beam diminishes. This mechanism consists of an operating rod connected to the slay sword, an operating lever connected to a letting-off mechanism connected to the beam, a connecting rod vertically slidably connected to said operating rod and operating lever, and a vertical rod which at its lower end is connected to said connecting rod to a point slightly displaced from the middle point of the connecting rod, and at its upper end is connected to the arm oscillating with the back rest.

In the accompanying drawings in which one embodiment of the invention is shown by way of example, Fig. 1 is a side view of the device according to this invention,

Fig. 2 is a plan thereof,

Fig. 3 is an enlarged view of the left upper part of Figure 1, and

Fig. 4 is a diagrammatic view illustrating the operation of the invention.

Referring to the drawings, 1 is the loom frame, and the warp beam is designated by the reference numeral 2. 3 is the back rest adapted to vibrate about the stud 4 secured thereto. Fixed to the stud 4 is an arm 5, to which at an intermediate point is connected a vertical link 6 which in turn is connected at its lower end to a lever 7 by means of a fulcrum pin. Said lever 7 is fulcrumed to a pin 8, and an arm 9 carrying a weight 10 is fixed relative to the lever 7 and is arranged in an inclined position. A vertical rod 11 is suspended from the inner end of the arm 5 and is connected to a connecting rod 12 at the point 12′ which is slightly displaced backwardly from the middle point of the rod 12, and said rod 12 is normally held in a horizontal position, as shown in the drawing. At both ends, the rod 12 is bent and is slidably connected with the slots 13 and 14, which slots are formed in the operating rod 23 and the operating lever 24, respectively. The operating rod 23 is fixed to the lower end of the slay sword 15, and the operating lever 24 is loosely mounted on the shaft 16. A pawl 17 is mounted to the upper arm of the lever 24 and is adapted to engage with and rotate the ratchet wheel 18 which is fixed on the shaft 16. The shaft 16 carries at the other end a bevel gear 19 meshing with the bevel gear 20 on the longitudinal shaft 21. This shaft 21 carries at its end a worm 22 meshing with a worm wheel 25. The shaft of said worm wheel 25 carries another gear which meshes with a large gear formed on the flange of the beam 2. Upon each forward and backward swing of the slay sword 15, its motion is transmitted to the beam 2 through the rod 12, the operating lever 24, the pawl 17, the ratchet 18, &c. Thus, it will be seen that the beam 2 is moved and the warps are delivered thereby, the delivering amount of the warps varying according to the position of the connecting rod 12 in the slots 14 and 13.

Figure 4 illustrates in a diagrammatic view varying positions of the weight 10 and the connecting rod 12 according to the displacement of the position of the back rest 3, which displacement takes place as the diameter of the warp beam diminishes. The position *a* is the full warp position and is shown in a full line. The position *b* shown by a dot-and-dash line corresponds to the intermediate reduced diameter of the warp beam. The third position *c* shown by a dotted line is the position when the beam is nearly empty. It is obvious that the back rest 3 will be moved to the positions 3′ and 3″ as the diameter of the warp beam diminishes, and consequently that the weight 10 will assume the positions 10, 10′ and 10″ corresponding to the positions *a*, *b* and *c* of the warp beam, respectively.

Now, it will be observed that the direction of the resultant force of the warp tension

acting on the back rest 3 will change as shown by arrows a', b', c' according to the displacement of the back rest 3. So the momentum about the stud 4 will change from 4—a'' to 4—b'' and 4—c'', thus the force pressing the back rest 3 will increase as the diameter of the warp beam diminishes. Therefore the warp tension would be decreased if the weight 10 is constant. However, as the weight 10 is displaced to the positions 10′ and 10″ according to the positions b and c, the momentum of the weight 10 about the stud 4 will gradually increase, whereby the gradual decrease of the warp tension is prevented.

As the diameter of the warp beam 2 diminishes, the arm 5 connected by means of the vertical rod 11 with the connecting rod 12 will be gradually lifted. The connecting rod 12 carries a weight 26 at a point displaced forwardly from the connecting point 12′. Therefore, according to the gradual rising of said arm 5, the rear end of the rod 12 will first slide upwardly toward the stop 14′, thus gradually increasing the rate of delivery of the warp on the beam. When the rear end of the connecting rod 12 reaches the stop 14′, then the rod 12 will now be gradually turned around the stop 14′ with the front end sliding upwardly along the slot 13, thus further adjusting the delivering rate of the warp. The stop 14′ is adjustably mounted in the slot 14, and is suitably set according to the nature of the fabric to be woven.

In order to prevent the vibration of the back rest 3 and the weight 10 by giving a greater tension upon the warp when the slay is beating, a brake 27 is mounted on the arm 5, which brake cooperates with a brake shoe 28 mounted on the rocker arm 29 which is pivoted at 30. A spring 31 is employed to normally pull the lower end of the rocker arm 29 so as to hold the brakes 27 and 28 in engagement. Secured on the crank shaft is a cam 32 engaging with a roller 33 carried by the lower end of the rocker arm 29. Thus, it will be seen that upon the rotation of the crank shaft, the cam 32 will force the rocker arm 29 forwardly against the action of the spring 31, disengaging the brakes 27 and 28, so that the back rest 3 will be allowed to vibrate freely. On the other hand, when the slay is in a beating stroke the high portion of the cam 32 is disengaged from the roller 33 so that the brakes will be applied to the arm 5 by the action of the spring 31, thereby preventing the vibration of the back rest and giving a greater tension upon the warps.

What I claim is:—

1. In a loom, a let-off device having a positive drive, a back rest, an arm securely connected to said back rest, means for moving said arm, a weighted lever pivoted in an inclined position to the frame and adapted to be oscillated according to the movement of the said arm, means for varying the angular position of the said lever according to the change of the position of said back rest to vary the effective position of the weight, and means for increasing the speed of the drive as the diameter of the beam decreases, whereby a uniform tension upon the warps is maintained.

2. A let-off device as specified in claim 1, comprising an operating rod connected to the slay sword, an operating lever connected to a letting-off mechanism for delivering the warp on the beam, a connecting rod vertically slidably connected to said operating rod and operating lever, and a vertical rod which at its lower end is connected to said connecting rod at a point slightly displaced from the middle point of the connecting rod and at its upper end is connected to the arm oscillating with the back rest.

3. In a let-off device as specified in claim 1, an arm securely connected to the back rest, a brake mounted on said arm, a brake shoe mounted on a rocker arm, a means for holding the said brake and brake shoe in braking engagement during the beating operation of the slay, and a means for disengaging said brake and brake shoe to allow the back rest to be vibrated during the warp delivering operation.

In testimony whereof I affix my signature.

KIICHIRO TOYODA.