REED CUSHIONING DEVICE
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Fig. 5 is a sectional view on substantially the line 5—5 of Fig. 3;
Fig. 6 is a perspective view of my cushioning unit as assembled in the lay alone as detached from the lay;
Fig. 7 is a sectional view similar to Fig. 5 but showing a somewhat modified arrangement of the mechanism;
Fig. 8 is a perspective view of the unit cushioning device of the modified structure shown in Fig. 7;
Fig. 9 is a fragmental sectional view of a different modification of lever arrangement;
Fig. 10 is a similar view to Fig. 9 of a still different modification.

In weaving fine goods, and particularly rayon and kindred synthetic fibres, it is essential that the reed action, in applying pressure and in relaxing that pressure, be smooth in its action and free from irregularity due to uncontrolled friction or obstruction due to uneven wear of co-acting surfaces, or misapplication of the forces invoked in actuating and controlling the reed. It is desirable that the reed encounter the "pick" and move it toward its ultimate position with a steady and relatively gentle elastic pressure and then accomplish the ultimate placement and incorporation of the pick with the fabric by means of more intense but equally firm, steady and elastic pressure. The spread between the desirable initial pressure and the essential ultimate pressure is too great to be compassed by only a single direct acting spring, within the restricted extent of contraction or extension which said spring would sustain due to action incidental to the restricted range of movement of the reed in beating up the pick—hardly more than \( \frac{4}{16} \)". The spring pressure must be applied to the reed by means that will multiply or accelerate the normal increase of intensity of its effect upon the reed during the period of the beat up, either by use of the compound spring disclosed in the Gobelle application supra, or by the device of variable leverage hereinafter described.

The means for "stepping up" the pressure may be by transferring the pressure from one spring to another, or I employ a lever with variable fulcrum, such that the spring action is quickly multiplied, as the lay advances, the peak pressure occurring when the new pick is forced against the already fabricated product—at the "fell" of the cloth; and the following is a more detailed description of the present embodiment of this invention, illustrating the preferred means by which these advantageous results may be accomplished.

With reference to the drawings, 10 designates a breast beam over which the finished fabric...
is drawn. 12 designates generally the lay mounted to be swung by a crank 13 and crank arm 14 to move the lay with the reed 15 and its holders 16 and 17 mounted thereon to bear upon the previous pick placed in the shed 18 formed by the harnesses 19 and 20 which raise and lower the warps 21 and 22 drawn from the warp beam 23 across the guide 24 and through the lease 25; the foregoing being all usual loom structure and known in the art.

The lay 22 is mounted in the lay sword 26 which has a bracket 27 on which the lay rests, which bracket is extended upward behind and against the lay at 28. At the upper end of the sword is mounted an L-shaped pivot block adjustable by the slot 30 in the lay sword through which it is bolted to the lay sword. The block provided with a cone projection 31 which, with the opening 33 in the arm 32 constitutes one of the bearings by which the rod is pivotally or pendulously mounted on the lay.

The reed 35 is mounted in the upper and lower reed mounting bars 34 and 35 which are grooved to receive the reed. The bracket arm 32 is provided with a L-shaped foot portion 36 set into the lower surface of the bar 35 with a portion 37 extending along the back thereof, while the upsetting portion 38 extends along the end of this supporting bar 36. The bracket is secured in place on the lower mounting bars by screws 39 extending through the holes 40. The upper bar or reed cap 34 is adjustably held on this bracket arm by means of a thumb screw 41 and bolt 42 extending through the slot 43 in the upper portion of this bracket arm for adjustably holding the reed in mounted position. The lower reed mounting bar 35 is received in the cut-out portion 45 of the lay 22 and may swing upon the cone pivot 31 in the opening 33 rearwardly over the surface 46 of this cut-out portion; and it is this movement of the reed relative to the lay which occurs at each beat of the pick which I desire to control by the cushioning action which will hereinafter be described.

In order to accomplish this controlled cushioning action or resistance to the relative movement of the reed and the lay, I have mounted a plurality of units, usually 4, such as are shown in perspective, in Fig. 6, along the bottom surface of the lay in suitably spaced relation, which units take the place of the other types of springs which are used to engage the reed in the usual loom construction.

Each of these units consists of a body portion designated generally 50 having an attaching face 51 with ears 52 through the openings 53 of which suitable fastening means are positioned, such as in Fig. 6. In the present embodiment, the ear 52 is attached to the body portion by a bolt 54 engaging the front edge 55 of the ear and the back 56 of the body portion. The body portion is secured downwardly as at 56 and is provided with an opening 57 in alignment with an opening 58 in a downwardly extending lug 59 from the attaching portion of the body.

A sleeve 60 slidably fits the opening 58 and is provided with a flange 61 to prevent movement through the opening in one direction. A rod 62 is slidably received in the sleeve 60 and engages loosely through the opening 57. A helical spring 63 encircles the rod 62 and abuts against the inner surface of the downwardly-extending portion 55 as at 64 and also abuts against the flange 61 of the sleeve 60, tending to force this sleeve through the opening 58 in one direction. The rod 62 is threaded as at 65 and a nut 66 and check nut 67 serve to provide an adjustable abutment for engaging the sleeve 60 so that the sleeve in effect moves with the rod 62 against the action of the spring 63.

The rod 62 terminates in a fork or yoke 70 which receives a lever 71 provided with a pivot pin 72 extending through the yoke and lever. One end of the lever is provided with anti-friction means such as roll 74 rotatable on a pin 75 fixed in a bifurcated end 76 to engage the hardened contact or abutment plate 77 which is fixed by means of screws 78 on the reed holder bar 35. The other end portion 79 of the lever contacts the extended bearing surface 80 of the downwardly extending portion 55 between projections 81, 82 for guiding the movement thereof.

The contacting surface 83 of the end portion 79 of the lever is shaped after the fashion of a cam so that when the lever is in a position, such as shown in full lines in Fig. 5, with the rod seated against the surface 84 of the cut-out, the contact will be at the upper end of the surface 85, or as at 86, whereas when this lever is moved to the dotted line position, as shown in Fig. 5, the contact will be at the lower portion of the surface 83 or as at 86. Thus, the lever changes its fulcrum point as it is moved about its pivot. The change of leverage is such that the spring will be applied through a greater leverage to the reed as the rod moves from its seated position, as shown in Fig. 5. Thus the resistance to the movement of the reed relative to the lay, in reacting to its encounter with the felt of the cloth, will have an accelerated increase of intensity as compared with the increase in intensity of the projection of the spring to movement of the lever; and pressure is applied to the pick with moderation, gradually, but with acceleration which culminates in an abrupt intensification such as a single spring, acting directly on the reed could not achieve, or a single spring acting on a plain lever.

The lever 71 is formed with a tooth or dowel 121 which extends into a conformed opening 122 in the downwardly portion 58 of the body 50. This dowelling or interlocking maintains a proper relative position of the lever 71, the rod 57 and the bearings in which said rod works to avoid friction and prevent undue resistance to action of the rod.

In the modified construction which I have illustrated in Figs. 7 and 8, the body portion of the cushioning device is designated 98 and is provided with ears 91 having openings 92 for securing this body portion to the bottom of the lay 12 with a lip 93 engaging the front 55 of the lay 12. This body has forwardly extending arms 94 with a cross piece 95 having an opening 96 therein for the reception of the sleeve 97 which is provided with a flange 98 to prevent the sleeve from slipping in one direction in the opening 96.

A downwardly depending portion 99 receives a threaded sleeve 100 having a head portion 101 and a check nut 102 for securing this threaded sleeve in the threaded opening 103 in the downwardly depending portion 99. A rod 104 extends through this sleeve 100 and through the sleeve 97 while a coiled spring 105 encircles the rod and acts between the end of the sleeve 100 and the head 99 of the sleeve 97, tending to move the sleeve through the opening 96.

A spring 106 located within the sleeve 97 also encircles the rod 104 and engages the inner surface of the head 99, and a washer 107 which is adjustably held in position by a nut 108 and
check nut 109 on the threaded end 110 of the rod 104. This rod 104 extends loosely through an opening 111 in a lever 112 and a washer 113 is held in position by a nut 114 for engagement with the lever. This lever is pivoted to an abutment arm 115 by means of a pivot pin 116, while at its opposite end there is rotatably supported an antifriction roll 117 to engage the hardened bearing plate 118 secured in position on the reed holding bar 35 by screws 119. Thus, as the rod or its holding bar 35 swings outwardly about its pivot, it moves the lever 112 about its pivot 116 and the rod 104, there being resistance offered to this movement by reason first of a spring 105 which is of lightweight until this rod has moved so as to cause the washer 107 to engage the end 120 of the sleeve 91, whereupon further movement of the rod guides the sleeve through its opening 98 and compresses the stronger spring 105 until it has reached its limit of pressure required to interlock the pick with the warp and incorporate it with the fabric.

By this last or modified arrangement I provide first a weak spring and then a stronger spring for resisting the movement of the lay, thus the action, instead of being purely progressive in an increment stage as previously described, is regulated first by a weak spring, the resistance gradually increasing, and then by a stronger spring whose resistance gradually increases as it is compressed, the leverage affording a very nice control and easy manipulation of this arrangement and an arrangement whereby a shorter movement of the springs is necessary than where the springs act directly upon a movement co-extensive with the movement of the reed, as in the application above referred to at the beginning hereof; and thus, by this shorter movement of the lever which occurs in both this form and in the previous forms, I acquire a better control and an even tensile strength of the spring than has heretofore been acquired.

Inasmuch as some looms are not so precisely built as are some of the more modern types, I provide means for compensating for such variations of structure and of relation as may occur.

Figs. 9 and 10 disclose derivations from my preferred construction of Figs. 5 and 6. Both illustrate the fact that the longer the pendant 123 of the lower lever arm, the wider the pressure range between that derived through the upper fulcrum and that derived through the lower fulcrum. Fig. 9 shows my device arranged with an adjustable lower portion 125 which swings on the pin 124 within the pendant portion 121 of the body of the device. The lever 126 is connected with the spring controlled rod 127 as above described. The upper arm of the lever carries an antifriction roll 128 which is held against the bearing plate 129 on the reed holder 130. The lever 125 is held in relation to the abutment 123 by the tooth 131 as already described. The lower arm 132 of the lever has a face 133 of cam formation such that the pressure of the roll 128 on the plate 125 increases rapidly as the rod achieves the extreme of its movement. At its bottom the pendant portion 125 has a transverse portion transverse bridge 140. Through this bridge extends a tapped hole 141 which carries a set screw 140. A check nut 142 serves to lock the set screw in position once it has been adjusted. The extremity 143 of the set screw serves as a stop to determine the position of the pendant abutment member 123.

The bolt 151 passes freely through a "size" hole 152 and takes into a tapped hole 153 in the pendant abutment member 123, serving to draw back said member 123 upon the set screw 140 and hold it there.

The modification shown in Fig. 10 has the adjustment on the lever rather than on the abutment. In consequence, this adaptation does not produce a regularly graduated increase of pressure but rather an abrupt change as in the structure of Figs. 7 and 8 where the reaction is transferred from a relatively light spring to a relatively heavy spring.

The downward extending portion 135 of the body of the device is fixed, and it carries a hardened abutment 136. The lever 137 at the extremity of its downward projecting arm carries a set screw 138 and preferably a check nut 139. The lever 137 is interlocked with or dowelled to the downward extending portion 140 of the body by the tooth formation 141 as previously described. The lever 137 has the usual antifriction roll 142 at the extremity of its upper arm, said roll being brought upon the bearing plate 143 by the spring pressure 144 as has already been described. The bearing plate is on the reed holder 145 as in the previously described structures.

The foregoing description is directed solely towards the construction illustrated, but I desire it to be understood that I reserve the privilege of resorting to all the mechanical changes to which the device is susceptible, the invention being defined and limited only by the terms of the appended claims.

I claim:

1. In a loom, a lay, a reed movably mounted on said lay, a spring for resisting relative movement of said lay and reed, and a lever through which said spring acts, said lever having a shifting fulcrum with reference to the relatively movable parts.

2. In a loom, a lay, a reed movably mounted on said lay, a spring for resisting relative movement of said lay and reed, and a lever through which said spring acts, said lever rocking on one of said relatively movable parts to change its leverage with reference to said spring.

3. In a loom, a lay, a reed movably mounted on said lay, a spring for resisting relative movement of said lay and reed, a lever through which said spring acts, said lever rocking on one of said relatively movable parts to change its leverage with relation to said spring, and said leverage change progressively increasing the resistance to said movement.

4. In a loom, a lay, a reed movably mounted on said lay, a lever contacting said reed and said lay and movable upon relative movement of said lay and reed, and resilient means resisting movement of said lever, said lever having means providing a roving point of contact to change its effective leverage with relation to said resilient means.

5. In a loom, a lay, a reed movably mounted on said lay, a lever contacting said reed and said lay and movable upon relative movement of said lay and reed, and resilient means resisting movement of said lever, said lever having a cam surface providing a roving point of contact to change its effective leverage with relation to said resilient means.

6. In a loom, a lay, a reed movably mounted on said lay, a lever contacting said reed and said lay and movable upon relative movement of said lay and reed, and resilient means resisting movement of said lever, said lever having a cam surface providing a roving point of contact to change its effective leverage with relation to said resilient means.
lay and reed, a spring resisting movement of said lever, said lever having a cam surface contacting said lay and rocking thereon to change its effective leverage with relation to said spring.

7. In a loom, a lay, a reed movably mounted on said lay, a lever contacting said reed and said lay and movable upon relative movement of said lay and reed, a spring resisting movement of said lever, said lever having a cam surface contacting said lay and rocking thereon to change its effective leverage with relation to said spring, the opposite end of said lever having anti-friction means contacting said reed.

8. In a loom, a lay, a reed movably mounted on said lay, a lever contacting said reed and at a point spaced therefrom contacting said lay, a rod pivotally connected to said lever intermediate said points of contact, and a spring encircling said rod and resisting movement thereof in one direction and urging the rod in the other direction, said lever having a rockable engagement with said lay to vary the effective leverage relative to said rod.

9. In a loom, a lay, a reed movably mounted on said lay, a lever contacting said reed and at a point spaced therefrom contacting said lay, a rod pivotally connected to said lever intermediate said points of contact, and a spring encircling said rod and resisting movement thereof in one direction and urging the rod in the other direction, said lever having a cam surface with rockable engagement with said lay to vary the effective leverage relative to said rod.

10. In a loom, the combination with a lay, a reed holder and lay, of a spring to press the reed holder toward the lay, a lever through which the spring acts upon the reed holder, a varying fulcrum about which the lever is swung by the spring for a varying leverage relation, and means to mount the aforesaid elements operatively in the loom for the purpose described.

11. In a loom, the combination with a reed, reed holder and lay, of a spring to press the reed holder toward the lay, a lever through which the spring acts upon the reed holder, a varying fulcrum about which the lever is swung by the spring arranged to increase the extent of lever to multiply the effect of the spring in the reed holder as moved away from the lay, and means to mount the aforesaid elements operatively in the loom for the purpose described.

12. In combination, a loom having a lay, a reed, a reed holder and means to pendulously mount the reed holder on the lay, means to limit movement of the reed holder in one direction, a lever abutting the lay adjacent one extremity and abutting the reed holder at another extremity, anti-friction devices interposed between the last named extremity and the reed holder, and a spring device acting upon the said lever between the two named extremities with elastic re-action to movement of the reed holder and with accelerated intensity from a moderate initial pressure to a relatively heavy pressure at the moment the reed is consummating the beat up of the pick.

13. In a loom, the combination with a lay, a reed, a reed holder, means for pendulously mounting the reed holder, of a lever bearing on the reed holder at one portion, an abutment on the lay to which another portion of said lever is pivotally secured, a compound spring mounted in the body of the abutment member, which spring acts with stepped up intensity, and means to connect the spring with the lever to cause the spring to act on the lever.

14. In a loom, the combination with a lay, a reed, a reed holder, means for pendulously mounting the reed holder of a lever bearing on the reed holder at one portion, an abutment on the lay to which another portion of said lever is pivotally secured, a compound spring mounted in the body of the abutment member, which spring acts with stepped up intensity, means to connect the spring with the lever to cause the spring to act on the lever, and anti-friction devices through which the lever bears on said reed holder.

15. In a loom, the combination with a lay, a reed, a reed holder, means for pendulously mounting the reed holder of a lever bearing on the reed holder at one portion, an abutment on the lay to which another portion of said lever is pivotally secured, a compound spring mounted in the body of the abutment member, comprising two rods arranged to act successively on said lever to step up the intensity of resistance to movement of the reed.

16. In a loom, a lay, a reed movably mounted on said lay, a lever bearing against the reed by one contact point and bearing on the lay by another point in the lever's length, the lever being movable with movement of reed and lay relative to each other, and a spring acting on said lever to resist such relative movement of reed and lay, the lever bearing at one of said points of contact with rocker action to shift the spacing of the points of contact and change the effective leverage with which the said spring acts.

17. In a loom, a lay, a reed movably mounted on said lay, a lever bearing on said reed and lay by two points of contact, variably spaced with movement of the lever under change in relation of the said reed and lay, and having a cam formation at one or said points of contact to effect such change in spacing, and resilient means resisting the movement of the lever with change of leverage due to the change in spacing between the two points of contact aforesaid.

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