F. NITSCHELM.

POWER LOOM.

APPLICATION FILED AUG. 19, 1909.

996,423.

Patented June 27, 1911.

2 SHEETS—SHEET 1.

FIG. 1.

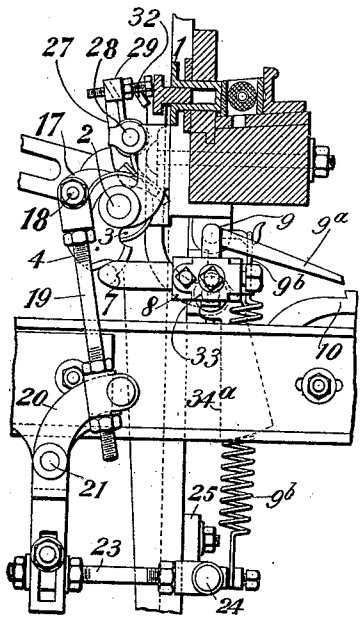


FIG. 2.

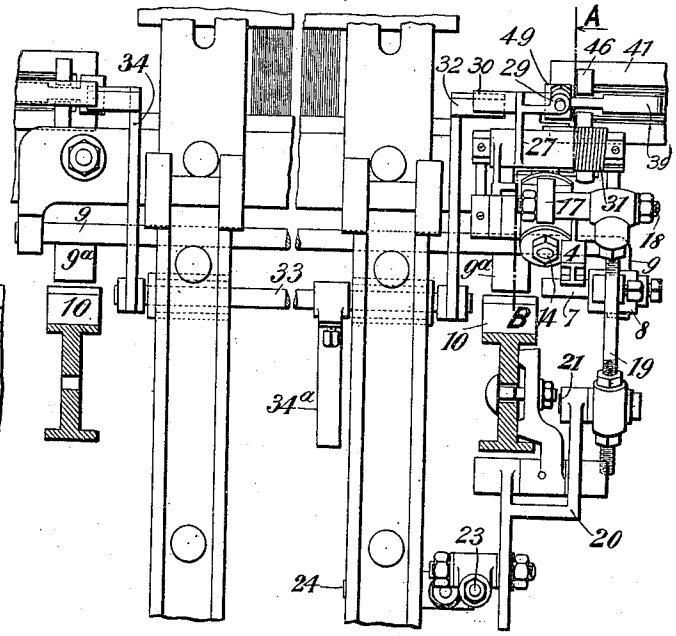


FIG. 3.

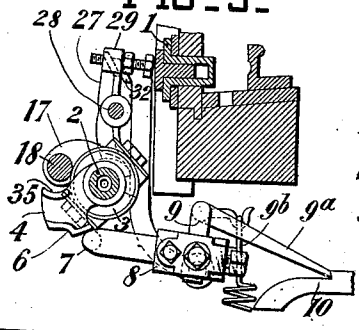


FIG. 4.

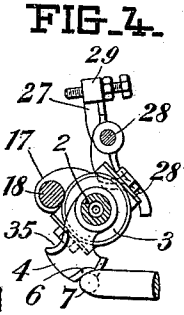


FIG. 5.

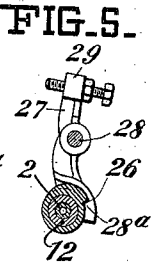


FIG. 6.

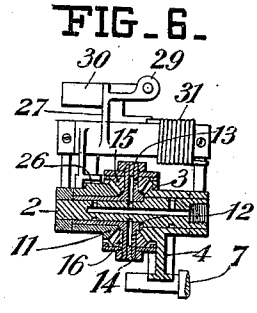


FIG. 7.

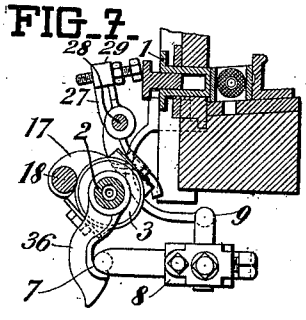


FIG. 8.

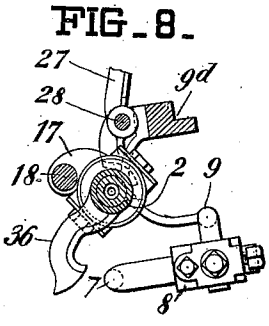


FIG. 11.

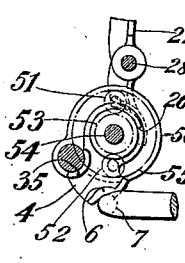
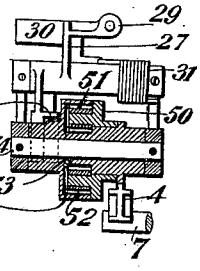


FIG. 12.



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POWER LOOM.

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2 SHEETS—SHEET 2.

FIG. 9.

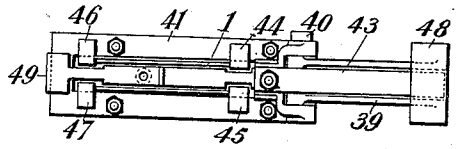


FIG. 10.

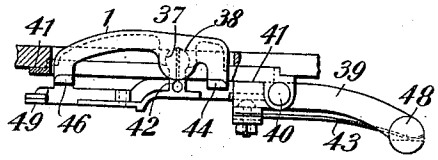
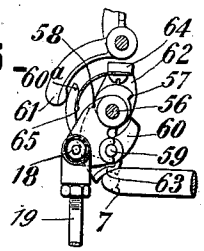


FIG. 13.



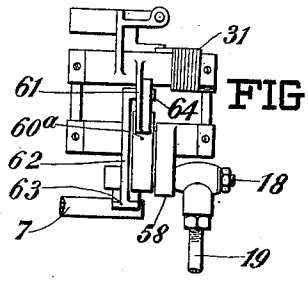


FIG. 14.

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FRITZ NITSCHELM, OF AUDINCOURT, FRANCE.

POWER-LOOM.

996,423. Specification of Letters Patent. Patented June 27, 1911.

Application filed August 19, 1909. Serial No. 513,683.

To all whom it may concern:

Be it known that I, FRITZ NITSCHELM, a subject of the Emperor of Germany, and resident of Audincourt, Doubs, France, have invented new and useful Improvements in Power-Looms, of which the following is a full, clear, and exact specification.

In power looms it may happen that for some reason or another the shuttle remains engaged in the warp, that is to say, does not come into the shuttle boxes, and on account of this engagement of the shuttle the threads of warp are liable to be broken on the beating up of the lay. In order to prevent in this case the breaking of the threads of warp, most power looms are provided with a protecting arrangement which consists in the case of looms having a fixed reed, of a transversal stop motion bar journaled to the lay, controlled by one or more springs and actuated directly by the shuttle on its entering into the shuttle boxes, the shuttle then pushing back by means of the usual brake tongue a lever fixed on this stop motion bar, so as to bring the stopping pieces thereof normally out of position to coöperate with stationary stops, the stop motion bar only coöperating with these stops for the purpose of stopping the lay and the whole loom when for some reason or other the shuttle fails to enter the shuttle boxes but remains engaged in the warp.

In looms having a movable reed the protecting arrangement consists in the same way of a protective stop motion bar journaled to the lay and acting in the same way as before, but this protective stop motion bar controls a locking member on the movable reed, so as to retain this normally against the beam of the lay but to unlock it when the shuttle does not reach the shuttle boxes but remains engaged in the warp, so as to prevent the breaking of the threads of warp by the shuttle, in engagement with them, at the advancing motion of the lay.

In looms having fixed reeds the above mentioned arrangement has the disadvantage that it takes up a great amount of power, and that it tends to give the protective stop motion bar a constant angular movement, thus wearing away the journaled parts of this bar. Moreover the wearing of the shuttle itself has a deteriorating influence on the protective stop motion bar as it may produce on it an angular change of position, to such an extent that the protective effect of the bar is destroyed, or rendered useless, on account of the wearing of the stop notches. In looms having movable reeds the protective effective of the arrangement mentioned above is uncertain especially in the case of openwork material or material having a raised weft.

The present invention has for its object a protective arrangement of this class also using a protective stop motion bar journaled on the lay to act so as to prevent breaking the threads of warp should the shuttle become engaged in the warp, that is to say, does not enter into the shuttle boxes, but which is so arranged that the shuttle no longer acts directly on the protective stop motion bar or on the reed so as to displace them, for the purpose of avoiding the inconveniences resulting of that direct action. In this protective arrangement the protective stop motion bar is controlled by a distinct supplementary gearing, part of which locks said bar normally in the inactive position, while another part of the gearing is under the constant action of positive driving means and is designed to transmit motion to the first part, this under the control of a brake tongue-feeling lever arranged to take up a throwing-into-action position in case of the absence of the shuttle from the shuttle boxes, so as to cause, with the aid of a constrained or positive movement, the unlocking and throwing-into-action of the protective stop motion bar.

In the accompanying drawings several modes of carrying out the inventive idea according to the present invention are shown by way of example.

Figure 1 shows a side view partly in section of the first preferred mode of carrying out the invention in its position on a loom having a fixed reed, the lay-sword being in its mid position; Fig. 2 is a corresponding view from behind; Fig. 3 is a side view partly in section of the mechanism in action, the shuttle failing to reach the shuttle boxes. Fig. 4 shows the normal position of the parts of the mechanism placed at one side of the loom when the shuttle is in the opposite shuttle box. Fig. 5 is a partial section on the line A—B of Fig. 2; Fig. 6 is a view in elevation of a part of the mechanism, with a differential gear of conical toothed wheels represented in section; Fig.

7 shows a mode of carrying out the invention as applied to a loom having a movable reed; Fig. 8 shows the latter embodiment in action, the shuttle failing to reach the shuttle boxes; Fig. 9 is a view in elevation of the brake tongue of one of the shuttle boxes; Fig. 10 is a partial plan, partly in section corresponding to Fig. 9; Fig. 11 is a side view partly in section of a method of carrying out the invention having a differential gear of plane spur wheels; Fig. 12 is a front view partly in section corresponding to Fig. 11; Fig. 13 shows a side view of a mechanism working by means of a pawl and ratchet; Fig. 14 is a front view corresponding to Fig. 13.

Figs. 1, 2, 3, 4, 5, 6, 9 and 10 which represent the preferred mode of carrying out the invention will be first referred to. Behind one of the shuttle boxes of the lay and underneath the brake tongue 1 of the box is mounted a conical toothed wheel 3 (Figs. 3, 4 and 6) which is movable about a fixed axle 2 carried by the lay and is provided with a locking arm 4 having a notch 6 at its lower end. During normal working of the loom whereby the shuttle passes from one shuttle box to the other, the locking arm 4 retains in the manner shown in Fig. 4 a bent finger 7 adjustable in a support 8 (Figs. 1, 2 and 3) which is mounted on a cranked end portion of the transversal stop motion bar 9, so as to keep the stopping parts 9^a forming the usual dagger devices on the lay of the bar 9 (of which there is one at each end of the stop motion bar) out of contact with the stationary notched stops 10 placed on both sides of the loom, as may be clearly seen in Fig. 2.

On the axle 2 and opposite to the toothed wheel 3 another conical toothed wheel 11, Fig. 6, is mounted, of the same diameter as the toothed wheel 3 and movable in the same way about said axle. A member 12 carrying two pivots 13, 14, diametrically opposite to one another, is arranged loose on the axle 2 and between the two conical pinions 3 and 11. The two pivots 13, 14 of the member 12 carry loose on them two planetary wheels 15, 16, meshing with the pinions 3 and 11 and thus forming with these latter a differential gear having conical pinions. A canal arranged along the core of the axle 2 and communicating with the bearing surfaces of the pinions of this differential gear allows them to be lubricated. The member 12 is moreover provided with an arm 17 which receives an alternating movement from the lay-sword by means of a pin 18 attached by a connecting rod 19 (Figs. 1 and 2) to one of the arms of an elbow lever 20 loosely mounted on an axle 21 carried by the frame of the loom. The other arm of this elbow lever is connected in its turn to the respective carrying sword of the lay by means of a rod 23 moving about a pivot 24 fixed to the said lay-sword by a support 25. As the finger 7 is held in engagement with the notch 6 of the arm 4 on the pinion 3 by means of springs 9^b controlling the protective stop motion bar 9 in a well known way, the pinion 3 will not be able to participate in the alternative to-and-fro movement of the member 12, as long as there will not be greater resistance than that caused by the pressure of the finger 7, which will act on the toothed wheel 11 of the differential gear. This alternating movement is simply transmitted by the planetary wheels 15, 16 upon the pinion 11, whose angular path is equal to that of the member 12 plus the path developed by the planetary pinions about the pinion 3.

The nave of the pinion 11 carries a projection or nose piece 26 (Fig. 5), and opposite to this nose piece there is the lower arm of a lever 27 mounted so as to be able to oscillate about a fixed axis 28 above and parallel to the axle 2. This lower arm of the lever 27 has a notch 28^a upon it, which is adapted to come into engagement with the nose piece 26. The upper arm of the lever 27 which constitutes the brake-tongue feeling lever terminates in two branches 29, 30. By means of the part 29 which is provided with an adjustable screw the lever 27 is under the control of the brake tongue 1 of the respective shuttle box, being always forced toward the tongue by means of a helical spring 31 surrounding the nave of the said lever (Fig. 6) and acting on the one hand on a projection of this nave, and on the other hand on one of two arms, connecting the axle 28 to the axle 2. The branch 30 of the lever 27 is controlled by an arm 32 (Figs. 1, 2 and 3) placed on the same side of the loom as the differential gear and fixed on the movable shaft 33 arranged underneath the lay beam and along the latter as far as the tongue of the shuttle box on the opposite side. At this end, the shaft 33 carries an arm 34 fixed upon it, similar to the arm 32, the free end of which bears against the tongue of the shuttle box placed at this side of the loom. A counterweight arm 34^a fixed on the shaft 33 balances the arms 32 and 34.

In the normal working of the loom the shuttle entering into one or the other shuttle box pushes back the corresponding tongue 1 and with it the lever 27 directly, if it is on the side of the differential gear, or by means of the arm 34, the shaft 33 and the arm 32 acting on the part 30 of the lever 27, when the shuttle is on the opposite side. The lower arm of the lever 27 is therefore removed from the path of the nose piece 26 so that the pinion 11 can follow the movement communicated to it by the planetary wheels 15, 16; but if for one reason or an-

other the shuttle does not reach the end of one of the shuttle boxes but remains in the threads of warp, the lever 27 no longer being controlled, remains with its notch 28ª in the path of the nose piece 26 which then in its movement comes into engagement with this notch. The pinion 11 to which the nose piece 26 is fixed is therefore stopped and the piece 12 with its planetary wheels 15, 16 moving alternately to and fro forces the pinion 3 to leave its position of rest and to turn so as to allow the stop motion bar 9 to describe, under the action of its springs, an angular movement to as to place the stopping parts 9ª of the stop motion bar in the working position with the fixed stops 10, so that the lay or batten is then stopped in its motion, in order to provide the necessary room for the shuttle, and to thus avoid the breaking of the warp threads in the engaged part of the warp. Simultaneously with this forced stopping of the lay the loom is brought to rest by well known knock off means (not shown), which are thrown into action by means of the stopping of the lay.

In order to bring back the different members to their original position, the irregularities in the working of the shuttle being eliminated, it is sufficient to push back the lay until the crank shaft which controls it arrives at its dead point. By this movement, the arm 17 is also brought back into its extreme rear position, the pin 18 now rests at the point 35 on the arm 4, and causes the latter to slip over the finger 7, thus forcing the protective stop motion bar 9 to an angular motion in an opposite direction, to bring it into its non-working position in which it is locked by the engagement of the finger 7 in the notch 6. The nose piece 26 being forced to follow this backward movement is also brought into its starting position.

The same controlling mechanism for the protective stop motion bar can in the same way be applied to looms having movable reeds (see Figs. 7 and 8), with this alteration, that the arm 4 of the pinion 3 of the differential gear is provided with a hooked part 36 which normally lies under the finger 7 of the protective stop bar 9 (Fig. 7) in order to hold the movable reed against the beam of the lay, by means of the locking member 9ª as is well known. Disengagement of the protective stop motion bar (Fig. 8) and the disengagement of the movable reed resulting therefrom, if the shuttle fails to reach the shuttle boxes, is brought in the same way into action, by the same controlling means as those previously described. The different members are brought into their starting position by hand. In order to avoid the action of the returning springs of the protective stop motion bar on the brake-tongues of the shuttle boxes, and in order moreover to assure an efficient braking of the shuttle, the brake-tongues 1 are here arranged in the following manner (Figs. 9 and 10).

The tongue 1 projects into the shuttle box by means of a part with a curved face which is used to facilitate the entry of the shuttle into the shuttle box and which becomes flat or plane toward the middle of the tongue. It is journaled by means of a cup-like member 37 on a rounded projection 38 of a lever 39 pivoted at 40 on a slotted plate 41 fixed to the shuttle box. A groove 42 allows for the lubrication of the articulation of the tongue 1. The lever 39 is under the action of a leaf spring 43 which causes it to push the tongue inside the shuttle box and causes it to press upon the entering shuttle in order to stop the motion of the latter, the normal position of the tongue being determined by means of ear pieces 44, 45, 46, 47 which bear against the plate 41. In order to compensate the momentum of the tongue and the parts connected thereto, which momentum is caused by the to and fro movement of the lay, the lever 39 is provided with a counter-weight 48 placed on the opposite side of the tongue (relatively to the pivot 40).

As the tongue 1 is articulated at a point about two-thirds of its length toward the outer end of the shuttle box, the shuttle on entering the latter only has to overcome a slight resistance and causes the tongue to oscillate slightly on its own pivot, the tongue remaining in this position bearing against the plate 41 by means of its ear pieces 44 and 45. According as the shuttle penetrates farther into the shuttle box, the point of articulation of the tongue 1 is forced to give way, pushing back the lever 39, whose end 49 bears on the lever 27 of the differential gear. The resistance to the shuttle is the greatest at the moment when the greatest thickness of the latter comes opposite to the point of articulation of the tongue, which then, by its flat part, is obliged to give way so that its ear pieces 44, 45, both leave also the plate 41 against which they rest. The tongue then acts with all the force of the leaf spring 43, which is then strained, and over the whole extent of its plane face upon the shuttle which thereby undergoes a strong braking and consequently its motion is stopped without shock. The displacement of the tongue and consequently of the lever 39 is of sufficient amplitude to compensate for a wear on the shuttle of from 4 to 5 mm. without allowing the nose piece 26 to engage in the notch 28ª of the lever 27 during normal working. This shuttle-braking mechanism is not claimed in the present application, but forms the subject-matter of a divisional application filed July 15, 1910, Serial No. 572,151.

Figs 11 and 12 relate to a further form of carrying out the invention. In this form,

the differential gear has plane spur wheels and comprises a plate 50 which is under the action of the lay-sword (as in the previous case), and also carries two planetary wheels 51 and 52. These planetary wheels mesh on the one hand with the pinion 53 loose about an axle 54 and provided with the locking arm 4 described above, and on the other hand with the internally toothed part of a wheel 55 carrying on its nave the nose piece 26 mentioned above. If this nose piece is stopped in its movement by the lever 27 (which occurs when the shuttle fails to reach the shuttle box), the planetary wheels cause the pinion 53 to turn on its axis 54 in order to disengage the finger 7 of the protective stop motion bar acting in the same way as the conical differential gear described with reference to Figs. 1 to 6.

In the method of carrying out the invention according to Figs. 13 and 14, the engaging and disengaging of the protective stop motion bar is not effected by a differential gear, but by a pawl and ratchet mechanism whose resultant effect is the same as that mentioned above. Upon the axle 56 corresponding to the axle 2 mentioned above, a ratchet or cam 57 movable about it, is arranged, which cam is fixed to an arm 58 connected by means of the connecting rod 19 to the lay sword so that the movement of the latter is communicated to it. Opposite to this cam 57 is arranged a pawl 60 pivoted about an axle 59 and provided with a curved arm 60^a on which bears the lower arm of a lever 61 corresponding in function and arrangement to the lever 27 of the first mode of carrying out the arrangement. The axle 59 of the pawl 60 is carried by a member 62 mounted loose about the axle 56 and provided with a notched locking member 63, which is in engagement with the finger 7 of the protective stop motion bar. A lateral projection 64 of the member 62 carries a leaf spring 65 pressing the curved arm 60^a against the lower arm of the lever 61, which by this means and also under the action of the torsion spring 31, is held against the tongue of the shuttle box. If the shuttle fails to reach the shuttle boxes, the nose of the cam 57 in the to-and-fro movement of the latter comes into engagement with the pawl 60 which is then not pushed out of the path of the said nose by the lever 61. The pawl 60, and consequently the piece 62, are thereby displaced by the cam 57 and the finger 7 of the protective stop motion bar is thereby disengaged in order to allow the stopping parts of the latter to engage in the notches of the stops (when the arrangement of the stop motion bar is according to the first type mentioned). In order to bring back the piece 62 into its original position, the axle 59 is lengthened on the side of the arm 58 so that the latter in its inverse movement can move with it the axle 59, bringing it, together with the piece 62, to its starting position, and causing in the same time the piece 62 to slide over the finger 7 which thus enters again the engagement notch 63.

What I claim is:

1. In apparatus for preventing the breakage of the warp threads of looms when the shuttle remains engaged in the warp, the combination of a lay, a protective stop motion bar journaled to said lay, a dagger device on the lay, connected to said bar, a stop device adapted to be engaged by the dagger device when said bar is in working position and thus to stop the lay, a locking member for the protective bar to hold it normally in the inactive position, a movable releasing member for unlocking said locking member, positive driving means to constantly actuate said releasing member, a motion transmitting gearing between said locking and releasing members and a brake-tongue feeling lever controlling said motion transmitting gearing so as to maintain it normally inoperative with respect to the releasing member, but to allow of its action upon said releasing member under the control of said driving means in order to cause the releasing member to unlock the protective bar when the shuttle has not reached the shuttle box, substantially as described.

2. In power looms, for the purpose of preventing the breakage of the warp threads when the shuttle remains engaged in the warp, the combination of a spring controlled protective stop motion bar journaled to the lay, a stop device arranged so as to be engaged by said bar when it is in working position and thus to stop the lay, a locking member to hold the protective bar normally in inactive position, a releasing member adapted to execute a rocking movement, positive means for constantly driving the said releasing member, connected to an oscillating part of the loom, a toothed gearing between the locking and the releasing member, said gearing having a normally moving member, and an oscillating lever placed under the control of the brake-tongue of the shuttle boxes and arranged to take, in case of absence of the shuttle from the shuttle boxes, a working position so as to hold said moving member of the gearing against movement and to thus cause the toothed gearing to transmit the motion of the releasing member upon the locking member for the purpose of disengaging the protective bar, substantially as described.

3. In power looms, for the purpose of preventing the breakage of the warp threads when the shuttle remains engaged in the warp, the combination of a spring controlled protective stop motion bar journaled to the lay, a stop device arranged so as to be

engaged by said bar when it is in working position and thus to stop the lay, a locking arm for engaging a finger on said bar and holding it normally in an inactive position, a releasing member capable of a rocking motion, positive driving means to constantly actuate said releasing member, an oscillating lever adapted to be actuated by the brake-tongue of the shuttle boxes, and a differential gearing comprising a principal gear which carries the said locking arm, a second principal gear, planetary gears mounted upon said releasing member and meshing with said principal gears, a projection carried by the said second principal gear, whereby the movement of said planetary gears is normally transmitted to the second principal gear and its projection, until the said oscillating lever, in case a shuttle is not in the shuttle boxes, stops the said projection to thus cause the movement of the planetary gears to be transmitted to the first principal gear and to its locking arm, in order to disengage the protective stop motion bar, substantially as described.

In witness whereof I have hereunto signed my name this 31st day of July, 1909, in the presence of two subscribing witnesses.

FRITZ NITSCHELM.

Witnesses:

GEORGE GIFFORD,

AMAND BRAUN.