J. F. DUSTIN.

WARP STOP MOTION FOR LOOMS.

APPLICATION FILED JULY 22, 1912.

1,043,815. Patented Nov. 12, 1912.

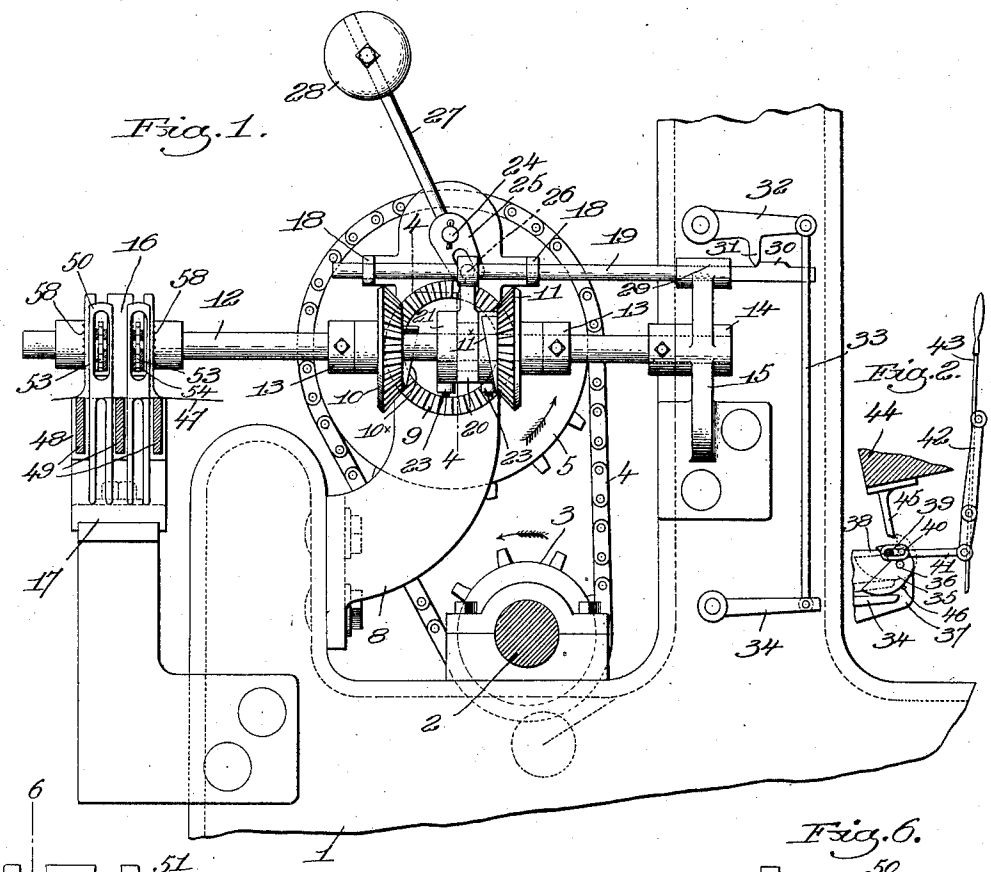

Fig. 1.

Fig. 2.

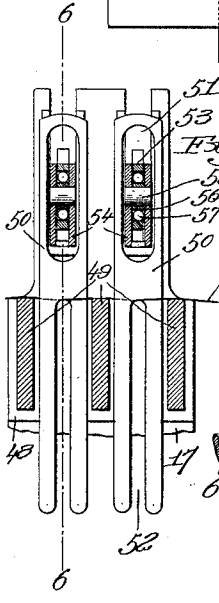

Fig. 5.

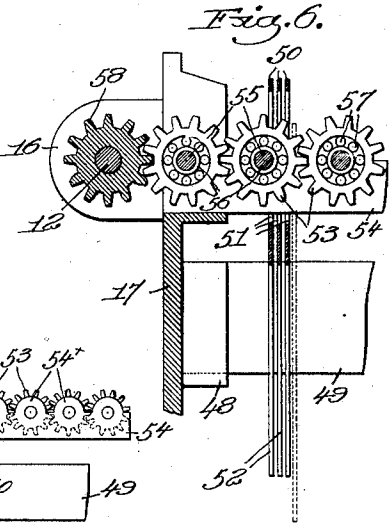

Fig. 6.

Fig. 3.

Fig. 4.

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WARP STOP-MOTION FOR LOOMS.

1,043,815. Specification of Letters Patent. Patented Nov. 12, 1912.

Application filed July 22, 1912. Serial No. 710,740.

To all whom it may concern:

Be it known that I, JOHN F. DUSTIN, a citizen of the United States, and resident of Lawrence, county of Essex, State of Massachusetts, have invented an Improvement in Warp Stop-Motions for Looms, of which the following description, in connection with the accompanying drawing, is a specification, like characters on the drawing representing like parts.

This invention has for its object the production of a warp stop-motion particularly adapted for looms, so constructed that a stopping instrumentality is caused to operate when a warp fault occurs, such as breakage, running out, or abnormal slackness of a warp thread.

My present invention is similar in certain features to a warp stop-motion which forms the subject-matter of a co-pending application Serial No. 681,045, filed by me the second day of March, 1912. In that application the detectors are thin, flat strips of metal suspended by the warp threads and held inoperative by normal threads, and these detectors, when released, are arranged to coöperate with feeler members arranged in a series transversely of the warp, said feelers being oscillated simultaneously when the loom is in normal operation. A released detector engages two adjacent feeler members and locks them from oscillation, and thereby a stopping instrumentality is brought into operation. Herein I make use of similar detectors, suspended by the warp threads, and I also make use of similar feeler members, which when locked by engagement with a released detector bring about the operation of a stopping instrumentality. In my present invention, however, the feeler members are not oscillated, but they are rotated continuously and simultaneously while the loom is in normal operation. When a warp fault occurs the rotation of the feeler members is arrested and said members are disconnected from the means for driving or rotating them, and as such disconnection is effected the stopping instrumentality is thrown into action. I have also provided means herein for effecting the continuous rotation of the feeler members in either direction. That is, if they are rotating continuously in one direction and a warp fault occurs the said members will be arrested and the loom will be stopped, and when the loom is started up the rotation of the feeler members will be resumed, but in the opposite direction.

The various novel features of my invention will be fully described in the subjoined specification and particularly pointed out in the following claims.

Figure 1 is a transverse section of a portion of a loom with a warp stop-motion embodying my present invention embodied therein, the crank-shaft being shown at about bottom center; Fig. 2 is a detail on a much smaller scale of the mechanism for effecting the operation of the loom stopping instrumentality when a warp fault is detected, the lay being indicated in the position corresponding to that of the crank-shaft in Fig. 1; Fig. 3 is a detail viewing Fig. 1 from the left hand, showing a part of the series of rotatable feeler members, the mechanism for rotating them, and some of the detectors; Fig. 4 is a sectional detail on the line 4—4, Fig. 1, looking toward the right, to be referred to; Fig. 5 is an enlarged sectional view on the line 5—5, Fig. 3, through the feeler members and the support therefor; Fig. 6 is a sectional detail on the line 6—6, Fig. 5, showing more clearly the structure of the feeler members and the manner in which they are mounted.

Referring to Fig. 1, the loom side 1, and crank-shaft 2 are of usual construction, and herein I have shown a sprocket 3 fast on the crank-shaft and connected by a sprocket chain 4 with a larger sprocket 5, fast on a shaft 6 above and parallel to the crank-shaft, rotatably mounted in a sleeve bearing 7 secured to or forming part of an upturned bracket 8 bolted to the loom side, Figs. 1 and 3. Herein I have shown the sprocket 5 as twice the diameter of the sprocket 3, and the shaft 6 may be termed the driving member of the mechanism for rotating the feeler members, said shaft having fast upon it a bevel gear 9 which is in continuous mesh with and rotates in opposite directions two axially alined and like bevel gears 10, 11. These latter gears are loosely mounted upon a fore and aft shaft 12, which may be termed the driven member of the mechanism for actuating the feeler members, separation of the gears being prevented by collars 13 on the shaft 12. The front end of this shaft is mounted in a bearing 14 on a bracket 15 secured to the loom side, and its rear end is sustained in an ear 16 forming part of a

stand 17, and in practice two of the stands are mounted on opposite loom sides at the back of the loom. The bracket 8 has two opposite, lateral ears 18 near its upper end, in which is mounted a longitudinally slidable rod 19 having fixed upon it between the ears a depending yoke 20 which enters an annularly grooved clutch collar 21 longitudinally slidable on the driven shaft 12 but rotatable therewith by means of a key 22, Fig. 4. Rolls 23 are mounted on the clutch collar, at opposite sides of the yoke, to cooperate with cams 10^x, 11^x on the gears 10 and 11, as shown in Fig. 1, but only one of the rolls will coöperate with its corresponding cam at any time, and in Fig. 1 the right hand roll is shown in operative position. When the clutch collar is held against the gear 11, with the cam 11^x engaging the adjacent roll 23, the shaft 12 will be rotated by and in unison with the gear 11, in the direction denoted by the arrow thereon, but when the clutch collar is shifted to the left to coöperate with gear 10 the shaft 12 will be rotated by it, but in the opposite direction. If the shaft 12 is arrested in its rotation the operative roll 23 will travel along the engaged cam, as 11^x, Fig. 1, and thereby the initial shifting of the clutch collar will be effected, the yoke 20 being moved thereby just past center relatively to a stud 24 on bracket 8. A depending arm 25 is fulcrumed on the stud and is longitudinally slotted to embrace loosely a pin 26 which projects laterally from the head of the yoke 20, the arm having an upturned extension 27 on which a weight 28 is mounted adjustably, the arm 25 and extension 27 constituting the short and long arms of a lever fulcrumed on stud 24. Now when the initial shifting of the clutch collar is effected as has been described the weight is gradually swung to a position immediately above the stud 24, and slightly beyond it, and instantly the weight is past dead center it acts to complete the shifting movement of the clutch collar with a quick movement. This causes the disengagement of said clutch member with one of the bevel gears and its immediate engagement with the opposite gear, as will be apparent, and if the shaft 6 is still rotating the shaft 12 will be rotated but in a reverse direction to that in force prior to the shift. So, too, if the actual disengagement of the clutch member and one bevel gear results in stoppage of the shaft 6, as is the case herein, then when said shaft is again put into operation the clutch member will be in operative engagement with the other bevel gear, and shaft 12 will be rotated in a direction opposite to the previous rotative motion thereof. Each shift of the clutch member 21 effects longitudinal movement of the rod 19 in the same direction, the front end of the rod sliding in a bearing 29 on the bracket 15 and having formed upon it a cam 30 which coöperates with a depending follower 31 on an arm 32 pivoted on the loom side.

Viewing Fig. 1, when the clutch member 21 is shifted to the left the cam 30 will cause the free end of arm 32 to be raised until the extreme movement of the rod 19 is attained, and thereupon the arm 32 returns to normal position as the follower 31 drops off the cam. The arm is connected by a link 33 with a long lever 34, partly shown in Figs. 1 and 2, the free end of said lever engaging a dog 35 pivoted at 36 on a bracket 37, in practice bolted to the loom frame, the dog having a shoulder 38 and a lateral pin 39, the latter entering loosely a slot 40 in a link 41, Fig. 2. Said link is jointed to a knock-off lever 42, arranged to coöperate with the shipper 43, to release the latter from its usual holding notch (not shown) when the link 41 is moved to the right, Fig. 2, the release of the shipper setting into operation the stopping instrumentality, of any usual or well known character and of itself forming no part of my invention.

In Fig. 2 the lay is partly shown at 44, and it has a rigidly attached bunter 45, which passes above the shoulder 38 of the pivoted dog when the loom is running and said dog is in full line position. Whenever the clutch member 21 is shifted, however, the arm 32 is raised and then lowered, and this results in raising the free end of the lever 34 and thereby turning the dog 35 into dotted line position, Fig. 2, with its shoulder 38 in the path of the bunter 45 as the lay beats up. When the dog is turned to dotted line position the pin 39 is moved to the front end of slot 40, so that when the bunter hits the shoulder 38 and slightly turns the dog the pin 39 will act upon link 41 to rock the knock-off lever 42 and thereby release the shipper. The slot 40 is long enough to permit the dog to return to normal position when the shipper has been knocked off, the lever 34 serving to limit such movement of the dog, or a stop pin as 46 can be used in addition. Herein I have arranged the stop-motion controlling detectors in two parallel banks or series extended transversely of the warp threads, indicated at 47 in Figs. 1 and 5, each bank of the detectors being arranged to coöperate with a transversely arranged series of feeler devices. The opposite stands 17 are provided with seats 48 for three upright and parallel bars 49, three being shown in Figs. 1 and 5, constituting warp rests, the detectors 50 being guided in their vertical movement between pairs of said bars, each detector having an elongated, closed slot 51 at its upper end, and a downwardly open slot 52 at its lower end, the latter slot receiving a warp thread.

In the present embodiment of my inven-

tion a series of feeler members is provided for each bank of detectors, said members being shown as peripherally toothed annuli or ring gears 53, arranged edge to edge in mesh with each other, between a support comprising a pair of laterally separated, parallel plates 54, connected at intervals by pivot pins 55 and fixedly mounted on the stands 17. There is one of said pins for each gear or feeler member 53, and I have particularly constructed the latter for easy rotation. To this end each pin 55 is surrounded by a collar 56 between the side plates 54, and the annular space between a collar and the surrounding feeler member is filled with anti-friction balls 57, the arrangement being shown very clearly in Fig. 6, the slots 51 of the detectors straddling a pair of plates 54 and the series of feeler members 53 between and supported by said plates. So long as the warp threads are intact and normal they uphold the suspended detectors with the upper ends of their slots 51 above the toothed feeler members 53, and the latter are free to be rotated about the pivot pins 55. Obviously, any rotative motion of any one of the series of intermeshing feeler members will be imparted simultaneously to all members of the series, adjacent members turning in opposite directions, and if any member is locked from rotative movement all of the members will be locked. To effect the normal and continuous rotation of the feeler members of a series the endmost member is in mesh with an actuating gear 58, Figs. 3 and 6, fast on the driven member or shaft 12 hereinbefore referred to, and herein there will be two of said actuating gears, on opposite sides of the ear 16, see Fig. 1.

Manifestly the rotation of the shaft 12 will cause the feeler members 53 of a series to be rotated continuously and simultaneously so long as the loom is in operation and there is nothing to arrest the rotation of a feeler member, the friction due to the several feeler members being very slight and insufficient to cause a roll 23 to move relatively to its cam 10^x or 11^x under normal conditions. The sides 54 of the support for the feeler members also serve to retain the balls 57 in the raceways of the members 53, and in order to get the proper engagement with a released detector the sides 54 are notched as shown in Fig. 3, leaving a notch between each pair of semi-circular lobes 54^x, which latter laterally close the upper halves of the ball raceways in the feeler members, the notches being opposite the engaging portions of adjacent and intermeshing feeler members. Now if a warp thread fails or becomes unduly slack its detector 50 is permitted to descend until the upper end of the slot 51 engages the toothed periphery of one of the rotating feeler members 53, and said detector will be carried laterally until it is also engaged by the next feeler member, to thereby stop both of said members from rotation and locking the entire series. It matters not where the detector drops, whether opposite a notch of the support, or midway between two notches, as the rotation of the feeler member in the latter case brings the engaged detector opposite a notch, as will be understood. The action of the two engaging members 53 upon the released detector tends to tip the latter and thereby assists the weaver in locating the faulty warp thread, the sheet of warp being opened more or less, depending upon the extent of lateral movement of the released detector. The notches in the support 54 assist in directing a released detector into proper position, and said support prevents a detector from traveling between and below adjacent feeler members. Now when the series of feeler members is locked, as has been explained, the corresponding master gear 58 and the fixedly attached shaft 12 will be held from rotation, whereupon the clutch member 21 is held from rotation, but immediately the continued rotation of one of the bevel gears, as 11, Fig. 1, brings its cam 11^x into action and it presses against the adjacent roll 23, and shifts initially the clutch member 21 to the left, far enough to carry the weight 28 past dead center, to complete the shift. This initial shift, however, has moved the rod 19 and the cam 30 thereon has operated as has been described to set in action the stopping instrumentality, and the loom is knocked off. The weight 28 completes the shift of the clutch member, however, so that when the loom comes to rest the said member 21 will be in position to coöperate with the cam of gear 10, thereby to rotate the shaft 12 and its adjuncts when the loom is again started. Said weight is only sufficient to maintain the proper operative engagement between the clutch member and one of the bevel gears loose on the shaft 12, in order that such gear may drive the shaft and the devices connected therewith, to wit, the toothed, rotatable feeler members, and when said members are locked the initial shifting of the clutch member, to disengage or uncouple the shaft and its then operating gear, is effected with a very slight expenditure of power.

It should be stated that after a shift of the clutch device from the position shown in Fig. 1 the finger 31 rests on the top of the rod or bar 19 at the right hand end of the cam 30, the throw of said rod in either direction being just a trifle greater than the length of the cam. The action of the feeler members on an engaged detector is not in the slightest degree objectionable, and the strain upon a detector is so slight as to be of no moment. By locating the feeler members above the sheet of warp they are out of the

way of dropping lint, and do not become clogged. Any number of banks of detectors may be employed, and each bank will have its own series of intermeshing and normally rotating feeler members, the several master or actuating gears for the latter being mounted on the common driven shaft or member 12. Said shaft is reversed as to the direction of rotation each time the loom is stopped, as hereinbefore set forth, and one of the bevel gears of the pair for actuating such shaft will always run idly when the loom is in operation.

Changes or modifications in details of construction and arrangement may be made by those skilled in the art without departing from the spirit and scope of my invention as set forth in the annexed claims.

Having fully described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a warp stop-motion, a series of rotatable and peripherally toothed feeler members extended transversely of the warp threads, means normally operative to effect continuous rotary movement of said members, means maintained inoperative by intact warp threads to coöperate with and lock said members from rotation when a warp thread fails, and a stopping instrumentality caused to operate by such locking of the feeler members.

2. In a warp stop-motion, a series of toothed, rotatable feeler members arranged in a row transversely of the warp threads, means normally operative to effect simultaneous and continuous rotary movement of said members, means maintained inoperative by intact warp threads to engage two adjacent feeler members and lock from rotation all of the feeler members when a warp thread fails, and a stopping instrumentality caused to operate by such locking of the feeler members.

3. In a warp stop-motion, a series of rotatable and peripherally toothed feeler members extended transversely of the warp threads, adjacent members intermeshing and rotating in opposite directions, means normally operative to effect simultaneous and continuous rotary movement of all such members, detectors slotted to receive the feeler members and maintained inoperative by intact warp threads, a dropped detector engaging two adjacent feelers to lock them, and thereby all of the feeler members, from rotation, and a stopping instrumentality set in action by or through locking of said feeler members.

4. In a warp stop-motion for looms, a seroes of rotatable, toothed and intermeshing feeler members extended transversely of the warp threads, means normally operative to effect continuous rotation of all of said members, detectors slotted to receive the said feeler members and held inactive by the warp threads, a released detector engaging simultaneously two adjacent feeler members to lock them, and thereby the series of feeler members, from rotation, and means whereby locking of the feeler members causes loom stoppage.

5. In a warp stop-motion for looms, a series of rotatable feeler members placed edge to edge and extended in a row transversely of the warp threads and operatively connected to transmit rotative movement from one to another, means to effect simultaneous and continuous rotation of said members when the loom is operating normally, means whereby failure of a warp thread will lock automatically the series of feeler members and prevent rotative movement thereof, and a stopping instrumentality set in action by or through such locking of the feeler members.

6. In a warp stop-motion, a support comprising two parallel, separated sides extended transversely of and adjacent to the warp threads, a series of ring gears in peripheral engagement with each other and located between said support sides, an axial member extended through each gear and fixed in the sides of the support, a series of bearing balls interposed between the inner circumference of a gear and its axial member, means to effect simultaneous rotative movement of said gears when the loom is operating normally, said gears being arranged in an upright plane transverse to the warp threads, detectors upheld by intact warp threads and slotted to embrace the support and the gears carried thereby, a released detector engaging two adjacent gears and locking them, and thereby the entire series of gears, from rotative movement, and a stopping instrumentality rendered operative by locking of said gears.

7. In a warp stop-motion for looms, a series of rotatable, peripherally toothed members operatively connected to transmit rotative movement from one to the other and extended transversely of the warp threads, means operative upon failure of a warp thread to engage simultaneously two adjacent members and lock the entire series of members from rotative movement, means normally operating to rotate said members continuously and simultaneously, including driving and driven members and an intermediate clutch, locking of the feeler members rendering said clutch inoperative, and a loom stopping instrumentality operated by or through the clutch when the latter is rendered inoperative.

8. In a warp stop-motion for looms, a series of rotatable, peripherally toothed members operatively connected to transmit rotative movement from one to the other and extended transversely of the warp threads,

means operative upon failure of a warp thread to lock the feeler members from rotation, means normally acting to rotate said members continuously, including driving and driven members and an intermediate clutch, locking of the feeler members stopping the driven member and through the clutch releasing it temporarily from the driving member, and a loom stopping instrumentality operated by or through the clutch when the latter releases the driving and driven members from coöperation.

9. In a warp stop-motion for looms, a series of rotatable, peripherally toothed members operatively connected to transmit rotative movement from one to the other and extended transversely of the warp threads, means operative upon failure of a warp thread to lock the feeler members from rotation and open the warp threads laterally, means for effecting continuous rotation of the feeler members when the warp threads are intact, including a driven shaft having two gears loose thereon, a releasing cam on each gear, a driving gear in permanent mesh with and to rotate said gears in opposite directions, a clutch rotatable with said shaft and adapted to coöperate with either of the gears thereon to effect rotation of the shaft when the feeler members are free to rotate, and a clutch-shifter to complete the shifting of the clutch when initiated by either of the releasing cams, combined with a stopping instrumentality for the loom, and an actuator therefor rendered operative by or through shifting of the clutch from one to the other of the gears on the driven shaft.

10. In a warp stop motion, a series of rotatable feeler members, placed edge to edge and extended in a row transversely of the warp threads, means normally acting to effect simultaneous and continuous rotation thereof, means whereby failure of a warp thread will lock automatically the series of feeler members and prevent rotative movement thereof, and a stopping instrumentality caused to operate by or through such locking of the feeler members.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

JOHN F. DUSTIN.

Witnesses:
JOHN C. EDWARDS,
FREDERICK S. GREENLEAF.

rection in Letters Patent No. 1,043,815.

It is hereby certified that in Letters Patent No. 1,043,815, granted November 12, 1912, upon the application of John F. Dustin, of Lawrence, Massachusetts, for an improvement in "Warp Stop-Motions for Looms," an error appears in the printed specification requiring correction as follows: Page 4, lines 60–61, for the word "seroes" read *series;* and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 10th day of December, A. D., 1912.

[SEAL.]

C. C. BILLINGS,
Acting Commissioner of Patents.