J. LUCAS

BOBBIN CHANGING MECHANISM

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INVENTOR

BY

JONATHAN LUCAS

ATTORNEYS
UNITED STATES PATENT OFFICE

JONATHAN LUCAS, OF SAVANNAH, GEORGIA, ASSIGNOR TO LUCAS-LAMBORN LOOM CORPORATION, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK

BOBBIN-CHANGING MECHANISM

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My invention relates to looms and more particularly to mechanism for periodically and automatically changing the bobbin with its holder at predetermined intervals during the operation of the loom in a positive and uniform manner free from shocks and impacts, the objects and advantages of which will appear more fully hereinafter.

In the accompanying drawings which illustrate by way of example a form of my invention without defining its limits, Fig. 1 is a front elevation of my apparatus; Fig. 2 is a vertical section taken along the line 2—2 of Fig. 1; Figs. 3 to 10 illustrate the bobbin transfer or changing mechanism in various progressive positions; Fig. 11 is a plan view of the shuttle and supporting arms, and Fig. 12 is a vertical section on line 12—12 of Fig. 11.

My present invention may in general be employed with any type of positive shuttle transfer mechanism such as that disclosed in United States Patent No. 1,624,108 issued to me April 12, 1927, or with that shown in the copending joint application of Arthur F. Case and myself, Serial No. 287,618, filed June 22, 1928. Certain parts of the shuttle transfer mechanism disclosed in my above patent and application are shown on the accompanying drawings for the sake of a clearer understanding of my invention and as shown include two oppositely reciprocating carriers 15 slidably mounted upon guides 16 fixed upon the frame 17 of the loom. The carriers 15 are provided with forwardly extending arms 18 (Fig. 11) for alternately supporting the shuttle in the manner disclosed in the above mentioned patent and application. The carriers may be reciprocated upon their guides in any suitable way and as shown the right-hand carrier may be operated from a crank 19 (Fig. 1) fixed to a shaft 19′ through link 20, oscillating lever 21 and connecting rod 22, which is pivoted to a lug 29 depending from the carrier 15. Upon continuous rotation of the crank 19 the carrier 15 is reciprocated back and forth between the side and center of the machine, Fig. 1 showing in dotted lines the inner limit of travel of the carrier. It will be understood that a second or left-hand carrier 15, similar to the righthand carrier, is located upon the other side of the machine and is operated in a similar manner by a crank (not shown), which actuates an oscillating lever 21 connected to the second carrier, so as to move the same toward and away from the center of the machine in synchronism with the right-hand carrier, the transfer of the shuttle from one carrier to the other taking place automatically at the center of the machine where said carriers meet, as described in the patent and application referred to.

Mounted upon the carrier 15 is a shuttle 23 which is provided with guideways 24′ within which the arms 18 of the carrier 15 alternately engage so as alternately to support the shuttle in its travel across the loom. It will be sufficient for the purposes of the present disclosure to state that as the carrier 15 approaches the center of the machine the shuttle is released from the arm upon which it is supported and becomes latched to and supported by the other arm which then carries it to the other side of the machine while the first arm returns idly to its side of the machine. When the arms again approach the center of the loom the shuttle is re-transferred from the second to the first arm and in this manner the shuttle is positively carried back and forth through the shed of the loom.

When weaving cloth which is to contain filler or weft threads of different colors or of different qualities it becomes necessary to change the bobbin which is contained in the shuttle at certain predetermined instants. I accomplish this change by means of a specially constructed shuttle which is employed in association with novel mechanism for removing the portion of the shuttle within which the bobbin is mounted, which portion I shall hereinafter refer to as the bobbin box, and simultaneously substituting for such box a similar box containing a bobbin having threads of different colors or qualities from said first-mentioned bobbin.

The mechanism about to be described is one of numerous forms which my invention may take, and has been designed to replace periodically and in rotation one of two re-
movable bobbin-holding boxes with the other at every two picks of the machine, one of the boxes being carried by the shuttle as it passes through the shed of the loom and returns while the other is carried by a movable platform disposed at the side of the machine. The first box is automatically displaced by that on the platform and is itself automatically positioned on the platform to displace the second in turn upon return of the shuttle.

Referring to Fig. 11, the shuttle 23 as shown includes a frame 24 provided with a cut-away 25, within which is adapted to fit a bobbin box 26 which is preferably of rectangular form and open at the top. This cut-away is open both at the top and bottom and also along the front side. The bobbin box 26 is provided with notches or openings 27 which are adapted to receive spring-pressed latches 28 mounted upon the frame of the shuttle. These latches serve to hold the box in position upon the shuttle frame during the reciprocation of the shuttle across the loom.

The transfer mechanism, which operates to replace the bobbin box with a new box during the operation of the machine, includes a platform 29 hinged to two parallel arms 30, the other ends of said arms being pivoted upon a fixed portion of the frame of the loom. The platform is offset from the carrier 15 longitudinally of the loom and is located below the bobbin box when the shuttle has been moved toward the right-hand end of the machine as viewed in Fig. 1. The platform is adapted to be raised vertically and simultaneously moved toward the right of the machine by means of an arm 31 which is rigidly connected to one of the arms 30 and is controlled by means of a cam 32 engaged by a follower 33 fixed upon an oscillating lever 34 pivoted at 35 to a bracket 36 attached to the frame of the machine and connected by means of a link 37 to the arm 31. Upon rotation of the cam 32 the lever 34 will be actuated to oscillate the arm 31 and thereby alternately raise and lower the platform 29.

The platform 29 is provided with an upstanding bracket 38 upon which is pivoted a spring-pressed latch 39 (Fig. 2), the latter having an extension 40 which is adapted to engage a cam 41 fixed upon the frame of the machine. The latch 39 is adapted to engage within an opening 42 in the side of the bobbin box 26 so as to hold the same upon the platform. The platform 29, latch 39 and cam 41 are so related that as the platform is raised upon oscillation of the arm 31, the extension 40 rides on cam 41 and the latch 39 is withdrawn from the opening 42 so as to release the bobbin box positioned on the platform prior to the replacement of the bobbin box positioned within the shuttle, as explained more fully below.

My novel bobbin box changing mechanism includes also means for receiving and holding the replaced or idle box as it is ejected from the shuttle by the box which is positioned upon the platform 29. In the form of the invention illustrated, this receiving and holding means comprises a pair of hooks 44 (Fig. 3) which are adapted to enter the opening in the top of the bobbin box 26 and engage under flanges 46 as described hereinafter. These hooks 44 are pivoted at 47 upon plates 48 which are connected together by means of a horizontal bar or plate 49. The plates 48 may form part of a housing 50 as shown in dotted lines in Figs. 3 to 10. The plate 49 and its attached housings 50 are supported by means of two parallel arms 51 which are pivoted at 52 upon fixed parts of the loom frame and at their other ends are pivotally connected to the plate 49 as shown at 53. It will be obvious from the construction so far described that upon oscillation of the arms 51 the plate 49 will be moved vertically while maintaining its horizontal position.

The arms 51 are rigidly connected to a pair of arms 54 which are pivotally connected by means of a link 55. The closed parallel system, composed of plate 49, arms 51, arms 54 and link 55, is given a rocking movement so as to raise and lower the plate 49 through the medium of an oscillating lever 56 (Fig. 1) which is connected by means of a link 57 to one of the points of connection of the arms 54 with link 55, as indicated at 58. The lever 56 is rocked by means of a cam 58 which is engaged by a follower 59 mounted upon the lever, the cam 58 being designed to produce the complex movement which is described below in connection with the operation of the mechanism.

The hooks 44, as shown in Fig. 3, pass through openings 59 in the plate 49 and are rabbed at 60 so as to provide a stop which engages the plate 49. The hooks are formed on the horizontal arms of a pair of bell-crank levers which are pivoted at 47, the vertical arms 61 of which are engaged by springs 62 located in the housings 50 so as to urge the hooks 44 into the openings 59. Each of the arms 61 is connected by means of a link to a lever 63 pivoted intermediate its ends upon the vertical plate 48 and terminating in a cam portion 64. Fixed upon the frame of the machine is an upright 65 while mounted upon the platform 29 is a similar upright 66, both of which are adapted to be engaged by the cams 64 as described below.

The driving mechanism for the carriers and the bobbin transfer mechanism includes a pulley 67 (Fig. 1) or other driven wheel mounted on the driven shaft 19'. A spur gear 68 on the shaft 19' engages an idler 69 journalled upon a support attached to the frame of the machine and meshing in turn with a gear 70 fixed upon the shaft 71 which carries the cam 92. The gear 70 meshes with an idler 100.
200 gear 72 and through the latter drives the gear 73 mounted upon the shaft 74 to which the cam 58 is fixed. The crank 19 and cams 32 and 38 are thus rotated in the same direction.

The left-hand carrier 15 may be operated in the same manner as the right-hand carrier and driven from the shaft 19' by means of a bevel gear 75 fixed to the shaft 19' and engaging a bevel gear 76 on a transverse shaft 77. This latter shaft can be made to operate a shaft corresponding to the shaft 19' and having a crank similar to the crank 19 connected thereto, the link 20, lever 21 and connecting rod 22 being similarly duplicated.

The operation of the transfer mechanism above described will be best understood by reference to Figs. 3 to 10 of the drawings. Fig. 3 shows the shuttle 23 having the bobbin box B latched thereon (as shown in Fig. 12) approaching the right-hand end of the machine as viewed in Fig. 1. The other box A is at this time positioned upon the platform 29 and held in proper position by the latch 30 shown in Fig. 2. The cam 32 is so designed that the lever 34 will be rocked to oscillate the arms 30 in a clockwise direction so as to raise the platform 29 before the box B in the shuttle 23 has reached a position in vertical alignment with the box A. As the shuttle continues its movement to the right, the bobbin box A is raised vertically and at the same time moved horizontally, the horizontal speed of the platform increasing until the boxes A and B are in exact vertical alignment, from which moment the horizontal speed of the platform 29 and the shuttle 23 is the same. During its movement the extension 40 (Fig. 2) rides over the cam 41 and releases the latch 39 from the shuttle 23. As the shuttle continues its movement there will then be only relative vertical movement between the shuttle and the platform. As the box A rises it will engage and push the box B out of the shuttle frame, the latches 38 being cammed outwardly against the action of their springs. During this movement of the shuttle and platform, the parallel arms 51 connected to the plate 49 have been oscillated by the rock lever 56 and cam 58' in a clockwise direction so as to move the plate 49 vertically and horizontally. The cams 52 and 58' are so formed that the vertical movement of the plate 49 is more rapid than that of the plate 49, so that the box B gradually approaches the plate 49 and by the time that the parts have reached the position shown in Fig. 5 the box B has approached so closely to the plate that the spring-pressed hooks 44 have engaged the under side of the flanges.

After the parts have reached the position shown in Fig. 5 the vertical speed of the plate 49 becomes greater than that of the platform 29 so that the box B which is now supported by the hooks 44 is moved away from the box A as the latter enters the cut-away section in the shuttle frame and becomes latched therein, as shown in Fig. 6.

Fig. 6 shows the position of the shuttle at approximately the extreme limit of its right-hand movement and after the completion of the bobbin transfer. When this position has been reached or very shortly thereafter the carrier 15 is reversed through the operation of the crank 19 and the shuttle which now has the box A therein proceeds to travel toward the center of the machine as indicated by the arrows in Fig. 7. Before this reverse movement has occurred, however, the arms 30 have continued their clockwise movement until the position indicated in Fig. 7 has been reached so as to provide a clearance between the shuttle and the platform.

At approximately the moment that the right-hand end of the shuttle clears the left-hand end of the platform 29 as shown in Fig. 7, the rock lever 34 becomes actuated by the cam 32 to reverse the direction of oscillation of the arms 30. At about the same time the arms 51 are similarly reversed by means of their cam 58' so as to lower the plate 49 and the box B supported by the hooks 44.

When the parts have reached the position shown in Fig. 8, the platform 29 is approximately at the position of rest shown in Fig. 3. The vertical downward movement of the plate 49 during this reverse movement has been more rapid than that of platform 29 so that the former overtakes the latter as shown in Figs. 8 and 9. As the box B is lowered the cams 64 on levers 65 engage the uprights 65 and 66 respectively, causing the levers 63 to rock and raise the hooks 44 out of engagement with the flanges 46 as clearly shown in Fig. 9. The box B is thus released from the hooks and drops onto the platform 29 where it becomes latched by the latch 30. The platform 29 travels further a very short distance until it reaches its position of rest shown in Fig. 10, while the direction of oscillation of the arms 51 is again reversed, whereupon the plate 49 is moved away from the platform 29 until the idle position shown in Fig. 10 is reached. This Fig. 10 position is maintained during the time that the shuttle is transferred at the center of the machine from the right-hand to the left-hand carrier 15 on which it is carried to the left-hand end of the machine and then returned to the center of the machine where it is retransferred to the right-hand carrier 15 and the above described cycle of bobbin box transfer operations is repeated as said right-hand carrier again approaches its right-hand limit of movement.

With the above construction the bobbin will be changed at every two picks of the machine. It will be obvious that by properly designing the cams 32 and 58' or by interposing suitable timing mechanism in the drive of these cams for driving them intermittently, the bobbins may be changed at
every four, six or any higher even number of picks. Furthermore, a similar bobbin transfer mechanism may be located at the left side of the machine, in which case, by suitably forming and driving the cams, the bobbins may be changed at every pick or at any even or odd numbered pick.

It will be clear that with the above mechanism the bobbins are changed in a uniform and positive manner and that the machine is not subjected to sudden shocks or strains; on the contrary, the engagement of one bobbin box by the other is gradual and free of shock or impact, whereby the wear and tear on the machine and the noise are materially diminished.

While I have shown my inventive idea embodied in a mechanism wherein the bobbin is housed within a bobbin box, which latter is the element that is directly transferred, it should be understood that the bobbins may be so designed as to be capable of being directly transferred or replaced one by the other without the aid of a bobbin box.

Where in the claims I refer to "positive shuttle-transfer mechanism" it is to be understood that I refer to those types of shuttle transfer devices wherein the movement of the shuttle through the shed and across the loom is under control and more or less fixed and definite in character, in contra-distinction to those shuttle-transfer devices whereby the shuttle is thrown or shot across the loom, the speed and trajectory of the shuttle in such cases not being fixed or predictable.

Variations from the specific form of the invention shown and described may be resorted to within the scope of the appended claims without departing from the spirit of my invention. For example, my improved mechanism may be employed as a weft replenishing mechanism, wherein a spent bobbin is replaced by a new bobbin, there being provided any suitable form of feeder device.

I claim:

1. In a loom, the combination with a positive shuttle-transfer mechanism, of a shuttle having a removable bobbin, means for operating said mechanism to transfer the shuttle across the shed of the loom, and bobbin changing mechanism located at one side of the loom and operating during the actuation of said shuttle-transfer mechanism by its operating means for automatically replacing the bobbin of said shuttle with another bobbin.

2. In a loom, the combination with a positive shuttle-transfer mechanism, of a shuttle having a removable bobbin, means for operating said mechanism to transfer the shuttle across the shed of the loom, and bobbin changing mechanism located at one side of the loom and operating during the actuation of said shuttle-transfer mechanism by its operating means for automatically displacing the bobbin of said shuttle upwardly with another bobbin.

3. In a loom, the combination with a positive shuttle-transfer mechanism, of a shuttle having a removable bobbin, means for operating said mechanism to transfer the shuttle across the shed of the loom, and bobbin changing mechanism located at one side of the loom and operative during the actuation of said shuttle-transfer mechanism by its operating means for automatically displacing the bobbin of said shuttle upwardly with another bobbin.

4. In a loom, the combination with a positive shuttle-transfer mechanism, of a shuttle having a removable bobbin, means for operating said mechanism to transfer the shuttle across the shed of the loom, and a movable support for a second bobbin operative during the actuation of said shuttle-transfer mechanism by its operating means for moving said second bobbin toward said shuttle in a direction having components parallel to and at an angle to the direction of movement of said shuttle, whereby said first bobbin is replaced by the second in a manner free from shock and impact.

5. In a loom, the combination with a positive shuttle-transfer mechanism, of a shuttle having a removable bobbin, a movable support for a second bobbin operative during the movement of the shuttle for moving said second bobbin toward said shuttle in a direction having components parallel to and at an angle to the direction of movement of said shuttle, whereby said first bobbin is replaced by the second in a manner free from shock and impact, and mechanism for removing said first bobbin from the path of said shuttle.

6. In a loom, the combination with a positive shuttle-transfer mechanism, of a shuttle having a removable bobbin, a movable support for a second bobbin operative during the movement of the shuttle for moving said second bobbin toward said shuttle in a direction having components parallel to and at an angle to the direction of movement of said shuttle whereby said first bobbin is replaced by the second in a manner free from shock and impact, and mechanism for removing said first bobbin from the path of said shuttle.

7. In a loom, the combination with a positive shuttle-transfer mechanism, of a shuttle having a removable bobbin, and bobbin changing mechanism located at one side of the loom and operative during the movement of said shuttle for automatically replacing the bobbin of said shuttle with another bobbin; said changing mechanism comprising a bobbin advancing device adapted to hold a
second bobbin thereon, a bobbin receiving device, operating mechanism for imparting to said advancing device for a portion of its travel substantially the same speed as said shuttle in the direction of the latter and also a relative movement at an angle to said direction whereby gradual displacement of said first by said second bobbin is effected in a manner free from shock and impact, and an operating mechanism for actuating said receiving device to remove said first bobbin from the path of movement of said shuttle.

8. In a loom, the combination with a positive shuttle-transfer mechanism, of a shuttle having a removable bobbin, and bobbin changing mechanism located at one side of the loom and operative during the movement of said shuttle for automatically replacing the bobbin of said shuttle with another bobbin; said changing mechanism comprising a platform adapted to hold a second bobbin thereon, operating mechanism for imparting to said platform for a portion of its travel substantially the same speed as said shuttle in the direction of movement of the latter and a relative movement at an angle to said direction to effect gradual displacement of the first by the second bobbin in a manner free from shock and impact, gripping mechanism located above the path of said shuttle and adapted to remove the displaced bobbin from the path of the shuttle, and means for effecting the transfer of said displaced bobbin from said gripping mechanism to said platform, whereby upon a subsequent return of the shuttle said first bobbin will replace the second in the body of the shuttle in the manner aforesaid.

9. In a loom, the combination with a positive shuttle-transfer mechanism, of a shuttle having a removable bobbin, and bobbin changing mechanism located at one side of the loom and operative during the movement of said shuttle for automatically replacing the bobbin of said shuttle with another bobbin; said changing mechanism comprising a platform adapted to hold a second bobbin thereon, means including a parallelogram linkage for imparting to said platform for a portion of its travel substantially the same speed as said shuttle in the direction of movement of the latter and a relative movement at an angle to said direction to effect gradual displacement of the first by the second bobbin in a manner free from shock and impact, gripping mechanism located above the path of said shuttle and adapted to remove the displaced bobbin from the path of the shuttle, and operating mechanism comprising a connection for said gripping mechanism for moving the latter toward said platform, and means for releasing said gripping mechanism whereby said first bobbin is transferred to said platform, said platform being adapted to be returned to initial position whereby upon a subsequent return of the shuttle said first bobbin will replace the second in the body of the shuttle in the manner aforesaid.

10. In a loom, the combination with a positive shuttle-transfer mechanism, of a shuttle having a removable bobbin, and bobbin changing mechanism located at one side of the loom and operative during the movement of said shuttle for automatically replacing the bobbin of said shuttle with another bobbin; said changing mechanism comprising a platform adapted to hold a second bobbin thereon, operating mechanism including a parallelogram linkage for imparting to said platform for a portion of its travel substantially the same speed as said shuttle in the direction of movement of the latter and a relative movement at an angle to said direction to effect gradual displacement of the first by the second bobbin in a manner free from shock and impact, gripping mechanism located above the path of said shuttle and adapted to remove the displaced bobbin from the path of the shuttle, and means for effecting the transfer of said displaced bobbin from said gripping mechanism to said platform, whereby upon a subsequent return of the shuttle said first bobbin will replace the second in the body of the shuttle in the manner aforesaid.
tially the same speed as said shuttle in the direction of movement of the latter and a relative movement at an angle to said direction to effect gradual displacement of the first by the second bobbin in a manner free from shock and impact, gripping mechanism located above the path of said shuttle and adapted to remove the displaced bobbin from the path of the shuttle, operating mechanism including a parallelogram linkage connection for said gripping mechanism for moving the latter toward said platform, and means for releasing said gripping mechanism whereby said first bobbin is transferred to said platform, said platform being adapted to be returned to initial position whereby upon a subsequent return of the shuttle said first bobbin will replace the second in the body of the shuttle in the manner aforesaid, said releasing means including cam levers associated with said gripping mechanism and means for tripping said levers.

13. In a loom, the combination with a positive shuttle-transfer mechanism, of a shuttle having a removable bobbin, and bobbin changing mechanism located at one side of the loom and operative during the movement of said shuttle for automatically replacing the bobbin of said shuttle with another bobbin; said changing mechanism comprising a platform adapted to hold a second bobbin thereon, a latching device on said platform adapted to position and hold the bobbin on the platform, operating mechanism for importing to said platform for a portion of its travel substantially the same speed as said shuttle in the direction of movement of the latter and a relative movement at an angle to said direction to effect gradual displacement of the first by the second bobbin in a manner free from shock and impact, releasing mechanism operative during such displacement to release said second bobbin from said latching device, bobbin receiving mechanism adapted to receive the displaced bobbin, and means for effecting the transfer of said displaced bobbin from said receiving mechanism to said platform, whereby upon a subsequent return of the shuttle said first bobbin will replace the second in the body of the shuttle in the manner aforesaid.

14. In a loom, the combination with a positive shuttle-transfer mechanism, of a shuttle having a removable bobbin, latching mechanism for releasably locking said bobbin to said shuttle, bobbin changing mechanism located at one side of the loom and operative during the movement of said shuttle for automatically replacing said bobbin with another bobbin, and means for releasing said latching mechanism prior to such replacement.

15. The method of changing the bobbin of a shuttle having a removable bobbin, which comprises so moving a second bobbin adjacent the path of the shuttle, while the latter is being transferred to lay the weft, as to impart to such second bobbin substantially the same speed as said shuttle in the direction of movement of the latter during such transfer and a relative movement at an angle to said direction to effect gradual displacement of the first by the second bobbin in a manner free from shock and impact.

16. The method of changing the bobbin of a shuttle having a removable bobbin, which comprises so moving a second bobbin adjacent the path of the shuttle, while the latter is being transferred to lay the weft, as to impart to such second bobbin substantially the same speed as said shuttle in the direction of movement of the latter during such transfer and a relative movement in a vertical direction to effect gradual displacement of the first by the second bobbin in a manner free from shock and impact.

17. The method of changing the bobbin of a shuttle having a removable bobbin during movement of the shuttle which comprises so moving a second bobbin adjacent to the path of the shuttle, while the latter is being transferred to lay the weft, as to impart to said second bobbin substantially the same speed as said shuttle in the direction of movement of the latter during such transfer and a relative movement at an angle to said direction to effect gradual displacement of the first by the second bobbin in a manner free from shock and impact, and removing said first bobbin from the path of the shuttle.

18. The method of changing the bobbin of a shuttle having a removable bobbin during movement of the shuttle, which comprises so moving a second bobbin adjacent to the path of the shuttle as to impart to said second bobbin substantially the same speed as said shuttle in the direction of movement of the latter and a relative movement at an angle to said direction to effect gradual displacement of the first by the second bobbin in a manner free from shock and impact, removing said first bobbin from the path of the shuttle and transferring the same to the initial position of said second bobbin, whereby upon a subsequent return of the shuttle the first bobbin is in position to replace the second in the body of the shuttle in the manner aforesaid.

19. In a loom, the combination with a positive shuttle transfer mechanism, of a shuttle having a removable bobbin, and means for operating said mechanism to transfer the shuttle across the shed of the loom, and bobbin changing mechanism operative during the actuation of said shuttle-transfer mechanism by its operating means for automatically replacing the bobbin of said shuttle with another bobbin.

JONATHAN LUCAS.