The present invention pertains to multi-shuttle, automatic, filling replenishing looms and, more particularly, relates to a means to be incorporated in such looms to delay and to space apart more widely the bobbin transfer in situations where such looms indicate a transfer to a second shuttle immediately after transfer to a first.

Looms of the type mentioned above, such, for example, as a loom with a (2 x 1) box motion, are usually equipped with a filling replenishing mechanism automatically operative upon substantial exhaustion of its filling supply to replace the bobbin in the working shuttle with a bobbin carrying a full supply. In addition to the above mechanism such looms are provided with upper and lower feeder devices disposed to enter their particular shuttle and to detect the condition of the filling supply on the then non-running shuttle upon each rise and drop of the shifting shuttle boxes. It may happen at times that a feeder may indicate substantial exhaustion of filling in a shuttle and initiate operation of the replenishing mechanism, and after picking the alternate shuttle, the boxes may be shifted and a second feeder device may detect and indicate substantial exhaustion of filling in that shuttle.

The replenishing mechanism of the loom will normally effect these two transfers in rapid succession, that is, with the usual 2 x 1 box motion, in such manner that the second transfer is spaced two picks from the first. However, there are other factors to be considered beyond the mere capability of the mechanism to accomplish such transfer functions in rapid succession. First, at transfer, the outgoing thread is cut and held by the Stafford cutter; also, this end held at the cutter and another running from the battery to the fabric selvage must be cut adjacent the selvage by the temple thread cutter. It is well known that this latter function takes more than the two picks above mentioned and, naturally, if a second transfer follows too closely, then the Stafford cutter is called upon to cut and bind a second end before that it already holds has been cut by the temple cutter. The result may well be that that released end will be dragged or whipped into the fabric to cause an imperfection.

Again, in looms with which a pirn winding means is directly employed to furnish a filling supply, e.g., the "Unifi" mechanism manufactured by Universal Winding Co. of Cranston, Rhode Island, a bobbin stripper is utilized and such a device is not adapted to receive a strip a second bobbin following too closely after a first one being stripped. The small number of picks normally available leaves too little time for the first to progress to a point where the second may start its stripping cycle without interference.

In either of these situations a delay between transfers or retarding the second for a few picks does make possible the successful acquisition of all functions attendant upon replenishing, despite the fact that at intervals during loom operation, these transfers, one following immediately after another, are experienced. The shorter the time required to run off a single filling supply, the more often this condition is repeated.

It is a general object of the invention to provide mechanism which may be readily applied to existing looms of the type described and which will delay a second bobbin transfer indicated immediately after one preceding.

A more specific object is that of devising means to delay such a bobbin transfer which may be utilized on looms of this type which employ either mechanically or electrically operating filling feeders.

Other objects will appear from the following more detailed disclosure.

According to the invention a means is applied to the transfer setting linkage to lock that linkage in an inactive position after a first transfer. When in that position, the replenishing mechanism is temporarily disabled from indicating a second transfer until at the next forward movement of the filling cam follower trip, the linkage is unlocked or released and can then indicate and initiate the cycle of transfer for replenishing the second shuttle.

The invention will be described in detail by reference to a preferred embodiment thereof as illustrated in the accompanying figures of drawing, wherein:

Figure 1 is a perspective view of a loom having a 2 x 1 box motion and to which the invention has been applied. Fig. 2 is a perspective view of that part of the filling motion with which the invention is intimately associated and showing parts locking the lifting lever in disabled position.

Fig. 3 is a view similar to Fig. 2 but showing parts as seen from the opposite side.

Figs. 4 and 5 are views similar to Figs. 2 and 3 but showing the parts with the lifting lever unlocked.

Fig. 6 is a section taken vertically at the line 6-6, Fig. 5.

Fig. 7 is a diagrammatic view illustrating the cycle in these looms where two transfers occur in succession with a minimum of picks intervening.

Now referring to Fig. 1, the invention has been shown as it applies to an XD model loom manufactured by Draper Corporation of Hope Dale, Massachusetts. These looms have a pair of vertically movable shuttle boxes at one end and a battery and other replenishing means at the opposite end. Two shuttles are picked in alternation, e.g., from the upper of the two movable boxes and then back from the replenishing side to that box and then, after shifting the boxes, the other shuttle is likewise picked and returned. This is repeated and the filling thereby mixed so that an appearance of uniformity is realized over an expanse of fabric area.

Filling carried by these fly shuttles periodically becomes exhausted and a feeder mechanism acts to set up the transfer function. Here each filling package and its shuttle are served by an individual feeder which may preferably be of the side slipping type although that is not entirely necessary. Here electrical feeder means is described but it is to be understood such function may be mechanically carried through.

The basic loom is shown in dot-and-dash lines and includes among other parts, a loom side 10, lay and lay end 11, picker stick 12, checking means 13 and a lug strap 14. At the lay end a pair of shuttle boxes 15 having upper and lower binders 16 and 17 are raised and lowered as a unit in a conventional manner by a rod 18. The usual lifting means is employed and the boxes are guided and stopped in a conventional way.

Parts which are more intimately concerned with the invention are shown in full lines. An upper feeder 19 and lower feeder 20 are of the type shown and described in United States Patent No. 1,854,963 and these are electrically interconnected through conduits 21 and 22 to a solenoid 23.
At the front of the loom, Figs. 2-5 also, means to set the transfer motion for actuation includes at the right hand end of the loom. An arm 26 fixed to the starting rod has a filling feeler slide 27 attached thereto forwardly and rearwardly of the loom and pivoted to it at 28. A depending lug 29 slides in slot 30 in bracket 31 and maintains the slide in its proper path and at a prescribed height.

The upper hooked end 32 of a filling cam follower trip 33 is swung to and fro, one complete oscillation for every two picks made by the loom and normally that motion induced by a filling cam (not shown) is an idle one. However, at such times as filling is indicated to be nearly exhausted in a shuttle, this hooked end 32 is connected to an end 34 of the slide 27 so that forward motion of the trip 33 carries slide 27 with it to swing arm 26 and the starter shaft forwardly to set the transfer parts. Of course, that is all timed to occur at the correct point in the cycle for transfer as will be explained.

To interconnect the hook 32 and slide end 34 a lifting lever 35 pivoted to the slide end at 36 is elevated to enter notch 37 in the hook end. That is accomplished here specifically by means of an auxiliary lever having a forwardly directed arm 38 and an offset arm 39 the toe 40 of which engages under lifter lever 35 between its pivot and that end engageable in the notch, and a Bowden wire cable 41. The latter is carried by a guide bracket 42 and is pushed upwardly by an arm 43 actuated by the solenoid. At its upper end it engages beneath arm 39 of the auxiliary lever. This lever is pivoted to the slide at 44.

Thus upon actuation of the solenoid by either feeler 19 or 20, the lifting lever is raised and transfer will be completed upon forward motion of the lay in the usual manner. However, in those looms it should be borne in mind that it is always the inactive shuttle the supply of filling in which is being indicated and thus there must be provision for holding that indication over until that shuttle is picked over to the replenishing side after two picks have been made by the then active shuttle. Here it is only necessary to recall the fact that it is accomplished by timing and by constituting the solenoid as a hold circuit. At the time indication is taken and the solenoid actuated the filling cam follower trip will have just moved forwardly so that the raising of the lifter lever comes just too late for it to enter the notch 37. Thus it will be two picks later before that can occur. The magnetic solenoid being part of a holding circuit provides for the lifter lever remaining up to latch these parts together so the slide may be pushed forwardly to set the transfer means to carry out its function after the boxes have moved and at the first pick of that shuttle which is to be replenished. When replenishment has occurred, the parts are rendered inactive by a cam 44 which acts upon an adjustable follower screw 39 at the end of arm 38. That forces the parts downwardly and releases the armature at the solenoid.

In the event filling in both shuttles becomes exhausted at substantially the same time two indications will take place, a second one at the very next vertical shifting of the shuttle boxes after first indication, and there can be no indication of the replenished shuttle, and then a pick of the second side to be replenished separating the two functions, that is, only two picks intervening between two successive transfers. As above stated, that allows too little time for several functions and thus a wider separation is desired.

In Fig. 7, the cycle from one transfer through another is shown diagrammatically. At position 1 the boxes have just moved upwardly and the X denotes an indication at feeler 19, Fig. 1 so that the transfer cycle is set up to the point where the lifting lever is raised. However, shuttle S-2 is picked over and back first whereupon the boxes move downwardly to position II and feeler 20 indicates for a transfer at shuttle S-2. Shuttle S-1 then is picked to the right, is replenished and is returned. The boxes then move to position III and as the shuttle S-2 is picked it receives a full bobbin and is returned. Thus, as the loom is normally operated second transfer comes at the second pick after the first.

According to the invention this spacing between picks is extended by four picks. To accomplish that a blocking means is applied to an element in the linkage which sets up the transfer mechanism for carrying through its function so that it will not be effective at that indication coming secondly, and just after the other shuttle has been replenished. Specifically such means is applied to the auxiliary lever arm 39, but it is to be understood that it may be applied at other points in the linkage.

This mechanism comprises very few, simple parts which may be installed without any change to existing parts on the loom. It comprises as its principal part a slide member 45 slotted as at 46 to be retained upon stud 44, Fig. 6 especially, and also to permit its movement lengthwise of the arm 39. This member 45 is continued upwardly at one end to extend as at 47 across the arm to the opposite side of the slide and to depend at 48 past the stud so as to provide a sort of U-shaped extension to which is adjustably attached by a screw 49 a resetting member 50. The latter is slotted at 51 and thus may be adjusted for a purpose to appear later.

At about its mid-point the slide member 45 carries an extension 52 offset slightly to align with the center of arm 39. This serves as a means to set the parts manually which is desirable, for example, when making loom adjustments. Every time the filling cam slide 27 moves to the front the forward end of slide 45 is then contacted by a fixed stop member 53 whereupon the device is set to project the parts into transfer inhibiting position (Fig. 2) in a manner to be explained. The stop member is clamped under or by the bracket 31, or by any other suitable fixed part of the adjacent loom structure.

The slide member also carries at its innermost end an adjustable plate 54 having an angularly disposed, laterally directed, wedge piece 55. This wedges under a boss 56 forming a part of the slide end 34 and when in the position of Figs. 2 and 3, that is, when a deflection arm 58 is set up locks the arm 39 downwardly so that the solenoid and linkage affected thereby cannot raise this arm and the lifter lever remains inactive. The plate 54 is reached to slide member 45 and the screw 57 and it may be swung about its attaching point to position the wedging piece 55 higher or lower.

A laterally bent lug 58 rests upon the top of arm 39 and holds up that end of the slide 45 on the arm so the wedging action may be imparted to the arm.

The parts are held in position by a U-shaped spring of flat spring stock. This spring has one side piece 59 apertured to be held on stud 44 and the other parallel side member 60 fits upon between slide 27 and the depending part 48. In assembly, the slide and attached parts are placed on the arm 39 and then the spring is sprung to place the slide 59 snapping onto the stud end when its aperture aligns therewith.

The parts are set in active or transfer inhibiting position at a transfer as at that time movement of slide 27 carries the parts to the front of the loom until the forward end of slide 45 strikes stop 53 under the boss 56 (Figs. 2 and 3). When released they move to the rear, Fig. 5, the first forward swing of the filling cam follower trip causes its top front portion to engage a laterally bent wall 61 of the resetting member 50 and thereby move the parts to an inactive relationship.

Now referring to Fig. 8, with the mechanism herein described and illustrated, the cycle of transfers, one immediately after another, starts as in Fig. 7, but every time the filling feeler slide moves to rock the starter rod
the wedge piece 55 is inserted below lug 56. At transfer indication X, position I, shuttle S-2 is picked over and back, the boxes move down to position II and the shuttle S-1 is picked and replenished.

On this move to position II a second indication for transfer has been made, however, this time for shuttle S-2, but since on the previous transfer arm 59 has been locked down and there has not been time for the wall 61 to be contacted to retract the parts, this is an idle or ineffective effort.

The boxes move up to position III and shuttle S-2 is again picked and returned. The feeder bunch on the bobbin must contain enough thread to make these extra picks.

The boxes move downwardly again to position IV and the replenished shuttle S-1 is picked to and fro. On that movement the feeder 20 will again indicate and this time the disabling means will have been withdrawn so that at the next box change V and the first pick of shuttle S-2 transfer will be effected.

Here it becomes evident that there are four more picks in the cycle after the first shuttle was replenished before the next one is actually in position and can receive its bobbin. This gives added time needed to assure that the temple thread cutter will have worked to sever the threads at the selvage, or if other apparatus utilizing a bobbin stripper, for example, is acting to supply filling in the weaving function, sufficient time to clear one empty bobbin before another enters will be available.

While one embodiment of the invention has been described, it is to be understood that the inventive concept may be carried out in a number of ways. This invention, therefore, not to be limited to the precise details described, is intended to embrace all variations and modifications thereof falling within the spirit of the invention and the scope of the claims.

We claim:

1. In a multi-shuttle loom of the type described the combination of means for successively replenishing filling in at least two shuttles wherein the filling supply has become exhausted at substantially the same time which includes filling feeder means for each shuttle, a linkage responsive to indication by either of said feeder means for effecting transfer of a full supply of filling first to one shuttle and then to a second shuttle, and means for locking said linkage against completing its transfer function at the first indication for the second shuttle to be replenished.

2. In a multi-shuttle loom of the type described the combination of means for successively replenishing filling in at least two shuttles wherein the filling supply has become exhausted at substantially the same time which includes filling feeder means for each shuttle, a linkage responsive to indication by either of said feeder means for effecting transfer of a full supply of filling first to one shuttle and then to a second shuttle, and a means forming a part of and effective upon at least one element in said linkage for locking it in an inactive position at the first indication for transfer to the second shuttle successively to be replenished.

3. In a multi-shuttle loom of the type described the combination of means for successively replenishing filling in at least two shuttles wherein the filling supply has become exhausted at substantially the same time which includes filling feeder means for each shuttle, a linkage responsive to indication by either of said feeder means for effecting transfer of a full supply of filling first to one shuttle and then to a second shuttle, and a latch means movable in response to indication by a feeder for temporarily interconnecting said periodically movable means and second member and means effective at each transfer function for locking the linkage against being interconnected at the next succeeding movement of said periodically movable member.

4. Mechanism as defined in claim 3 wherein said means for locking the linkage as described is applied to a lever movable in response to indication for filling replenishment.

5. Mechanism as defined in claim 3 wherein said means for locking the linkage as described comprises a slide member applied to a lever, a wedging portion carried by said slide member engageable with a fixed abutment and a means engageable by a stop for setting said slide member in a position to lock the lever in an inactive position.

6. In a multi-shuttle loom of the type described the combination of movable shuttle boxes, shuttles in said shuttle boxes, means to move said shuttle boxes for picking first one shuttle to and fro in the loom and then the second shuttle while the filling is maintained in the means to indicate near exhaustion of filling in each shuttle and other means responsive to an indication for transferring a full supply of filling to that shuttle requiring replenishment, said last mentioned means normally acting to replenish the second shuttle becoming exhausted two picks later in the cycle than the first where both shuttles become exhausted at substantially the same time, and means for delaying the replenishing of the second shuttle simultaneously requiring such replenishment for at least four additional picks.

7. Mechanism as defined in claim 6 wherein said means for causing such delay is set in active position to effect said delay by a first transfer motion of parts and is released upon a subsequent movement of parts incidental to transfer, but after two intervening picks.

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