Dec. 13, 1938. H. KÖHLER ET AL 2,140,134

DOUBLE-SHED LOOM

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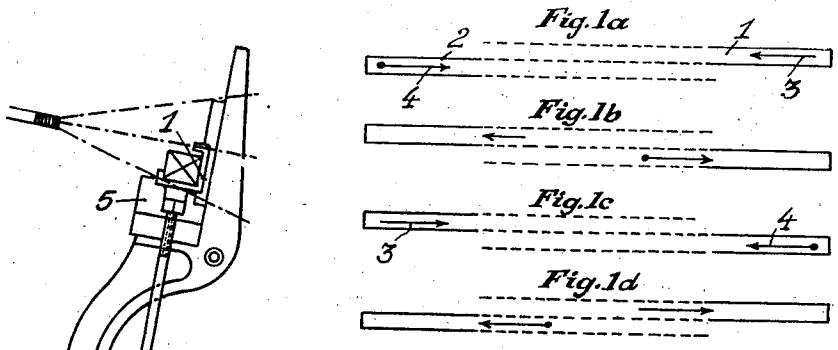


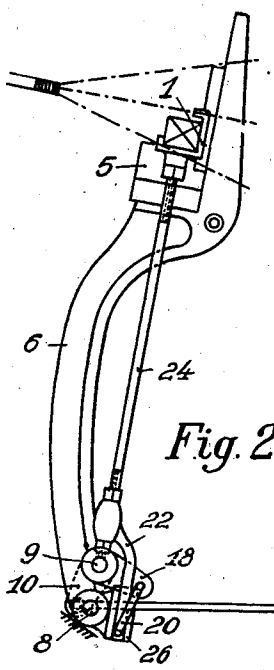


Fig. 2

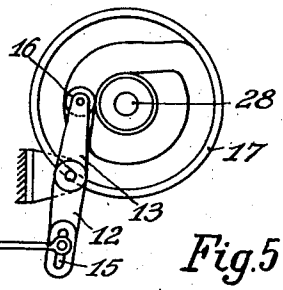


Fig. 5

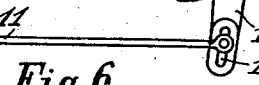


Fig. 6

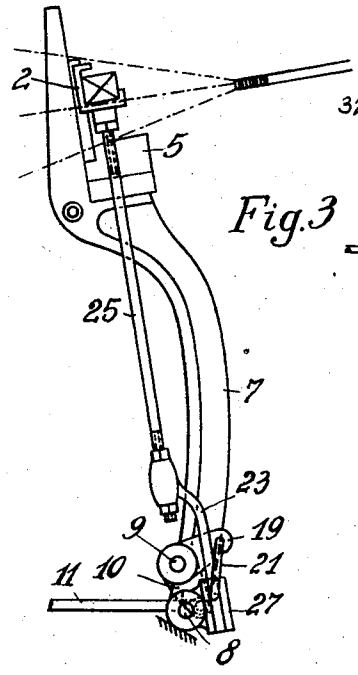
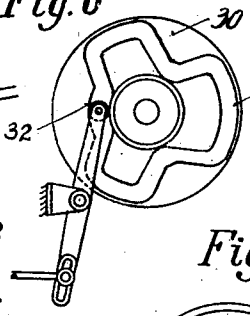


Fig. 3



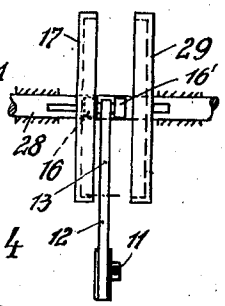
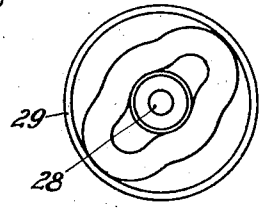


Fig. 4



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UNITED STATES PATENT OFFICE

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DOUBLE-SHED LOOM

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6 Claims. (Cl. 139—20)

The invention relates to double-shed looms, i. e. looms of the class in which two shuttles are thrown from opposite sides of the loom, one leaving its thread in the upper and the other in the lower of two sheds formed in the warp, for the purpose of increasing the output of the loom. There is only a single shuttle-box provided at each end of the lay, this shuttle-box changing its position while the shuttles travel through their sheds.

Constructions of this kind have ben used so far in connection with looms for weaving seamless bags or other tubular or hose-shaped fabrics in which two shuttles are simultaneously thrown through the double-sheds in opposite directions. In these looms the position of the shuttle-boxes has been changed in the interval between the throwing and receiving of the shuttle on the one hand and after receiving of the shuttles in the shuttle-boxes on the other hand, so that the shuttle which first travelled through the upper shed travels through the lower shed in the next shuttle-stroke, while the shuttle first having passed through the lower shed now enters into the upper shed.

A similar process has been used in weaving double-plush fabrics with two shuttles, for the purpose of introducing alternatively fine and coarse weft threads into the fabric while retaining the method of weaving with two shuttles. In the first mentioned case the connection between the borders of the two layers of fabric thus resulting was intended for the production of seamless bags, while in the second instance this connection was not detrimental, since the weft threads passing over from the upper to the under cloth and vice versa could be cut by the interposed knife holder without impairing the market value of the fabric. The movement of the shuttle-boxes required for this type of weaving has been effected partly by grooved cams separately provided for each side, partly also grooved cams or eccentrics in combination with balance levers or arms, oppositely swinging angle levers and draw-bar systems have been used in order to do with a single grooved cam for both sides. Also cranks driven by partly toothed wheels are known for the purpose of driving the said cross weft changing boxes.

Compared to arrangements with two shuttles and two superposed stationary shuttle-boxes at each end of the lay such as used for twin looms, double-plush, moquette and carpet looms the single-cell cross-wisely operated movable shuttles offer the advantage that they permit of inspection by the weaver as regards the quantity of thread still available in the two shuttles.

It is the object of the invention, to secure this advantage also for the production of fabrics by means of two shuttles which strictly require a solid selvedge at both sides. To this end the control device for the shuttle boxes is so provided that the position of the shuttle-boxes is changed only in the interval between the discharging and receiving of the shuttles. Thus, one of the two shuttles is caused to pass always only through the upper shed, while the other shuttle is always discharged only through the lower shed. The fabric is thus provided with the desirable solid selvedge without necessitating double-cell shuttle boxes at each end of the lay which would hinder the free inspection.

It is thus possible to use the lay with the cross weft changing device also for double carpet looms or for twin looms in which the upper weft thread has another colour than the under weft thread (Umbra-drill and similar cloth). In case of high pile plush, such as used, for instance, for covering or lining of toy animals, the new apparatus and process moreover offers the advantage that the position of the shuttle box can always be easily adapted to the middle shed position by simply increasing the stroke of the shuttle box, while in case of two stationary shuttle boxes at each end of the lay the height of the upper box has to be regulated by interposing additional spacing members in the back wall of the shuttle box.

The shuttle box motion is so constructed that the short changing motions will be effected with the highest possible precision, avoiding additional motions of the shuttle box with respect to the lay and vibrations of the machine parts which would impair the safety of operation. Moreover provision has been made for using our new device instead of the aforementioned known devices, also for weaving seamless bags and double plush with two kinds of weft thread.

The invention will be better understood by reference to the following detailed description in connection with the accompanying drawing, showing by way of example and diagrammatically an embodiment of the invention.

We have only shown in the drawing such parts of a loom of the class referred to as are necessary to enable those skilled in the art to which our improvements belong to understand the construction and operation of the same.

Referring to the drawing,

Figure 1a, Figure 1b, Figure 1c and Figure 1d

illustrate the four phases of the new working method;

Fig. 2 is a side elevation of the right hand end of the lay with our new control system;

Fig. 3 is a side elevation of the left hand end of the lay:

Fig. 4 is a grooved cam of a type known per se to be used in combination with our new and improved control system;

Fig. 5 is a fragmentary view, showing the combined arrangement of two different grooved cams to be moved alternately into driving position with respect to the control lever;

Fig. 6 shows another type of grooved cam.

As our invention relates only to our improvements in looms of the kind referred to, it will not be necessary to particularly describe the construction and operation of the other parts of the loom which may be of any usual and well-known construction and operation.

As indicated in Figures 1^a—1^d of the drawing, a single cell shuttle change box 1 of known kind is disposed at the right hand end of the lay, and a similar single cell shuttle change box 2 is disposed at the left hand end of the lay. The upper and lower sheds are indicated by dotted lines. The upper shuttle 3 is represented by an arrow and the lower shuttle 4 by an arrow having a dash at its end. The operation of our novel device is as follows:

If the first pair of weft threads is to be inserted, the left hand shuttle box 2 is in its lower position and the right hand shuttle box 1 is in its upper position (position Figure 1^a). Now, the lower shuttle 4 is discharged, through the lower shed, towards the right and the upper shuttle 3 is discharged through the upper shed towards the left. Having discharged the shuttles 3 and 4, the shuttle boxes 1, 2, change their position so that the shuttle 4 is received by the right hand shuttle box 1 and the shuttle 3 is received by the left hand shuttle box 2 (position Figure 1^b). Contrary to the known lays having cross weft change operation the position of the shuttle boxes according to this invention is not changed while the shuttles are in the boxes. Accordingly the upper shuttle 3 is again discharged through the upper shed and the lower shuttle 4 through the lower shed (position Figure 1^c). Immediately after the discharge of the shuttles the position of the shuttle boxes 1, 2 is again changed so that on arrival of the shuttles the left hand shuttle box 2 is ready for receiving the lower shuttle and the right hand shuttle box 1 is ready for receiving the upper shuttle (position Figure 1^d). This operation is now repeated. The four phases of the operation will be clear from Figures 1^a—1^b, showing that the upper shuttle 3 always travels only through the upper shed and the lower shuttle 4 passes always only through the lower shed. Hence the shuttles are operated in the desired manner. Compared to the known cross shuttle change motions the device offers the advantage that it works with half of the change strokes and thus permits of a quicker operation of the looms provided therewith.

In order to effect the aforedescribed movements the construction shown in Figs. 2 and 3 has been provided.

The single cell shuttle boxes 1 of the right and 2 of the left hand side are guided in customary manner at the front ends of the lay 5 which is supported by the lay arms 6 and 7. A shaft 9 is rotatably mounted on the lay arms 6 and 7, above the lay shaft 8 which is rotatably supported in a stationary bearing. Fast on shaft 9 is a lever 10 which is connected, by a draw-bar 11 with a two-armed lever 12, 13 which is operated from a grooved cam 17, by its roller 16. The stroke of the draw-bar 11 can be adjusted by changing the point of attachment in a slot 15 of the lever arm 12. Levers 18 and 19 are fast on the shaft 9, lever 18 being directed to the rear and lever 19 to the front end of the loom. The levers 18, 19 are connected, by short draw-bars 20, 21, respectively, with the lower ends 22 and 23 respectively, of the rods 24 and 25, carrying the shuttle boxes. Guiding slots 27, swinging with the lay arms 6 and 7 are provided for guiding the lower ends 22 and 23 of the rods 24 and 25, respectively. The effective length of the lever 10 is equal to the distance between the axes of shafts 8 and 9. By this arrangement and due to the considerable length of draw-bar 11 the stationary position of the shuttle boxes in their end positions with respect to the lay is absolutely ensured which is an important expedient in order to secure a good run of the shuttles, in view of the particular operation of looms with cross shuttle motion. The aforedescribed particular combination of the driving members with the shaft 9 which swings together with the lay, permits of the use of very short levers 10, 18, 19, thus obviating undesirable dynamic or inertia effects which would cause, in case of quick operation, undesirable vibrations and hence detrimentally affect the run of the shuttles, this disadvantage being known from the cross shuttle looms hitherto used.

The operation of our novel device hereinbefore described is as follows:

The two-armed lever 12, 13 is reciprocated by the grooved cam 17, in the desired manner, and in turn drives, by the draw bar 11 and lever 10, the shaft 9 and the levers 18, 19. The shuttle boxes 1, 2 are thus simultaneously moved in opposite vertical directions.

The stroke of the shuttle boxes can be adjusted by displacing the end of the draw bar 11 in the slot 15 of the lever arm 12.

Our invention also comprises the combination of our novel shuttle box motion with the known shuttle box motion for cross shuttle operation. To this end a grooved cam 29 of the kind shown in Fig. 4 and known per se may be mounted on shaft 28 oppositely to the grooved cam 17 in the manner shown in Figure 5, acting upon an additional roller 16' on arm 13 of the control lever. Now, by axially displacing the grooved cams on shaft 28 either of the two cams can be engaged with the lever arm 13. By providing an automatic control for the displacing movement of the cams 17 and 29 the operation of the shuttle boxes can be periodically changed from ordinary cross shuttle operation to our novel cross shuttle operation, if desired.

Another possibility of combining the old and new operation is represented in Fig. 6, showing a grooved cam 30 which is intended for inserting periodically by one shuttle two wefts into the upper shed and two wefts into the under shed. To this end, the cam 30 makes one revolution while the two shuttles move four times from shuttle box 1 to shuttle box 2 in opposite directions. It will be seen that the groove in cam 30 is so curved that the lever arm 13 is operated to carry out six strokes during one revolution of the cam 30, i. e. dwelling in its extreme outer or inner positions respectively for a longer period while passing along the curve portions

31 and 32 so that during this period the shuttle boxes do not change their position while holding the shuttles.

In a similar way, any other sequence of shuttle motions can be obtained by using suitable cams. For instance in case of three wefts of one shuttle through the upper shed in periodic succession with three wefts of the same shuttle through the under shed a grooved cam would have to be used making one revolution during six passages of the two shuttles through the fabric.

While we have herein shown and described certain preferred embodiments of our invention, we wish it to be understood that we do not confine ourselves to all the precise details herein set forth by way of illustration, as modification and variation may be made without departing from the spirit of the invention or exceeding the scope of the appended claims.

We claim:—

1. In a double-shed loom, a lay, a single cell shuttle box at each side of the lay, two shuttles adapted to be simultaneously thrown through the sheds from opposite sides of the loom, means for moving the shuttle boxes alternately up and down and means for controlling said up and down movement to occur only during the passage of the shuttles through the sheds and retaining said shuttle boxes in their position while the shuttles are in said shuttle boxes.

2. In a double-shed loom, a lay, a single cell shuttle box at each side of the lay, two shuttles adapted to be simultaneously thrown through the sheds from opposite sides of the loom, a rotatable cam and a control lever coacting with said cam for moving the shuttle boxes alternately up and down during the passage of the shuttles through the sheds only and retaining said shuttle boxes in their position while the shuttles are in said shuttle boxes.

3. In a double-shed loom, a lay, a lay shaft, a single cell shuttle box at each side of the lay, driving rods for the shuttle boxes, two shuttles adapted to be simultaneously thrown through the sheds from opposite sides of the loom, lay arms on both sides of the lay, a shaft rotatably mounted in said lay arms, a driving lever with a length equal to the distance between said shaft and the lay shaft fast on said shaft, and two further levers fast on said shaft at opposite sides of the lay and directed to the rear and to the front of the loom respectively, said two further levers acting on the driving rods of the shuttle boxes.

4. In a double-shed loom, a lay, a single cell shuttle box at each side of the lay, driving rods for the shuttle boxes, two shuttles adapted to be simultaneously thrown through the sheds from opposite sides of the loom, lay arms on both sides of the lay, a shaft rotatably mounted in said lay arms, a driving lever fast on said shaft, and two further levers fast on said shaft at opposite sides of the lay and directed to the rear and to the front of the loom respectively, said two further levers acting on the lower ends of the said driving rods, said lower ends being guided in slots disposed in projections of the lay.

5. In a double-shed loom, a lay, a single cell shuttle box at each side of the lay, two shuttles adapted to be simultaneously thrown through the sheds from opposite sides of the loom, a driving shaft, two cams slidable on said driving shaft, and a control lever adapted to engage either of said two cams, whereby the shuttle boxes are moved alternately up and down, either during the passage of the shuttles through the sheds only when the control lever engages one of the cams and during each passage of the shuttles through the sheds or while the shuttles are in the shuttle boxes, when the control lever engages the other cam.

6. In a double-shed loom, a lay, a single cell shuttle box at each side of the lay, two shuttles adapted to be simultaneously thrown through the sheds from opposite sides of the loom, a rotatable cam and a control lever coacting with said cam for moving the shuttle boxes alternately up and down during the passage of the shuttles through the sheds, said cam comprising curved portions adapted to control said control lever, for effecting a change of the shuttle box position each time when the shuttles travel through the sheds and while the shuttles are in the shuttle boxes and further curved portions adapted to hold said control lever in a stationary position while the shuttles are in the shuttle boxes, said curved portions forming one closed endless path.

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