March 30, 1948. O. ZOLLIKOFER 2,438,796

POSITIVELY OPERATING DOBBY

Filed April 24, 1944 2 Sheets-Sheet 1

FIG.1

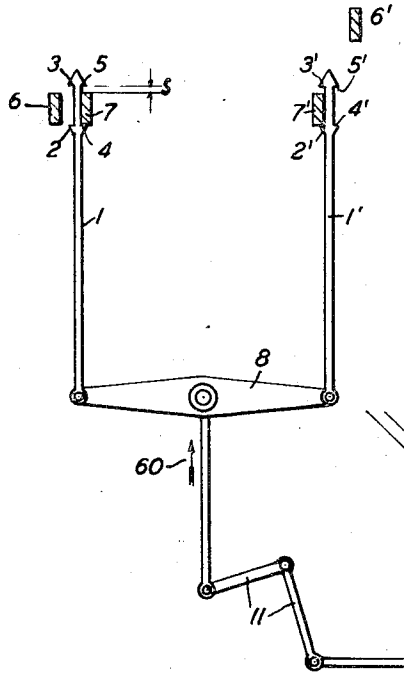


FIG.2

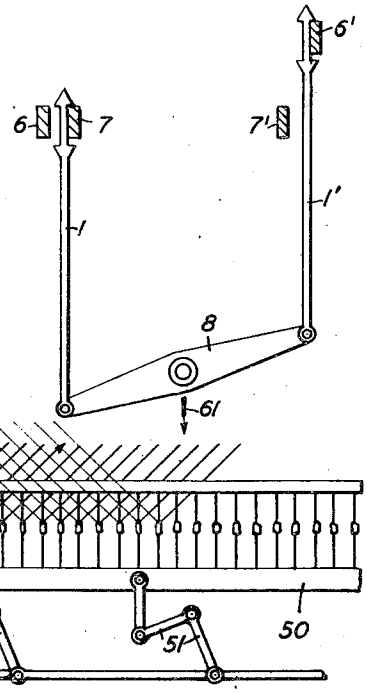


FIG.3

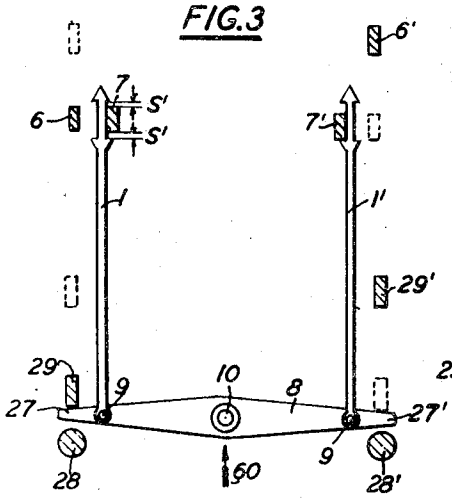
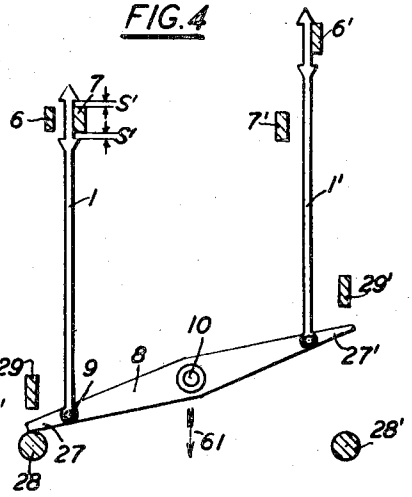


FIG.4



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Filed April 24, 1944 2 Sheets-Sheet 2

Fig. 5.

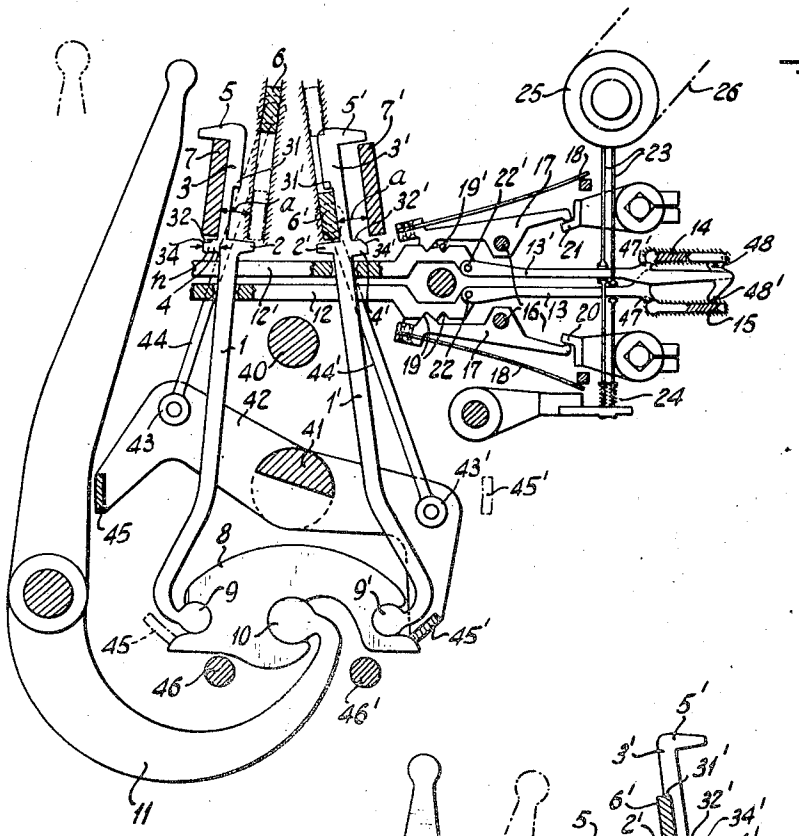
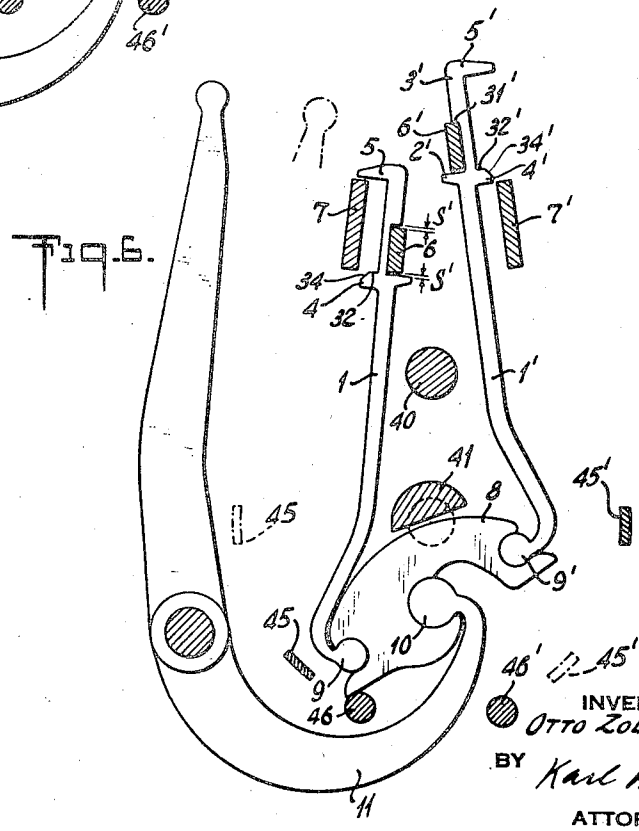


Fig. 6.



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POSITIVELY OPERATING DOBBY

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Application April 24, 1944, Serial No. 532,470

11 Claims. (Cl. 139—72)

1

Positively operating dobbies are known in which the harnesses are held firm while the shuttle is moving. These dobbies have the drawback that during the beating-up of the weft threads into the fabric the warp threads exercise different reactions, in particular the threads which remain in the lower shed several times in succession. The harnesses which remain several times in succession in the lower shed are not positively held at the moment of the beating up, so that the warp threads which they control have less tension than the others, thus giving rise to a difference in the way these threads are bent into the fabric. In other respects also such dobbies are so troublesome that their field of application is limited.

The invention relates to a shedding mechanism or a double-lift open-shed dobby with positive operation of the free ends of the balance-lever by lifters which are actuated by movable draw knives or bars, the forces on the knives being taken up in both directions. The invention consists in that the end of the balance lever on which is fixed the positively operated lifter that has to be controlled, is moved, without the intermediacy of this lifter, by the movement of the other positively operated lifter and a fixed stop, or by a movable stop, in such a way that the lifter which is to be controlled is set free from the movable bar or from a fixed knife or locking bar at the moment when this lifter is allowed to swivel.

The stops may act on extensions of the free ends of the balance lever. The positively operated lifter may be located between a fixed and a movable harness knife. Each of the two hooks which engages with each knife, may be so high that it is always subjected to the influence of this knife.

Figs. 1 and 2 show diagrammatically the method of working of a normal dobby, and

Figs. 3 and 4 that of a dobby working according to the invention.

Figs. 5 and 6 illustrate a further example of an execution according to the invention.

In Fig. 1 the position of the two arm balance lever 8 corresponds to the lower position of the harness 50, to which the healds with the warp threads are connected. In this position, the weft threads exert a lifting influence on the healds and this influence acts through shaft drive 51 and lever 11 on the balance lever 8 from below and exerts a force acting in the direction of arrow 60.

In Fig. 2 the balance lever 8 is drawn in the inclined position. For this position the harness

2

50 will be in the opposite extreme position to that shown in Fig. 1. The thread reaction acting through the lever 11 on the balance lever 8 will then be directed from above to below. In all these positions the balance lever 8 is subjected to forces which are finally taken up by the hooks or projections 2 to 5 or 2' to 5' of the lifters 1 and 1'. A positive control of these lifters 1, 1' would in these circumstances be very difficult and entail great wear of the hooks 2—5 or 2'—5'.

In Figs. 3 and 4 the balance levers are shown in the same positions as those in Figs. 1 and 2, respectively, but the above-mentioned difficulty of control and great wear is eliminated. Two press rails or abutment means 29, 29', whose extreme positions are shown dotted, move in time (synchronously) with the lift rails or draw bars 6, 6'; two fixed stops or abutment means 28, 28' are provided adjacent the balance lever 8. These various stops or abutments 29, 29', 28, 28' act on the extensions 27, 27' of the balance lever 8 as follows:

If the lifters 1, 1' are controlled in such a way that the pivot points 9, 9' of the balance lever 8 are at the same level (Fig. 3), the force exerted from the harness 50 are directed upwards (arrow 60). In order to make these forces ineffective on the lifter 1 which has to be controlled, the press rail 29 will press on the extension 27 of the balance lever 8 and the play s (Fig. 1) will be distributed on both sides of the fixed rail 7, a clearance of s' on each side.

When the control is set so that the balance lever 8 is set obliquely (Fig. 4), the forces operating from the harness 50 are directed downwards (arrow 61). In order to free the lifter 1, it is therefore necessary to exercise a reaction in the other direction than in Fig. 3. Because of the oblique position of the balance-lever 8, the extension 27 is pressed on to the fixed stop 28 and the distribution of the play s' will have no effect on the rail 7. Through the stops 28, 29 or 28', 29' the lifters 1 or 1' will not transmit any forces from the balance lever 8 to the knives or bars 7, 7' or 6, 6' and can therefore be controlled without any friction.

Fig. 5 illustrates an example of execution of such a double-lift dobby. The lifters 1, 1' are provided with two double hooks 2, 3 and 4, 5, and 2', 3' and 4', 5', which can take up in both directions the forces transmitted from the harness (not shown) over the balance lever 8 and the lever 11. The hooks 2, 3 form a recess which will come into engagement at choice with the movable shaft draw knife or bar 6, and the hooks

4, 5 from a recess which engages the fixed knife or locking bar 7. A lifter 1, 1' is articulated to each end 9, 9' of the balance lever 8. The fulcrum 10 of the balance lever is connected to the lever 11.

The lifters are controlled by means of the rods 12, 12', the control lifters 13, 13' and the control knives 14, 15. The rods 12, 12' are held fast in their end positions by the levers 17 which are carried on the pins 16 and pressed by the leaf springs 18 into the notches 19, 19' in the rods 12, 12'. In order to hold the rods 12, 12' with certainty in their end positions, movable stops 20, 21 are also provided which press the levers 17 positively into the notches 19, 19'. If one rod 12 or 12' is not in its proper position and if the lever 17 cannot be pressed right down into the notch 19, the loom will be stopped by some safety device known per se.

The control lifters 13, 13' are on the one hand attached to the rods 12, 12' so that they can pivot about the axes 22, 22' and are on the other hand held by the needles 23. The needles 23 are pressed by springs 24 against the pattern card 26 which is held against the drum 25; the needles 23 therefore take up a definite position depending on the holes in the card. In this way the control lifters 13, 13' come into engagement either with the control knife 14 or with the control knife 15. For this purpose the lifters 13, 13' have free end portions, each provided with hooks or projections 47, 48 and 47', 48' respectively, projecting from opposite sides of said end portions and having operating faces facing one another; the distance between said faces on each lifter is greater than the breadth of each reciprocating knife 14 and 15 plus one-half of its stroke. This assures reliable engagement of all parts of the mechanism.

The transmission shaft 40 is driven by the loom. On this shaft 40 are keyed cams (for the sake of clearness, not shown) which give the shaft 41 an oscillating reciprocating motion. On the shaft 41 is keyed a double lever 42 on which are fitted the pins 43, 43' which operate the lift knives 6 and 6' through the connecting rods 44 and 44'. On this double lever 42 are also two abutment means constituted by press rails 45, 45' which press on the balance lever 8 or not, according to their position. Two fixed abutments constituted by press rails 46, 46' are also provided, against which the balance lever 8 presses or not, according to its position. The press rails 45, 45' are shown dotted in their outermost positions.

When the balance lever 8 is in its horizontal position as shown in Fig. 5, the press rail 45' presses so strongly on the balance lever 8 that the lifter 1' is freed and, depending on the control of the rods 12, 12', is swung over or not. On the other hand, when the balance lever 8 is in an oblique position (Fig. 6), the end 9 of the balance lever 8 which remains in the lower position presses so strongly against the fixed stop 46 that the lifter 1 is freed, i. e. the play s' is distributed on both sides of the movable rail 6. In this freed position, each control motion can take place unhindered and also without any wear.

The hooks 2 and 5 or 2' and 5' (Fig. 5) are so high that they never come out of potential engagement with the corresponding knives or bars 6, 7 or 6', 7'. The hooks or projections 4 and 4' are provided with operating surfaces 32 and 32' and inclined surfaces 34 and 34' respectively. The sum of the projections of the two operating surfaces 31 and 32 or 31' and 32' is somewhat less than the distance a between the two harness

knives 6 and 7 or 6' and 7', so that the lifter 1 or 1' of the movable harness knives 6 or 6' can in no case be blocked by the lifter 1, 1' being in the wrong position.

The total projection h of the hooks 4 or 4' and the thickness of the part of the hook between the operating surface of the hook 2 or 2' and the surface 31 or 31' is chosen somewhat less than the distance a so that the hook 4 can rest on and slidably engage the fixed knife 7 during the whole movement of the lifter 1 with the shaft draw knife 6, whereby the lifter 1 remains locked in engagement during its whole movement with the shaft draw knife 6.

I claim:

1. A double-lift open-shed dobby comprising, in combination, a two arm balance lever, a lifter member swingably connected with each arm of said balance lever, harness lever means having an end portion swingably connected with said balance lever at its fulcrum, a two arm operating lever positively operated by the loom, two link members, each of said link members having one end swingably connected with one arm of said operating lever, a draw bar connected with each of said link members at the other ends thereof, said draw bars being adapted to individually engage and positively operate said lifter members in two substantially opposite directions, and abutment means forming part of said operating lever and being adapted to engage said balance lever and fix its position upon engagement.

2. A double-lift open-shed dobby comprising, in combination, a two arm balance lever, a lifter member swingably connected with each arm of said balance lever, harness lever means having an end portion swingably connected with said balance lever at its fulcrum, a two arm operating lever positively operated by the loom, two link members, each of said link members having one end swingably connected with one arm of said operating lever, a draw bar connected with each of said link members at the other ends thereof, said draw bars being adapted to individually engage and to operate positively said lifter members in two substantially opposite directions, and abutment means rigidly connected with each arm of said operating lever and adapted to individually engage one arm of said balance lever and to prevent movement in a predetermined direction of the engaged arm of said balance lever.

3. A double-lift open-shed dobby as set forth in claim 1, the leverage of said abutment means being greater than that of the connection of said link means with said operating lever.

4. A double-lift open-shed dobby comprising, in combination, a two arm balance lever, a lifter member swingably connected with each arm of said balance lever, harness lever means having an end portion swingably connected with said balance lever at its fulcrum, a two arm operating lever positively operated by the loom, two link members, each of said link members having one end swingably connected with one arm of said operating lever, a draw bar connected with each of said link members at the other ends thereof, said draw bars being adapted to individually engage and positively operate said lifter members in two substantially opposite directions, said balance lever having end portions extending beyond the connections with said link members, and two stationary abutment means adapted to individually engage said end portions of said balance lever and prevent movement in a predetermined direction of the engaged arm.

5. A double-lift open-shed dobby comprising, in combination, a two arm balance lever, two lifter members, each of said lifter members having one end portion swingably connected with one arm of said balance lever and having another end portion, said other end portions individually having two substantially oppositely positioned recesses, harness lever means having an end portion swingably connected with said balance lever at its fulcrum, a two arm operating lever positively operated by the loom, abutment means connected with each arm of said operating lever and adapted to individually engage one arm of said balance lever and to prevent movement in a predetermined direction of the engaged arm of said balance lever, two link members, each of said members having one end swingably connected with one arm of said operating lever, a draw bar connected with each of said link members at the other ends thereof, said draw bars being adapted to individually rest in one of said recesses of said lifter members and to operate individually said lifter members in two substantially opposite directions, and two stationary bars adapted to intermittently individually rest in the other of said recesses of said lifter members.

6. A double-lift open-shed dobby comprising, in combination, a two arm balance lever, two lifter members, each of said lifter members having one end portion swingably connected with one arm of said balance lever and having another end portion, harness lever means having one end portion swingably connected with said balance lever at its fulcrum, a two arm operating lever positively operated by the loom, abutment means connected with each arm of said operating lever and adapted to individually engage one arm of said balance lever and to prevent movement in a predetermined direction of the engaged arm of said balance lever, two link members, each of said members having one end swingably connected with one arm of said operating lever, a draw bar connected with each of said link members at the other ends thereof, said other end portions of said lifter members individually having projections at substantially opposite sides of said end portions and forming substantially oppositely positioned recesses, said draw bars individually intermittently resting in one of said recesses and individually operating the lifter member in whose recess they rest, in two substantially opposite directions, and two stationary bars adapted to intermittently individually rest in the other of said recesses of said lifter members, one of said projections forming the recesses for said stationary bars individually slidingly engaging said stationary bars during the operation of said lifter members by said draw bars.

7. In a shedding mechanism for looms, a two-arm balance lever, a lifter member articulated to each arm of said lever and having a hooked end portion, a locking bar disposed on one side of and adapted to be engaged by said end portion, a substantially reciprocatingly movable draw bar disposed on the other side of and adapted to engage said end portion, and means provided on said end portion facing and slidingly engaging said locking bar when said draw bar actuates said lifter member.

8. In a shedding mechanism for looms, a two-arm balance lever, a lifter member articulated to each arm of said lever and having an end portion provided with a hook having an inside

portion, a locking bar disposed on one side of said end portion and adapted to be engaged by said inside portion of said hook, the other side of said end portion having a recessed portion, a draw bar disposed at the other side of said end portion and being reciprocatingly movable substantially parallel to the longitudinal axis of said lifter member and shaped to be inserted in said recessed portion, and a projection extending from said lifter member in the direction of and being spaced from, said hook for accommodating said locking bar, said projection sliding along said locking bar when said draw bar is in said recessed portion and transports said lifter member.

9. In a shedding mechanism for looms, a two-arm balance lever, a lifter member articulated to each arm of said lever and having a hooked end portion, a locking bar disposed on one side of and adapted to be engaged by said end portion, a substantially reciprocatingly movable draw bar disposed on the other side of said end portion, and a projection provided on said other side and adapted to engage said draw bar also when said end portion engages said locking bar.

10. In a shedding mechanism for looms, a two-arm balance lever, a lifter member articulated to each arm of said lever and having an end portion, a substantially reciprocatingly movable draw bar disposed on one side of and adapted to engage said end portion, a locking bar disposed on the other side of said end portion, and a projecting portion disposed at the end of and projecting from the other side of said end portion farther than the distance between said draw bar and said locking bar and adapted to engage said locking bar also when said end portion engages said draw bar.

11. In a shedding mechanism for looms, a two-arm balance lever, a lifter member articulated to each arm of said lever and having an end portion provided with a hook having an inside portion, a locking bar disposed on one side of said end portion and adapted to be engaged by said inside portion of said hook, the other side of said end portion having a recessed portion, a draw bar disposed at the other side of said end portion and being reciprocatingly movable substantially parallel to the longitudinal axis of said lifter member and shaped to be inserted in said recessed portion, and a projection extending from said lifter member in the direction of and being spaced from said hook for accommodating said locking bar, said projection sliding along said locking bar when said draw bar is in said recessed portion and transports said lifter member, the extent of said projection plus the thickness of said recessed portion of said lifter member being only slightly smaller than the space between said locking bar and said draw bar.

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