May 30, 1967 F. LUTZ 3,322,160

DEVICE FOR CONTROLLING MOVEMENT OF A DROP BOX ON A LOOM

Filed June 17, 1965 2 Sheets-Sheet 1

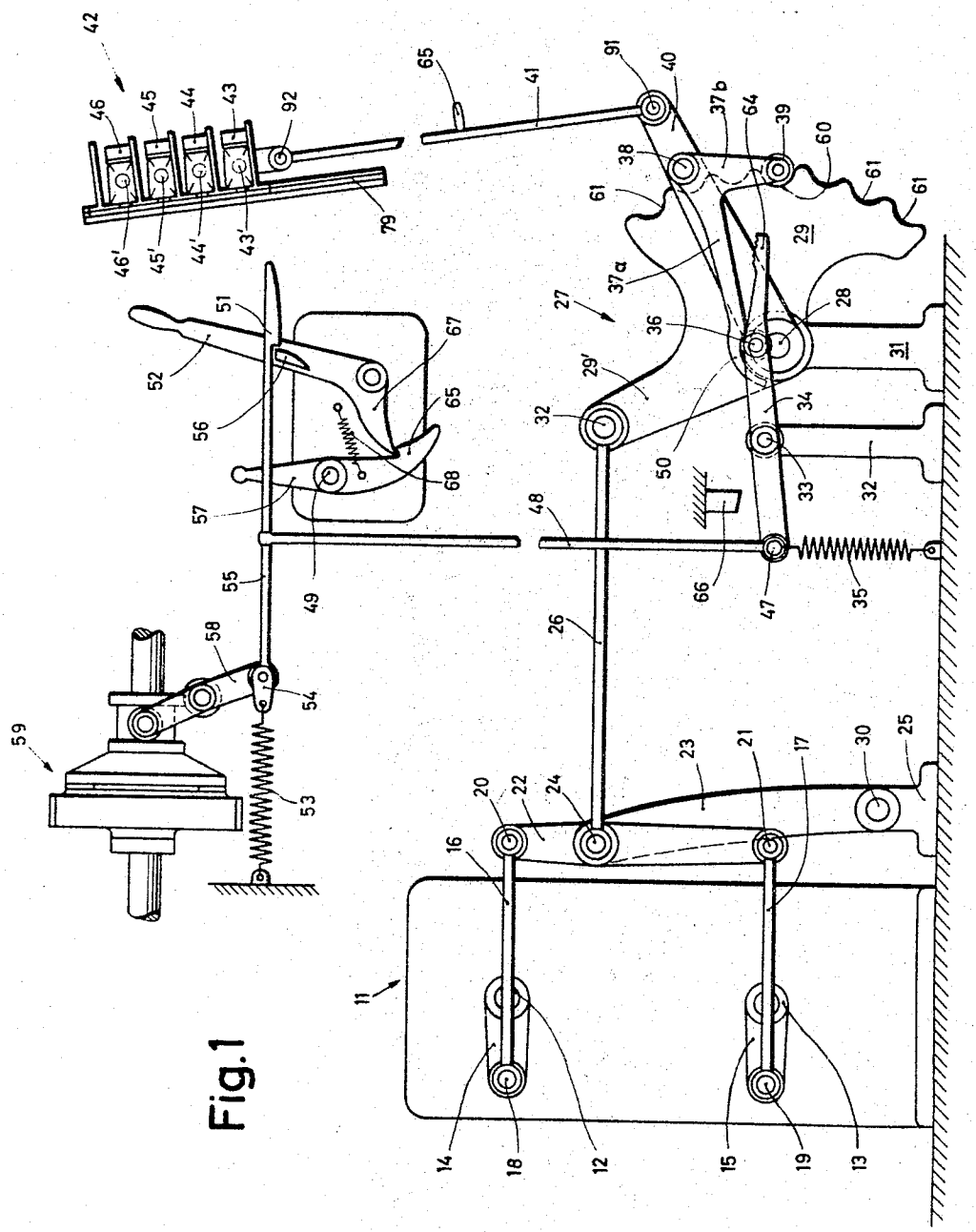

Fig.1

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Filed June 17, 1965 2 Sheets-Sheet 2

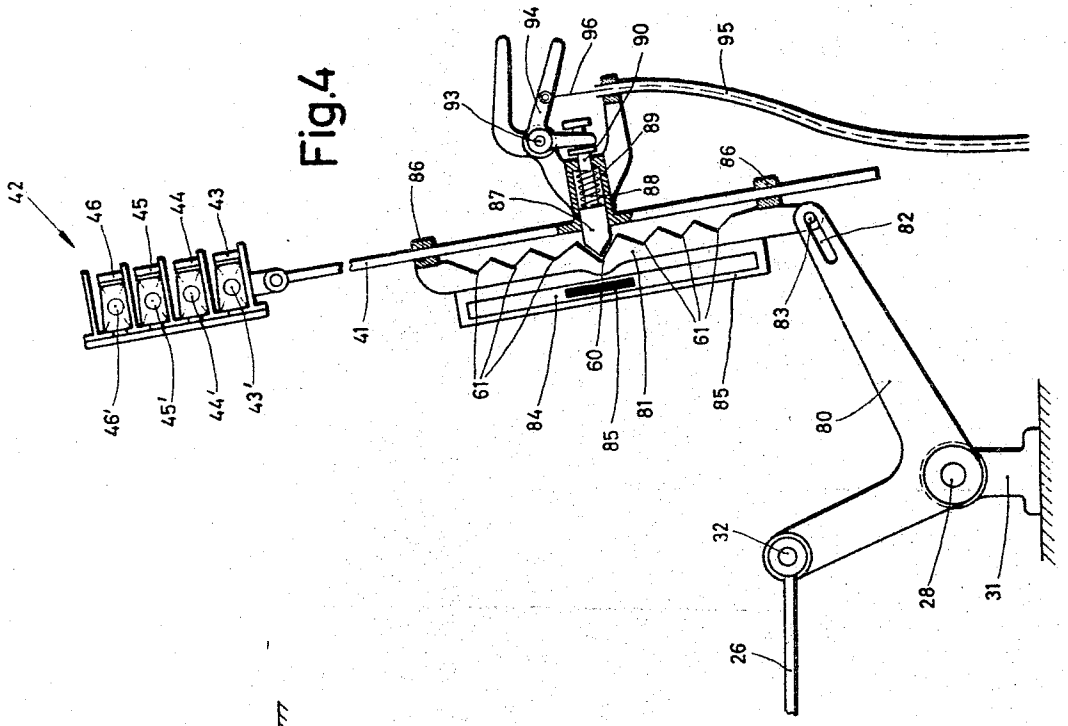

Fig.4

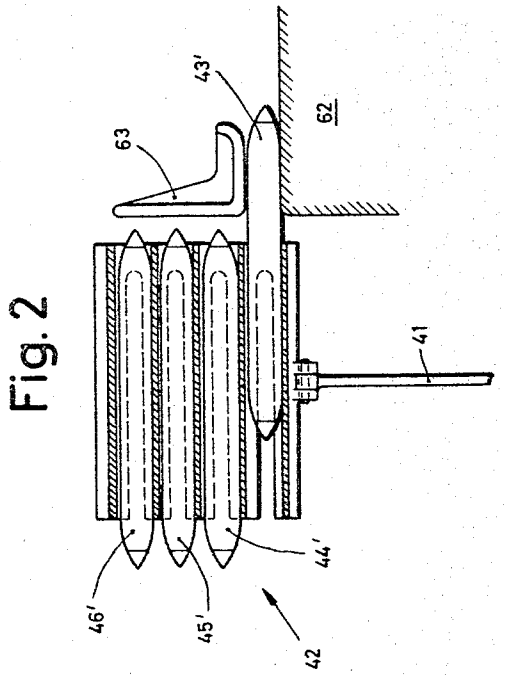

Fig. 2

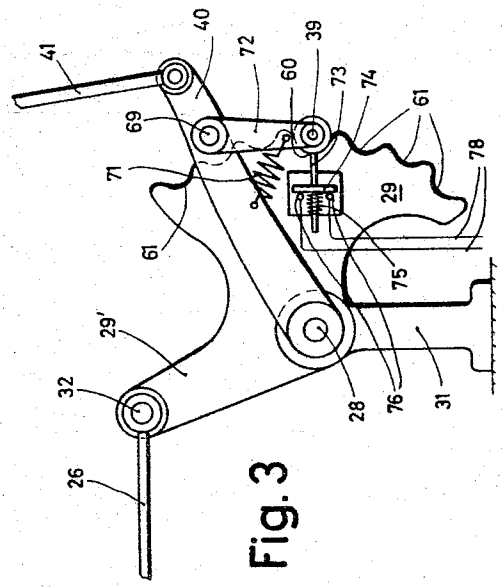

Fig. 3

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3,322,160

DEVICE FOR CONTROLLING MOVEMENT OF A DROP BOX ON A LOOM

Friedrich Lutz, Rothaus, Durnten, Zurich, Switzerland, assignor to Ruti Machinery Works Ltd., formerly Casper Honegger, Ruti, Zurich, Switzerland, a corporation of Switzerland

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14 Claims. (Cl. 139—182)

The present invention relates to a device for controlling movement of a drop box on a loom which is adapted to be positioned in various picking positions by a drop box motion, and in particular to a device providing a coupling means having a working position in which said drop box motion is normally coupled to said drop box during operation of the loom.

In looms with which threads or yarns of varying properties, such as for example varying colors, are woven, a special shuttle is provided for each thread or yarn sort. The drop box for carrying the shuttles in the rest positions has a separate compartment for each individual shuttle. The insertion of the various threads as picks is effected in accordance with a pre-determined program which fixes the alternate settings for operation of the various shuttles.

This operation is effected in such manner that the various compartments of the drop box are, according to the program, moved into a working position so that the desired shuttle sequence or the prescribed sequence of threads may be accomplished. The pre-determined program may be determined by punched cards. By means of the latter, that is in accordance with the arrangement of the apertures therein, a drop box motion is controlled so that its movements are determined by the program and are transmitted to the drop box via a transmission coupling means.

It may happen during the operation of the loom that a shuttle does not take up the correct position of rest in the shuttle box. If, for example, the shuttle still projects a short distance out of the drop box, it will block the movement of the drop box; this may result in damage to the weaving loom. Primarily, damage may take place at any machine part as a direct result of the jamming of the mechanism or, secondarily, in consequence of the immediately following picking motion of the pick.

It is the object of the present invention to overcome these disadvantages. The invention is characterized in that the coupling means has, on both sides of its working position, positioning positions corresponding to the number of maximum possible picking positions of the drop box into which the drop box can be changed; the working position and the positioning positions provide stable coupling states and the locations between these positions form unstable coupling states. The invention is also characterized in that an indicator means is provided which, when the coupling means is moved out of its working position, supplies an indication or signal to actuate a shut-off device which stops the weaving loom.

If, during a box change, the drop box encounters a resistance which is greater than the force which maintains the coupling means in one of its stable coupling states, the coupling means permits deflection to another stable coupling state. In this manner, the coupling means automatically again positions the drop box in one of the stable positioning positions so that when the picking motion follows, the drop box is in a proper position for picking. Finally, the coupling means is so designed that each time a deflection has taken place, an indication is given which is used for stopping the loom.

The invention will now be discussed with reference to embodiments and to the accompanying drawings, wherein:

FIGURE 1 shows a diagrammatic lateral view of a device having coupling means according to the invention;

FIGURE 2 shows a front elevation of the drop box;

FIGURE 3 shows a diagrammatic lateral view of a variant of the coupling means according to the invention; and

FIGURE 4 shows a diagrammatic lateral view of a further embodiment of the invention.

FIGURE 1 shows a drop box motion **11**, which has two pivots **12** and **13** that rotate and, depending on the orders of a punch card (not shown), displace cranks **14** and **15** connected therewith into the position shown or into the position rotated through 180° relative thereto. With the cranks **14** and **15**, as FIGURE 1 shows, rods **16** and **17** are coupled in such manner as to be pivotal about the pivots **18** and **19**, respectively. Pivots **18** and **19** are connected to the two-armed lever **22** in such manner as to be pivotal about the pivots **20** or **21**, respectively. Lever **23** carries the two-armed lever **22** through the agency of a pivot **24** and is pivotal about a pivot **30** (which is secured on a fixed portion **25** of the machine frame).

Pivotal about the pivot **24** is a connecting rod **26** that connects the drop box motion **11** with the transmission coupling means **27**. Said coupling means comprises a rotary body **29** which is rotatable about a pivot **28** and which on the one hand comprises a circular-sector body with grooves **60** and **61** and on the other hand comprises an arm **29'**. The connecting rod **26** is secured by means of a pivot **32** to the outer end of arm **29'**. Pivot **28** is secured to the machine frame by means of a carrier **31**. A two-armed lever **34** is mounted in such manner as to be pivotal about a pivot **33** on a carrier **32** which is also secured to the machine frame. Lever **34** is subjected to an anti-clockwise rotational force by means of tension spring **35**. This force produces, via lever **34** and a roller **36** secured thereto, an upwardly directed pressure on the horizontal arm **37*a*** of a cranked lever, the other arm of which is designated by reference numeral **37*b***. Since the angle-lever having arms **37*a*** and **37*b*** is pivotal about a pivot **38**, it is subjected to a clockwise rotational force. Consequently, a roller or biased member **39** is pressed into groove **60**, as shown in FIGURE 1.

The pivot **38** holds a lever **40**, which is also pivotal about pivot **28** and to which a carrier rod **41** is secured. Secured to the upper end of the carrier rod is a drop box **42**. The drop box has compartments **43** to **46**, inclusive, with shuttles **43'** to **46'**, inclusive, being disposed in each of said compartments. In order that the drop box may be guided exactly in its longitudinal direction, guides **79**, which are secured to the loading frame, are provided. Carrier rod **41** has jointed connections **91** and **92**, respectively, at its ends.

Secured on the two-armed lever **34** is a control rod **48** which is so mounted as to be pivotal about pivot **47**. The control rod actuates a rod **55** rotatably mounted on connecting member **54**. Rod **55** has a projection **51** engaged on a holding member **56**. The holding member is secured to an actuating lever **52** which is retained in its position by means of a retaining lever **57**. The retaining lever is tensioned by tension spring **68**, with the projection **65** holding the projecting arm **67** secured to actuating lever **52**.

Via the connecting member **54** and double lever **58**, spring **53** endeavors to release drive coupling **59**, which couples the driving motor to the main shaft of the loom and thereby acts to separate the drive from the weaving loom. As long, however, as rod **55** is retained on holding member **56** by projection **51**, the driving motor is coupled to the loomn.

FIGURE 2 shows a front elevation of drop box **42** with

the shuttles 43′ to 46′ contained therein. Furthermore, this figure shows a sley 62 and a run-in member 63 for guiding of the shuttles.

In the operation of the device described hereinabove, the control of the punched card causes pivots 12 and 13 of the drop box motion 11 to position cranks 14 and 15 in the position illustrated or in the position rotated through 180° relative thereto. If, for example, crank 14 is in the illustrated position and crank 15 is in the position rotated by 180° about the pivot 13 relative thereto, then this brings about a displacement of the pivot 21 toward the right. This also produces a displacement of the pivot 24 toward the right, although the magnitude of this displacement is smaller than the displacement of the pivot 21, since of course pivot 20 has retained its position. If pivot 24 is to be moved toward the right for a relatively larger distance, the control action of the punched card must produce a 180° rotation of crank 14 and must keep crank 15 in the position illustrated. The relatively larger movement toward the right is accomplished because pivot 24 is closer to pivot 20 than to pivot 21. It will be obvious that rotation of both cranks 14 and 15 through 180° relative to the position shown in FIGURE 1 will produce the maximum displacement toward the right of the pivot 24.

The movement of pivot 24 is transferred to rotary body 29 via connecting rod 26. In this manner, the four different positions (mentioned hereinabove) of the pivot 24 correspond to different angular positions of the rotary body. Since roller 39 is pressed into groove 60 by means of spring 35, it will be appreciated that, when the rotary body rotates, roller 39, the angle lever with arms 37*a* and 37*b*, the pivot 38 and the lever 40 together with carrier rod and the drop box are constrained. In this way, an adjustment of the drop box in accordance with the control provided by the punched card is achieved. The shape of the arcuate travel curve 50 at the end portion of arm 37*a* is so selected that in each of the different angular positions of the rotary body and of lever 40, lever 34 does not vary its angular position as long as roller 39 remains in groove 60.

If, for any reason whatsoever, movement of the drop box is hindered, for example, due to the fact that a shuttle, as shown in FIGURE 2, does not come to a standstill in its prescribed rest position, then, if the drop box motion were rigidly coupled with the drop box, something would have to break somewhere since the upward and downward movement of the drop box is prevented by the jamming of the shuttle 43′ between the sley 62 and the run-in member 63. Fracture of this kind is avoided by the arrangement shown whereby roller 39 is moved out of groove 60 (which "represents" the working position of the coupling means) as soon as the effective forces exceed a pre-determined value, which is determined by spring 35. According to the invention, there are on both sides of the working groove 60, grooves 61 which form positioning positions, the working groove 60 being advantageously deeper than the positioning grooves 61.

Assuming, for example, that the drop box 42 is compelled, in accordance with an order from a punched card, to move downwardly by the amount of two positions but is (as shown in FIGURE 2) jammed by the shuttle 43′: The drop box motion brings about the rotation of rotary body 29 but roller 39 takes up its position in that groove 61 which, in the position shown in FIGURE 1, is under lever 40. The roller 39 endeavors constantly to take up its position in the deepest portion of a groove. This is caused by the pressure on the roller 39 produced by the pull of the spring 35 via lever 34 and the cranked lever having arms 37*a* and 37*b*. In this way, the advantage is obtained that, in the event of jamming which holds the drop box in a position between two of its regular positions, as prescribed for the shuttle pick, the drop box cannot remain in this position but always passes into a position which is prescribed for the picking (that is, the drop box is properly positioned in relation to the sley). Only those positions of the coupling means 27 are stable in which the roller 39 has dipped into the grooves 60 or 61 to the maximum depth. These positions are, on the other hand, so selected that they correspond to the four picking positions of the drop box 42 prescribed for the picking motion and determined by the four different positions of the rod 26 moved by the drop box motion 11. Thus, during a following picking motion, there is no danger that the picking stick might damage or destroy the drop box, the shuttle or any other part of the weaving loom. The only consequence of jamming of the drop box 42 is in that, during the next picking motion, the wrong shuttle is struck, that is, an incorrect thread is picked, unless the loom can beforehand be brought to a standstill.

In the event of incorrect operation of the drop box 42 and consequently of displacement of the roller 39 out of its working position 60 into one of the positioning positions 61, the roller 39 is, as it is transferred from one groove to the other, pressed somewhat outwardly. In consequence of this, the angle lever having arms 37*a* and 37*b* rotates anti-clockwise. During this movement, roller 36 is pressed downwardly and again produces a rotation in the clockwise direction of the two-armed lever 34. The lifting resulting therefrom of pivot 47 and of control rod 48 produces an indication which indicates or signals the incorrect mode of operation and serves to shut down the loom.

According to the present embodiment, the indication is used for lifting of rod 55, that is, for rotating the connecting member 54, so that projection 51 is released from engagement with the holding member 56 and, consequently, the tension spring 53 is released. The spring is thus able to rotate the two-armed lever 58 clockwise so that the drive coupling 59 between the loom-driving motor and the loom is interrupted. At the same time, by braking means which are not shown, immediate braking of the machine is initiated. After the defect has been eliminated, the drive coupling is again switched on by actuating lever 52. Actuation of lever 52 is possible inasmuch as its fixed position has been released by retaining lever 57.

In order that under all circumstances, that is with every positional change which may take place of the drop box 42, the drop box may always pass into a rest position which has been prescribed for a picking motion, there are, as the above example shows, on both sides of the working position as many positioning positions available as there are possible picking positions into which the drop box can be changed. In the example Ilustrated in FIGURE 1, drop box 42 is in its uppermost position and can be changed into one of three lower positions. Thus, three positioning positions must be provided upwardly from the working position on the rotary body 29. If the drop box were to be in its lowermost position, there would be three box or picking positions located above into which the drop box could be ordered to travel by instructions on the punched card. Thus, for this case, it is also necessary to provide three positioning grooves 61 on the lower half of the rotary body 29.

Advantageously, the positioning grooves 61 are made shallower than the working groove 60. By means of this measure, the result is achieved that starting-up of the loom is not possible so long as the roller 39 is not in the working position corresponding to groove 60; that is, for example, if it has been overlooked that the machine has been shut down due to the fact that the roller 39 has moved out of its working position. This is due to the fact, that, in consequence of the shallower depth of the positioning positions as compared with the working position, under such circumstances rod 48 is not moved sufficiently downward to cause projection 51 to engage; thus, as long as the roller 39 is in a positioning position, rod 55 is not influenced by actuation of lever 52.

It is a further advantage of the device described that it permits easy changing of the shuttles disposed in the

drop box. For example, if the second shuttle from the top is to be removed for any reason and if the drop box is (as shown in FIGURE 2) in its uppermost position, then the drop box is released from the rotary body **29** by pressure on the pedal **64** at the end of lever **34**. Simultaneously, by a guiding action with the aid of handle **65** secured to the carrier rod, the drop box is lowered to such an extent that the shuttle (shuttle **45'**) adopts a position between the sley **62** and the run-in member **63**. When the pedal is released, the drop box is then adjusted precisely in its picking position prescribed for the actuation of the shuttle by the restored pressure on roller **39** produced by the spring **35**. In this manner, easy take-out and introduction of the shuttles is made possible. A stop **66** is provided in order that lever **34** may not be rotated farther than is necessary.

FIGURE 3 shows a further embodiment of a transmission coupling means. For like parts, the same reference numerals employed in FIGURE 1 have been used. Connecting rod **26** secured to the drop box motion is again pivotal about pivot **32** and is connected with rotary body **29**, whereby a reciprocating movement of rod **26** produces a rotary movement of body **29** about pivot **28**. By means of this rotary movement, roller **39**, which is pressed by a compression spring **71** into working groove **60**, and lever arm **40** connected with the roller via a connecting member **72** are also moved about the pivot **28**. The connecting member is secured on the lever arm in such manner as to be pivotal about pivot **69**.

It will be apparent that the mode of operation of the coupling means shown in FIGURE 3 is similar to that of the coupling means shown in FIGURE 1. A difference, however, resides in the arrangement for the pressing-on of the roller against the rotary body. This difference is due to the fact that, instead of a mechanical indicator device for indicating when the roller **39** is no longer in working groove **60**, according to FIGURE 3 an electrical indicating device is provided. This indicating device comprises a pin **73** which is movable in its longitudinal direction and which is secured to a contact member **74**. A spring **75** endeavors to press the contact member toward the right, that is in the direction of the roller. As long as the roller is in the working groove, however, the pressure thereof (which is produced by spring **71**) holds the contact member in contact with two contacts **76**. Two electrical conductors **78** formed by movable cables are connected with the contacts **76**. As long as the two cables are electrically connected by contact member **74** via contacts **76**, a current flowing through them holds a relay (not shown). In the holding state, the relay causes a drive coupling to be engaged between the loom-driving motor and the loom. Since this is a conventional arrangement, it is not shown in the drawings.

During a drop box change, if movement is hindered and a predetermined force is exceeded (as in the example according to FIGURES 1 and 2), roller **39** is moved out of working groove **60**. The roller will, due to the force exerted by spring **71**, descend to the lowest portion of a position groove **61** in consequence of which, not the desired shuttle but one of the shuttles or one compartment of the shuttle box is put in a correct posiiton for the picking motion. By this means, damage to the loom or parts is prevented.

FIGURE 4 shows a further embodiment of the present invention. Those parts which are identical with parts of FIGURE 1 have again been given the same reference numerals. A horizontal movement of connecting rod **26** produces, via the connection through the agency of pivot **32**, a pivoting movement of lever **80** about the pivot **28** secured on stationary carrier **31**. Secured on lever **80** is a movable body **81** formed with a groove **60** defining the working position and with grooves **61** defining positioning positions, said movable body being secured by a sliding and retaining arrangement having a slot **82** and pins **83** sliding therein. For rectilinear guiding, the movable body is provided with a slot **84** which together with a guide plate **85** secured to the sley frame provides for the rectilinear guiding. Both ends of the movable body **81** have sliding and retaining means **86** in which a carrier rod **41** is able to slide. Furthermore, there is a wedge or biased member **87** which is pressed outwardly in a guide **89** by means of a compression spring **88**. The carrier rod is secured to the guide **89**. A pin is secured to the wedge. The pin transmits its movement to a Bowden cable **95** via an angle lever **94** that is pivotal about pivot **93**.

The spring **88** is so pre-tensioned that, under normal operational conditions, an upward and downward movement of the movable body contains the wedge **87** and also the carrier rod **41** with drop box **42**. If for any reason whatsoever the resistance to the upward or downward movement of the drop box becomes excessive, the wedge is pressed toward the right and, as the carrier rod slides in means **86**, only body **81** is moved. Under these circumstances, wedge **87** is moved out of the working groove **60** and takes up its position in one of the positioning grooves **61**. Consequently, at the instant of the following picking motion, one of the compartments **43** to **46** is in one of the positions prescribed for the picking. It will be appreciated that, due to the pressure of the spring **88**, the wedge is forced into the lowest position in one of the grooves **60** or **61** since only these lowest positions are stable.

If the wedge moves out of the working groove, pin **90** moves toward the right as the wedge passes from the groove **60** into the adjacent groove **61**. As a result, the inner wire **96** of the Bowden cable **95** is actuated via the angle lever **94** so that an indication of the incorrect operation is given. The actuation of the Bowden cable is utilized, in combination with known means, for uncoupling the driving motor from the loom and braking the latter.

It will be seen from FIGURE 4 that in this embodiment the working groove **60** is also deeper than the positioning groove **61**. In this way, it becomes possible to utilize the indication provided by the Bowden cable in such manner that each position of the wire **96** which does not correspond to the maximum insertion of wedge **87** in groove **60** is utilized as a signal for stopping the loom. Re-starting the loom with the drop box wrongly positioned is thereby avoided.

A further variant for producing an indicating signal is obtained with a coupling means wherein, in contradistinction to the example of FIGURE 3, groove **60** is not provided with a contact. Instead, there are contacts that can be actuated by roller **39**, at least in the positioning grooves **61** adjacent the groove **60** and preferably in all the positioning grooves **61**. The evaluation of the indication obtained from these contacts is such that the actuation of one of these contacts produces a signal or a signal change by means of which another device is actuated for uncoupling the loom from the drive and exerting a braking action thereon.

While the novel features of the invention have been shown and described and are pointed out in the appended claims, it is to be understood that various omissions, substitutions and changes in construction and arrangement of the features shown and described may be made by those skilled in the art without departing from the spirit and scope of the invention.

What is claimed is:

1. In a loom, a device for controlling movement of a drop box adapted to be positioned in various picking positions by movement of a drop box motion, which comprises coupling means operably associated with said drop box motion for positioning said drop box, said coupling means having a working position in which it is normally coupled to said drop box operation of said loom and also having positioning positions on both sides of said working position, the number of positioning positions corresponding to the maximum number of possible picking

positions into which the drop box can be changed, the working position and the positioning positions forming stable coupling states and the locations between these positions forming unstable coupling states, means for allowing said coupling means to shift to one of said positioning positions when movement of said drop box is hindered, and an indicator means which supplies an indication for actuating a shutoff mechanism for stopping the loom when the coupling means is coupled to said drop box in one of said positioning positions.

2. A device according to claim 1 in which the working position has a design that differs from that of the positioning positions, the difference in the design being utilized for producing said indication.

3. In a loom, a device for controlling movement of a drop box adapted to be positioned in various picking positions by movement of a drop box motion, which comprises coupling means operably associated with said drop box motion for positioning said drop box, said coupling means having a working position in which it is normally coupled to said drop box during operation of said loom and also having positioning positions on both sides of said working position, the number of positioning positions corresponding to the maximum number of possible picking positions into which the drop box can be changed, the working position and the positioning positions forming stable coupling states and the locations between these positions forming unstable states; said coupling means comprising at least two movable parts, a first part being adapted to be actuated by the drop box motion and a second part being coupled with the drop box, one of said parts providing the working position and the positioning positions and the other part having means for biasing it towards said one part whereby retaining arrangements are provided between said parts for allowing said coupling means to shift to one of said positioning positions when movement of said drop box is hindered and an indicator means which supplies an indication for actuating a shut-off mechanism for stopping the loom when the coupling means is coupled to said drop box in one of said positioning positions.

4. A device according to claim 3 in which a foot pedal, when actuated, releases the biased retaining arrangements between the parts of said coupling means for allowing manual adjustment of the drop box between the stable positions of said coupling means.

5. A device according to claim 3 in which one of said parts has a first groove forming the working position and additional grooves forming the positioning positions on either side of said first groove and said other part includes a biased member adapted to be pressed into each of said grooves.

6. A device according to claim 5 in which the groove corresponding to the working position is deeper than the grooves corresponding to the positioning positions, and the indicator means supplying the indication comprises a linkage means which is coupled with the member which is adapted to be inserted, whereby said linkage means controls an indicating mechanism in dependence on the insertion depth of the member.

7. A device according to claim 5 in which said member is a roller pressed against the grooves by a resilient means.

8. A device according to claim 5 in which the grooves are V-shaped and said member is a wedge which is pressed against the grooves by resilient means.

9. A device according to claim 5 in which one of said parts has said grooves on its periphery and is pivotable about a pivot and the other part includes an arm jointedly secured to said member and pivotable about said pivot, said member being pressed by a resilient means against said grooves so as to provide a reciprocal coupling of the parts.

10. In a loom, a device for controlling movement of a drop box adapted to be positioned in various picking positions by movement of a drop box motion, which comprises coupling means operably associated with said drop box motion for positioning said drop box, said coupling means having a working position in which it is normally coupled to said drop box during operation of said loom and also having positioning positions on both sides of said working position, the number of positioning positions corresponding to the maximum number of possible picking positions into which the drop box can be changed, the working position and the positioning positions forming stable coupling states and the locations between these positions forming unstable coupling states, said coupling means having at least two movable parts, a first part being adapted to be actuated by the drop box motion and a second part being coupled with a drop box, one of said parts having a first groove forming the working position and additional grooves forming the positioning positions on either side of said first groove; and the other of said parts comprising a member biased by resilient means and adapted to be inserted in each of said grooves, whereby one of said parts and the member are pressed against each other, said member being operably associated with linkage means whereby said linkage means is moved out of its normal position when said member is moved out of the working position formed by the first groove, movement of said linkage means supplying an indication for actuating a shut-off mechanism for stopping said loom.

11. A device according the claim 10 in which said linkage means comprises a movable lever by which said member is pressed-on by said resilient means; movement of said lever serving as the indication for actuating said shut-off mechanism.

12. A device according to claim 10 in which said linkage means comprises a pressure member which, when it is moved out of its normal position, actuates an electrical contact for producing indication that actuates said shut-off mechanism.

13. A device according to claim 12 in which the member in the working position holds an electrical contact closed by pressure on the pressure member.

14. A device according to claim 10 in which a pressure member is located in at least each of the positioning positions adjacent the working position, whereby, in the event of the movement out of its normal position, said pressure member actuates an electrical contact for producing the indication that actuates said shut-off mechanism.

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MERVIN STEIN, *Primary Examiner.*

H. S. JAUDON, *Assistant Examiner.*

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,322,160 May 30, 1967

Friedrich Lutz

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 6, line 72, after "box" insert -- during --.

Signed and sealed this 5th day of November 1968.

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents