

[72] Inventor **Erwin Pfarrwaller**
Winterthur, Switzerland
[21] Appl. No. **12,738**
[22] Filed **Feb. 19, 1970**
[45] Patented **Oct. 12, 1971**
[73] Assignee **Sulzer Brothers, Ltd.**
Winterthur, Switzerland
[32] Priority **Mar. 18, 1969**
[33] **Switzerland**
[31] **4023/69**

[50] Field of Search..... 139/122,
125, 126, 304, 314; 242/45

[56] **References Cited**
UNITED STATES PATENTS
982,390 1/1911 Rhoades..... 139/314
3,528,459 9/1970 Pfarrwaller et al. 139/126

Primary Examiner—Henry S. Jaudon
Attorney—Kenyon & Kenyon Reilly Carr & Chapin

[54] **WEAVING MACHINE**
6 Claims, 5 Drawing Figs.

[52] U.S. Cl..... 139/126,
139/304
[51] Int. Cl..... D03d 47/24,
D03d 49/20

ABSTRACT: The cloth takeoff mechanism is connected over a releaseable coupling to the drive mechanism of the machine so as to be selectively disengaged by the hand lever should a weft yarn break occur. The hand lever also actuates the locking device so as to prevent the Jacquard mechanism from rotating the multiple-weft mechanism segment.

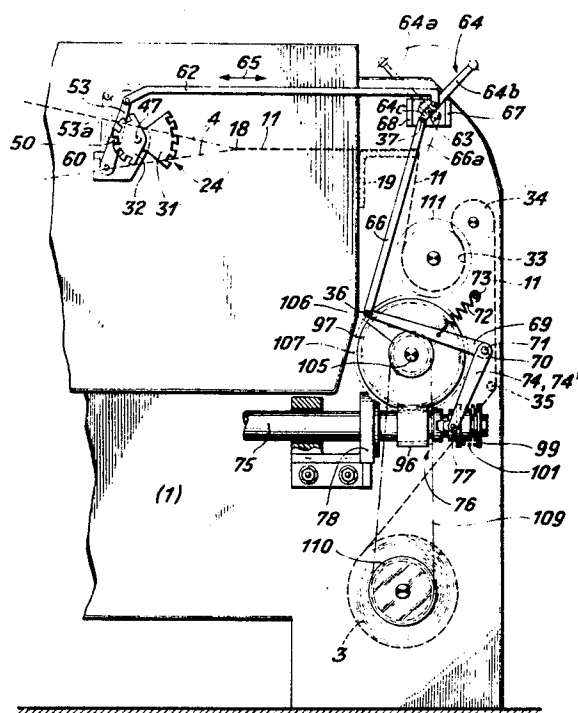


Fig. 1

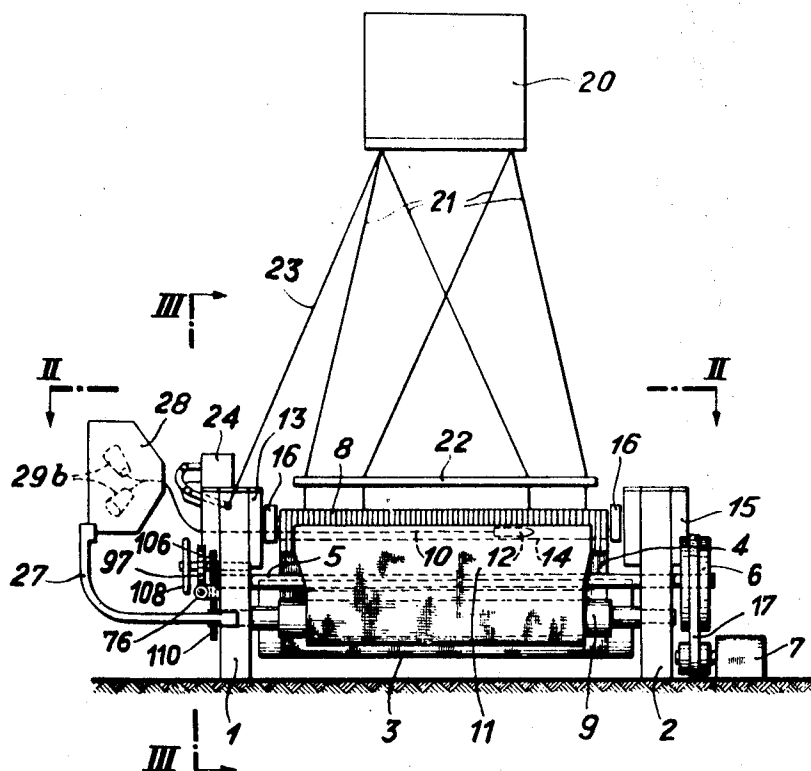
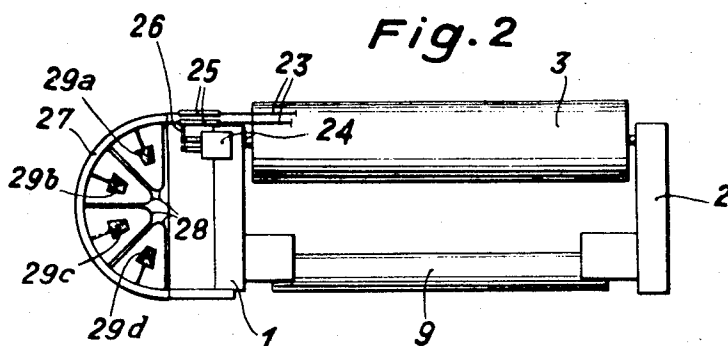


Fig. 2



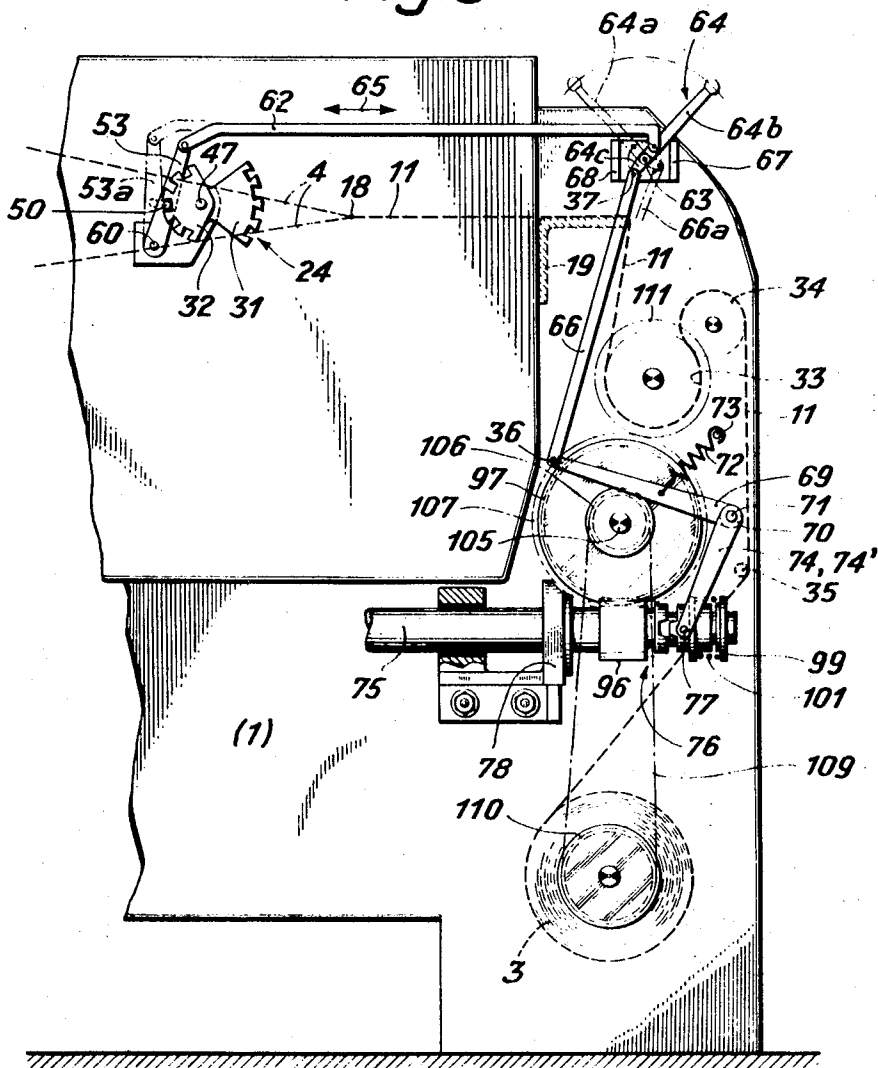
Inventor:

ERWIN PFARRWALLER

BY

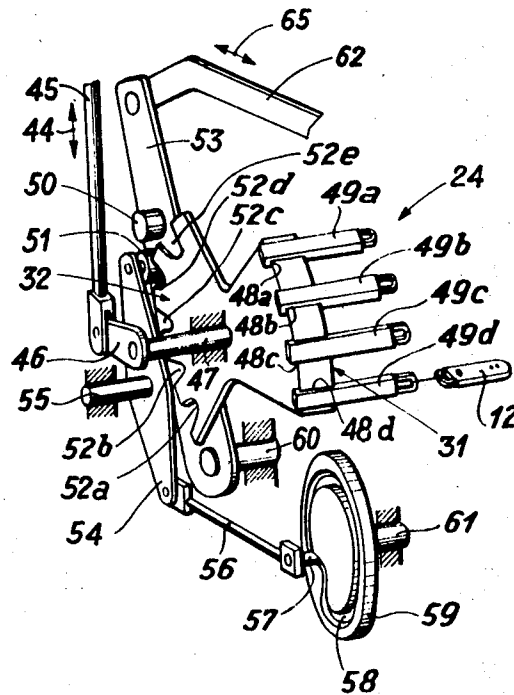
Kenyon & Kenyon Reilly, Carr & Chapin
ATTORNEYS

Fig. 3



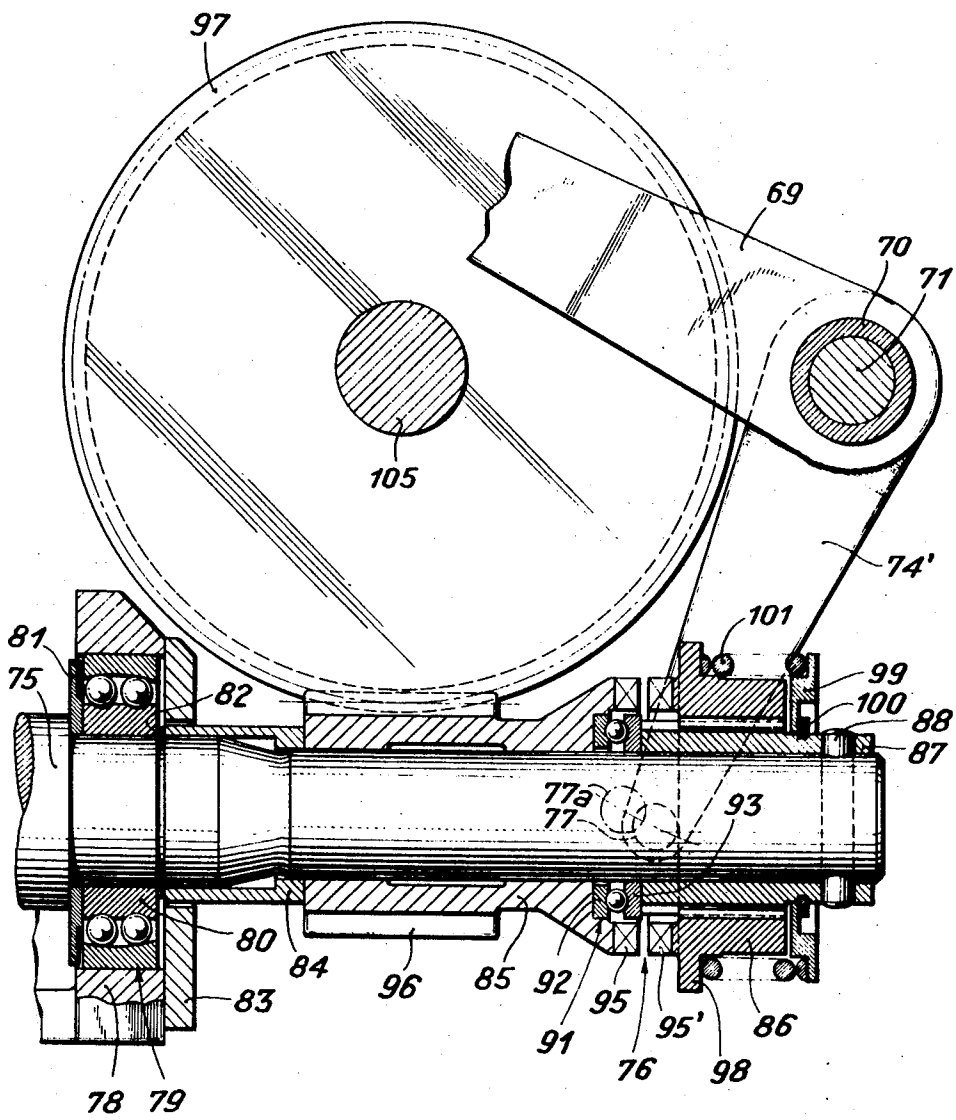
Inventor:
 ERWIN PFARRWALLER
 BY
 Kenyon & Kenyon Kelly Carr & Chapin
 ATTORNEYS

Fig. 4



Inventor:
ERWIN PFARRWALLER
BY
Kenyon & Kenyon, Kelly, Lau & Chapin
ATTORNEYS

Fig. 5



Inventor:
ERWIN PFARRWALLER
BY
Kenyon & Kenyon, Kelly, Case & Chapin
ATTORNEYS

WEAVING MACHINE

This invention relates to a weaving machine. More particularly, this invention relates to a transmission for selectively coupling a cloth take up drive mechanism to the drive of the weaving machine.

Heretofore, weaving machines have been constructed with a weft picking mechanism, a locking device for locking in the weft picking mechanism, and a driving mechanism for drawing off the cloth produced with the driving mechanism being controlled by the weaving machine drive. In some instances, a weaving machine is provided with a Jacquard mechanism for forming a shed or selvedge and for controlling a change motion for the weft picking mechanism. A picking mechanism of this type may, for example, have a multiple-weft change motion which is engaged by the locking device and which enables wefts of different types to be inserted in the shed according to a preset program.

In weaving machines of the above type, a signal to stop the weaving machine is produced if a weft breaks. The broken weft must then be removed from the shed, and the pick must be repeated. Since the new weft must be of the same color and type and must take up the same position within the weft texture as the broken weft, the shedding motion, especially, must be put back one or more cycles. However, not all Jacquard mechanisms for shedding can be put back or forward as desired. Often the mechanism used cannot as a whole run other than forwards. In this type of Jacquard mechanism, only the punched card which controls the texture program or only the lease mechanism can be put back. Since some cycles pass before a shed position corresponding to a preset position in the punched card for the Jacquard mechanism is produced in the weaving machine, the punched card must be put back a plurality of cycles, generally three cycles. The weaving machine and Jacquard mechanism are then run together for, for example, two cycles without the broken weft being attached.

In order to prevent other wefts from entering the sheds formed during these cycles when the machine is running forwards again, a locking device for the weft change motion has been proposed. This device prevents the change motion from taking up a position other than that corresponding to the faulty pick, so that "mispicks" can occur, that is, picks in which no weft is transferred to the picking member. After each of these "mispicks," the weaving machine is stopped by a stop motion which responds to absence of the weft.

In conventional weaving machines of the type described, mispicks are carried out when the weft change motion is locked, while the other mechanisms in the machine, especially the cloth takeoff mechanism, remain positively connected to the machine drive. Even during mispicks, therefore, the warp and cloth are advanced unnecessarily by the amount required during normal operation. Therefore, in order to prevent faults in the cloth, the cloth must be turned back by this amount before the machine is started again.

Accordingly, it is an object of the invention to prevent the formation of visible attachment points in a cloth woven on a weaving machine.

It is another object of the invention to avoid turning the cloth back by an amount equal to a number of picks to a precise beat-up position after a weft break.

It is another object of the invention to improve the operation of weaving machines.

Briefly, the invention provides the drive mechanism of a weaving machine having a weft picking mechanism and a locking device therefor as well as a cloth takeoff mechanism with a releaseable coupling means which is controllable separately from the drive mechanism to disengage the cloth takeup mechanism from the drive mechanism e.g. after a weft break. The coupling means includes an operating device which is coupled to the locking device in such a way that when the locking device is in a locking position to lock the weft picking mechanism against operation, the coupling is disengaged. Thus, should a weft break take place, a mispick can be carried out while the cloth takeup mechanism is disengaged from the drive mechanism of the machine.

Further, the cloth takeoff mechanism and the weft picking mechanism can be operated simultaneously. In such a case, the operating device for the coupling and an operating device for the locking device are interconnected by a common adjustable control element, e.g. a manually actuated control element.

In one embodiment of the invention which is of simple construction, the operating device of the coupling includes a hand lever pivotally mounted on the weaving machine base, and a pair of rods pivoted on the hand lever with one rod engaging a rocking lever situated in the vicinity of the driving mechanism and having an entrainment means for entering within range of an adjustable portion of the coupling and the other rod engaging a second rocking lever of the locking device. The second rocking lever includes a locking bolt which cooperates with a locking segment in the picking mechanism locking device. As such, the operating device can be readily added to existing machines.

In order to prevent accidental adjustment of the operating device in either of the two operative positions, the hand lever is situated between two stops which define its pivoting range, and the point at which the rod associated with the coupling is pivoted on the hand lever is located to the left or right, respectively, of the dead center position for the rod and hand lever when the hand lever is bearing on either of the stops; the dead center position being defined by a straight line connecting the fulcrum for the hand lever and the point at which the rod is pivoted on the rocking lever. In addition, a spring is attached to the weaving-machine base in engagement with the rocking lever in such a way that the hand lever is urged onto the associated stop via the rod.

These and other objects and advantages of the invention will become more apparent from the following detailed description and appended claims taken in conjunction with the accompanying drawings in which:

FIG. 1 illustrates a front view of a weaving machine incorporating an apparatus of the invention therein as seen from the cloth end;

FIG. 2 is illustrates a simplified top view of the machine of FIG. 1 taken on line II—II;

FIG. 3 illustrates a view taken on line III—III of FIG. 1;

FIG. 4 illustrates a perspective view of certain parts of the weft picking mechanism of the machine of FIG. 1; and

FIG. 5 illustrates an enlarged detail of FIG. 3.

Referring to FIG. 1, the weaving machine includes a pair of lateral uprights 1, 2 in the base of the machine. These uprights 1, 2 serve to mount a warp beam 3 which supplies warp yarns 4, a main driving shaft 5, a cloth beam 9 with a web of cloth 11 wound thereon, and a sley with a reed 8 and a guide 14 for a gripper shuttle 12. The warp yarns 4 run over tension devices (not shown) and healds of a shedding motion controlled by a Jacquard mechanism 20. The cloth 11 produced begins at the apex 18 (FIG. 3) of the shed formed by the warp yarns 4 where a weft 10, inserted by the gripper shuttle 12, is beaten up by the reed 8. The cloth 11 then runs over a breast beam 19 (FIG. 3) and, wrapping part way round a friction coated stepping beam 33 mounted on the uprights 1, 2, and a deflecting roller 34, passes over a deflecting rod 36 to the cloth beam 3.

The weaving machine also includes a coupling 6 with a built in brake which is mounted on the main drive shaft 5 outside one upright 2 for connecting the shaft 5 to a drive motor 7 over a belt drive 17. Alternatively, the coupling 6, brake and motor 7 can be mounted on the opposite upright 1.

Referring to FIGS. 1 and 2, in order to form a shed, the Jacquard mechanism 20 is mounted above the weaving machine. This mechanism 20 has pulling cords 21 which run through a harness board 22 to the healds for each warp yarn. One or more pulling cords 23 (e.g. two) are used to control the the weft change, and run from the Jacquard mechanism 20 to a lever mechanism 25, 26 in a weft picking or multiple-weft mechanism 24 mounted on the upright 1, e.g. a four-weft mechanism.

A bobbin supporting frame 27 for four pairs of fixed weft supply bobbins 29a to 29d is mounted on the upright 1 to supply the weft yarns for the weft mechanism 24. Each of the superjacent pairs of bobbins carries a yarn of a different color from the others. During weaving, a weft 10 is drawn off a bobbin and inserted in the shed by a gripper shuttle 12 as is known. Limiting screens 28 are provided to limit the yarn balloon produced as the weft is taken off. The multiple-weft mechanism 24 sets the correct weft color for the weft repeat and feeds the weft to the shuttle 12 by means of components described below.

The gripper shuttle 12 is fired by a picking motion 13 and runs through the guide 14 to a catching motion 15 on the upright 2. A selvage tuck-in device 16 is provided at each edge of the warp. This device 16 contains, inter alia, a centering device for the weft 10 picked, a selvage yarn clip for gripping the weft, a selvage tuck-in needle for tucking the free weft end into the next shed, and—on the picking side—cutting means for severing the weft 10.

Referring to FIGS. 3 and 4, the multiple-weft mechanism 24 is mounted on the upright 1 and contains a changing drum 31, which rests on a fixed pivot 47 and is connected to a locking segment 32. A rocking lever 46 (FIG. 4) is fixedly attached to the pivot 47 and has a free end of which is pivoted on a connecting rod 45 operable as indicated by arrows 44. This rod 45 is connected by an adjusting means (not shown) to the lever mechanism 25, 26 (FIG. 2).

The changing drum 31 contains four grooves 48a, b, c, d, in which four yarn members 49a, b, c, d are mounted. These feed members are passed by a suitable means (not shown) to the gripper shuttle 12 as required when entering the line of picking.

The locking segment 32 contains five slots 52a, b, c, d, e for receiving two roller-shaped locking bolts 50, 51. One bolt 50 is rotatably mounted on a one-arm lever 53 and the other bolt 51 is rotatably mounted on a two-arm lever 54. The one-arm lever 53 is mounted at one end of a pivot 60 supported on the upright 1 and is pivotally connected at the free end to a rod 62 which is pivotably connected to a two-arm hand lever 64 mounted on the upright 1 (FIG. 3).

The two-arm lever 54 rests on a fixed pivot 55 and is pivotably attached at one end to a rod 56. This rod 56 carries a pin 57 which engages in a control groove 58 in a grooved disc 59 attached to a shaft 61 connected to the weaving-machine drive and operated at a speed equal to the picking rate of the weaving machine.

The changing drum 31 is pivoted by the Jacquard mechanism 20 by way of the rod 45, controlled by the lever mechanism 25, 26 and the adjusting means (not shown), so that the required yarn feed member 49a, b, c, or d (member 49d in FIG. 4) is brought into a position opposite the shuttle 12 which is to be inserted, that is, is brought into the line of picking. During each cycle, the changing drum 31 is locked into the yarn-transfer position for a preset time by the locking bolt 51, which cooperates with the slots 52a, b, c, d. Then, as the lever 56 is controlled by the groove disc 59, the bolt 51 is pivoted out of the slot 52a, b, c or d, to permit the changing 31 to be readjusted according to the preset texture program.

The locking bolt 50 on the lever 53 cooperates with the slots 52b, c, d, e. The lever 53 is so mounted that the bolt 50 always engages the locking segment 32 one slot higher than the bolt 51 on the lever 54. In the position shown in FIG. 4, the bolt 50 is in an inoperative position, outside the associated slot 52e, so that operation of the changing drum 31 by the Jacquard mechanism 20 is not prevented.

Referring to FIG. 3, the one-arm lever 53 is controlled by the rod 62, which is adjustable as indicated by arrows 65. This rod 62 and a second rod 66 are each pivoted to one arm 64b or 64c of the hand lever 64 pivotable on a pin 63 secured in an upright 1. The pivoting range of the hand lever 64 is defined by two stops 67, 68. The other end of the rod 66 from the lever 64 is pivoted at 36 on a rocking lever 69, supported on a hub 70 which is mounted on a pin 71 attached to the upright 1.

In the position shown in FIG. 3, the lever arm 64b bears on the stop 67. In this position, the lever arm 64c and rod 66 form an obtuse angle, and the pivoting point 37 is to one side (in FIG. 3 to the left) of the dead center position of the lever arm 64c and rod 66. This dead center position is defined by a straight line connecting the pin 63 to the pivoting point 36. The rocking lever 69 is engaged approximately centrally by a tension spring 72, which is attached to a pin 73 on the upright 1 and tends to turn the locking lever 69 clockwise as viewed in FIG. 3. The hand lever 64 is therefore urged onto the stop 67 by the rod 66, which engages the lever 64 eccentrically.

A pair of lever arms 74, 74', one behind the other in FIG. 3, are attached to the hub 70 substantially at right angles to the lever 69 and engage in a forklike manner around a releasable coupling (dog clutch) 76 mounted on a shaft 75. The free ends of each arm 74, 74' are provided with entrainment means 77 which project inwardly towards each other.

Referring to FIG. 5, shaft 75 serves to drive the cloth takeoff and is connected by driving means (not shown) to the weaving-machine drive and is mounted in bearing brackets 78 on the upright 1. Only one bearing bracket 78 is visible in FIGS. 3 and 5. The bearing bracket 78 contains a ball bearing 79, of which the inner race 80 is supported on the shaft 75 between an end-plate 81 bearing on a shoulder of the shaft 75, which is offset at this place, and a guard-ring 82 held in an annular groove. The ball bearing 79 is covered on the outside by a plate 82 attached to the bracket 78. The end of the shaft 75 projects out of the ball bearing 79 and carries a bush 85 belonging to the dog clutch 76. The bush 85 abuts the entrainment means 77 of the arms 74, 74' so as to be moved thereby as explained below. A second bush 86 or operating device, cooperating with the first bush 85 has a splined hub profile and is axially displaceable along a sleeve 87 having a corresponding splined shaft profile. The sleeve 87 is fixed to the free end of the shaft 75 by a pin 88 in such a way as to be rotationally fixed. The bush 86, on the other hand, is freely rotatable between a spacer ring 84, bearing on the guard-ring 82, and a thrust washer 92. This washer 92 is mounted with a clearance on the shaft 75 and forms a race of a ball thrust bearing 91, whose other thrust washer 93 rests on the shaft 75 and bears on the end face of the sleeve 87.

The mutually facing end faces of the two bushes 85, 86 each carry three projecting claws 95, 95' which are formed so that each claw on one bush can be inserted between two claws on the other bush. The bush 85 is provided with self-locking helical toothing 96, in which a worm gear 97 of the cloth takeoff mechanism engages.

The end of the bush 86 which is nearer the bush 85 carries a radially outstanding collar 98 and together with a stop disc 99 mounted on the sleeve 87 outside the splined shaft profile defines a recess in which a compression spring 101 is mounted. The stop disc 99 bears on a guard-ring 100, situated in an annular groove of the sleeve 87 and defines the extent to which the bush 86 can move towards the end of the shaft 75. The compression spring 101 is supported at the ends on the collar 98 and on the stop disc 99.

Referring to FIG. 3, the worm gear 97 is journaled on a shaft 105 which is mounted in the upright 1 and carries a chain-wheel 106, a gear 107 and, on its outwardly projecting end, a handwheel 108 (FIG. 1), and is connected by driving means (not shown) to a device for relaxing the warp 4. The chain-wheel 106 is connected by a driving chain 109 to a chain-wheel 110 mounted on the pivot for the cloth beam 3. The gear 107 engages a gear 111 mounted on the pivot for the stepping beam 33. The gears 107, 111 form change gears.

The stepping beam 33 is driven intermittently by the weaving-machine drive by way of the shaft 75, worm transmission and gears 107, 111, so that the cloth 11 is advanced by the correct amount after every pick. Accordingly, the warp letoff motion (not shown) is operated and the cloth beam 3 is turned intermittently by way of the chain transmission 106, 109, 110. By turning the handwheel 108, the cloth takeoff mechanism can be adjusted as desired and, for example, the desired cloth

tension can be set. The worm transmission need not be self-locking, but, if not, a separate locking device must be provided to ensure that the cloth takeoff mechanism is not run back unintentionally.

When the weaving machine is in the operational condition illustrated in FIG. 3, the locking device for the weft picking mechanism 24 is in operative position with the bolt 50 of the lever 53 engaging in the slot of the locking segment 32. The Jacquard mechanism 20 is thus prevented from rotating the segment 32. The position of the lever 53 corresponds to that of the hand lever 64, which, due to the action of the tension spring 72 engaging the rocking lever 69, is urged onto the stop 67 by the rod 66. When the lever 64 is in this position, the bush 86 of the dog clutch 76 is held back by the entrainment means 77 on the lever arms 74, 74' (which counteracts the compression spring 101) in the inoperative position illustrated. In addition, the claws 95' do not intermesh with the claws 95 of the other bush 85. The shaft 75 and the bush 86 can therefore, for example, when mispicks are carried out, be rotated by the weaving-machine drive, without this motion being transmitted to the worm transmission and to the other parts of the cloth takeoff mechanism connected to this transmission.

In order to couple the cloth takeoff mechanism to the machine drive, the hand lever 64 is tilted into the position 64a shown by dash lines (FIG. 3), to bear on the stop 68. By means of the rod 62, the lever 53 is thus pivoted of its operative position into an inoperative position 53a, and the bolt 50 moves away from the locking segment 32, releasing the segment 32 as shown in FIG. 4. The rocking lever 69 and arms 74, 74' are also lifted clockwise in FIG. 3 by the rod 66, which takes up the position 66a shown by dashlines, and the entrainment means 77 takes up the position 77a (FIG. 5). The bush 86, which is urged onto the entrainment means 77 by the compression spring 110, follows the movement of the lever arms 74, 74' until entering its operative position, in which the claws 95' engage the claws 95.

When the machine has stopped, the bush 85 may need to be brought into the corresponding position for engagement. This is accomplished by turning the worm gear 97 by means of the handwheel 108. Normal weaving can then begin, with all the mechanisms in the weaving-machine cooperating, especially the multiple-weft mechanism 24 and cloth takeoff mechanism. Due to the action of the tension spring 72, the hand lever 64 is urged onto the stop 68 by the rod 66, which is in position 66a, so that the lever 53 and entrainment means 77 are fixed in their positions 53a and 77a respectively during weaving.

The coupling for disengaging the cloth takeoff mechanism may be constructed in any suitable manner, for example with some other number of mutually engaging claws, or as another type of coupling, for example a friction clutch or an electromagnetic coupling. Instead of the mechanical operating device, the weaving machine may have, for example, a corresponding pneumatically, hydraulically or electrically operated device. If it is not desirable for the locking device for the weft-picking mechanism and the clutch to be operated together, two separate operating devices may also be provided.

It is noted that the invention relates not only to gripper shuttle weaving machines but also to weaving machines having any other weft-picking system, including, for example, machines with gripper needles, bobbin-carrying shuttles, or a water or

air jet as the weft-picking means.

The invention may also be used accordingly in connection with some other form of locking device which cooperates with another component in the weft-picking mechanism, for example with the drive for the weft-picking means (e.g. a gripper needle). In this case, the weft-picking means is disengaged so as not to move through the shed when the machine runs forwards again.

Also, the invention is not restricted to weaving machines having a Jacquard shedding motion of the type described. On the contrary, it may be used in connection with all types of machine in which the correct position in the texture cannot be produced simply by putting back the shedding mechanism. A weaving-machine of this type may, for example, have a Jacquard mechanism only to form the selvedge and to control the multiple-weft mechanism, the shed proper being formed by means of a card dobby.

What is claimed is:

1. In a weaving machine having a drive, a weft picking mechanism, a locking device for locking said weft picking mechanism against operation, and a driving mechanism for drawing off cloth;

means for releasably coupling said driving mechanism to said drive, said means being connected to said locking device to actuate said locking device to lock said weft picking mechanism against operation whereby when said driving mechanism is released from said drive said locking device is actuated.

2. In a weaving machine as set forth in claim 1, said means including an operating device coupled to said locking device and separately controlled from said drive.

3. In a weaving machine as set forth in claim 2 which further includes manually operated means connected to said operating device for controlling the operation of said operating device separately of said drive.

4. In a weaving machine as set forth in claim 1 wherein said means includes a coupling having a fixed bush connected to said driving mechanism and a movable bush for selective engagement with said fixed bush, said movable bush being drivingly connected to said drive, a pivotally mounted hand lever, a first rod pivotally connected to said lever, a first rocking lever connected to said first rod opposite said lever and having entrainment means thereon for moving said movable bush of said coupling away from said fixed bush.

5. In a weaving machine as set forth in claim 4 wherein said picking mechanism includes a pivotal segment having at least one slot therein and wherein said means further includes a second rod pivotally connected to said hand lever, a second rocking lever connected to said second rod opposite said lever, and a bolt on said second rocking lever sized to be disposed in said slot of said segment to prevent pivoting thereof upon movement of said bushes of said coupling from each other.

6. In a weaving machine as set forth in claim 5, a pair of stops disposed on opposite sides of said hand lever to define a pivoting range therefor, said first rod being connected to said hand lever at a point offset from a straight line passing through the fulcrum of said hand lever and the point of connection of said rod on said first rocking lever when said hand lever abuts either of said stops, and a spring attached to said first rocking lever to bias said hand lever against either of said stops.

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,612,109 Dated October 12, 1971

Inventor(s) WEAVING MACHINE

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 2, line 40, delete "is"

Column 3, line 30, insert "feed" before "--members--"

Signed and sealed this 18th day of April 1972.

(SEAL)

Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents