Oct. 30, 1962 E. PFARRWALLER 3,060,975

METHOD AND MEANS FOR SCANNING A PATTERN CARD OF A DOBBY

Filed April 21, 1961 3 Sheets-Sheet 1

Fig. 1

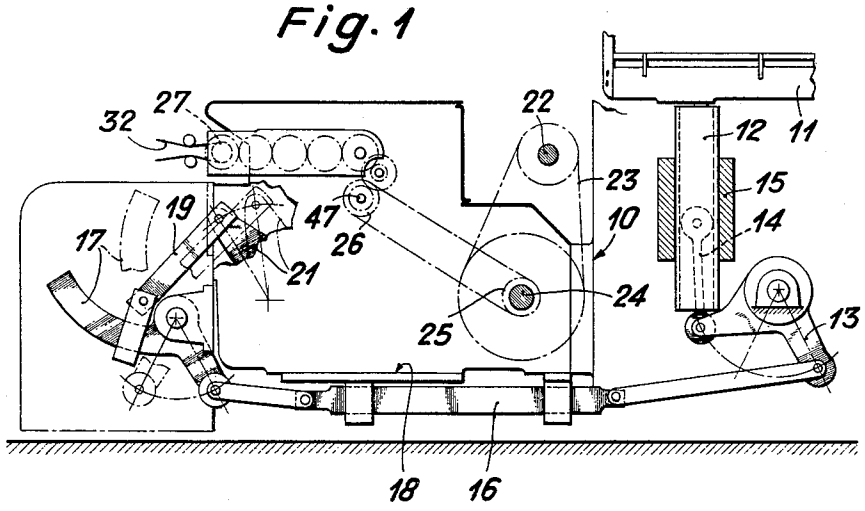
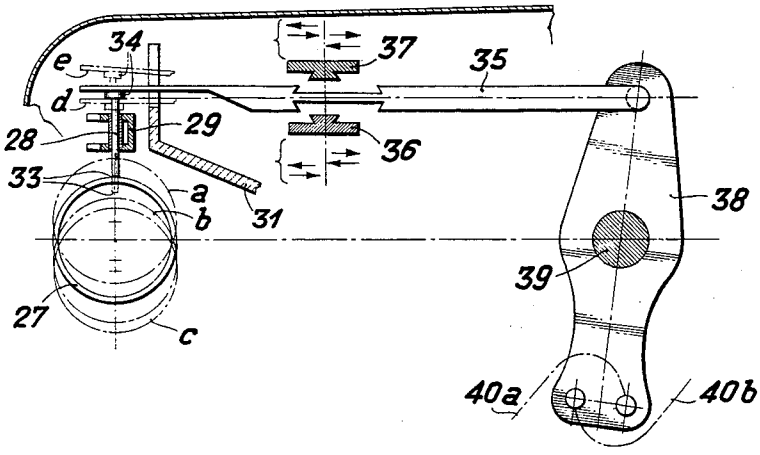


Fig. 2



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Filed April 21, 1961 3 Sheets-Sheet 2

Fig. 3

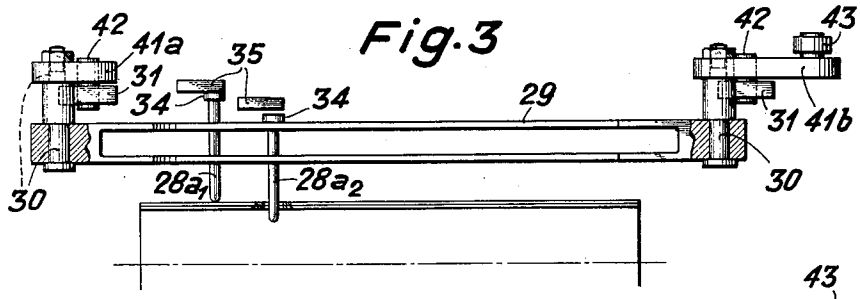


Fig. 4

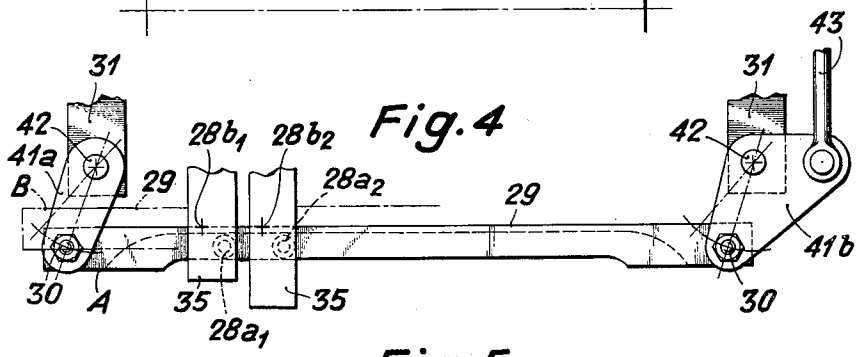


Fig. 5

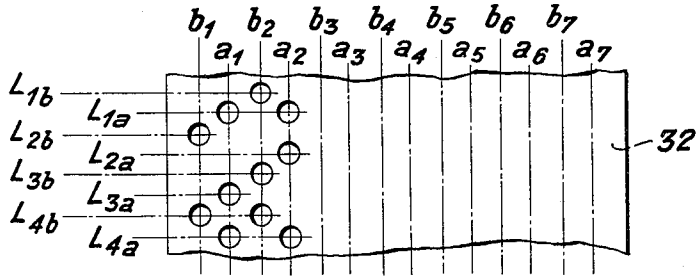
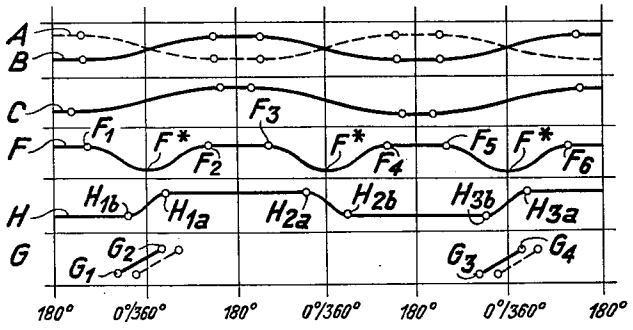


Fig. 8



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METHOD AND MEANS FOR SCANNING A PATTERN CARD OF A DOBBY

Filed April 21, 1961 3 Sheets-Sheet 3

Fig. 6

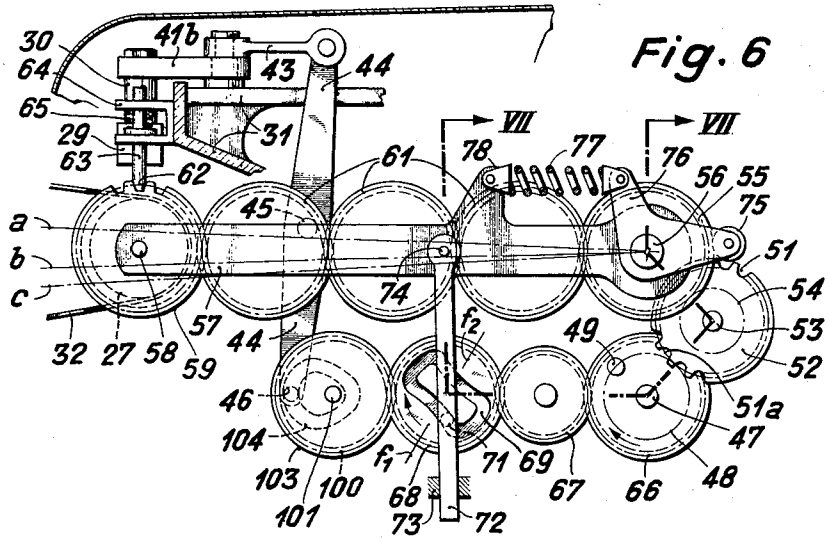
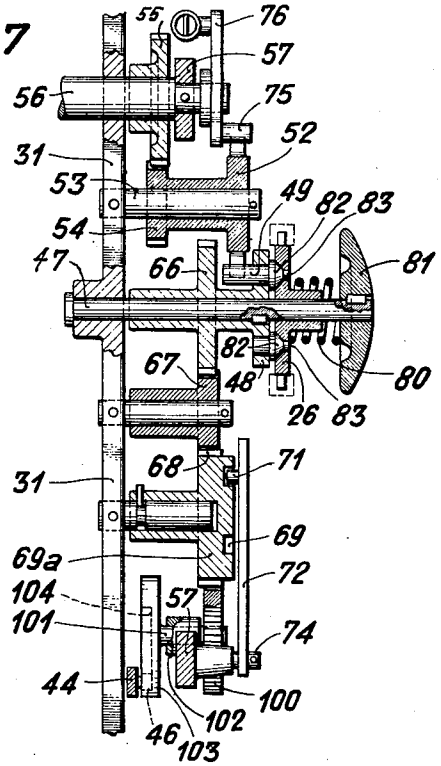


Fig. 7



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3,060,975

METHOD AND MEANS FOR SCANNING A PATTERN CARD OF A DOBBY

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Filed Apr. 21, 1961, Ser. No. 104,673
Claims priority, application Switzerland Apr. 26, 1960
8 Claims. (Cl. 139—317)

The present invention relates to a method and means for scanning a periodically advanced pattern card of a card controlled shedding mechanism of a loom for weaving.

The present application is a continuation-in-part of my copending application Serial No. 86,487, filed February 1, 1961.

An object of the present invention is the provision of a method and apparatus for scanning the holes in a pattern card of a card controlled dobby for actuating the heddle frames in a loom for weaving whereby the spacing of the hole rows which are at a right angle to the direction of movement of the pattern card and which must be scanned at every pick of a weft thread through a shed formed by warp threads can be much smaller than in conventional methods and apparatus.

A further object of the invention is the provision of a method and apparatus for scanning the holes in a pattern card of a card controlled dobby for actuating the heddle frames in a loom for weaving whereby the pattern card can be provided with first holes forming rows across the pattern card and also forming rows parallel to the direction of advance movement of the pattern card and the pattern card can be provided with additional rows of holes parallel to and between the rows formed by said first holes so that the spacing of the hole rows across the pattern card is substantially reduced because the holes of successive rows are placed in staggered relation.

These objects are achieved by advancing the pattern card relatively to scanning means formed by pegs supported by a peg guide or holder only after a plurality of successive weft thread picks and by moving the scanning means relatively to the pattern card in the direction longitudinally of and also at an angle to the longitudinal extension of the pattern card for scanning the transverse hole rows of the pattern card which must be scanned for the weft thread picks between the picks at which the pattern card is advanced.

The novel features which are considered characteristic of the invention are set forth with particularity in the appended claims. The invention itself, however, and additional objects and advantages thereof will best be understood from the following description of embodiments thereof when read in connection with the accompanying drawing wherein:

FIG. 1 is a diagrammatic part-sectional elevation of a portion of a weaving machine and of a pattern card controlled dobby for controlling the movement of the heddle frames connected thereto.

FIG. 2 is a large scale part-sectional elevation of the pattern card responsive mechanism of the dobby.

FIG. 3 is a part-sectional elevation of the scanning mechanism.

FIG. 4 is a plan view of the mechanism shown in FIG. 3.

FIG. 5 shows a portion of the pattern card.

FIG. 6 is a part-sectional elevation of a mechanism for advancing the pattern card and for positioning the guide bar for the scanning pegs.

FIG. 7 is a sectional view of the mechanism shown in FIG. 6 in rolled out representation, the section being made along line VII—VII of FIG. 6.

FIG. 8 is a diagram showing the movements of the heddle frames, of the mechanism for actuating the heddle frames, and of the mechanism for advancing the pattern card and positioning the scanning pegs.

Referring more particularly to FIG. 1 of the drawing, numeral 10 designates a weaving machine having a heddle frame 11 supported by an element 12 which is reciprocatingly movable in a vertical guide 15 and actuated by an angle lever 13 to which it is connected by a link 14. The lever 13 is connected by a linkage 16 to an actuating lever 17 forming part of a dobby 18 and connected by a link 19 to a rocking lever 21. The solid lines show the heddle frame actuating mechanism in lower shed position. The broken line representation of the lever 17 shows this part in position corresponding to the upper shed position of the heddle frame.

Numeral 22 designates a shaft which is driven by the main shaft of the weaving machine 10 at the same speed as the main shaft of the loom. A shaft 24 is connected to the shaft 22 by means of a chain 23 and is driven at half the speed of the shaft 22. The shaft 24 drives a lifting mechanism, usually comprising reciprocating lifter rails with which lifting blades are selectively engaged by a control mechanism, which will be described later, in response to the apertures in a pattern card. The lifting blades actuate the rocking levers 21 either directly or indirectly. A suitable heddle frame lifting mechanism is disclosed in my copending application Serial No. 86,492, filed February 1, 1961. A rocking lever 21 is provided for each heddle frame of the weaving machine.

A sprocket wheel mounted on the shaft 24 drives a sprocket wheel 25 which actuates a mechanism for rotating and for lifting and lowering a pattern card cylinder 27.

The pattern card reading device shown in FIG. 2 comprises the card cylinder 27 and reading pegs 28 which are vertically movable in a guide bar 29 for scanning the apertures in a pattern card 32 (FIG. 5). The card cylinder may be rotated for advancing the pattern card when the cylinder is in the lower position shown by a broken line *c*. FIG. 2 shows the card cylinder 27 in an intermediate position between an extreme low position *c* and an extreme upper position *a*. FIG. 2 shows a peg 28 resting on an unperforated portion of the pattern card. When the card cylinder is in the position *b* the pattern card is adjacent to the lower ends 33 of the pegs 28 when the latter have dropped to their lowermost position.

The upper end of each peg 28 is provided with a head 34 on which rests the end of a control rod 35. The latter are adapted to be selectively engaged and reciprocatingly moved by control rails 36, 37 for swinging a control lever 38 on a stationary fulcrum 39 to its end positions. The lever is connected by links 40*a* and 40*b* to lifting blades, not shown, in the manner shown in my copending application Serial No. 86,492. Depending on whether the lever 38 is in the right extreme position shown in FIG. 2 or in the left extreme position, the lifting blade connected to the link 40*a* or the lifting blade connected to the link 40*b* is engaged by a lifter rail (not shown).

If a peg 28 meets with a hole in the pattern card 32 the peg drops in the guide bar 29 until the head 34 of the peg rests on the guide whereby the control rod 35 assumes its lowermost position *d* and is engaged by the actuating rail 36. If the peg end 33 is opposite an unperforated portion of the pattern card and the card cylinder is lifted from the position *c* to the position *a*, the peg 28 is lifted in the guide bar 29 whereby the control rod 35 resting on the head 34 of the peg is moved to the upper position *e* wherein it can be engaged by the actuating rail 37. The rails 36 and 37 are shown in their middle positions in FIG. 2. They are reciprocatingly moved

in opposite direction by a mechanism, not shown, and disclosed in my copending application Serial No. 86,492. The rails **36** and **37** move in opposite directions in the sequence shown by arrows in FIG. 2.

As seen in FIGS. 3 and 4, the guide bar **29** for the pegs **28** is suspended at each end by a pin **30**, the pins being mounted on arms **41***a* and **41***b* which are rockable on pins **42** mounted on the frame **31** and afford movement of the guide bar parallel to its longitudinal axis. FIG. 4 shows the guide bar in full lines in position A. It can be swung to the position B indicated by dash-dot lines for movement of the pegs **28** from positions $28a_1$ and $28a_2$ to positions $28b_1$ and $28b_2$, respectively. When the guide bar **29** is in position A, the pegs scan the rows of holes a_1, a_2, etc., of the card **32** (FIG. 5) and when the guide bar is in the position B the pegs scan the rows of holes b_1, b_2, etc.

The ends of the control rods **35** resting on the heads **34** of the scanning pegs **28** are wide enough to be engaged by the pegs **28** in the positions **28***a* as well as **28***b*. Since the guide bar moves longitudinally of as well as at an angle to the longitudinal extension of the pattern card, the holes of consecutive transverse hole rows can be placed in staggered relation so that efficient use can be made of the space available on the card.

The mechanism shown in FIG. 6 for rotating the card cylinder **27** comprises a shaft **47** which is rotatably mounted in the frame **31** of the dobby **18** and to which a wheel **48** carrying a pin **49** is rigidly connected. The sprocket wheel **26** is rotatable and axially movable on the shaft **47**. The pin **49** is adapted to be received in gaps **51** between teeth of a wheel **52** which is rotatable on a shaft **53** mounted on the frame **31**. A gear **54** engaging a gear **55** is rigidly connected to the gear **52**.

The gear **55** is rotatable on a shaft **56** oscillatably mounted on the frame **31**. Two arms **57** are fast on the shaft **56**. The free ends of the arms **57** carry a rod **58** supporting the card cylinder **27**. A gear **59** driven by the gear **55** through gears **61** rotatably mounted on at least one of the arms **57** is coaxially connected to the card cylinder.

A point **62** at the lower end of a locking pin **63** guided for vertical movement by a guide **64** mounted to the frame **31** and urged to move downward by a spring **65** fits into the gaps between the teeth of the gear **59**.

A gear **66** is made fast on the shaft **47** and drives a gear **68** through a gear **67** in the direction indicated by an arrow in FIG. 6. The gear **68** is provided with a groove **69** receiving a roller **71** mounted on a rod **72**. The latter is guided for substantially vertical movement by a guide **73** mounted to or forming part of the frame of the dobby. The upper end of the rod **72** is pivotally connected at **74** to one of the arms **57**.

The gear **68** drives a gear **100** on a shaft **101** which is supported by a bearing **102** connected to the frame **31**. A disc **103** provided with a cam groove **104** is rigidly connected to the shaft **101**.

The cam groove **104** is followed by a roller **46** at the end of a two-arm lever **44** which is rockable on a stationary fulcrum **45** mounted on the frame **31**. The upper arm of the lever **44** is pivotally connected to one end of a rod **43**, the second end of the rod being pivotally connected to the arm **41***b* for rocking the peg guide bar **29**.

The shaft **47** is driven at the same speed as the shaft **24**. Therefore, the gear **66** rotates at half the speed of the main drive shaft, i.e., it makes one revolution during the time two consecutive weft threads are inserted. The gears **68** and **100** rotate at the same speed as the gear **66** and the card cylinder **27** advances the card **32** by one hole row L_a per two shuttle picks. During the time the card **32** stands still the guide **29** is moved from the position A to the position B, as shown in FIG. 4. Since the cam disc **103** rotates at one half of the speed of the weaving machine, the follower roller **46** is at one pick in the left position shown in FIG. 6 and the guide bar is in the position A, and at the subsequent pick the roller is at right and diametrically opposed to the position in which it is shown in FIG. 6 and the guide bar **29** is in the position B.

When the guide bar **29** is moved and the card cylinder is not rotated, the latter must be lowered to release the pegs **28**. For this reason the groove **69** is so shaped as to place the roller **71** twice into an upper position and twice into a lower position during one revolution of the gear **68** so that the card cylinder is lowered and lifted at each shuttle pick.

A locking lever **76** swingable on the shaft **56** has an arm whose end carries a locking roller **75** adapted to engage the gaps **51** between the teeth of the gear **52**. The lever **76** is urged to swing clockwise by means of a spring **77** interposed between the end of a second arm of the lever **76** which second arm is placed at an angle to the first arm, and an abutment **78** mounted on the arm **57**.

FIG. 7 shows a section of the mechanism shown in FIG. 6 in rolled out representation showing the lateral relative position of the aforedescribed elements. A clutch is interposed between the sprocket wheel **26** and the wheel **48**. The wheel **26** is freely rotatable on the shaft **47** to the right end of which a hand wheel **81** is mounted. A spring **80** interposed between the hand wheel **81** and the sprocket wheel **26** presses the latter against pins **82** mounted on the wheel **48** and having conical heads fitting into conical cavities **83** in the sprocket wheel **26**.

Operation of the device is now explained with reference to the diagram FIG. 8.

The abscissa in the diagram FIG. 8 represents the angular positions of the main shaft of the weaving machine **10**. The ordinates represent the strokes of individual elements of the system. Lines A and B represent the movements of two heddle frames. Since a weft thread is inserted in the shed formed by warp threads during each revolution of the main loom shaft, certain heddle frames are in the upper shed position during one revolution and are in the lower shed position during another revolution of the loom shaft, depending on the weave pattern. The drive shaft **24** of the dobby rotates at one half of the speed of the loom shaft and the lifter rails actuating the heddle frames make one stroke in one direction and one stroke in the opposite direction during two revolutions of the drive shaft of the weaving machine. Since there are two lifter rails, if the rails move in the same direction, and since there are two lifting blades for each heddle frame, the lifting blades may be so moved to be engaged by the lifter rails that each heddle frame may be moved according to the line A or according to the line B, whether the lifter rails move in one direction or in the opposite direction.

The pattern card **32** is provided with a row of holes L_{1a}, L_{1b} to L_{4a}, L_{4b} for each shuttle pick and is advanced from one row of holes to the next row of holes. Since the sprocket wheel **26** has the same number of teeth as the sprocket wheel **25** (FIG. 1), the shaft **47** and the wheel **48** rotate at one half of the speed of the main loom shaft. The changeover from scanning the rows L_a to scanning the rows L_b of the holes in the pattern card is effected exclusively by the movement of the guide bar **29**. The pattern card is moved only at the rows L_a, i.e., at every second pick. The gear **52** is advanced by one tooth and the card **32** is advanced by one hole row L_a at every revolution of the pin wheel **48**. Since the tooth pitch of the gear **52** is greater than the pitch of the hole rows and the diameter of the tooth pitch circle of the gear **52** is greater than the diameter of the card cylinder **27**, a corresponding step-down is required for the gears **54** and **55**.

Scanning of a row of holes of the pattern card **32**

takes place upon lifting of the card cylinder from the position *c* to the position *a* (FIG. 2). This is illustrated by line F in FIG. 8. At point F_1 the roller **71** in FIG. 6 is in the position f_1. Each peg **28** which is in lowermost position (FIG. 2) with the head **34** resting on the guide **29** must have left the respective hole in the pattern card **32** before the card can be advanced at point G_1 of the line G in FIG. 8 which represents the movement of the pattern card. Thereupon the pin **49** enters the gap **51***a* of the gear **52** which is advanced by one tooth pitch and fixed in that position by the locking roller **75** which has entered a new tooth gap. The new position is illustrated by point G_2 in FIG. 8. In the meantime the card cylinder **27** has reached its lowermost position *c* at F* and has already been lifted before the pattern card has reached the new position G_2.

The card cylinder **27** must not reach position *b* in FIG. 2 before the pattern card has reached the positions G_2, G_4 shown in FIG. 8. When the card cylinder continues to move upward from the position *b* the pegs **28** enter holes in the pattern card and the advance of the latter must be completed before this happens.

Line H in FIG. 8 shows the movement of the peg guide bar **29**. Between the positions F_1 and F_2 of the card cylinder whose movement corresponds to the line F in FIG. 8, the guide bar **29** is moved from position H_{1b} to position H_{1a}, i.e., from position B to position A shown in FIG. 4. During this time the pattern card **32** has been moved by one hole row from position G_1 to position G_2 in FIG. 8.

After completion of one revolution of the main loom shaft the card cylinder **27** is lowered between the positions F_3 and F_4 shown in FIG. 8. The card **32**, however, is not advanced and the bar **29** is moved from position A to position B between H_{2a} and H_{2b} of the line H in FIG. 8 so that the hole row L_{2b} can be scanned.

The same happens when the card cylinder is between the positions F_5 and F_6 as has happened when the cylinder was between the positions F_1 and F_2. The line H shows the transition from H_{3b} to H_{3a} and the line G_3—G_4 shows the advance of the card **32** by one hole row.

Since the locking lever **76** stops the gear **52**, the gear **55** cannot move relatively to the frame **31** of the dobby **18**. The shaft **56** supporting the gear **55** forms the fulcrum of the arms **57** supporting the card cylinder.

When the gear **55** does not move, the adjacent gear **61** rolls on the gear **55** upon continued swinging of the arms **57** from the position *b* to the position *a* in FIG. 6. Therefore, the gear **59** and the card cylinder **27** make a translatory movement during the rocking of the lever **57** from position *b* to position *a*, i.e., the hole row to be scanned moves through the same arc as the rod **58** which supports the card cylinder, i.e. the radial plane of the card cylinder on which the hole row is located, remains in a vertical position.

With the apparatus according to the invention a pattern card **32** whose hole rows *a* are widely spaced, for example, because of space requirements of the heddle frames, can be more efficiently used. Since the guide bar **29** affords provision of hole rows *b* between the hole rows *a* and the hole rows *b* can be scanned without advancing the pattern card, the length of the card can be reduced.

If the hole rows *a* are widely spaced longitudinally of the pattern card, two or more rows *b* can be associated with each row *a*. This, of course, necessitates movement of the bar **29** from the base position A into a plurality of subpositions and a corresponding shaping of the cam grooves **104** and **69**. In this case the rotational speed of the shaft **47** would have to be still less so that the pattern card **32** is advanced by one step per three, four, etc., picks, depending on the number of subpositions of the guide bar.

I claim:

1. A method for controlling a dobby forming part of a weaving machine wherein weft threads are picked through a shed formed by warp threads, the dobby including a pattern card and scanning means for scanning the pattern card and controlling the operation of the dobby, the method including the steps of periodically longitudinally advancing the pattern card relatively to the scanning means for scanning predetermined parts of the pattern card at predetermined moments, and of periodically moving the scanning means relatively to the pattern card for scanning portions of the pattern card located between said parts.

2. A method as defined in claim 1 wherein each advance of the pattern card and each movement of the scanning means is coordinated to a pick of a weft thread through the shed formed by warp threads.

3. In a loom for weaving having heddle frames, a dobby for actuating the heddle frames, a pattern card, means for scanning said pattern card, said scanning means being operatively connected to said dobby for controlling operation thereof, and means for periodically longitudinally advancing said pattern card relatively to said scanning means for scanning predetermined parts of the pattern card at predetermined moments: means operatively connected to said advancing means and to said scanning means for periodically moving said scanning means relatively to said pattern card for scanning portions of the pattern card located between said predetermined parts.

4. In a loom for weaving as defined in claim 3 and wherein said scanning means is movable in a direction longitudinally of and at an angle to the longitudinal extension of said pattern card.

5. In a loom for weaving as defined in claim 3 and wherein said scanning means includes a plurality of pegs and said pattern card has holes for selectively receiving said pegs, said means for moving said scanning means including a guide bar axially movably supporting said pegs and extending at a right angle to the direction of the advance movement of and parallel to said pattern card, and a lever swingable on a stationary fulcrum at each end of said guide bar, one of said levers being operatively connected to said advancing means for actuation thereby, the free ends of said levers being pivotally connected to the ends of said guide bar, said levers and said guide bar forming a parallelogram for moving said guide bar parallel to itself upon swinging of one of said levers.

6. In a loom for weaving having drive means, means actuated by said drive means for picking weft threads through a shed formed by warp threads, heddle frames, a dobby actuated by said drive means for actuating the heddle frames, a pattern card, means for scanning the pattern card, said scanning means being operatively connected to said dobby for controlling operation thereof, a card cylinder for said pattern card, and a mechanism operatively connected to and driven by said drive means for periodically actuating said card cylinder for periodically longitudinally advancing said pattern card relatively to said scanning means for scanning predetermined parts of said pattern card at predetermined moments: means operatively connected to said mechanism and to said scanning means for periodically moving said scanning means relatively to said pattern card for scanning portions of said pattern card located between said predetermined parts, said mechanism including means for moving said card cylinder and said pattern card away from said scanning means upon every advance movement of said pattern card and upon every movement of said scanning means.

7. In a loom for weaving as defined in claim 6 and wherein said mechanism includes a cam means and a cam follower means associated therewith for effecting movement of said card cylinder, and a cam means and a cam follower means associated therewith for effecting

movement of said scanning means, said cam means making one revolution per two weft thread picks.

8. In a loom for weaving as defined in claim 6 and wherein said mechanism includes a cam means and a cam follower means associated therewith for effecting movement of said card cylinder, and a cam means and a cam follower means associated therewith for effecting movement of said scanning means to a plurality of positions for scanning a plurality of portions of the pattern card between two parts of the pattern card scanned upon advance movement of the pattern card, said cam means making one revolution per a number of weft thread picks which number is equal to the number of scanning positions of said scanning means.

No references cited.