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PATTERN CARDS OF LOOMS

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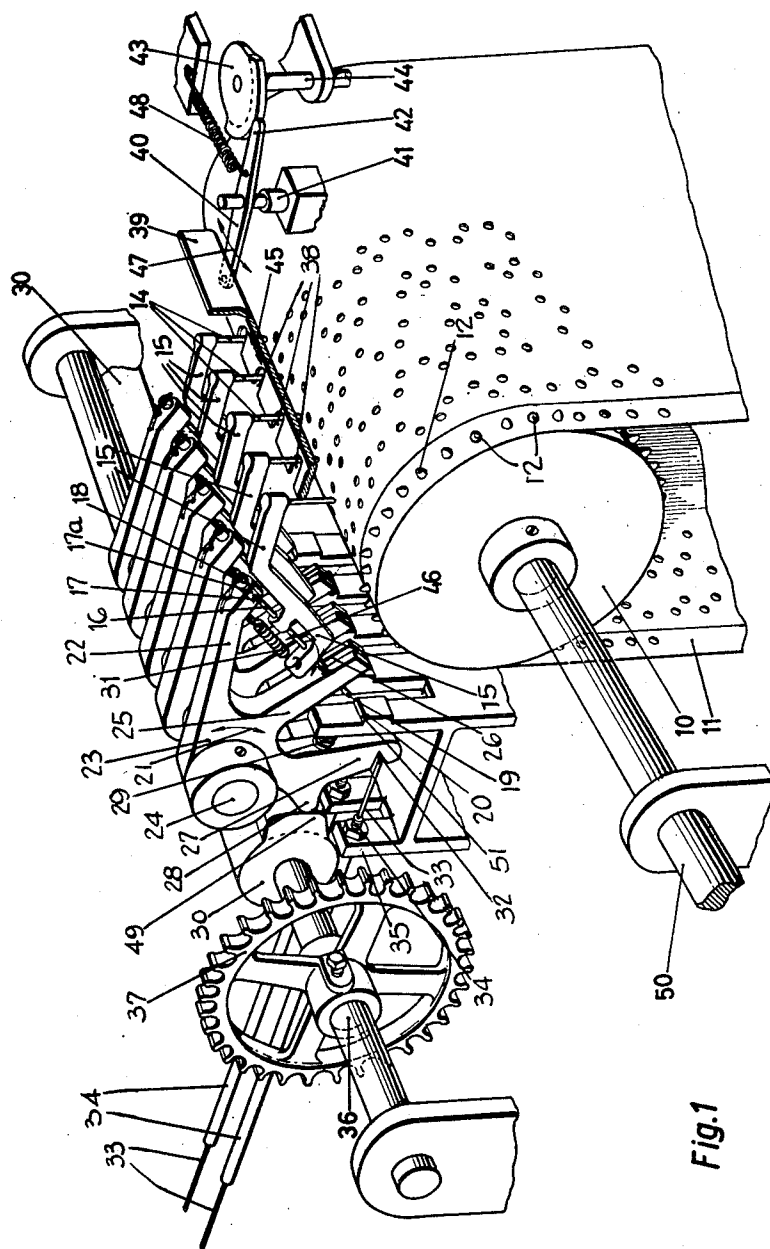


Fig. 1

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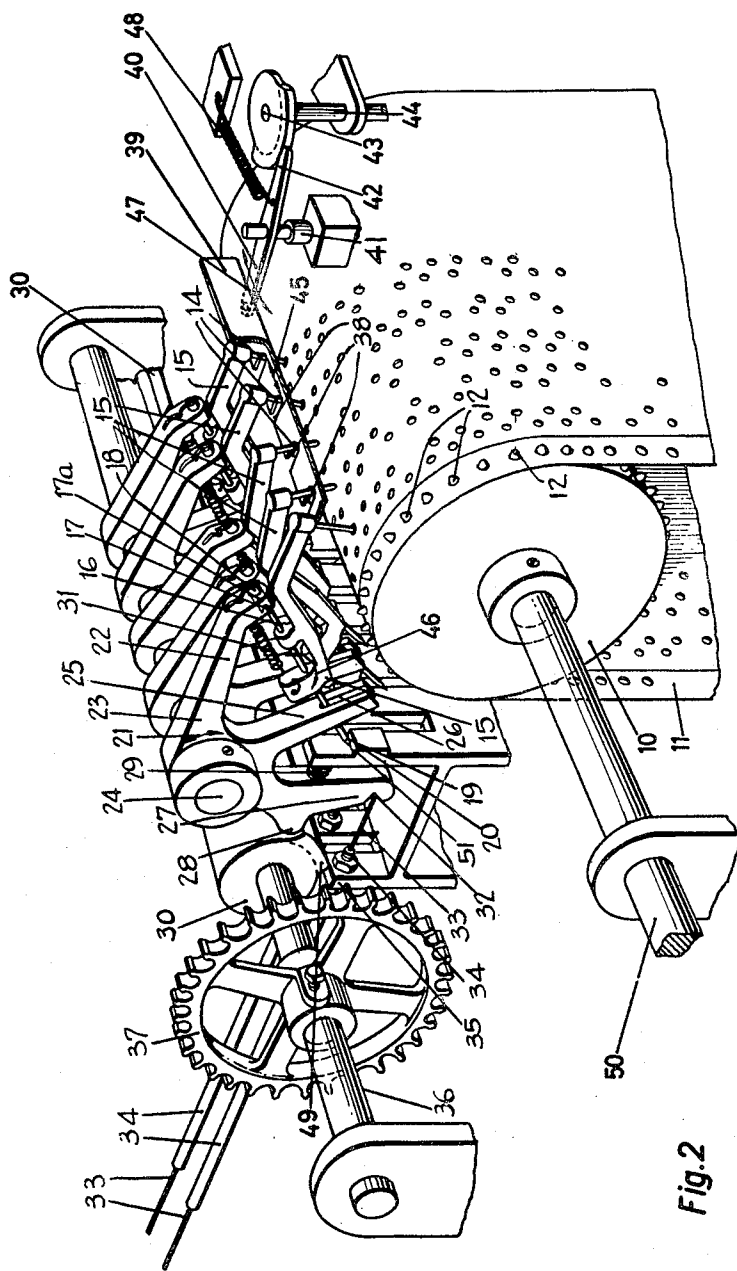


Fig. 2

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FEELER NEEDLE MECHANISM FOR EXPLORING PATTERN CARDS OF LOOMS

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19 Claims. (Cl. 139—331)

The present invention relates to an improved feeler needle mechanism for moving the loom harnesses or heald frames in conformance with a pattern by exploring a pattern card through the intermediary of feeler needles during forward and reverse running of the loom.

Feeler needle mechanisms of this type are known for dobbies provided with knife drive, especially for double-lift dobbies. However, such feeler needle mechanisms are very complicated due to the requirement that the correct position of the heald or harness frame be achieved from any desired position thereof as well as during forward and also reverse running of the loom. Since the pattern cards which are generally employed are made of paper the feeler needles may only bear lightly against the pattern card, so that previously in order to attain a sufficiently large control force, so-called force or power boosters were necessary. Light and heavy knife hooks were employed for these power boosters. However, these knife hooks no longer worked reliably with high-speed looms.

Thus, this invention has the purpose, on the one hand, to open the correct sheds during forward and reverse running of the loom from any desired position and, on the other hand, to simplify the aforementioned power boosting.

Another important object of the present invention is to provide an improved feeler needle mechanism for harness motion control comprising rockable means for controlling the motion of each harness frame mounted for displacement into at least two operable positions, a feeler needle support including locking means operatively connected with each rockable means, a feeler needle for exploring a pattern card provided at each feeler needle support, and means engageable with said locking means of each feeler needle support when the feeler needle thereof encounters a hole in the pattern card, with said locking means remaining out of operable cooperation with said engageable means when the associated feeler needle fails to encounter a hole in the pattern card.

A further important object of the present invention is to provide an improved feeler needle mechanism for reliably and positively moving the harnesses or heald frames in conformance with a pattern by exploring a pattern card provided with perforations by means of feeler needles during forward and reverse running of a loom.

Still a further important object of the present invention is to provide an improved feeler needle mechanism for reliably and efficiently exploring a pattern card, said mechanism being relatively simplified in construction, yet highly reliable in performing its designed function, and wherein a single feeler needle suffices for exploring two adjacent rows of perforations of the pattern card.

Generally speaking, the feeler needle mechanism according to the present invention is essentially characterized by the fact that, a plurality of supports are provided each of which carries a feeler needle and a locking rod or bar, each of said supports being pivotably mounted in a respective rocking lever in lengthwise direction, and against the force of a spring substantially radially or inwardly, with respect to a card cylinder carrying the pattern card, said rocking levers being pivotable and driven by the continuous loom drive laterally in spaced

relation from and with respect to the lengthwise axis of the card cylinder carrying the pattern card in order to actuate the push rods or other suitable expedient connected with the dobbie. Additionally, stationary stops or supports are provided for the locking bars to prevent pivotable movement of the rocking levers in such a manner that the locking bars of the supports lying upon the pattern card by means of their associated feeler needles are located out of the zone of contact of the aforesaid stationary supports, and that with the feeler needles extending through the pattern card with the presence of perforations in such pattern card the corresponding locking bars are located in the zone of contact of the stationary supports.

Still further objects and the entire scope of applicability of the present invention will become apparent from the detailed description given hereinafter; it should be understood, however, that the detailed description and specific examples, while indicating a preferred embodiment of the invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description.

In the drawings:

FIGURE 1 is a perspective view of a feeler needle mechanism designed according to the teachings of the present invention; and

FIGURE 2 illustrates the feeler needle mechanism of FIGURE 1 during exploring of the pattern card and depicting different positions of the feeler needles.

Referring now to the drawings, the inventive feeler needle mechanism or device exhibits a card cylinder 10 upon which there is held an endless pattern card 11 by means of guide pins 12. These guide pins 12 are advantageously secured to both ends of the card cylinder 10 and engage in specially provided holes of the pattern card 11 in order to entrain the latter. Above this card cylinder 11 there are located feeler needles 14 which are secured to supports or carrier members 15. In each of these supports 15 there is connected a locking bar or rod 16 non-displaceably with respect to its associated support 15. The one end 17 of the locking bar or rod 16 is mounted in a tapered or cone-shaped recess 17a of a screw 18 or the like, whereas the other end 19 of such locking bar 16 is located in or out of the zone of contact of a stationary stop or support 20. This stationary support is provided with shoulder means 51 and is constructed in the form of a stop, for purposes to be more fully described hereinafter.

Each screw 18 is located in an arm 22 of an associated three-arm rocking lever 23 providing a displaceable member which is mounted upon a stationary shaft 24 for pivoting or rocking laterally in spaced relation from and with respect to the longitudinal axis of the card cylinder in the direction of the doubleheaded arrow 21. A second arm 25 of the three-arm lever 23 exhibits a slot 26 in which the locking rod or bar 16 is suitably guided. A tension spring 31 which, on the one hand, is articulated to the associated feeler needle support 15 and, on the other hand, to the arm 22 of the associated three-arm lever 23 strives to pull the corresponding locking bar 16 completely into the slot 26 of the arm 25.

A cam or protrusion 28 is located at a third arm 27 of each three-arm rocking lever 23. Each such three-arm lever 23 is rockable or pivotable in counterclockwise direction against the force of an associated pressure spring 29 located between the third arm 27 of the rocking lever 23 and the stationary stop or support means 20. The pressure spring 29 strives to pivot the associated rocking lever 23 together with its cam 28 in clockwise direction and to press such against a driven eccentric 30. The

eccentric 30 exhibits a cam or cam surface 49. A recess or notch 32 is provided at the arm 27 of each rocking lever 23 into which extends the end of an associated actuating member for harness motion control, in the illustrated embodiment being in the form of a cable 33 operating as a push rod and located in a suitable sheath or jacket 34. Such actuating members, more specifically the cables or rods 33, are normally urged toward the associated notches 32 of the arms 27, as for example by being spring biased such that the ends of the cables 33 facing their associated lever arm 27 are in engagement with such corresponding notches. The cable jacket 34 is advantageously secured to a stationary support device 35. The push rods 33 of the feeler needle device are connected with the non-illustrated dobby and serve to control the same, as for example in the manner of the Hattersley dobby, as is well known to those skilled in the art. The eccentric 30 is secured to a shaft 36 connected via a sprocket wheel 37 with the continuous drive of the loom and which with each working cycle of the loom executes one revolution.

In order to attain an exploration or scanning of two rows of perforations lying transversely on the pattern card 11, the feeler needles 14 are guided in open-ended slots 38 of a guide rail 39 mounted to be displaceable transversely of the pattern card 11. This guide rail 39 is displaceable lengthwise in the direction of the double-headed arrow 45 and serves to correspondingly displace the feeler needles 14, whereby the supports 15 carrying such feeler needles having a first degree of freedom of movement in that they are pivotable about the axis of their associated locking bar 16 in the direction of the double-headed arrows 46. The displacement of the guide rail 39 occurs via a double-arm lever 40 mounted for pivoting in the direction of the double-headed arrow 47 upon a stationary shaft 41, said double-arm lever bearing with its end 42, by virtue of a spring 48, against an eccentric 43, the shaft 44 of which rotates one-half of a revolution during each working cycle of the loom.

The mode of operation of the heretofore described apparatus is as follows:

A generally conventional pattern card can be employed for the described mechanism, the perforations of which are so displaced in the transverse direction of the pattern card that the perforations for the even numbered picks lie in one longitudinal row and the perforations for the odd numbered picks lie in another, likewise in a row of perforations extending in the longitudinal direction of the pattern card. The advantage of such an arrangement of the perforations resides in the unusually good utilization of the available space of the pattern card.

In order to be able to explore both of the aforementioned rows of perforations for the even and odd numbered picks with a single feeler needle 14, each feeler needle 14 must be capable of being displaced in the axial or lengthwise direction of the card cylinder 10. Such occurs by means of the angle or guide rail 39 in which, as will be recalled, the feeler needles 14 are guided in slots 38, said guide rail alternately bringing the feeler needles 14 into the operating zone of the one and the other rows of perforations, whereby the feeler needles 14 together with their supports 15 undergo their first degree of freedom of movement in that they are pivoted in the direction of the double-headed arrows 46 about the axis of their corresponding locking bar 16 i.e. lengthwise in spaced relation from the longitudinal axis of the card cylinder 10. By virtue of this transverse displacement of the feeler needles 14 only half the number of feeler needles are necessary, since with the known feeler needle devices a separate feeler needle is necessary for each row of perforations of the pattern card.

In order to lift the feeler needles 14 out of the zone or range of the pattern card 11, in order to move or index the latter forward, each three-arm lever 23 is pivoted or rocked counter-clockwise by means of the eccentric 30 in

that the cam 49 of said eccentric 30 bears against the cam 28 of the respective arms 27. Consequently, each support 15 mounted for at least two degrees of freedom of movement in the three-arm lever 23 together with its feeler needle 14 is raised to such an extent that, the feeler needles 14 are simultaneously and collectively removed from the pattern card 11 so that the card cylinder 10 receiving such pattern card 11 can be further indexed via its shaft 50 by means of a suitable, non-illustrated step-by-step drive. Any standard and well known step-by-step drive or indexing mechanism suitable for this purpose, such as a Maltese cross, can be employed, as will be apparent to those familiar with the art. As soon as the card has been turned or indexed further and the cam 49 of the eccentric 30 has run-off the respective cams 28 of the displaceable members or rocking levers 23, such rocking levers 23 are pivoted clockwise by the associated springs 29 and the feeler needles 14 are lowered onto the pattern card 11. It is to be appreciated that when the cam or cam surface 49 engages with the cams 28 and the three-arm levers 23 are thus rocked counter-clockwise, the actuating rods 33 move under the influence of their spring-bias forwardly towards the card cylinder 10.

If a perforation for a feeler needle 14 is present in the pattern card 11 then the associated support 15 undertakes its second degree of freedom of movement and such corresponding feeler needle 14 can pivotably sink or lower inwardly in the direction of the longitudinal axis of the card cylinder 10 to such an extent that the locking bar 16 thereof arrives with its end 19 at the shoulder or notch 51 of the stop-like stationary support 20 (FIGURE 2), whereby a further pivoting of its rocking lever 23 in clockwise direction due to the associated spring 29 is prevented. The arm 27 of the rocking or rockable lever 23 cannot operate upon the corresponding forwardly positioned actuating or push rod 33 which, in this case, will not be displaced and therefore remains in its forward position. The corresponding harness or heald frame to be controlled thus has its operation directed in that it is thereby brought into its upper position, or in the event it is already located there then it remains in such position.

On the other hand, if a perforation is not present in the pattern card 11 then the corresponding feeler needle 14 bears against the pattern card 11. The associated support 15 together with the locking bar 16 is pivoted against the action of the spring 31 in counterclockwise direction about the cone-shaped recess 17a, whereby the locking bar 16 guided in the slot 26 of the support 15 is pivoted to such an extent that the end 19 of the locking bar 16 does not come into contact with the stop-like stationary support 20 (FIGURE 2). As a result, the three-arm rocking lever 23 remains in contact with the eccentric 30 under the influence of the pressure spring 29 and the lever arm 27 bears against the actuating or push rod 33 during pivoting of the rocking lever 23 in clockwise direction, whereby such push rod is displaced in the reverse direction out of its previously attained forward position. The harness or heald frame to be controlled is thus directed in operation in that it is brought into its lower position, or in the event it is already located there then it remains in the same. It will be understood and appreciated that for the reverse running of the loom the operation is similar to that described herein.

While there is shown and described a present preferred embodiment of the invention, it is to be distinctly understood that the invention is not limited thereto but may be otherwise variously embodied and practised within the scope of the following claims.

Having thus described the present invention, what is desired to be secured by United States Letters Patent is:

1. A feeler needle mechanism for reading a pattern and thereby controlling shed forming at a loom comprising a separate rocking lever, a feeler needle support provided with locking means operably connected with each rocking lever, a feeler needle for reading a pattern

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carried by each feeler needle support, and means cooperating with said locking means of each feeler needle support for arresting the associated rocking lever in a first position when its feeler needle encounters a hole in the pattern and for allowing movement of said rocking lever into a second position when its feeler needle fails to encounter a hole in the pattern.

2. Feeler needle mechanism for controlling the movement of the harness frames of a loom comprising means for controlling the motion of each harness frame mounted to be displaceable into at least two operable positions, one operable position of which directs operation of the associated harness frame in one predetermined position and the other operable position of which directs operation of the associated harness frame in another predetermined position, a feeler needle support including locking means operatively connected to each harness motion controlling means, a feeler needle for sensing a pattern card carried by each feeler needle support, means engageable with said locking means of each feeler needle support when the feeler needle thereof encounters a hole in the pattern card to allow said harness motion controlling means to assume said one position, said locking means remaining out of operable cooperation with said engageable means when the associated feeler needle of said locking means fails to encounter a hole in the pattern card such that said harness motion controlling means assumes said second position.

3. Feeler needle mechanism for controlling the movement of the harness frames of a dobby loom comprising a separate rockable member adapted for controlling movement of each harness frame mounted for pivotal movement into at least two operable positions, one operable position of which directs operation of the associated harness frame in one predetermined position and the other operable position of which directs operation of the associated harness frame in another predetermined position, a feeler needle support including locking means operatively connected to each rockable member, a feeler needle for sensing a pattern card carried by each feeler needle support, means engageable with said locking means of each feeler needle support when the feeler needle thereof encounters a hole in the pattern card to permit said rockable member to assume said one position, said locking means remaining out of operable cooperation with said engageable means when the associated feeler needle of said locking means fails to encounter a hole in the pattern card such that said rockable member assumes said second position.

4. Feeler needle mechanism for controlling the movement of the harness frames of a dobby loom comprising a separate rockable member for controlling movement of each harness frame mounted for pivotal movement into at least two operable positions, one operable position of which directs operation of the associated harness frame in one predetermined position and the other operable position of which directs operation of the associated harness frame in another predetermined position, a feeler needle support including locking means provided for each rockable member, means for pivotally connecting each feeler needle support to its rockable member, a feeler needle supported by each feeler needle support for reading a pattern card, and means cooperating with said locking means of each feeler needle support for arresting the associated rockable member in one of said operable positions when its feeler needle encounters a hole in the pattern card and for allowing movement of said rockable member into the other operable position when its feeler needle fails to encounter a hole in the pattern card.

5. Feeler needle mechanism for controlling the movement of the harness frames of a dobby loom comprising a separate rockable member for controlling movement of each harness frame mounted for pivotal movement into at least two operable positions, one operable position of which directs operation of the associated harness frame in one predetermined position and the other operable posi-

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tion of which directs operation of the associated harness frame in another predetermined position, a feeler needle support including locking means provided for each rockable member, means for pivotally connecting each feeler needle support to its rockable member to permit at least two degrees of freedom of pivotal movement of such feeler needle support and its locking means relative to its rockable member, a feeler needle supported by each feeler needle support for reading a pattern card, and means cooperating with said locking means of each feeler needle support for arresting the associated rockable member in one of said operable positions when its feeler needle encounters a hole in the pattern card and for allowing movement of said rockable member into the other operable position when its feeler needle fails to encounter a hole in the pattern card.

6. Feeler needle mechanism for controlling the movement of the harness frames of a dobby loom comprising a separate rockable member for controlling movement of each harness frame mounted for pivotal movement into at least two operable positions, one operable position of which directs operation of the associated harness frame in one predetermined position and the other operable position of which directs operation of the associated harness frame in another predetermined position, a feeler needle support provided for each rockable member, means for connecting each feeler needle support to its rockable member for pivotal movement thereof lengthwise in spaced relation from and with respect to the longitudinal axis of a card cylinder for a pattern card as well as inwardly in the direction of the longitudinal axis thereof, a feeler needle supported by each feeler needle support for reading a pattern card, and means for arresting each rockable member in one of said operable positions when its feeler needle encounters a hole in the pattern card and for allowing movement of said rockable member into the other operable position when its feeler needle fails to encounter a hole in the pattern card.

7. Feeler needle mechanism for controlling the movement of the harness frames of a dobby loom comprising a separate rockable member for controlling movement of each harness frame mounted for pivotal movement into at least two operable positions, one operable position of which directs operation of the associated harness frame in one predetermined position and the other operable position of which directs operation of the associated harness frame in another predetermined position, a card cylinder for detachably carrying a pattern card, a pattern card provided with perforations carried by said card cylinder, a feeler needle support including locking means provided for each rockable member adjacent said card cylinder, a feeler needle carried by each feeler needle support for reading the pattern card, means for connecting each feeler needle support and its locking means to its associated rockable member for pivotal movement lengthwise in spaced relation from and with respect to the longitudinal axis of said card cylinder as well as inwardly in the direction of the longitudinal axis thereof, and means cooperating with said locking means of each feeler needle support for arresting the associated rockable member in one of said operable positions when its feeler needle encounters a hole in the pattern card and for allowing movement of said rockable member into the other operable position when its feeler needle fails to encounter a hole in the pattern card.

8. Feeler needle mechanism according to claim 7 wherein said perforations of said pattern card are arranged in rows, with any two adjacent rows of perforations controlling the even and odd picks of the loom, and means for displacing said feeler needles such that each feeler needle alternately reads two rows of perforations.

9. Feeler needle mechanism according to claim 8 wherein said displacing means comprises a guide rail

provided with spaced slots through each of which piercingly extends a respective feeler needle.

10. Feeler needle mechanism according to claim 7 including means for selectively and collectively raising all of the feeler needles away from the pattern card.

11. Feeler needle mechanism according to claim 10 wherein said raising means comprises an eccentric adapted to be driven by the continuous loom drive.

12. Feeler needle mechanism according to claim 11 including spring means provided for urging each rockable member into operable association with said eccentric.

13. Feeler needle mechanism according to claim 12 wherein each rockable member comprises a three-arm lever, one arm of which is provided with a slot through which extends said locking means, said connecting means for each feeler needle support including spring means for urging said locking means in the direction of its associated slot.

14. Feeler needle mechanism according to claim 13 wherein another arm of said three-arm lever is provided with a cam surface actuatable by said eccentric for rocking such three-arm lever to thereby raise the associated feeler needle away from the pattern card.

15. Feeler needle device for displacing the harnesses in conformance with a pattern by exploring a pattern card exhibiting a plurality of perforations arranged in rows of perforations through the agency of feeler needles during forward and reverse running of the loom whereby control impulses are imparted to a dobby via actuating members for harness motion control, comprising a plurality of supports each of which carries a feeler needle and a locking bar, a respective rocking lever in which each support is mounted for pivotal movement lengthwise in spaced relation from and with respect to the longitudinal axis of a card cylinder carrying the pattern card as well as inwardly in the direction of the longitudinal axis thereof, means pivotably mounting said rocking levers to be driven by the continuous loom drive laterally in spaced relation from and with respect to the longitudinal axis of the card cylinder carrying the pattern card in order to operate the actuating members adapted to be operably connected with the dobby, stationary stop means provided for the locking bars to prevent pivotable movement of the associated rocking levers in such a manner that the locking bars of those supports lying upon the pattern card by means of their respective feeler needle are located out of the zone of contact of the stationary stop means and that with the feeler needles extending through the pattern card in the presence of a perforation in such pattern card the corresponding locking bars are located in the zone of contact of the stationary stop means.

16. Feeler needle device for displacing the harnesses in conformance with a pattern by exploring a pattern card carried upon a card cylinder and exhibiting a plurality

of perforations arranged in rows of perforations through the agency of feeler needles during forward and reverse running of the loom whereby control impulses are imparted to a dobby via push rods for harness motion control, comprising a plurality of supports each of which carries a feeler needle and a locking bar, a respective rocking lever including means whereby each support is mounted for pivotal movement lengthwise and against the force of a spring inwardly with respect to the longitudinal axis of the card cylinder carrying the pattern card, means pivotably mounting said rocking levers to be driven by the continuous loom drive laterally in spaced relation from and with respect to the longitudinal axis of the card cylinder carrying the pattern card in order to operate the push rods operably connected with the dobby, stationary stop means provided for the locking bars to prevent pivotable movement of the associated rocking levers in such a manner that the locking bars of those supports lying upon the pattern card by means of their respective feeler needle are located out of the zone of contact of the stationary stop means and that with the feeler needles piercingly extending through the pattern card in the presence of a perforation in such pattern card the corresponding locking bars are located in the zone of contact of the stationary stop means.

17. Feeler needle device according to claim 16 including a continuous loom drive mechanism provided with an eccentric for driving said rocking levers, a pressure spring located between each rocking lever and said stationary stop means for pressing said rocking levers against said eccentric.

18. Feeler needle device according to claim 16 wherein said means of each rocking lever articulates one end of the associated locking bar to said rocking lever with the other end of said locking bar being located in or out of the zone of contact of said stationary stop means in dependence upon the position of the associated feeler needle.

19. Feeler needle device according to claim 16 including a guide rail mounted to be displaceable in transverse direction with respect to the pattern card, said guide rail having respective slots in which said feeler needles are individually guided to shift said feeler needles for exploring by means of a single feeler needle two rows of perforations lying in transverse direction on the pattern card.

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