Dec. 15, 1942. R. G. TURNER 2,305,328

PAPER PATTERN INDICATED LOOM DOBBY

Filed July 12, 1941 5 Sheets-Sheet 1

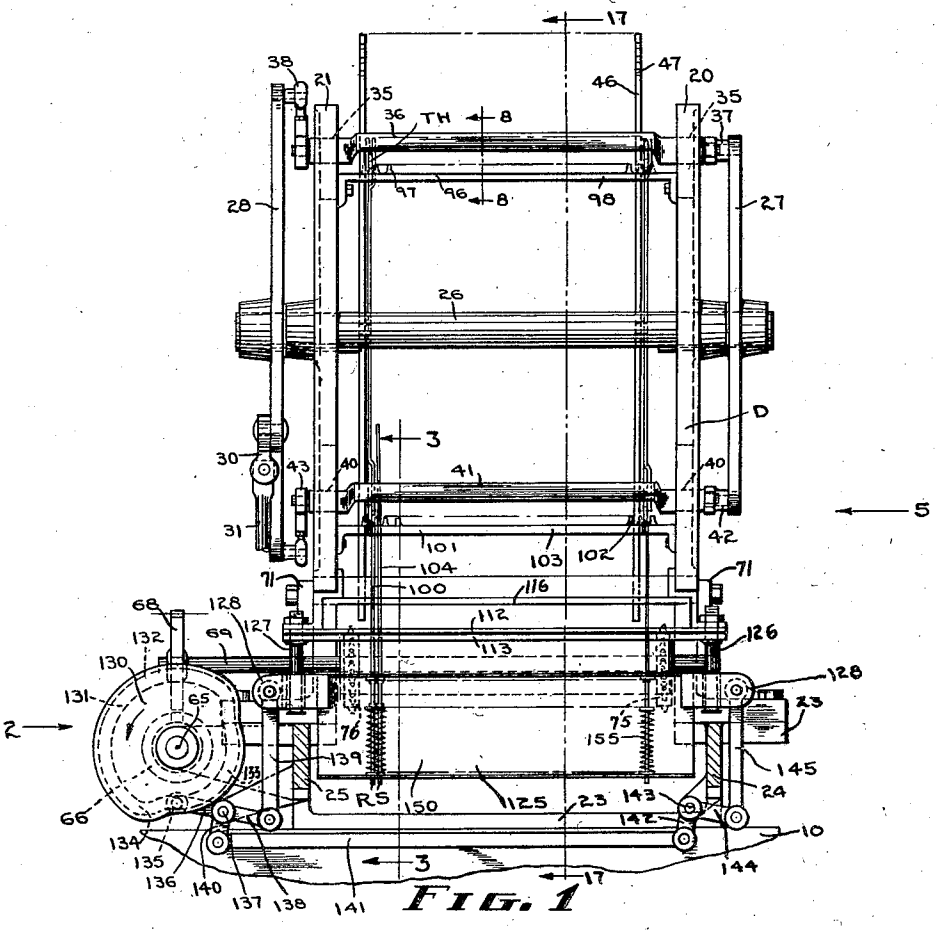


FIG. 1

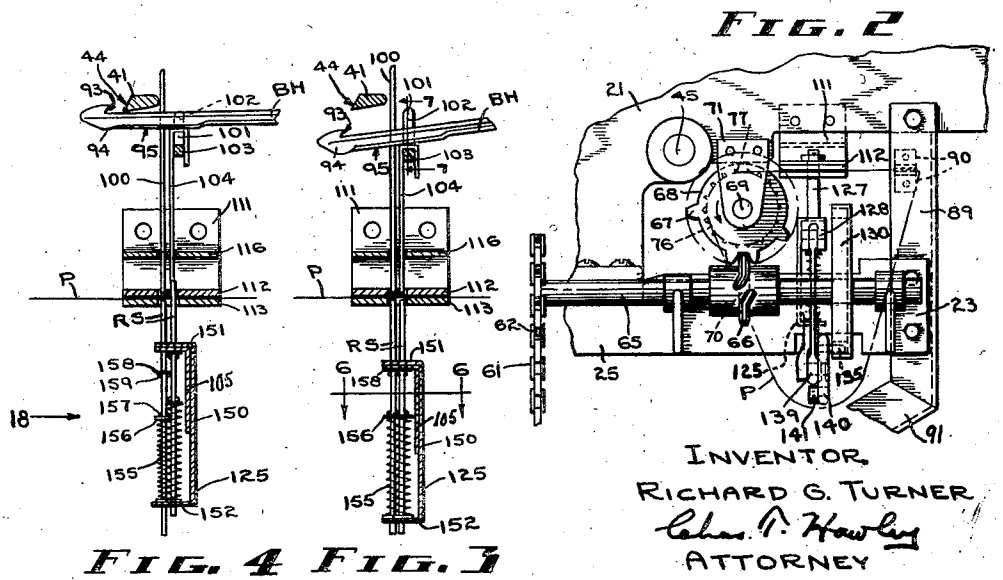


FIG. 2

FIG. 4

FIG. 3

INVENTOR.
RICHARD G. TURNER
Edwin A. Hawley
ATTORNEY

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FIG. 5

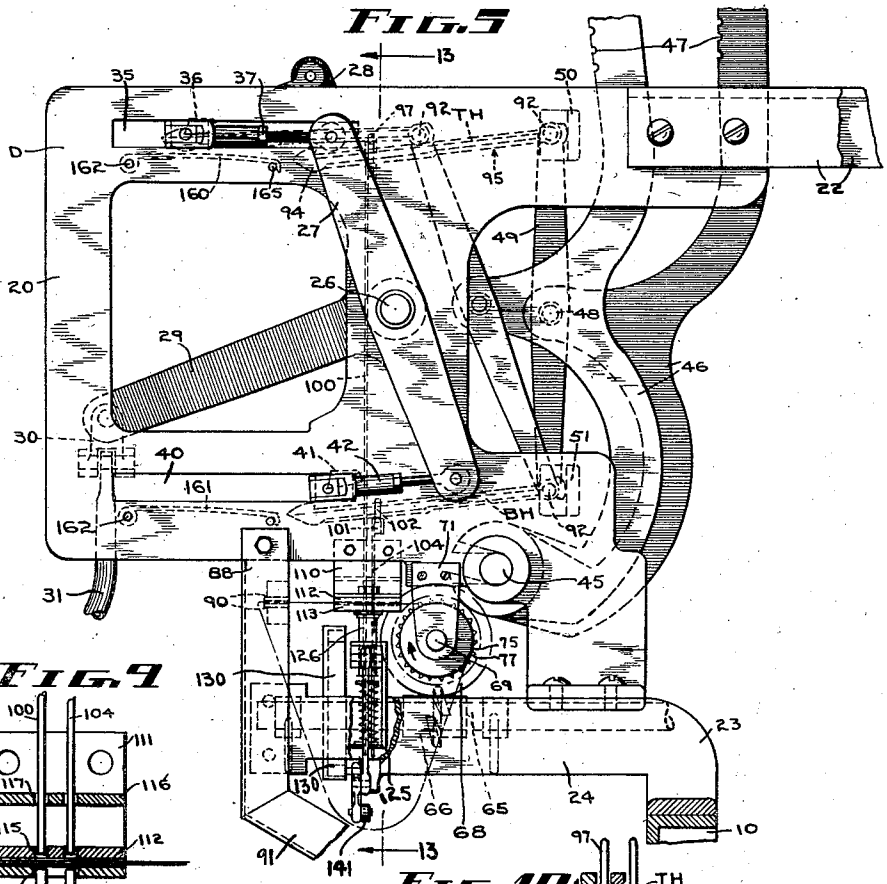


FIG. 9

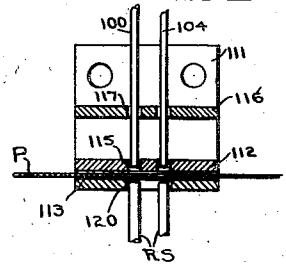
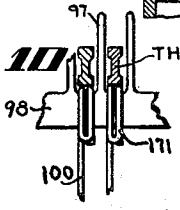


FIG. 10



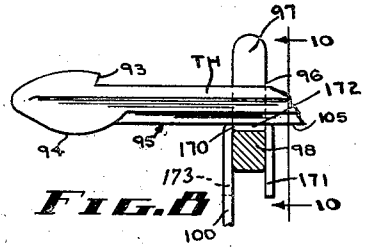


FIG. 8

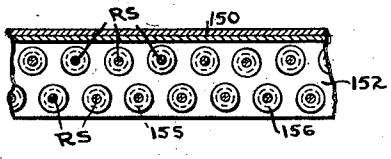
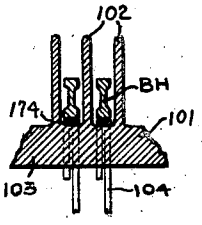


FIG. 6

FIG. 7



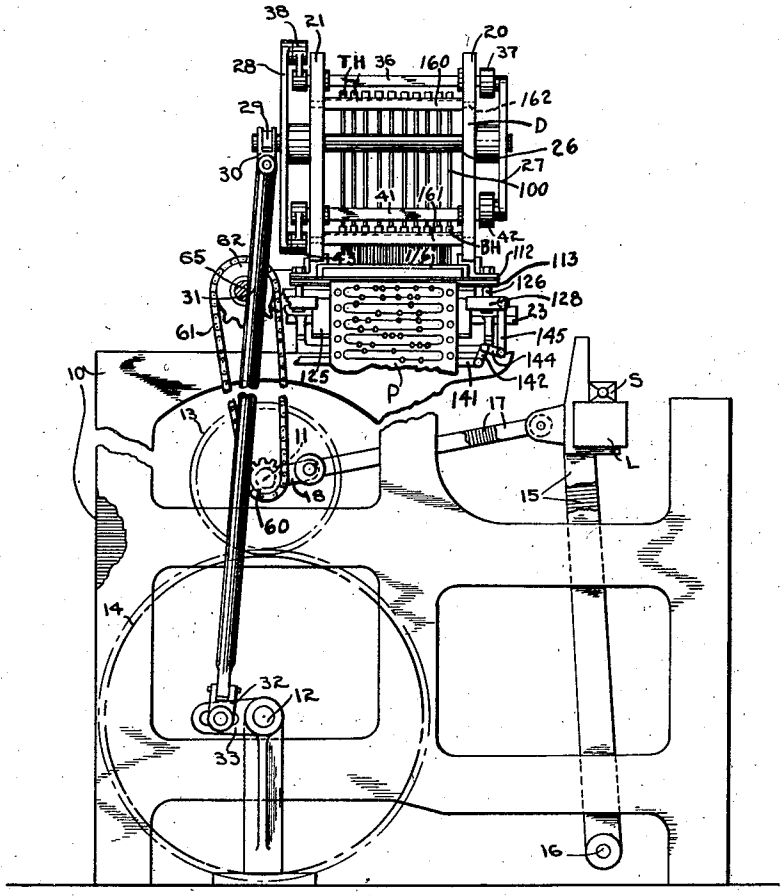
INVENTOR,
RICHARD G. TURNER
Chas. T. Hartley
ATTORNEY

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FIG. 11



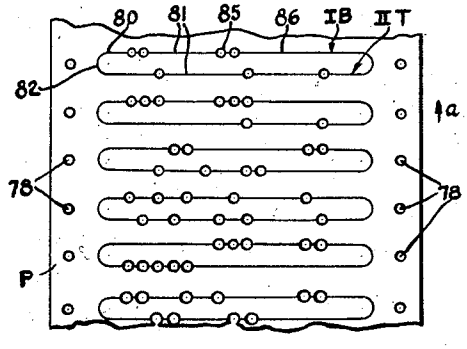


FIG. 12

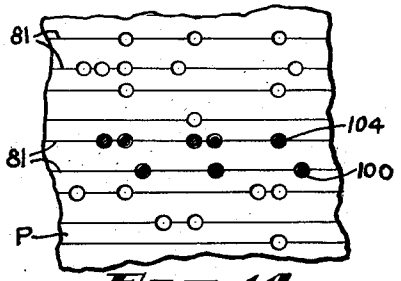


FIG. 14

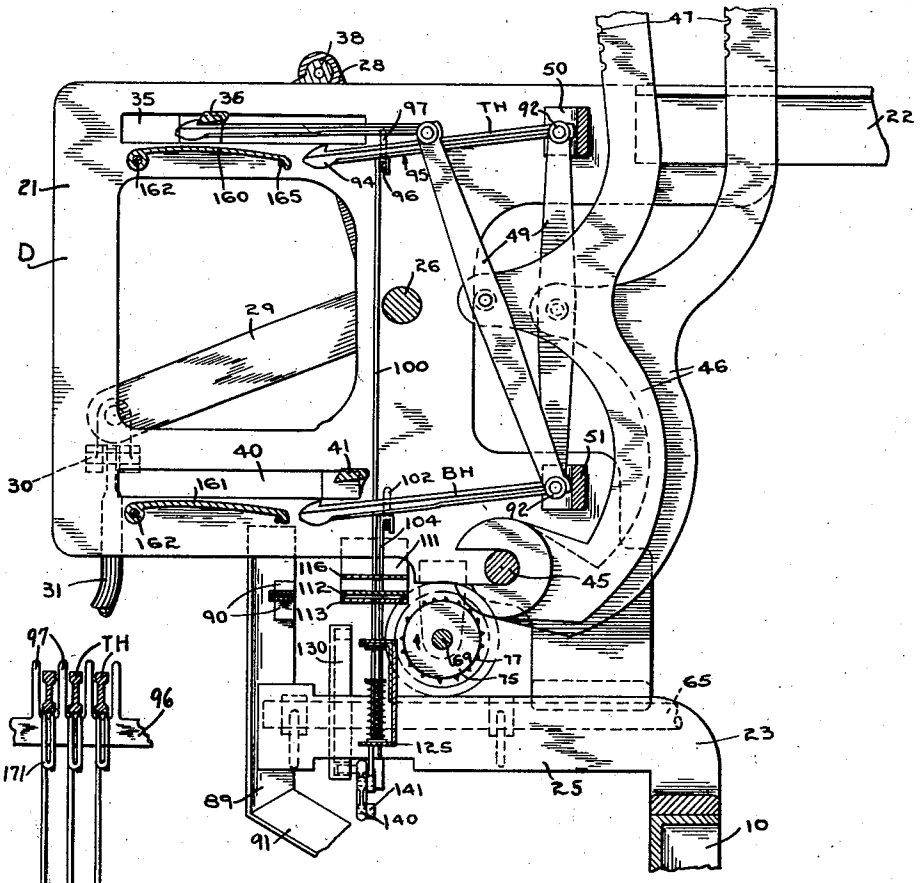
INVENTOR,
RICHARD G. TURNER
Edwin T. Hawley
ATTORNEY

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FIG. 17



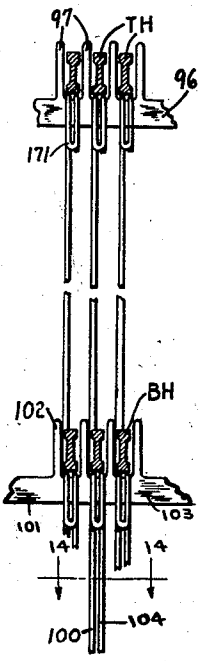


FIG. 13

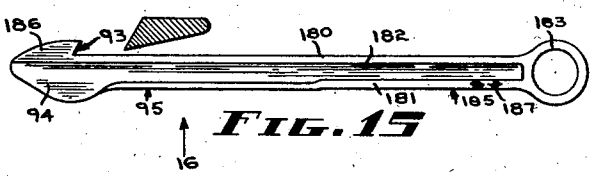


FIG. 15

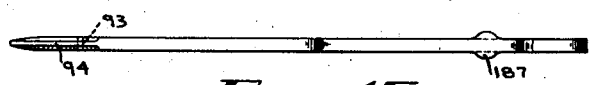


FIG. 16

INVENTOR.
RICHARD G. TURNER
Chas. T. Hawley
ATTORNEY

Dec. 15, 1942. R. G. TURNER 2,305,328

PAPER PATTERN INDICATED LOOM DOBBY

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FIG. 18

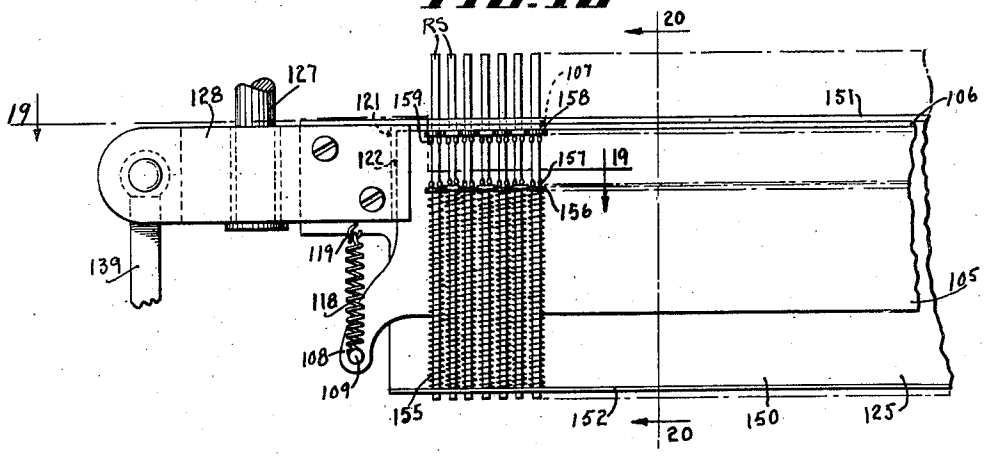


FIG. 19

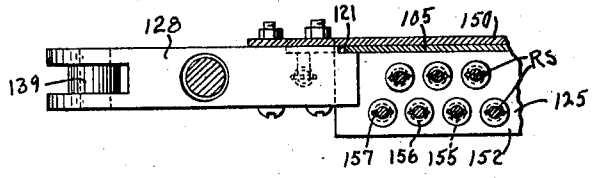
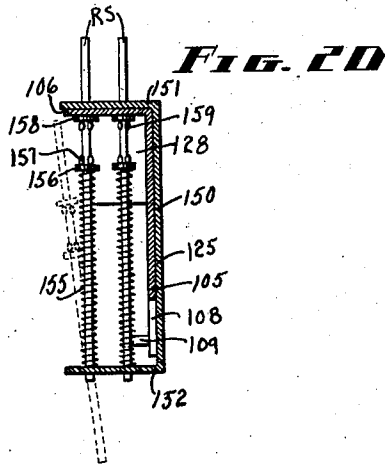


FIG. 20



INVENTOR
RICHARD G. TURNER
Richard T. Hawley
ATTORNEY

Patented Dec. 15, 1942 2,305,328

UNITED STATES PATENT OFFICE

2,305,328

PAPER PATTERN INDICATED LOOM DOBBY

Richard G. Turner, Worcester, Mass., assignor to Crompton & Knowles Loom Works, Worcester, Mass., a corporation of Massachusetts

Application July 12, 1941, Serial No. 402,080

29 Claims. (Cl. 139—68)

This invention relates to improvements in loom dobbies and it is the general object of the invention to provide a dobby with a sheet or paper pattern to control pattern reading members which also move the harness lifting hooks relatively to the lifter knives.

It has been proposed heretofore to employ endless paper patterns punched to control one mechanism which in turn controls a second mechanism to supply the force which moves the selected harness hooks into operative position. In such mechanisms two distinct units have been employed, one relatively weak to read the pattern indication from the paper pattern, and the other relatively strong to relay the reading of the first unit to the hooks. It is an important object of my present invention to provide a combined pattern reading and hook setting mechanism wherein the reading mechanism supplies the force required to set the hooks.

It is a further object of my present invention to provide the reading and setting unit having a plurality of resiliently mounted members on one side of the pattern sheet which are aligned with hook lifting wires or the like on the opposite side of the sheet and move the members against the pattern to permit those members which register with perforations to pass through the sheet and transmit a lifting force directly to the corresponding wires. The paper is strong enough to withstand the resilient force of those members aligned with blank portions of the paper and hold them back to prevent actuation of the wires and hooks associated with them.

It is a further object of my present invention to provide a carriage to raise the reading and setting members and their springs at such a time as to lift the hooks either against or in the path of the knives before the latter reach the end of their return or non-lifting stroke. By this arrangement close timing of the knife stroke with respect to the up motion of the members is avoided, and the knives can subject the reading and setting members to a momentary depression to loosen them should they or their springs stick, after which the springs snap their members upwardly into the path of the knives.

It is another object of my invention to provide a guard under the hooks which becomes operative soon after the knives start their working stroke to hold the hooks in engagement with their respective knives should breakage occur in the harness straps with which the hooks are associated. The bottom of each hook is formed with a rounded projection or engagement with the guard to permit free angular motion of the hook due to turning of the harness jack lever as the hook is drawn outwardly by its knife. The guard is mounted to be released and swing downwardly should it be necessary to release a hook from a knife which has not completed its return stroke.

It is a still further object of my present invention to pass the paper pattern between pattern sheet guide plates one of which is punched with holes to receive the reading and setting members. The pattern sheet slides along the perforated guide plate and is supported by the latter when the members are moved against it. The reading and setting members are of larger diameter than the hook controlling wires to insure registry and transmission of force from the members to the wires. The latter extend into the perforations of the guide plate but are of less diameter than the perforations and it is a further object of my present invention to provide an auxiliary guide plate which holds the lower ends of the wires in registering position with respect to their corresponding members.

Heretofore, the reading members have moved toward the feed cylinder for the paper, but since I transmit the hook lifting force through the paper, I locate the feeding mechanism, such as a step-by-step actuated cylinder, at one side of the aforesaid plates where it will not interfere with the reading and setting members. The cylinder advances the paper pattern through a narrow space between the plates and is close enough to the latter to obviate the need of a clamp or the like to hold the paper in register with the reading and setting knives. The feeding mechanism includes a dwell worm or the like to hold the paper stationary and in reading position while the members move toward it.

It is another object of my present invention to provide an improved form of hook lifting wire so constructed as to present a large surface to the hook. This result is accomplished by bending the wire back on itself to form a double strand which engages the hook. The double strands are so disposed as to assist in locating the lower ends of the two rows of wires in staggered relation with respect to each other to register with the staggered perforations in the pattern sheet. The double strand for the wire of the top hook also avoids objectionable inclination of the wire by enabling the elongated part of the wire to lie wholly to one side of a line joining the transverse centers of the hooks connected to the associated jack lever.

It is a further object of my present invention

to provide a paper pattern indicated dobby operating on the double index principle. In dobbies of this type the top knife moves out on one pick to form a warp shed, and moves in on the following pick as the lower knife moves out to form the next shed. The hooks for both knives are set at the same time by perforations arranged in two parallel transverse rows of holes in the paper and the pattern is moved every other pick. All the rows in the sheet are equally spaced, and in order to indicate the rows which form a pair I connect them visually, as by connected lines printed on the paper and running through the perforation of adjacent rows which belong to a pair. In this feature of my invention the reading and setting members move toward the sheet on alternate picks of the loom immediately after a new pair of rows of perforations have been moved to reading position.

A more specific object of my invention is to mount the reading and setting members on a carriage movable toward and from the paper pattern by a single cam acting through a pair of linked levers and having a dwell to hold the members in setting position for a period greater than one pick of the loom to allow each knife to engage the hooks which are placed in its path by a single reading of the pattern. The timing of this feature is related to the double index principle of operation already mentioned. A further feature of this object of my invention is to locate the pattern reading and hook setting members close to the paper and design the cam in such a way as to give a slowly increasing motion to the members toward the paper to permit the latter to assume its load with little or no danger of puncture.

It is a further detailed object of my present invention to provide an improved dobby lifter hook wherein the knife engaging end is provided with a depending rounded projection adapted for cooperation with the previously mentioned guard and also located in such position as to reinforce that part of the hook which engages the lifter knife.

It is a further object of my invention to provide the carriage for the reading and hook setting members with a depressor which may be operated manually to lower all the members and thereby permit manipulation of the sheet pattern.

With these and other objects in view which will appear as the description proceeds, my invention resides in the combination and arrangement of parts hereinafter described and set forth.

On the accompanying drawings, wherein a convenient embodiment of my invention is set forth,

Fig. 1 is an end elevation of a dobby made according to my present invention,

Fig. 2 is a detailed rear elevation looking in the direction of arrow 2, Fig. 1,

Figs. 3 and 4 are diagrammatic vertical sections on line 3—3, Fig. 1, showing the operation of the reading and setting unit with respect to the lifting wires for the bottom set of hooks before and during a hook lifting operation, respectively,

Fig. 5 is a front elevation taken in the direction of arrow 5, Fig. 1,

Fig. 6 is a detail horizontal section on an enlarged scale on line 6—6, Fig. 3,

Fig. 7 is a detail enlarged vertical section on line 7—7, Fig. 3,

Fig. 8 is a detail enlarged vertical section on line 8—8, Fig. 1, parts being omitted,

Fig. 9 is a section similar to a portion of Fig. 4 on an enlarged scale,

Fig. 10 is a vertical section on line 10—10, Fig. 8,

Fig. 11 is an end elevation of a loom equipped with my invention and looking in the direction in which Fig. 1 is viewed,

Fig. 12 is a plan view of part of a sheet or paper pattern used with my improved dobby,

Fig. 13 is an enlarged vertical section on line 13—13, Fig. 5, showing the lifter wires for a pair of hooks associated with a jack lever,

Fig. 14 is a horizontal section on line 14—14, Fig. 13, showing the staggered relation of the lifter wires, parts omitted,

Fig. 15 is an enlarged front elevation of a lifter hook,

Fig. 16 is a bottom plan in the direction of arrow 16, Fig. 15,

Fig. 17 is a vertical section on line 17—17 of Fig. 1,

Fig. 18 is an enlarged side elevation of one end of the carriage for the pattern reading and hook setting members as seen at the left end of Fig. 1,

Fig. 19 is a horizontal section on line 19—19, Fig. 18, and

Fig. 20 is a vertical section on line 20—20, Fig. 18.

Referring particularly to Fig. 11, the loom to which my invention is applied may be of usual construction and includes a pair of spaced loomsides 10 which support top and bottom shafts 11 and 12, respectively. An upper gear 13 fast on shaft 11 meshes with a lower gear 14 of twice its size fast on shaft 12. The lay L is mounted on swords 15 to oscillate about a rocker shaft 16 of usual construction, and connectors 17 attach the lay to the cranks 18, one of which is shown in Fig. 11, of the top or crank shaft 11 and cause a reciprocation of the lay each pick of the loom. A shuttle S is moved back and forth across the lay by mechanism not shown but of any approved construction.

The dobby designated generally at D comprises front and back side plates 20 and 21 fixed to the loom frame as indicated more particularly in Fig. 5, the upper part of the side plates being secured to the loom arches 22 while the lower parts of the plates are mounted on bracket 23 secured to one of the loomsides, see Figs. 1, 5 and 11, and having front and back horizontal arms 24 and 25, respectively. A shaft 26 is mounted for rocking motion on the plates 20 and 21 and has secured to the forward end thereof a relatively short lever 27, while the rear end thereof is secured to a longer lever 28. The latter lever has a medial arm 29 which is connected by a swivel head 30 to a rod 31 extending downwardly to have the lower end thereof connected by a second swivel 32 to a crank arm 33 secured to and rotating with the bottom shaft 12 every second pick of the loom.

The upper part of each of the plates 20 and 21 is provided with a horizontal slot 35 to accommodate a top knife 36 the forward end of which is attached by connector 37 to the top of lever 27 and the rear end of which is attached by connector 38 to the top of lever 28. Similarly, lower horizontal slots 40 in the side plates receive a bottom knife 41 the forward end of which is connected by link 42 to the bottom of lever 27 while the rear end is connected by

link 43 to the bottom of lever 28. The working surface 44 of each knife is inclined downwardly and away from the driving levers 27 and 28 as indicated for instance in Figs. 3, 4 and 5.

Extending between and secured to the blades 20 and 21 is a rod 45 on which is rockably mounted a set of harness jacks 46 the upper ends of which are notched as at 47 to receive connections not shown to the harness frames which are also omitted from the drawings. Each jack 46 is pivoted at 48 to a normally vertical jack lever 49 the upper and lower ends of which are positioned by top and bottom cross girts 50 and 51, respectively, fastened to the plates. The upper end of each lever 49 is pivoted to a top hook TH while the lower end is similarly pivoted to a bottom hook BH. These hooks will be described in detail hereinafter.

The matter thus far described, except the hooks, are of usual construction. The top shaft 11 makes a rotation for each pick of the loom to cause a complete back and forth reciprocation of the lay L and the shuttle S will make one flight for each pick. The bottom shaft 12 makes a complete rotation for every second pick of the loom and the connector rod 31 will therefore rise during one pick to rock shaft 26 in one direction to cause opposite reciprocation of the knives in one direction, and on the next pick rod 31 will descend to rock shaft 26 in the other direction to cause an opposite reciprocation of the knives. Any hooks which are in the paths of their corresponding knives will cause rocking of the associated levers 49 and harness jacks when the knives have a working stroke to the left as viewed in Fig. 5. Two picks of the loom are therefore required for two successive working strokes of the knives.

In carrying my present invention into effect I provide a pattern surface made of sheet material, such as paper, which is punched for so-called double index indication and gives the paper a step-by-step advance motion every second pick of the loom. The paper cooperates with a set of movable pattern reading and hook setting members or rods which rise to reading position every second pick of a loom and are aligned with lifter wires for the hooks.

More particularly, I secure a sprocket wheel 60 to shaft 11 and provide the same with a chain 61 which is trained around a sprocket wheel 62 twice the diameter of sprocket 60 and secured to a shaft 65 journaled for rotation in the lower part of the dobby, preferably on rear arm 25 of bracket 23, and extending parallel to and behind the rear plate 21. Secured to shaft 65 is a worm wheel 66 which meshes with the teeth 67 of a worm gear 68 secured to a shaft 69 rotatably mounted in hanging bearings 71 on plates 20 and 21, see Figs. 2 and 5. Each rotation of shaft 65 causes an angular advance motion of shaft 69 every second pick of the loom. A dwell 70 on worm wheel 66 holds the worm gear 68 and shaft 69 stationary during the greater part of two successive picks of the loom. Secured to shaft 69 are spaced front and back sheaves 75 and 76, respectively, the peripheries of which are provided with pegs 77 which enter marginal perforations 78 in the edges of the paper or sheet pattern designated at P for the purpose of feeding the pattern step-by-step on alternate picks of the loom.

The paper pattern in the present instance is a continuous endless strip of durable paper shown more particularly in Fig. 12 and having perforated and unperforated portions 85 and 86, respectively, arranged in rows which are equally spaced longitudinally of the pattern. For each angular motion of the shaft 69 the paper is given an advance motion equal to twice the distance between adjacent rows, and there is a perforation 78 at each margin for every pair of rows. The marginal perforations are spaced to receive the pegs 77, and preferably lie midway between adjacent rows, measured longitudinally of the pattern. In order that the pairs of rows may be readily identified, the paper is printed with loops 80 having parallel spaced lines 81 which are connected at their ends as at 82 and the perforations for any pair of rows are located along the two lines 81 of a loop. The printed lines indicate at a glance which rows of holes belong to a pair. Row IB is for the bottom hooks to be moved on the first pick of the loom after a pair of rows moves to reading position, and row IIT is for the top hooks which are moved on the second pick, and the direction of intermittent feed of the pattern sheet is in the direction of arrow *a*, Fig. 12.

In order to support that part of the paper pattern to the right of the feeding sheaves as seen in Fig. 2 I provide the dobby sides 20 and 21 with depending brackets 88 and 89, connected respectively to arms 24 and 25. These brackets support a pair of spaced upper and lower bars 90 between which the paper pattern passes. The lower bar 90 is located in such position as to direct the paper pattern horizontally toward the upper part of the feeding sheaves. The loop of the pattern extends downwardly from the sheaves and the guide bars 90 and may be protected by a web 91 connecting brackets 88 and 89. Brackets 88 and 89 may extend downwardly for attachment to the adjacent loomside to afford support for the outer end of the dobby.

The previously described hooks TH and BH are both alike, each having a hub 92 for pivotal connection to a jack lever 49 and each having an upwardly facing hook 93 the lower part of which is rounded as at 94 to extend below the straight lower edge 95 of the hook. The top hooks are guided by a comb 96 extending between and secured to the plates 20 and 21 and having upwardly extending teeth or fingers 97 between which the top hooks lie, see Figs. 5 and 8. The web 98 of comb 96 has hooked thereover and normally supports the upper ends of top hook lifter wires 100 which are relatively long and extend downwardly between the bottom hooks. In like manner, the lower hooks BH are guided by a comb 101, see Fig. 7, having spaced fingers 102 and a web 103 over which are hooked the upper ends of bottom hook lifter wires 104 normally resting on web 103. Wires 104 are shorter than wires 100 and the bottom of both wires terminate at points adjacent to and above the pattern surface. There is a wire 100 for each top hook and a wire 104 for each bottom hook, and the wires are arranged in two planes spaced by the distance between lines IB and IIT of the pattern, the long wires being in one plane and the short wires in the other plane. Further details of the hooks and wires 100 and 104 will be described hereinafter.

The wires 100 and 104 are arranged to be lifted by a set of resiliently mounted pattern reading and hook setting members or rods RS mounted below the upper horizontal part of the paper pattern and operated to have a rising motion every second pick of the loom. These members

RS, together with their supports and actuating mechanism, are shown more particularly in Figs. 1, 3, 4 and 9. Brackets 110 and 111 extend downwardly from the plates 20 and 21, respectively, and have extending between them and secured thereto a pair of vertically spaced upper and lower horizontal flat plates 112 and 113, respectively. The upper plate 112 is perforated as at 115 to receive the lower ends of the wires 100 and 104 and also the upper ends of members RS. A third horizontal plate 116 secured to brackets 110 and 111 above plate 112 is perforated at 117 to guide the lower ends of wires 100 and 104, which are smaller in diameter than perforations 115. The bottom plate 113 supports the paper pattern between the feeding sheaves and bars 90 and may be formed with an elongated slot 120 under perforations 115 and through which the upper ends of members RS pass.

A carriage 125 for the members RS is guided for vertical reciprocation by front and back upright guide rods 126 and 127, respectively, Fig. 1, which may conveniently be mounted on the plates 112 and 113, as shown in Figs. 1 and 2. The carriage has laterally extending front and back bearings or hubs 128 slidable up and down on and guided by the rods 126 and 127.

In order that the carriage may be reciprocated vertically I secure to shaft 65 a cam 130 provided with a groove 131 having a high dwell 132 and a lower dwell 133 connected thereto by inclines 134. A roll 135 in the groove is supported by the rear end of a lever 136 pivoted as at 137 on rear arm 25 of bracket 23. The lever 136 has a substantially horizontal forwardly extending arm 138, see Fig. 1, which is pivoted to an upright link 139 pivoted to the rear bearing 128 of the carriage. Lever 136 also has a depending arm 140 connected to a horizontal link 141 the forward end of which is pivoted to the lower arm of a lever 142 pivoted at 143 on the front arm 24 of bracket 23. The last named lever has a horizontal arm 144 pivoted to an ascending link 145 similar to link 139 and connected to the front carriage bearing 128.

As the cam 130 rotates the carriage will first be held in the down position shown in Fig. 1 when the low shorter dwell 133 controls the roll 135 and will thereafter be in raised position when the high longer dwell 132 controls the roll 135. When the roll is passing from one dwell to the other along the inclines 134 the carriage will either rise or fall, depending upon whether the roll 135 is leaving dwell 133 or dwell 132.

The carriage is formed with a vertical plate 150 secured to slide bearings 128 and has spaced upper and lower horizontal flanges 151 and 152, respectively. The flanges are perforated to receive the vertical pattern reading and hook setting members or wires RS which are arranged in two parallel rows under the sets of wires 100 and 104, respectively, and are staggered with respect to each other as indicated in Fig. 6. Each wire RS has the lower end thereof surrounded by a spring 155, the lower end of which is limited as to downward motion by bottom flange 152. The upper end of each spring engages a collar 156 surrounding its member RS and limited as to upward motion by a burr 157. Each member RS is also provided with a second collar 158 resting normally on another burr 159 and limited as to upward motion under action of its spring by top flange 151 which serves as a stop for an evener to be described hereinafter which actually engages the collar 158.

The carriage is so located and positioned by the guides 126 and 127 as to hold each member RS in vertical alignment with a perforation 115 and one or another of the wires 100 and 104. As viewed in Fig. 4, for instance, the right hand row of members RS is aligned with the lifter wires 104 for the lower hooks, while the left hand row is aligned with the longer lifter wires 100 for the top hooks.

In order that all of the reading and setting members RS may be depressed at any time independently of the position of cam 130 to permit manipulation of the sheet pattern I provide a depressor plate 105 having an upper horizontal flange 106 perforated at 107 to receive the upper ends of members RS, see Figs. 18, 19 and 20. This flange 106 limits upward motion of collars or washers 158 under action of their springs 155. A horn 108 extending downwardly from the bottom of each end of the plate 105 carries a pin 109 to which is attached the lower end of a tension spring 118 the upper end of which is connected to a hook 119 extending downwardly from the under side of adjacent bearing 123. The springs 118 hold the flange 106 against the flange 151 and thus yieldingly retain the depressor normally in raised position. When it is desired to lower all of the members RS the operator may depress the pins 109 against the action of springs 118 and cause the flange 106 to move all of the reading and setting members downwardly, after which the pattern sheet may be moved by hand. The need for lowering members RS manually will ordinarily exist when the carriage 125 is raised and the sheet pattern stationary, but slippage of the driving mechanism for either the pattern or carriage may require lowering of the carriage when the pattern is moving in order to save the latter.

In order that the resetting or the depressing plate 106 may be guided, each of the bearings 128, as shown in Fig. 19, is formed with a notch 121 which receives the adjacent vertical edge 122 of the depressor. The bearings 128 and the plate 150 therefore cooperate to hold the depressor 105 in position.

When it is desired to remove one of the reading and setting members it may be depressed manually sufficiently to move its upper end below the flange 106, after which the member can be moved forwardly from the flanges 106 and 151 until the upper end lies at one side of the top of the carriage, as in dotted lines, Fig. 20, whereupon the member may then be removed for repair or renewal. The perforations in the bottom flange 152 are slightly elongated and formed as shown in Fig. 20 to facilitate this removal.

The upper and lower sets of hooks are provided with guards 160 and 161, respectively, each formed of a flat strip of sheet metal extending between the dobby sides and pivoted as at 162 with respect to them. Each guard lies under its corresponding knife below the path normally traversed by the hooks connected to the knife, and is supported at its inner edge by a rod 165 which is removable to permit the guard to swing downwardly. These guards are for the purpose of engaging the lower curved surfaces 94 of the hooks TH and BH to prevent the latter from falling away from their knives should they become loose, as by breakage of a harness lifter cord, while the knives are moving on a working stroke. The guards are so located as to permit free rising and falling of the hooks, however, when the jack levers 49 are vertical.

In the usual dobby the knives and pattern are so related to the shuttles that the shuttle leaving the drop box end of the loom enters a shed which is made by the bottom knife. For convenience I preserve this relationship, although I am not limited in the practice of my invention to this operation.

Assuming that the pattern mechanism is about to move a double row of perforations to controlling or reading position, the cam **130** will be as shown in Fig. 1 with the low dwell **133** holding carriage **125** in down position, such as shown in Fig. 3. Under these conditions the members RS will all be up with respect to the carriage and slightly below the plane of the pattern sheet, and the hook lifting wires **100** and **104** will be supported in down position by the webs of their respective combs. As soon as shaft **69** has completed the angular motion imparted to it by the worm **66** to locate a pair of pattern rows in reading position under perforations **115**, cam **130** will act by one of its inclines **134** to rock lever **136** in a counter-clockwise direction as viewed in Fig. 1 to raise the carriage **125** by a motion which starts gradually to move the members RS up against the pattern sheet at a relatively slow rate of speed. At this time the lower knife is nearing the end of its return stroke and the upper knife is moving outwardly on a working stroke. As the carriage rises, those members RS which are aligned with perforations in the paper will pass through the latter to engage and raise the wires **100** and **104** aligned with them and thus tend to lift the associated or selected hooks. Those members RS which strike the unperforated part of the paper during the gradual rise of carrier **125** will be held down by the paper and the corresponding springs **155** will be compressed as the carriage rises to exert a force on the paper which increases slowly enough to avoid puncture of the paper. As shown in Fig. 4 the left hand member RS is held down by the unperforated paper while the right hand member has passed through a perforation to raise one of the short wires **104** for the bottom hook. The paper is sufficiently strong to compress the spring **155**, and the latter are strong enough to raise the hooks. The inactive indicated hooks are thus raised to operative or set position before the bottom knife on its return stroke reaches them. As the bottom knife continues to move to the right, Fig. 5, it will engage the tops of the raised hooks BH to depress them and compress their springs momentarily, and will later pass beyond the hook edges **93**, whereupon the springs of the depressed members RS will raise the latter by a snap action to place the associated hooks BH in the path of the bottom knife. Crank arm **33** is down at this time and ready to start up to reverse the motion of the knives and move bottom knife **41** on an outward working stroke to draw with it the indicated hooks which in turn rock their levers **49** and harness jacks **46** to form a shed.

As the bottom knife moves on its working stroke the top knife starts back to the right, Fig. 5, and as it nears the end of its return stroke it will momentarily depress any of the indicated top hooks TH which were raised as carriage **125** ascended. As the top knife reaches the end of its return stroke these hooks will snap up into the path of knife **36** in a manner similar to that already described for the bottom hooks. It will thus be seen that both the top and bottom hooks which are indicated for action are momentarily depressed by their respective knives to release any sticking parts which may have caused an incomplete setting of the hooks, and immediately thereafter snap back into the paths of the knives by expansion of the compressed springs. As the top knife starts a working stroke it moves with it the indicated top hooks to form the next shed of the loom.

The dwell **132** holds the carriage up for a period slightly more than one pick of the loom, or from the time that the lower hooks are first raised into the path of the bottom knife until the top hooks start moving on the working stroke of the top knife. During this time the dwell **70** of worm **66** has held the pattern sheet stationary with respect to the guide plates and members RS. The cam **130** now acts to lower the carriage and when the members RS are again all in their up position relatively to the carriage and the latter is held down by dwell **133**, the worm **66** will give the sheaves and pattern sheet another feeding motion to the right, Fig. 5, to move the next pair of pattern rows into reading position. The lengths of dwells **132** and **133** are such as to give the described time relationship between the knives, carriage and worm **66**.

The operation described is for a so-called double index dobby and is possible because of the pairs of rows of pattern indications which move together to reading position and also because of the actuation of the carriage and pattern feeding mechanism every second pick of the loom, as well as the two pick motion of crank **33** which requires two picks for a complete operation of the knives.

It is to be understood that if desired the cam **130** can be set in such a position as to raise the bottom hooks upon completion of the return stroke of the bottom knife, but this setting is closer than that already described and lacks the advantage of vibrating the raised members RS and their springs should the latter fail to lift the members and hooks to their full up position.

In the preceding description it is assumed that all of the hooks are down when carriage **125** rises and that any of the members RS which pass through perforations in the paper pattern would lift their hooks. In the actual operation of the dobby there will almost always be certain hooks engaged with the knives during their working and return strokes. Certain hooks will thus be connected to the bottom knife, for instance, on its return stroke and some of these hooks may not be needed for the next shed, in which case their corresponding members RS will engage unperforated parts of the pattern and when the knife reaches its extreme right hand position as viewed in Fig. 5 these hooks will fall from the bottom knife. Other of these hooks may be destined to remain connected to the bottom knife for the next pick and their members RS will pass through perforations and when the knife reaches the end of its return stroke these last hooks, instead of falling as in the previous case, will be held up. The members RS of the hooks which are to remain on their knives will be limited as to their up position by cam groove dwell **132** which will hold the parts at such a level as to keep the lifter wires **100** and **104** slightly below their knife engaged hooks to avoid wear. The inclined parts **93** of the hooks and **44** of the knives cooperate to raise the indicated hooks slightly above their lifter wires at the beginning of a knife working stroke.

The lifter wires already mentioned are made more particularly though not necessarily for use with a dobby shown in prior Patent No. 2,054,585 wherein the top hook is directly over the bottom

hook and both hooks have their pivots in alignment with the central axis of the jack lever. The wires 100 must necessarily pass to one side of the lower hooks, in the past they are either inclined considerably toward the top hooks which they control or have had their upper ends bent laterally relatively to the hooks. As shown herein I form the upper ends of the wires 100 in such a way as to reduce their inclination and increase the wearing surface which they present to their hooks as shown in Fig. 13, and at the same time effect the desired staggered relation between the wires of the two sets.

Th upper end of each wire 100 is folded back on itself and then bent to form a hook 170, see Fig. 8, the right end 171 of which projects downwardly below the web 98 of the upper comb sufficiently to maintain guiding contact with said web when the wire 100 is in its highest position. This hook is formed by bending two right angles in the double folded end of the wire to form a horizontal hook supporting section 172 of double the width of the wire. The two strand section 172 is parallel to and under the hook TH and the wire hook head 170 straddles the web 98 and lies between adjacent comb teeth 97. The short side 173 of the wire extends downwardly to a point level with the bottom of the end 171. The upper end of the long part of the wire is therefore located at one side of the center of the hook TH and as shown in Fig. 13 this results in a reduction of the inclination necessary to clear the bottom hook.

The wires 104 for the lower hooks are similar to the wires 100 except in the reversal of the hooked end with respect to the side which extends downwardly for engagement with the reading members, see Fig. 13. Thus, the double stranded hooked head 174 of wire 104 requires the main part of the latter wire to lie on that side of a vertical line passing centrally through hooks TH and BH opposite to the side on which the long part of wire 100 is located. In both wires it will be seen that an enlarged bearing surface is provided for the lifter hooks and the formation of the hooked heads 170 and 174 is such as to arrange the lower ends of the wires 100 and 104 staggered with respect to each other relatively to the width of the pattern sheet, see Fig. 14, thus permitting the wires to align with the members RS and perforations 115 without undue wear at plate 116.

Returning to the lifter hooks TH and BH both of which are alike and referring to Figs. 15 and 16 it is seen that each hook is formed with top and bottom ribs 180 and 181 spaced by a web 182 of less thickness which may extend outwardly from a point adjacent to the bearings 183 to the hooked head at the other end of the hook. The under surface 95 already mentioned may be at a slightly lower level than the surface 185 which is nearer the bearing 183 to provide clearance for the lifter wire after the lifter hook has started on its working stroke.

The edge 93 previously described is part of an enlarged head 186 the under side of which includes the rounded projection 94 which, as shown in Fig. 16, is of reduced thickness, being preferably of the same thickness as the web 182. The knife when engaging the hook surface 93 tends to bend the head downwardly, but this tendency is checked by the projection 94 which, as seen in Fig. 15, extends below the bottom 95 not only to provide clearance for the guard 160 when the jack levers turn on their axes, but also to provide a substantial vertical dimension which will resist twisting of the head. The lower rib 181 may be formed with lateral protuberances 187 to keep adjacent hooks and jack levers 49 properly spaced.

From the foregoing it will be seen that I have provided a paper pattern indicated dobby wherein a single unit of members RS serve the dual purpose of reading the pattern and setting the hooks. These members RS are aligned with the hook lifting wires 100 and 104 and are held normally raised by springs 155 which are strong enough to raise their corresponding wires and hooks but not strong enough to injure unperforated portions of the paper. Also, the carriage rises before the return stroke of the lower knife is completed, thereby lifting the hooks in time to permit momentary depression of the hooks, after which the hooks snap upwardly into the path of the knife. Because of the double index feature this snapping always occurs with the top hooks, and a similar snapping for the lower hooks is desirable, as it eliminates close timing of the carriage motion with respect to the lower knife. The dobby is also provided with guards under the hooks which hold the latter up should their associated harness straps break during a working stroke of a knife. The upper of the paper pattern guide plates has perforations only slightly larger than the diameter of the members RS to support the paper and prevent its puncture. The feed cylinder is located close to the guide plates to avoid the use of clamps or the like to secure registry of the perforations in reading position with the members RS. Also, the pattern is read far enough from the cylinder to allow free action of the members RS without interference by the cylinder, and the dwell of worm 66 holds the pattern sheet stationary while the members RS are in the perforations. The hook lifting wires are bent back on themselves to afford increased surface to lift the hooks, and also lessen the inclination of wires 100 while at the same time disposing the wires in staggered relation. Further, the dobby operates on the double index principle and the paper pattern has printed thereon visual means to associate the rows of perforations in pairs. Furthermore, the upwardly pointing hooks permit a direct transfer of force from the members RS to the hooks and reduces the number of parts heretofore employed between the hooks and pattern. A single cam acting through a pair of linked levers applies a lifting force to each side of the carriage 125. Also, the hooks TH and BH are formed to permit angular motion of jack levers 49 without interfering with the guards. Furthermore, an evener is provided to move the members RS out of the path of the sheet pattern. It will further be noted that the cam 130 is so made that its inclines 134 move the members RS against the paper with a slow motion which reduces their tendency to puncture the paper. Since a yielding element is introduced in the train of connections between the source of power and the hooks TH and BH, the cam can start to operate before the knives reach the inner end of their return stroke, thus providing ample time for a low rate assumption of load by the paper.

Having thus described my invention it will be seen that changes and modifications may be made therein by those skilled in the art without departing from the spirit and scope of the invention and I do not wish to be limited to the details herein disclosed, but what I claim is:

1. In a loom dobby having a lifter knife reciprocating along a given path and having a harness lifter hook normally at one side of the path and a positioner for said hook movable to set the hook in said path, a sheet pattern having perforated and unperforated portions and located on said one side of the given path with the positioner between said hook and the sheet pattern, mechanism to feed the sheet pattern to place the perforated and unperforated portions thereof progressively in reading position, and means operating from that side of the sheet pattern opposite the path and aligned with the positioner and that portion of the sheet pattern in reading position to transmit a force through the perforated portions of the sheet and communicate said force to the positioner to cause the latter to move the hook from normal position into said given path, the unperforated portions of the sheet pattern preventing operation of said means to move the positioner and permitting the hook to remain in normal position at said one side of said path.

2. In a loom dobby having a lifter knife moving in a given path and having a harness lifter hook normally at one side of said path, a sheet pattern on said side of the path having perforated and unperforated portions, hook positioning means including two cooperable parts one of which is located on said side of the path and between the sheet and the hook and the other part of which is on that side of the sheet opposite the path, feeding mechanism to move the perforated and unperforated portions of the sheet pattern progressively between said parts, and means to cause said other part to communicate a force from that side of the sheet opposite the given path through a perforated portion of the sheet pattern to move the first named part and cause the latter to move the hook from normal position to a position in said path, an unperforated part of the sheet pattern preventing cooperation of said parts and permitting the hook to remain at said one side of said path.

3. In a loom dobby having a lifter knife moving along a given path, a harness lifter hook normally below said path, a sheet pattern below said hook and having perforated and unperforated portions, mechanisms to feed said sheet pattern to move the perforated and unperforated portions thereof progressively to reading position, hook positioning means including two parts accessible to each other for mutual engagement through a perforated portion of the sheet pattern in reading position, one part being on one side of the sheet pattern and the other part on the opposite side of the sheet pattern and movable to set the hook into said path, an unperforated portion of the sheet pattern in reading position preventing mutual engagement of said parts, and means to cause said parts when in mutual engagement to communicate a force from one part through a perforated portion of the sheet pattern to the other part and from the latter to said hook to raise said hook from normal position to a position in said path.

4. In a loom dobby having a harness lifter knife moving along a given path, a harness lifter hook normally below said path, two hook positioning members one of which is movable by the other to lift the hook into said path, a sheet pattern located between said members and having perforated and unperforated portions, feeding mechanism to move the perforated and unperforated portions progressively to controlling position between said members, and means to cause said members to lift the hook into said path by a force transmitted through a perforated portion of said sheet which is in controlling position between said members, an unperforated portion of the sheet pattern in controlling position between said members preventing said means from causing said members to lift the hook.

5. In a loom dobby having a lifter knife reciprocating in a given path and having a set of harness lifting hooks normally out of said path, a sheet pattern having perforations arranged transversely therein between unperforated portions thereof, a set of hook moving elements arranged transversely of the sheet pattern on one side thereof, one element for each hook, certain of said elements aligned with the perforations and the others aligned with the unperforated portions of the sheet pattern, a set of pattern reading and hook setting members on the opposite side of the paper with respect to said elements, each member aligned with one of said hook moving elements, certain of said members aligned with perforations and other of said members aligned with unperforated portions of the sheet pattern, a carrier on which said reading and setting members are movably mounted, resilient means for each member strong enough to move a hook and its element and urging the member toward the sheet pattern relatively to the carrier, and means to move the carrier toward the sheet pattern to cause the resilient means of those members aligned with the perforated portions of the sheet pattern to pass through the latter and move the elements aligned therewith to set the corresponding hooks into the path of the knife, the resilient means of the members engaging the unperforated portions of the sheet pattern being caused to yield by the unperforated portions to permit the last named members to remain out of engagement with the hook moving elements aligned therewith and permit the corresponding hooks to remain out of said path.

6. In a loom dobby having a lifter knife reciprocating in a given path and having a set of harness lifting hooks normally out of said path, a sheet pattern having a row of perforations arranged transversely therein between unperforated portions thereof, a set of pairs of aligned hook controlling members arranged transversely of the sheet pattern, one pair for each hook, certain pairs aligned with perforations and other pairs aligned with unperforated portions of the sheet pattern, each pair including a hook moving member located on one side of the sheet pattern movable to place the corresponding hook into said path of the knife, each pair including also a pattern reading and hook setting member on the opposite side of the sheet pattern with respect to the first member, actuator means to move all of said pattern reading and hook setting members toward the sheet pattern to cause those reading and setting members aligned with the perforations to pass through the sheet pattern, and resilient means between the actuator and each of said reading and setting members to transmit yieldingly to the latter members a force derived from the actuator, the resilient means of each member which passes through perforations in the sheet pattern moving the corresponding hook moving member to set the associated hook into said given path of the knife, the resilient means of the reading and setting

members aligned with the unperforated parts of the sheet being caused to yield by said unperforated parts of the sheet to prevent the latter named reading and setting members from engaging the corresponding hook moving members and thereby permit the corresponding hooks to remain out of said path.

7. In a loom dobby having a lifter knife reciprocating in a given path, a harness lifting hook normally out of said path, a sheet pattern having perforated and unperforated portions, a pair of aligned members, one on each side of the sheet, one of said members being on one side of the sheet between the latter and said hook and movable against the hook to move the latter into said path, actuator means to move the other member toward the first member from the side of the sheet opposite the first member, a resilient connection between said actuator and said other member, the latter movable relatively to the actuator means against the action of said resilient means, and feeding mechanism to move the sheet pattern relatively to said members to place both perforated and unperforated portions of said sheet pattern progressively between said members, said actuator means operating to move said other member through perforated portions of the sheet pattern into engagement with the first member and causing the resilient connection to move said first member by a force derived from the actuator means and transmitted through said other member to set the hook into the path of the knife, and said resilient connection being caused to yield to permit relative motion of the actuator means with respect to said other member when the latter engages an unperforated portion of the sheet pattern to prevent said other member from engaging the first member and thereby permit the hook to remain out of said path.

8. In a loom dobby having a lifter knife reciprocating in a given path and having also a hook normally at one side of said path, a sheet pattern located on said one side of the path and having perforated and unperforated portions, a pattern reading and hook setting member located on that side of the sheet pattern opposite said path, means to move said perforated and unperforated portions of the sheet pattern progressively into register with said member, mechanism movable toward the sheet pattern to move the reading and setting member toward the sheet pattern, means to mount the member for movement relatively to said mechanism, a resilient element between the member and the mechanism yieldable to permit the latter to move toward the sheet pattern relatively to the member when the latter engages an unperforated portion of the pattern, said member when in register with a perforated portion of the sheet pattern being moved through the latter by said mechanism, and hook moving means engaged by the member when the latter registers with and moves through a perforated portion of the sheet pattern to move the hook into said given path of the lifter knife by a force derived from said mechanism and transmitted through the resilient element to said member, an unperforated part of the sheet pattern when in register with said member causing deformation of said resilient element and preventing engagement of said hook moving means by said reading and setting member.

9. In a loom dobby having a lifter knife moving in a given path and having a harness lifter hook normally at one side of said path and a hook positioner for said hook movable to move the hook into said path, a sheet pattern on said side of the path and positioner and having perforated and unperforated portions, feeding mechanism to move the perforated and unperforated portions of said sheet progressively to reading position, a positioner moving member located on that side of the sheet pattern opposite the path and aligned with the positioner, actuating means to cause said member to exert a given moving force from said other side of the sheet transversely of the latter toward the positioner sufficiently strong to move the positioner and cause the latter to move the hook into said path, an unperforated portion of the sheet in reading position being capable of withstanding said given force to prevent engagement of the member with the positioner, the member when aligned with a perforated portion of the sheet in reading position and moved toward the latter by said actuating means transmitting the said force through said perforated portion and against the positioner to cause the latter to move the hook into said path.

10. In a loom dobby having a lifter knife moving in a given path and having a harness lifter hook normally below said path, a sheet pattern below said path and having perforated and unperforated portions movable one at a time to reading position, a pattern reading and hook setting member below the sheet pattern, mechanism to raise the member and cause the latter to exert a given upward force toward the hook and either against an unperforated or through a perforated portion of said sheet in reading position, and hook positioning means to receive said given force from the reading and setting member when the latter is aligned with and passes through a perforated portion of the sheet pattern in reading position to move the hook into said path, an unperforated portion of the sheet pattern when in reading position being capable of resisting said given force to prevent the member from communicating said given force to the hook positioning means when said member is moved against an unperforated part of said sheet by said mechanism, thereby permitting the hook to remain out of said path.

11. In a dobby having a reciprocating knife moving with alternate working strokes and intervening return strokes, a harness controlling hook normally below the path of the knife, a sheet pattern below the hook having perforated and unperforated portions movable progressively to reading position, a pattern reading and hook setting member under the sheet pattern, a hook controller under the hook and above the sheet pattern and aligned with the member, a carrier for the member under the sheet pattern, means to move the carrier toward the sheet pattern prior to the end of a return stroke of the knife, a resilient element between the carrier and member to raise the latter through a perforated portion of the pattern in reading position to engage and exert an upward yielding force on the controller to lift the hook into said path when the carrier moves toward said pattern, said resilient element being compressible by the sheet pattern when the carrier moves the member toward an unperforated portion of the pattern in reading position to prevent the hook from moving into said path, said member and hook being depressed and the resilient element compressed by engagement of the hook with the knife during the latter part of the return stroke of the knife,

the resilient element thereafter acting to raise the member and controller to return the hook to a position in said path when the knife nears the completion of its return stroke.

12. In a dobby provided with a reciprocating knife having working and return strokes along a given path, a harness controlling hook normally below the path of the knife and having a head movable to operative position relatively to the knife in said path at a point between the ends of the return stroke of the knife, a pattern sheet having a perforation therein, a pattern reading and hook setting member, a carriage for the member, spring means located between the member and the carriage, means to move the carriage and member toward the pattern sheet to move the member through the perforation prior to arrival of the knife on its return stroke to the operative position of the hook head, and means moved by the reading and setting member when the latter passes through a perforation to move the hook head to operative position in said knife path, the knife thereafter engaging the head to depress the same to compress said spring means and the latter subsequently acting to return the hook head to operative position in the path of the knife as the latter nears completion of the return stroke thereof.

13. In a dobby provided with a reciprocating knife having working and return strokes, a hook normally below the knife and having a head movable to operative position in the path at a point between the ends of the return stroke, a pattern sheet having a perforation therein, a positioning mechanism for the hook including a compressible spring and a pattern reading and hook setting member controlled by the spring and urged by the latter toward the pattern sheet, a carriage for the member and spring movable toward the pattern sheet prior to arrival of the knife on the return stroke thereof to the operative position of said hook head to move the member through the perforation, and a hook lifter forming part of said positioning mechanism to be engaged by the member when the latter passes through the perforation to lift said hook head to operative position by a force derived from the carriage and transmitted through said spring to the member when said carriage moves toward said pattern sheet, the knife depressing the hook head against the action of said spring when said knife on its return stroke reaches the operative position of said hook head, and said spring thereafter acting through said member and lifter to raise said hook head into the path of the knife during the latter part of the return stroke thereof when the knife passes beyond the operative position of the hook head.

14. In a dobby provided with a reciprocating knife having working and return strokes, a hook normally below the knife and having a head movable to operative position at a point in said path between the ends of the return stroke, a pattern sheet located below the hook and having a perforation therein, a pattern reading and hook setting member below said pattern sheet, a carriage for the member below said pattern sheet, a compression spring between the member and carriage normally holding the member in raised position with respect to the carriage but compressible by down motion of said member relatively to said carriage, driving means to lift the carriage toward the pattern sheet before the knife on the return stroke thereof reaches the operative position of said hook head to move the member through the perforation, said driving means maintaining the carriage in raised position until the return stroke of the knife is completed, and a lifter for the hook to be raised by said spring acting through said member when the latter passes through the perforation to raise said hook head to operative position, the knife thereafter on said return stroke thereof depressing the hook head against the action of said spring when said knife reaches the operative position of the hook head, and the spring thereafter acting through said member and lifter to return the hook head to operative position as the knife passes the operative position of said hook head later on said return stroke.

15. In a loom dobby having spaced front and back plates and a reciprocating knife extending between the plates and having working and return strokes along a given path, a harness actuating hook normally below the path traversed by the knife and disposed at one end of said path when in normal position, means to raise the hook into said path and cause said hook to be moved by the knife from idle to working position on a working stroke of the knife, and a guard extending below and along the path of the knife and supported by the plates and out of vertical alignment with the hook when the latter is in normal position, the hook when engaged with the knife being moved on a working stroke thereof over the guard and the latter preventing the hook from falling off the knife.

16. In a loom dobby having a reciprocating knife and a set of harness controlling hooks normally out of the path of the knife, a sheet pattern having transverse rows of perforated and unperforated portions, said rows spaced longitudinally of the sheet pattern, feeding mechanism to advance the sheet step-by-step to move said rows progressively in reading position, a set of pattern reading and hook setting members, one for each hook, means to move said members toward said sheet and cause the members aligned with the perforated portions to pass through said sheet, the unperforated portions of said sheet preventing the members aligned therewith from passing through the sheet, means to transmit a lifting force from the members which pass through said sheet to the hooks corresponding thereto to move the latter into said path, and guide means spaced from the feeding mechanism for that part of said sheet in reading position and through which said members move when aligned with the perforated portions of the sheet pattern.

17. In a loom dobby having a reciprocating knife and a harness controlling hook normally out of the path of the knife, a sheet pattern having perforated and unperforated portions, feeding mechanism to advance the sheet step-by-step to move said perforated and unperforated portions progressively to reading position, a pattern reading and hook setting member, actuator means to move said member toward said sheet pattern and cause the member to pass through the perforated portions thereof in reading position, the unperforated portions of said sheet in reading position preventing the member from passing through the sheet, setting means to transmit a force from the member when the latter passes through a perforated portion of said sheet pattern to move the hook into the path of the knife, and guide means for said portions of the sheet pattern which are in reading position located between the actuator means

and said hook and along which the sheet is moved to reading position by said feeding mechanism, said member passing through the guide means to engage said setting means.

18. In a loom dobby having a reciprocating knife and a harness controlling hook normally out of the path of the knife, a sheet pattern having perforated and unperforated portions, feeding mechanism to advance the sheet step-by-step to place said portions progressively in reading position, a pattern reading and hook setting member, actuator means to move said member toward that portion of the sheet pattern in reading position and cause the member when aligned with a perforated portion to pass through the latter, an unperforated portion of said sheet preventing the member from passing through the sheet, setting means to transmit a force from the member when the latter passes through a perforated portion of said sheet to the hook to move the latter into said path, and a pair of spaced guide plates between which the sheet is moved by said feeding mechanism to reading position, said member passing through both plates when passing through a perforated portion of the sheet, and the plate on that side of the sheet adjacent to the hooks guiding that portion of the sheet in reading position and supporting the latter against movement when said member engages an unperforated portion of said sheet.

19. In a loom dobby having a reciprocating lifter knife and harness controlling hooks to be actuated thereby, a longitudinally extending sheet pattern having longitudinally spaced transverse rows of perforated and non-perforated portions, feeding means to advance the sheet step-by-step to place said rows progressively in reading position, guide means for said sheet pattern spaced from the feeding means and extending transversely of said sheet adjacent to the reading position of said sheet pattern, a set of pairs of aligned hook positioning members arranged transversely of said sheet at the reading position thereof, one pair for each hook, one member of each pair located on one side of said sheet and movable to move the corresponding hook into position to be actuated by said knife, the other member of each pair located on the opposite side of said sheet pattern and passing through said guide means, actuator means to move the pairs of members aligned with the perforated portions of said sheet in reading position to move the corresponding hooks into position to be actuated by said knife, the unperforated portions of said sheet in reading position preventing the pairs of members aligned therewith from moving the corresponding hooks.

20. In a loom dobby having a reciprocating lifter knife and a plurality of harness controlling hooks movable by lifters into the path of said knife, a sheet pattern having perforated and non-perforated portions extending in longitudinally spaced rows extending transversely of said sheet, a pair of spaced guides between which the sheet pattern lies, a set of pattern reading members for the sheet pattern, one for each lifter, actuator means to move said members toward said sheet and move the members aligned with the perforated portions through the latter into engagement with the corresponding lifters to move the corresponding hooks into said path, all of said members to pass through one of the guides and those members which are aligned with the perforated portions of the paper pattern passing through both guides, and means spaced longitudinally with respect to the length of the sheet pattern from said guides to move the paper pattern intermittently and progressively place said rows into reading position between the guides to control said pattern reading members.

21. In a loom dobby having a reciprocating knife and a harness controlling hook normally out of the path of the knife, a sheet pattern having perforated and unperforated portions, feeding mechanism to advance the sheet step-by-step and place the said portions of the sheet progressively in reading position, a pattern reading and hook setting member spaced from the feeding mechanism in the direction of the length of said sheet, means to move said member toward the portion of said sheet in reading position and cause the member when aligned with a perforated portion of said sheet to pass through said sheet, the unperforated portions of said sheet preventing the member aligned therewith from passing through the sheet, means to transmit a lifting force from the member to the hook when the member passes through said sheet to move the hook into the path of the knife, a guide plate to support that part of the sheet pattern in reading position, the member passing through said guide plate, and means to hold the feeding mechanism and guide plate in spaced relation.

22. In a loom dobby having a knife reciprocating along a given path and a set of harness controlling hooks normally out of the path of the knife, a sheet pattern having longitudinally spaced transverse rows of perforated and unperforated portions, feeding mechanism to advance the sheet step-by-step and move the rows progressively to reading position, a set of pattern reading and hook setting members arranged transversely of said sheet to cooperate with a row in reading position, one member for each hook, said members spaced from the feeding mechanism in the direction of the length of said sheet, means to move said members toward that part of said sheet in reading position and cause the members aligned with perforated portions thereof to pass through said sheet, the unperforated portions of said sheet in reading position preventing the members aligned therewith from passing through the sheet, means to transmit a lifting force from the members which pass through said sheet to the hooks corresponding thereto to move the latter into said knife path, a pair of spaced guide plates spaced from said feeding mechanism and between which the sheet is moved by said feeding mechanism to hold part of the sheet in reading position, said members aligned with perforated portions of the sheet pattern passing through both plates, the plate on that side of the sheet adjacent to the hooks guiding the sheet and supporting the latter against movement toward said hooks when said members engage unperforated parts of said sheet, and means to hold the feeding mechanism stationary when the members move toward that part of the sheet pattern in reading position.

23. In a double index loom dobby having spaced oppositely reciprocating top and bottom harness lifter knives moving along given paths and having a harness jack lever provided with top and bottom hooks normally out of the path of their respective knives and each hook having a lifter movable to locate the corresponding hook in the path of the associated knife, each knife requiring one pick for a working stroke and a second pick for the return stroke thereof, a sheet pattern having perforated and unperforated portions arranged in pairs of parallel rows extending transversely across the sheet pattern, means to ad-

vance the pattern sheet every second pick of the loom to locate a pair of rows in reading position, one row in reading position being for the lifters of the top hooks and the other row being for the lifters of the bottom hooks, a set of pattern reading members under each sheet pattern row in reading position, a carriage for said sets of members, a resilient element between each member and the carriage deformable to permit relative motion of the associated member with respect to the carriage in a direction away from the sheet pattern, and means to move the carriage toward the sheet pattern at two-pick intervals while a pair of sheet pattern rows is in reading position, the members aligned with perforated portions in both rows of the sheet pattern passing through said perforations and transmitting forces to the corresponding lifters to cause the latter to set their respective hooks in the paths of their knives, unperforated portions of the sheet pattern aligned with other members causing deformation of the resilient elements associated with the latter members to prevent the lifters corresponding thereto from moving the associated hooks, the knives on their return strokes temporarily depressing the hooks in their paths to deform the corresponding resilient elements and the latter thereafter returning their hooks to their respective knife paths.

24. In a double index loom dobby having top and bottom oppositely reciprocating harness lifter knives each of which has a working stroke and a return stroke, each knife requiring two successive picks of the loom to complete successive working and return strokes, the dobby having a harness jack lever provided with top and bottom hooks normally out of the path of their respective knives, a lifter for each hook, each lifter movable to locate the corresponding hook in the path of the associated knife, a sheet pattern having perforated and unperforated portions to be in reading position and aligned with said lifters when the sheet pattern is stationary, a pair of pattern reading members aligned with that part of the sheet pattern in reading position, one member aligned with each of said lifters, said members located on that side of the sheet pattern opposite the lifters, a carriage for the members movable from inoperative position toward the sheet pattern to operative position, a resilient element between the carriage and each member deformable to permit motion of the associated member with respect to the carriage in a direction away from the sheet pattern, and means to move the carriage to operative position at regularly recurring two-pick intervals to move the members against that part of the sheet pattern in reading position and maintain said carriage in operative position for an interval of more than one pick of the loom, either member when aligned with a perforated part of the sheet pattern passing therethrough and moving the associated lifter when the carriage moves to operative position, to locate the corresponding hook in the path of the knife associated therewith, an unperforated portion of the pattern causing motion of a member aligned therewith in a direction relatively to the carriage away from the sheet to deform the corresponding resilient element and prevent actuation of the associated lifter and hook, the knives on their return strokes temporarily depressing the hooks in their paths to deform the corresponding resilient elements and the latter thereafter returning their hooks to their respective knife paths.

25. In a double index loom dobby having top and bottom oppositely reciprocating harness lifter knives each of which has a working stroke and a return stroke, each knife requiring two successive picks of the loom to complete successive working and return strokes, the dobby having a harness jack lever provided with top and bottom hooks normally out of the path of their respective knives, a lifter for each hook, each lifter movable to locate the corresponding hook in the path of the associated knife, a sheet pattern having perforated and unperforated portions to be in reading position and aligned with said lifters when the sheet pattern is stationary, two pairs of cooperating aligned members extending transversely of a pattern sheet, one pair registering with one part of the sheet pattern in reading position and the other pair registering with another part of said sheet pattern in reading position, one pair including a member between the pattern sheet and the top hook and movable to locate the latter hook in the path of the top knife and the other pair including a member between the sheet pattern and the bottom knife and movable to locate the latter in the path of the bottom knife, a carriage for the other members of said pairs, a resilient deformable connection between the carriage and each of said other members, means to move the carriage toward the pattern sheet at two-pick intervals when perforated and unperforated portions of the pattern sheet are in reading position and maintain said carriage in such position from an interval of loom operation starting not later than the arrival of one of the knives at the end of its return stroke and ending not earlier than the beginning of the working stroke of the other knife, said other members aligned with perforations passing through the latter to actuate their corresponding members to lift the associated hooks into the paths of their knives, unperforated portions of the sheet pattern aligned with said other members causing deformation of the resilient connections associated with the last named other members to prevent the corresponding lifter members from moving their hooks into the paths of the respective knives, the knives on their return strokes temporarily depressing the hooks in their paths to deform the corresponding resilient elements and the latter thereafter returning their hooks to their respective knife paths.

26. In a loom dobby having a plurality of harness lifting hooks and operating with a sheet pattern having perforated and unperforated portions to control a plurality of hook setting members disposed transversely with respect to and under the sheet pattern, a carriage for the members extending transversely of the sheet pattern, a pair of levers pivoted with respect to the dobby, one at each end of the carriage, a link connecting said levers to cause the latter to move in unison, means to connect each lever to its respective end of the carriage, and a single cam connected to one of said levers to oscillate the latter and act through the link to oscillate the other lever to cause motion of both ends of the carriage toward and from the pattern sheet to move the members against the sheet pattern.

27. In an evener for a loom dobby having a plurality of harness lifting hooks and operating with a sheet pattern having transversely arranged perforated and unperforated portions to align with hook lifters disposed transversely of the sheet pattern on one side of the latter, a set of pattern reading and lifter actuating members

aligned with the lifters on the opposite side of the sheet pattern, a carriage for the members on which the latter are movably mounted, said carriage extending transversely of the sheet pattern, resilient means on the carriage to urge the members yielding toward the lifters, and an evener for the members supported by the carriage and engaging the members and movable manually relatively to the carriage to move said members away from the sheet pattern against the action of said resilient means.

28. A carriage unit for a set of pattern reading and hook setting members for use in a loom dobby provided with a sheet pattern and lifter hooks, said carriage unit comprising an elongated frame, a set of pattern reading and hook setting members arranged side by side and supported by and each movable relatively to the frame, a stop element extending along the top of the frame through and above which the members project, said stop element limiting upward motion of said members relatively to the frame, and a resilient means for each member supported by the frame and exerting a yielding force between the frame and the respective member to hold the latter yieldingly in raised position with respect to the frame with the upper end thereof projected above said stop element, each resilient means yieldable when the associated member is moved down relatively to the frame, and each resilient means being yieldable through a distance greater than the distance by which corresponding setting member extends above the stop member, whereby each setting member is movable downwardly to a position below said stop to facilitate removal of the member.

29. In a loom dobby having a harness lifter knife moving along a given path, a harness lifter hook to be moved into and out of said given path, two hook positioning members one of which is movable by the other to move said hook with respect to said path, a sheet pattern located between said members and having perforated and unperforated portions, feeding mechanism to move the perforated and unperforated portions progressively to controlling position between said members, and means to cause said members to change the position of a hook with respect to the path by a force transmitted through a perforated portion of said pattern sheet which is in controlling position between said members, and unperforated portions of the sheet pattern in controlling position between said members preventing said means from causing said members to move the hook relatively to the path.

RICHARD G. TURNER.