June 1, 1965 W. SEILER 3,186,439

JACQUARD LOOMS

Filed Aug. 22, 1962 3 Sheets-Sheet 1

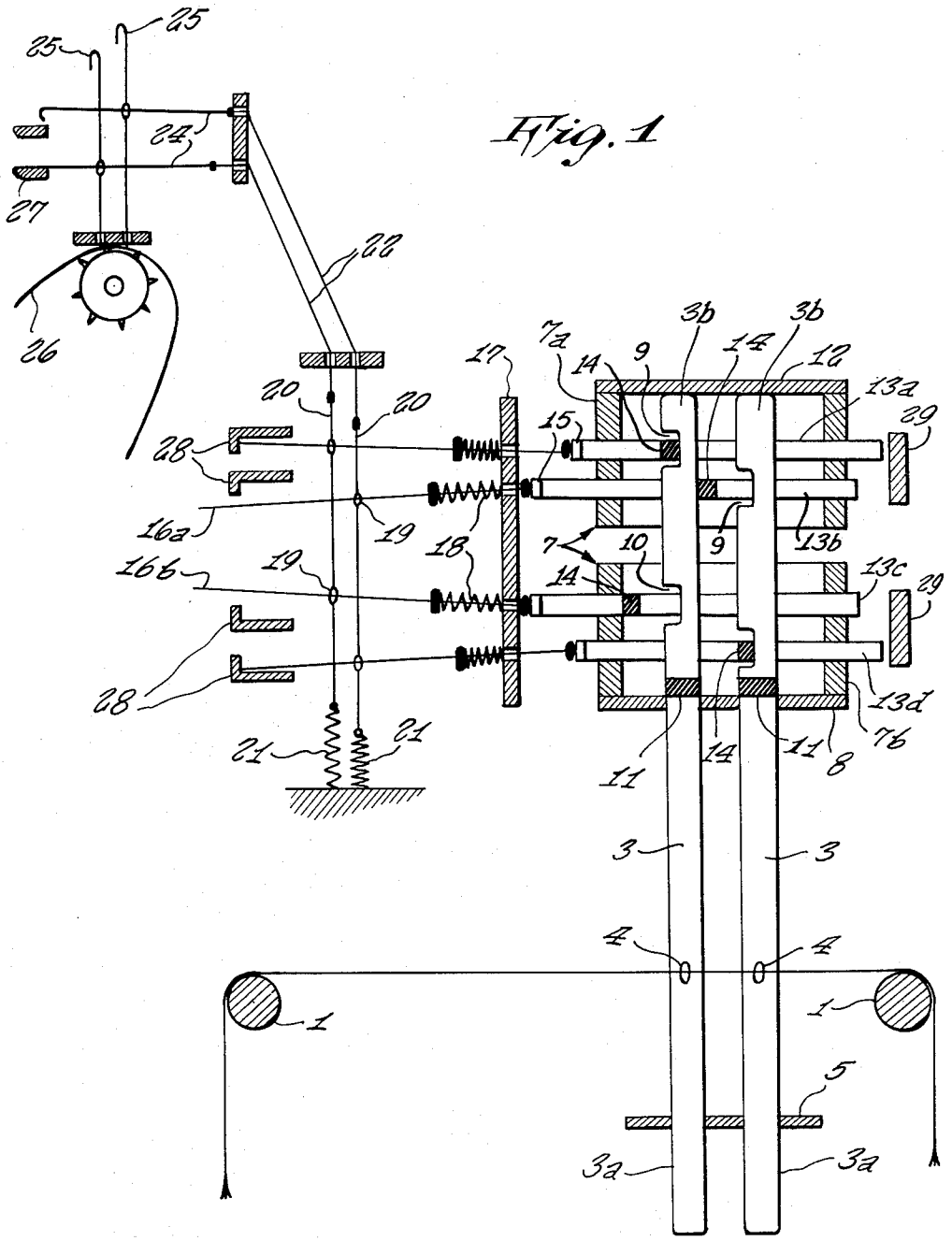


Fig. 1

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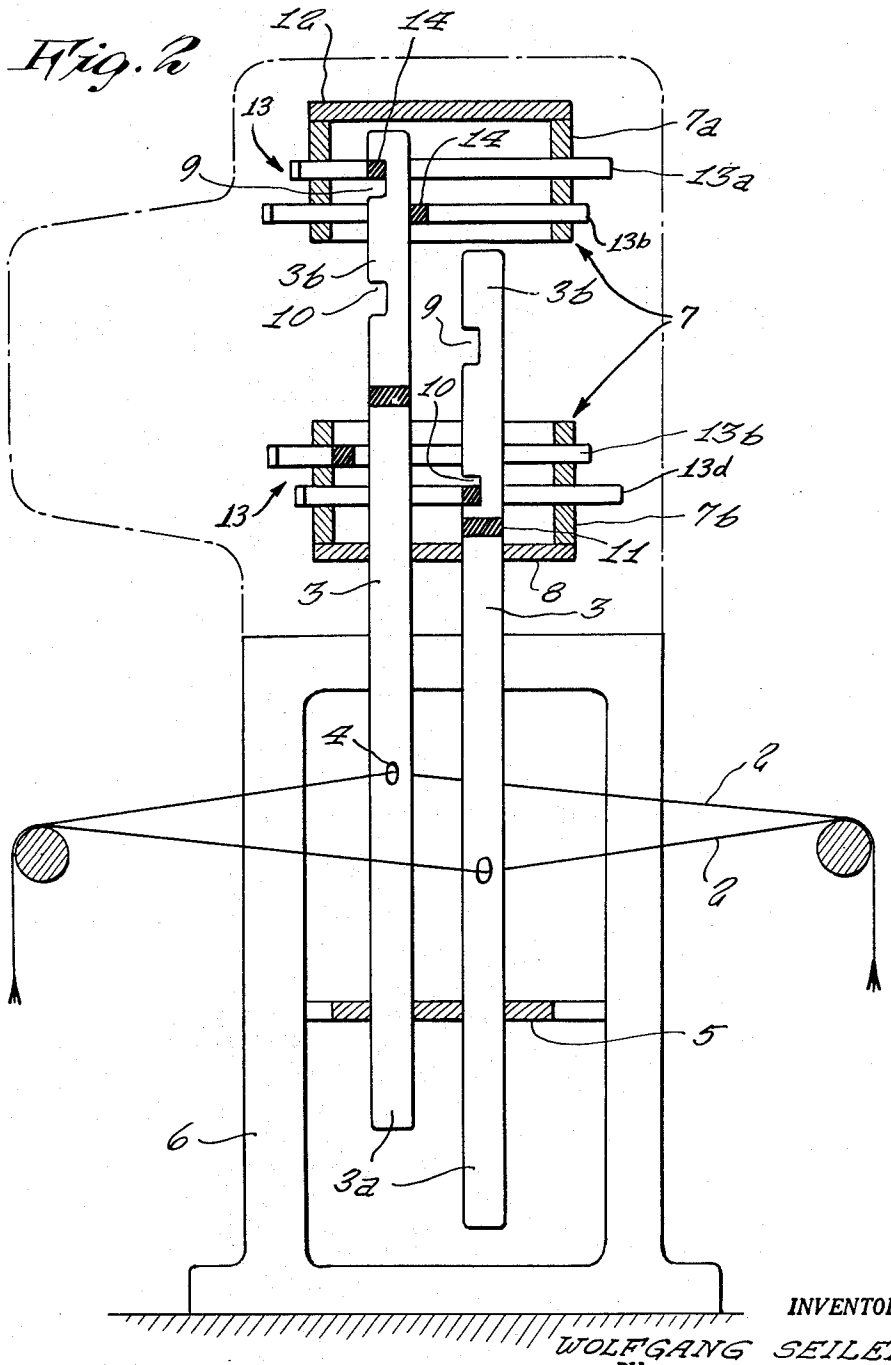
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Fig. 2



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Fig. 3

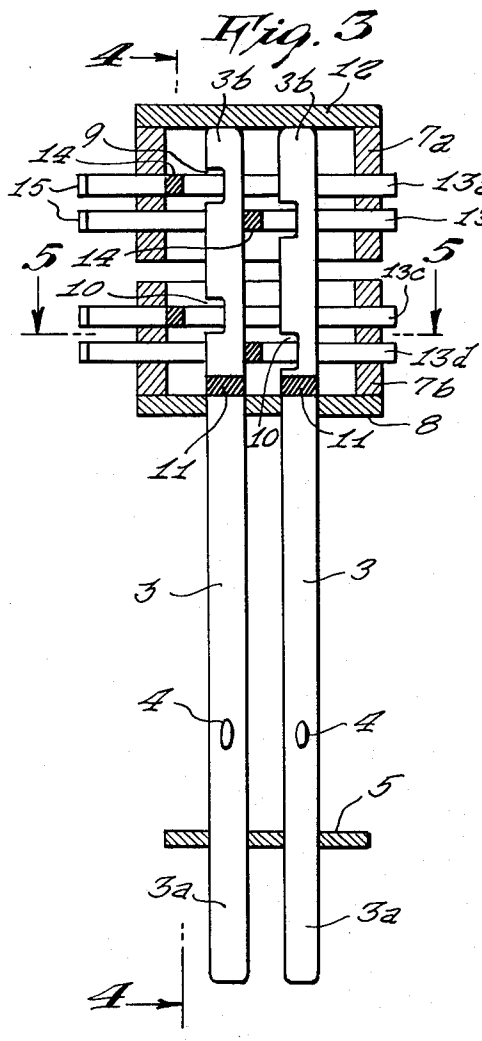
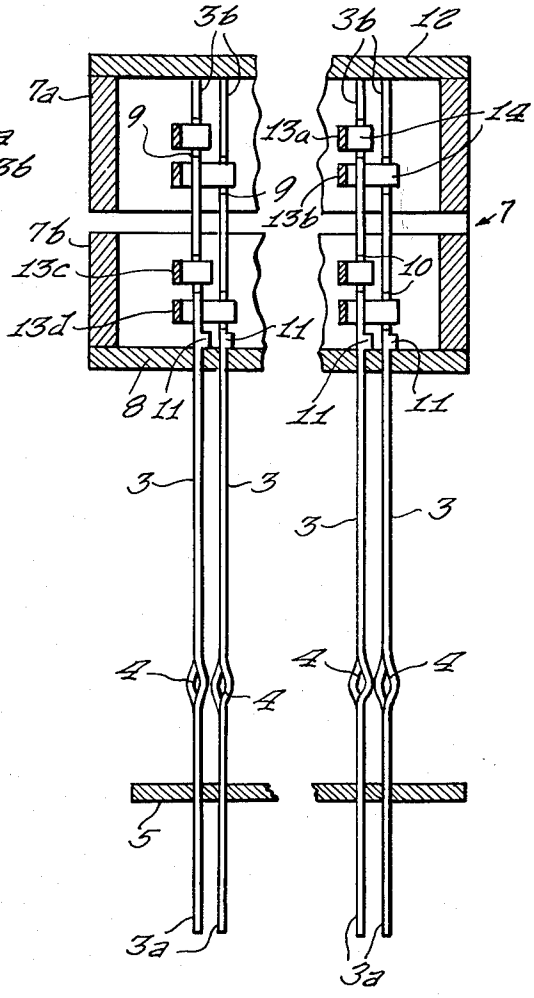


Fig. 4



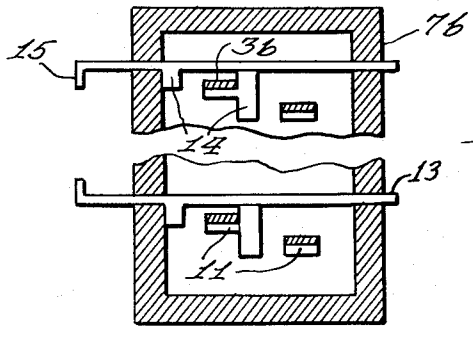


Fig. 5

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JACQUARD LOOMS

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5 Claims. (Cl. 139—59)

The present invention concerns a Jacquard loom, the warp threads of which are adapted selectively to be brought into an upper shed and a lower shed position by means of the Jacquard mechanism for forming a shed.

Control members which are adapted to be raised and lowered engage the warp threads and operate in conjunction with a punch card belt of the Jacquard mechanism by means of drop needles, leading needles and main needles and also lifting bars. If a drop needle is read in a hole of the card belt, then the lifting bar associated with this drop needle, which in turn is urged against a reciprocating cutter bar by the associated needles, lifts the control member connected thereto, whereby the warp thread concerned gets into the upper shed position. On the other hand while the drop needle is not read in the punch card belt, the control member associated therewith is released and then under the influence of an external force is drawn downwards causing the warp thread connected therewith to be brought into the lower shed position.

In known Jacquard looms the actual Jacquard mechanism is arranged a few feet distance from the warp threads adapted to form the shed and on a correspondingly high upper structure frame and connected with the warp threads by means of so-called healds.

In order to bring the warp threads released by the Jacquard mechanism downwards each time into the lower shed position, weights are suspended on connecting healds between the harness cords and warp threads.

The object of the present invention is to eliminate in a Jacquard controlled loom the weight loading of the healds and of the needle mechanism of the Jacquard mechanism to reduce the overall height with the omission of long heald cords and to enable rotary speed to be increased to an extent possible in other types of looms.

According to the present invention, a Jacquard controlled loom comprises the combination of a plurality of lifting bars serving as control members for the individual warp threads of the loom, each lifting bar having an eyelet through which warp threads pass and two vertically spaced apart recesses, a plurality of control slides, arranged in pairs, associated with the individual lifting bars and arranged at such vertical distances from one another, that one slide of each pair is adapted to engage in the upper recess and the other slide in the lower recess of the associated lifting bar, a plurality of slide housings arranged in pairs one above the other, and adapted to be controlled so as to be moved in vertically opposite directions, the control slides being mounted in these housings so as to be horizontally displaceable while the lifting bars are vertically displaceable, control means being provided for displacing the slide housings in opposite directions and means being provided for reciprocating the control slides within the slide housings so that the two control slides of each pair are caused to be engaged in and disengaged from the associated lifting bar.

After each weft entry the control slide housings return to their initial position which they assume at small vertical spacings from one another, and the control slides are caused to disengage again from the lifting bar recesses by any suitable means. The working cycle is then repeated corresponding to the punch card pattern, which is incorporated in the card belt passing through

intermittently beneath the drop needles of the Jacquard mechanism.

In the loom of the present invention it is necessary for the needle mechanism of the actual Jacquard mechanism to displace the control slide only to a negligible extent compared with hitherto required cord weights. As soon as the control slides actuated by the Jacquard mechanism have engaged in the associated lifting bars, each slide housing forcibly carries the lifting bar connected thereto upwards or downwards. Without noteworthy loading of the actual Jacquard mechanism a warp thread group is thus caused to be lifted into the upper shed position and a second group of warp threads simultaneously pushed down into the lower shed position exclusively with the aid of rigid control members in the form of lifting bars, control slides and slide housings.

The invention will be described further, by way of example, with reference to the accompanying diagrammatic drawings, in which:

FIG. 1 is a side elevation, partly in section, showing the Jacquard control system of a loom;

FIG. 2 is a view similar to that of FIG. 1, but on a somewhat larger scale, showing the Jacquard control system in a different working position and including a supporting frame;

FIG. 3 is a fragmentary view on an enlarged scale corresponding to part of FIG. 1 with the individual parts in different position;

FIG. 4 is a vertical section on the line IV—IV of FIG. 3; and

FIG. 5 is a horizontal cross-section on the line V—V of FIG. 3.

The Jacquard control system illustrated in the drawings, serves the purpose of bringing, in conventional manner, warp threads 2, stretched in conventional manner over warp beams 1 of a loom, in groups alternately into the upper shed and lower shed positions. The system comprises lifting bars 3 having eyelets 4 through which the warp threads 2 are inserted, the lifting bars 3 being arranged in two rows situated one behind the other and extending over the whole width of the loom. Each lifting bar 3 is guided below its eyelet 4, by its lower end 3*a*, which is adapted to reciprocate in a slot in a horizontally disposed fixed slot plate 5, which is mounted on a frame 6 placed on the base of the Jacquard loom adjacent thereto.

Two box-like slide housings 7*a* and 7*b* are mounted on the frame 6 so as to be raised and lowered by means of a drive conveniently actuated by branching from the main drive of the loom, and are retained in their starting position, evident from FIGS. 1, 3 and 4, before each shed formation of the warp threads 2. For the purpose of shed formation, the slide housings 7 are displaced from the position in which they are situated at the smallest vertical distance from one another, away from each other by means of the aforementioned actuated drive so that the upper housing 7*a* moves upwards and the lower housing 7*b* moves downwards and after picking in the shed has been carried out they are returned to their starting position. Each housing thereby carries, via the particular lifting bars 3 which are connected thereto in a manner described below, the corresponding group of warp threads 2 into the upper shed or lower shed position and subsequently returns the warp threads into the center position (FIG. 1). The housings 7 like the above mentioned rows of lifting bars 3 also extend transversely (weft direction) of the Jacquard loom and over the whole width thereof.

The upper end 3*b* of each lifting bar 3 which passes through the lower housing 7*b* and extends into the upper housing 7*b* is guided in a correspondingly slotted base plate 8 of the housing 7*b*. The slotted plates 5 and 8 serving to guide the lifting bars ensure that these bars assume a vertical position and are prevented from tilting in every posi-

tion of the housings 7. Each upper end 3*b* of lifting bars 3 has two recesses 9 and 10 formed therein, of which the recess 9 is situated within the housing 7*a* and recess 10 within the housing 7*b* as long as the two housings are situated in the original position. Moreover, each lifting bar end 3*b* also has a projection 11 which is adapted to be supported against the base plate 8 of the housing 7*b* and prevents the bars 3 from slipping down out of this housing.

Each bar 3 is controlled by a pair of slides 13*a*, 13*c*, and 13*b*, 13*d*. Slides 13*a* and 13*b* are guided in the upper housing 7*a* and the slides 13*c* and 13*d* are guided in the lower housing 7*b*, each being displaceable in a horizontal direction in corresponding slots in opposite side walls of the associated housing. Each of the control slides 13*a*, 13*b*, 13*c* and 13*d* projects outwardly from these side walls and carries a projection 14 situated within its associated housing. Through this projection the slides are adapted to engage in one of the two recesses 9 and 10 of the lifting bar 3 associated therewith. The individual pairs of control slides 13*a*, 13*c* and 13*b*, 13*d*, are so controlled, in a manner described below, that continually only one slide of each pair, slides 13*a*, 13*c* which are operable with one of the two bars 3 as seen in FIG. 1 and slides 13*b*, 13*d* which are operable with the other of the bars 3, is adapted to be brought periodically into rigid connection with the associated lifting bar 3, the two housings 7*a* and 7*b*, during the engagement, being situated in their abovementioned original position.

Pusher needles 16*a* and *b*, displaceable in the horizontal direction, are adapted to act on that one of the two ends of each control slide pair projecting from the associated housing 7 which with the action of an external compressive force, causes the slide to engage in the corresponding recess 9 or 10 of the lifting bar 3 associated therewith. Advantageously, as seen in FIG. 5, each slide 13 has a head surface 15 upset or flanged thereon. The individual pusher needles 16*a* and *b* are guided in a vertical supporting plate 17 fixedly mounted on the frame 6 and are biased by coil springs 18 (FIG. 1) which tend to draw the pusher needles off the associated slider heads 15. Moreover the two pusher needles 16*a* and *b* associated to each control slide pair 13*a*, 13*c* and 13*b*, 13*d* are also guided behind the supporting plate 17 in eyelets 19 of a draw needle 20 adapted to be raised and lowered. Each individual draw needle 20 is engaged by a spring 21 which tends to pull the needle 20 downwardly and by a connection 22, which may be constructed in the form of a cable, chain, lever rod mechanism or even a manotte. The connections 22 of the draw needles 20 are adjoined by the pattern reading mechanism of a Jacquard mechanism 23, which is of conventional design. Each of the hooks 24 belonging to the pattern reading mechanism is guided on a drop needle 25 which, depending upon the punched pattern of a belt card 26 passing over the pattern drum during a working stroke of the loom is either retained in a raised position by this card belt or however read into a pattern hole of the band. The Jacquard mechanism moreover contains a pair of reciprocating knives 27, which engage the hooks 24 adjusted by those drop needles 25 which are read-in and via the connections 22 also draw the associated draw needles upwardly against the action of the springs 21.

As is evident particularly from FIG. 1, a complete set of control slide pairs, pusher needle pairs, draw needles 20, connections, hooks 24, drop needles 25 and cutters 27 is provided for each row of the lifting bar 3, these sets being arranged behind one another in the direction of the warp threads 2. Only the card belt 26 of the Jacquard mechanism 23 and the two slide housings 7*a* and 7*b* are common to the two rows of lifting bars.

If, a drop needle 25 in the card band 26 via the associated hook 24 and the connection 22 a draw needle 21 is drawn upwardly, the draw needle concerned accordingly swings upwardly the pair of pusher needles 16*a* or *b* mounted displaceably in its eyelet 19 about the

guide positions thereof in the fixed plate 17. Controlled thrust members in the form of angular ledges 28 which are mounted so as to be displaceable in a horizontal direction on the frame 6 are adapted to act on the ends of the pusher needles 16 remote from the control slides 13. For all pusher needle pairs, which belong to one or the other abovementioned rows of lifting bars, a thrust member pair comprised of superimposed angle ledges 28 are provided. The thrust members 28 in each of these two pairs are situated at such vertical spacings from one another that only one of a pair of needles 16*a* and *b* controlled by the same needle 20 can get into the operational range of a thrust member 28 at the same time. That is the case in all upper pusher needles 16*a*, when the draw needles 20 associated therewith are in a raised position. Likewise, the lower needles 16 of the same pusher needle pairs, when the Jacquard mechanism releases the draw needles associated with these pairs and the springs 21 draw the needles 20 concerned downwardly, are controlled by means of thrust members 28 associated therewith and thereby to bring the control slides co-operating therewith to engage in the associated lifting bar recesses.

The whole control system for the warp threads 2 inserted through the lifting bar eyelets 4 comprising the Jacquard apparatus 23 including drop needles 25, hooks 24 and cutters 27, draw needles 20 and the connections 22 thereof to the hooks 24, controlled thrust members 28 together with pusher needle pairs 16*a* and *b*, control slide pairs 13*a–d*, slide housings 7 and also lifting bars 3 adapted to be raised and lowered, is arranged on the frame 6 disposed on the loom floor. Owing to this separate disposal it is readily possible for the Jacquard control system to be free of all vibrations caused in the actual loom, more especially by impacts of the shed and consequently able to operate without interruption. It also ensures a satisfactory engagement of the control slides in the associated recesses 9 and 10 of the lifting bars 3 before the shed is formed when the housings 7 assume their original position, i.e. are at their shortest vertical distance from one another. In this position of the two housings 7*a* and 7*b* the upper ends 3*b* of the lifting bars 3 which project correspondingly upwardly beyond the projections 11 formed thereon, strike against the cover plate 12 of the upper slide housing 7*a* (FIGS. 1, 3 and 4). The position of the lifting bar ends 3*b* is hence accurately fixed like the position of the control slides guided in the lateral housing walls and associated therewith.

If, by corresponding control from the Jacquard mechanism 23, the different control slides engage in an upper or lower recess 9 or 10 of the lifting bars 3 associated therewith and together with the bars 3 have been carried along by the housings 7*a* and 7*b* moving apart, the warp threads inserted through the lifting bar eyelets 4 form a shed (FIG. 2). The mean height of the shed formed each time is adapted to be very accurately and finely adjusted in the most simple manner by the fact that the stroke distance of the two housings 7*a* and 7*b* is accordingly regulated within liimts conditioned by the construction. After the shed formation, as already mentioned, the two housings 7*a* and 7*b* again carry out a movement opposite to one another until they have returned to the original position and the warp threads 2 have assumed a central position (FIG. 1). The main drive of the loom now via an intermediate drive (not shown) actuates counter thrust members 29 which on the opposite side of the housing 7, like the thrust members 28, are mounted on the frame 6 so as to be horizontally displaceable. One controlled counter thrust member 29 suffices for each slide housing 7. When the two counter thrust members 29 advance from their inoperative position shown in FIG. 1 in the direction of the control slides, they lead all the control slides engaged in the lifting bar 3 to the left to such an extent that the slide projections 14 are again disengaged from the associated recesses 9 or 10 of the lifting bars 3. The return movement of the control slides from

the original position evident from FIG. 3 can be limited by the slide projections **14** or also by other stops provided on the control slides in such a manner that all slides with their head ends **15** are again just supported against the associated pusher needles, which in turn after being released by those thrust members **28** which have just receded, have assumed their inoperative position under the influence of the springs **18**. This terminates a working stroke of the Jacquard loom.

As will be apparent, it is dependent alone upon the pattern punched in the card band **26** as to which of the drop needles **25** are momentarily read into the card band and which drop needles **25** are released by the Jacquard mechanism **23** for the working stroke concerned. The control slides **13** co-operating with the drop needles which function to bring the lifting bars **3** associated therewith into the upper end position, for example, when the housings **7***a* and **7***b* move apart, simultaneously causing the control slides co-operating with the released drop needles and the lifting bars connected therewith to assume the lower end position during the working stroke concerned.

The Jacquard control system is also adapted to be accommodated on the substructure frame of the loom, if the arrangement of a separate supporting frame appears inappropriate. However, particularly with a smaller number of warp threads, it is also possible to utilize only a single row of lifting bars **3**. It is also possible to arrange the lifting bars **3** in more than two rows disposed one behind the other in the direction of the warp threads.

I claim:

1. In a Jacquard controlled loom having warp and weft threads, a device comprising the combination of a plurality of vertically displaceable lifting bars serving as control members for the individual warp threads, each lifting bar having an eyelet through which passes a warp thread, an upper recess and a lower recess vertically spaced apart in each lifting bar, a plurality of horizontally displaceable control slides arranged in pairs and associated with each said individual lifting bar and arranged at such vertical distances from one another, that one slide of each pair is adapted to engage in said upper recess while the other slide is adapted to engage in said lower recess of the associated lifting bar, a plurality of vertically displaceable slide housings arranged one above the other,

and adapted to be controlled to move in vertically opposite directions, said control slides being mounted in said slide housings so as to be horizontally displaceable while said lifting bars are vertically displaceable and means are provided for reciprocating said control slides within said slide housings so that the two control slides of each pair are caused to be engaged in and disengaged from the associated lifting bar.

2. The device according to claim **1**, wherein said lifting bars are arranged widthwise of the loom in a plurality of rows, one behind the other, the eyelets of the lifting bars through which the warp threads pass being situated one behind the other, a pair of control slides being associated with each lifting bar of a row.

3. The device according to claim **1**, wherein actuating means are arranged for displacing the control slides to cause them to engage in the associated lifting bars, the actuating means operating in response to a pattern mechanism including drop needles and a pattern card.

4. The device according to claim **1**, wherein each lifting bar is guided in a lower slot of the lower slide housing and in a fixed slot plate which is conveniently arranged beneath the eyelet of the lifting bar.

5. The device according to claim **1**, wherein the Jacquard mechanism, including the control slides, the means for actuating said slides, the slide housings and the lifting bars, is mounted on a separate frame disposed adjacent said loom controlled by said Jacquard mechanism.

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