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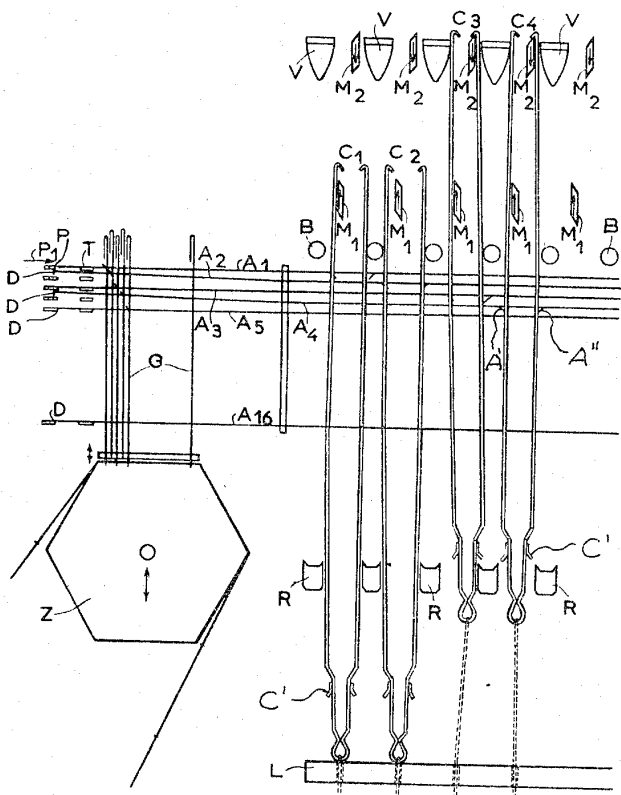
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JACQUARD MACHINE WITH AN OPEN SHED CARRYING HOOK  
NEEDLES, PROVIDING A DOUBLE POSITIVE ACTION

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3 Sheets-Sheet 1

Fig. 1



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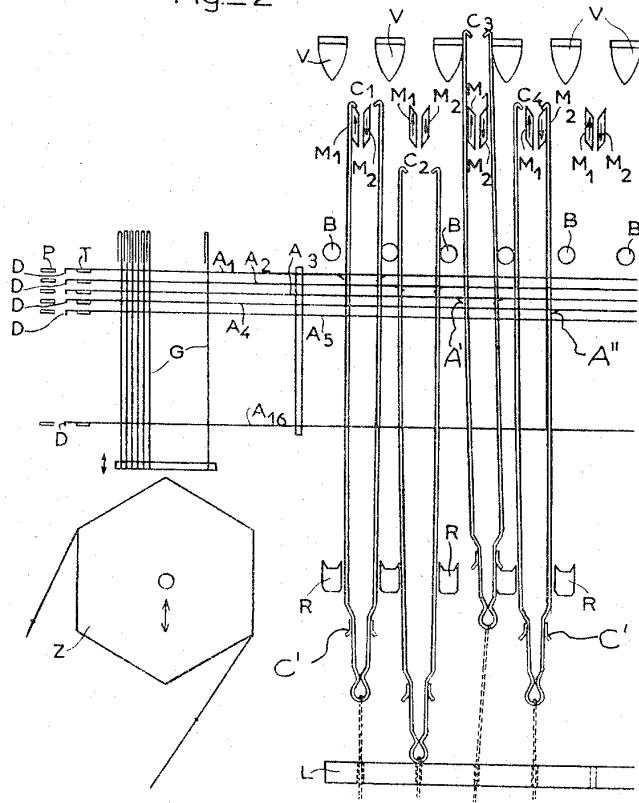
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Fig. 2



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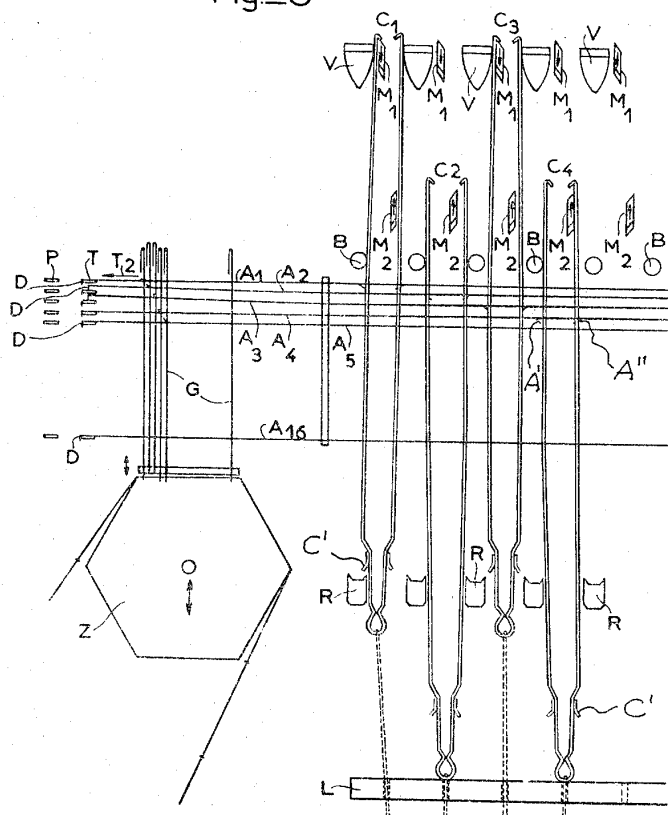
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Fig. 3



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**JACQUARD MACHINE WITH AN OPEN SHED CARRYING HOOK NEEDLES, PROVIDING A DOUBLE POSITIVE ACTION**

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3 Claims. (Cl. 139—63)

The increase in the speed of modern looms makes it more and more necessary to incorporate Jacquard machines of the open shed type, which spare to the utmost both the harness and the warp threads in spite of the high speed of operation.

Such machines have been in existence for a long time, but their intricate structure limits their use. Various simpler structures have already been proposed.

The first embodiments with a front pattern cylinder carrying the cards for the odd picks and a rear cylinder carrying the cards for the even picks, which cylinders act alternately on the opposite ends of the needles, have led the way to machines with a single cylinder so that it was possible to resort without any modification to the extant card systems provided for ordinary mechanisms.

However, these improvements led to an intricate structure for the single selecting means since it was necessary for the hook needles or main needles controlling the double hooks with two noses to be provided with springs and to be associated with a movable needle box or else it was necessary for the main needles to control two simple hooks of which the action was controlled in unison by a pulley block system for a given group of harness cords.

My invention has for its object improvements in the means for selecting the needles, which permits eliminating the control of the needles by springs and pulley block arrangements.

According to the invention, the needles are actuated by double positive action, the main needles forming with the presser needle action a single member long enough to be subjected, without any permanent deformation, to a slight vertical bending under the action of a vertical needle, controlled by the card, a part of the needle being bent at a right angle so that the needle is pushed in the horizontal direction by one series of vertical bars and drawn back by another series.

Furthermore, according to the invention, the double elastic hook provided with two operative arms includes two upper noses facing each other, which may lie in their inoperative position outside the path of the knives, each of said arms of the hook carrying at its lower end an auxiliary nose directed outwardly and adapted to engage arresting bars and to hold in their raised inoperative position the hooks which are not to recede onto the bottom board during the following stage.

A further feature of the invention consists in deflecting members secured to the upper part of the machine and adapted to urge into the upwardly directed path of the knives the free noses of those hooks of which the lower nose has engaged a lower arresting bar and to release thus the said lower nose with reference to the arresting bar thereby to allow the hook in question to recede.

Further features of my invention will appear from the following description, reference being made to the accompanying drawings illustrating diagrammatically the operation of the arrangement, in which:

FIG. 1 represents the respective positions of the different members of the machine at the beginning of the first stage of a complete cycle;

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FIG. 2 represents the positions of said members during one-half revolution of the machine; and

FIG. 3 represents the positions of the members at the beginning of the second stage of a complete cycle.

As shown in the drawings, the main needles A are unitary and are sufficiently long that they may be subjected, without any permanent deformation, to a slight bending in a vertical direction under the conventional action of a vertical needle G. Each of their front sections, as shown at D, terminates in a short right-angle bend.

A double series of bars is provided; in other words, it includes two vertical series P and T which are spaced apart by a gap. The needle bends D extend in their inoperative or starting position (FIG. 2) medially of said gap. Said two series of bars P and T execute in unison a horizontal reciprocation as seen at P1 and T2. The over-all cycle of movement of the loom is the same as in other types of Jacquard machines with an open shed.

At the beginning of the first stage and after action of the wire pins or needles G on the needles A in accordance with the distribution of the perforations forming a pattern on the surface of the cylinder Z (FIG. 1), the main needles A1 and A3 have their bends D unshifted so that said bends lie in the path of the bars of the series P of bars. Said bars moving then towards the right hand side, that is towards the rear of the machine in the direction of the arrow P1 (FIG. 1) urge rearwardly all the main needles assuming the same position as A1 and A3 so that at the end of the stroke (FIG. 1) the front arms of the hooks with which they are rigid are urged back into their extreme rear position. The needles such as A2 and A4 of which the bend has been raised cannot be operated by the bars of the series P so that they remain stationary together with their hooks.

After one revolution of the loom, that is after one half revolution of the Jacquard machine, the second stage of the cycle begins. During said second half-revolution and as soon as the knives M1 and M2 (FIG. 1) have ensured through their movement their engagement with the corresponding noses carried by the desired hooks, the double series of bars has returned to its starting position illustrated in FIG. 2 and the knives M1 and M2 continue moving and reverse their relative positions. Then and shortly after the beginning of said second stage, the double series of bars moves forwardly, that is in the direction of the arrow T2 of FIG. 3 while the bends of the main needles such as A1 and A4 which have not been raised by their vertical needles because they lie in front of perforations in the second patterned surface of the Jacquard cylinder which has been brought into operation upon rotation by one angular shifting through 60° of the cylinder Z, are drawn towards the left and their rear heads carry along the rear arms of their hooks. After the shifting of the knives M1 and M2 in the direction of the arrows illustrated in FIG. 3 has ensured the engagement of the desired hook noses such as C4, the double series of bars returns to its original position (FIG. 2) while the cylinder as it rotates through one further angle of 60° brings a third patterned surface into a horizontal position, so that the machine has returned to a position corresponding to the beginning of its first stage after it has executed one complete revolution.

As in all other types of Jacquard machines with an open shed, my improved machine includes two griffes or lifting bars constituted respectively by the system of odd-numbered knives M1 and by the even-numbered knives M2. During the operative stage described previously, the griffe carrying the knives M1 rises vertically

so as to occupy the position illustrated in FIG. 3, whereas the griffe carrying the knives M2 has descended to the position illustrated also in FIG. 3. Subsequently during the second stage, the griffe boxes execute the reverse movement and return to the position illustrated in FIG. 1.

As is well known in the art, the reciprocatory movements of the two griffe boxes in opposite directions are obtained by means of connecting rods, rocking levers and a crank and, in certain cases, by means of cams the outline of which is designed in accordance with the special Jacquard machine required for a predetermined fabric or loom, but in any event in timed sequence with the loom cycle.

During their vertical reciprocatory movements in opposite directions, the two griffe boxes have their knives M1 and M2 lying at the same level (FIG. 2) twice during each revolution of the machine. In other types of machines with an open shed, the hooks receding with a griffe box engaging one of their noses meet the other noses in the path of the other rising griffe box. In order to avoid any interengagement between said noses, which would make said hooks rise untimely, special members act on the desired arm of the hooks or more generally the series of bars continues its action on the presser needles or else the needle box lying to the rear is movable and shifts the needles in the desired direction so as to prevent said interengagement between the hooks. In all cases, this leads to an intricate structure and, in the case where one has to execute a compensating action through the needles, this leads to a speedier wear of the needle heads by the hook arms moving at maximum speed.

Now, the present invention eliminates this drawback by resorting to a double hook or lifting wire of a novel design having two operative arms. Its two upper noses or catches are directed inwardly and towards each other, while in their inoperative position as illustrated for C2 (FIGS. 1 and 3), said noses lie outside the path of the knives, the two arms of the hooks being shifted apart by reason of their elasticity or selectively individually moved toward each other by the oppositely acting detents A' and A'' on the main needles. Said spacing apart is limited by stationary bars B. It will therefore be readily understood that when the griffe boxes cross each other as illustrated in FIG. 2, the noses of the hooks such as C4 which are not engaged by the knives move automatically out of the path of the rising knives and abut against the bars B without any risk of wearing the heads of the needles and without requiring the interference of special members such as movable bars or the protracted action of the pressure exerted by the main needles.

Furthermore said hooks carry at their lower ends two lower noses C' facing outwardly. These latter noses are adapted to engage the inoperative bars R so as to hold in their raised position the hooks which, during the following stage of the cycle should be prevented from descending onto the bottom board L (FIGS. 1 to 3).

Furthermore, in order to ensure during a following stage the reengagement of the free noses of the hooks which have remained raised during the preceding stage, through the engagement of their lower noses by the inoperative bars R, deflecting members V (FIGS. 1 to 3) hold said free noses, on the path of the lifting knives which move up, so that a slight rising of the hooks may ensure thus a release of the lower nose C', with reference to the inoperative bars R. Accordingly, hooks such as C4 (FIG. 1) may fall, since they are not subjected to any action of their needle, the two lower noses being no longer engaged by the inoperative bars R.

It is thus apparent, in contradistinction with other types of open shed machines, that the needles when urged forwardly or drawn back raise their hooks or else hold them in a raised position whereas the needles which remain stationary allow the hooks remaining in a raised posi-

tion to fall, or else hold in their lowered position over the bottom board L, the hooks which are already in contact with the bottom board. It is also apparent that, although the operation of the needles is reversed, a perforation in the pattern provides as in the usual machines a raising of the hooks or the maintenance of said hooks in a raised position, whereas a solid section of the design card operates in the opposite manner.

This particular feature of a reversed operation of the selecting system has for its object the use of the above-described hooks the chief feature of which consists in that no special operation or member is required any longer for the crossing of the griffe boxes (FIG. 2).

However, it is obvious that the double positive action of the main needles, which simplifies considerably the machines of the open shed type, may be applied to the extant type of machines including double hooks with two noses facing outwardly, which hooks are adapted to be held in a raised position by any known means.

It is also possible to make the ends of the needle bends D extend upwardly and to arrange the bars of the double series P and T in a manner such that the raising of the auxiliary vertical needles G by the solid sections of the pattern brings said bends into registry with the bars of either series so as to provide for advancing or retracting the main needles.

With the hooks having inwardly facing noses and while retaining the deflecting members V, it is also possible to eliminate the lower noses and the lower bars, and to ensure the holding of the hooks in a raised position by means of a movable locking grid at the upper end of the arrangement.

What I claim is:

1. In combination in a Jacquard machine of the open-shed type:
  - (A) pattern delivery means;
  - (B) a plurality of vertical needles operated by said pattern delivery means;
  - (C) a plurality of flexible, selectively reciprocating, superimposed needles, each being in contact with one of said vertical needles, each having a front and a back end, said front end terminating in a right-angle bend, said needles being adapted to bend slightly in a vertical direction under the action of a respective one of the said vertical needles;
  - (D) a plurality of lifting knives having a vertical path of travel;
  - (E) a plurality of resilient, reciprocating, double-armed hooks actuated by said knives, each of said hooks terminating (1) in its upper part in a laterally extending nose; (2) said noses facing one another and in the inoperative position lying outside the path of said knives; (3) each arm of said hooks having a retaining nose at its lower end;
  - (F) a plurality of arresting bars for supporting said hooks in a raised position by engaging said retaining noses;
  - (G) a plurality of stationary bars for limiting the spacing apart of said arms of said hooks;
  - (H) a plurality of fixed deflecting members for causing said hooks to engage said lifting knives only when these meet therewith in their raised position;
  - (I) double reciprocatory drive means for said superimposed needles consisting of two horizontally reciprocating rows of spaced bars one row serving for pulling and the other for pushing said main needles by engaging said right-angle bends thereof in response to selection by said vertical needles.
2. Apparatus as claimed in claim 1, wherein said pattern delivery means consist of a perforated card.
3. Apparatus as claimed in claim 1, wherein said deflecting members have a generally triangular shape.

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