

May 21, 1963

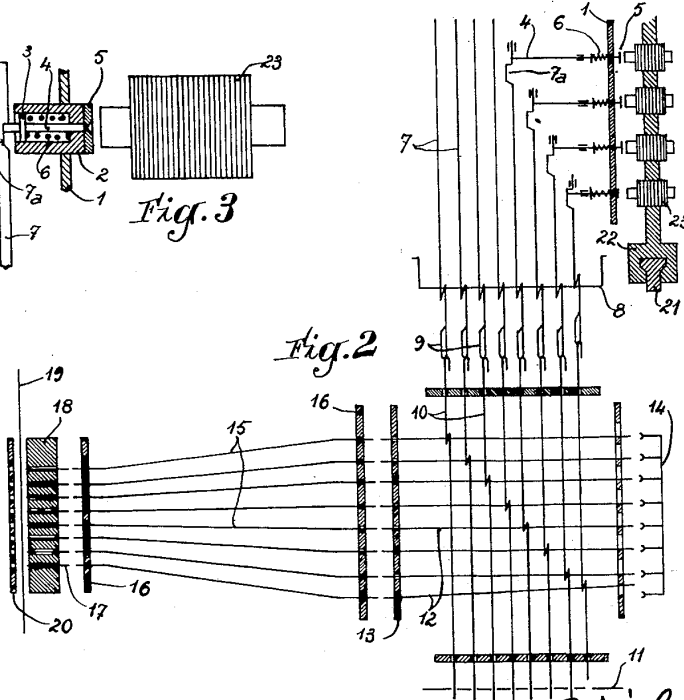
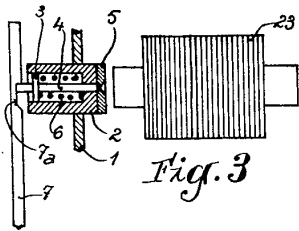
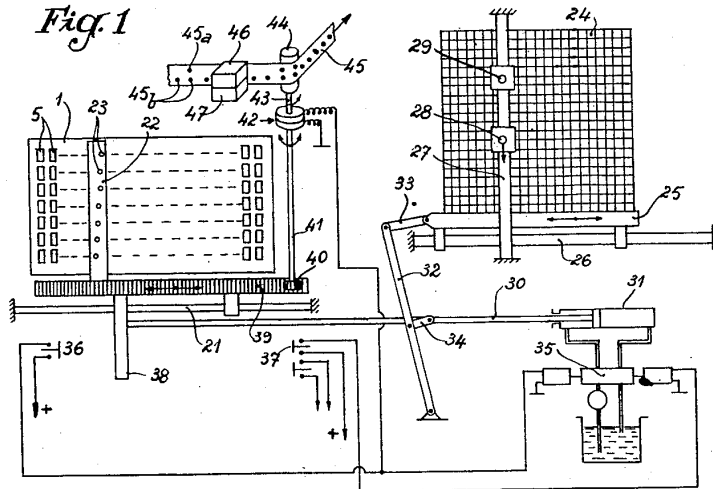
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MACHINES FOR THE PREPARATION OF CARDS FOR JACQUARDS

Filed May 31, 1962

2 Sheets-Sheet 1



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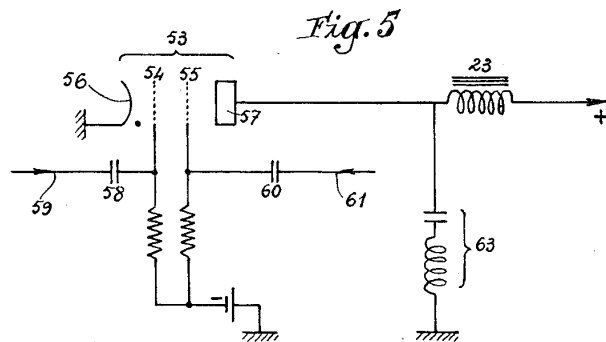
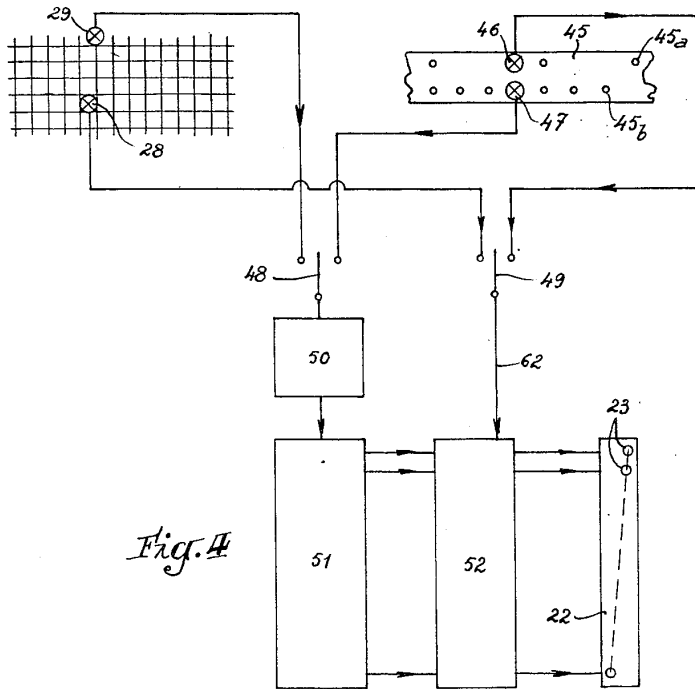
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1

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MACHINES FOR THE PREPARATION OF CARDS FOR JACQUARDS

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9 Claims. (Cl. 234-54)

This invention relates to the machines used to prepare pattern cards and more particularly pattern cards in the form of continuous paper bands for Jacquards of the Verdol type.

In the conventional methods the drawing or pattern to be realized on the fabric is established on squared paper, each square representing the crossing of a weft thread and of a warp thread in the fabric. The operator "reads in" each color of the drawing by following successively the horizontal rows of squares (which rows represent the successive warp threads) and by actuating in accordance the punch controlling members of a card perforating machine. These members are also selected by means of a master card in accordance with an appropriate weave, in such a manner that the operator only has to "take" or "leave" the successive squares according as they are or not in the portion of the drawing which is being read in. It is also known to effect the reading-in operation automatically by means of photo-electric cells.

A problem which is encountered in such a reading-in operation is to distribute the information derived from the drawing to the individual perforating mechanisms of card perforating machine, owing to the great number of these mechanisms (1,344 in the case of the paper bands used in connection with Verdol Jacquards).

U.S. Patent 2,552,942 describes and claims a machine in which the vertically slidable feeler needles which control the card punching means are individually suspended to feeler needle controlling members which are themselves selectively positionable either to retain the feeler needles spaced from the master card or to leave them free to rest on the said card and to be selected thereby, the said feeler needle controlling members being disposed in a number of parallel rows and being positioned by selecting pusher members supported by a movable carriage displaced in front of the said successive rows so that all the feeler needles may be actuated with a limited number of such pusher members by successive advances of the carriage. The pusher members are in turn actuated by longitudinal bars operated by fixed electromagnets, the latter being energized by means of keys adapted to be depressed by the reading-in operator. This machine is quite satisfactory for its purpose, i.e. when the drawing is read-in by a human operator, but its operation becomes much too slow when this operation is effected automatically, as for instance by means of photo-electric cells, or when the information read-in by a human operator or by such cells has previously been registered in some kind of memory. In such cases the output of the perforating machine is unduly limited by the time required for the step by step advance of the carriage in front of the successive rows of feeler needle controlling members and for the actuation of the relatively heavy longitudinal bars which in turn actuate the said controlling members through the

2

intermediate pusher members carried by the movable carriage.

A first object of the present invention is to provide a machine for the preparation of pattern cards, and more particularly of pattern paper bands for Verdol Jacquards, which will be capable of operating at a quite high speed.

Another object of the present invention is to provide a machine of the kind above referred to, in which the carriage which supports the actuating members adapted to act on the feeler needle controlling members will move continuously without any intermediate stop in front of each of successive rows of selecting members which in turn act on the feeler needle controlling members.

A further object of the present invention is to provide a machine of the kind above referred to, which may operate under the action of any reading-in information, as for instance of the information directly derived from a photo-electric cell displaced in front of a drawing to scan the latter, or of an information previously registered in an appropriate memory.

Still another object of the present invention is to provide a machine adapted to receive at the same time a locating information corresponding to a given point of the drawing or pattern, and a reading-in information corresponding to the said point.

In accordance with the present invention in a machine for the preparation of pattern cards, having feeler needle controlling members and a movable carriage carrying selecting members adapted to act on the said feeler needle controlling members, the carriage moves continuously at a substantially constant speed in front of successive rows of intermediate retaining members adapted to normally retain the feeler needle controlling members at a first inoperative position for which the feeler needles are spaced from the master card, and it supports a row of electromagnets adapted to selectively actuate the said retaining members to permit the said feeler needle controlling members to come to a second operating position for which the feeler needles engage the master card and are selected thereby, the said row of electromagnets being disposed obliquely with respect to the successive rows of retaining members, in such a manner that the electromagnets pass successively, and not simultaneously, in front of the retaining members of each row of same and that all the said retaining members may be regularly swept and selectively actuated in succession at each stroke of the carriage.

The locating information, in the form of a succession of signals corresponding to the successive points of the drawing, is sent to an electronic computer which acts as a rotating multiple-way commutator switch to distribute these signals to a number of electronic elements of the "and" type which simultaneously receive the reading-in information, each of the said elements being connected with an electromagnet of the carriage so as to only actuate the latter when the said element receives at the same time a signal from the locating information and a signal from the reading-in information.

In the annexed drawings:

FIG. 1 is a very fragmental view of a machine according to the invention, the view illustrating the panel in front of which the actuating electromagnets are reciprocated by the movable carriage.

FIG. 2 is a diagrammatical section showing the connection between the retaining members supported by the

3

panel and the elements of the Verdol punching device forming part of the machine.

FIG. 3 is an enlarged section of a retaining member and of the corresponding electromagnet.

FIG. 4 is a general diagram of the electrical circuits.

FIG. 5 illustrates an element of the electronic controlling device.

The machine illustrated comprises a vertical plate or panel 1 (FIGS. 1, 2 and 3) in which are mounted a number of horizontal sleeves arranged in vertical and horizontal rows, as shown. In the case of a Verdol Jacquard with 1,344 hooks, each vertical row may comprise 24 sleeves (and not only 7, as illustrated for the sake of clearness) and each horizontal row 56 sleeves, or in other words panel 1 may have 56 vertical rows with 24 sleeves in each row. In each sleeve 2 is slidably disposed a piston 3 having a rod 4 which passes freely through the bottom of the sleeve, its outer end carrying a head 5, as for instance of soft steel, which is normally maintained against the outer side of sleeve 2 by a spring 6 mounted on rod 4 between piston 3 and the bottom of the sleeve. Rod 4 extends rearwardly beyond the open end of sleeve 2 and it forms a retaining finger for a vertically movable blade 7 provided for this purpose with a lateral notch 7a. Blades 7 are associated with cross-members 8 by means of which they may be raised as a whole after perforating step. These cross members 8 may for instance be passed through vertically elongated openings of blades 8, whereby when the cross members are not raised the blades may be free to effect the vertical selecting movements required. Each blade 7 has at its lower end an eyelet 9 in which is engaged the hook-shaped upper end of a Verdol feeler needle 10 forming part of a Verdol punching device of known construction which will therefore be only very briefly described. The lower end of each feeler needle 10 is adapted to feel a master card or weave card 11. Each feeler needle 10 is associated with a horizontal needle 12 having one end guided in a fixed plate 13 while its other end or rear end is supported by the corresponding feeler needle 10. The rear ends of needles 12 may receive the action of a row of bars 14 which move horizontally to strike those of needles 12 which have not been retained at the raised position either by blades 7 or by feeler needles 10. Needles 12 in turn act on pusher rods 15 guided in plates 16, and pusher rods 15 operate punches 17 slidably carried by a plate 18 to punch the paper band 19 against the perforated plate or die 20.

In front of panel 1 is disposed a guide bar 21 (FIGS. 1 and 2) on which is slidably mounted a carriage 22. Carriage 22 supports a vertical row of electromagnets 23 which are so arranged that each may sweep a horizontal row of heads 5. As clearly shown in FIG. 1 this row of electromagnets is disposed somewhat obliquely on the carriage in such a manner that when the electromagnet which is the rearmost one with respect to the motion of carriage 22 has just passed in front of a head 5 in a given vertical row of such heads, the foremost electromagnet is just coming in front of a head 5 in the next vertical row. It will be appreciated that with such an arrangement all heads 5 are successively swept by electromagnets 23.

The information required for selective energization of electromagnets 23 may be derived from a memory in which it has been previously registered, or from the direct automatic reading in of an appropriately prepared pattern drawing.

In the case of a drawing the latter may be read in photoelectrically in any known manner. In FIG. 1 the drawing has been established on a squared support 24 carried by a carriage 25 slidably on a guide bar 26 in synchronism with the above-described carriage 22, in front of a support 27 which carries the photo-electric cells. In the case illustrated there is provided a main

4

cell adapted to read in the successive horizontal rows of squares of support 24 to detect those which correspond to the color being read in, the said cell being indexed downwardly before each operating stroke of carriage 22 so as to read the next horizontal row of squares, as for instance by means of a screw rotated through a pre-determined angle by an appropriate servo motor. Carriage 22 also supports an auxiliary cell 29 adapted to detect the successive vertical lines of support 24 above the drawing itself in order to emit successive signals which constitute the locating information.

Carriage 22 is directly driven by the rod 30 of a hydraulic ram 31, while carriage 25 is actuated by an oscillating lever 32 connected with the said carriage 25 and with rod 30 by connecting rods 33 and 34. Ram 31 is under control of a multiple electro-valve 35 energized by two end switches 36 and 37 actuated by an abutment 38 secured to carriage 22.

When the information has been previously registered in a memory, as for instance in a perforated tape, this information is previously extracted therefrom in the form of locating signals and of reading-in signals. In FIG. 1 carriage 22 has a horizontal rack 39 which rotates a pinion 40 keyed on a vertical shaft 41 mechanically connected by an electromagnetic clutch 42 with a shaft 43 which carries the driving roller 44 of the perforated tape 45. The latter has two superposed rows of perforations the upper one 45a corresponding to the reading-in information and the lower one 45b to the locating information. These rows are read by two electric feelers 46 and 47 which emit one pulse for each perforation of the row. Clutch 42 permits to leave shaft 23 idle during the return stroke of carriage 22.

FIG. 4 very diagrammatically shows how the reading-in and the locating signal pulses from cells 28 and 29 or from feelers 46 and 47 are used for actuating electromagnets 23. There is first provided a double commutator switch 48-49 to select either the cells or the feelers. The locating pulses from cell 29 or from feeler 47 are led to an electronic pulse multiplier which when it receives one pulse, emits one, two or more response pulses, as desired. The role of this apparatus will be more fully explained but for a clearer discussion it may be first assumed that it has been set to emit one response pulse for each impulse received. The pulses from multiplier 50 are led to the inlet of an electronic computer 51 of known type having a number of outlets equal to the number of electromagnets 23. This computer distributes the pulses received to the successive outlets in succession from the first one to the last one and again to the first one, as a multiple way commutator switch which would be continuously rotated in the same direction in synchronism with the pulses received.

The pulses from computer 51 are led to one of the two inlets of the corresponding elements of an electronic actuating device 52, the second inlets of all these elements being connected in parallel to receive the reading-in pulses from either cell 28 or feeler 46. The outlets of the said elements are individually connected with electromagnets 23. Each element is an electronic "and" gate which only emits an outlet signal when it receives substantially at the same time two inlet pulses. In the embodiment illustrated in FIG. 5 such an element comprises a thyatron having two control grids 54 and 55 between a cathode 56 and an anode 57. Grid 54 is connected through a capacitor 58 with an inlet 59, the latter being itself connected with an outlet of computer 51 as above explained. Grid 55 is connected through a capacitor 60 with an inlet wire 61, all the wires 61 being connected with a common inlet line 62 itself connected with switch element 49. Anode 57 is connected with the corresponding electromagnet 23 and with an oscillating circuit 63 adapted to produce de-ionization of the thyatron after a pre-determined time in the known manner. When such an element receives a locating pulse

5

through wire 59, grid 54 becomes positive. If at the same time a reading-in pulse is applied to grid 55, the thyatron is ionized and electromagnet 23 is energized. If on the contrary grid 55 receives no reading-in pulse, thyatron 5 remains idle and electromagnet 23 is not energized. In other words the element described acts as an "and" gate and only actuates electromagnet 23 in response to two substantially simultaneous pulses. In device 52 each reading-in pulse is applied at the same time to all the elements of the device, but one only of these elements can strike and actuate the corresponding electromagnet, namely the element which receives the locating pulse.

It will be appreciated that with such an arrangement the reading-in pulses are regularly distributed in succession to electromagnets 23 as the latter pass in front of the successive vertical rows of heads 5 and that the latter are therefore actuated in accordance with the reading in information either to liberate blades 7 (FIG. 2) or to retain same. When the carriage 22 has completed its operative stroke, the punching operation may take place in the usual manner by advancing bars 14. This may be automatically obtained by means of a switch actuated by carriage 22 at the end of its operative stroke.

When each square of the drawing corresponds to more than one warp thread, multiplicator 50 may be set to emit two or more outlet pulses for each reading-in pulse received from cell 28 or from feeler 46.

When the drawing or pattern is to be repeated along the width of the fabric, carriage 22 may be provided with a corresponding number of rows of electromagnets 23 with the electromagnets of each row connected in parallel with those of the other rows. The stroke of the carriage is then reduced and the drawing is read-in a single time. Assuming for instance that the drawing is to be repeated twice, carriage 22 will have two rows of electromagnets 23, its stroke will be reduced by one half and all the heads 5 will nevertheless be actuated at each stroke to cause perforation of a card comprising two identical portions.

I claim:

1. A machine for the preparation of cards for Jacquards comprising in combination card punching means; substantially vertical feeler needles adapted to be selected by a master card to cause selective operation of said card punching means; vertically slidable feeler needle controlling members to which said feeler needles are individually suspended, said feeler needle controlling members being selectively movable between an inoperative position for which said feeler needles are spaced from the master card and an operative position for which said feeler needles engage said master card and are selected thereby; disengageable retaining members disposed in successive parallel rows, each of said retaining members being associated with one of said feeler needle controlling members to retain same at said inoperative position; a carriage movable in front of said parallel rows of retaining members, substantially transversely thereto; means to move said carriage continuously at a substantially constant speed to cause same to effect an operative stroke in front of said rows of retaining members; electromagnets supported by said carriage to selectively actuate said retaining members during the operative stroke of said carriage to cause said retaining members to permit said feeler needle controlling members to come to said operative position, said electromagnets forming on said carriage a row obliquely disposed with respect to said parallel rows of retaining members in order that during operative stroke of said carriage said electromagnets pass successively and not simultaneously in front of the retaining members of each row of same and that all said retaining members may be regularly swept and selectively actuated in succession; and energizing means to selectively energize said electromagnets during operative stroke of said carriage in unison with passage of said elec-

6

tromagnets in front of said retaining members and in accordance with a reading-in information corresponding to the pattern to be woven by means of the cards perforated by said machine.

2. In a machine as claimed in claim 1, said energizing means comprising electric elements of the "and" type each having a first and a second inlet and a single outlet, with said outlet connected with one of said electromagnets to energize same, and each being arranged to only emit an energizing outlet pulse when its first and second inlet receive each an inlet pulse substantially at the same time; means to emit in unison with movement of said carriage a series of electric locating pulses, each corresponding to passage of one of said electromagnets in front of one of said retaining members; means to distribute said locating pulses in succession to the first inlet of said elements; and means to emit electric reading-in pulses in unison with passage of said electromagnets in front of said retaining members, and to send said reading-in pulses to the second inlet of all said elements.

3. In a machine as claimed in claim 1, said energizing means comprising electric elements of the "and" type each having a first and a second inlet and a single outlet, with said outlet connected with one of said electromagnets to energize same, and each being arranged to only emit an energizing outlet pulse when its first and second inlet receive each an inlet pulse substantially at the same time; means to emit in unison with movement of said carriage a series of electric locating pulses, each corresponding to passage of one of said electromagnets in front of one of said retaining members; a multiplicator having an inlet to receive said locating pulses and an outlet emitting at will a variable number of outlet pulses in response to each locating pulse received; means to distribute the outlet pulses from said multiplicator in succession to the first inlet of said elements; and means to emit electric reading-in pulses in unison with passage of said electromagnets in front of said retaining members and to send said reading-in pulses to the second inlet of all said elements.

4. In a machine as claimed in claim 1, said feeler needle controlling members being in the form of vertical blades each having a lateral notch to receive one of said retaining members.

5. In a machine as claimed in claim 1, said feeler needle controlling members being in the form of vertical blades each having a lateral notch; and said retaining members comprising slidably supported horizontal rods each having a first end engageable into the lateral notch of one of said blades and a second end formed with a magnetic head capable of being attracted by one of said electromagnets to disengage said first end from said last-named lateral notch.

6. A machine for the preparation of cards for Jacquards comprising in combination card punching means; substantially vertical feeler needles adapted to be selected by a master card to cause selective operation of said card punching means; vertically slidable feeler needle controlling members to which said feeler needles are individually suspended, said feeler needle controlling members being selectively movable between an inoperative position for which said feeler needles are spaced from the master card and an operative position for which said feeler needles engage said master card and are selected thereby; disengageable retaining members disposed in successive parallel rows, each of said retaining members being associated with one of said feeler needle controlling members to retain same at said inoperative position; a carriage movable in front of said parallel rows of retaining members, substantially transversely thereto; means to move said carriage continuously at a substantially constant speed to cause same to effect an operative stroke in front of said rows of retaining members; electromagnets supported by said carriage to selectively actuate said retain-

7

ing members during operative stroke of said carriage to cause said retaining members to permit said feeler needle controlling members to come to said operative position, said electromagnets forming on said carriage a row obliquely disposed with respect to said parallel rows of retaining members in order that during operative stroke of said carriage said electromagnets pass successively and not simultaneously in front of the retaining members of each row of same and that all said retaining members may be regularly swept and selectively actuated in succession; a second carriage mechanically connected with said first-named carriage to effect an operative stroke in unison therewith, said second carriage supporting the drawing according to which the cards are to be prepared; a main photo-electric cell disposed in front of said second carriage to read the successive points of a weft line in the drawing during operative stroke of said second carriage and to emit corresponding electric reading-in pulses; an auxiliary photo-electric cell disposed in front of said second carriage to emit one electric locating pulse at the passage of said main photo-electric cell in front of each point of the drawing during operative stroke of said second carriage, the relation between the speed of said second carriage and the speed of said first-named carriage being such that each of said locating pulses substantially corresponds to passage of one of said electromagnets in front of one of said retaining members; and means to receive said locating pulses and said reading-in pulses and to selectively energize said electromagnets in accordance with said reading-in pulses and in unison with said locating pulses.

7. A machine for the preparation of cards for Jacquards comprising in combination card punching means; substantially vertical feeler needles adapted to be selected by a master card to cause selective operation of said card punching means; vertically slidable feeler needle controlling members to which said feeler needles are individually suspended, said feeler needle controlling members being selectively movable between an inoperative position for which said feeler needles are spaced from the master card and an operative position for which said feeler needles engage said master card and are selected thereby; disengageable retaining members disposed in successive parallel rows, each of said retaining members being associated with one of said feeler needle controlling members to retain same at said inoperative position; a carriage movable in front of said parallel rows of retaining members, substantially transversely thereto; means to move said carriage continuously at a substantially constant speed to cause same to effect an operative stroke in front of said rows of retaining members; electromagnets supported by said carriage to selectively actuate said retaining members during operative stroke of said carriage to cause said retaining members to permit said feeler needle controlling members to come to said operative position, said electromagnets forming on said carriage a row obliquely disposed with respect to said parallel rows of retaining members in order that during operative stroke of said carriage said electromagnets pass successively and not simultaneously in front of the retaining members of each row of same and that all said retaining members may be regularly swept and selectively actuated in succession; means to advance in unison with the operative stroke of said carriage a tape supporting a locating information corresponding to the succession of points along a weft line of the drawing according to which the cards are to be prepared and a reading-in information corresponding to said successive points; translator means to read said tape to derive therefrom electric locating pulses and electric reading-in pulses, the relation between the advancing speed of said tape and the speed of said carriage being such that each one of said locating pulses substantially corresponds to passage of one of said electromagnets in front of one of said retaining members; and

8

means to receive said locating pulses and said reading-in pulses and to selectively energize said electromagnets in accordance with said reading-in pulses and in unison with said locating pulses.

8. A machine for the preparation of cards for Jacquards comprising in combination card punching means; substantially vertical feeler needles adapted to be selected by a master card to cause selective operation of said card punching means; vertically slidable blades to which said feeler needles are individually suspended, said blades being selectively movable between an inoperative position for which said feeler needles are spaced from the master card and an operative position for which said feeler needles engage said master card to be selected thereby, and each of said blades being formed with a substantially horizontal downwardly facing retaining edge; horizontally slidable retaining members each having a first and a second end, each of said retaining members being movable between a first position for which said first end engages the retaining edge of one of said blades to retain same at said inoperative position and a second position for which said first end is disengaged from said retaining edge to permit said one of said blades to come to said operative position; a head of magnetic material at the second end of each of said retaining members; guiding members in which said retaining members are slidably mounted; spring means associated to each of said retaining members to urge same towards said first position; a substantially vertical panel member to support said guiding members in successive parallel vertical and horizontal rows with said heads on the front side of said panel member and substantially in the same vertical plane at the first position of said retaining members; a carriage horizontally movable in front of the front side of said panel member; means to move said carriage continuously at a substantially constant speed to cause same to effect an operative stroke in front of said panel member; electromagnets supported by said carriage each in front of a horizontal row of said guiding members to selectively actuate said heads against said spring means so as to selectively bring said retaining members to said second position, said electromagnets forming on said carriage a row at a small angle to the vertical in order that during operative stroke of said carriage said electromagnets pass successively and not simultaneously in front of the heads corresponding to each vertical row of said guiding members and that all said heads may be regularly swept and selectively actuated in succession; and energizing means to selectively energize said electromagnets, during operative stroke of said carriage in unison with passage of said electromagnets in front of said heads and in accordance with a reading-in information corresponding to the pattern to be woven by means of the cards perforated by said machine.

9. In a machine for the preparation of cards for Jacquards embodying punching means selected by controlling members movable between a first position for which said punching means are inoperative and a second position for which said controlling members permit operation of said punching means, means to select said controlling members comprising retaining members, each selectively movable between an engaged position for which it individually retains one of said controlling members at said first position, and a disengaged position for which said one controlling member comes to said second position, said retaining members being disposed in a plurality of parallel rows in a first direction and in a plurality of parallel rows in a second direction at an angle to said first direction; a carriage movable in a direction parallel to said second direction to effect an operative stroke in front of said retaining members; electromagnets supported by said carriage, each being so disposed thereon as to move with said carriage in front of the retaining members of one row in said second direction to selec-

tively act on the retaining members of said one row to selectively bring same from said engaged position to said disengaged position, and said electromagnets further being so disposed with respect to said rows of retaining members in said first direction that they pass successively and not simultaneously in front of all said retaining members and that same may be regularly swept and selectively actuated in succession during operative stroke of said carriage; and energizing means to selectively energize said electromagnets during operative stroke of said carriage

in unison with passage of said electromagnets in front of said retaining members and in accordance with a reading-in information corresponding to the pattern to be woven by means of the cards perforated by said machine.

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