

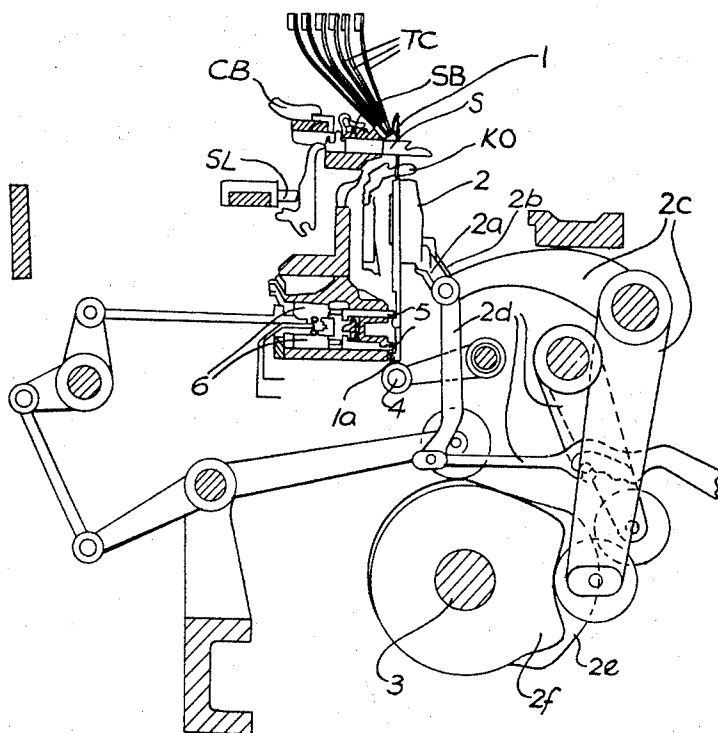
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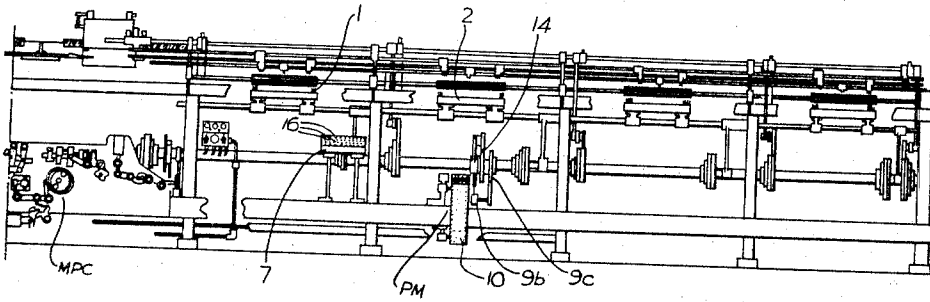


FIG. 2.

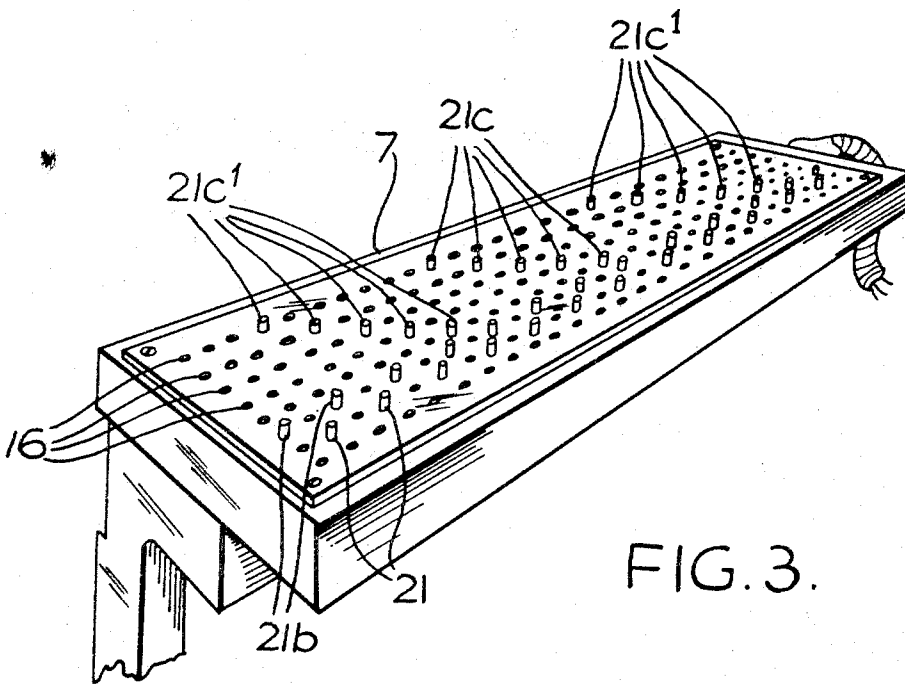


FIG. 3.

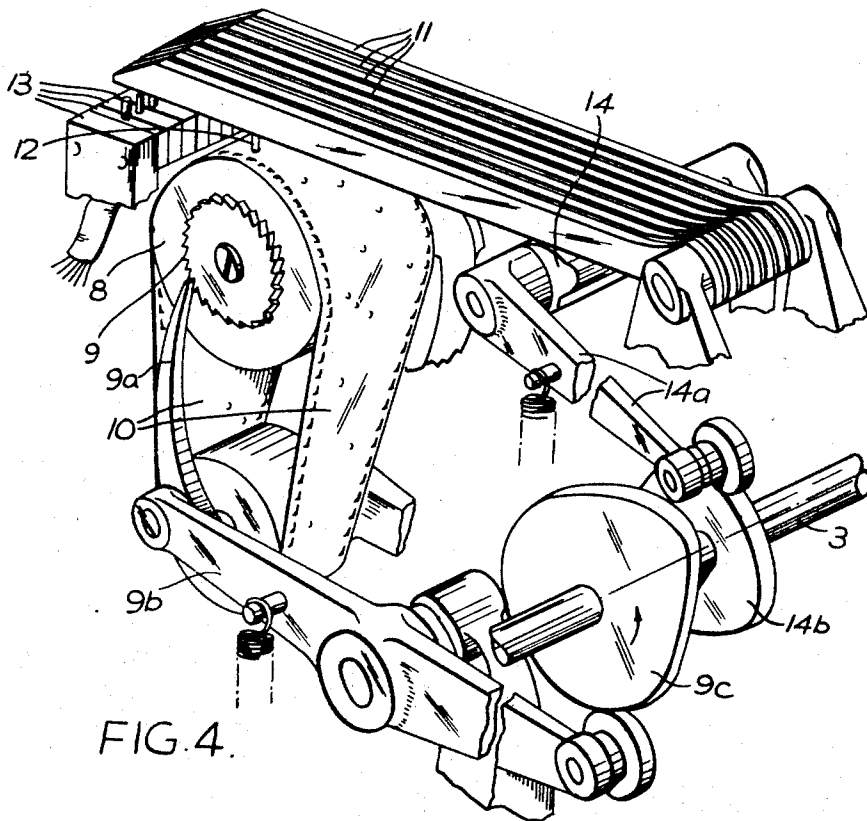
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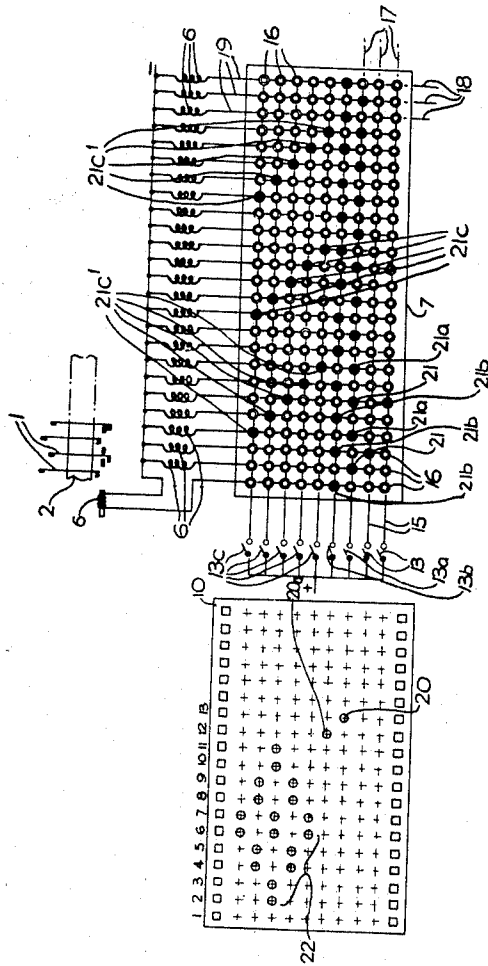


FIG. 5

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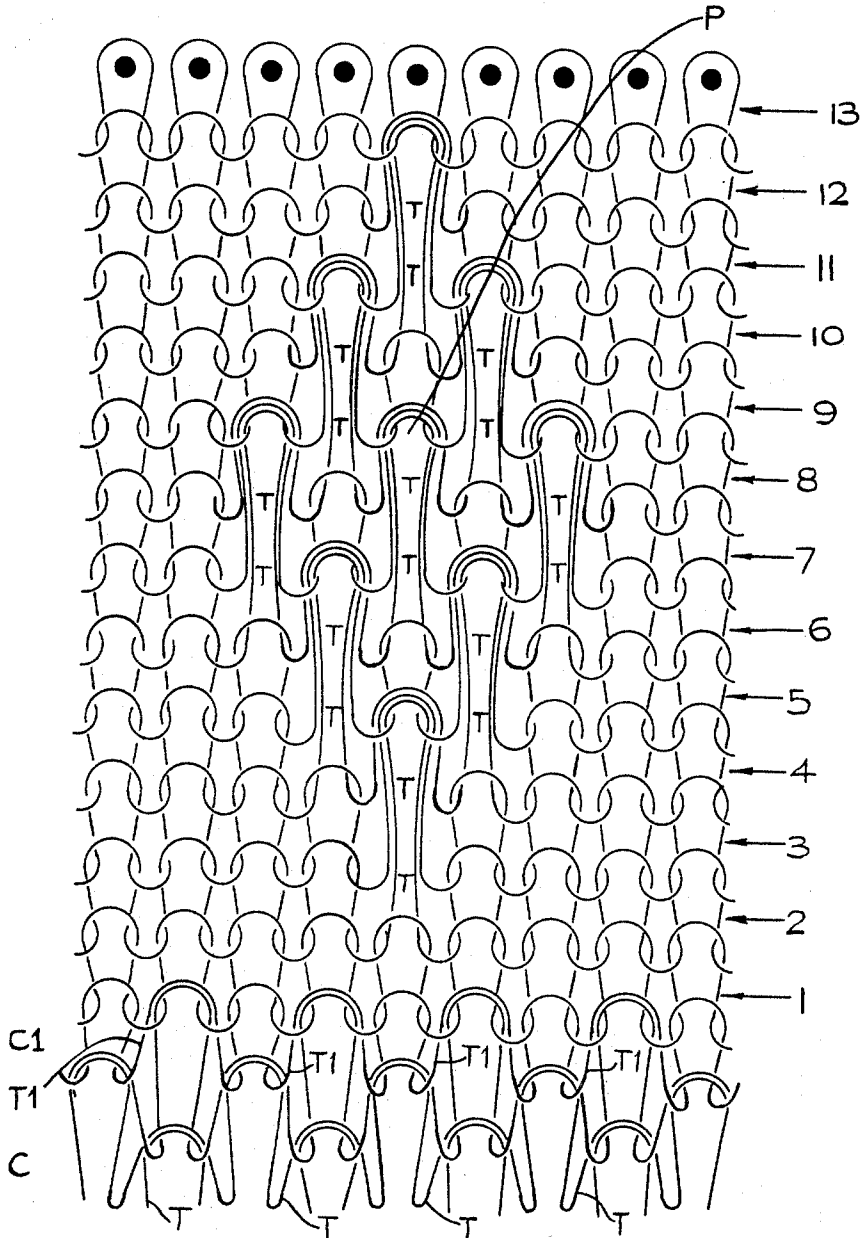


FIG. 6

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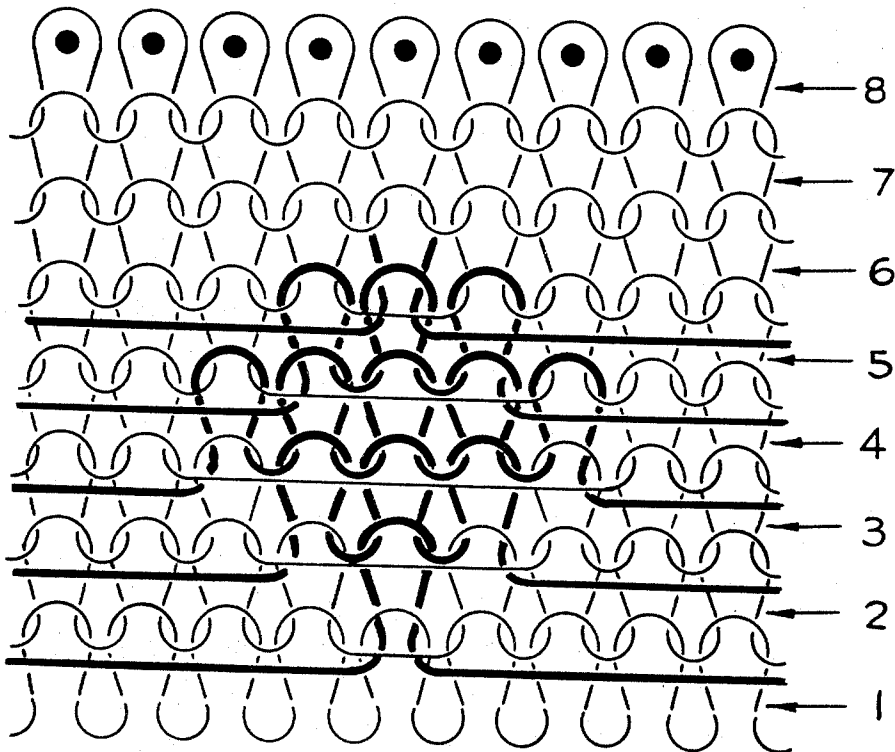


FIG. 7.

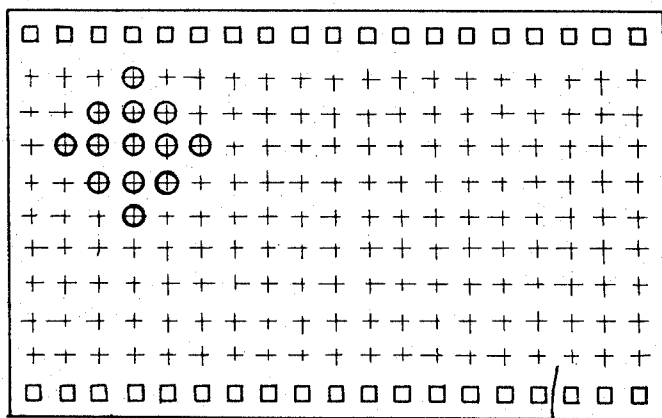


FIG. 8.

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KNITTING MACHINES

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Int. Cl. D04b 39/00, 15/68, 15/78

U.S. Cl. 66—5

6 Claims

ABSTRACT OF THE DISCLOSURE

A knitting machine having patterning means with individual electric actuators arranged for selection control of needles, relatively movable program carrier and reader means having electric switch control points prearranged for control of required shape of a pattern in a fabric, an electric plug board having control points all connected on one series of parallel axes to the switch control points and another series of parallel axes to said actuators so that electric plugs can be set out on the plug board to provide for required positioning of the pattern widthwise of the fabric.

This invention is for improvements in or relating to knitting machines of a type having needles mounted independently for pattern selection, such for example as disclosed in our U.S. patent application Ser. No. 448,115, now Patent No. 3,370,443, to tuck or miss-stitch, and concerns programme controlling the pattern by relatively movable programme carrier (e.g. a punched chart, or a panel of switch control points) and reader means (stationary switches or rotary switch means).

For patterning by needle selection from a punched chart, the latter would normally have to be a sufficient width to include as many repeat arrangements of pattern governing holes as the number of pattern repeats required across the width of the fabric.

An object of the invention is to provide, for a machine of the type referred to, patterning means in such improved manner that a programme carrier for controlling the widthwise position or positions of a pattern or repeat pattern can be of desirably small width.

The invention provides, for a knitting machine of the type referred to, patterning means comprising individual electric actuators arranged for selection control of the needles, relatively movable programme carrier and reader means providing electric switch control points prearranged for control of the required shape of a pattern in the fabric, and an electric plug board having its control points connected on one series of parallel axes to said switch control points and on the other series of parallel axes to said actuators so that electric plugs can be set out on the plug board to provide for required repetition of the pattern widthwise of the fabric or for its formation at required position widthwise of the fabric.

The foregoing and other features of the invention set out in the appended claims are incorporated in the specific embodiment hereinafter particularly described with reference to the accompanying drawings in which:

FIGURE 1 is a general cross sectional view of a knitting machine having patterning means according to the invention.

FIGURE 2 is a front view of part of the machine.

FIGURE 3 is a perspective view of a plug board in the machine.

FIGURE 4 is an enlarged perspective view of programming means in the machine.

FIGURE 5 is a diagrammatic illustration of the relationship between the machine's needles, the plug board, and the programming means.

FIGURE 6 is an enlarged view of tuck patterned fabric produced according to the invention.

FIGURE 7 is an enlarged view of float patterned knitted fabric produced according to the invention.

FIGURE 8 is a view of a programme chart for the float patterned fabric.

Referring now to FIGURE 1 the knitting machine is represented by bearded needles 1 which in this example are frictionally mounted in a needle bar 2 by which the needles are operated to knit, the bar 2 being connected by brackets 2a, 2b to usual cam follower means 2c, 2d engaging usual cams 2e, 2f on the machine's main cam shaft 3. The machine shown is a Cotton's patent straight bar knitting machine of the type in which the needles are thus frictionally mounted, there being also provided a stop bar 4 under the needles. However it is to be understood that the arrangement is also representative of a flat bed knitting machine in which latch needles are mounted in tricks for individual operation.

The needles are provided with bottom butts 1a for the purpose of needle selection.

Considering the Cottons type machine, it has usual sinkers S in the sinker bar SB, with slurcock SL and catch bar CB, knocking over bits KO, and thread carriers TC.

The bearded needles 1 can be selected either for tucking or miss-stitching, for which purpose according to our U.S. Patent No. 3,370,443 to which reference is directed for full details, there is provided selecting means comprising a row of selecting sliders 5 and a row of solenoids or electro magnets 6 behind the sliders.

Said patent provides, for example, two series of the sliders 5, as shown in the present FIGURE 1, and two series of the solenoids 6 at different levels, the lower level being such that a selection of the sliders, when projected by their solenoids, overlies their associated needle butts 1a thereby to hold down their associated needles at a low inoperative level while the remaining needles are raised and lowered for knitting, and an upper level at which a selection of the upper sliders, when advanced by their upper solenoids, allow their associated needles to have limited raising movements to tucking height whereat they receive the yarn with the other fully raised needles 1 at a lower height for tucking, their lower needles at the time of pressing the beards of the upper needles being below the presser edge so as to hold their yarn while the remaining needles knit the yarn.

Although FIGURE 1 shows the arrangement for tucking and miss-stitching by way of example, it is to be understood that the invention is applicable to the tucking arrangement only or to the miss-stitching arrangement only.

The solenoids 6 are connected to a plug board 7, FIGURES 2 and 3, and the plug board 7 is connected to programming means such as indicated at PM.

This programming means comprises, in this example, a rotatable drum 8, FIGURE 4, which is racked round, as required, by racking means comprising ratchet wheel 9, pawl 9a connected to a cam follower lever 9b on a cam 9c on the cam shaft 3. There is mounted on the drum 8 a punched card or chart 10 which is punched with holes in suitable manner to govern the shape of patterning in the fabric. For reading the holes there is provided a row of pivoted feeler arms 11 with feeler pegs such as 12 and a series of electric switches 13, with means comprising a cam bar 14 attached to a cam follower lever 14a cooperating with a cam 14b on the cam shaft 3 for periodically raising and lowering the arms 11 into and out of engagement with the punched chart such that in each instance where a feeler peg 12 engages in a hole in the chart, its feeler arm 11 is lowered sufficiently to operate its switch contact 13. Reverse racking means for the drum 8 may be provided. The racking means may be under control of

bluffing means in any known manner, e.g. another "main" programming chart and reader means such as disclosed in our Great British Patent No. 960,816, and indicated in the present FIGURE 2 at MPC may control the bluffing means, through the intermediary of a solenoid.

The row of switch contacts 13 is represented by the ten switches shown in FIGURE 5 and it will be seen that these switches are connected on one side to the mains and from the other side conducting wires 15 extend to the plug board 7 whereat they are connected to the control points 16 along the horizontal axes 17.

The aforesaid solenoids 6 are also connected to the control points 16 of the plug board 7 along the vertical axes 18 through conducting wires such as 19.

In use of the arrangement, let it be assumed for example that it is desired to produce a course of fabric in which alternate needles tuck as indicated at course C in FIGURE 6.

For this purpose there would be provided in the chart 10, FIGURE 5, a single hole 20 and in the corresponding row of sockets of the control points 16 in the plug board 7 there would be fitted contact plugs such as 21, 21a, see also FIGURE 3, in alternate of the sockets, this arrangement being such that the switch 13a associated with the punched hole 20 becomes connected by the plugs 21, 21a to alternate ones of the actuators 6 so that alternate ones of the needles will be thereby caused to tuck in the required manner as at T in FIGURE 6. Assuming now that the following course of fabric is to be made with the other alternate needles tucking as at course C1, FIGURE 2, this would be accomplished by a second single hole 20a, FIGURE 5, in the chart 10 at a stepped on position from the hole 20 i.e. for the next course, and spaced laterally from the hole 20 to be associated with the next switch 13b. In addition plugs such as 21b would be inserted in the corresponding row of sockets in the plug board 7 opposite the empty sockets in the first row thereof, this arrangement resulting in the switch 13b being connected through the plugs 21b to the other alternate solenoids 6 so that the other alternate needles will tuck as required and as shown at T1 in FIGURE 6.

A repeat of this course sequence is obtained for as many courses as required either by additional single holes in repeat of the holes 20 and 20a, or by racking the chart to and fro using also reverse racking means to repeat the use of the holes 20, 20a.

It will thus be seen that only a very small portion of the chart, in the widthwise, or lengthwise and widthwise directions, is required to provide for the pattern being repeated by the plug board throughout the width of the fabric.

It is to be understood that this 1 x 1 tuck arrangement is described by way of example only and that it is representative of any tuck or float stitch pattern the shape of which is governed by an arrangement of holes in the chart and the widthwise repeat of which is governed by plugs in the plug board 7.

For example let it be assumed that a diamond double tuck pattern is required. For this purpose the chart 10 would have a diamond shaped arrangement of pairs of holes such as 22, FIGURE 5, it will be seen that this is a five wale pattern and it may be produced on any five adjacent needles, for example to appear as a single pattern such as shown at P in FIGURE 6, simply by inserting plugs 21c, FIGURE 5, see also FIGURE 3 at locations in the plug board where they connect the switches 13c to the appropriate solenoids 6.

Evidently if it is desired to repeat the pattern across the width of the fabric, further plugs such as 21c¹ would be inserted in the plug board in repeat diagonal manner from left to right thereof, and if the pattern is to be repeated along the length of the fabric there would be either a repeat arrangement of the holes 22 at stepped positions of the chart 10, or the chart would be racked to and fro

using also reverse racking means i.e. first ten racks in one direction and then ten racks in reverse.

From the foregoing it will be appreciated that the chart can be of comparatively small width e.g. not greater or much greater in width than is required to provide punched holes for the widest pattern required, and that the plug board 7 can be provided having the same number of sockets widthwise thereof as the number of rows of holes in the chart widthwise thereof, and with the same number of sockets lengthwise of the plug board as the number of needles on which the fabric is to be produced, the chart being set out to provide the shape of one or more patterns required in the fabric and the plug board being set out to govern the repetition of one or more of the patterns widthwise of the fabric, or to govern the widthwise position of one or more of the patterns.

In the alternative example of float stitch patterning, the principle is the same as for the tuck patterning; for example the diamond float stitch pattern shown in FIGURE 7 is provided for, in widthwise repeat, by using the plug board with the diagonal rows of plugs 21c, 21c¹, and by holes set out in diamond form in the chart 10 as shown in FIGURE 8. Of course the sliders would be at a lower level to hold selected needles down at a low level.

To produce a tuck and float stitch pattern, both series of sliders would be used each with their own solenoids connected up to their own sockets in the plug board, and two sets of holes being provided in the chart 10.

What we claim is:

1. For a straight bar knitting machine including needles, patterning means comprising individual electric actuators arranged for selection control of the needles, relatively movable programme carrier and reader means providing electric switch control points pre-arranged for control of the required shape of a pattern in the fabric, and an electric plug board having control points all connected on one series of parallel axes to said switch control points and on another series of parallel axes to said actuators so that electric plugs can be set out on the plug board to provide for required positioning of the pattern widthwise of the fabric.

2. In or for a straight knitting machine having a needle bar having slidable needles for movement simultaneously or individually, butts on said needles, sliders one to cooperate with the butt of each needle, electro mechanical devices one for operating each slider, an electric programming carrier and reader device such as a punched card or chart with feeler means and electric switches operated by the feeler means, and an electric plug board having rows and columns of electric conducting sockets whereof the rows are electrically connected to said electric switches respectively and the columns are electrically connected to the electro mechanical devices respectively, whereby upon setting out a pattern of punched holes in the card or chart, and inserting electrical conducting plugs in predetermined positions in the plug board, knitted fabric can be patterned under widthwise positional or repeat control of the plug board.

3. In a straight bar knitting machine patterning means comprising in combination a row of identical movable needle elements, a row of electric actuators arranged for selection control of said identical movable needle elements, relatively movable programme carrier and reader means, a row of electric feeler switches provided by said reader means, rows of control points for said feeler switches and provided by said programme carrier according to the patterning required, an electric plug board, rows of electric switch contact sockets in said electric plug board on horizontal and vertical axes and having an end horizontal row of said electric switch contact sockets and an end vertical row of said electric switch contact sockets, first electric conductors inter-connecting all said electric switch contact sockets horizontally and vertically, second electric conductors connecting said end horizontal row of electric switch contact sockets to said electric actuators respective-

ly, third electric conductors connecting said end vertical row of electric switch contact sockets to said feeler switches respectively, and electric plugs received in said electric switch contact sockets in a predetermined pattern arrangement governed by said patterning arrangement of control points to cause operation of at least one group of said identical movable needle elements according to said patterning required.

4. In a straight bar knitting machine patterning means comprising in combination a row of identical movable needle elements, a row of electric actuators arranged for selection control of said identical movable needle elements, relatively movable programme carrier and reader means, a row of electric feeler switches provided by said reader means, rows of control points for said feeler switches and provided by said programme carrier according to the patterning required, an electric plug board, rows of electric switch contact sockets in said electric plug board on horizontal and vertical axes and having an end horizontal row of said electric switch contact sockets and an end vertical row of said electric switch contact sockets, first electric conductors inter-connecting all said electric switch contact sockets horizontally and vertically, second electric conductors connecting said end horizontal row of electric switch contact sockets to said electric actuators respectively, third electric conductors connecting said end vertical row of electric switch contact sockets to said electric feeler switches respectively, and a plurality of groups of electric plugs received in said electric switch contact sockets and being in a repeat predetermined pattern arrangement governed by said patterning arrangement of control points to cause operation of spaced groups of said identical movable needle elements according to repeat group patterning required.

5. In a Cotton's patent straight bar knitting machine having individually operable needles the combination of a punched chart patterning device, a row of feeler operable electric switches selectively operated by said punched chart patterning device, a row of electro-magnetic devices for selectively controlling said individually operable needles according to the selection control of said feeler switches for knitting by said needles fabric having a predetermined pattern, an electric plug board, rows of electric switch contact sockets in said electric plug board on horizontal and vertical axes and having an end horizontal row of said electric switch contact sockets and an end vertical row of said electric switch contact sockets, first electric conductors inter-connecting said electric switch contact sockets horizontally and vertically, second electric conductors connecting said end horizontal row of electric switch contact sockets to said electro-magnetic devices respectively, third electric conductors connecting said end vertical row of electric switch contact sockets to said feeler operable elec-

tric switches respectively, and contact plugs for insertion selectively in said electric switch contact sockets in predetermined pattern manner for controlling the pattern in relation to the width of the fabric.

6. A straight bar knitting machine having in combination cam-operable frictionally-mounted needles with selection butts, selecting sliders projectable to overlie said selection butts, solenoids for projecting said selecting sliders, programming means for selection control of said solenoids and comprising a punched chart patterning device and a row of feeler-operable electric switches selectively operable by said punched chart patterning device for controlling said needles to form in the fabric a predetermined pattern, an electric plug board, rows of electric switch contact sockets in said electric plug board on horizontal and vertical axes and having an end horizontal row of said electric switch contact sockets and an end vertical row of said electric switch contact sockets, first electric conductors inter-connecting said electric switch contact sockets horizontally and vertically, second electric conductors connecting said end horizontal row of said electric switch contact sockets to said solenoids respectively, third electric conductors connecting said vertical row of electric switch contact sockets to said feeler-operable electric switches respectively, and contact plugs for insertion selectively in said electric switch contact sockets in predetermined patterned manner for controlling the pattern in relation to the width of the fabric.

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WM. CARTER REYNOLDS, *Primary Examiner*.

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