STRAIGHT BAR KNITTING MACHINE WITH ELECTROMAGNETIC SELECTION

Filed April 14, 1965 6 Sheets-Sheet 1

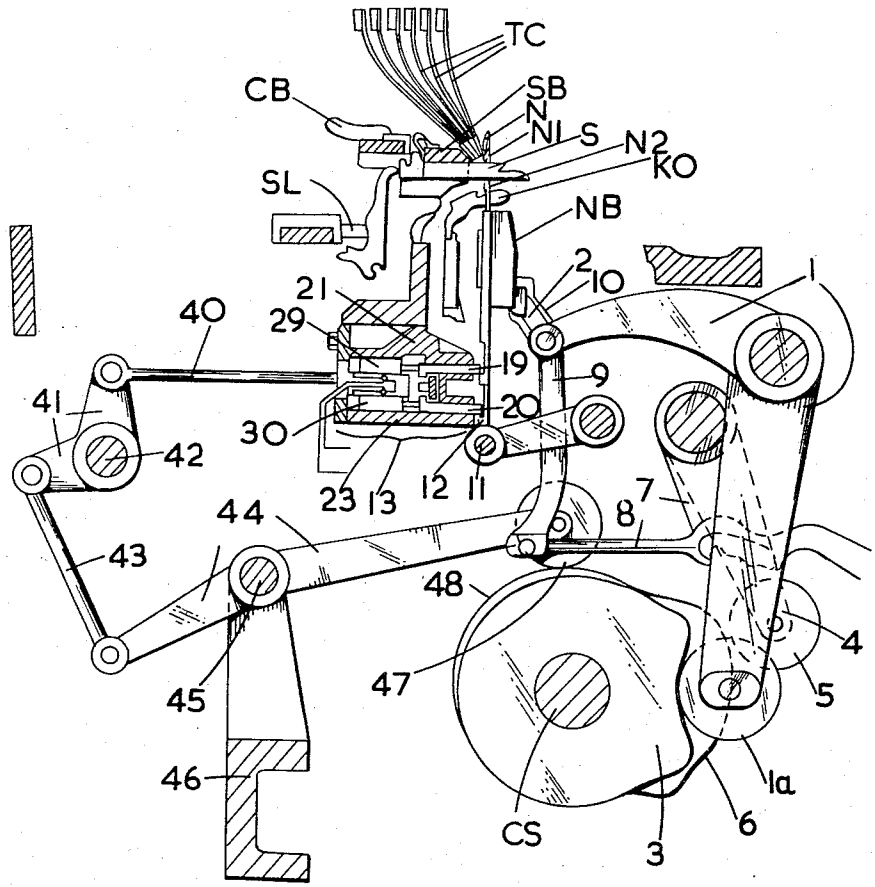


FIG 1

STRAIGHT BAR KNITTING MACHINE WITH ELECTROMAGNETIC SELECTION

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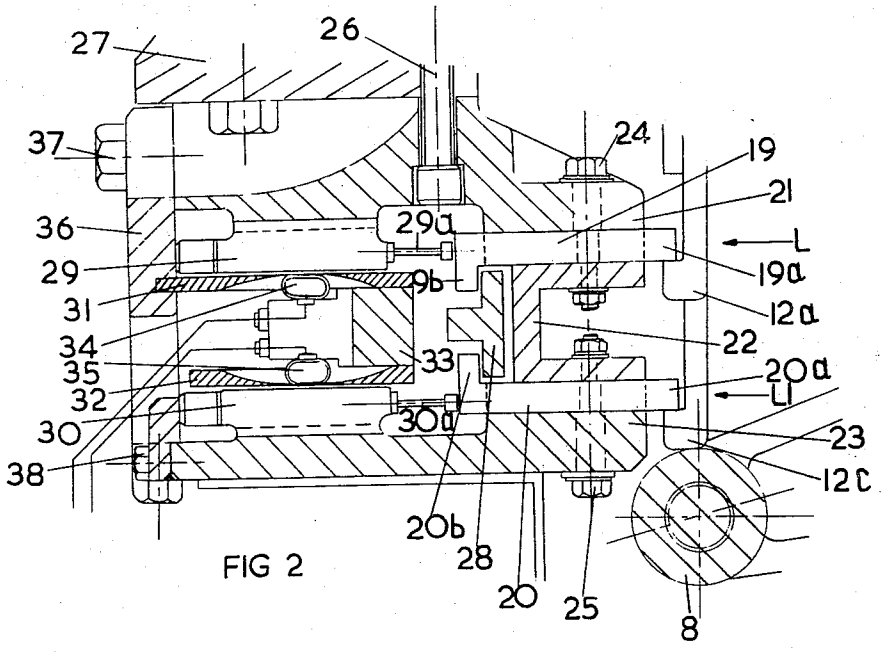


FIG 2

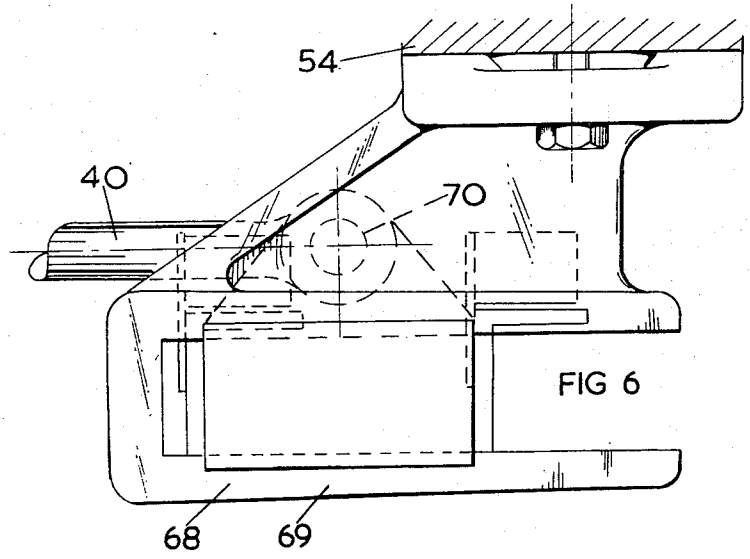
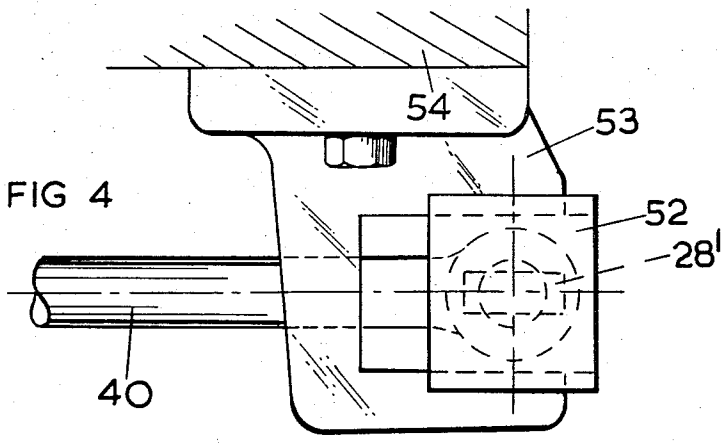


FIG 6

STRAIGHT BAR KNITTING MACHINE WITH ELECTROMAGNETIC SELECTION

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FIG 4



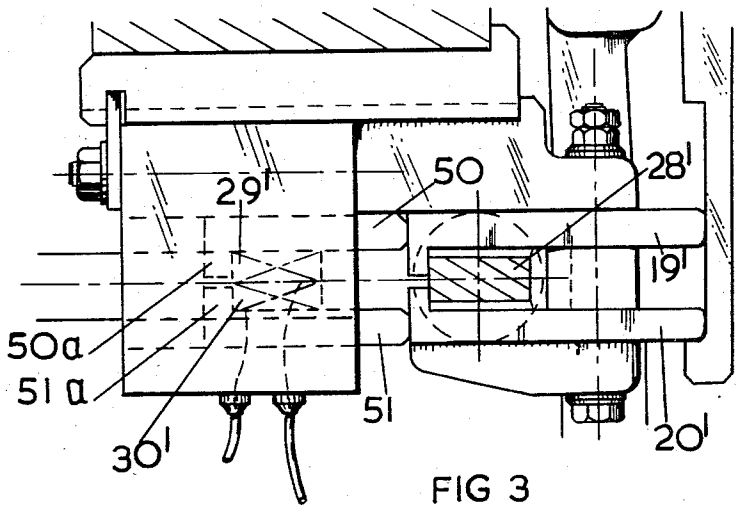
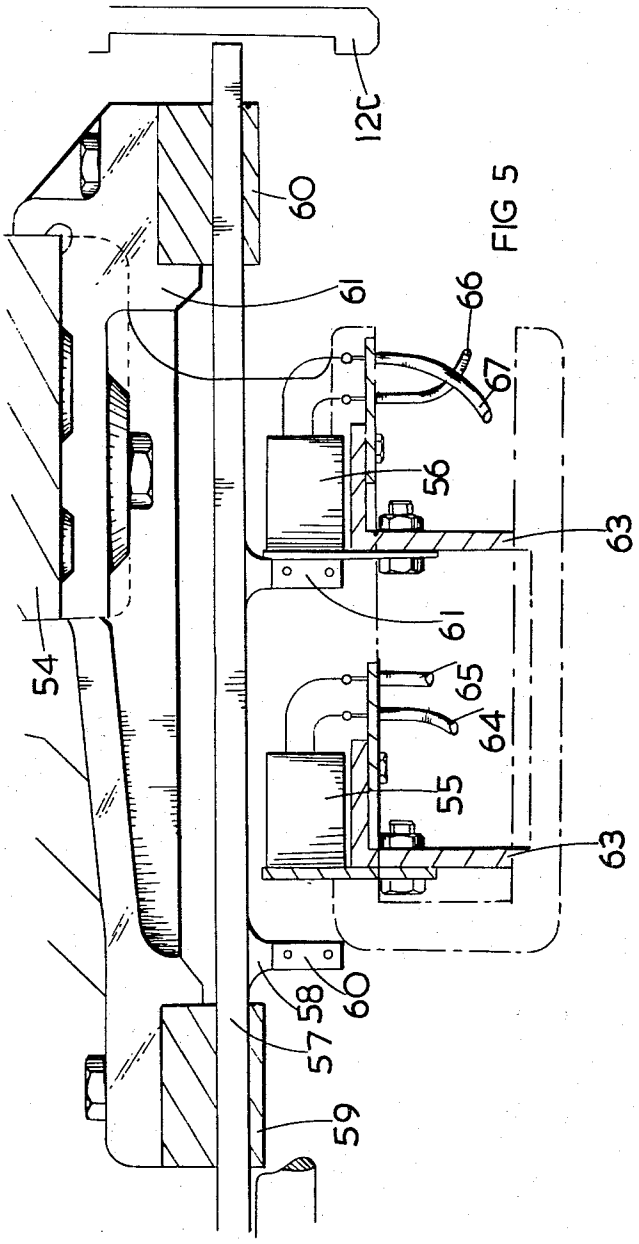


FIG 3

STRAIGHT BAR KNITTING MACHINE WITH ELECTROMAGNETIC SELECTION

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FIG 5



STRAIGHT BAR KNITTING MACHINE WITH ELECTROMAGNETIC SELECTION

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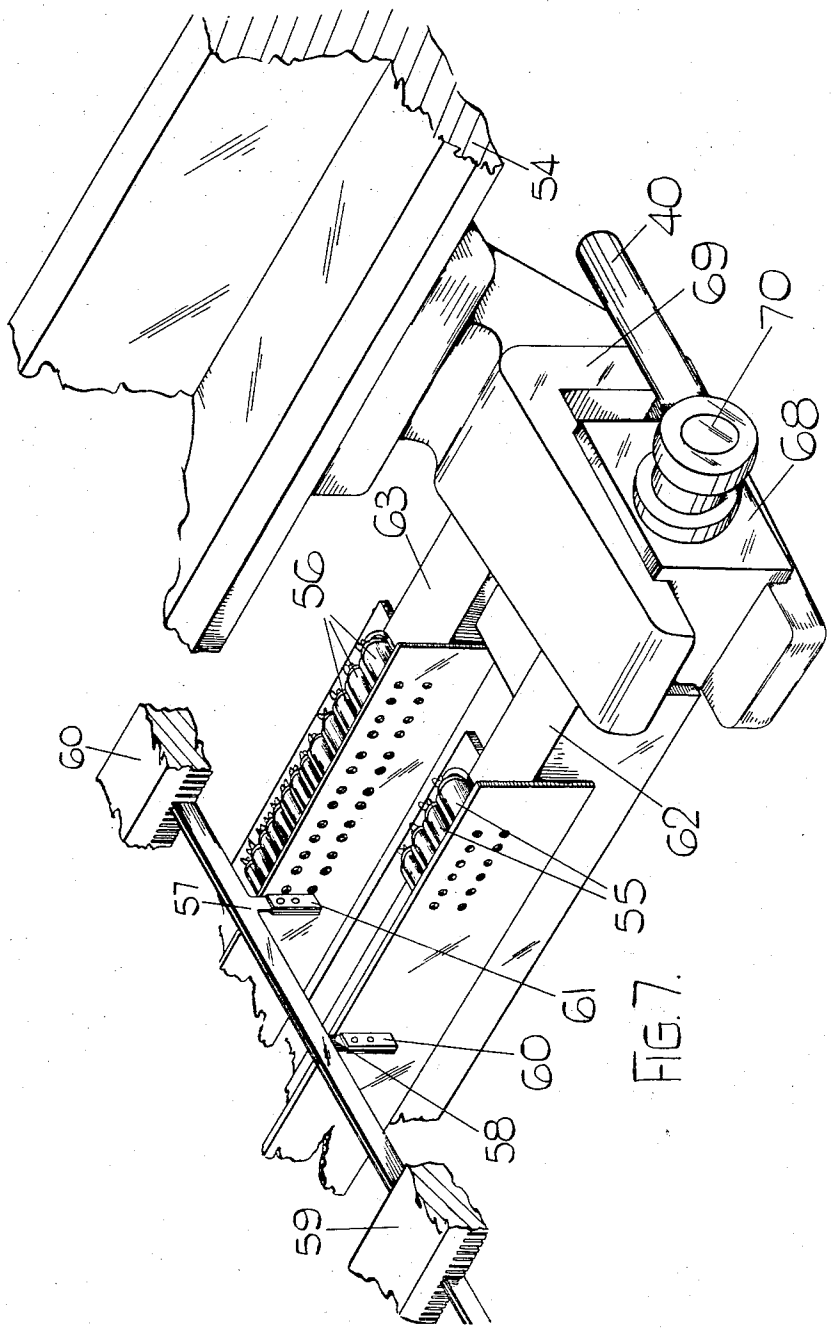


FIG. 7.

STRAIGHT BAR KNITTING MACHINE WITH ELECTROMAGNETIC SELECTION

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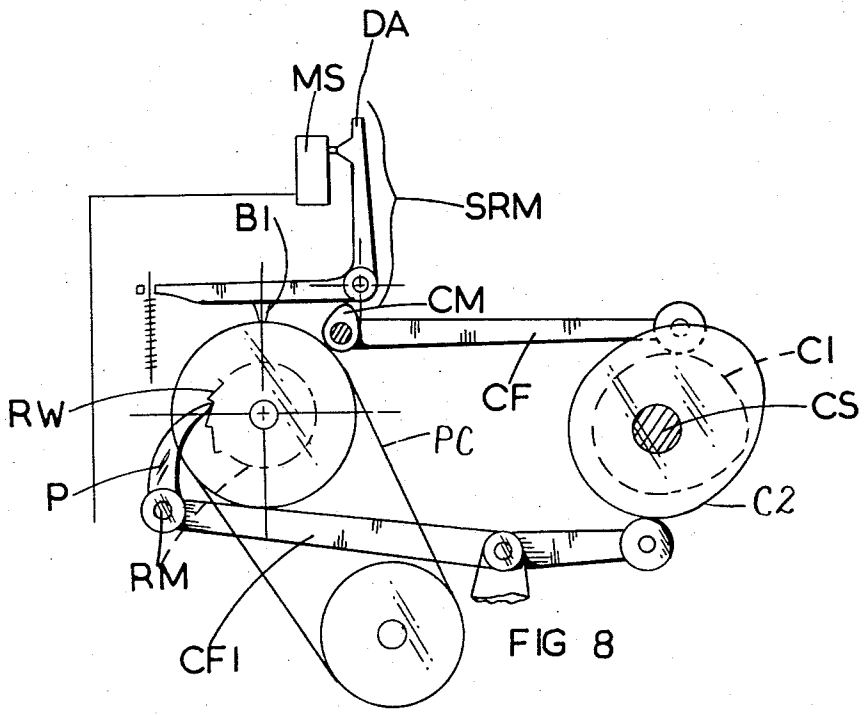


FIG 8

United States Patent Office

3,370,443

Patented Feb. 27, 1968

3,370,443

STRAIGHT BAR KNITTING MACHINE WITH ELECTROMAGNETIC SELECTION

William Bentley, Woodhouse Eaves, and Raymond Blood, Shepshed, England, assignors to William Cotton Limited

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Claims priority, application Great Britain, Apr. 18, 1964, 16,162/64
12 Claims. (Cl. 66—82)

ABSTRACT OF THE DISCLOSURE

A straight bar knitting machine having independently movable and frictionally mounted needles in the needle bar. The needles normally move in unison with said bar to produce a plain knit fabric. Solenoid operated sliders mounted transverse of the needles at plural levels are selectively projected into the path of selective needle butts when the bar is moved upward to limit the upward movement of selected needles to form stitches other than plain; for example, tuck or miss stitches.

This invention is for improvements in or relating to knitting machines of a type having needles which are independently movable such for example as a certain type of Cotton's patent straight bar knitting machine particularly disclosed in our United States Patent No. 3,292,395 and flat bed knitting machines.

In this type of knitting machine, patterning can be effected by tucking to form tuck stitches, or miss-stitching to form float threads. The tucking can be effected by some needles being raised to full height for receiving yarn and others being raised to receive yarn but not to full height so that at the presser stage only the higher needles' beards are pressed for knitting while the lower needles' beards remain open under the presser to retain their yarn for tucking. The miss-stitching can be effected by holding some needles down to miss yarn while others are fully raised to receive yarn followed by lowering to knit, the yarn that is feed over the held down needles forming floats in the fabric.

An object of the invention is to provide for the needles to form tuck or float thread fabric by patterning means which is of such improved construction that the patterning can be programme controlled.

The invention provides in or for a knitting machine of the type referred to having butts on the needles, a series of selecting sliders for association with the butts, and a series of electro-mechanical devices for controlling the selecting sliders and which can be operated selectively from an electric programme control means. The electro mechanical devices may be magnets or solenoids. Conveniently there are two series of selecting sliders at different levels, one suitable for tucking by needles and the other suitable for miss-stitching by needles, and two series of the electro mechanical devices, one series for each series of selecting sliders.

The needle selecting means is applicable particularly to a Cottons Patent straight bar knitting machine of said type which has needles operable in unison for knitting but frictionally mounted for individual selection for tucking or miss-stitching as disclosed in said United States Patent No. 3,292,395, and to flat bed knitting machines having a bed of needles which are independently mounted

in tricks for knitting and so as to be individually selectable for tucking and miss-stitching.

The electro mechanical devices are conveniently of thin flat form disposed on edge behind each selecting slider.

In one arrangement solenoids are disposed immediately behind the sliders to advance them by pushing forwardly. In another arrangement auxiliary sliders are dropped behind the selecting sliders and solenoids are disposed in front of butts on the auxiliary sliders to advance them and the selecting sliders by pulling on said butts. In a further arrangement the sliders have butts, and magnets pull on these butts. Advanced sliders are returned by a cam operated bar.

The foregoing and other features of the invention set out in the appended claims are incorporated in the constructions which will now be described, as a specific embodiment with reference to the accompanying drawings in which:

FIGURE 1 is a general cross section of relevant parts of a Cottons Patent straight bar knitting machine of the type referred to.

FIGURE 2 is an enlarged cross section of needle selecting mechanism in the machine.

FIGURE 3 is an enlarged detail view of modified needle selecting mechanism.

FIGURE 4 is another view of the modified selecting mechanism.

FIGURE 5 is an enlarged cross section of a further modified needle selecting mechanism.

FIGURE 6 is an end view of the further modified needle selecting mechanism.

FIGURE 7 is a perspective view of the selecting mechanism of FIGURE 5.

FIGURE 8 is a showing of a programming device.

Referring to FIGURE 1 the machine is represented by thread carriers TC, sinkers S, operated by usual slurcock SL and catch bar CB and mounted in the usual sinker bar SB, usual knocking over bits KO and bearded needles N.

In this type of machine the bearded needles N are frictionally mounted in the needle bar NB so as to be capable of movement in unison with the needle bar NB and of being individually movable relative to the needle bar NB. The needle bar NB is operated by the usual mechanism comprising a cam follower lever **1** connected bracket **2** to the needle bar NB and having a cam follower **1***a* engaging the usual needle raising and lowering cam **3** on the machines main cam shaft CS, and by a cam follower lever **4** having a cam follower **5** engaging the usual presser cam **6** on the shaft CS, the cam follower **4** being connected by an arm **7** to an arm **8** which is connected by a link **9** to a bracket **10** secured to the needle bar NB. There is also a stop bar **11** for the lower end of the needles and which may have a small movement imparted to it by cam mechanism in known manner.

The lower end of each needle is formed with a butt **12**.

There is also provided a needle selecting unit indicated generally at **13** and edapted to co-operate with the needle butts **12** so that when the needle bar rises, selected needles can be prevented from rising to feeding height.

There are two possible arrangements, one in which needles are held down at the low level so that they take no part in the knitting resulting in the formation of float threads for patterning purposes, and a second in which selected needles are allowed to rise only to tucking height

so that these needles tuck the yarn for tuck pattern purposes, the float patterning and the tuck patterning being as well known in the art.

The needle selecting unit **13** is more clearly shown in FIGURE 2.

From this figure it will be seen that at a level L just above the needle butts **12***a* when the needles N are raised to a tucking height, as at N1 in FIGURE 1, there is a row of "tuck" selecting sliders **19**, FIGURE 2, and at a level L1 just above the needle butts **12***c* when the needles **4** are at a low inoperative level, as at N2 FIGURE 1, there is a row of "float" selecting sliders **20**, FIGURE 2.

The sliders **19, 20** are slidably mounted between bars **21, 22, 23** secured together by bolts **24, 25,** and the upper bar **21** is secured by bolts **26** to a machine rail **27**. Each slider **19, 20** has an operative end **19***a*, **20***a*, and a tail end **19***b*, **20***b*, the latter being directed towards each other behind parts of a common return bar **28** which is operable by suitable cam operated means to be hereinafter described.

Behind each row of sliders **19, 20** there is a row of solenoids **29, 30** each of which is of small rectangular and thin, flat form disposed on edge behind its associated slider, and between the two bars **21, 23** and intermediate bars **31, 32** secured to a common bar **33**.

The bars **31, 32** have recesses to accommodate conducting wires **34, 35** from the solenoids.

A back plate **36** is secured by bolts **37, 38** to the bars **21, 23**.

Each solenoid has its core **29***a*, **30***a* directed towards the tail **19***b*, **20***b* of its associated slider **19, 20**.

The solenoids are connected by the conducting wires **34, 35** to control means such for example as a control panel or otherwise connected to electrical programming means employing relatively moving programme carrier and reader means to be hereinafter described.

For operation of the returning bar **28** it is connected by a link **40**, FIGURE 1, to a bell crank device **41** pivoted on a shaft **42** and connected by a link **43** to a cam follower lever **44** pivoted to a bracket **45** on a machine rail **46** and having a cam follower **47** engaging a cam **48** on the main cam shaft CS.

The programme carrier and reader means conveniently comprises a punched card PC FIGURE 8 and switch reader means SRM and including dropper arms such as DA having bits B1 co-operating with holes in the punched card and raised and lowered under control of a cam rod CM, cam follower CF and cam C1 or a cam shaft CS, pawl and ratchet racking means RM for racking on the punched card and comprising ratchet wheel RW, pawl P, cam follower CF1 and cam C2 on the shaft CS, and electric micro switches such as MS to which the solenoids are connected.

In operation, the pattern can be set out by predetermined arrangement of holes in the punched card with the result that required different needles will tuck or miss stitch in different courses according to the desired pattern by the solenoids being operated in the required selected manner by the micro-switches to selectively operate the sliders. Those sliders which are not projected by their associated solenoids allow their associated needles to be fully raised for knitting. Those tuck sliders **19** which are projected by their solenoids **29** have their operating ends **19***a* overlying the butts **12***a* of their associated needles N so that these needles are only raised to the tucking height N1 for tucking to form tuck stitches. Those float sliders **20** which are projected by their solenoids **30** have their operating ends **20***a* overlying the butts **12***c* of their associated needles N so that these needles are retained down at a low inoperative level N2 for miss stitching to form floats.

After each selection the returning bar **28** is operated by the cam **48** to return the projected sliders so that all the sliders are then ready for re-selection by fresh holes in the punched card after being racked on.

In a modification shown in FIGURE 3 the returning bar **28'** is of flat section as shown and behind each slider **19', 20'** there are further sliders **50, 51** with tail portions **50***a*, **51***a* behind the solenoids **29', 30'**.

This arrangement operates substantially as before except that instead of the solenoids pushing against the rear of the sliders **19, 20**, the solenoids **29', 30'** pull against the tails **50***a*, **51***a* of the additional sliders **50, 51**, the movement of these sliders being imparted to the sliders **19', 20'**.

FIGURE 4 illustrates a convenient form of mounting for the ends of the bar **28** in which blocks such as **52** secured to the ends of the bar **28'** are slidably mounted in brackets such as **53** secured to a rail **54** in the machine there being two of the rods **40** connected to the blocks respectively.

In a further modification FIGURES 5 to 7, use is made of electro magnets **55, 56** instead of solenoids.

To co-operate with these magnets there is provided sliders such as **57, 58** mounted slidably in end bearings **59, 60** carried by a bracket **61** secured to the machine rail **54**.

Depending from the sliders are butts **60, 61** adapted to be magnetically attracted and the magnets **55, 56** are disposed opposite these butts as shown.

The magnets **55, 56** are mounted on angle brackets **62, 63** and are connected by electric conductors **64** to **67** to the micro switches MS of the programming means.

The magnets **55** are associated with the butts **60** of alternate sliders such as **58** and the magnets **56** co-operate with the butts **61** of the other alternate sliders **57**. This staggered arrangement enables the magnets to be of greater width and providing greater magnetic force than if the magnets are all in alignment.

Of course the solenoids of FIGURES 1 and 3 may also be provided in a staggered arrangement enabling them to be of greater width.

The arrangement of FIGURES 5 to 7, is to pjrovide for selection of the needles to one level only i.e. to the tucking level or the miss stitching or float level, but if desired there may be a second row of the sliders to provide for selection at both these levels.

The angle bars **62, 63** have secured to them end blocks such as **68**, FIGURES 5, 6, and these are slidably mounted in brackets such as **69** secured to the machine frame **54**, the blocks such as **68** being connected by pivots such as **70** to the rod **40**, so that this rod serves to advance and retract the magnets towards and away from the slider butts.

In operation of the arrangement in FIGURE 5 the sliders **58** are shown in their normal retracted position separated from the magnets **55** so that their right hand ends are clear of the needle butts **12***c* so that these needles will rise to feeding height whereas the butts **61** of the sliders **57** are shown at a stage, after the magnets have been moved by rod **40** to the slider butts, attracted by the magnets **56** and advanced thereby towards the needles, so that their right hand ends are projected into the path of their associated needle butts **12***c* so that these needles are allowed to rise only to tuck in height.

In the alternative arrangement for miss stitch or float patterning the sliders would be provided at the necessary lower level to hold their associated needles at the float stitch level when projected by the attraction of their magnets.

It will be understood that where there are sliders at only one level, these could be mounted in brackets which are upwardly and downwardly displaceable by suitable cam means to dispose the sliders at the level for tuck stitching or at the level for float stitching as and when required.

It will be understood that substantially similar needle selecting means to those particularly described are readily applicable for needle selection for tucking and float stitch-

ing in flat bed knitting machines having one or two beds of independently operable needles, for which purpose the selecting mechanism may be arranged to act on the butts of jacks disposed under the needles, and means such for example as a bar operated by suitable cam mechanism to lower the raised needles and jacks to their original level after each selection.

What we claim is:

1. A knitting machine having a straight row of needles frictionally mounted for individual selection for tucking and miss-stitching, needle butts on said needles, two series only of selecting sliders at different levels for direct co-operation with said needle butts suitable for tucking and miss-stitching respectively by said needles, and two series only of electro-magnetic devices of thin flat form disposed on edge behind each selecting slider for selectively controlling the two series of selecting sliders respectively and which can be operated selectively from an electric programme control means.

2. A knitting machine having a straight row of needles frictionally mounted for individual selection for tucking and miss-stitching, needle butts on said needles, two series only of selecting sliders at different levels for direct co-operation with said needle butts suitable for tucking and miss-stitching respectively by said needles, and two series only of solenoids disposed immediately behind the sliders to advance them by a pushing action forwardly thereof and which can be operated selectively from an electric programme control means.

3. A knitting machine having a straight row of needles frictionally mounted for individual selection for tuck and miss-stitching, needle butts on said needles, two series only of selecting sliders at different levels for direct co-operation with said needle butts suitable for tucking and miss-stitching respectively by said needles, auxiliary sliders disposed behind said selecting sliders, auxiliary slider butts on said sliders, and two series only of solenoids disposed in front of said auxiliary slider butts to advance them and consequently the selecting sliders by a pulling action on said slider butts and which can be operated selectively from an electric programme control means.

4. A knitting machine having a straight row of needles frictionally mounted for individual selection, needle butts on said needles, a series of selecting sliders for direct co-operation with said needle butts, selecting slider butts on said selecting sliders, and electro-magnets having a pulling action on said selecting slider butts and which can be operated selectively from an electric programme control means.

5. A knitting machine having a straight row of needles frictionally mounted for individual selection, needle butts on said needles, a series of selecting sliders for direct co-operation with said needle butts, selecting slider butts on said selecting sliders, electro-magnetic devices for selectively controlling the selecting sliders and which can be operated selectively from an electric programme control means, and a cam operated bar for acting on said selecting slider butts to return the selecting sliders after each selection.

6. A knitting machine having a straight row of needles, a bar in which said needles are frictionally mounted for individual selection, cam operated means operably connected to said bar for operating said bar and consequently said needles in unison, butts on said needles, a row of selecting sliders for direct cooperation with said butts, selecting slider butts on said selecting sliders, a row of electro-magnetic devices operably associated with said selecting slider butts for selectively controlling said selecting sliders and which can be selectively operated from an electric programme control means.

7. A knitting machine having a straight row of vertical needles frictionally mounted for individual selection, needle butts on said needles, at least one row of horizontal selecting sliders disposed for direct co-operation with said needle butts, selecting slider butts on said selecting sliders, a row of horizontal electro-magnetic devices disposed for operative association with said selecting slider butts, and electric programme control means for selectively operating said electro-magnetic devices.

8. A knitting machine having a straight row of vertical needles, a cam operated vertically moving bar in which said needles are frictionally mounted, needle butts on said needles, a row of horizontal selecting sliders disposed for movement into and out of the path of said needle butts, selecting slider butts on said selecting sliders, a row of horizontal electro-magnetic devices disposed for movement into and out of moving engagement with said selecting slider butts, and electric programme control means for selectively operating said electro-magnetic devices.

9. A knitting machine having a straight row of vertical needles, a cam-operated vertically moving bar in which said needles are frictionally mounted, needle butts on said needles, a row of horizontal selecting sliders disposed for movement into and out of the path of said needle butts, at least one series of selecting slider butts on said selecting sliders, at least one row of electro-magnets disposed for operative association with said selection slider butts, means for reciprocating said row of electric magnets to and from said selecting slider butts, and electric programme control means for selectively operating said electro-magnets.

10. A knitting machine having a straight row of needles, a bar in which said needles are frictionally mounted, cam-operated means operably connected to said bar for moving the latter and consequently moving said needles in unison, butts on said needles, a row of selecting sliders movable for direct cooperation with said butts to selectively permit and prevent the movement on said instruments, selecting slider butts on said selecting sliders, a row of electro-magnetic devices operably associated with said selecting slider butts for selectively moving said selecting sliders, electric programme control means operably connected to said electro-magnetic devices for selectively operating the latter, and cam-operated means arranged for operable association with said selecting sliders to return the latter after their selective movement.

11. A knitting machine having a straight row of needles, a bar in which said needles are frictionally mounted, cam-operated means operably connected to said bar for moving the latter and consequently moving said needles in unison, butts on said needles, two spaced rows of selection elements which are selectively movable for selectively permitting and preventing the movements of said needles, two spaced rows of electro-magnetic devices operably associated with said selection elements for selectively moving them and which can be operated selectively from an electric programme control means, and cam operated means for operable association with said selection elements to return the latter after their selection movement.

12. A knitting machine having in combination, a straight needle bed; a series of needles each frictionally movable in longitudinal direction relative to said straight needle bed; a series of control butts for said series of needles and capable of being changeably dispositioned in said longitudinal direction relative to said straight needle bed to cause said series of needles to be likewise changeably dispositioned in said longitudinal direction relative to said straight needle bed between knitting and patterning positions; a straight needle selecting unit disposed for co-operating with said series of control butts and having, a series of selecting sliders, and a series of electro-magnetic devices which are operable selectively from electric programming control means for sliding said series of selecting sliders selectively from an inoperative position clear of said series of control butts to an operative position operable directly on said series of control butts; and means for imparting motion to said series of needles to knit only on those needles which are dispositioned in the knitting posi-

tion by said selective control of said selecting sliders directly on said needle control butts.

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MERVIN STEIN, *Primary Examiner.*

RONALD FELDBAUM, *Assistant Examiner.*