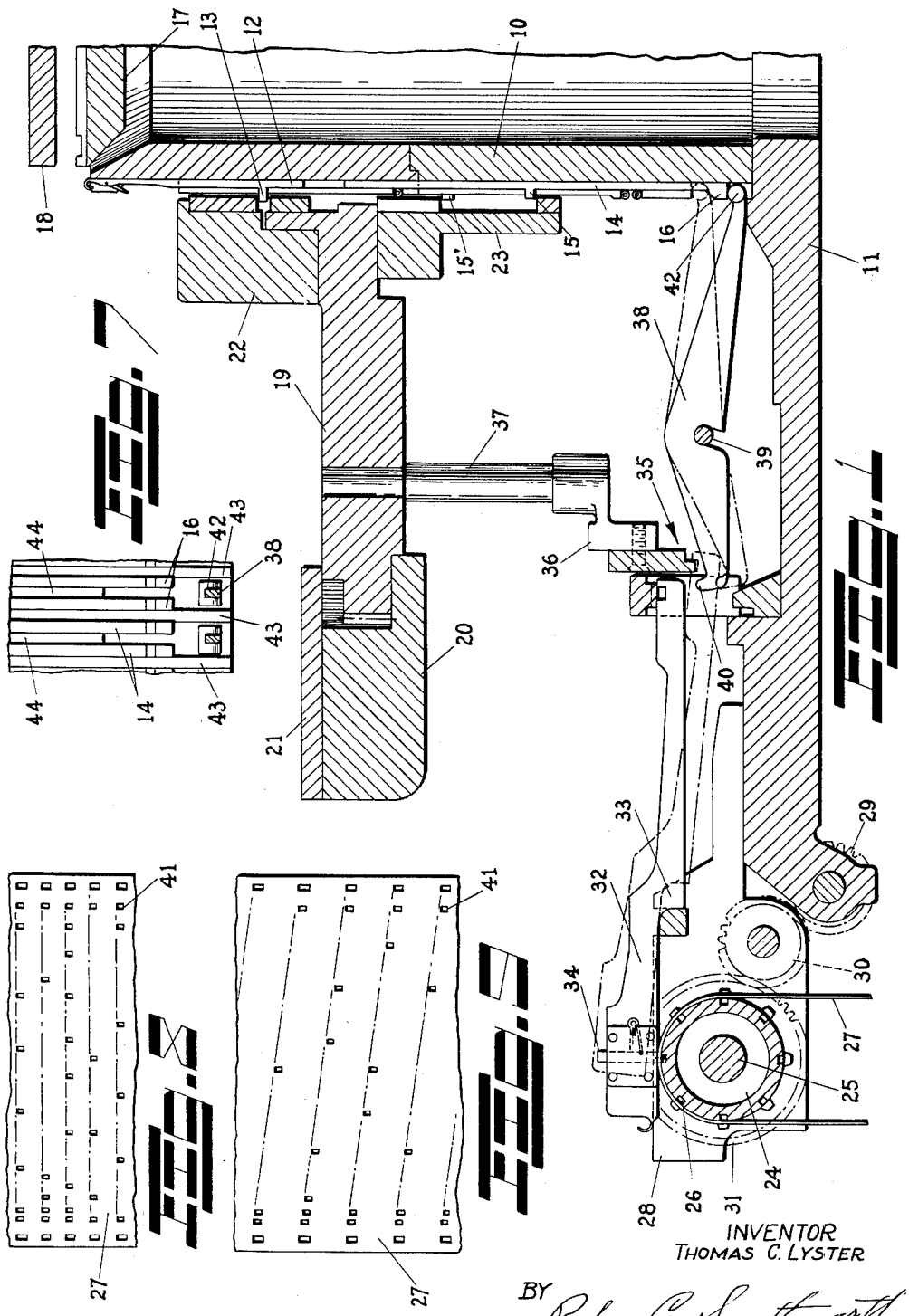
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PATTERN CONTROL MEANS FOR KNITTING MACHINES

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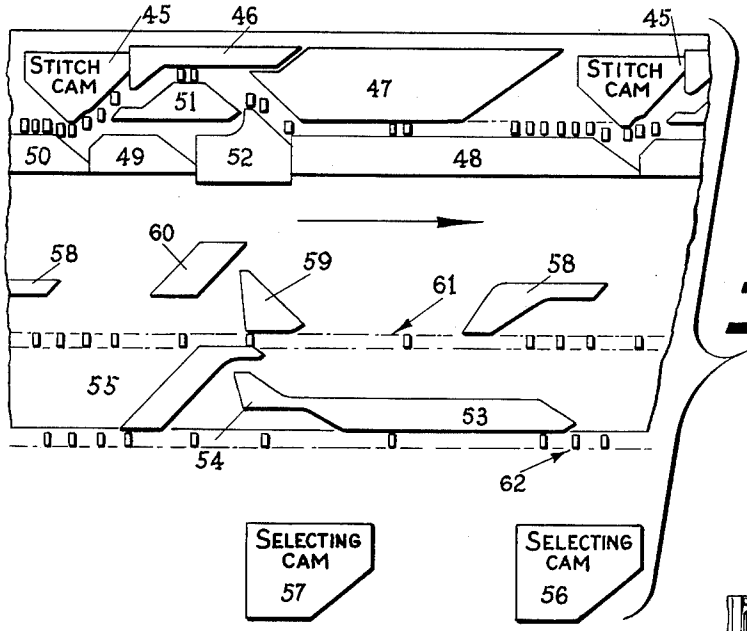
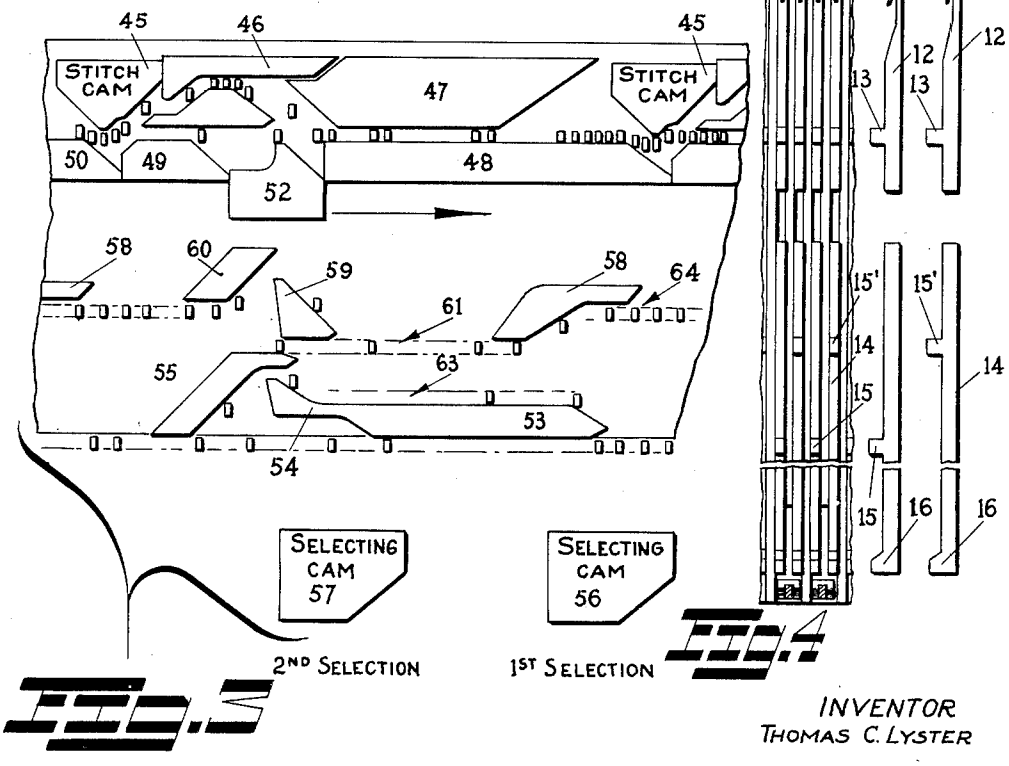


FIG. 2

FIG. 3 FIG. 4



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PATTERN CONTROL MEANS FOR KNITTING MACHINES

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This invention relates to improvements in pattern mechanisms for independent needle knitting machines, and more particularly, to such means which shall be particularly adapted to function in a Jacquard type pattern control for knitting machines of finer gauges.

It is a general object of the invention to devise means which shall adapt the Jacquard type control means to finer gauged installations than has heretofore been considered practical.

A more specific object involves the modification of a Circular Jacquard mechanism in such manner that a knitting machine of finer gauge than could heretofore be taken care of by such selecting means without unduly close spacing of rows of pattern perforations in the strip now becomes practical and functions without close limits being met and without resort to finer gauged selecting members than have been employed for machines of considerably coarser gauge.

A further object is that of devising a new mode of operation of a Circular Jacquard pattern means and corresponding alterations in the mechanism itself so that this highly effective pattern means may be applied to machines of very fine gauge.

Other objects of the invention will become apparent from the following more detailed disclosure.

In knitting machines of the independent needle type such, for example, as that shown in United States Patents 2,281,721 and 2,786,343 a most comprehensive pattern control for needles has been utilized for many years. This Jacquard mechanism of the Verdol type gives complete scope of selectivity, but has to this time been somewhat limited in that with application to finer gauges, there comes a point where for reasonably sized pattern perforation on the card or strip, the spacing between rows of perforations approaches a minimum distance below which it is not practical to go. Again, the various levers involved cannot be reduced in thickness below practical dimensions. In fact, the limitations in the above mentioned factors are reached at gauges which are not as fine as may for many purposes be found desirable.

According to the instant invention, the more or less conventional Circular Jacquard mechanism manufactured by Wildman Jacquard Co., of Norristown, Pennsylvania, and illustrated in United States patents, above noted, is utilized for a machine of very fine gauge by so devising and operating the parts that a single selecting member is applied to control at least two needles, that is, when it is caused to effect a selection of any instrumentality, it actually selects two adjacent ones of them. Then in addition to that, it effects two time spaced selections between each pair of feeding and knitting stations with the added cam control of the instrumentalities by which one of the two instrumentalities affected at the first selection has its movement nullified and at the second selection, the opposite is possible so that while at each point two adjacent needles may be selected, but one of the two always has its selection canceled prior to its affecting knitting in a final manner and the other of the pair, if they are again affected to be moved to selected position at the second selecting station is likewise nullified or at least, is incompleted. Thus by the time each needle (or other instrumentality selected) has arrived at a feeding and knitting station, it will have been subjected to a selecting function, either positive or negative, and through the nullification of the action undesirably imparted to one needle of each pair at a selecting station, there will be no ultimate effect differing from that normally arrived at by the mechanism previously employed.

The invention will be described by reference to a specific embodiment thereof as illustrated in the accompanying figures of drawing, wherein:

FIG. 1 is a section taken through a part of a knitting machine to which the invention has been applied.

FIG. 2 is a development of cam sections according to the invention and wherein butts follow a pathway unaffected by the selecting means.

FIG. 3 is a similar view but illustrative of butt paths as affected by the selecting means.

FIG. 4 is a fragmentary view of a section of the needle cylinder showing pairs of needles and the manner in which the selection is applied thereto.

FIGS. 5 and 6 show different jacks applied to their respective needles.

FIG. 7 is an enlarged detail of the cylinder walls at their lower ends.

FIG. 8 shows one form of pattern strip used.

FIG. 9 shows a second form which this strip may take.

Now referring to FIG. 1, the invention, while applicable to any knitting machine of the general form to which the invention applies, is here illustrated as applied to a dial and cylinder machine having a cylinder **10** mounted fixedly on a base **11**. The cylinder is slotted to carry needles **12** having butts **13** and accompanying jacks **14** which, in turn, have their operating butts **15** and are enlarged at their lower ends to terminate in a foot **16**.

A dial **17** is of usual construction and would likewise carry dail needles actuated by cams, neither of which are shown here, although the dial cap itself is indicated at **18**.

In this particular embodiment the cylinder and dial are stationary while the dial cap and needle cam sections are moved relatively to the first mentioned parts. A cam plate **19** is supported for rotation in a fixed bearing ring **20** and cap **21**. This plate has cam sections **22** fixed to it which have attached thereto various cams better shown in FIGS. 2 and 3 and some of which are movable to and from an active position. These are the needle cams only while a depending bracket or support **23** mounts the lower or jack cams also shown in FIGS. 2 and 3.

A selecting means of the Jacquard type is generally similar to that of United States Patent 2,281,721 and comprises several sections about the machine one only of which is shown here. A drum **24** is either continuously or intermittently rotated about its axis **25** and has slots **26** along its length which register beneath rows of pattern perforations in a continuous pattern strip **27**. This strip is formed with sprocket holes at its edges which are meshed with the sprocket teeth on the drum all as described in United States Patents 2,281,721 and 2,814,937, one of which illustrates the intermittently moved pattern and the other of which is rotated continuously while patterning. Patterns in FIGS. 8 and 9 are respectively formed to be employed in these two examples of the device.

Drum **24** is rotated upon its shaft **25** which is borne in brackets **28** attached to base **11** and is rotated by gearing including a drive gear **29**, intermediate gear **30** and driven gear **31**.

A plurality of selector levers **32** are pivoted at **33** and may be slid radially of the machine for a short space. Each of these carries adjacent its outer end a spring pressed detent **34** the point of which is aligned with a row of pattern perforations and at its inner end is notched for reception of selector cam **35** when selected and moved inwardly. All these levers are spaced and guided in a known way. Cam **35** is mounted on a bracket **36** on de-

pending stud 37 and is movable with respect to the needle cylinder and selector levers which are relatively stationary.

Each selector lever has cooperating with it a jack raising lever 38 pivoted at 39 and having a toe 40 which is aligned beneath its corresponding lever 32 so that when a detent 34 falls into a slot in the drum and motion of the drum then pushes the lever radially inwardly, its inner end is pressed down by passing cam 35, the lever 38 is racked from the full to the dotted line positions, FIG. 1.

Normally, machines of this type have for each needle and jack a cooperating pair of levers 38–32 with which a single row of pattern perforations 41, FIG. 8, may be identified. Such selecting means makes possible the universal selection of all needles at each feeding and knitting station and it is possible to apply it to various types of machines of widely different gauges so long as the cut or gauge is not too fine. Obviously, when it is to be adapted to finer gauged machines, the selecting levers may not be as thick or strong and, more important, one reaches a point where the adjacent perforations which must be of some minimum opening to assure entry of detent 34 do get so close together that there is insufficient material left between rows to prevent tearing. In order to overcome these limitations and to maintain a full range of pattern selection, each lever 38 is so formed as to raise two adjacent jacks. Then in a manner to be explained, the selection of one raised jack is nullified. There are at each station two such selecting movements with nullification, first of one jack and then a failure to complete the selection of the other of a cooperating pair. These levers 38 have a widened, preferably cylindrical lifter portion 42 at their innermost ends which engages beneath two adjacent jack toes 16. As seen in FIG. 7, the cylinder walls are formed so that alternate walls 43 are of full length while the intermediate walls 44 are cut off a considerable distance short of the lower end of the cylinder. The jacks 14 having toes 16 are confined between walls 43 and are spaced by a wall 44 and a lever end 42, also confined to act on both toes, may rise to press its jacks upwardly without interference from wall 44. Thus it becomes evident that one selector lever acts upon two jacks and thus spacing of rows of pattern formations, etc., does not become critical until the gauge becomes much finer than before, and in fact, this arrangement will function very safely for any practical gauges at which machines of this type may be built.

Up to this point it would appear that, without more, any selection must affect pairs of needles only, that is, one could not select single needles to the exclusion of an adjacent one. It will presently be explained how that seeming disadvantage is removed.

Each jack 14 has a butt 15 or 15′ as above noted and each of a pair of jacks affected by a single lever will have a low butt 15 and a high butt 15′. These should be arranged uniformly so that, for example, going about the cylinder in one direction, the first jack of a pair will have a butt 15′ and the second a butt 15.

Now referring to FIGS. 2 and 3, the various cams involved comprise at the needle level, stitch cams 45, guard cams 46, 47, levelling cams 48, 49, 50, clearing cam 51 and a knitting gate cam 52 movable to and from positions shown.

At the jack level a cam 53 acts both as a dividing cam for butts 15 and also at its end 54 provides for raising selected jacks with those butts 15 to a level at which their needles will pass over cam 51. Cam 55 then draws down to unselected level all those jacks which had butts passing over cam 54. The latter is cut out at a location underneath it for a purpose to be described.

There are two selections made at each station so that a Jacquard selecting cam 56, equivalent to cam 35 in FIG. 1, acts just after instrumentalities have passed a stitch cam 45 and then a second such cam 57 acts as soon thereafter

as is practicable. Just after the first selection has been effected there is a nullification as to the selection of the high butt jack so that, in effect, only the first of a pair, the jack with low butt 15 can be selected at that point. Of course, the jack has not imparted its motion to its needle yet. Cam 58 effects that nullification.

At the second selection, considering for example the same pair of jacks, the lever 38 will swing upwardly lifting the nullified jack with butt 15′ or both jacks in the event neither was selected at the first cam 56. As a jack with a butt 15′ is raised at this second selection, its selecting function is completed as the butt 15′ is elevated by a cam 59. They are then lowered by cam 60, part way only being returned to level 61 by cam 58. At this second selection the cutout below cam end 54 permits the butts 15 on the raised but not ultimately selected jacks to pass without interference. A cam 60 lowers these jacks with high butts 15′ after they have raised their needles so their butts pass up over cam 51. At this second selecting station jacks with low butts 15 are returned to normal level by cam 55. While they were selected at the second station (cam 57) they have no high butts and thus cannot be raised by the cam 59 so that their function is an idle or ineffective or incompleted one at this second station.

The drum 24 must be advanced in two steps, one at the first selection (cam 56) and another at the second (cam 57) if the pattern is formed as in FIG. 8. Thus it requires two rows of perforations for a complete selecting function at one feeding and knitting station.

The same applies generally with the pattern as in FIG. 9, but here as in United States Patent 2,814,937 the drum and pattern are continuously advanced at a uniform speed, however, it requires two rows of perforations for each complete selecting function.

Now referring to FIG, 2 butt pathways are shown with the selection out of action and with all needles knitting. Cam 52 is in raised position and elevates all needle butts over the point of clearing cam 51 whereupon those needles then knit as their butts are drawn down by cams 46 and 45.

High butts 15′ pass through inactively in pathway 61 while low butts 15 follow pathway 62.

Continuing to FIG. 3, in which knitting is governed by the selection, gate cam 52 is moved to lower position. Thus any needles not selected will welt and their butts merely pass along cam 48, under cams 51 and 45.

Assuming that a needle governed by a low butt jack 14 is to be selected to knit, the pattern at the first selection will present a perforation to the detent and a lever 32 will be pushed in so cam 56 will press it down raising the end 42 of a lever 38 to elevate both a low and high butt jack. The low butt 15 is elevated over the point of cam 53 and then follows along pathway 63 to be raised at cam end 54 thereby elevating the corresponding needle onto cam 51. In other words, the jack accomplishes what cam 52 did in FIG. 2.

Of course, at this same selecting motion the high butt jack was raised and its butt 15′ moved up to pathway 64 but cam 58 immediately moved it down to inactive pathway 61.

Now, assuming that it had been desired to knit with the needle over the high butt jack and not that of the low butt one, there would have been no selection at cam 56, but rather one at cam 57. There both jacks must be raised the high butt jack being elevated so its butt will pass up cam 59 and its needle be cleared over cam 51 and knit under influence of cam 45. The jack butt 15′ then passes down cam 60 to engage the cam 58 by which it is then lowered the remainder of the distance back to level 61.

It becomes evident that at the first selection there will be times when the high butt jack is already elevated, but this does not matter since the selection of a high butt jack at the first point would have to be nullified anyway.

If both jacks controlled by a single lifter lever are to be selected then the pattern is set up to raise their lifter lever at both selections and what has been described above will make it clear to one skilled in the art that both needles will, by the time they have reached clearing cam 51 be raised to pass above it.

If neither needle is to knit at a feeding station then no selection at all is effected.

The invention may be applied in machines other than dial and cylinder types, for example, open top or sinker head machines and double cylinder machines. While primarily for use in finer gauges, there may be reasons why one would prefer this system where the gauge alone would not be compelling.

The selecting means may be varied widely so long as it is adapted to function on a pair of adjacent instrumentalities and to effect two separate selecting functions between each pair of feeding and knitting stations. Of course, the needle cylinder may be the moving member and the cams may be relatively stationary, that merely being a reversal of what has been described by way of a preferred embodiment.

While one embodiment of the invention has been disclosed, it is to be understood that the inventive concept may be carried out in a number of ways. This invention is, therefore, not to be limited to the precise details described, but is intended to embrace all variations and modifications thereof falling within the spirit of the invention and the scope of the claims.

I claim:

In a knitting machine of the type described, a cylinder, needles operably carried in said cylinder, cam means for actuating said needles and selecting means functioning upon said needles to move them from a non-selected to a selected position thereby to cause them to pass said cam means in a relationship such that a selected needle shall be affected by said cam means differently than shall a non-selected needle, said selecting means comprising a single selecting member acting to displace two adjacent needles, means to impart to said member two selecting motions prior to the affected needles passing through knitting cams, and means to inhibit completion of the selection of one of said two needles at each of the two selecting motions.

2. In a knitting machine of the type described, a cylinder, needles operably carried in said cylinder, cam means for actuating said needles and selecting means functioning upon said needles to move them from a non-selected to a selected position thereby to cause them to pass said cam means in a relationship such that a selected needle shall be affected by said cam means differently than shall a non-selected needle, said selecting means comprising a single selecting member acting to displace two adjacent needles, means to impart to said member two selecting motions at each of two selecting stations prior to the affected needles passing through a yarn feeding and knitting station, means at the first of these selecting stations to nullify the selection of one of said needles and other means at the second selecting station for completing the selection so that it shall be effective on one needle but ineffective upon that adjacent.

3. In a knitting machine of the type described, a cylinder, needles operably carried in said cylinder, individual jacks effective upon said needles, cam means for actuating said needles and jacks, and selecting means functioning upon said jacks to move them from a non-selected to a selected position thereby to cause them to pass said cam means in a relationship such that a selected needle shall be affected by said cam means differently than shall a non-selected needle, said selecting means comprising a single selecting member acting to displace two adjacent jacks, means to impart to said member two selecting motions prior to the affected needles passing through a yarn feeding and knitting station, means at the first of said selections for returning one of said two adjacent jacks to a non-selected position before its respective needles have been affected and other means at the second of said selections for completing a selecting of that needle the selection of which was inhibited at the first selection while rendering ineffective the simultaneous selection imparted for affecting the adjacent needle of the two affected by said single member.

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