

[54] **FLAT BED KNITTING MACHINE**

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[22] Filed: **Jan. 22, 1971**  
[21] Appl. No.: **108,763**

[30] **Foreign Application Priority Data**  
Jan. 23, 1970 Germany.....P 20 02 991.8  
[52] U.S. Cl. ....66/75 R, 66/78, 66/154 A  
[51] Int. Cl. ....D04b 7/00, D04b 7/20  
[58] Field of Search.....66/78, 64, 75, 72, 154 A

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[57] **ABSTRACT**

A flat bed knitting machine including jacks mounted in needle tricks in the needle beds and arranged to control movement of the needles. Selector jacks operate the needle-actuating jacks in accordance with the pattern and patterning butts on successive selector jacks are staggered in different planes. Each patterning lock has, for each plane of the patterning butts, adjustable advancing lock parts for selecting jack butts to be acted on and hence to operate the respective needle-actuating jacks. Each advancing lock part is controlled electrically, independently of the other advancing lock part in accordance with the pattern. The advancing lock parts, viewed in the direction of travel of the carriage, are located in advance of a characteristic operating position of the needles. Further lock parts return the selector jacks to the original positions following each characteristic operating position.

13 Claims, 8 Drawing Figures

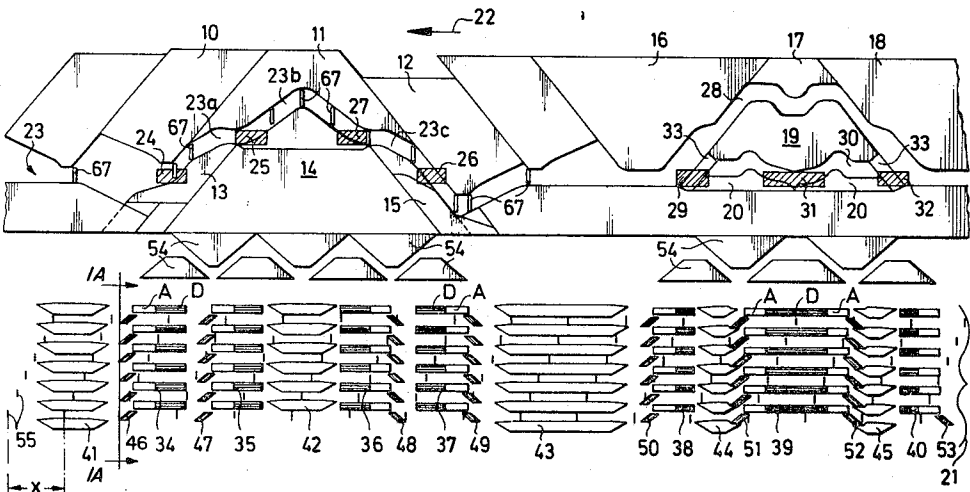
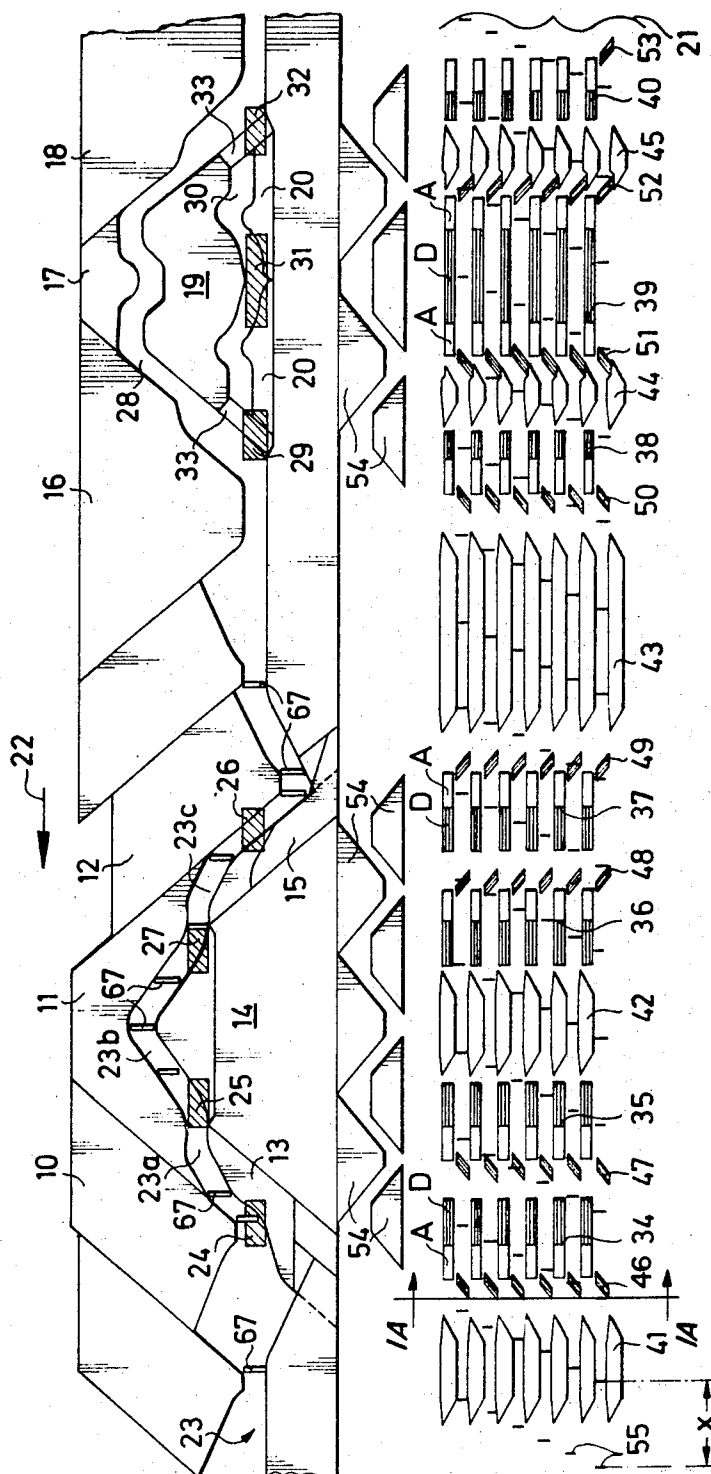


Fig. 1



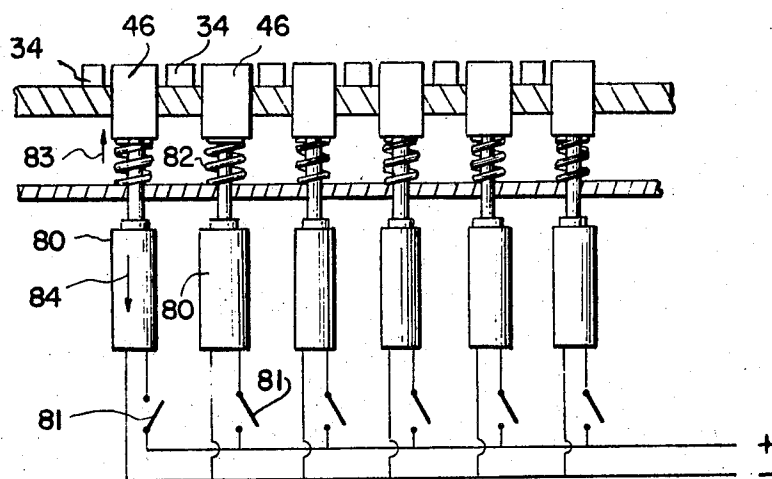


FIG. 1A

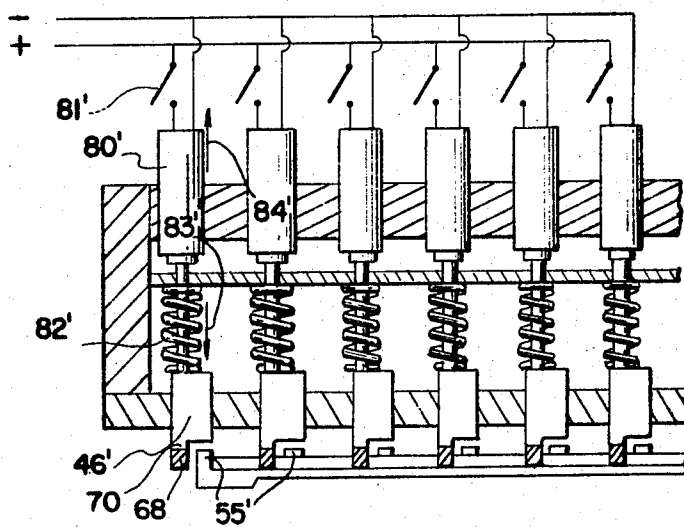


FIG. 5A

Fig. 2

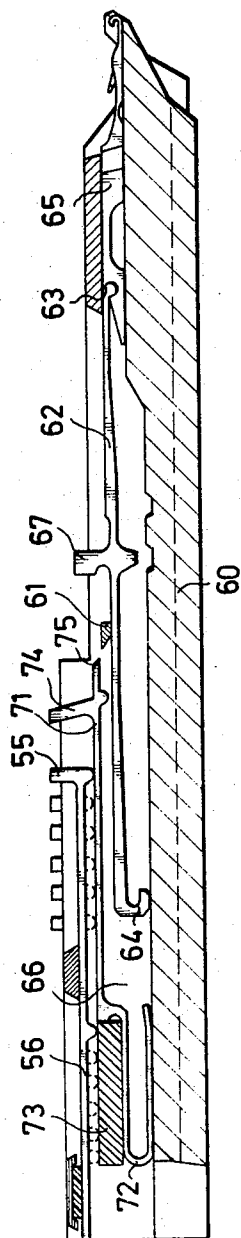
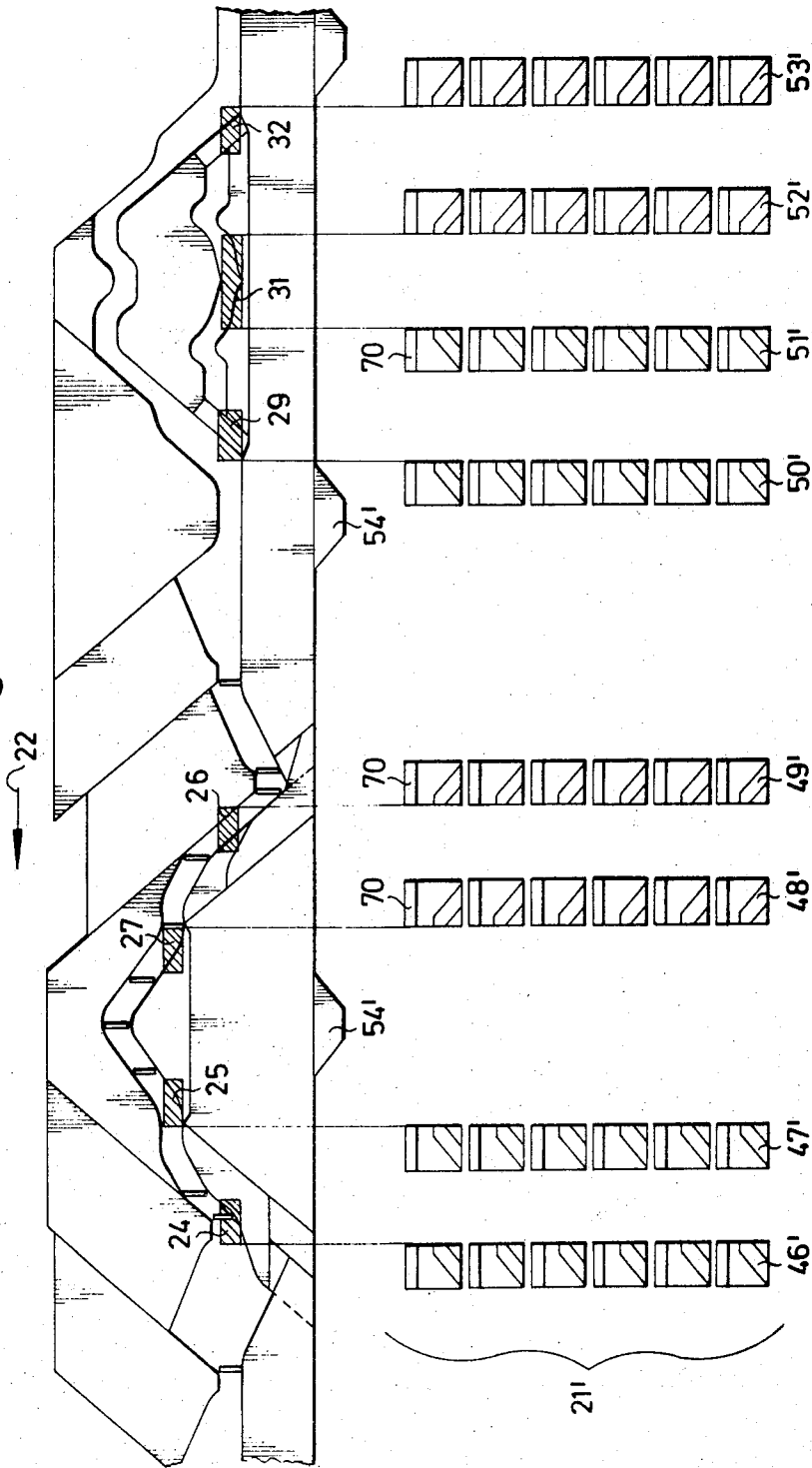


Fig. 3



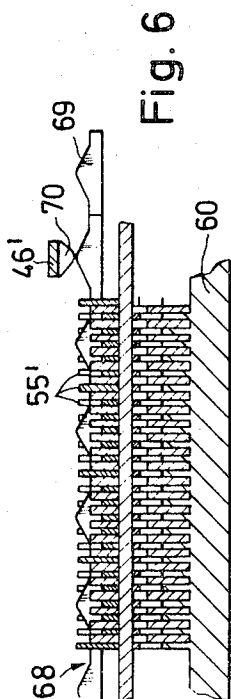


Fig. 6

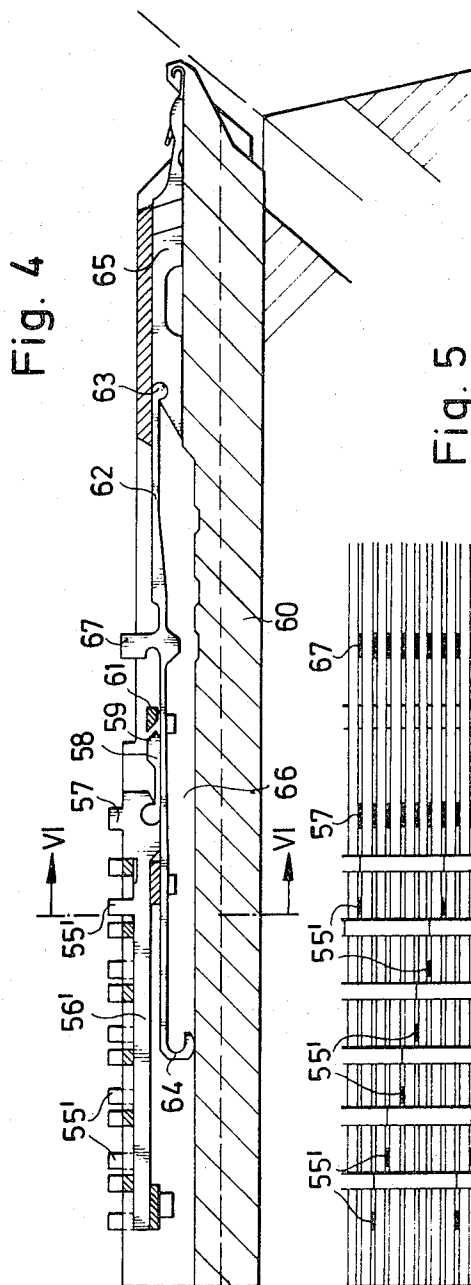


Fig. 4

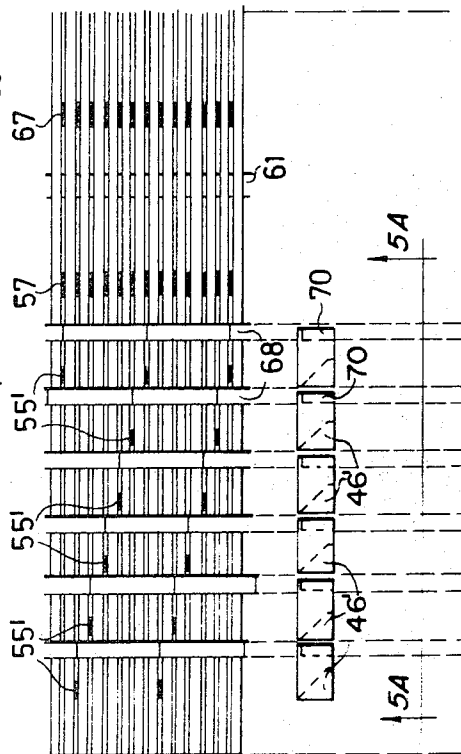


Fig. 5

## FLAT BED KNITTING MACHINE

### BACKGROUND OF THE INVENTION

This invention relates to a flat bed knitting machine of the kind furnished with jacks which are mounted in needle tricks in the needle beds and are arranged to control the movements of the needles, the said needle-actuating jacks being operated by selector jacks controlled in accordance with the pattern, and in which patterning butts on successive selector jacks in the needle beds are disposed in a staggered formation such that there are, lengthwise of the bed, parallel inclined lines of the butts which latter are consequently disposed in planes one above or in front of the other, the space between any two butts in any one of these planes thus corresponding to the spacing between the said inclined parallel lines.

The object of the present invention is so to construct the locks and needle beds of a flat bed knitting machine of this kind that needles can be selected, during a stroke of the carriage of the machine, under the control of an electrical selector mechanism with the assistance of electrically controlled patterning lock parts for each operating position of each change in knitting width.

This object is difficult to achieve with prior flat V-bed and links/links knitting machines having mechanical needle selector arrangements which are either mechanically operated or operable through the medium of a sensor bar associated with perforated steel jacquard cards. In such prior cases the object could only be achieved with a considerable outlay in jacquard cards or/and idle non-productive strokes of the machine carriage.

It has, however, previously been proposed, in connection with an electrical patterning mechanism in a flat bed knitting machine to arrange needle selectors on the carriage of the machine with the assistance of which selectors the individual needles, when the carriage passes, are pushed from their retracted rest position into either their fully advanced knitting position or their partially advanced tucking position. These needle selectors are coupled to a continuously turning driving shaft through magnetic clutches which are operated under the dictation of the pattern. A mechanism of this previously proposed form is not sufficiently precise in its operation to cater for the relatively high rates of carriage travel which are current today, because they call for an extremely accurate synchronization of the movement of the needle selectors with the movement of the machine, and a very rapid coupling and uncoupling of these selectors respectively to and from the driving shaft. The inertial forces on these parts is much too great to ensure practical effectiveness of these machines.

### SUMMARY OF THE INVENTION

The problem presented is fully solved by the present invention in that each patterning lock of the machine has, for each plane of staggered patterning butts, adjustable advancing lock parts which are constructed to be electrically operable or electrically controllable independently of one another in accordance with the pattern, and in that such adjustable advancing lock parts, as seen in the direction of travel at any time of the carriage, are arranged in advance of at least one position of the needles suchwise that, in their operative condi-

tion and in conjunction with longitudinal displacement of the selector jacks concerned, they bring about an interruption of the operation of the associated needles caused by the locks until re-setting lock parts, or restoring lock parts, are engaged by the selector jacks.

The aforesaid position of the needles may be a characteristic position such, for example, as the "non-knitting," "tucking," "knitting," "stitch-receiving," or "stitch transfer" position determined by the knitting or/and looping or/and transfer locks.

By virtue of the features defined above the invention achieves the result that each needle in a needle bed can be operated by the carriage, and under the dictation of the pattern, with the assistance of setting members which are electrically operated or controlled, and the needles can be controlled in every characteristic position — including their rest position — which has hitherto not been possible with any known electrical patterning device. The patterning possibilities of the improved machine are thus practically unlimited.

The advancing lock parts which are mounted for displacement in the patterning locks of the machine carriage may have a guide surface with which they are normally applied against fixed cam tracks which extend between the spaced planes of patterning butts on the selector jacks in the longitudinal direction of the machine and bring about a continuous movement of the advancing lock parts in and out of the range of action of the patterning butts in each case in the gap between two patterning butts in the same plane. There is advantageously associated with each advancing lock part a holding magnet the energized condition of which is controlled in accordance with the pattern, and the advancing lock parts pass along the cam tracks, during movement out of the range of the patterning butts, in each instance into the range of action of the relevant holding magnets. Each such holding magnet may, for example, be a permanent magnet. The advancing lock parts may be spring urged towards the cam tracks. The lock parts may, however, also be connected with electro-mechanical setting members, for example, based on electro-magnetic or piezo-electric principles, for example with electro-magnetically operated catches.

The selector jacks in a knitting machine constructed in accordance with the invention advantageously act on jacks which are pivotally coupled either to the needles or to intermediate needle jacks, in such a way that the operating butts of these pivotally coupled jacks are moved out of range of the locks of the machine carriage when the advancing lock part becomes effective, for example by resilient flexing of the said jacks. Theoretically, this provides for disengagement of the needles from the lock parts in each needle position. To protect the needle butts and the lock parts, the engagement and disengagement of the two may, however, advantageously take place in zones of the lock which extend in the direction of carriage travel.

The invention may be applied both to flat bed knitting machines with needle beds arranged in V-fashion and to links/links machines with opposed needle beds in the same plane. The operative travel of the machine parts are all short and the advancing lock parts can be made very small and light so that they can be quickly shifted with little consumption of energy; this is not the case where whole lock parts are moved,

as has hitherto been performed mechanically at the zones where the carriage reverses, and this has even been performed mechanically at these zones. As a consequence of the hereinbefore described staggered arrangement of the patterning butts on the selector jacks there is a gap between successive patterning butts in each plane of such butts and this gap is sufficiently large to enable the lightweight advancing lock parts to be moved both into and out of the path of these patterning butts.

Thus, it is an object of this invention to provide a new and improved arrangement for controlling the selection of needles in a flat bed knitting machine.

It is another object of this invention to provide, in a flat bed knitting machine, a new and improved means for operating advancing lock parts for selecting selector jacks, and hence the corresponding needle-actuating jacks.

It is still another object of this invention to provide, in a flat bed knitting machine, a means for electrically controlling each advancing lock part independently of each other lock part.

It is still another object of this invention to provide, in a flat bed knitting machine, a means for electrically, individually controlling the means for selecting jacks, the means being operable at a high rate of carriage travel without the need for extreme accurate synchronization of movement of the needle selectors with the movement of the machine.

Further objects and advantages of the invention will be apparent from the following detailed description, with reference to the accompanying drawings.

#### BRIEF DESCRIPTION OF THE DRAWINGS

There follows a detailed description of preferred embodiments of the invention to be read together with the accompanying drawings.

FIG. 1 is a diagrammatic plan view of a knitting lock and a transfer lock together with the associated pattern lock of the carriage of a flat bed knitting machine.

FIG. 1A is a cross-sectional view of the patterning lock, taken along line 1A—1A of FIG. 1, showing in addition an exemplary electrical control means.

FIG. 2 is a cross-section through a needle bed which is used with the pattern lock of FIG. 1.

FIG. 3 is a diagrammatic representation similar to FIG. 1 but of a modified pattern lock.

FIG. 4 is a cross-section through a needle bed which is used with the pattern lock of FIG. 3.

FIG. 5 is a partial plan of the needle bed seen in FIG. 4.

FIG. 5A is a cross-sectional view taken along line 5A—5A of FIG. 5, and showing in addition an exemplary electrical control means.

FIG. 6 is a detail sectional view taken on the line VI—VI of FIG. 4.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the accompanying drawings, like elements are represented by like numerals throughout the several views.

FIG. 1 depicts half of the complete lock of a flat bed knitting machine with a knitting lock principally comprising parts 10 to 15, and a transfer lock primarily

represented by the lock parts 16 to 20 and two advancing lock parts 33. There is also illustrated in FIG. 1 a part 21 of the complete pattern lock which is associated with the aforementioned knitting and transfer locks. The construction of this part 21 will be described in more detail later.

When the carriage moves in the direction of arrow 22, the needles 62 of the knitting machine (shown in FIG. 2 but not in FIG. 1) are operated indirectly, through the medium of operating butts 67 shown in FIGS. 1 and 2 on needle-actuating jacks 62 coupled to the needles, first by the knitting lock and subsequently by the transfer lock. In conformity with known techniques, the needles may selectively be moved to or permitted to be in any of the following operative positions:

1. A "knitting" position in which the operating butts 67 (see FIGS. 1 and 2) of the jacks 62 (FIG. 2) associated with the needles pass through the lock channel defined between the lock parts 10 to 12, on the one hand, and the parts 13 to 15 on the other hand, in all sections 23a, 23b, and 23c;

2. A "tucking" position in which the needles are taken out of engagement with the lock parts in the hatched zone 25 in the tuck positions, that is to say after passing through the first section 23a of the lock channel, by virtue of the disengagement of the operating butt 67 of the jacks 62 from this lock channel;

3. A "non-knitting" position in which the needles in the hatched zone 24 in FIG. 1 are brought out of the range of action of the lock parts by disengagement of the operating butts 67 of the jack 62, so that these operating butts are no longer able to pass through any of the lock channel sections 23a to 23c.

When the travel of the carriage is reversed the needles are disengaged in the same way at the heights of the hatched zones 26 and 27 to produce operative "non-knitting" or "tucking" conditions; that is to say, the operating butts 67 of the jacks 62 associated with the needles are taken out of engagement with the lock parts.

Even when passing through the transfer lock, primarily composed of the lock parts 16 to 20 and 33, the needles are able to assume any of three different operative positions, viz.

4. A "stitch transfer" position by virtue of the operating butts 67 of the jacks 62 passing fully through the lock channel 28 defined by the lock parts 16 to 18, on the one hand, and the lock parts 19 and 33 on the other hand;

5. A "stitch-receiving" position by virtue of the operating butt 67 of the jacks 62 in the hatched zone 29 being disengaged from the lock parts and subsequently operated upon in lock channel 30; and

6. "Non-transfer and non-receiving" position as a consequence of the operating butts 67 of the needle-actuating jacks 62 being disengaged from the lock parts both in the hatched zone 29 and in the hatched zone 31 and thus passing neither through lock channel 28 nor lock channel 30.

During the travel of the carriage in the reverse direction, i.e., in the direction opposite to arrow 22, the operating butts 67 are brought out of engagement with the lock parts in the hatched zones 32, or 32 and 31 to achieve the two last-mentioned operating conditions in corresponding fashion.



The needle bed shown in cross-section in FIG. 2 has a construction corresponding to FIG. 1 and illustrates selector jacks 56 furnished with pattern butts 55 which are arranged to be depressed. The pattern butts 55 are disposed on successive selector jacks 56 at different positions along their stems so as to present along each needle bed parallel inclined lines of the said butts which latter are also spaced apart in straight planes disposed one above or in front of the other, as previously described herein. The selector jacks 56 are accommodated in needle tricks 66 of the needle beds 60. Moreover, each of the selector jacks 56 is applied against a resiliently flexible intermediate jack 71 having an end portion 72 of hairpin form which is displaceably mounted between a bar 73 and the bottom of the corresponding needle trick 66. Each intermediate jack 71 is provided in the vicinity of its outer end with an operating butt 74 and at its outer extremity with a bevel surface 75. The operating butts 74 on the intermediate jacks 71 project into the operative region of advancing and retracting lock parts 54 shown in FIG. 1, these parts producing the required longitudinal displacements of the intermediate jacks in the needle tricks 66. Such a displacement of an intermediate jack 71 to advance the same, together with simultaneous operation of the corresponding selector jack 56 to depress the said intermediate jack into the corresponding needle trick 66, moves the bevel surface 75 into cooperative relationship with a complementary counter bevel formed on a narrow bar 61 which extends above the corresponding needle-actuating jack 62 over the complete length of the needle bed 60. The forward end 63 of each jack 62 is pivotally connected to the stem 65 of the corresponding latch needle and is thus non-positively coupled thereto, whilst the tail end 64 is supported on the bottom of the needle trick 66. Each needle-actuating jack 62, moreover, is provided midway along its length, that is to say in the vicinity of its maximum amplitude of flexing, with an operating butt 67 which normally protrudes into the passage of the knitting lock partially illustrated in FIG. 1.

The selector jacks 56 are operated by the patterning lock 21 which has the same pattern lock parts for each plane of patterning butts 55 of these jacks, namely fixed presser lock parts 34, 35, 36, 37, 38, 39 and 40, fixed restoring lock parts 41, 42, 43, 44 and 45 disposed within the presser lock parts, together with advancing lock parts 46, 47, 48, 49, 50, 51, 52, and 53, which are each arranged directly in front of the presser lock parts as regards the effective direction of travel and are adjustable at right angles to the plane of the drawing. Since the patterning butts 55 are arranged in parallel inclined lines each of six butts, thus appear in six different planes or straight rows the butts, each set of six elements of the aforementioned presser lock parts, restoring lock parts and advancing lock parts are arranged in a bank one above another. Besides the restoring lock parts there is in some cases yet a further, i.e., a seventh, lock part which defines, with the adjacent restoring lock parts, a guide channel (closed at the two sides) also for the patterning butts 55 of the outermost planes.

In this embodiment, the presser lock parts only have the function of depressing the intermediate jacks 71 into the needle tricks 66 through the medium of the selector jacks 56. The further operation of the said in-

intermediate jacks is effected by the lock parts 54 which act on the operating butts 74 to shift the jacks, in their depressed condition, under the bar 61. The operating butts 67 of the needle-actuating jacks 62 are pressed down into the needle tricks 66 and thereby drawn out of the ambit of the lock parts and held in this position, without further application of force, until the corresponding intermediate jacks 71 are pulled forward by the relevant lock part 54, through the agency of the operating butts 74, to advanced positions in which the bevel surfaces 75 engage under the bar 61. These jacks 62 can spring back into their rest positions shown in FIG. 2 providing the corresponding selector jacks 56 are not acted upon and depressed.

In a simplified embodiment of the invention, the intermediate jacks 71 and the bevelled bar 61 are omitted, and the selector jack butts 55, which are disposed closer to the butts 67 of the needle-actuating jacks 62, act directly upon the latter. As shown in the lock illustrated in FIG. 1, the advancing and restoring lock parts may consequently also be omitted. This has a result, however, that the restoring forces of all the bent needle-actuating jacks act as external forces on the needle bed and the carriage.

Each of the advancing lock parts 46 to 53 shown in FIG. 1 is connected with its own electromagnetic transducer constituting an operating or control means. For example, FIG. 1A shows a series of electromagnets 80, one for each lock part 46. A similar set of electromagnets would be provided for each row of locks parts 47 to 53. The switches 81 are operated by an electrical patterning device independently of one another so that the advancing lock parts 46 to 53 may be individually advanced into or retracted from the relevant plane of patterning butts 55 on selector jacks 56 in a direction at right angles to the plane of the paper on which FIG. 1 is drawn. As shown in FIG. 1A, springs 82 may be provided to urge the lock parts 46 - 53 into the operating position in the direction of arrow 83, as the electromagnets 80 act in the opposite direction as shown by the arrow 84. There is a constant distance (see FIG. 1) between all of the successive patterning butts 55 in any one plane of such butts and this distance substantially exceeds the width of any one of the said advancing lock parts. It is, therefore, technically possible, without difficulty and with a relatively large synchronization tolerance range, to retract any one of the electrically controlled advancing lock parts 46 to 53 from the gap, or to advance such lock parts into the gap, between two succeeding patterning butts 55 in the same plane during movement of the carriage over the needle bed 60, in each case depending on whether or not a patterning signal is given to the switch 81 of the associated electromagnet 80.

As can further be seen from FIG. 1, all of the advancing lock parts 46 to 53 present bevel faces over which the patterning butts 55 of the selector jacks 56 can travel. The selector jacks 56 are thereby moved along the needle tricks 66 towards the knitting lock or the transfer lock of the carriage. The patterning butts 55 pass into the range of the fixed presser lock parts 34 to 40 which succeed one another in each plane of such butts and each of which has a run-on bevel A in advance of its horizontally shaded presser region D. The intermediate jacks 71 associated with the selector jacks

56 are operated by the lock parts 54 suchwise that the jack butts 67 are out of engagement with the lock parts at the areas 24 to 26 and 29 to 32 shown by inclined hatching, whenever these selector jacks are triggered by the advancing lock parts 46 to 53.

When a patterning butt 55 is shifted to the height of the succeeding presser lock part, the advancing lock part concerned is immediately retracted to its ineffective position. The patterning butts which emerge beneath the presser lock parts spring back to their starting positions and the intermediate jacks are restored again by the resetting lock parts 54, as has been previously explained. With the advancing lock parts in their retracted positions the patterning butts 55 are not affected thereby and travel through between the presser lock parts 34 to 40 as also shown in FIG. 1. When the carriage moves in the direction of arrow 22, only the advancing lock parts 46, 47, 50 and 51 are operated in conformity with the pattern, whilst only the advancing lock parts 53, 52, 49 and 48 can be effective during the movement of the carriage in the reverse direction. Advantageously the electrical patterning device is laid out in such a way as to ensure that only the groups of advancing lock parts which are destined for the appropriate purpose can be effective in the two different directions of travel of the carriage.

FIG. 3 shows a modified arrangement of patterning lock which operates without using presser lock parts. The patterning lock 21' in this embodiment comprises only the groups of, in each case, six advancing lock parts 46', 47', 48', 49', 50', 51', 53', which correspond to the advancing lock parts 46 to 53 of the embodiment illustrated and describe with reference to FIG. 1, and these are arranged in exactly the same relative position to the knitting lock and the transfer lock. Moreover, the patterning lock 21' has lock parts 54' which serve merely as restoring lock parts. The selector jacks 56' which are used in connection with this modified construction of patterning lock are shown in the sectional illustration of FIG. 4. The advancing lock parts 46' to 53' act on the patterning butts 55' which again are in the staggered arrangement hereinbefore described with reference to the butts 55. Each selector jack 56' is additionally provided with a restoring butt 57 at the end thereof nearest the needles. In contrast to the patterning butts 55', the restoring butts 57 are not staggered and in different planes but are all in the same plane as can be seen from FIG. 5. Each selector jack 56' is pivotally coupled to a slider element 58 which, at its free leading end, has thereon a bevel 59 which can slide along a counter bevel surface provide, at the same height, on a bar 61 which extends over the complete length of that portion of the needle bed 60 which is furnished with needles; this arrangement is thus similar to that hereinbefore described with reference to FIG. 2. The needle-actuating jacks 62, which have the corresponding slide elements 58 applied against their flexible portions, are the same as the jacks 62 in the embodiment illustrated in FIGS. 1 and 2.

When the patterning butt 55' of a selector jack 56' runs up the bevel surface of an interposed advancing lock part 46' to 53' the said jack is shifted to the right, as viewed in FIG. 4. The bevel 59 on the slider element 58 slides down the counter on the bar 61 as a result of which the slider is pushed under this bar and bends the

corresponding jack 62 downwards into the needle trick 66. Consequently the operating butt 67 of the jack 62 is withdrawn downwardly from the lock tracks. Return of the selector jacks 56' is effected by the restoring lock parts 54' which act upon the restoring butts 57 of the advanced selector jacks 56'. The slider elements 58 are positively withdrawn from beneath the bar 61 on resetting of the selector jacks 56'. The needle-actuating jacks 62 can then spring back into their starting positions so that the operating butts 67 are again presented to relevant lock parts.

As can be seen from FIG. 5 and FIG. 6, there are provided between the individual planes of the patterning butts 55' cam tracks 68 which extend parallel to one another in the longitudinal direction of the needle bed 60. These tracks 68 are, as shown in FIG. 6, of bar-form each being composed of a series of triangular cam elements 69 juxtaposed in a row. One of these cam tracks 68 is associated with each longitudinal series of the advancing lock parts 46' to 53' (arranged in banks of six) which means that one such track is provided for each plane of patterning butts 55'. The cam tracks 68 at the same time constitute stops for the patterning butts 55' so as to limit the longitudinal displacement of the selector jacks 56'. The individual cam elements 69 are mounted in the needle bed so as to be quickly detachable and removable to facilitate changing of jacks. For this purpose each cam element is advantageously provided, in a manner which has not been illustrated in detail, with a lug which extends unilaterally from the element thereby enabling the latter to be inserted into a correspondingly shaped recess in the needle bed. The unilateral lugs thus engage behind restraining portions of the needle bed. The said lugs may advantageously be retained in these positions by means of leaf springs. Conversely, the lugs in the recesses can be moved against the influence of these springs into positions in which the lugs can be lifted out of the recesses in the needle bed for removal of the cam elements.

The advancing lock parts 46' to 53' are mounted for individual adjustment in the needle carriage as shown diagrammatically in FIG. 5A such that they normally have a guide surface 70 applied against the cam track 68 (see also FIG. 6) for which purpose they may be spring biased by springs 82' in the direction of the arrow 83'. The dimensions of the cam elements 69 defining the cam tracks 68 are so selected and so orientated relatively to the patterning butts 55' of the selector jacks 56' in the needle bed that the ridges constituted by the central crests of the said cam elements are located in each case centrally between two successive patterning butts in the same plane. This means that when the carriage moves over the needle bed, the advancing lock parts 46' to 53', during their passage over the cam tracks 68, are always raised into the carriage between two successive patterning butts 55' and hence brought into the operative range of electromagnets 80' which determine whether advancing lock parts shall be held under magnetic action in this upper position, the electromagnets 80' acting in the direction of the arrow 84' and thus outside the range of action of the patterning butts 55', or whether such parts shall immediately be dropped again along the cam track so that the next following patterning butt in the same plane likewise will be able to run up the bevel surface of the advancing

lock part. The electromagnets can also be so-called holding magnets, e.g., in the form of permanent magnets, the magnetic field of each of which may have superimposed thereupon the field of an opposed electromagnet, depending on the pattern. The switches 81' of the electromagnets 80' are capable of being energized as dictated by the pattern to retain the advancing lock parts in their upper retracted positions.

The illustrated and described embodiments of the invention are applied to normal flat bed knitting machines with needle beds which are relatively arranged in an inclined V-arrangement. The invention may, however, also be employed in similar fashion in links/links flat bed knitting machines, additional advancing lock parts then being provided in the needle transfer part of the complete lock of the machine, for use in effecting transfer of stitches from or/and reception of stitches by needles in accordance with the pattern.

It is to be clearly understood that the particular form of the electromagnetic devices, e.g., control magnets, employed for controlling and selectively retaining advancing lock parts temporarily in their inoperative positions, the way in which these devices are actually arranged in relation to the said cams and the pattern influenced means for transmitting signals to such electromagnetic devices are all themselves already known and form no actual part of the invention; it is for this reason that the said devices are not illustrated in detail.

Although the invention has been described in considerable detail with respect to preferred embodiments thereof, it will be apparent that the invention is capable of numerous modifications and variations apparent to those skilled in the art, without departing from the spirit and scope of the invention.

I claim:

1. In a flat bed knitting machine of the type which includes jacks mounted in needle tricks in the needle beds and arranged to control the movement of the needles, the said needle-actuating jacks being operated by selector jacks controlled by patterning locks of a machine carriage in accordance with the pattern as the carriage moves relative to the beds, and in which patterning butts on successive selector jacks in the needles beds are disposed in different planes in a staggered formation; the improvement wherein each patterning lock of the machine has, for each plane of patterning butts first means for acting on the selector jacks in that plane to operate their respective needle-actuating jacks, adjustable advancing lock parts for selectively causing selector jack butts to be operated by said first means, control means for electrically controlling the operation of each advancing lock part independently of one another in accordance with the pattern, said adjustable advancing lock parts, viewed in the direction of travel at any time of the carriage, being arranged in advance of a characteristic operating position of the needles such that, in their operative condition and in conjunction with longitudinal displacement of the selector jacks concerned, they bring about an interruption of the operation of the associated needles and including returning means for returning said selector jacks to their original positions after their respective needles pass each said characteristic position.

2. A flat bed knitting machine according to claim 1, wherein the said advancing lock parts are displaceably mounted in the patterning locks of the machine carriage and are provided with guide surfaces held against fixed cam tracks which extend in the longitudinal direction of the needle beds, between the said planes of patterning butts, such that after each selection of selector jacks, the advancing lock parts, selectable in accordance with the pattern, are positively lifted by the fixed cam tracks clear of the patterning butts and into the range of action of said control means which comprises electrical retaining elements which are so selectively influenced as either to hold advancing lock parts in their lifted positions or to permit such lock parts to fall again for action upon predetermined patterning butts.

3. A flat bed knitting machine according to claim 2, wherein each cam track comprises initially separate parts which function to retain jacks in the needle beds and are readily removable from the bed to permit of changing jacks.

4. A flat bed knitting machine according to claim 2, wherein a holding magnet, the energized condition of which is controlled in accordance with the pattern, is associated with each advancing lock part as a retaining element, and the advancing lock parts pass along the cam tracks during movement out of the range of the patterning butts and, in each instance, into the range of action of the holding magnets, the advancing lock parts and the associated holding magnets being arranged in the carriage of the machine and having no movement relatively to one another in the direction of travel of the carriage.

5. A flat bed knitting machine according to claim 2, wherein the advancing lock parts are spring biased towards the cam tracks.

6. A flat bed knitting machine according to claim 2, wherein each of the cam tracks is defined by a series of identical cam elements which are juxtaposed in a row, these cam elements additionally forming abutments for the patterning butts of the selector jacks for limiting the longitudinal displacement of the said jacks.

7. A flat bed knitting machine according to claim 6, wherein the cam elements are detachably secured in the needle bed by spring urged engagement of lugs on the elements in recesses in the needle bed.

8. A flat bed knitting machine according to claim 1, wherein the selector jacks act on needle-actuating jacks which are pivotally coupled to the needles, or to other jacks which are in turn coupled to the needles such that the operating butts of the said needle-actuating jacks are moved out of the range of action of the locks on the machine carriage, by virtue of resilient bending of the jacks, when the advancing lock parts become effective.

9. A flat bed knitting machine according to claim 8, wherein the pattern locks of the machine carriage include presser lock parts over which run the patterning butts of those selector jacks operated by advancing lock parts.

10. A flat bed knitting machine according to claim 8, wherein each selector jack is pivotally connected to a slider element having a bevel shaped end which is adapted to cooperate with a stationary counter bevel surface on a bar extending in the longitudinal direction

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of the needle beds transversely to the needle tricks therein.

11. A flat bed needle bed according to claim 1, wherein the said advancing lock parts are displaceably mounted in patterning locks of the machine carriage, between the said planes of patterning butts, presser lock parts fixed on the carriage between said advancing lock parts and extending in the longitudinal direction of said carriage, such that when an advancing lock part is in the operative position, it moves a patterning butt

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onto a presser lock part located adjacent thereto.

12. A flat bed needle bed according to claim 11, wherein said returning means includes restoring lock parts fixed on the carriage between the planes and arranged to restore selected patterning butts to their original position.

13. A flat bed needle bed according to claim 11, including a separate electromagnet for operating each advancing lock part.

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