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Findlay et al.

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[54] **PATTERNING MECHANISMS FOR KNITTING MACHINES**

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[30] **Foreign Application Priority Data**

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May 14, 1971 Great Britain 15072/71

[52] **U.S. Cl.** ..... **66/50 R**
[51] **Int. Cl.** **D04b 15/78**
[58] **Field of Search** ..... 66/50 R, 50 A, 50 B, 154, 66/156, 25, 36 R, 36 A

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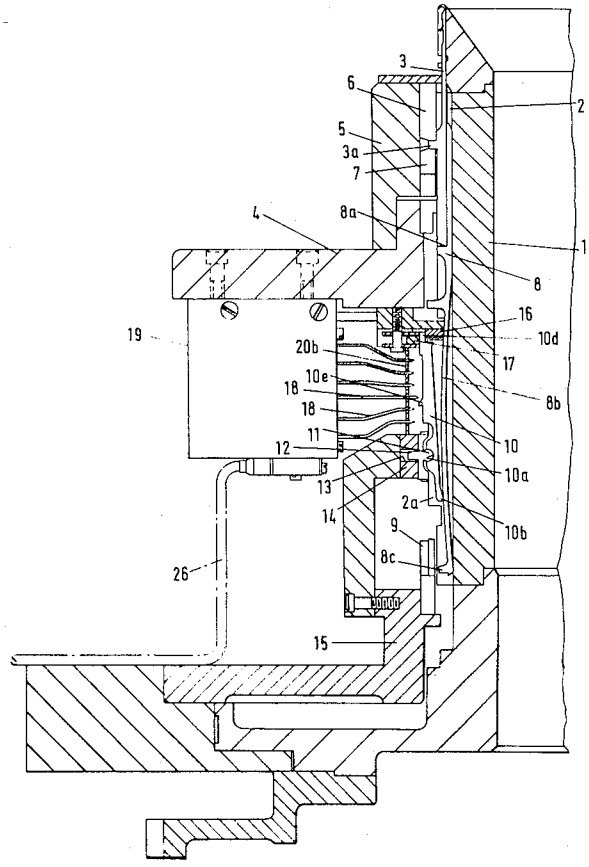
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Attorney, Agent, or Firm—Weiner, Basile and Weintraub

[57] **ABSTRACT**

The invention relates to patterning mechanisms for modified knitting machines. It particularly relates to patterning mechanisms in the form in which the needles are lifted by jacks having lifting butts movable between a position for engagement with a lifting cam at each feed station and a position for missing the lifting cams, the lifting butts being moved to cam-missing position by rocking pressers cammed outwardly on approach to each feed station, to cause retraction of the associated jack, and the rocking pressers having, or being associated with, patterning butts which cooperate with selectors which either miss the patterning butts to retain the lifting butts in cam-missing position, or strike the patterning butts to rock the pressers to cause return of the lifting butts to the lifting cam engaging position. According to the invention, the action to operate the pressers to move the lifting butts to cam-engaging position comprises a first motion in one direction parallel with the needles, and a second motion perpendicular to the needles to complete the operation of the pressers, one of said two motions being applied to the pattern butts by the selectors, and the other being applied to the pressers by a formation fixed relative to the lifting cam.

14 Claims, 6 Drawing Figures



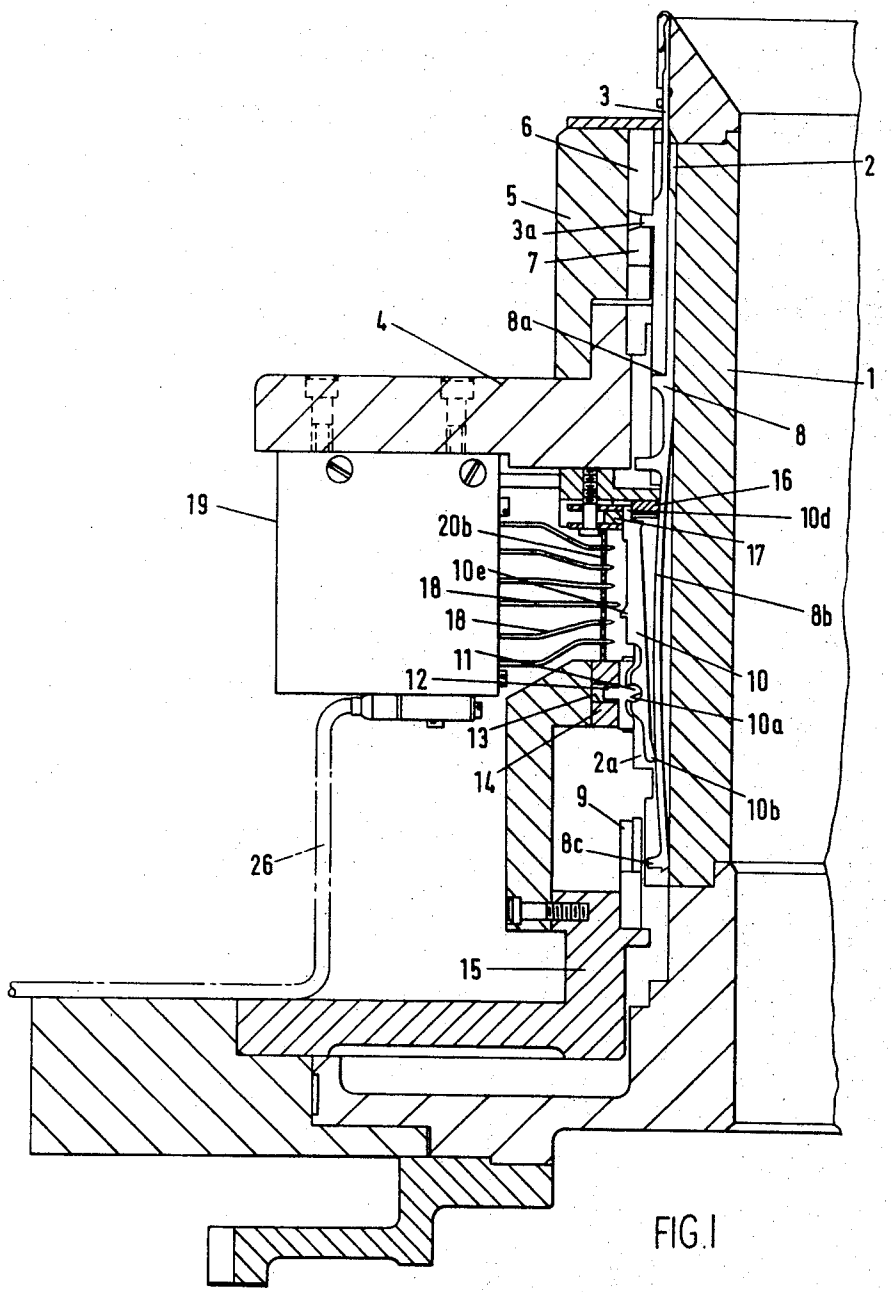

3
6
2
5
3a
7
8a
4
1
8
16
19
10d
20b
17
10e
8b
18
18
11
10
12
10a
13
2a
14
9
10b
8c
26
15

FIG. 1

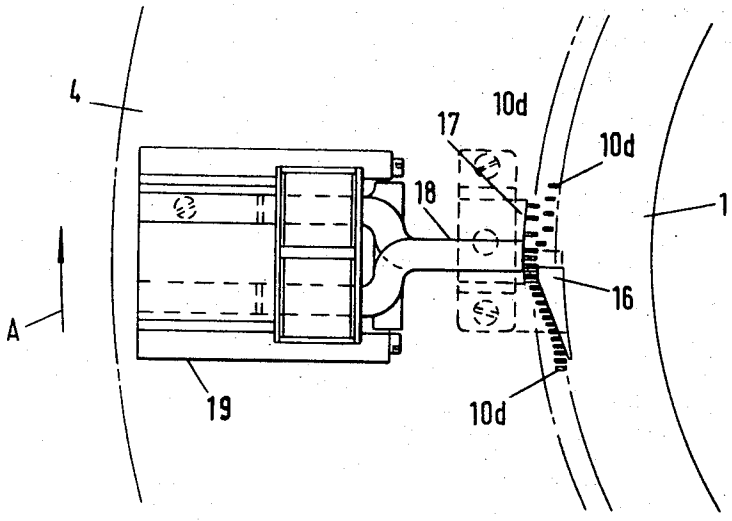


FIG.2

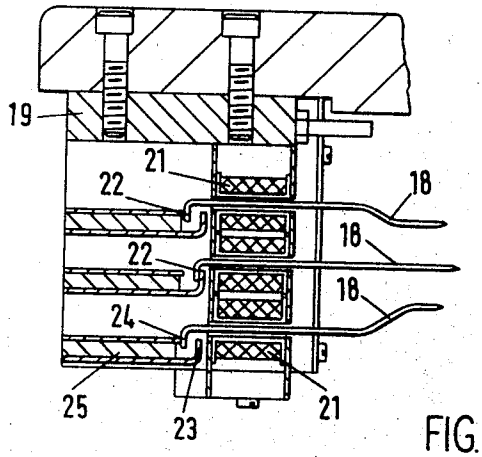


FIG.3

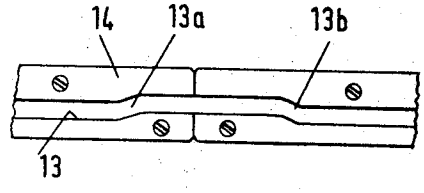


FIG.4

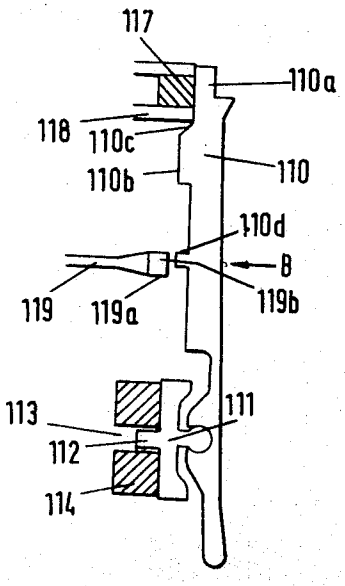

117
110a
118
110c
110b
110
110d
B
119
119a
119b
113
112
114
111

FIG.5

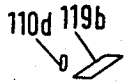

110d
119b
θ

FIG.6

PATTERNING MECHANISMS FOR KNITTING MACHINES

This invention relates to patterning mechanisms for multifeed knitting machines.

Knitting machines comprise a plurality of needles which are associated with patterning butts, which may be on the needles themselves, but are more usually on lifting jacks for the needles or on operating pressers for the jacks. The patterning butts are arranged so as to co-operate with selectors controlled by a pattern control mechanism so as to engage or miss the successive pattern butts to influence the action or non-action of the successive needles to form a pattern.

In one particular form of patterning mechanism, the needles are lifted by jacks having lifting butts movable between a position for engagement with a lifting cam at each feed station and a position for missing the lifting cams, the lifting butts being moved to cam-missing position by rocking pressers cammed outwardly on approach to each feed station, to cause retraction of the associated jack, and the rocking pressers having, or being associated with, patterning butts which cooperate with selectors which either miss the patterning butts to retain the lifting butts in cam missing position, or strike the patterning butts to rock the pressers to cause return of the lifting butts to the lifting cam engaging position.

In a particular type of mechanism of such a form, the lifting butts are urged into cam-engaging position by inherent springiness of the jacks and the rocking pressers are held in the outward position by a permanent magnet opposing the spring force exerted by the jacks. In this type of mechanism, the engagement of the patterning butts on the selectors causes release of the pressers from the permanent magnet and the springiness of the jacks causes completion of the return of the lifting butts to lifting cam engaging position. The actual reaction force required to be absorbed by the selector is thus quite small.

In an alternative type of mechanism of such a form, the jacks may be rocking jacks, which have their lifting butts retracted, and the lifting butts of selected jacks positively moved to lifting cams engaging position by engagement between the pattern butts and the selectors.

It will be appreciated that such a mechanism is applicable to machines with stationary or movable cam boxes.

According to a first aspect of the invention, there is provided a patterning mechanism of the form described in which the action to operate the pressers to move the lifting butts to cam engaging position, comprises a first motion in one direction parallel with the needles and a second motion perpendicular to the needles to complete the operation of the pressers, one of said two motions being applied to the pattern butts by the selectors, and the other being applied to the pressers by a formation fixed relative to the lifting cam.

According to a second aspect of the present invention, there are provided, in a patterning mechanism of the form described, selectors which move substantially horizontally in translation in and out of butt-engaging position, and means for causing the pattern butts to follow a short upward movement into the path of the selectors, whereby engagement between the pattern butts and the selectors is in a vertical direction.

The lifting movement may be achieved by mounting each rocking presser on an individual pivot and causing the pivot to be lifted to impart vertical motion to the pattern butt.

In a machine of the stationary cam box type, the pivots could each be supported by a cam track to lift the pivots at the appropriate parts of each rotation of the needle cylinder.

In such an arrangement the pattern butts would normally be on the rocking presser, but they could be on an extension of the pivot, which would then itself act on part of the rocking pressers.

In an alternative, the rocking pressers would be mounted on fixed pivots and have a degree of sliding movement relative thereto, cam means being provided to ensure the required vertical movement.

According to a third aspect of the invention, there are provided in a patterning mechanism of the described, formations on the rocking pressers to cooperate with formations fixed relative to the lifting cam to release the rocking pressers from the permanent magnet when the rocking pressers are moved in one direction parallel with the needles, and selectors which are adapted to impart movement in the said direction to the selected rocking pressers.

The movement imparted to the pressers by the selectors is preferably a lifting movement when the needle tricks are vertical.

The selectors may be in the form of selector levers which swing horizontally about a vertical pivot or which rock in a vertical plane, or they may be in the form of reciprocating elements movable in translation substantially horizontally into and out of butt engaging position.

In all these cases the selectors will normally have a lifting cam face to engage the pattern butts of the rocking pressers.

The invention will be further described with reference to the accompanying drawings which show preferred embodiments of the invention as applied to a circular knitting machine of the rotating needle cylinder variety, although it will be understood that the invention is more widely applicable.

IN THE DRAWINGS:

FIG. **1** is a vertical section view of said parts of a rotary needle cylinder knitting machine as are necessary for an understanding of the invention and showing a preferred form of patterning mechanism according to the invention;

FIG. **2** is a plan view of the structure of FIG. **1**;

FIG. **3** is a sectional view of part of the structure of FIG. **1**;

FIG. **4** is a developed view of another part of the structure of FIG. **1**;

FIG. **5** is a fragmentary sectional view of part of a knitting machine embodying the invention; and

FIG. **6** is a part elevation in the direction of the arrow B of FIG. **5**.

Referring now particularly to FIGS. **1** and **2**, the circular knitting machine shown comprises a rotary needle cylinder **1** provided with the conventional angularly spaced vertical tricks **2** each of which carries a latch needle **3**. A stationary support plate **4** supports, inter alia, a stationary cam box **5** carrying cams **6** and **7** which cooperates with butts **3***a* of the needles **3**. In each trick **2** there is also a needle lifting jack **8** which

has a supporting shoulder 8*a* for the lower end of the needle, the jack 8 also being provided with a lower spring extension 8*b* carrying at its lower end a lifting butt 8*c*. The springiness of the extension 8*b* is such as to urge the butt 8*c* out of the needle trick so that its path lies over a lifting cam 9 located at the feed station illustrated.

The function of selection at the feed station is to control whether the butt 8*c* engages the cam 9, or whether it is retained in the position illustrated in FIG. 1 in which it passes behind cam 9 and is not lifted, so that the needle does not perform a knitting operation at the feed station.

The position of the jack 8 is controlled by a rocking presser 10 associated with the jack in a forward protrusion 2*a* of the trick 2. Each rocking presser 10 is pivoted by a recess 10*a* about an individual pivot member 11 which rotates with the needle cylinder and is supported heightwise by a projection 12 cooperating with a cam track 13 formed in a support member 14 carried on a stationary part 15 of the machine. The lower end 10*b* of the presser bears on the springy extension of the jack and is adapted to hold the jack within the trick or to release it therefrom.

In order to prepare the jacks for selection, upper ends 10*d* of the pressures 10 are cammed outwardly by a cam 16 supported from the plate 4, and they are held in the outward position by means of a permanent magnet 17, also supported from the plate 4. The spring force of the springy extension 8*b* of the jack 8 is chosen such that when the upper end of the rocking presser is on the magnet 17, the jack will be held in the retracted position, but as soon as the presser is released from the magnet 17, the spring force will overcome the magnetic attraction and complete movement to the outer position with the butt 8*c* in the path of the cam 9.

In order to achieve release of the rocking presser 10 from the magnet 17, each rocking presser is provided with a pattern butt 10*e* cooperable with one of a series of six selectors 18. The pattern butts 10*e* are angled off on their upper sides so as to have a smooth engagement on upward movement with the underside of the selector, which is also provided with a cooperating downwardly facing cam face.

Originally, each rocking presser 10 is provided with a frangible butt for cooperation with each of the selectors, and all but one of these butts is broken away prior to the assembly of the presser into the machine, so that each selector 18 is cooperable with only one rocking presser in six as it reaches the selection station just prior to the feed as the needle cylinder 1 rotates in the direction of the arrow A of FIG. 2.

The selectors are movable in translation between inner and outer positions, and in their inner positions they cooperate with the butts 10*e* to release the rocking presser 10 from the magnet 17 and thereby allow the butt 8*c* to cooperate with the cam 9 to lift the needle to perform a stitch forming operation.

As can be seen from FIG. 4, the cam track 13 is formed with an upwardly inclined portion 13*a* which bodily lifts the pivot 11 and rocking presser 10 so that the butts 10*e* are lifted upwardly into engagement with the corresponding selector 18 if this is in its inner position.

After passing through the selecting station, the cam has a downwardly inclined portion 13*b* which returns the pivots and rockers to the lower position illustrated in FIG. 1 in which the pattern butts 10*e* pass somewhat below the planes of the inner ends of the selectors.

It can be seen from FIGS. 3 and 4 that the selectors 18 are supported for bodily movement substantially radially of the cylinder axis into and out of their butt engaging positions. A guide plate 20b supports the operative nose portions of the selectors 18, and tail end portions are supported by bearings (not shown) in the selector unit 19 which is supported from the support plate 4. The tail end portions of the selectors 18 (see FIG. 3) pass through electromagnetic coils 21 and form moving cores within these coils. Tails 22 on the tail end portions are turned down so as to cooperate with pole pieces 23 and 34 on permanent magnets 25. The coils 21 can be energized in either sense so that the tails 22 can be magnetised at either north or south poles, and are then attracted to one of the pole pieces and repelled from the other to provide a quick and short changeover of the position of the selectors. The selector position is then held by the permanent magnet until a further pulse of opposite polarity is supplied to the coil 21. The pulses are provided from a suitable pattern control system (not illustrated) through a cable 26.

It can be seen from FIG. 2 that the operative nose portions of all of the selectors are aligned in a vertical direction, and these operative nose portions are connected by cranked portions to the tail end portions of the selectors within the selector unit 19 so as to allow a more economical use of the space available.

It will be appreciated that the invention may be supplied with other forms of electromagnetic operation of the selectors, and also that the selectors need not necessarily act in a strictly radial path. It is quite feasible, and may be preferable in certain operating circumstances, for the selectors to be operated on a path which is inclined to the strictly radial direction.

Further, the patterning butts 10*e* need not necessarily be fitted on the rocking presser in this particular construction, since it would be feasible for them to be provided on an upward extension of the pivot portion 11 for bodily movement therewith. Upon engagement by a selector 18 the extension could rock backwardly and would then engage with a portion provided on the rocking presser to release the same from the magnet 17.

As a further alternative, the rocking pressers could be pivotable about fixed pivots, e.g. of the type described in United Kingdom patent specification 1187911 but in such a manner as to have a degree of vertical freedom in relation thereto, and cooperable with a cam or cams to lift and lower them to provide the necessary movement into the planes of the selector ends.

It will be appreciated that by having the pattern butts movable in a generally vertical direction into engagement with the broad selectors, the engagement force between these is generally vertical, so that any reaction arising from contact between selectors and the pattern butts is largely absorbed in the supporting guides for the selectors and is not taken by the magnetic attraction between the tails and the pole pieces 23 and 24.

FIG. 5 shows one rocking presser 110 of a modified form of the invention. The presser 110 is pivoted on an individual pivot member 111 rotating bodily with the needle cylinder and having a projection 112 supported heightwise by a generally circumferential slot 113 in a support member 114. The slot 113 is widened adjacent

the selection point to allow the pivot to move upwards a short distance together with the presser **110.**

As before, the pressers are all cammed outwardly onto a permanent magnet **117,** mounted in a support member **118** itself supported on the fixed part of the machine. Somewhat below an upper end **110***a* in cooperation with the magnet **117,** the rocking presser **110** is provided with a projection **110***b* having a cam surface **110***c* cooperable with the lower part of the support **118** when the rocking presser **110** is lifted so as to release the upper end **110***a* from the magnet **117** and allow the jack to project from the needle trick.

One selector **119** is illustrated in FIG. **5,** and this may take the form of a radially reciprocable selector, or it may be in the form of a lever rocking about a horizontal or vertical or inclined axis. As can be seen particularly in FIG. **6,** the selector **119** is formed with an enlarged end **119***a* having a lifting cam surface **119***b* which cooperates with the pattern butt **110***d* of the rocking presser to lift the selected rocking pressers so that their cam surface **110***c* engage the support member **118** and release the rocking pressers from the permanent magnet **117.** The non-selected pressers continue in engagement with the magnet **117** and the corresponding jacks remain retracted into the needle trick and pass behind the lifting cam.

Various other modifications may be made within the scope of the invention. For instance, the inherently springy jacks may be replaced by rocking jacks, and the permanent magnet could then be dispensed with. The return movement of the lifting butts to position for engaging the lifting cam would then be positive and wholly achieved by the cam faces on the selector and the fixed formation.

We claim:

1. In a patterning mechanism of the type in which the needles are lifted by jacks having lifting butts movable between a position for engagement with a lifting cam at each feed station and a position for missing the lifting cams, the lifting butts being moved to cam missing position by rocking pressers cammed outwardly by approach to each feed station to cause retraction of the associated jack, and the rocking pressers having associated therewith patterning butts which cooperate with selectors which either miss the patterning butts to retain the lifting butts in cam missing position, or strike the patterning butts to rock the pressure to cause return of the lifting butts to the lifting cam engaging position, the improvement which comprises:

means for operating each presser in two directions to move the lifting butts to cam-engaging position, one of said direction being parallel to the needles, and the other being perpendicular to the needles,

each presser being pivoted about an individual pivot member which is supported by means formed in a support member carried on a part of the machine fixed relative to the lifting cam and wherein,

engagement between the pattern butts and the selectors defines means for one of said two directions, and a formation which is fixed relative to the lifting cam defines means for the other direction.

2. In a patterning mechanism of the type in which the needles are lifted by jacks having lifting butts movable between a position for engagement with a lifting cam at each feed station and a position for missing the lifting cams, the lifting butts being moved to cam-missing position by rocking pressers cammed outwardly on approach to each feed station to cause rotation of the associated jack, and the rocking pressers having associated therewith patterning butts which cooperate with selectors which either miss the patterning butts to retain the lifting butts in cam missing position, or strike the patterning butts to rock the pressers to cause return of the lifting butts to the lifting cam engaging position, the improvement that the selectors are mounted to move substantially horizontally in translation into and out of butt-engaging position, and means for causing the pattern butts to follow a short upward movement into the path of the selectors, said means comprising for each presser a pivot member about which said each presser is pivoted, the pivot member being supported by means formed in a support member carried on a part of the machine fixed relative to the lifting cam, whereby engagement between the pattern butts and the selectors is in a vertical direction.

3. In a patterning mechanism of the form in which the needles are lifted by jacks having lifting butts movable between a position for engagement with a lifting cam at each station and a position for missing the lifting cams, the lifting butts being moved to cam missing position by rocking pressers cammed outwardly on approach to each feed station, to cause retraction of the associated jack, and the rocking pressers having, or being associated with, patterning butts which cooperate with selectors which either miss the patterning butts to retain the lifting butts in cam missing position, or strike the patterning butts to rock the pressers to cause return of the lifting butts to the lifting cam engaging position; in which the lifting butts are urged into cam-engaging position by inherent springiness of the jacks and the rocking pressers are held in the outward position by a permanent magnet opposing the spring force exerted by the jacks; the improvement that the selectors are mounted to move substantially horizontally in translation into and out of butt-engaging positions, and means for causing the pattern butts to follow a short upward movement into the path of the selectors whereby engagement between the pattern butts and the selectors is in a vertical direction, said means for causing the pattern butts to follow a short upward movement comprising a pivot member for each of the pressers and about which each presser is pivoted, the pivot member being supported by means formed in a support member carried on a part of the machine fixed relative to the lifting cam.

4. A patterning mechanism as claimed in claim **2,** in which the pattern butts are on the pressers themselves.

5. A patterning mechanism as claimed in claim **2,** wherein the machine is of the stationary cam box type, the means for supporting the pivot member is a cam track, the pivot member including a projection which rides in the cam track, the cam track adapted to lift the pivot members in the regions of the selectors at each rotation of the needle cylinder.

6. A patterning mechanism as claimed in claim **5,** in which the pattern butts are on the pressers themselves.

7. In a patterning mechanism of the form in which the needles are lifted by jacks having lifting butts movable between a position for engagement with a lifting cam at each feed station and a position for missing the lifting cams, the lifting butts being moved to cam missing posi-

tion by rocking pressers cammed outwardly on approach to each feed station, to cause retraction of the associated jack, and the rocking pressers having, or being associated with, patterning butts which cooperate with selectors which either miss the patterning butts to retain the lifting butts in cam missing position, or strike the patterning butts to rock the pressers to cause return of the lifting butts to the lifting cam engaging position; the improvements comprising formations provided on the rocking pressers and formations fixed relative to the lifting cams which cooperate with the formations on the rocking pressers to move the lifting butts into cam-engaging position when the rocking pressers are moved in one direction parallel with the needles, and selectors which are adapted to impart movement in the said direction to the selected rocking pressure, the fixed formation including a pivot member about which each presser is pivoted, the pivot member being supported by means formed in a support member carried on a stationary part of the machine.

8. A patterning mechanism as claimed in claim **7**, in which the lifting butts are urged into cam-engaging position by inherent springiness of the jacks and the rocking pressers are held in the outward position by a permanent magnet opposing the spring force exerted by the jacks.

9. A patterning mechanism as claimed in claim **7**, in which the needle tricks are vertical and the movement imparted to the pressers by the selectors is a lifting movement.

10. A patterning mechanism as claimed in claim **7**, in which the selector are in the form of reciprocating elements movable in translation substantially horizontally into and out of butt engaging position.

10. A patterning mechanism as claimed in claim **7**, in which the selectors have a lifting cam face to engage the pattern butts of the rocking pressers.

11. In a patterning mechanism of the type in which the needles are lifted by jacks having lifting butts movable between a position for engagement with a lifting cam at each feed station and a position for missing the lifting cams, the lifting butts being moved to cam missing position by rocking pressers cammed outwardly by approach to each feed station to cause retraction of the associated jack, and the rocking pressers having associated therewith patterning butts which cooperate with selectors which either miss the patterning butts to retain the lifting butts in cam missing position, or strike the patterning butts to rock the pressers to cause return of the lifting butts to the lifting cam engaging position, the improvement which comprises:

means for operating each presser in two directions to move the lifting butts to cam-engaging position, one of said direction being parallel to the needles, and the other being perpendicular to the needles, each presser being pivoted about an individual pivot member which is supported by means formed in a support member carried on a part of the machine fixed relative to the lifting cam and wherein, engagement between the pattern butts and the selectors defines means for one of said two directions, and a formation which is fixed relative to the lifting cam defines means for the other direction.

12. In a patterning mechanism of the type in which the needles are lifted by jacks having lifting butts movable between a position for engagement with a lifting cam at each feed station and a position for missing the lifting cams, the lifting butts being moved to cam missing position by rocking pressers cammed outwardly by approach to each feed station to cause retraction of the associated jack, and the rocking pressers having associated therewith patterning butts which cooperate with selectors which either miss the patterning butts to retain the lifting butts in cam missing position, or strike the patterning butts to rock the pressers to cause return of the lifting butts to the lifting cam engaging position, the improvement which comprises:

means for operating each presser in two directions to move the lifting butts to cam-engaging position, one of said direction being parallel to the needles, and the other being perpendicular to the needles, each presser being pivoted about an individual pivot member which is supported by means formed in a support member carried on a part of the machine fixed relative to the lifting cam and wherein, engagement between the pattern butts and the selectors defines means for one of said two directions, and a formation which is fixed relative to the lifting cam defines means for the other direction.

13. In a patterning mechanism of the type in which the needles are lifted by jacks having lifting butts movable between a position for engagement with a lifting cam at each feed station and a position for missing the lifting cams, the lifting butts being moved to cam-missing position by rocking pressers cammed outwardly on approach to each feed station to cause rotation of the associated jack, and the rocking pressers having associated therewith patterning butts which cooperate with selectors which either miss the patterning butts to retain the lifting butts in cam missing position, or strike the patterning butts to rock the pressers to cause return of the lifting butts to the lifting cam engaging position, the improvement that the selectors are mounted to move substantially horizontally in translation into and out of butt-engaging position, and means for causing the pattern butts to follow a short upward movement into the path of the selectors, said means comprising for each presser a pivot member about which said each presser is pivoted, the pivot member being supported by means formed in a support member carried on a part of the machine fixed relative to the lifting cam, whereby engagement between the pattern butts and the selectors is in a vertical direction.

14. In a patterning mechanism of the form in which the needles are lifted by jacks having lifting butts movable between a position for engagement with a lifting cam at each station and a position for missing the lifting cams, the lifting butts being moved to cam missing position by rocking pressers cammed outwardly on approach to each feed station, to cause retraction of the associated jack, and the rocking pressers having, or being associated with, patterning butts which cooperate with selectors which either miss the patterning butts to retain the lifting butts in cam missing position, or strike the patterning butts to rock the pressers to cause return of the lifting butts to the lifting cam engaging position; in which the lifting butts are urged into cam-engaging position by inherent springiness of the jacks and the rocking pressers are held in the outward position by a permanent magnet opposing the spring force exerted by the jacks; the improvement

that the selectors are mounted to move substantially horizontally in translation into and out of butt-engaging positions, and means for causing the pattern butts to follow a short upward movement into the path of the selectors whereby engagement between the pattern butts and the selectors is in a vertical direction, said means for causing the pattern butts to follow a short upward movement comprising a pivot member for each of the pressers and about which each presser is pivoted, the pivot member being supported by means formed in a support member carried on a part of the machine fixed relative to the lifting cam.

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