

April 30, 1968

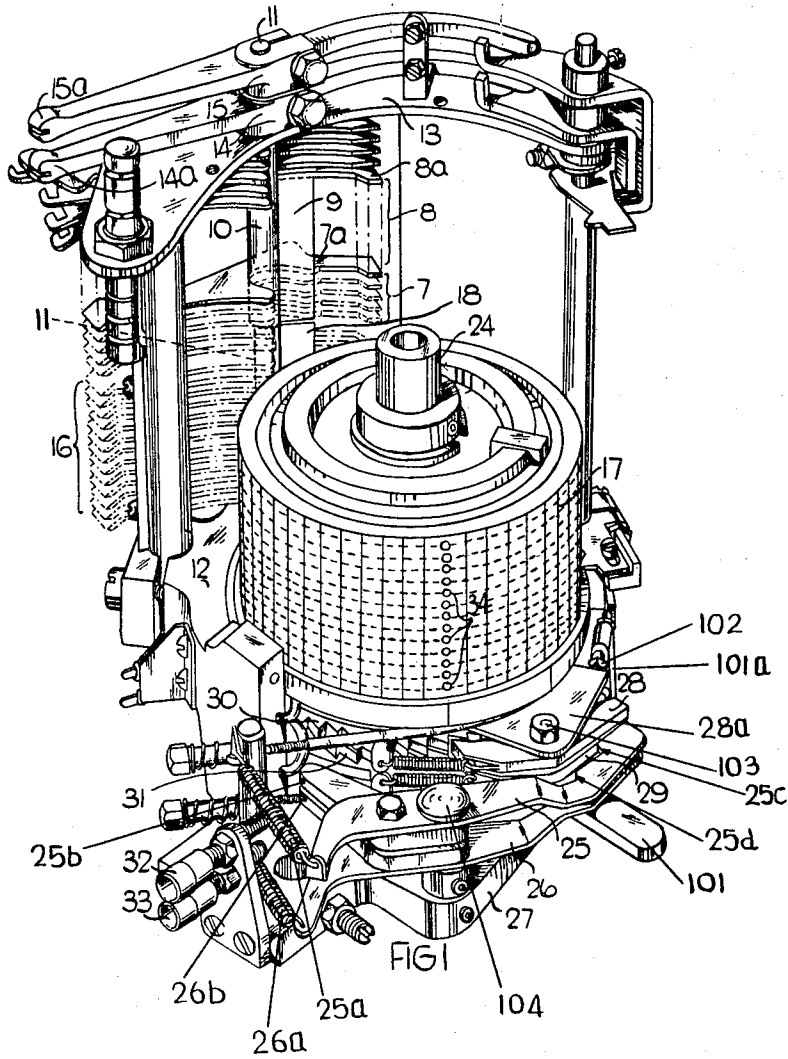
R. PEBERDY

3,380,265

KNITTING MACHINES

Filed Sept. 1, 1964

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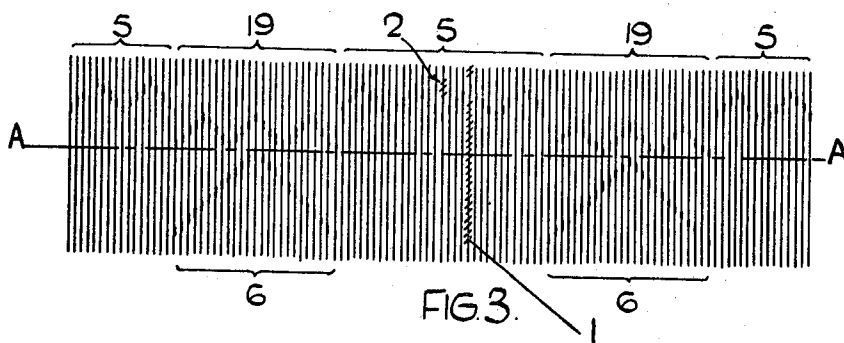
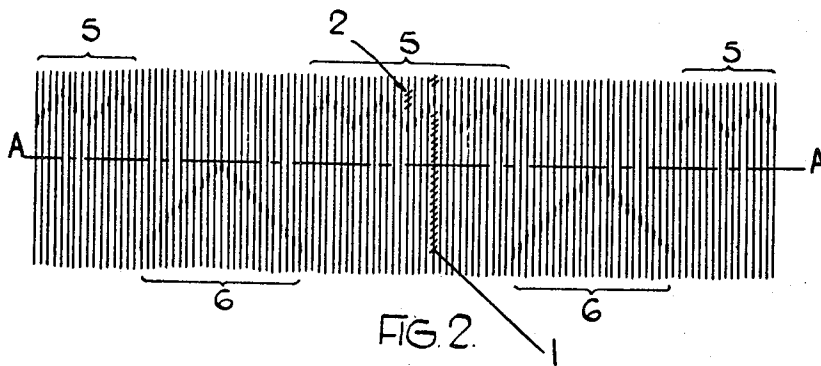
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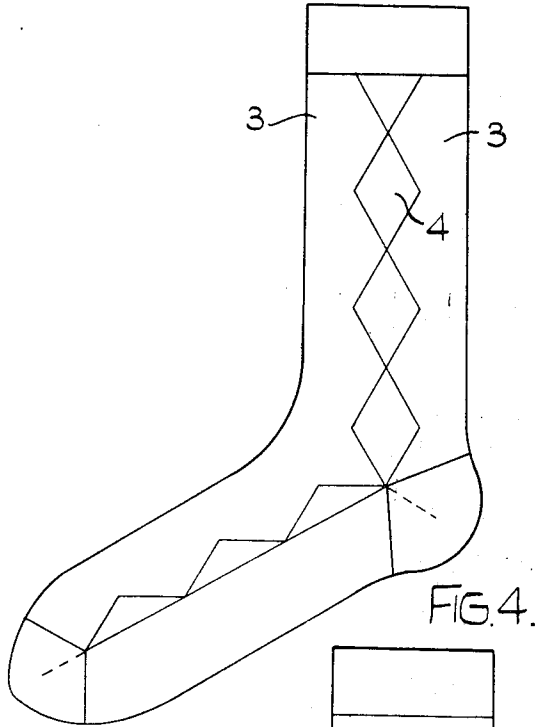


FIG. 4.

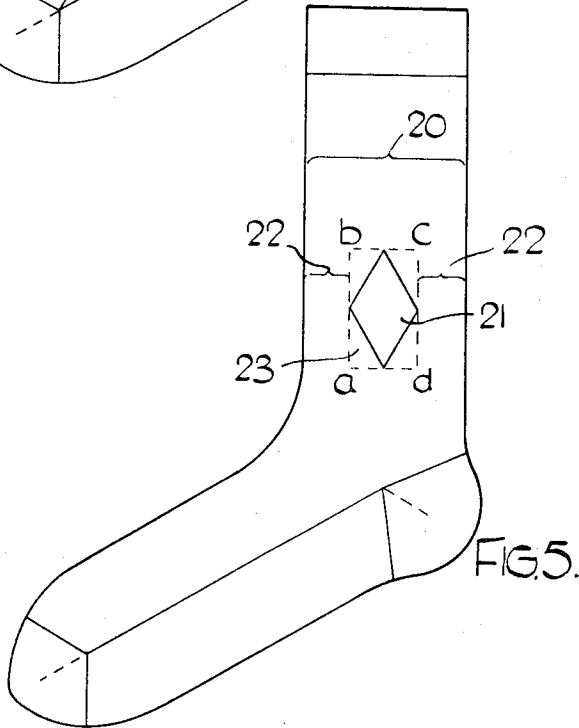


FIG. 5.

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**KNITTING MACHINES**

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8 Claims. (Cl. 66—14)

**ABSTRACT OF THE DISCLOSURE**

A patterning mechanism in a circular knitting machine of the opposed needle cylinder type has a pattern drum adapted to have patterning projections set up at selected peripheral locations in a plurality of axially spaced rings, selector levers appropriated one to each ring of projection locations on the drum for operation as the drum is racked around, by projections set up on the drum, each lever being movable between an operative location in which it is disposed for actuation by an appropriate projection on the drum and an inoperative position in which it is not so disposed. These levers are sub-divided into two banks associated with different groups of rings of projection locations on the drum, one bank being further sub-divided into two sub-groups, control means including bluffing means common to said two sub-groups and operable in two steps successively to move first one and then the other of the two sub-groups of selector levers en bloc to inoperative position, and further control means operable to move the selector levers of the other bank en bloc to inoperative position.

This invention relates to knitting machines and is particularly concerned with patterning mechanism, of the type used to vary the stitch structure of a knitted fabric, in circular knitting machines of the opposed needle cylinder type: that is to say machines having two coaxial opposed (e.g. superimposed) needle cylinders (termed a plain cylinder and a rib cylinder), double ended needles operable in either cylinder to produce rib or plain needle loops and capable of transfer between the two cylinders to knit plain or rib fabric and to change the rib pattern, sliders in each cylinder for operating the needles, cams for operating the sliders, and needle selectors associated with one of the cylinders for sliding the sliders to obtain selective needle operation, under the control of patterning mechanism.

Types of stitches which are used frequently to create pattern effects in articles of hosiery are purl stitches interspersed with plain stitches (i.e. links-links patterns) and also non-knit stitches (i.e. float or tuck stitches).

With a multi-feed knitting machine of the said opposed needle cylinder type equipped with patterning mechanism associated with each feeding station it is possible to combine links-links with float stitch effects, and by feeding yarns of different colours a large variety of patterns is made available.

A very effective design for an article of hosiery can be obtained by producing an overall small pattern as a background to a strong design which may appear down both sides of the leg and foot. A desirable variation in this type of article would be obtained if the strong design, instead of repeating down the sides of the leg, was only allowed to occur once say, so as to become an isolated design completely surrounded by the overall small background pattern.

It is to a means for modifying existing patterning mechanism to achieve this desired effect that this invention is directed.

The existing pattern mechanisms are of the pin-drum type having a bank of needle selector levers. Each lever is pivotally mounted in such a manner that when that end of the lever which co-operates with the pin drum is acted on by a pin projecting from the drum, the opposite end of the lever is lifted away from the butts of needle selectors carried by the needle cylinder. The pin drum may be split to make an upper and lower drum, each of which may be racked individually. This type of split drum permits a different pattern of pins to be laid out on each drum. Thus one drum may have the pins positioned to produce the overall small patterned background while the other drum has the pins arranged to provide the strong design down both sides of the leg and foot. The bank of selector levers, which extends across both top and bottom pattern drums, is provided with a control which lifts the levers en bloc away from the pins in the drum thus pivoting the other ends of the levers away from the butts of the selectors so that patterning is interrupted.

The present invention provides in a circular knitting machine of the opposed needle cylinder type, a patterning mechanism comprising a pattern drum (e.g. a pin drum) equipped or adapted to be equipped with patterning projections (e.g. pins) at selected peripheral locations in any selected rings of a plurality of axially spaced rings, selector levers appropriated one to each ring for actuation by projections in that ring as the drum is racked round thereby to select needles for predetermined patterning operations, each of which lever is movable between an operative location in which it is so disposed as to be actuated and an inoperative position in which it is not so disposed which levers are sub-divided into two banks associated respectively with a different group of the rings and one of which banks is further sub-divided into two sub-groups, a control operable in two steps to move first one and then the other of the two sub-groups of selector levers en bloc to inoperative position, and a further control operable to move the selector levers of the other bank en bloc to inoperative position. The drum may consist of a unitary drum, or of upper and lower drums capable of being racked individually.

For further explanation of the foregoing and other provisions of the invention, a patterning unit and butt set-out for producing an article of hosiery having an overall small background pattern and a strong design down both sides of the leg, will now be described, by way of example, with reference to certain of the accompanying drawings in which:

FIGURE 1 is a perspective view of an improved patterning unit with certain parts removed for clarity,

FIGURE 2 is a developed view of a previously known needle selector butt arrangement,

FIGURE 3 is a modified arrangement of FIGURE 2 for use with the improved mechanism,

FIGURE 4 is a diagrammatic view of a previously known sock having a small patterned background and a strong design down the side of the leg and foot,

FIGURE 5 is a variation of the design of sock shown in FIGURE 4 made possible by the modified patterning mechanism.

FIGURE 1 shows a somewhat modified form of a patterning unit of generally orthodox construction as used on a circular knitting machine such as one used for knitting men's socks. The unit illustrated has two pin drums, one of which is shown at 17, mounted respectively on a sleeve 24 and a spindle (not shown). The drums, when in action, are racked round at suitable intervals by pawls 28 and 29 associated with rack wheels 30 and 31 and controlled by bluffing levers 25 and 26. The levers 25 and 26 are operated in any convenient way, for example, by Bowden cable mechanism which may be connected to the unit at 32 and 33. Each drum is formed with circular

rows of sockets holes **34** to receive outwardly projecting pins which are set up in arrangement to suit particular patterning dictates. The pins co-operate with portions of selector levers indicated at **7**, **8** and **16** to move appropriate selector levers to cause them to co-operate with selector butts at appropriate levels in known manner.

A racking arm **101** is mounted for oscillatory movement about the axis of the drum and has an upstanding projection **101a** which is equipped with two hexagon headed screws, one of which is shown at **102**. The head of screw **102** is positioned to contact an edge of a pawl carrying plate **28a**, which is also mounted for oscillatory movement about the axis of the drum. Pawl **28** is mounted on a shoulder screw **103**, secured to the plate **28a**. In like manner pawl **29** is mounted on a plate (not shown) which may be oscillated about the drum axis by contact with the head of the second screw such as **102** carried by the upstanding projection **101a**.

The pawls **28** and **29** are given racking motions in conventional manner by contact of the arm **101** with a cam which encircles the needle cylinder.

Lever **25** and **26** are pivotally mounted on a post **104** secured to the base **27**. They are urged in a clockwise direction by springs **25a** and **26a** against the action of cables (not shown) carried by the cable adjusting screws **32** and **33**. The cable nipples locate in slots **25b** and **26b** of arms attached to the levers **25** and **26**.

The ends of the levers **25** and **26** adjacent the pawls **28** and **29** are shaped to provide steps such as **25c** and **25d**. Each step provides a stop capable of limiting the fall-back of a pawl. The position of each lever is controlled by means of its respective cable from suitable cams carried by the main control drum of the machine so that either the stepped end is completely removed from its respective pawl, or one or the other step is positioned to limit the fall back of the pawl. If the pawl is allowed to fall back completely it will rack a tooth through two pitches. If the fall back is restricted by step **25c** the pawl will rack a tooth through one pitch only and if the fall back is restricted by step **25d** the pawl is unable to rack at all.

The selector butt set-out shown in FIGURE 2 is used to produce an article such as that shown in FIGURE 4. The pins in the top drum operate selector levers which co-operate with the butts shown above the line A—A and the pins of the lower drum operate selector levers co-operating with butts shown below line A—A. The camming ends of the selector levers are shown as **1** and those of the delayed selector levers are shown as **2**. (Delay selector levers are always required to "bridge" the line of butts when the levers are lowered in, or lifted out, during patterning.)

The pins in the upper drum are arranged to actuate the selector levers to produce an overall small pattern in area shown as **3** in FIGURE 4. The pins in the lower drum are arranged to produce the strong design shown as **4** in FIGURE 4. As can be seen in FIGURE 2 the selector butts **5** are arranged on selectors in each trick of the two arcs of circumference of the needle cylinder which extend between the panels of butts **6** which control the needles which knit the strong design down each side of the sock. Thus the selector levers associated with the pins of the upper drum will act upon butts **5** to produce the overall small pattern in the areas **3** FIGURE 4 while the selector levers associated with the pins of the lower drum will act upon butts **6** to produce the strong design such as **4** down each side of the sock. By using split drums, either drum may be racked independently thus allowing, say, single racking on one and double racking on the other etc. to increase the patterning scope.

The modification to this patterning mechanism which is necessary to produce the article shown in FIGURE 5 will now be described.

FIGURE 1 shows a modified patterning unit. The upper drum has been removed to enable the selector levers

to be seen. The control to the bank of levers has now been split so that instead of a single control spanning the levers associated with both drums, the levers have been split into two banks, one for each drum and each having its own control.

In addition to this the levers of one of the banks (in this case the upper bank) are also formed into two sub-groups, one sub-group having a projection formed on an edge of each selector lever, the said edge being that which is acted upon by the common control for the two groups forming the upper bank. In the present instance there are five levers indicated by the number **7** in FIGURE 1 which have the projection **7a**. The levers immediately above them are represented by chain dot lines **8** and the top lever of this sub-group is shown as **8a**. These levers do not have a projection. (A group of four selector levers are shown above lever **8a** but these may be disregarded so far as this description is concerned.) There is a control common to both sub-groups, in the form of a flat bar **9** which is attached to a tube **10** carried on a vertical spindle **11** which has a bearing in the cast base **12** of the patterning unit. The tube **10** and spindle **11** protrude through a top plate **13** of the unit and are each provided with a lever **14** and **15** respectively. The levers are operated from the main control drum by cables attached to the ends **14a** and **15a** of the levers. By pulling on the cables the levers are urged in a contra-clockwise direction, thus the lever **14** will turn the tube **10** about the spindle **11** to cause the attached bar **9** to lift first the levers **7** of one sub-group by contact with the projection **7a** and then by pulling the cable further the sub-group of levers **8** will also be lifted. The levers forming the upper bank are thus lifted out of action in two steps, one step for each sub-group, by two successive pulls on the cable obtained from a two step cam on the main control drum. The levers **14** and **15** are returned by spring means when tension is released in the cables.

The lower bank of levers **16** associated with the lower pattern drum **17** are operated in similar fashion. They are not split into two sub-groups but are all lifted out of action by a single pull on the cable attached to end **15a** of lever **15**, the lever being attached to the spindle **11** which is provided with a bar **18** for lifting the bank of levers **16** out of action en bloc.

If reference is made to FIGURE 3 it will be seen that two more groups of butts **19** have been introduced by providing another butt on each needle selector having a butt **6**. These butts **19** are positioned to be operated on by the group of selector levers **7** having the projection **7a**.

The small background pattern can now be produced all round the sock (as indicated in FIGURE 5 by the number **20**) by using only the upper pattern drum and the two groups of selector levers of the upper bank acting upon butts **5** and **19** FIGURE 3.

At the commencement of the isolated pattern **21** FIGURE 5 the lever **14** FIGURE 1 is operated by its cable to lift only the selector levers **7** (by contact with their projection **7a**) clear of the butts **19**. At the same time the lever **15** is operated by its cable to lower the selector levers **16** into the path of the butts **6** for selection according to the pattern of pins in the lower drum.

The result of this will be that the small pattern will continue in the areas **22** FIGURE 5 by using butts **5** FIGURE 3. It will cease in the wales contained in the isolated pattern area **21** so that the different pattern set-out on the lower pin drum may be obtained by using butts **6**. It should be pointed out that, where the background pattern is required inside the wales and courses bordering the isolated pattern area, e.g. in corners **23** in FIGURE 5, the selection of needles is made from butts **6**, the pins of the lower drum being arranged to provide the necessary selection for all stitches in the rectangle *abcd*.

At the finish of the isolated pattern area **21** the lever is again operated to lift the lower bank of selector levers **16** clear of butts **6** and leave their needle selectors free

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for continuation of the background pattern on butts 19, the lever 14 having been again operated to lower selector levers 7 back into action.

Patterning is continued as long as desired using the top drum only. The lever 14 is then operated by its cable through the complete movement necessary to lift both sub-groups of the upper bank of levers out of action.

What I claim is:

1. In a circular knitting machine of the opposed needle cylinder type, patterning mechanism comprising in combination a pattern drum adapted for mounting of patterning projections at selected peripheral locations in any of a plurality of axially spaced rings, selector levers appropriated one to each ring of projection locations for actuation by projections in the appropriate rings as the drum is racked round so as to select needles for predetermined patterning operations, means for mounting said levers so that each is movable between an operative location in which it is so disposed as to be actuated by an appropriate projection on the drum and an inoperative position in which it is not so disposed, said levers being sub-divided into two banks associated respectively with different groups of rings on the drum, one of which banks of levers is further sub-divided into two sub-groups, control means including bluffing means common to said two sub groups and operable in two steps successively to move first one and then the other of the two sub-groups of the selector levers en bloc to inoperative position, and further control means operable to move the selector levers of the other bank en block to inoperative position.

2. Patterning mechanism according to claim 1 wherein the pattern drum consists of a unitary drum extending continuously across both banks of the levers.

3. Patterning mechanism according to claim 1 wherein the drum consists of upper and lower drum sections separate from one another and capable of being racked individually, such sections being associated respectively with the two banks of the levers.

4. Patterning mechanism according to claim 1 wherein the control means for moving the selector levers to inoperative position comprises bars and means for mounting such bars to extend across the selector levers and permit each bar to turn about its longitudinal axis to deflect the related selector levers to inoperative position.

5. Patterning mechanism according to claim 4 having a control bar forming the bluffing means common to the two sub-groups of the first bank of selector levers and means whereby turning of said bar causes the levers of one sub-group to be engaged and deflected to inoperative

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position before the levers of the other sub-group are similarly engaged and deflected.

6. Patterning mechanism according to claim 5 having provided on the selector levers of the first sub-group projections to co-operate with the related control bar whereby such levers are caused to be deflected by the control bar before said bar engages the selector levers of the other sub-group.

7. In a circular knitting machine of the opposed needle cylinder type, patterning mechanism comprising in combination a pattern drum equipped with means for supporting patterning projections arranged in coaxial circumferential axially spaced rings, a set of selector levers allocated one to each ring of projection locations for actuation during racking of the drum by projections set up thereon to select needles for predetermined patterning operations, means mounting said levers so that each is movable between an operative location in which it is so disposed as to be actuatable by a patterning projection and an inoperative position in which it is not so disposed, said levers being sub-divided into two banks associated respectively with different groups of rings of locations for patterning projections, one of which banks of levers is further sub-divided into two sub-groups, movable control bars associated respectively with the two banks of levers and extending across them for moving the banks of levers respectively groupwise into their inoperative positions, and means whereby movement of the control bar associated with the sub-divided bank of levers is caused when operated to move first one and then the other of the sub-groups of levers groupwise to their inoperative positions.

8. Patterning mechanism according to claim 7 wherein the selector levers of the first sub-group of the sub-divided bank of levers are provided with projections to co-operate with the appropriate control bar, whereby the levers of the first sub-group are caused to be deflected to their inoperative positions before the levers of the other sub-group are so deflected.

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WM. CARTER REYNOLDS, *Primary Examiner.*