(12) UK Patent Application (19) GB (11) 2 076 024 A

(21) Application No 8111510
(22) Date of filing 13 Apr 1981
(30) Priority data
(31) 3017214
(32) 6 May 1980
(33) Fed. Rep. of Germany (DE)
(43) Application published 25 Nov 1981
(51) INT CL³ D04B 15/70 37/02
(52) Domestic classification D1C 1C2 X11
(56) Documents cited None
(58) Field of search D1C
(71) Applicants H. Stoll & Co. Geschaefts-fuehrungsgesellschaft mbH, personally responsible partner to the firm of H. Stoll GmbH & Co., Stollweg 1, 7410 Reutlingen, Federal Republic of Germany

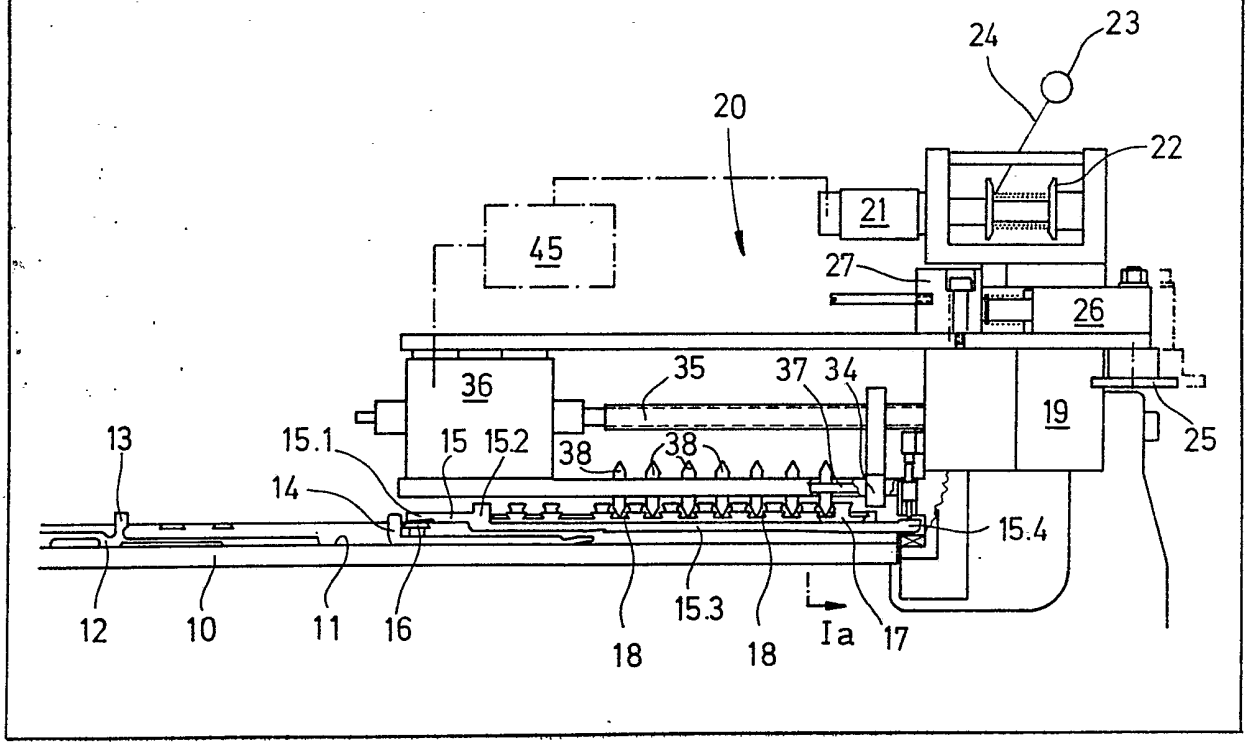
(72) Inventors Ernst Goller, Fritz Walker

(74) Agents E. N. Lewis & Taylor, 144 New Walk, Leicester LE1 7JA

(54) Flat knitting machine having a pattern change arrangement

(57) The invention relates to a flat knitting machine having a pattern change arrangement in which there is automatic positioning of the selector butts (17) of selector sinkers (15) longitudinally of the sinkers by means of a setting member (34) which is arranged as a setting trolley (20) which can be moved in appropriate needle stages along the longitudinal direction of the needle bed (10). The operation of the setting member (34) and of the setting trolley (20) may be controlled by a programmer (45).

Fig. 1



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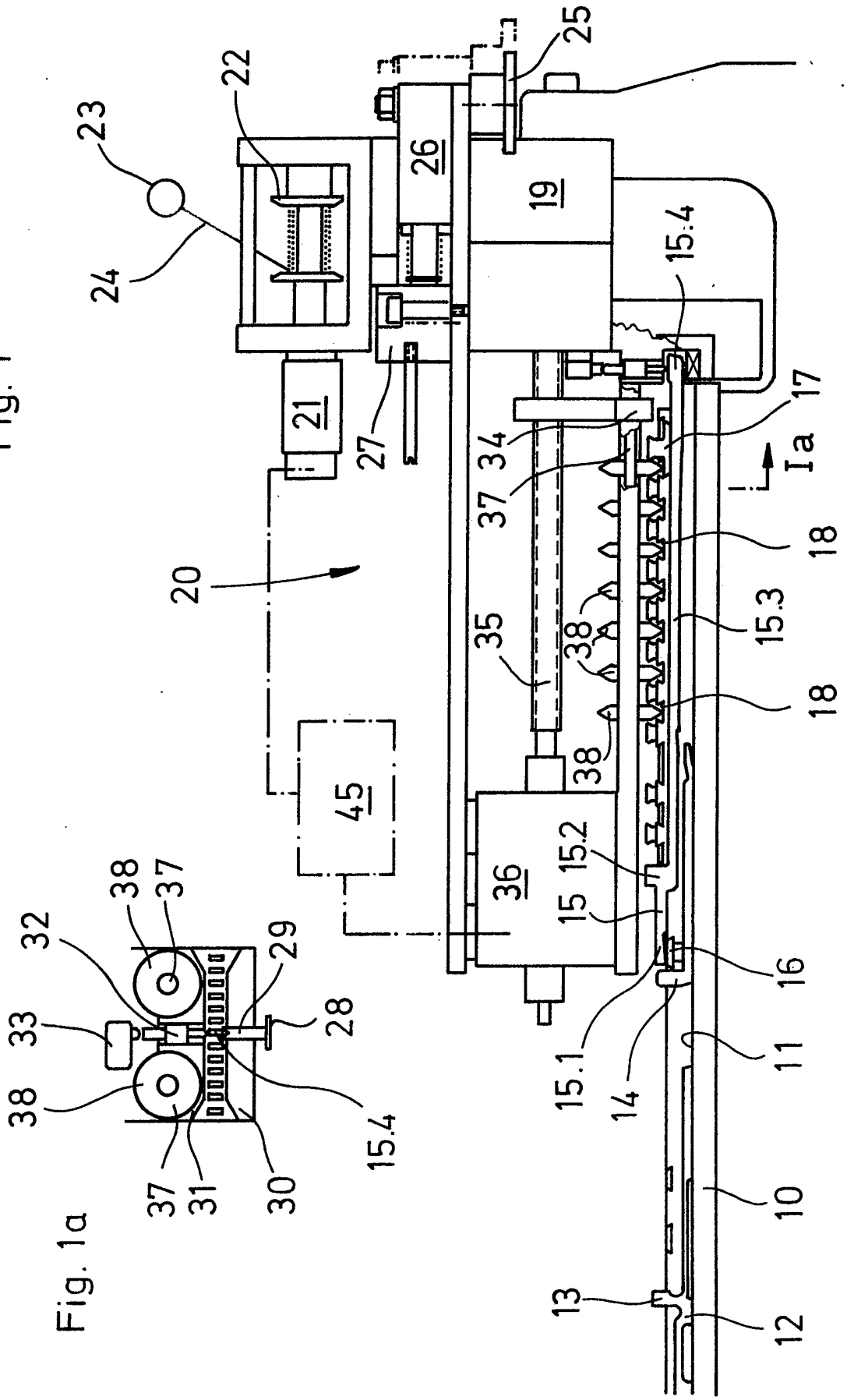
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Fig. 1

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Fig. 1a

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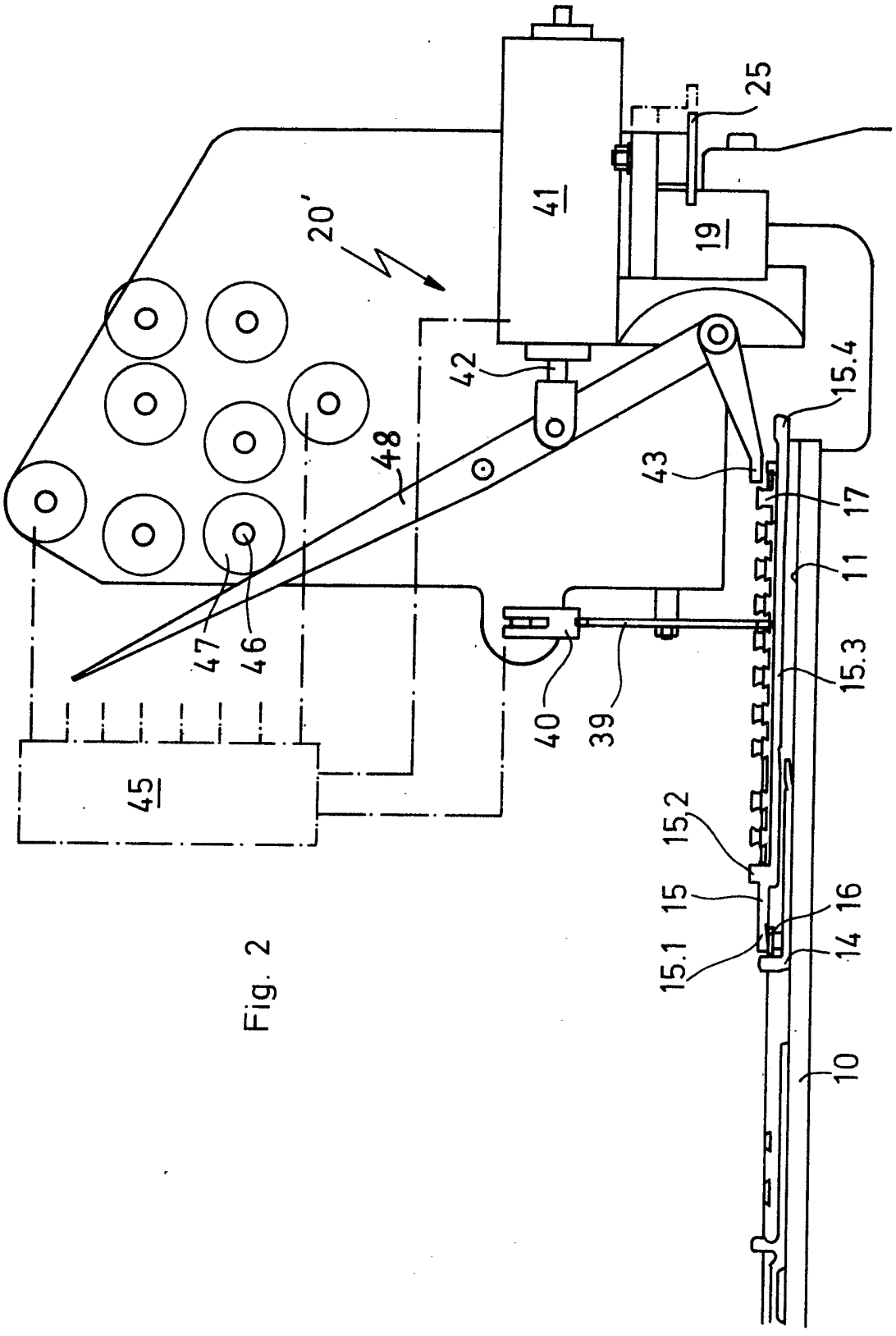

Fig. 2

SPECIFICATION

Flat knitting machine having a change arrangement

This invention relates to a flat knitting machine having a pattern change arrangement comprising selector sinkers with selector butts which are adjustable in the projected position of the needles and can then be held in the adjusted position.

A pattern change arrangement of the kind set forth has already been proposed. The object of the present invention is to provide a pattern change arrangement of the kind set forth which will cater for a setting of the selector butts automatically during a pattern change.

This object is met in the present invention by the provision of a flat knitting machine having a pattern change arrangement comprising selector sinkers with selector butts which are adjustable in the clearing direction of the needles and can be then held in the clearing positions, characterised by an arrangement for programmed adjustment of the selector butts for the purpose of changing the pattern, comprising at least one setting member which is movable in the longitudinal direction of the related selector sinker in both directions, and in each case acts on at least one selector butt, such setting member being arranged on a setting trolley or slide which can be moved in the longitudinal direction of the needle bed through appropriate needle divisions, the means operating said setting member and/or the setting trolley being controlled by a programmer.

A selector butt adjusting arrangement constructed in accordance with the invention can where required be mounted on a needle bed and moved stepwise over the length of the bed appropriately to the divisioning of the needles, the setting member acting in programmed manner on the adjustable selector butts of the individual selector sinkers. An adjusting arrangement of this nature constitutes particularly an advantageous supplementation of electronically controlled flat knitting machines because the control of the arrangement can be effected without any prior-set programmer of these machines.

The controlled movement of the setting trolley and/or the setting member can be performed in different ways, for example by electric motor means or by means of electromagnetic operating or retaining members. Advantageously the setting arrangement can be provided with justifying devices which give an accurate orientation of at least one setting member of the setting arrangement on the tricks of the needle bed and an exact orientation of the adjustable selector butts in the selector sinkers mounted in these tricks into a selected position. Different constructional arrangements are also possible here.

Thus in a flat knitting machine presented in accordance with the invention the required adjustment of the pattern selector members required can be performed automatically during a pattern change, thus avoiding faulty adjustments. Moreover with flat knitting machines equipped in accordance with the present invention pattern changes can be made by machine operating personnel of very limited capability.

Two embodiments of a pattern change arrangement in accordance with the invention are shown in very diagrammatic fashion in the accompanying drawings, in which:

Figure 1 is a partial cross section through the needle bed of a flat knitting machine, taken along a needle trick in the bed, giving a side view of a first form of pattern change arrangement,

Figure 1a is a scrap cross section through the mounted pattern change arrangement taken along the line 1*a* of Figure 1,

Figure 2 is an illustration corresponding to that of Figure 1 of a second embodiment of the pattern change arrangement.

Figures 1 and 2 show a needle bed 10 which is provided in a transverse direction with parallel tricks 11 in the usual way, and in each of these there is a needle 12 (not fully illustrated) having a needle butt 13, a needle jack 14 and a selector sinker 15 in the form of a rocking sinker. The selector sinker 15 has its leading end portion 15.1 mounted on a longitudinal rib 16 of the needle bed. The point of contact between them constitutes a fulcrum for the selector sinker 15, this also being provided at this end with a restoring butt 15.2 and adjoining this a long shank 15.3 having a smooth, continuous and non-stepped upper side. At its outer end 15.4 the selector sinker 15 projects beyond the needle bed 10 and can here be struck from below by cam parts of the machine carriage which are not of further interest here.

Arranged on the flat long shank 15.3 is at least one selector butt 17 in the form of a slider cooperating with selector presser cam parts of the carriage of the machine (not shown). The selector butts 17, in the form of sliders, can be shifted on the selector shank 15.3 into any of a plurality of chosen selector positions. The plural selector positions are indicated in the sectional illustrations of Figure 1 and 2 by further designated selector butts; in all there are ten selector positions. In the individual positions the slider selector butts are held by needle bars, in each case anchored in longitudinal tricks 18 of the needle bed and extending tranversely to the needle bed tricks 11, these bars being set into the required selector position in the needle bed 10 after adjustment of the needle butts 17.

In Figures 1 and 2 the needle bars are not shown and V-section rollers 34 of a justifying device of the pattern change arrangement, which will be described later, project into the longitudinal tricks 18.

The patterning arrangement in this case a setting comprises a trolley 20 disposed on a slide guide rail 19 of the machine. The trolley 20 can be moved along the rail 19 over the complete length of the needle bed 10.

In the embodiment illustrated in Figure 1 the trolley 20 is moved by means of a drive motor 21

which operates a cable pulley 22 mounted on the trolley 20, a cable 24 being wound on this pulley and extending in the longitudinal direction of the needle bed 10 and provided with a ring 23 anchored at one end of the needle bed. The trolley 20 is halted by a catch device having a spring-loaded plunger 26 with a guide roller 25 which can be brought into the engagement position with the stationary slide guide rail 19 by means of a rotary eccentric 27.

A final adjustment of the trolley 20 against the end of the jack 15.4 lying thereover is effected in each trick 11 of the needle bed. In accordance with Figure 1*a* a detent bolt 29 operated by a leaf spring 28 engages the free jack end 15.4. Deflection of the end of the selector sinkers 15.4 in the vertical direction is prohibited by a lower abutment rail 30 and an upper such rail 31 between which the selector sinker ends 15.4 rock during the passage of the setting trolley 20. A microswitch 33 is then operated through a detector 32 by the engaged selector sinker ends 15.4 and thereby the insertion of a setting member acting on the selector sinker butts 17 is effected through a programmer 45. The microswitch 33 also controls the arrest of the setting trolley 20.

The setting member acting on the selector butts 17 is a finger 34 which is held against rotation by virtue of having a threaded bore mounted on a setting spindle 35. The setting spindle 35 is operated by an electric motor 36. This setting motor 36 performs each time a number of rotations determined by a programmer 45 to move the setting member 34 a prescribed distance from a starting position. The setting butt 17 which is also seen in Figure 1 in a base position has previously been adjusted into the required setting position. A final setting device which is mounted on spindles 37 and which has in each case a V-bevelled roller 38 projecting into the longitudinal tricks 18 in the needle bed is used to deflect the selector butts 17 with complete accuracy to the required selector position so that the needle rails can then be introduced without difficulties into the needle bed longitudinal tricks 18. The V-bevelled rollers 38 projecting into the needle bed longitudinal tricks 18 additionally give support and guidance to the setting trolley 20.

Figure 2 shows diagrammatically a form of the pattern change arrangement in which the movement of the trolley 20 and the setting member 34 are not performed by electric motor but electromagnetically. The trolley 20′ mounted on the carriage guide rail is held under tension by a cable (not shown) and is moved stepwise under the preset tension from needle bed trick 11 to the selected trick 12. A toothed wheel which is moved by engagement therewith in the needle bed tricks 11 is blocked after each step by an electromagnet 40 which only releases the toothed wheel 39 and thus also the trolley 20′ when the adjustment of the selector butt 17 in the appropriate needle bed trick 12 has taken place. The adjustment of the selector butt 17 is effected by means of an electromagnet 41 arranged on the setting trolley 20′. The stroke of the armature 42 of this electromagnet, which operates on a setting member 43 through a lever system is divided up into a plurality of stages of the stroke determined by the armature 46 of magnets 47. The stop magnets 47 which control the amount of adjustment of the lever 48 of the lever system are controlled by the programmer 45.

As already mentioned the adjustment of the selector butts 47 takes place from a specific starting position. The selector butts 17 can be restored manually to this position before the pattern change arrangement is put into effect, for example by a slider which is moved beneath the needle bed. This restoration can however be performed automatically by a bevel slider which is previously applied to the setting trolley 20 or 20′, but this is not shown in the drawings.

CLAIMS

1. A flat knitting machine having a pattern change arrangement comprising selector sinkers with selector butts which are adjustable in the clearing direction of the needles and can be then held in their clearing positions, characterised by an arrangement for programmed adjustment of the selector butts for the purpose of changing the pattern, comprising at least one setting member which is movable in the longitudinal direction of the related selector sinker in both directions, and in each case acts on at least one selector butt, such setting member being arranged on a setting trolley or slide which can be moved in the longitudinal direction of the needle bed through appropriate needle divisions, the means operating said setting member and/or the setting trolley being controlled by a programmer.

2. A flat knitting machine according to Claim 1, characterised by the fact that the setting trolley and/or the setting member can be moved by electric motor means.

3. A flat knitting machine according to Claim 1, characterised by the fact that the setting trolley and/or the setting member can be moved or held electromagnetically.

4. A flat knitting machine according to one of Claims 1—3, characterised by the fact that the setting trolley is provided with an inclined bar, which leads in the direction of operating travel, for restoring all the selector butts into their starting position.

5. A flat knitting machine according to one of Claims 1—4, characterised by the fact that the setting trolley has an assembly for justifying the adjusted selector butts which is arranged at the rear in the direction of operating travel.

6. A flat knitting machine according to Claim 5, characterised by the fact that the justifying assembly comprises bevelled rollers in the interspace between the various selected positions of the selector butts.

7. A flat knitting machine according to one of Claims 1—6, characterised by the fact that the setting member is arranged on a setting spindle

drivable by a stepped switch motor.

8. A flat knitting machine according to one of Claims 1—7, characterised by the fact that the setting trolley is mounted on a guide bar for the machine carriage and is provided with a catch device adjacent the needle bed tricks.

9. A flat knitting machine according to one of Claims 1—8, characterised by the fact that the setting trolley is provided with a detector arrangement which includes a detector which cooperates with an end of the selector sinkers projecting over the edge of the needle bed.

10. A flat knitting machine with a pattern change arrangement substantially as herein described and as shown in the accompanying drawings.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1981. Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.