July 26, 1966 W. BENTLEY ETAL 3,262,286

STRAIGHT BAR KNITTING MACHINES

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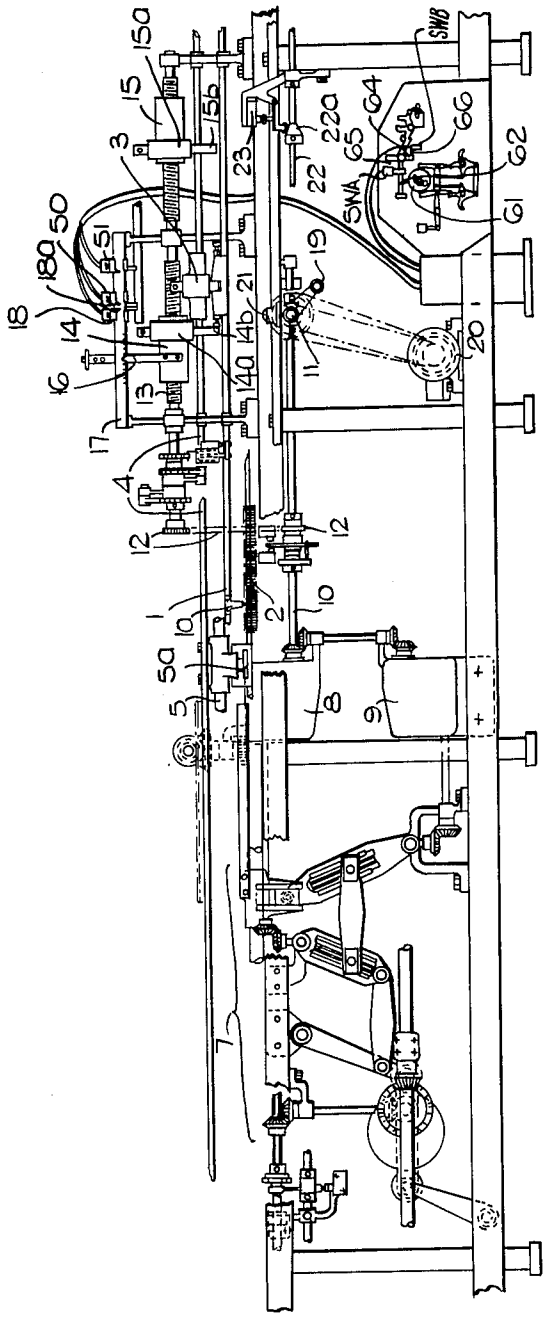


FIG. 1.

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STRAIGHT BAR KNITTING MACHINES

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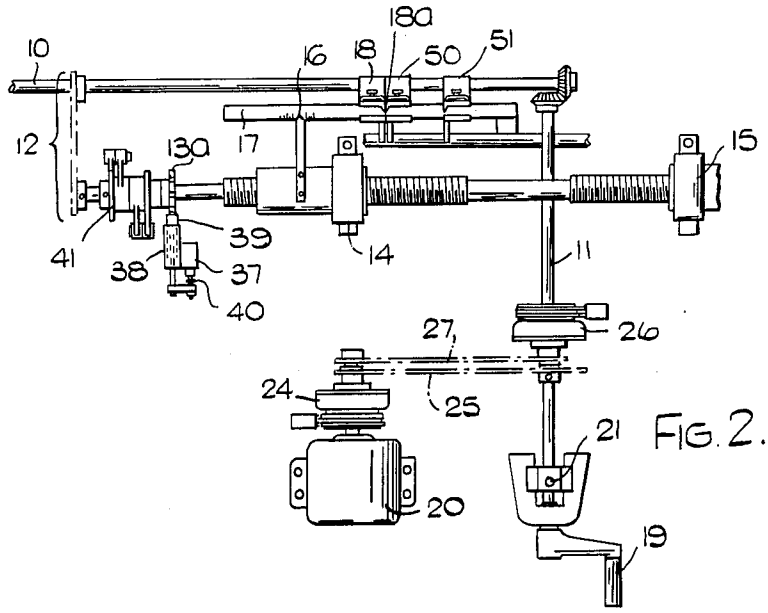


FIG. 2.

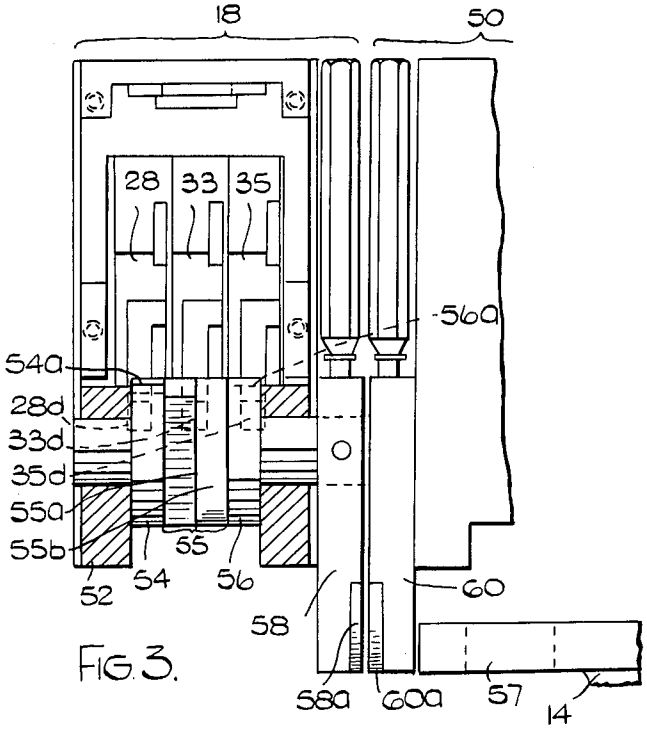


FIG. 3.

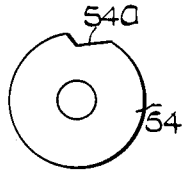


FIG. 6.

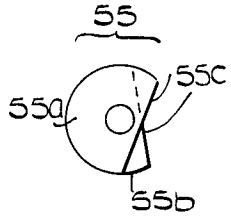


FIG. 7.

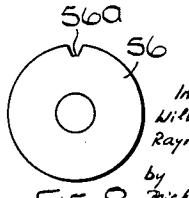


FIG. 8.

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STRAIGHT BAR KNITTING MACHINES

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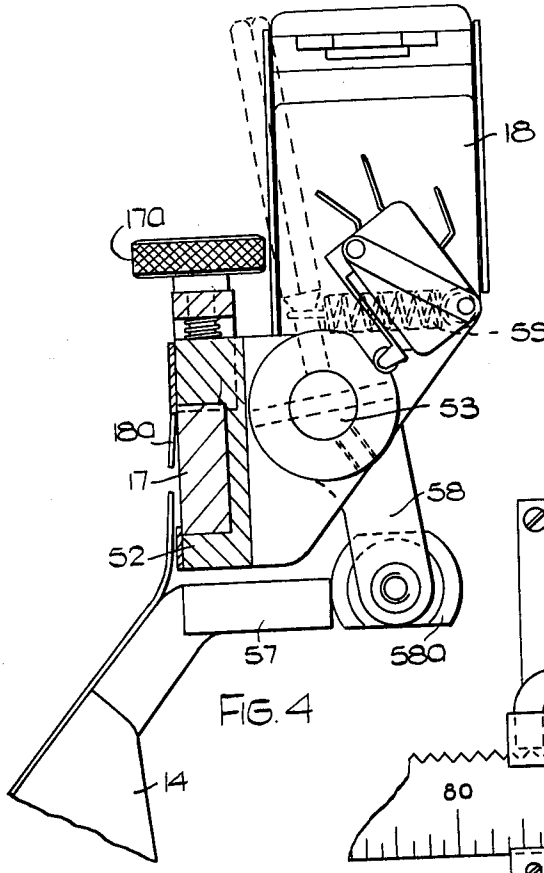


FIG. 4

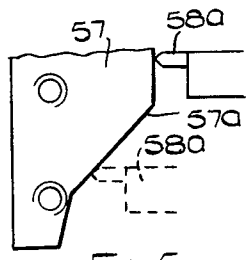


FIG. 5.

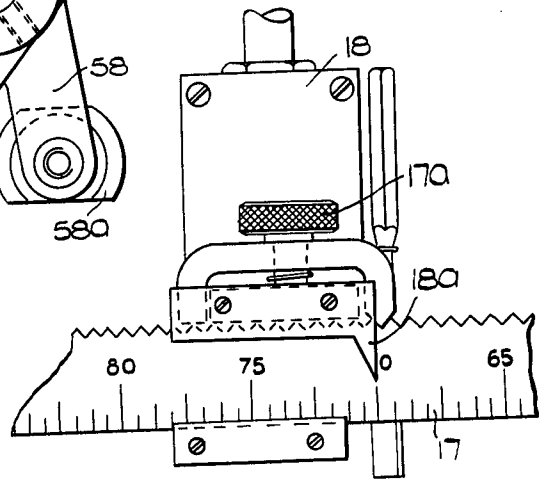


FIG. 9

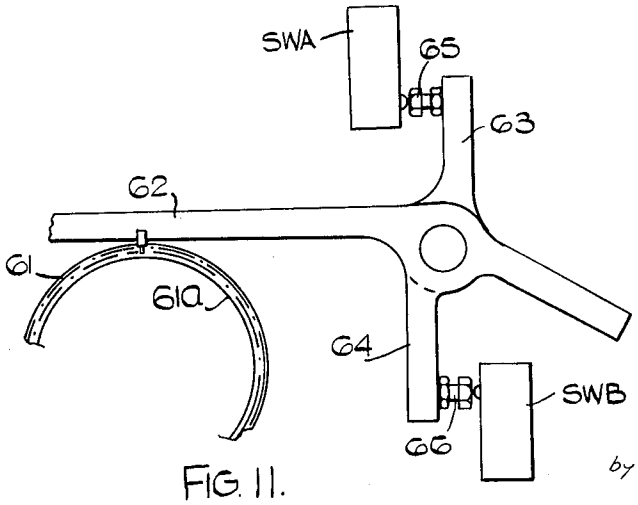


FIG. 11.

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STRAIGHT BAR KNITTING MACHINES

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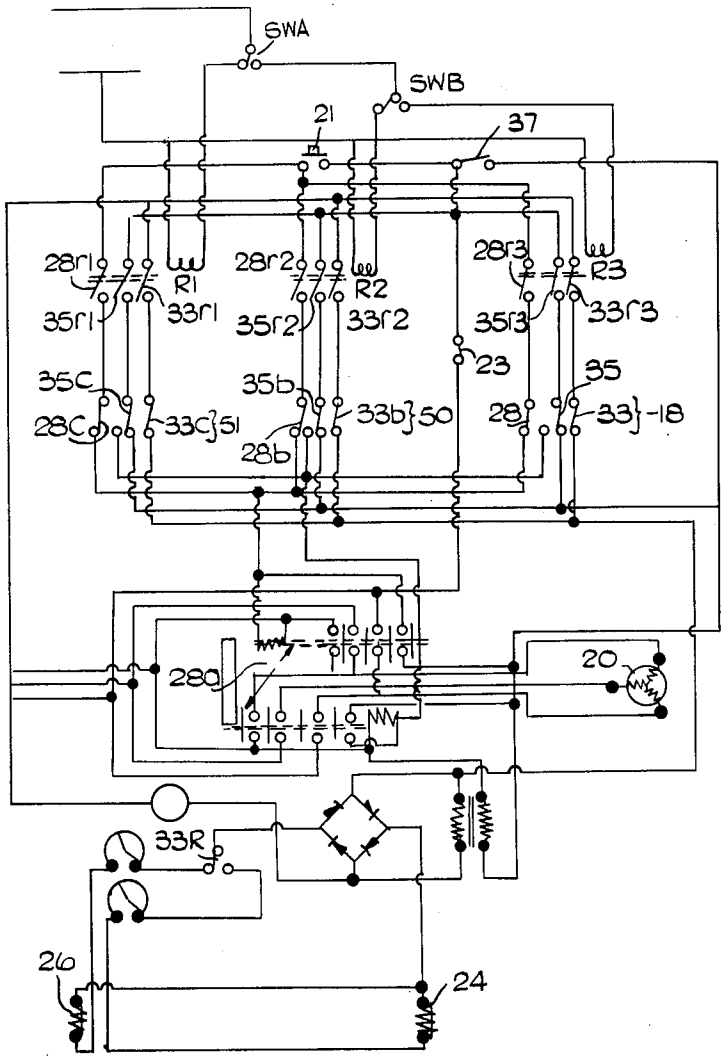


FIG. 10.

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STRAIGHT BAR KNITTING MACHINES

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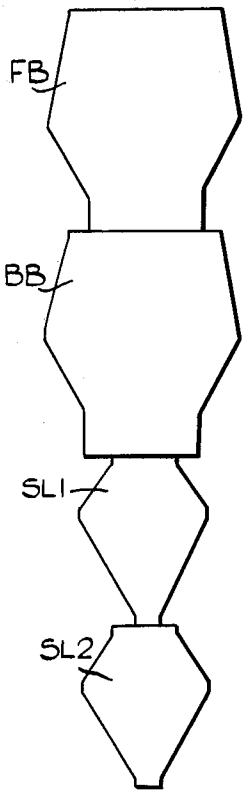


FIG. 13.

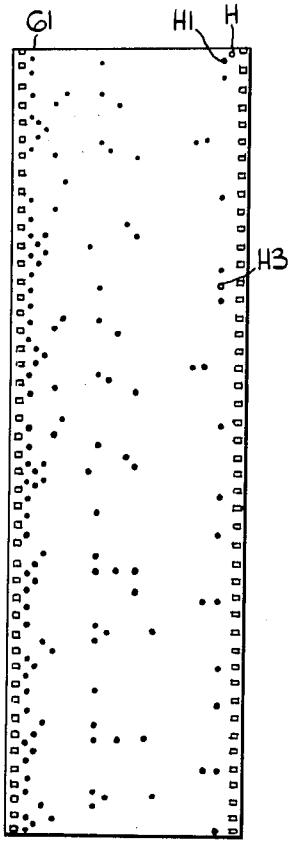


FIG. 12.

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3,262,286

STRAIGHT BAR KNITTING MACHINES

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Claims priority, application Great Britain, Dec. 15, 1961, 44,945/61
11 Claims. (Cl. 66—89)

This invention is for improvements in or relating to straight bar knitting machines, and concerns machine parts (e.g. thread carrier selvedge stops on adjustable racked lead screws for fashioning) which when the machine is running are adjustably displaced intermittently (by intermittent racking of the adjustable lead screws) from a starting position when starting to knit a blank to a finishing position, and which are required to be returned to their starting position in a continuous reverse movement (continuous reverse rotation of the adjustable lead screws) when the blank is finished and the machine is stopped.

It is known to provide one of the selvedge stops with a pointer and also to provide a linear scale on which an adjustable reset stop with a pointer is mounted, both pointers co-operating with the scale, and the arrangement being such that first the reset stop is positioned with its pointer registering with the selvedge stop pointer when starting to knit a blank, and when the blank is finished, with the selvedge stops in the finishing position and the machine stopped, to then effect the resetting of the selvedge stops by manually, or automatically by a timing mechanism, starting a motor which is connected by a drive transmitting mechanism to the adjustable lead screws so that the resetting is under power of the motor, and when the selvedge stop pointer re-registers with the reset pointer at the starting position this causes operation of a switch to stop the motor, with the selvedge stops and selvedge stop pointer at the starting posiion ready for repeat operation for the next blank and so on.

In the underwear and outerwear straight bar knitting machines there is both narrowing and widening of blanks during which inward and outward adjustments of the selvedge stops take place, this being distinct from the usual arrangement in a full fashioned stocking straight bar knitting machine wherein only narrowing and inward adjustments of the selvedge stops take place.

Our U.S. Patent No. 3,019,626 provides, in an underwear and outerwear straight bar knitting machine, for the aforesaid motor being of reversible type and for a 2-way switch to be connected to directional control means for the motor. The arrangement is such that the 2-way switch is operated, by the initial intermittent adjustment of the selvedge stops, one way or the other according to the particular direction of the initial intermittent adjustment of the selvedge stops, and this controls the motor in such manner that its direction of operation must be in reverse to the direction of the initial intermittent adjustment of the selvedge stops, whether this direction be one way or the other.

However in these underwear and outerwear machines it is usual to produce blanks of different shapes e.g. fronts, backs and sleeves of garments and, since the starting widths of these different blanks are usually different, it has been necessary heretofore to preset the reset stop at different positions for different blanks. There are two attendant disadvantages of this arrangement, (1) that the operator must be relied upon to effect the different presettings of the reset stop for the different blanks and (2) that time and labour must be undesirably expended in matching up the different blanks into garment sets.

An object of the invention is to provide a programme controlled means to avoid the necessity not only for manual presetting of a reset stop at different positions but

also to avoid manual matching of different blanks into garment sets.

The invention provides a straight bar knitting machine having machine parts (e.g. selvedge stops) which when the machine is running are adjustably displaced intermittently (by intermittent racking of adjustable lead screws) from a starting position when starting a blank to a finishing position when the blank is finished, and control means for controlling the machine and re-setting the machine parts such that the machine can produce blanks of a set of blanks for a garment sequentially. Said means conveniently includes a plurality of reset stops pre-set to positions governed by starting widths of the blanks, each of said reset stops having associated switch means any of which is operable by the intermittent displacement of said machine parts to control motorized return of the latter to a starting position governed by the associated reset stop, and each of said switch means being programmed to be effective at required sequential times. Conveniently also in an underwear and outerwear straight bar knitting machine, the motor is of reversible type and each reset stop has an associated two-way switch which is operated one way or the other by the intermittent displacement of the machine parts so the direction of the operation of the motor is always reverse to the direction of the intermittent displacement of the machine parts, whichever the latter direction may be. Each of the reset stops also conveniently has associated switch means for control of the speed of the motor and consequently of the speed of return of the machine parts, and there are switch means for control of the stopping of the motor at precise times and consequently stopping the machine parts at accurate positions.

More specifically a programming control means is employed having instructional control points for programming the different blanks and including instructional control points for selecting different electric switch means of the different reset stops to be effective in turn, through a suitable arrangement of electric control switches, electric relays, electric motor control circuits and electric relay switches therefor, to reset said machine parts to different start-indicating positions of the reset stop.

The foregoing and other features of the invention set out in the appended claims are incorporated in the specific embodiment hereinafter particularly described in greater detail by way of example with reference to the accompanying drawings in which:

FIGURE 1 is a general front view of a straight bar knitting machine having reset stop means according to the invention.

FIGURE 2 is a diagrammatic enlargement of the reset stop means.

FIGURE 3 is an enlarged detail section of switch means associated with a reset stop.

FIGURE 4 is a cross sectional view of said reset stop.

FIGURE 5 is a detail view of part of a control cam for the reset stop.

FIGURES 6, 7 and 8 illustrate rotary cams for control of electric switches on said reset stop.

FIGURE 9 is a detail front view of FIGURE 4.

FIGURE 10 is a circuit diagram of an electric circuit for the machine.

FIGURE 11 is a diagrammatic illustration of a programming control device.

FIGURE 12 is a diagram of a programming chart for the machine.

FIGURE 13 is a diagram of a garment set of blanks produced on the machine from the chart.

Referring to FIGURE 1 the machine is substantially as disclosed in our U.S. Patent No. 3,019,626, to which reference is directed for full details, in the following respects. There is a usual thread carrier bar **1** for use in

the production of garment blanks in different knitting sections, one usual thread carrier being indicated at **1***a* and the usual needles of one knitting section being indicated at **2**. A usual friction box is shown at **3** on a usual friction bar **4**, the latter carrying a usual slurcock **5***a* slidable on a slur bar **5**. The friction bar **4** is also connected to a usual draw bar to be reciprocated thereby, the draw mechanism being indicated generally at **7** and being of a kind adapted to be adjustable by variable motion transmitting mechanism, indicated at **8** and **9**, through the intermediary of an operating shaft **10** (see also FIGURE 2) and countershaft **11**. In addition the operating shaft **10** is connected by a chain and sprocket means **12** to a usual adjustable lead screw **13** on which usual selvedge stop boxes **14**, **15** are mounted and which carry stop bolts **14***b*, **15***b* in housings **14***a*, **15***a*.

The selvedge stop **14** carries a datum pointer **16** co-operating with a linear scale **17**, and also co-operating with the linear scale **17** there is a reset stop **18** having a reset pointer **18***a*.

The reset stop **18** is initially located at the starting position of the selvedge stop **14** with the pointers **16**, **18***a* in registry and when the machine is not running between the production of successive blanks the countershaft **11** is turned to rotate the operating shaft **10** for returning the selvedge stops **14**, **15** from the positions to which they have been adjusted in fashioning in usual manner back to their starting position determined by the unaltered position of the reset stop **18**.

According to our U.S. Patent No. 3,019,626 the necessity for the usual manual turning of the usual handle **19** to reset the selvedge stops is avoided by motorising the operation, employing a reversible electric motor **20** (see also FIGURE 10 hereinafter more fully referred to), and for starting the motor **20** an electric switch **21** which is shown as of press button type but which may be automatically controlled in known manner by an electric sequence motor. The switch **21** has in series with it a control switch **23** operable by the usual power control rod **22** through a cone collar **22***a* to ensure that the motor can be started only when the machine is not running. The motor **20** can drive either through a low speed clutch **24**, see FIGURE 2, and chain and sprocket means **25**, or through a high speed clutch **26** and chain and sprocket means **27**.

FIGURE 2 also indicates usual lead screw racking means **41** and usual indexing wheel **13***a* for the lead screw.

For controlling operation of the motor there is provided a motor stopping re-set switch **37** operable each time that an indexing plunger **39** in a support **38** drops in a notch in the indexing wheel **13***a*, the operation being adjustable by adjusting screw **40**, the switch **37** being in series with a motor stop preparing re-set switch (**35** in FIGURE 10), and this latter switch **35**, a direction control re-set switch (**28**, FIGURE 10) and a speed control re-set switch (**33**, FIGURE 10) being in a group associated with the re-set stop **18**.

The present invention is characterised by the provision of a plurality of the re-set stops (each having a re-set pointer), in this instance three including the re-set stop **18**, and by each of these stops **18**, **50**, **51**, FIGURES 1 and 2, having a group of said re-set switches associated with it (**28**, **33**, **35**, **28***b*, **33***b*, **35***b*, **28***c*, **33***c*, **35***c* in FIGURE 10).

More speecifically and with reference to FIGURE 3 in respect of the re-set stop **18**, the three re-set switches shown at **28**, **33**, **35** are mounted side by side in a support **52** which as seen in FIGURES 4 and 5 is mounted on the scale **17** in slidably adjustable manner with a finger screw **17***a* for releasably securing it in position, and said re-set pointer **18***a* being carried by said support **52** and registering with the scale **17**.

For operating the re-set switches **28**, **33**, **35** said support **52** also carries an axle **53** on which there are three rotary cams **54**, **55**, **56** whereof the middle cam **55** is in two side by side sections **55***a*, **55***b*. These cams as shown in FIGURE 3 are in co-operation respectively with three switch arms **28***d*, **33***d*, **35***d* of said re-set switches **28**, **33**, **35** and the cams are rotatably displaceable by a cam plate **57** which is carried by the selvedge stop **14** and has ramp edges such as **57***a* near opposite ends, as shown in FIGURE 5, which act on a cam follower **58***a* on a cam follower arm **58** mounted on the cam's axle **53**, the follower **58** being biassed by a spring **59** against the plate cam **57**.

The rotary cams **54**, **55**, **56** are shown individually in FIGURES 6, 7, 8, cam **54** having an irregular obtuse angled fall **54***a* for the motor direction switch **28**, the cam sections **55***a*, **55***b* providing a regular obtuse angled fall **55***c* for the speed control switch **33**, and the cam **56** having an acute angled fall **56***a* for the motor stopping switch **35**.

The operation of these re-set switches **28**, **33**, **35** by the cams **54**, **55**, **56** from the cam plate **57** is substantially as and for the purpose described in said U.S. Patent No. 3,019,626 re-set switch **28** being operated when selvedge stop **14** carries the datum pointer **16** away from the re-set stop **18** and pointer **18***a*, in fashioning, thereby to pre-set the motor for operation in the correct direction (switch **28** operating a directional control device **28***a*, FIGURE 10) for eventually returning the datum pointer to the re-set stop pointer **18***a*; the re-set switch **33** operating after eventual operation of the motor in returning the datum pointer, and towards the end of the movement, to reduce the speed of the motor by switching from the high speed clutch to the low speed clutch (switch **33** operating a relay switch **33R**, FIGURE 10); and the re-set switch **35** operating at the end of the movement to prepare the motor for stopping, the actual stopping being caused by the indexing plunger **39** dropping in the next notch of the indexing wheel **13***a*, to operate the indexing switch **37**. The arrangement of the electric circuit for this purpose is substantially the same as in said patent to which reference is directed for full details and the lower part of which is reproduced almost identically in FIGURE 10.

The switch and cam arrangement of each other re-set stop **50**, **51** is substantially the same as for the re-set stop **18** particularly described, the only difference being that in order to obtain close association of the re-set stops **18** and **50**, their cam followers **58***a*, **60***a* and arms **58**, **60**, FIGURE 3, respectively are disposed side by side when the two stops are close together.

It is intended for the re-set stops to be effective in turn automatically for the purpose of producing garment sets of blanks in sequential succession on the same knitting section.

For this purpose three groups of three reset-switches **28**, **33**, **35**, **28***b*, **33***b*, **35***b* and **28***c*, **33***c*, **35***c*, are associated with the three re-set stops **18**, **50**, **51** respectively and are in parallel in the electric circuit FIGURE 10.

The three groups of re-set switches are respectively rendered operative and inoperative at required times by three electrical relays **R1**, **R2**, and **R3** with respective groups of three relay switches **28***r***1** **33***r***1** **35***r***1**, **28***r***2**, **33***r***2**, **35***r***2**; and **28***r***3**, **33***r***3**, **35***r***3**.

More specifically and referring to the circuit diagram FIGURE 10, the groups of relay switches are in series with the groups of re-set switches respectively so that if the relays are operated in turn, the groups of re-set switches will be rendered operative in turn.

Control of the relays is effected by any suitable programming or other selecting means. Conveniently in the circuit, FIGURE 10, the relay **R1** and its relay switches are normally operative so that the re-set switches **28C**, **33C**, and **35C** are normally effective for the associated re-set stop **51** to be normally operative. This relay **R1** is under control of a two-way electric switch SWA which can cut out relay **R1** and introduce relay **R2** through a

second two-way electric switch SWB. Similarly switch SWB can cut out relay R2 and introduce relay R3.

A convenient programming arrangement employing a chart with punched holes is represented in FIGURES 11 and 12, the chart being indicated at **61** on a racking drum **61***a* and having co-operating feelers (FIGURES 11) such as **62**, two of which have projections **63**, **64** carrying adjusting screws **65**, **66** co-operating with said switches SWA, SWB respectively. The arrangement is such that with no hole in the chart, neither switch SWA, SWB is operated; a hole at one position in the chart causes projection **63** to operate switch SWA; and a hole at another position in the chart causes projection **64** to operate switch SWB.

In operation of the invention say for producing garment sets for example of a front blank FB (FIGURE 13), a back blank BB and two sleeve blanks SL1, SL2 in sequential succession on the same knitting section, a pair of holes H, H1 are provided in the chart for the first reading by the feeler projections **63**, **64** such that both of the switches SWA, SWB or the relays R2, R3, are operated so that after finishing the second sleeve blank SL2, the re-set switches **28**, **33**, **35** of the re-set stop **18** are effective whereby the datum pointer returns to this re-set stop **18**, i.e. to a width setting appropriate for the next blank to be a front blank FB during which the drum is racked on; next (at the completion of the front blank FB) the programming control causes, by a single hole H3 in the chart for reading by the feeler projections **63**, **64** at this stage, operation of switch SW and relay R2 but because there is no second hole for this reading this causes no operation of the switch SWB and the relay R3 so that the re-set switches **28**, **33**, **35** of re-set stop **18** are in-effective and the re-set switches **28***b*, **33***b*, **35***b* of re-set stop **50** are effective appropriate for the next blank to be a back blank BB; then (at the completion of the back blank BB during which the drum is racked on) the programming control, no holes being provided in the chart for reading by the feeler projections **63**, **64** at this stage, causes no operation of the switches SWA, SWB and relays R2, R3 so that the re-set switches **28***a*, **33***a*, **35***a* of re-set stop **50** are ineffective and the re-set switches **28***c*, **33***c*, **35***c* of the re-set stop **51** are effective appropriate for the first sleeve blank SL1; this is repeated no holes being provided in the chart same as before, for the second sleeve blank SL2. At the completion of the second sleeve blank SL2, the programming control reverts to the starting arrangement so that the reset-switches **28**, **33**, **35** of re-set stop **18** are again effective for repeat of the cycle of operations.

Conveniently the motorised re-setting of the selvedge stops is coupled with corresponding motorised re-setting of the variable draw **7** through the medium of said operating shaft **10** and variable motion transmitting mechanism **8** and **9**, and the racking mechanism **41** may be uncoupled from the operating shaft **10** allowing use of the motor **20** to adjust the draw independently of the lead screw mechanism.

What we claim is:

1. In a straight bar knitting machine for knitting fabric blanks of different widths, in combination, selvedge stop means movable to determine the outlines of the knit fabric blanks; a series of reset means independently settable to selected positions for limiting the movement of said selvedge stop means in accordance with the different widths of the fabric blanks; and program control means for rendering said reset means sequentially effective whereby a series of knit fabric blanks of different widths are knitted in accordance with a program.

2. In a straight bar knitting machine, for knitting fabric blanks of different widths, in combination, selvedge stop means settable to different control positions to determine the outlines of the knit fabric blanks; drive means for moving said selvedge stop means toward said control positions; a series of reset means independently settable to selected positions respectively correlated with said control positions, each reset means being connected to said drive means for stopping the same when said selvedge stop means is the respective correlated control position so that said selvedge stop means is successively positioned in accordance with the different widths of the fabric blanks; and program control means for rendering said reset means sequentially effective to control said drive means whereby a series of knit fabric blanks of different widths are knitted in accordance with a program.

3. A straight bar knitting machine having selvedge stops, intermittently racked adjustable lead screws for adjustably displacing the selvedge stops, in either opposite direction, while the machine is running, from a starting position when starting a knitting of a fabric blank to a finishing position when finishing the knit fabric blank, a plurality of reset stops preset to starting positions governed by different starting widths of knit fabric blanks, a reversible motor for returning the selvedge stops in either opposite return direction from different finishing positions in accordance with different finishing widths for the blanks, switch means associated with each of the reset stops for controlling operation of the motor, and program control means for rendering the switch means sequentially effective.

4. A straight bar knitting machine for knitting fabric blanks of different widths having selvedge stops, intermittently racked adjustable lead screws for adjustably displacing the selvedge stops in either opposite direction while the machine is running, a plurality of reset stops to be preset to starting positions for different knit fabric blanks, a reversible type motor for returning the selvedge stops in either opposite returning direction upon completion of each knit fabric blank, each reset stop having an associated two-way switch to control the direction of operation of the motor and other switch means to control the speed and stopping of the motor, and program control means for rendering the two-way switch and the other switch means sequentially effective for the re-set stops.

5. A straight bar knitting machine having selvedge stops, intermittently racked adjustable lead screws for adjustably displacing the selvedge stops while the machine is running, a first pointer carried by one of the selvedge stops, a stationary linear scale for the first pointer, a reset stop and second pointer carried by the same and co-operating with the linear scale and preset with the first and second pointers in registry, operating mechanism for returning the selvedge stops after their intermittent operation in which the first pointer is carried away from the reset pointer, to their starting position with the first and second pointers again in registry, a reversible motor for operating said operating mechanism, switch means associated with the reset stop for controlling the direction, speed and stopping of the motor, at least one additional reset stop with a third pointer and another switch means, and program control means for rendering the different switch means effective sequentially.

6. A straight bar knitting machine having one pair of selvedge stops and a pointer on one of said selvedge stops intermittently adjustable while the machine is running, a plurality of reset stops with pointers, operably connected with said pair of selvedge stops, reversible motor operating mechanism for returning the selvedge stops, a first switch associated with each reset stop to control the direction of the motor, a second switch associated with each reset stop to control the speed of the motor, a third switch associated with each reset stop to control stopping of the motor, relay means for controlling the first, second and third switches in groups thereof, first, and second control switches for controlling the relay means, and a program control device for rendering the first and second control switches sequentially effective.

7. A straight bar knitting machine having one pair of selvedge stops and a pointer intermittently adjusted while the machine is running, indexing means for the selvedge stops operably connected with said pair of selvedge stops, a plurality of reset stops, a reversible motor, friction clutch means associated with the motor, a stop switch closed by each operation of the indexing means, a group of switches associated with each reset stop and comprising a first switch for controlling the direction of the motor, a second switch associated with said clutch means for controlling the motor speed, and a third switch associated with said stop switch for controlling the stopping of the motor, and program control means for rendering the groups of switches sequentially effective.

8. A straight bar knitting machine having means including one pair of selvedge stops for producing knitted blanks of different shapes and sizes, reset mechanisms operably connected with said pair of selvedge stops for predetermining the shapes and sizes of the blanks, and program controlled switch means for rendering the reset mechanisms sequentially effective.

9. A straight bar knitting machine having means including one pair of selvedge stops for producing knitted blanks of different shapes and sizes, reset mechanisms operably connected with said pair of selvedge stops for predetermining the shapes and sizes of the blanks, switch means for controlling the reset mechanisms, and punched chart programming means for rendering the switch means effective sequentially.

10. A straight bar knitting machine having means including one pair of selvedge stops for producing knitted blanks of different shapes and sizes, reset mechanisms

operably connected with said pair of selvedge stops comprising reset stops and associated switch means, operating mechanism including a reversible motor for returning the selvedge stops from finishing positions to starting positions, relay means for controlling the groups of switch means, control switch means for controlling the relay means, and punched chart programming means for rendering the control switch means sequentially effective.

11. A straight bar knitting machine having means including one pair of selvedge stops for producing knitted blanks of different shapes and sizes, reset mechanisms operably connected with said pair of selvedge stops for predetermining shapes and sizes of the blanks, a motor and operating mechanism for returning said selvedge stops to different starting positions determined by the reset mechanisms for different blanks, program controlled switch means for rendering the reset mechanisms sequentially effective, and a machine stopping and starting switch associated with the motor to ensure that the latter can operate only when the machine is not running.

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