Feb. 6, 1962 R. BLOOD 3,019,626

STRAIGHT BAR KNITTING MACHINES

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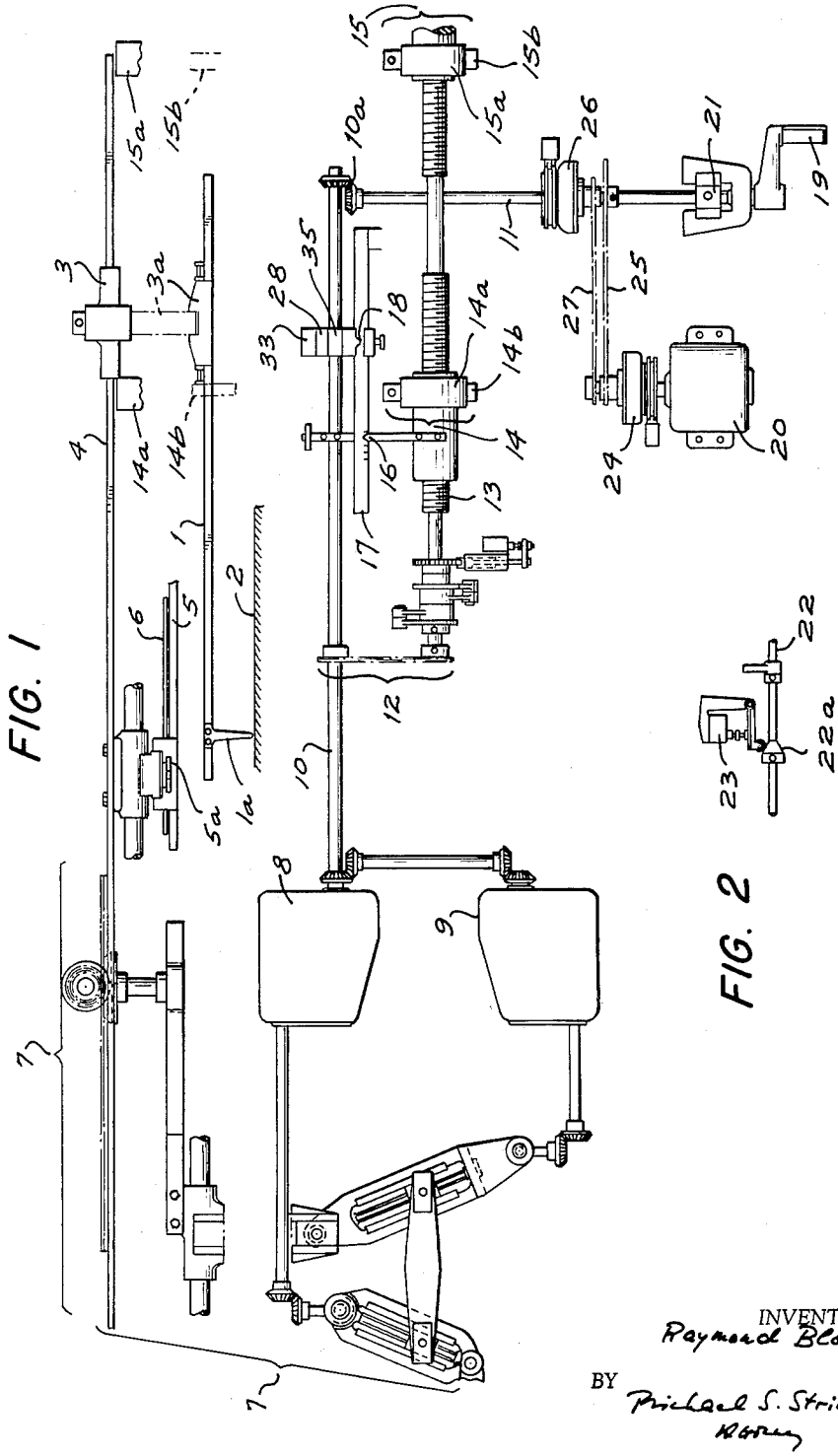


FIG. 1

FIG. 2

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STRAIGHT BAR KNITTING MACHINES

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FIG. 3a

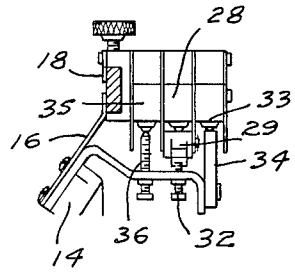


FIG. 3b

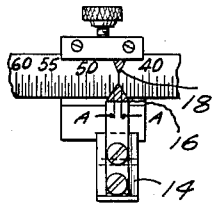


FIG. 3c

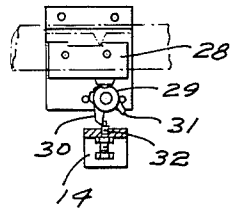


FIG. 3d

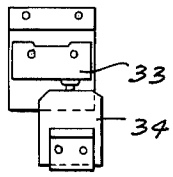


FIG. 4

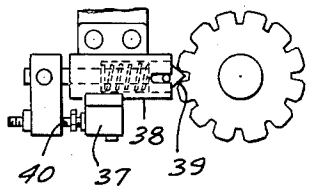
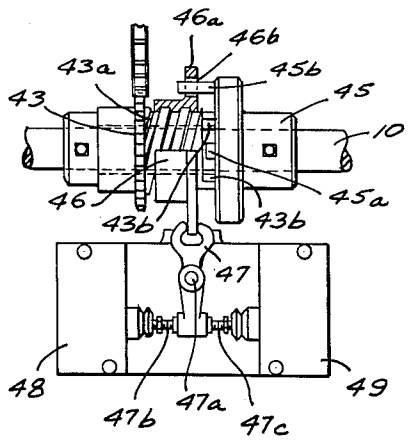


FIG. 7



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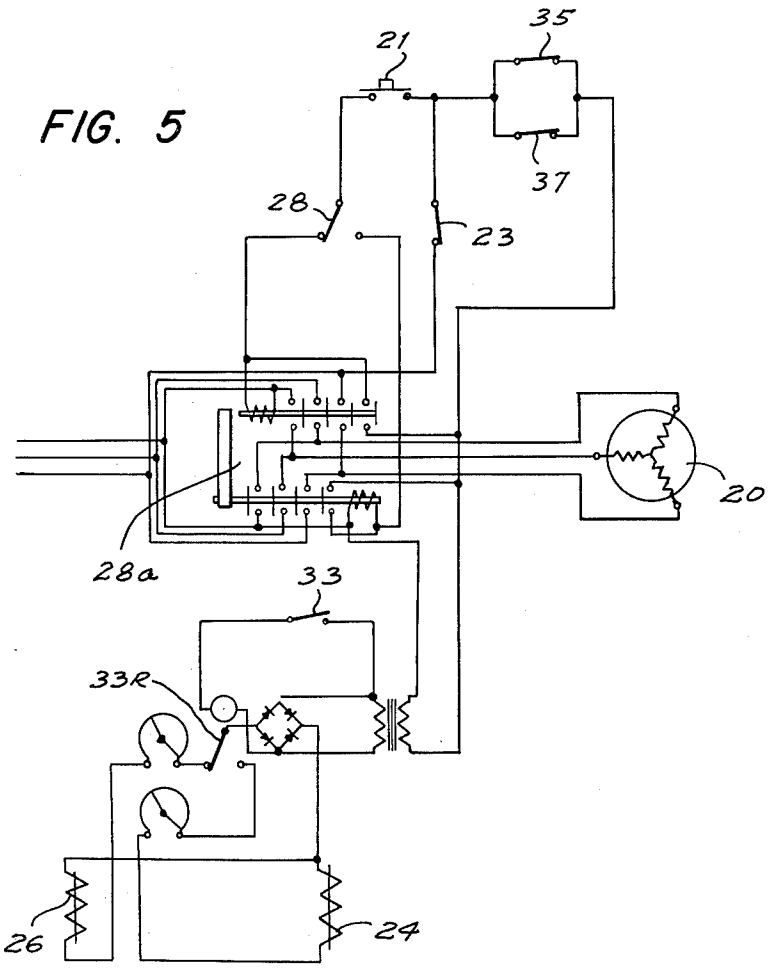
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STRAIGHT BAR KNITTING MACHINES

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FIG. 5



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Feb. 6, 1962 R. BLOOD 3,019,626

STRAIGHT BAR KNITTING MACHINES

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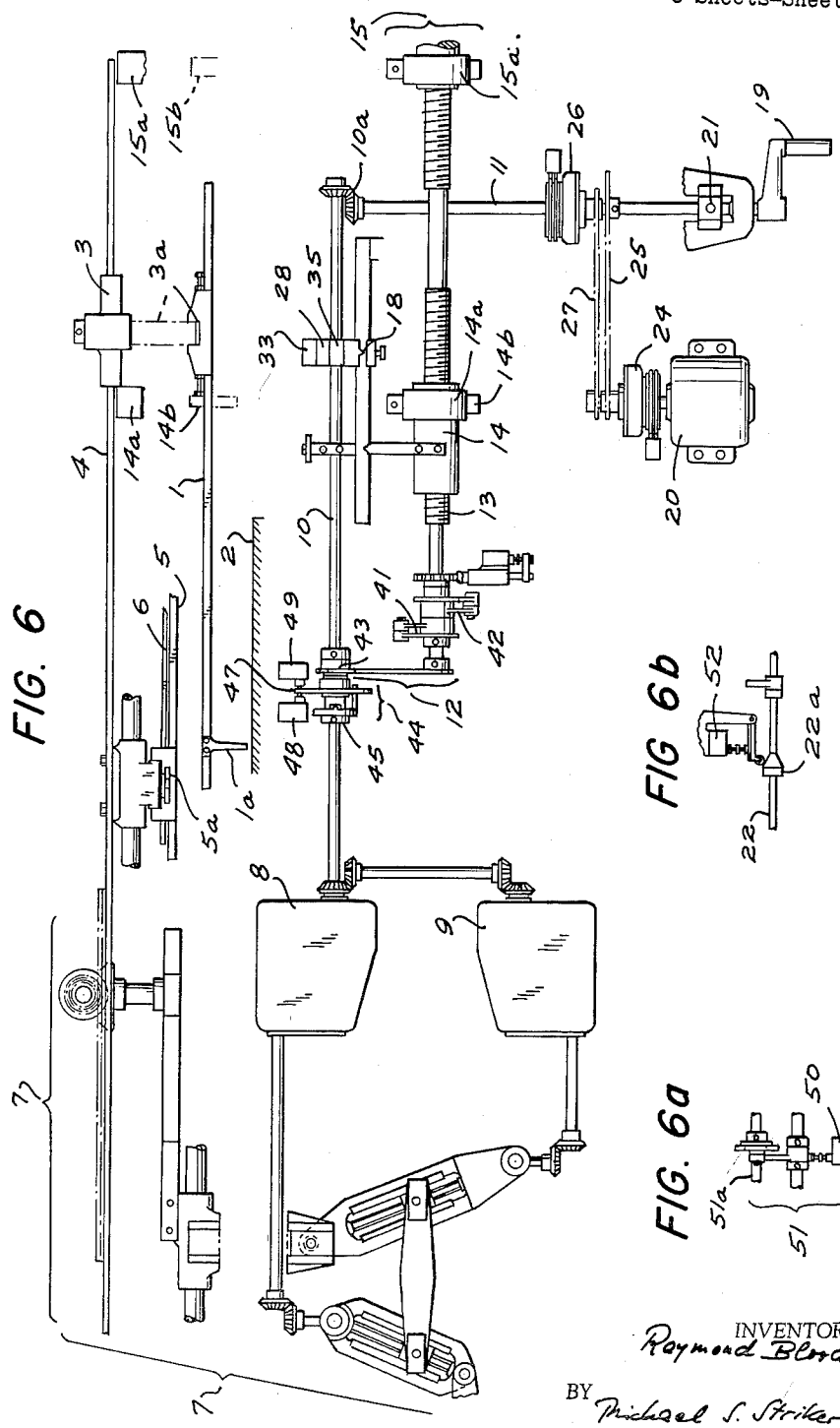


FIG. 6

FIG 6b

FIG. 6a

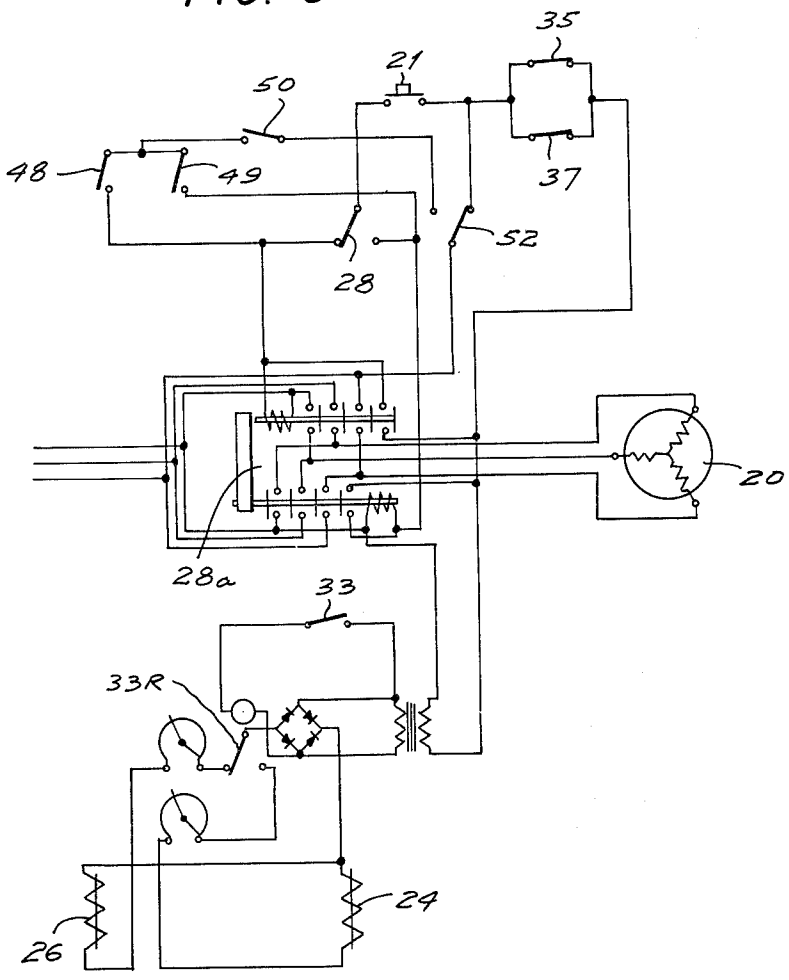
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STRAIGHT BAR KNITTING MACHINES

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FIG. 8



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STRAIGHT BAR KNITTING MACHINES

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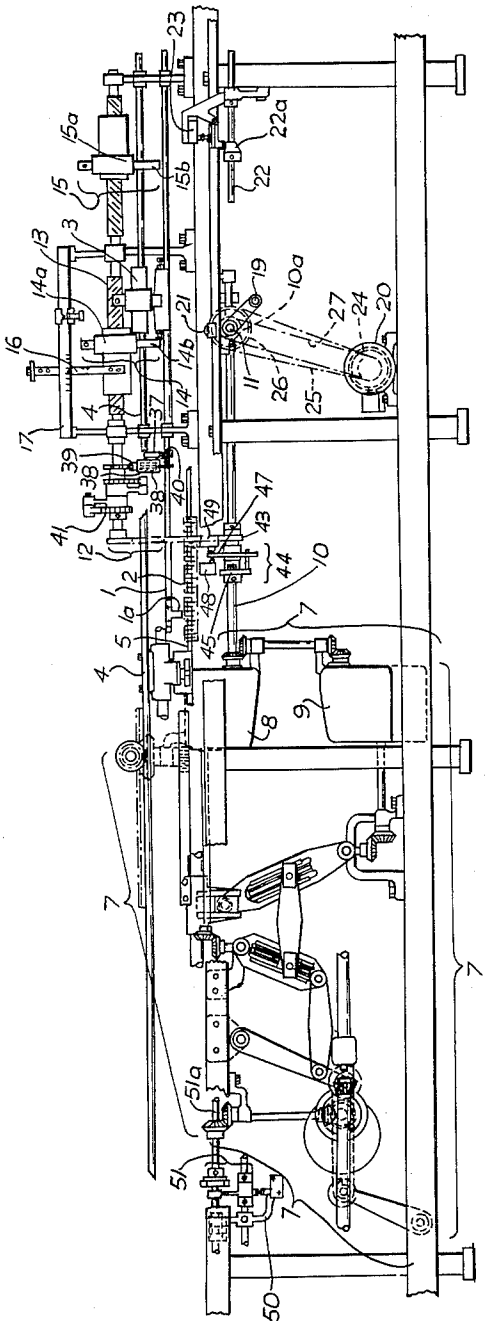


FIG. 9.

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United States Patent Office

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Patented Feb. 6, 1962

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STRAIGHT BAR KNITTING MACHINES

Raymond Blood, Shepshed, England, assignor to William Cotton Limited

Filed July 15, 1959, Ser. No. 827,208
Claims priority, application Great Britain July 18, 1958
10 Claims. (Cl. 66—89)

This invention is for improvements in or relating to straight bar knitting machines and concerns the adjustment of parts in the machine, primarily selvedge stops, and a variable draw lever.

In the instance of selvedge stops, it usually happens that adjustment for fashioning purposes during the production of a blank, results when the blank is finished, in the stops being located in different relative positions from their relative positions at the start of the blank. It then becomes necessary when the machine is not running, to reset the selvedge stops back to their original positions which has been usually accomplished heretofore by the manual turning of a handle.

Additionally when it is required to change from production of one type of blank to another type of blank, it usually happens that the position of the selvedge stops at the end of the first type of blank is different from the position required for the stops to commence the other type of blank. Accordingly heretofore in this instance also the stops are re-set, when the machine is not running at a time between production of the two types of blanks, usually by manual turning of a handle. To facilitate the re-setting of the stops, there is usually provided a linear scale with which one of the stops co-operates and with which there is an independently movable pointer which is initially disposed to indicate the starting position of the stops and consequently the position to which the stops are required to be re-set.

The usual manual operation referred to has at least two attendant disadvantages (1) that it occupies an undesirable amount of time such as to correspondingly limit the production time and (2) that it is a laborious operation due to the fact that its operation also effects adjustment of the draw and moves the tie bar, the siurcocks, and the carrier rods through various selection means.

An object of the invention is to provide more efficient operating means in substitution for the manually operable means.

In hose machines it is usual during production of the hose never to rack the stops for fashioning back beyond the starting point so that it is only necessary to re-set the stop by back racking in the one reverse direction to the direction of fashion racking, and it is known for this to be accomplished using power. In underwear and outerwear machines the fashion racks may be in opposite directions i.e. to each side of the stocking point, and the re-set rackings have been usually effected in either of the reverse directions by hand racks, and in a certain instance using power for one direction only.

An object of the invention is to provide power operated means for re-set racking of the stops in either of the reverse directions.

The invention provides a straight bar knitting machine in which selvedge stops are required to be progressively adjusted in either or both opposite directions in fashioning and to be re-set in either the one or the other reverse direction, such machine having a reversible power drive, means for releasably connecting the power drive to means for displacing the stops, and switch means for determining the direction of power drive under different control of the different directional movements of the stops in fashioning, respectively whereby the stops can be re-set in either of the required reverse directions under power.

In the instance of a variable draw lever, this is required to be adjusted each time the selvedge stops are adjusted for each widening or narrowing operation and this is effected by the racking mechanism which turns the lead screws to adjust the selvedge stops whilst the machine is running. There are at least two attendant disadvantages of this (1) that the adjustment of the draw lever imposes an undesirable load on the lead screw racking mechanism and (2) that the draw lever is adjusted when in its extreme positions so that the adjustment is effected when the draw mechanism is under maximum load conditions.

An other object of the invention is to provide means for adjusting the draw lever more efficiently and primarily independently of the selvedge stop racking mechanism whilst the draw mechanism is under minimum load conditions.

A further object of the invention is to enable the adjustment of two parts of the machine in required manner at different times by and through the intermediary of means common to both adjustments.

The invention provides, from one aspect, motorised re-set racking means for selvedge stops, characterised by including high and low speed clutches, and switch means to determine (*a*) the direction of the motor and consequently the direction of adjustment of the selvedge stops (*b*) operation of the clutches in turn to obtain first high speed adjustment of the selvedge stops and final low speed of adjustment thereof and (*c*) accurate stopping of the drive to ensure accurate re-setting of the selvedge stops.

The invention provides, from another aspect, motorised adjustment means for a variable draw lever in coordination with racks of selvedge stops, characterised by a screw controlled clutch between selvedge stop racking mechanism and draw adjusting mechanism, the screw being operable by the selvedge stop racking mechanism to operate motor clutch control switch means after taking up lost motion in the clutch to allow racking of the stops without simultaneously adjusting the mechanism, the motor operating the draw adjusting mechanism at specified time in the draw by half speed shaft controlled switch means, and operation of the draw adjusting mechanism re-setting the screw control of the screw controlled clutch for repeat operation by the selvedge stop racking mechanism.

The invention also provides, from a further aspect, common motorised adjustment means for two parts of the machine characterised by two electric circuits controlling a common motor clutch, switch means determining operation of the circuits in turn, and lost motion clutch means operable under control of one circuit for simultaneous adjustment by the motor of the two parts and under control of the other circuit for motor adjustment of one of the parts without the other part being adjusted simultaneously.

The above and other features of the invention set out in the appended claims are incorporated in the construction which will now be described as a specific embodiment with reference to the drawings accompanying the specification in which:

FIGURE 1 is a diagrammatic view of relevant parts of a straight bar knitting machine to illustrate the re-setting of selvedge stops;

FIGURE 2 is a diagrammatic detail of starting switch means;

FIGURES 3*a* and 3*b* are cross sectional and front views respectively of a re-setting switch box indicator for the selvedge screws;

FIGURES 3*c* and 3*d* are detail views of switches in said switch box;

FIGURE 4 is a detail view of index mechanism operating a further switch;

FIGURE 5 is a circuit diagram of the electric part of the re-setting mechanism;

FIGURE 6 is a similar view of FIGURE 1 to illustrate draw lever adjustment means and including a detail of the starting switch device;

FIGS. 6*a* and 6*b* respectively show different switch arrangements;

FIGURE 7 is a detail elevational view of a screw controlled lost motion clutch device;

FIGURE 8 is a diagramatic illustration of the clutch lost motion;

FIGURE 9 is a general front view of the machine showing relevant parts in correct mutual relationship.

Referring first to FIGURES 1 and 9 these show the conventional arrangement primarily in respect of cottons patent straight bar knitting machine and particularly in respect of this machine of underwear and outerwear or pant frame type of a thread carrier bar 1 with a thread carrier 1*a* associated with a knitting head 2 and connected to a friction box 3 (by well known means 3*a*) which latter is frictionally slidable on a friction bar 4; the friction bar 4 as usual carries a slurcock 5*a* slidably mounted on the slurcock bar 5. The friction bar 4 is also connected to variable draw mechanism indicated generally at 7 to be reciprocated thereby in well known manner in said machines with variable amplitude of travel always greater than the amplitude of travel required of the thread carrier bar 1.

The lower half of FIGURE 1 and the left hand part of FIGURE 9 shows the draw mechanism 7 adapted to be adjustable by variable motion transmitting mechanisms indicated at 8 and 9 through the intermediary of an operating shaft 10 e.g. substantially as disclosed in my U.S. patent application Serial No. 759,902. This operating shaft 10 is connected by bevel gears 10*a* and countershaft 11 and by chain and sprocket means 12 to a well known type of adjustable lead screw 13 on which selvedge stops 14 and 15 are mounted. These selvedge stops 14, 15 are for limiting traverse of the thread carrier 1*a* to a required less distance than that of the slurcock 5*a*, the friction bar 4 sliding through the friction box 3 at the end of each traverse, all as well known in said machines, and for which purpose usual selvedge stop portions 14*a*, 15*a* co-operate with the friction box 3, and usual selvedge bolts 14*b*, 15*b* co-operate with the means 3*a* connecting the friction box 3 to the thread carrier bar 1.

The selvedge stop 14 carries a pointer 16 co-operating with a linear scale 17, and also co-operating with the linear scale 17 there is an independently movable re-set pointer 18.

The re-set pointer 18 is usually located at the starting position of the selvedge stops 14, 15 as indicated by the pointer 16, and when the machine is not running between the production of successive blanks, the counter shaft 11 is usually turned by a handle 19 to rotate the operating shaft 10 and consequently re-set the selvedge stops 14, 15 back to the re-set position of the re-set pointer 18, and in so doing the operating shaft 10 also re-sets the draw mechanism back to its original setting.

According to the invention this re-setting operation is motorised to avoid the necessity for manual operation by the handle 19.

For this purpose the counter shaft 11 is operable by an electric motor 20 consequent upon operation of a manually operated starting switch 21. To ensure that the motor 20 can be started by the switch 21 only when the machine is not running, the usual power rod 22 (see also FIGURE 2) is adapted by a cone collar 22*a* on it to open a control switch 23 in series with switch 21 when the power "rod" is "on" and the machine is running and to close it only when the power rod is "off" and the machine is not running.

The motor 20 is adapted to drive through one clutch 24 at low speed, through chain and sprocket means 25, and through a high speed clutch 26, through chain and sprocket means 27.

For determining in which direction the motor is to operate to return the selvedge stops to their initial position with the pointers 16 and 18 registering, the re-set pointer 18 has associated with it a tappet switch 28 (FIGURES 1, 3*a* and 3*c*.)

More specifically the switch 28 includes a pivotal operating member 29 (FIGURES 3*a*, 3*c*) having a pair of lugs 30, 31 adapted to be engaged selectively by an adjustable screw 32 on the selvedge stop 14. Operation of the switch will be fully described hereinafter.

For determining when operation of the re-set pointer 18 is reduced in speed by changing over control from the high speed clutch 24 to the low speed clutch 26, there is a cam operated switch 33 (FIGURES 1, 3*a* and 3*d*) also associated with the re-set pointer 18. This switch 33 is operated by a cam plate 34 (FIGURES 3*a*, 3*d*) carried by the selvedge stop 14. Further operation will be described more fully hereinafter.

For accurate stopping of the motor with the re-set pointer 18 in registry with the selvedge stop point 16, there is first a preparing switch 35 (FIGURES 1 and 3*a*) also associated with the re-set pointer 18 and operated by an adjustable screw 36 (FIGURE 3*a*) on the selvedge stop 14. This switch 35 is set to trip approximately within one needle distance each side of the needle to which the thread carrier is to be pre-set, as indicated by the distance between the arrows A—A in FIGURE 3*b*. In addition, as shown in FIGURES 4 and 9, the existing indexing mechanism illustrated therein includes a final switch 37 associated with a support 38 for the plunger 39 and operated by an adjustable screw 40 carried by the plunger 39; operation of these switches 35, 37 will be described more fully hereinafter.

Referring now to FIGURE 5 is will be seen that an electric system is provided including the motor 20, the starting switch 21, the control switch 23, the low speed clutch 24, and the high speed clutch 26.

It will be seen that the clutches 24, 26 are selectible for operation through the relay 33R from the switch 33.

The circuit also includes the tappet switch 28 which it will be seen is in circuit with means indicated at 28*a* determining the direction of the motor 20.

In addition the switches 35, 37 are, as shown, in parallel and in circuit with the starting switch 21 and operable in turn to break the circuit after switch 21 is closed.

In operation of the apparatus as so far particularly described, the starting switch 21 is normally open, the control switch 23 is closed only when the machine is not running and switches 35 and 37 are normally closed.

The cam operated switch 33 is normally open with the relay switch 33R in a position preparing the high speed clutch for operation, and the tappet switch 28 is closed to prepare the motor 20 for operation in one direction according to the position at which the pivoted tappet 29 has been left, the position of the tappet 29 always being appropriate for the motorised operation of the selvedge screw 13 to move the selvedge stops 14, 15 back to the re-set position in the opposite direction from which they have moved away from the re-set position

Assuming that one blank has been produced and the machine is not running, the starting switch 21 is pressed to close it and, provided that the power rod 22 is in the "off" position i.e. with the switch 23 closed, the motor 20 starts up to drive the operating shaft 10 through the high speed clutch 26, the direction of the motor being preset by the tappet switch 28 in the manner above stated so that the selvedge stops 14, 15 proceed to be re-set by the motor 20 at high speed back towards their initial position with the selvedge stop pointer 16 in registry with the pre-set point 18.

As the selvedge stop pointer 16 approaches the re-set pointer 18, the cam 34 engages the cam operated switch

33 and closes it thereby to operate the relay 33R and to switch over control from the high speed clutch 26 to the low speed clutch 24, so that thereafter re-setting of the selvedge stops 14, 15 is at low speed.

As the selvedge stop pointer 16 approaches the re-set pointer 18 to within one needle's distance each side the required needle for the thread carrier to stop at, the switch 35 is opened by the screw 36 to prepare for complete opening of the circuit. At the end of the one needle distance, the switch 37 is opened by the index plunger 39 dropping in the appropriate notch in the index wheel, so that precisely at this point the motor 20 is stopped and the selvedge stops 14, 15 cease their movement with the selvedge stop pointer 16 returned to the position of the re-set pointer 18, and the important point being that the clutch is disengaged at the same time, so that any overrun of the motor will not cause movement of the stops. The breaking of the clutch drive in this manner ensures accuracy of location of the selvedge stops.

With further reference to the tappet switch 28, the pivoted member 29 will not be operated whilever the selvedge stops 14, 15 move only at one side of their starting position, said member 29 therefore remaining in the correct position for return of the selvedge stops 14, 15. However if at any time the selvedge stops move to the other side of their starting positions, the adjustable screw 32 will operate the member 29 and consequently the tappet switch 28 for changing the direction of return of the selvedge stops 14, 15 accordingly.

It is to be noted that the motorised re-setting of the selvedge stops 14, 15 is also coupled with corresponding motorised re-setting of the draw through the intermediary of the operating shaft 10.

Conveniently the same motorised means is employed to effect the usual progressive adjustment of the variable draw 7 for each fashioning whilst the machine is running, instead of the more usual arrangement of effecting this adjustment by the same racking mechanism that progressively adjusts the selvedge stops 14, 15 for each said fashion, and without this adjustment of the variable draw 7 being effected against maximum load.

For this purpose the usual selvedge stop racking mechanism indicated at 41, 42 in FIGURES 6 and 9 is employed to operate electric switch means at an instance of predetermined minimum load of the draw to start the electric motor 20 for the progressive adjustment of the variable draw to re-establish the lost motion, for repeat operation.

More specifically and referring again to FIGURES 6 and 9 the sprocket wheel 43 of the aforementioned chain and sprocket means 12 is in this instance loose on the operating shaft 10 and is operable for the first described purpose of re-setting the selvedge stops only through the intermediary of a clutch device indicated generally at 44 and a collar 45 of which is fixed on the operating shaft 10.

This sprocket wheel 43, as shown in FIGURE 7, has an axial bush 43*a* which is externally screw threaded and has clutch teeth 43*b* which are widely spaced from co-operating clutch teeth 45*a* of the collar 45 to provide a lost motion equivalent to two needle pitches in either direction.

On the screw bush 43*a* there is a nut 46 which is formed with a flange 46*a* having a hole 46*b* through which extends a peg 45*b* projecting from the collar 45.

This flange 46*a* is engaged by a forked switch operating lever 47 which is pivoted at 47*a* and has oppositely directed adjustable screws 47*b*, 47*c* adapted for operating electric switches 48, 49 respectively.

These switches 48, 49 are, as shown in FIGURE 8, in parallel with each other and also in parallel with the aforementioned tappet switch 28 for controlling the direction of the adjustment by the motor 20.

In addition, see also FIGURE 6*a* and 9, there is a final switch 50 in series with the switches 48, 49 and operable by cam and truck lever means 51 from the usual half

speed shaft 51*a* at a time when the draw lever is in its mid position. FIGURE 6*b* shows that there is also a control switch 52 in lieu of control switch 23 operable by the cone collar 22*a* on the power rod 22 to be closed and prepare the circuit when the rod is "on" and be "open" to render the circuit inoperative when the power rod is "off."

Operation of this arrangement if allowed to take place for each fashioning only whilst the machine is running, by virtue of the control switch 52 being then closed with the power rod 22 "on."

For each fashioning the selvedge stop racking means, 41, 42 operates to adjust the selvedge stops, and this also turns the sprocket wheel 43 about the operating shaft during which the lost motion between the clutch dogs 43*b* and 45*a* is taken up so that this selvedge stop racking means is not used to simultaneously adjust the variable draw.

However the sprocket wheel 43, in its part rotation carries the bush 43*a* with it such that the bush 43*a* moves rotationally and consequently moves the nut 46 axially. For the latter movement the nut flange 46*a* tilts the switch lever 47 about its pivot 47*a* such that this lever 47 operates the appropriate switch 48 or 49 to prepare the motor 20 for operation in appropriate direction.

Actual operation of the motor 20 is started by closing of the final switch 50 at a time governed by the half speed shaft cam means 51 when the variable draw is in its mid-position of minimum load.

The motor 20 then operating through the high speed clutch 24, rotates the operating shaft 10 to effect the appropriate adjustments of the variable draw through the variable motion transmitting device 8, 9.

The operating shaft 10, in its rotation, carries the collar 45 with it and consequently the peg 45*b*; the latter, in its movement rotates the nut 46 which accordingly moves also axially and in this movement the nut 46 returns the switch lever 47 back to its initial neutral position with both switches 48, 49 open so that the motor 20 stops and the parts are thus re-set for repeat operation.

It is to be noted from the foregoing particular description that the selvedge stops may be considered as one part of the machine and the variable draw may be considered as a second part of the machine; and further that the provision of the means described enables the two parts to be adjusted simultaneously by automatic means only when required during non-running of the machine, and also enables the first part to be adjusted by usual means in association with the second part being adjusted by said automatic means only when required during running of the machine.

What we claim is:

1. A straight bar knitting machine in which at least one mechanism is required to be progressively adjusted in fashioning operations of the machine and is required to be re-set, having in combination, adjustment means connected to said mechanism for adjusting it, an adjustment operating shaft connected to said adjustment means for operating the latter, drive transmitting means connected to said adjustment operating shaft for transmitting drive thereto, a power drive connected to the drive transmitting means and operable for imparting drive thereto, clutch means connected in said drive transmitting means for control of the drive, and switch means associated with the clutch means and operable to effect such control of the clutch means that re-setting of said mechanism in desired direction can be effected through said adjustment operating shaft from said power drive.

2. A machine as claimed in claim 1 wherein the clutch means, the power drive, and the switch means are electric, and the switch means includes an operating electric switch and an electric switch in series therewith, the latter electric switch being broken when the machine is running and being made when the machine is not running, so that

the re-setting can be effected only when the machine is not running.

3. A straight bar knitting machine in which selvedge stops for limiting the traverse of thread carriers are required to be progressively adjusted in either direction in fashioning and to be re-set in either direction, such machine having in combination, a reversible power drive, means for displacing the selvedge stops, means for releasably connecting the reversible power drive to said means for displacing the selvedge stops, and switch means for determining the direction of power drive under different control of the different directional movements of the selvedge stops in fashioning respectively, whereby the stops can be re-set in either of the required directions under power.

4. A straight bar knitting machine in which selvedge stops for limiting the traverse of thread carriers are required to be re-set in opposite directions to that in which they are progressively adjusted from a starting position in fashioning, such means having in combination, a reversible electric motor, lead screw racking means for said selvedge stops, an adjustment operating shaft connected to said lead screw racking means, a drive connection between said adjustment operating shaft and said reversible electric motor, high and low speed clutches in said drive connection, indicator means associated with the selvedge stops, and electric switch means in association with the clutches, motor, and indicator means in such manner that the re-setting of the selvedge stops can be effected in desired direction from said motor and through said clutches initially at high speed and ultimately at low speed for accuracy.

5. A machine as claimed in claim 4 having indexing mechanism operable by the lead screw racking means; the indicator means comprises a scale, a selvedge stop pointer movable along the scale with the selvedge stops, and a re-set pointer manually displaceable along the scale to required starting and re-set position of the selvedge stop pointer; and said electric switch means includes a manual switch for starting re-setting operation of the reversible electric motor through the high speed clutch, a tappet switch device operable through co-operation with the two pointers to determine the direction of the reversible electric motor so that the direction of re-setting the re-set pointer is automatically opposite to the direction of the progressive adjustment from the starting position in fashioning, a clutch control switch device operable through approaching co-operation of the two pointers to transfer the drive transmission to the low speed clutch, a preparing switch device operable through near-co-operation of the two pointers to prepare for stopping of the reversible electric motor, and a final switch device operable by said indexing mechanism for stopping the motor.

6. A machine as claimed in claim 5 wherein the tappet switch, the clutch control switch, and the preparing switch, devices, each comprises a switch movable with the re-set pointer, and an operating member therefor movable with the selvedge stops, and wherein there is a power control rod, a switch operable by the power control rod, and said manual switch is in series with this latter switch in a manner to ensure that the motor operated adjustment means is operable only when the machine is not running.

7. A straight bar knitting machine in which variable draw mechanism is required to be adjusted progressively and re-set in fashioning, such machine having adjustment means connected to said draw mechanism, an adjustment operating shaft adapted for transmitting drive to said adjustment means, a reversible electric motor, a clutch connection between said shaft and said reversible electric motor, electric switch means in association with the clutch and the motor, and suitable control mechanism also in association with the electric switch means in such manner that the progressive adjustment and re-setting of the variable draw is effected through said shaft from said power drive without being through the intermediary of selvedge stop racking means and at a time of minimum load on the draw mechanism.

8. A straight bar knitting machine in which selvedge stops and variable draw mechanism are required to be progressively adjusted in either of opposite directions in fashioning and to be re-set in either of the opposite directions, said machine having in combination, adjustable lead screw mechanism for the selvedge stops, screw adjustment means for the variable draw mechanism, an adjustment operating shaft, a drive connection between said adjustment operating shaft and said lead screw mechanism and said screw adjustment means, a reversible electric motor, drive transmitting means between said adjustment operating shaft and said reversible electric motor, high and low speed clutches included in said drive transmitting means, indicator means associated with the selvedge stops, electric switch means in association with the clutches, motor, and indicator means and operable for re-setting of the selvedge stops in either direction from said motor and through said clutches initially at high speed and subsequently at low speed for accuracy, a lost motion clutch device having screwed parts and associated with said drive connection allowing for adjustment of the selvedge stops without adjusting the variable draw mechanism, and switch means operated by said screwed parts of the clutch whilst taking up the lost motion to thereafter start the motor in appropriate direction and adjust the variable draw mechanism in appropriate direction, after which the lost motion clutch re-sets by reverse action of said screwed parts.

9. A machine as claimed in claim 8 wherein the lost motion clutch device comprises a dog clutch member fixed on said shaft, a screw threaded movable dog clutch member having a drive connection with the selvedge stop racking adjustment means and free on said shaft with a lost motion between the dogs, and a screw nut on the movable clutch member, there being also provided forward drive and reverse drive switches for the motor, and said screw nut being slidably connected to the fixed dog clutch and adapted to operate said forward drive and reverse drive switches.

10. A machine as claimed in claim 9 having a final switch in series with said forward drive and reverse drive switches, a half-speed shaft, and said final switch being operable from the half-speed shaft at a time when the draw is at a mid-position of minimum load, so that the variable draw's adjustment is effected at this time, and having a control switch in series with the final switch and operable according to whether the machine is running or not running such that the variable draws' adjustment can take place only while the machine is running.

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2,273,301	Tuchscherer et al.	Feb. 17, 1942
2,625,024	Zesch	Jan. 13, 1953
2,684,582	Bauer	July 27, 1954
2,705,879	Scheller	Apr. 12, 1955
2,823,531	Monk	Feb. 18, 1958
2,839,908	McCarthy et al.	June 24, 1958