Feb. 11, 1936. A. FRIEDMANN 2,030,697

KNITTING MACHINE

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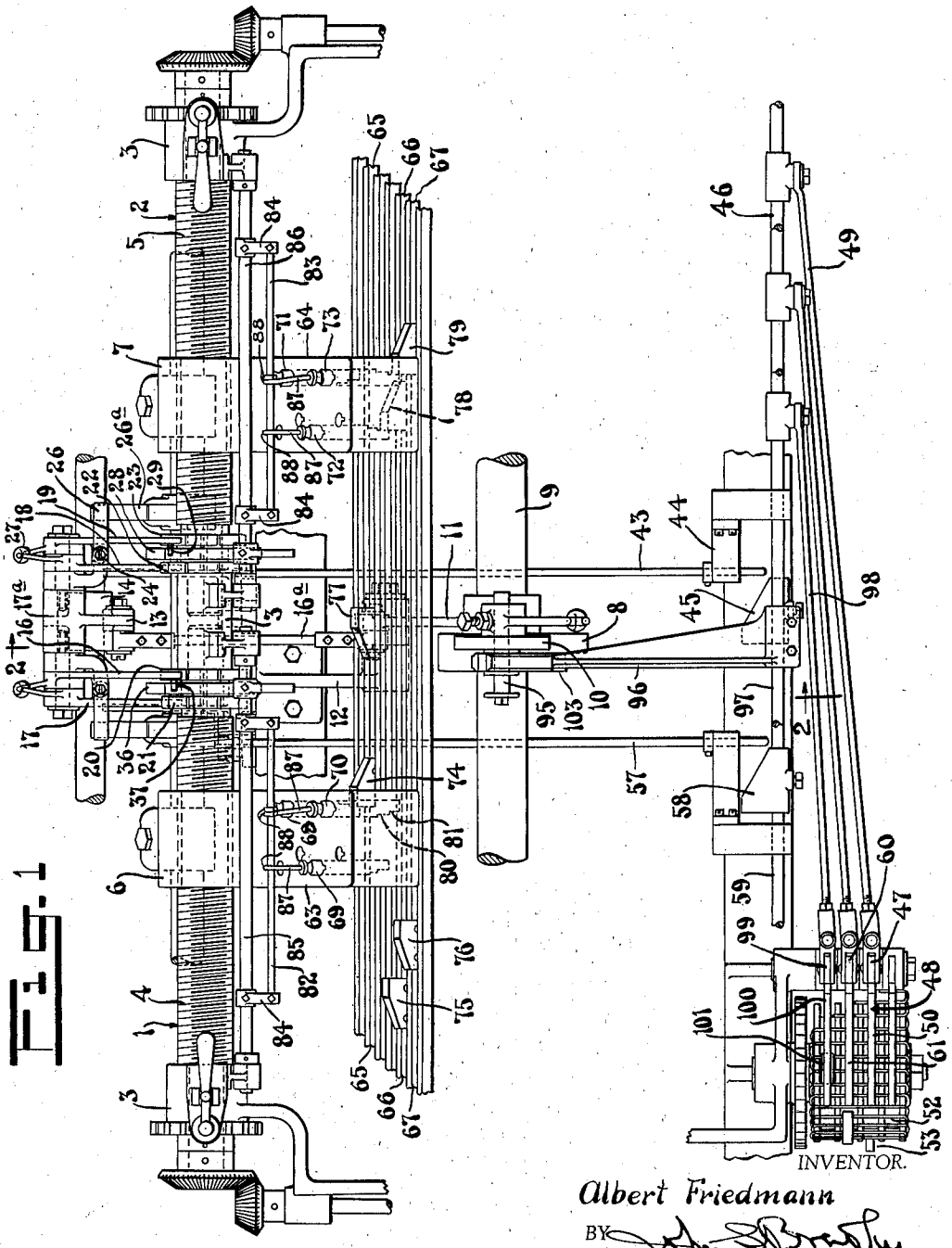


FIG. 1

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Fig. 2

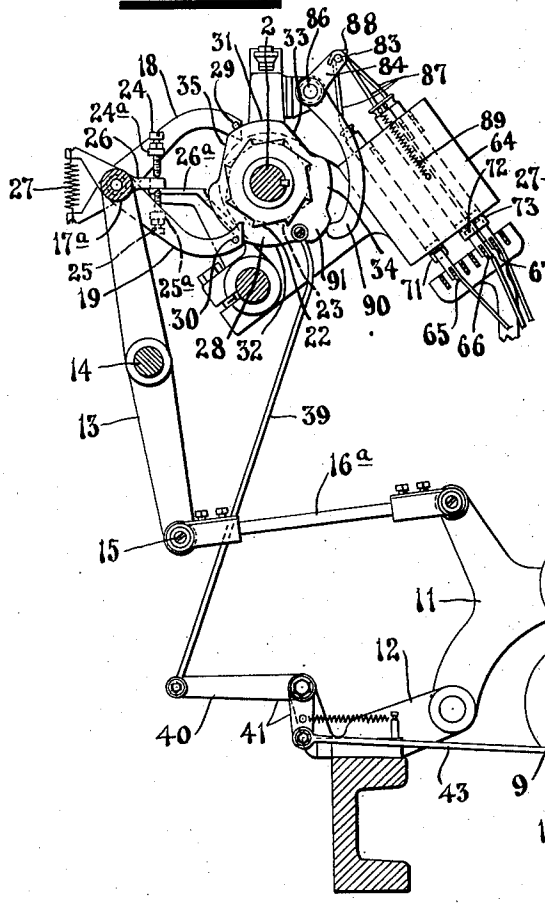



Fig. 3

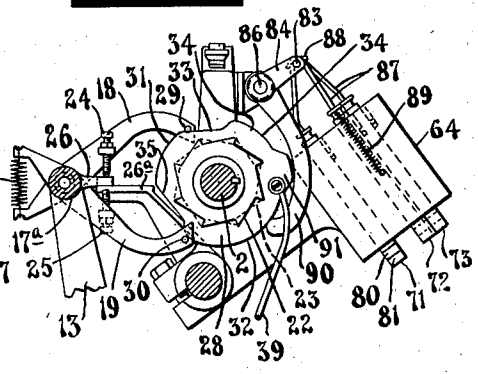



Fig. 4

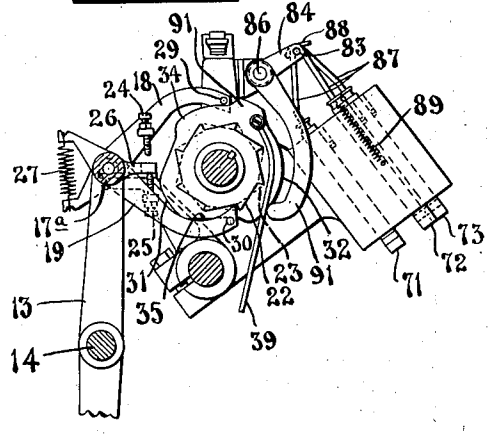
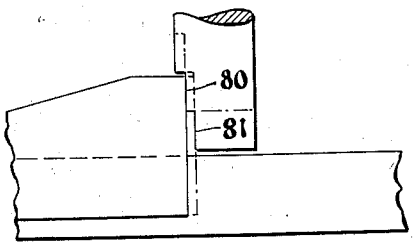



Fig. 7




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KNITTING MACHINE

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Fig. 5

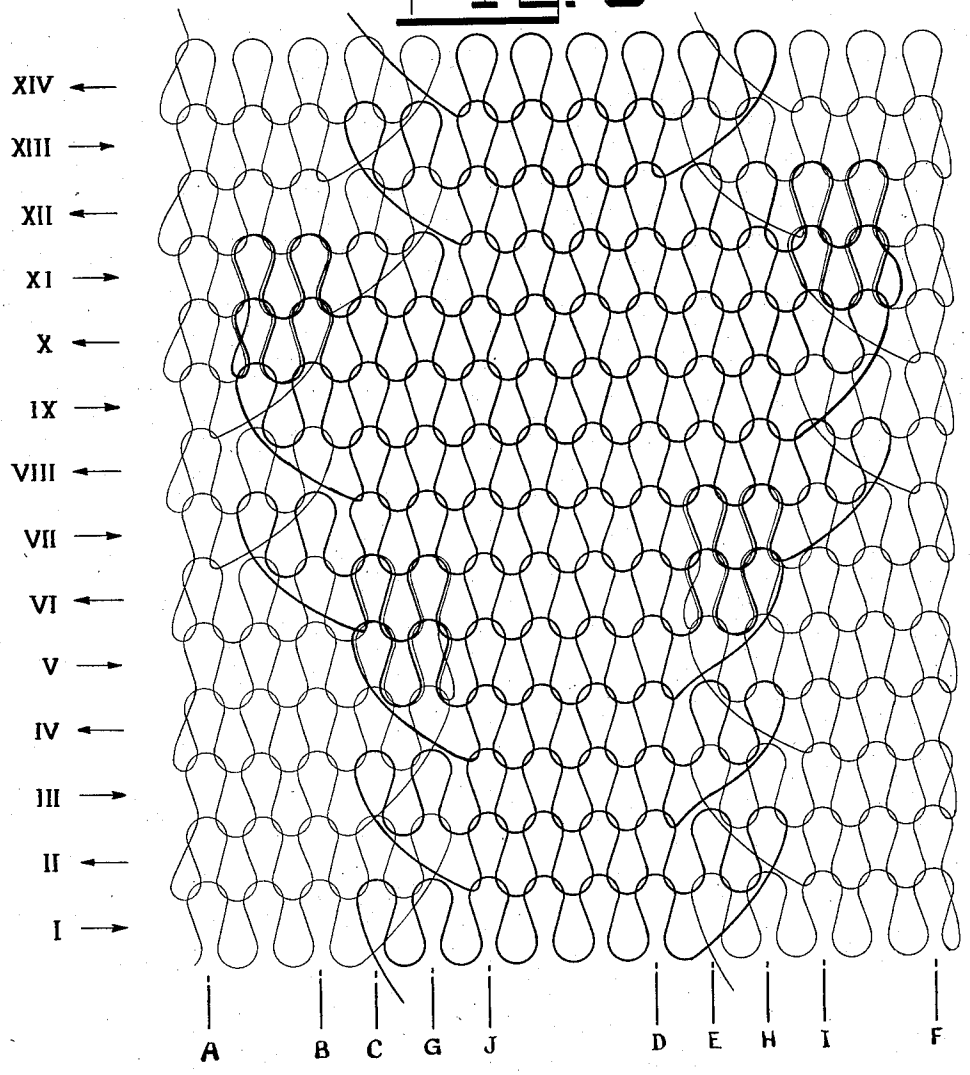
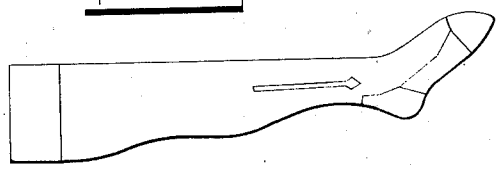



Fig. 6



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Patented Feb. 11, 1936

2,030,697

# UNITED STATES PATENT OFFICE

2,030,697

## KNITTING MACHINE

Albert Friedmann, Wyomissing, Pa., assignor to Louis Hirsch Textile Machines, Inc., New York, N. Y., a corporation of New York

Application August 3, 1935, Serial No. 34,491

18 Claims. (Cl. 66—128)

This application relates to a new and useful improvement in knitted fabrics and in flat knitting machines or attachments therefor and, in particular, in mechanisms for controlling the extent of travel of thread carrier rods. Such control is required in many forms of reenforcing, plating and the making of overlaid designs, and also in various types of split seam work in which the travel of at least some of the carriers is restricted to less than their normal full traverse.

A familiar means for controlling the travel of the carrier rods for such purposes consists, essentially, of a spindle carrying opposed threads upon its respective halves and provided with ratchet or other means whereby it may be rotated in either direction whenever and to the extent desired. An internally threaded stop bearing nut is carried by each half of the spindle, the function of which is to engage the carrier rods, to limit the movement thereof in one or both directions. Whenever the spindle is rotated, the nuts will be moved towards or away from each other with a corresponding alteration in the movement of the rods engaged by the stops. A serious limitation in such devices is that no variation in the relative movement of the nuts is possible. They can only move either inwardly or outwardly simultaneously and to the same extent.

This invention relates, in part, to improvements in such mechanism. Since a description of one form of the device will be sufficient to demonstrate and disclose all that will be required by those skilled in the art to apply it to other uses, the following drawings and description will be confined primarily to a mechanism for producing fabric embodying a novel herringbone split seam which will demonstrate its unique capabilities.

In the drawings:

Figure 1 is a plan view of a flat knitting machine embodying the mechanism of the invention;

Fig. 2 is a cross-section of the machine along the line 2—2 of Fig. 1 viewed as indicated by the arrows and showing the pawl controlling mechanism in neutral position;

Fig. 3 is a view of a fragment of Fig. 2 showing the upper pawl in operating condition;

Fig. 4 is a similar view showing the lower pawl in operating condition;

Fig. 5 is a diagrammatic illustration of the loop arrangement of the split seam fabric of this invention;

Fig. 6 is a diagrammatic representation of a stocking to illustrate some of the parts in which such a split seam structure may be utilized; and

Fig. 7 is a fragmentary view of the end of a stop pin showing the stepped faces with which the carrier rod engages.

Unlike present day mechanism the device of this invention employs two separate spindles 1 and 2 positioned end to end and preferably, though not necessarily, close together, as shown in Fig. 1. Each spindle is supported by suitable bearings 3 at either end. Each spindle is threaded, preferably in the same direction, as at 4 and 5, both threads having the same degree of pitch. Upon each spindle is a nut 6 and 7 respectively, with internal threads engaging respectively with threads 4 and 5 of the spindles.

Obviously, if either spindle is rotated, the corresponding nut will be moved one way or the other, and, since the two spindles are separate, the nuts may be caused to approach or move away from each other or to move in the same direction, or either one may be moved independently of the other by rotating one or both spindles in the manner required to bring about the desired result.

The rotating means shown (Figs. 1 and 2) consists of a cam 8 on the main cam shaft 9 with which engages a roller 10 mounted upon an arm 11 which is pivoted to a suitable fixed bracket 12. A lever 13 pivoted intermediate its ends as at 14 is pivotally connected at one end 15 to arm 11 by rod 16a. Adjacent the other end of lever 13 is provided pivotal bearings 17a for two pairs of pawls 16 and 17, 18 and 19. Upon the inner end of spindle 1 are mounted two ratchet wheels 20 and 21, the teeth of one being opposed to the teeth of the other and engageable respectively by pawls 16 and 17.

Similar ratchet wheels 22 and 23 having similarly opposed teeth are similarly mounted on the inner end of spindle 2 so as to be engageable by the other pair of pawls 18 and 19. For the purpose of this description it will be assumed that the teeth of ratchet wheels 20 and 22 face in one direction and that ratchets 21 and 23 face in the other direction. Pawls 18 and 19 are maintained in position by stops 24 and 25 threaded through lugs 24a and 25a and engaging with lever 26 pivoted upon pawl bearing 17a against which the stops are held by a spring 27. Lever 26 is supported upon and guided by guide plate 26a rigidly attached to any suitable stationary part of the machine so that it moves in a substantially straight line and does not dip when the pawls are rocked. To render pawl 19 inoperative it may be swung downwardly so that it will not engage

with ratchet 23. Similarly pawl 18 may be swung upwardly so that it will clear ratchet 22. By swinging both pawls, as above described, both may be rendered inoperative. Thus, by manipulating the pawls, the spindle may be rotated in either direction or may be insulated from the action of the pawls.

Pawls 16 and 17 may be similarly controlled so that spindle 1 also may be rotated in the desired direction or maintained idle through manipulation of the pawls as above described.

Means for thus manipulating pawls 18 and 19 is shown in Figs. 2, 3 and 4. It consists of a cam plate 28 rotatably mounted upon spindle 2 between ratchets 22 and 23. Adjacent the tip of each pawl is an inwardly extending pin 29 and 30. These pins are engageable with cam plate 28 when the pawls are rocked forward as the result of the rocking of lever 13. Upon cam disk 28 are two surfaces 31 and 32 so positioned with respect to each other that pin 29 of pawl 18 will engage with surface 31 simultaneously with the engagement of pin 30 of pawl 19 with surface 32. Surfaces 31 and 32 are of sufficient height so that, when the pawls are rocked forward, both pawls will be lifted sufficiently to prevent them from engaging with the teeth of their respective ratchets (see Fig. 2). Consequently, as long as the cam disk is in the position above described spindle 2 will not be rotated.

To rotate spindle 2 in clockwise direction cam disk 28 is rotated counter-clockwise until surface 33 has assumed the position originally occupied by surface 31. Surface 33 is sufficiently low as compared with surface 31 so that when the pawls are rocked forward pawl 18 can engage with its ratchet 22 (see Fig. 3). High surface 32 of cam disk 28 is of sufficient extent that when the cam disk is rotated as above described, to make pawl 18 operative, pawl 19 is still maintained out of engaging position with respect to its ratchet 23.

A further counter-clockwise rotation of cam disk 28 will bring another high lift 34 into the position originally occupied by high lift 31 so that pawl 18 will again be disengaged from its ratchet (see Fig. 4). This rotation will also bring a low portion 35 of cam disk 28 into the position originally occupied by high lift 32 so that pawl 19 is now able to engage with its ratchet 23 to rotate spindle 2 in counter-clockwise direction.

Pawls 16 and 17 are similarly controlled by a similar cam disk 36 engageable with pin 37 on pawl 16 and a similar pin on pawl 17, to lift one or the other or both out of operating position.

In order that the operation of one spindle may be entirely independent from that of the other cam disks 28 and 36 each has its separate control mechanism as shown in Fig. 1. That which controls the operation of cam disk 28 consists of a rod 39 pivotally connected to cam disk 28 and extending downwardly to arm 40 of rock lever 41, the other arm of which is connected to another rod 43 extending in a generally horizontal direction through a bearing 44 in which it is slidable and terminates within the line of travel of a cam piece 45 upon another slidable rod 46. Rod 46 is connected to arm 47 of a rock lever 48 by means of a connecting rod 49. The other arm 50 of rock lever 48 rests in the path of a row of buttons on pattern chain 52. When arm 50 of rock lever 48 is not in contact with a pattern chain button, cam disk 28 is in the position described above and shown in Fig. 2, in which both ratchets 22 and 23 are shielded from the action of their pawls 18 and 19. When a button 53 of suitable height passes under arm 50 of rock lever 48, rod 46 will be pushed to the right and cam piece 45 will be carried under the end of rod 43 pushing it backward sufficiently to rock lever 41, lift rod 39 and rotate cam disk 28 into the position described and as shown in Fig. 3, in which pawl 18 is permitted to engage with its ratchet 22. The passage of a higher button under arm 50 of rock lever 48 will carry cam piece 45 still further under the end of rod 43 with the result that cam disk 28 will be further rotated to bring it into the position in which it will permit pawl 19 to engage with its ratchet 23 as heretofore described and as shown in Fig. 4.

The other cam disk 36 which controls the operation of pawls 16 and 17 in a similar manner is operated by a similar linkage consisting of a rod similar to rod 39, a rock lever similar to rock lever 41, rod 57, cam piece 58 upon rod 59 and rock lever 60, arm 61 of which lies in the path of another row of buttons on pattern chain 52.

Thus in spite of the fact that all of the pawls are mounted upon a common rock lever operated from a single cam it is possible, through the medium of the pattern chain, to so control each pair of pawls so as to rotate spindles 1 and 2 simultaneously in the same direction and to the same or different amounts, to rotate both spindles simultaneously in opposite directions, to rotate either one in either direction without rotating the other or to maintain both spindles in a given state as long as desired. All of these movements can, obviously, be properly synchronized so that the shifting of the pawls will not conflict with the rocking of lever 13 and so that the desired rotation of spindles 1 and 2 will occur at the desired time in the knitting cycle.

The pawls and their rocking motion may be thrown completely out of action as, for example, when plain knitting is being done or other work in which the above described mechanism is not required. To make this possible cam roller 10 is slidably mounted upon its shaft 95 and a forked shifting lever 96 is engaged therewith (see Fig. 2). Shifting lever 96 is attached to a rod 97 which is in turn connected, through connecting rod 98, to one arm of a rock lever 99, the other arm 100 of which lies in the path of another row of buttons 101 on pattern chain 52. By this mechanism cam roller 10 normally rides upon circular idling cam 103 but will be shifted onto working cam 8 at any desired time by the passage of a suitably placed button 101 on pattern chain 52

The carrier rod control mechanism disclosed also includes a pair of blocks 63 and 64 mounted upon nuts 6 and 7 respectively, (Figs. 1 and 2), and each provided with a set of adjustable stop pins, one stop pin of each set being adapted to engage with stops upon a different one of the carrier rods to control the traverse of the rods, as will be described. Seven carrier rods are shown in Figs. 1 and 2 and seven corresponding stop pins should be provided upon each block 63 and 64. However, to simplify the discussion it will be assumed that only three carrier rods will be used and only the corresponding pins are shown. The three rods referred to are numbered 65, 66 and 67; the three corresponding stop pins upon block 63 are numbered 68, 69 and 70, and the three corresponding stop pins on block 64 are numbered 71, 72 and 73. The stops on carrier rod 65, 66 and 67 are numbered 74, 77; 75, 78 and 76, 79 respectively.

The face of each stop pin which engages with

the corresponding carrier rod stop is stepped as shown at 80 and 81 in Fig. 2, and each stop pin is slidable in its block 63 or 64 so that either face 80 or face 81 may be positioned so as to be engageable with the corresponding carrier rod stop. When a stop pin is down face 80 is in operative position and the travel of the carrier rod affected will be terminated when a carrier rod stop engages with it. When a stop pin is lifted, face 81 be moved into engaging position and the travel of the carrier rod affected will be terminated when a carrier rod stop engages with it. When a stop pin is lifted, face 81 will be moved into engaging position and the travel of the carrier rod will be increased to the extent of the depth of the step between faces 80 and 81, say two needles.

Mechanism for manipulating the stop pins is also shown in Figs. 1 and 2. It consists of stop pin lifter rods 82 and 83, each mounted upon arms 84, attached to rock shafts 85 and 86 respectively, and lying above stop blocks 63 and 64 respectively. Each of stop pins 68—70 is provided with a rod 87 terminating in a hook 88 which can be hooked over lifter rod 82 and each of stop pins 71—73 is provided with a similar hooked rod 87 for attachment to lifter rod 83 so that any of the stop pins may be engaged or disengaged at will. Also each stop pin is provided with a spring 89 by which it is urged downwardly. Rock shafts 85 and 86 are each provided with a rock lever 90 engaging with the periphery of cam disks 28 and 36 respectively, as shown in Fig. 2.

In addition to the cam surfaces already described for controlling the operation of pawls 16—19 each of cam disks 28 and 36 is provided with another high lift 91 positioned so as to rock lever 90 forward when the disk is in position to prevent both pawls from operating their ratchets as already described and shown in Fig. 2. Such rocking of rock lever 90 will raise such of the stop pins as are connected to lifter rod 82 or 83 to bring faces 81 into operating position. At other times rock lever 90 rides upon a lower cam surface 92 by which it is rocked backward to force the stop pins into the position in which faces 80 are operative. It will be noted that cam disks 28 and 36 are utilized to operate both the pawls and the stop pins, thus simplifying the mechanism and concentrating the ultimate control in two rows of pattern chain buttons.

From the above it will be evident that since the spindles 1 and 2 may be operated independently or in unison to move either nuts 6 and 7 in either direction to any extent at any time and that any of the stop pins on block 63 may be moved into up or down position, independently of the pins on blocks 64 the device is adaptable for numerous operations. The limitations of the unitary reversely threaded spindle in common use are wholly overcome and a much wider field of usefulness opened up.

As already stated, the particular type of work selected for illustrating the capabilities of the invention is that embodying the so called herringbone split seams to join the three sections of a foot The herringbone split is one in which each midsection course is staggered with respect to the preceding course, first in one direction and then in the other by two needle loops and the adjoining ends of the corresponding courses of the side sole sections staggered inversely to the same extent so that there is no overlapping of the loops of the three sections in any course (except when narrowing or widening) but each section of each course is dovetailed or interlocked at the suture with the adjacent section of the next course.

The herringbone split is superior to the lap split because of this absence of overlapped loops which create undesirably heavy seams and mar the appearance of the fabric. However, in the past it has been impossible to make a perfect herringbone split because the mechanism available was not able to produce at the points at which widening or narrowing were required a perfect interlock between the sections. At these points unsightly eyelets were formed and with some mechanisms even a dropped stitch. In consequence, when the herringbone type of split has been employed at all it has been combined with the lap split and resulted on a hybrid having the undesirable qualities of the lap split and largely lacking the good features of the herringbone split.

By this invention a herringbone split seam may be made without any overlapping of sections with the exception of two loops in two courses where the midsection is widened or narrowed, an area so small as to be unnoticeable. The construction referred to is shown in Fig. 5 and can be understood best by following the operation of the thread carriers in knitting it.

The description will start with the laying of course I of Fig. 5 which is laid from left to right. Carrier rod 65 will operate upon the midsection of the fabric, carrier rod 66 upon the right sole section and carrier rod 67 upon the left sole section. The three thread carriers start therefore at the left. Midsection carrier rod stop 74 rests against stop pin 68. Stop 78 on right sole strip carrier rod 66 is in contact with stop pin 72 and left sole section carrier rod 67 rests against its left end stop 73. Cam disks 28 and 36 are in the position to prevent rotation of spindles 1 and 2 and the stop pins are down with faces 80 in operative position.

When these rods are driven to the right rod 67 will lay the thread for needle loops A—B, at which point it will be arrested by the engagement of its stop 76 with stop pin 70. Simultaneously midsection rod 65 will lay its thread for loops C—D at which point it will be arrested by the engagement of its stop 77 with stop pin 71 and right sole section rod will lay its thread for loops E—F coming to rest against its right end stop. Thereupon the loops are formed in the usual manner.

It will be observed that as yet there is no connection between the three sections. This is effected as follows: Before the beginning of the next traverse of the carrier rods (from right to left) cam disks 28 and 36 are rotated as above described, to permit the pawls to rotate both spindles 1 and 2 in the proper directions to shift both nuts 6 and 7 two needles to the right. Then the friction rod is caused to move again slightly to the right (this motion being caused by a suitably positioned lift on the coulier cam, for example) with the result that left sole section rod 67 and midsection rod 65 will move over to the right an additional two needles from B to G and D to H respectively. Right sole section rod 66 rests against end stop so that it does not move. The starting position of rods 65 and 67 for the next course II is therefore two needles to the right of the stopping points in course I.

The traverse of the three rods to lay the threads for course II will be from right to left. Since the stop pins have been moved to the right by two needles the traverse of right sole section rod

66 and midsection rod 65 will terminate two needles to the right of their stopping point in course one or at points or at I and J respectively. Left sole section rod 67 will be stopped at A by its left end stop.

After the loops are completed spindles 1 and 2 are again rotated to move the stop pins to the left a distance of two needles and carrier rods 66 and 65 are carried to move two additional needs to the left to positions E and C so that the starting position of the carriers of rods 65 and 66 for course III is two needles to the left of the points at which they stopped in laying the threads for course II. Carrier rod 67 starts, of course, from its end stop 93 at which its previous traverse terminated.

The manner of laying course III repeats that of course I and is followed as above described, by a shift of the stop pins and carriers 67 and 65 two needles to the right before the beginning of course. IV is laid and the carriers subsequently shifted to the left in the way described with respect to course two. By thus shifting the junction points of the midsection and sole sections alternately to the right and left two loops of one course of the midsection are positioned between two loops of the immediately preceding and following courses of a sole section or vice versa so that, as the courses are knit, the sections are securely looped together.

The method above described may be continued until it becomes necessary to widen or narrow the midsection. Assume that the midsection is to be widened by two needles on each side and that course IV has just been completed and the carrier rods 65 and 66 shifted an additional two needles to the left to the starting point for course V (laid from left to right). While this course is being laid cam disk 36 is operated to render spindle 1 inoperative. However, stop pin 69 is thereby lifted to bring face 81 into operative position so that left sole section rod 67 can move to the right two additional needles producing a two loop overlap between the left sole section and the midsection in course V.

In course VI the procedure followed in course V is reversed, spindle 2, being kept stationary by cam disk 28 and stop pin 72 lifted to permit a two loop overlap between the right sole section and the midsection, is returned to normal operation so that two needle overlap occurs at the left suture also. Spindle 1 now is returned to normal operation to permit midsection rod to move outwardly two needles before the beginning of course VII with the result that beginning at that course the midsection is two needles wider on the left side. On the right side there will be a two needle overlap as shown and also an additional two needle movement given midsection rod 65, spindle 2 having been returned to its normal operating condition. The return of the spindles to normal operation also returns stops 69 and 72 to their original positions in which faces 80 are operative.

The knitting now continues upon the method described for courses I–IV, the stop pins being shifted one way and then the other, a distance of two needles, in successive courses, until additional widening is required. This would be performed in the same manner as the original widening described above.

Narrowing of the midsection is accomplished in an equivalent manner, the only difference being that additional traverse is given to the midsection carrier rod 65 in the transitional courses instead of to the two sole section rods 66 and 67. For example, in course X of Fig. 5 which is laid from right to left, spindle 2 has been operated in the normal way after the course is laid to permit right sole section carrier rod 66 to move over to the left two needles before starting upon course XI. Spindle 1, however, has been rendered inoperative and stop pin 68 lifted in consequence so that the traverse of midsection carrier rod 65 terminates two needles further to the right than usual and a two loop overlap is produced at the left suture. In course XI this two loop overlap is, of course, repeated and a similar two loop overlap produced at the right suture as the result of maintaining spindle 2 idle and lifting stop pin 71.

In course XII the overlap in the right suture is repeated but at the left suture the regular herringbone split structure is resumed, spindle 1 having been thrown into normal operation again before the laying of the course to move the left sole section rod 67 and midsection rod 65 two needles inwardly instead of outwardly as when widening.

In course XIII the right suture also returns to normal since spindle 2 has been returned to normal operation before the laying of that course. Thereafter the knitting of the split sole for courses such as XIV continues as described for courses I–IV until additional narrowing or widening is required. It will be understood that the use of this novel split seam type of fabric is not limited to the sole but may be employed whenever desired as, for example, the insertion of clocks or other designs. It will also be understood that the mechanism is capable of knitting other type of split seam fabric such as the lap split and also may be utilized for reinforcing the leg or foot, for plating or the making of overlaid designs of symmetrical or unsymmetrical pattern, all of which uses are diagrammatically indicated in Fig. 6.

An advantage possessed by this invention not heretofore mentioned and which is also derived from the use of two separate spindles is that the shock which results from the striking of a carrier rod stop against a stop pin is confined to one stop block and its spindle and is not imparted to the other stop block or to any carrier rod which may be engaged with a stop thereof. This and the other advantages mentioned are obtained without sacrificing compactness and convenience of operation. The parts may all be concentrated at a single point on the machine and their operation observed as a unit. This, as all those skilled in the art are aware, is an important consideration.

I claim:

1. In a flat knitting machine having a plurality of longitudinally reciprocable carrier rods, means for arresting the traverse of the carrier rods at an intermediate point which consists of a pair of threaded, independently rotatable, spindles, a nut upon each spindle provided with individual stops for each rod and movable longitudinally thereof upon rotation thereof, stops upon each carrier rod engageable with the related stop upon each nut, means for rotating each spindle in either direction, means for rendering said rotating means operative and inoperative upon either spindle independently of the other and means for operating said last mentioned means in timed relation to the knitting cycle.

2. In a flat knitting machine having a plurality of longitudinally reciprocable carrier rods, means for arresting the traverse of the carrier

rods at an intermediate point which consists of a pair of threaded, independently rotatable spindles, a nut upon each spindle provided with individual stops for each rod and movable longitudinally thereof upon rotation thereof, stops upon each carrier rod engageable with the related stop upon each nut, means for rotating each spindle in either direction, separate means associated with each spindle for rendering said rotating means operative and inoperative upon that spindle independently of the other and means for operating said last mentioned means in timed relation to the knitting cycle.

3. In a flat knitting machine having a plurality of longitudinally reciprocable carrier rods, means for arresting the traverse of the carrier rods at an intermediate point which consists of a pair of threaded, independently rotatable, spindles, a nut upon each spindle provided with individual stops for each rod and movable longitudinally thereof upon rotation thereof, stops upon each carrier rod engageable with the related stop upon each nut, means for rotating each spindle in either direction, individual means associated with each spindle for rendering said rotating means operative and inoperative upon that spindle independently of the other and individual means for operating each of said last mentioned means independently of the other.

4. In a flat knitting machine having a plurality of longitudinally reciprocable carrier rods, means for arresting the traverse of the carrier rods at an intermediate point which consists of a pair of threaded, independently rotatable, spindles, a nut upon each spindle provided with individual stops for each rod and movable longitudinally thereof upon rotation thereof, stops upon each carrier rod engageable with the related stop upon each nut, means for rotating each spindle in either direction, a cam disk associated with the rotating means for each spindle for rendering said rotating means operative and inoperative upon that spindle and means for operating each cam disk independently of the other.

5. A flat knitting machine according to claim 4, in which the cam disk operating means includes a pattern chain.

6. In a flat knitting machine having a plurality of longitudinally reciprocable carrier rods, means for arresting the traverse of the carrier rods at an intermediate point which consists of a pair of threaded, independently rotatable spindles, a nut upon each spindle provided with individual stops for each rod and movable longitudinally thereof upon rotation thereof, each of said stops being provided with a plurality of faces in stepped relation and being adjustable so that each stop is movable into and out of rod engaging position, stops upon each rod engageable with the related stop upon each nut, means for rotating each spindle in either direction, means for rendering said rotating means operative and inoperative upon either spindle independently of the other and for simultaneously shifting the operative faces of the stops upon the corresponding nut.

7. In a flat knitting machine having a plurality of longitudinally reciprocable carrier rods, means for arresting the traverse of the carrier rods at an intermediate point which consists of a pair of threaded, independently rotatable spindles, a nut upon each spindle provided with individual stops for each rod and movable longitudinally thereof upon rotation thereof, stops upon each carrier rod engageable with the related stop upon each nut, individual means for rotating each spindle in either direction, a common actuating means for all the individual spindle rotating means, means for rendering each of said individual spindle rotating means operative and inoperative independently of the other and means for operating said last mentioned means in timed relation to the knitting cycle.

8. A flat knitting machine according to claim 1 in which the spindle rotating means includes two ratchet wheels upon each spindle, the teeth of one of which are opposed to the teeth of the other, a pawl for each ratchet wheel and a common means for rocking all of the pawls simultaneously.

9. In a flat knitting machine having a plurality of longitudinally reciprocable carrier rods, means for arresting the traverse of the carrier rods at an intermediate point which consists of a pair of threaded rotatable spindles means for rotating each spindle, a nut upon each spindle, a stop upon each nut, a pair of stops upon one carrier rod engageable with said stops upon said nuts to arrest the traverse of the carrier rod at an intermediate point in both directions, a second stop upon one of said nuts engageable with a stop upon a second carrier rod to arrest its traverse in one direction at an intermediate point and a second stop upon the other nut engageable with a stop upon a third carrier rod to arrest the traverse of that rod in the opposite direction at an intermediate point, each of said stops upon said nuts having a plurality of faces in stepped relation and being adjustable to bring any face into carrier rod engaging position whereby the length of the traverse of each carrier rod may be varied without altering the position of either nut and means for adjusting said stops upon said nut.

10. A flat knitting machine according to claim 9 in which each of said stops upon said nuts is disconnectible from the adjusting means and removable from carrier rod engaging position.

11. In a flat knitting machine having a plurality of longitudinally reciprocable carrier rods, means for arresting the traverse of the carrier rods at an intermediate point which consists of a pair of threaded rotatable spindles, means for rotating each spindle, a nut upon each spindle, a stop upon each nut, a pair of stops upon one carrier rod engageable with said stops upon said nut to arrest the traverse of the carrier rod at an intermediate point in both directions, a second stop upon one of said nuts engageable with a stop upon a second carrier rod to arrest its traverse in one direction at an intermediate point and a second stop upon the other nut engageable with a stop upon a third carrier rod to arrest the traverse of that rod in the other direction at an intermediate point, each of said stops upon said nuts having a plurality of faces in stepped relation and being adjustable to bring any face into rod engaging position whereby the length of traverse of each rod may be varied without altering the position of either nut and means for adjusting said stops upon said nut, means for rendering said spindle rotating means operative and inoperative upon either spindle independently of the other and individual means for timing the operation of said last mentioned means upon each spindle.

12. In a flat knitting machine having a plurality of longitudinally reciprocable carrier rods, means for arresting the traverse of the carrier

rods at an intermediate point which consists of a pair of threaded, independently rotatable, spindles, a nut upon each spindle provided with individual stops for each rod and movable longitudinally thereof upon rotation thereof, a stop upon each carrier rod engageable with the related stop upon a nut, means for rotating each spindle in either direction, means for rendering said rotating means operative and inoperative upon either spindle independently of the other, and means for operating said last mentioned means in timed relation to the knitting cycle.

13. In a flat knitting machine having a plurality of longitudinally reciprocable carrier rods, means for arresting the traverse of the carrier rods at an intermediate point which consists of a pair of threaded, independently rotatable, spindles, a nut upon each spindle provided with individual stops for each rod and movable longitudinally thereof upon rotation thereof, a stop upon each carrier rod engageable with the related stop upon a nut, means for rotating each spindle in either direction, separate means associated with each spindle for rendering said rotating means operative and inoperative upon that spindle independently of the other, and means for operating said last mentioned means in timed relation to the knitting cycle.

14. In a flat knitting machine having a plurality of longitudinally reciprocable carrier rods, means for arresting the traverse of the carrier rods at an intermediate point which consists of a pair of threaded, independently rotatable, spindles, a nut upon each spindle provided with individual stops for each rod and movable longitudinally thereof upon rotation thereof, a stop upon each carrier rod engageable with the related stop upon a nut, means for rotating each spindle in either direction, individual means associated with each spindle for rendering said rotating means operative and inoperative upon that spindle independently of the other and individual means for operating each of said last mentioned means independently of the other.

15. In a flat knitting machine having a plurality of longitudinally reciprocable carrier rods, means for arresting the traverse of the carrier rods at an intermediate point which consists of a pair of threaded, independently rotatable, spindles, a nut upon each spindle provided with individual stops for each rod and movable longitudinally thereof upon rotation thereof, a stop upon each carrier rod engageable with the related stop upon a nut, means for rotating each spindle in either direction, a cam disk associated with the rotating means for each spindle for rendering said rotating means operative and inoperative upon that spindle, and means for operating each cam disk independently of the other.

16. A flat knitting machine according to claim 15 in which the cam disk operating means includes a pattern chain.

17. In a flat knitting machine having a plurality of longitudinally reciprocable carrier rods, means for arresting the traverse of the carrier rods at an intermediate point which consists of a pair of threaded, independently rotatable spindles, a nut upon each spindle provided with individual stops for each rod and movable longitudinally thereof upon rotation thereof, each of said stops being provided with a plurality of faces in stepped relation and being adjustable so that each step is movable into and out of rod engaging position, a stop upon each rod engageable with the related stop upon a nut, means for rotating each spindle in either direction, means for rendering said rotating means operative and inoperative upon either spindle independently of the other and for simultaneously shifting the operative faces of the stops upon the corresponding nut.

18. A flat knitting machine according to claim 12 in which the spindle rotating means includes two ratchet wheels upon each spindle, the teeth of one of which are opposed to the teeth of the other, a pawl for each ratchet wheel and a common means for rocking all of the pawls simultaneously.

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