March 16, 1926. 1,577,330

G. W. LINDLEY

PATTERN CONTROL MEANS FOR WARP KNITTING MACHINES

Filed June 8, 1923 3 Sheets-Sheet 1

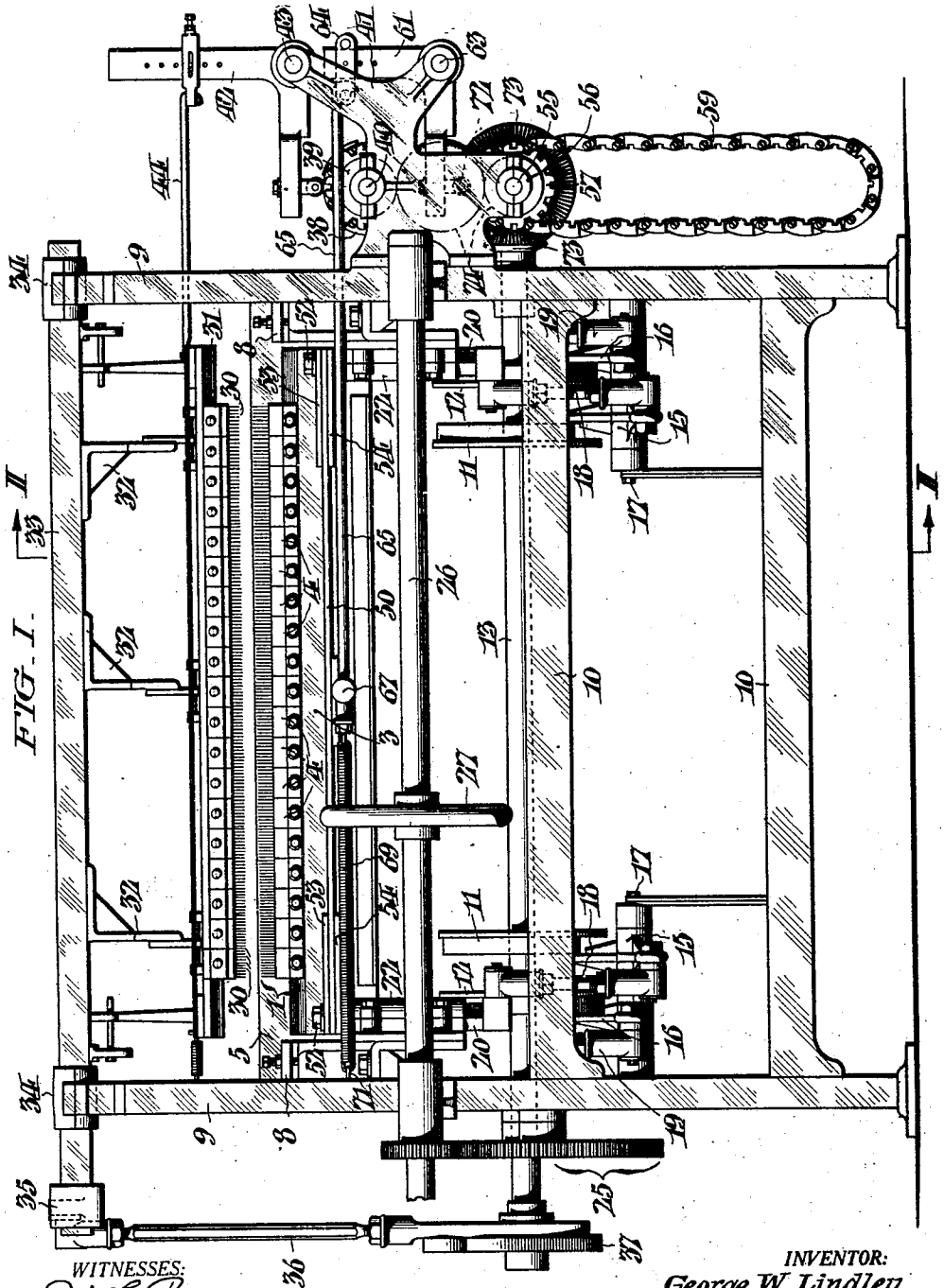


FIG. I.

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Filed June 8, 1923 3 Sheets-Sheet 2

FIG. II.

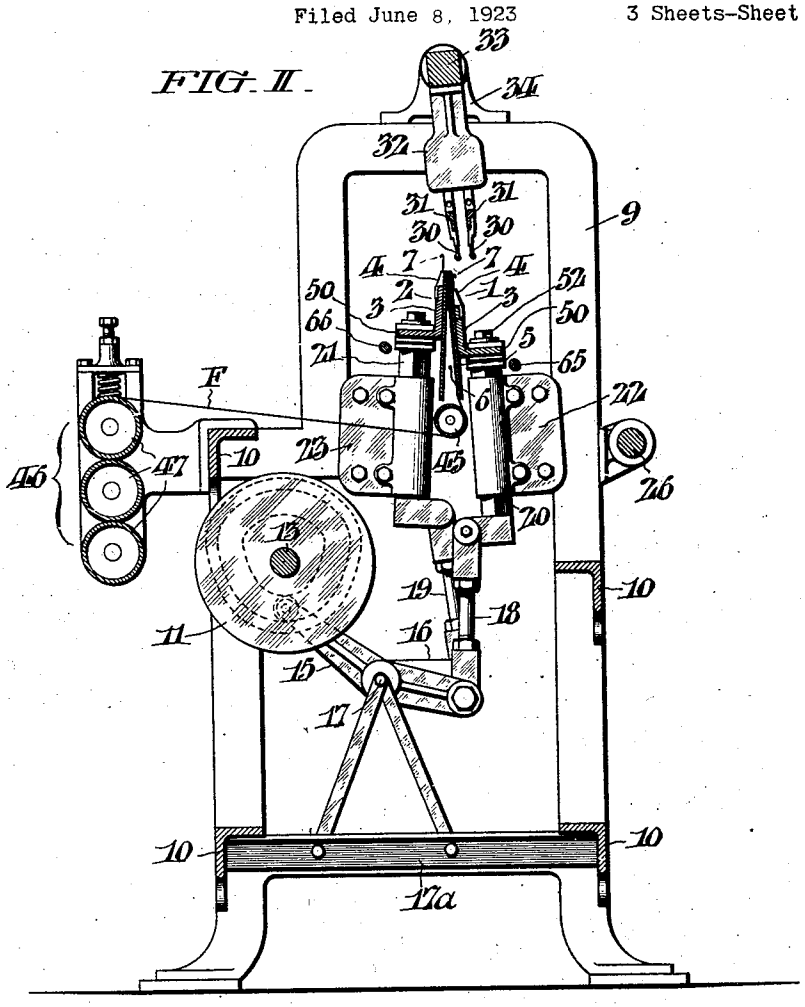
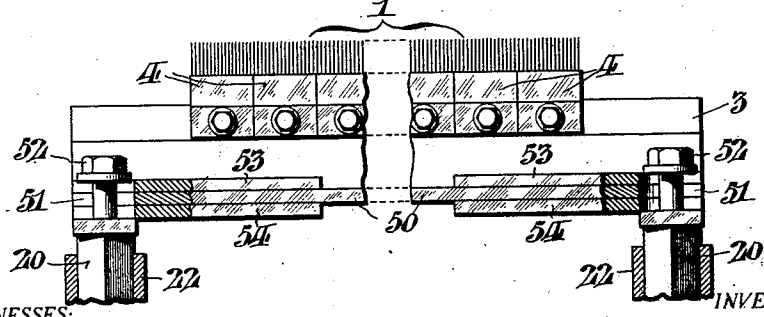


FIG. III.



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Filed June 8, 1923 3 Sheets-Sheet 3

FIG. IV.

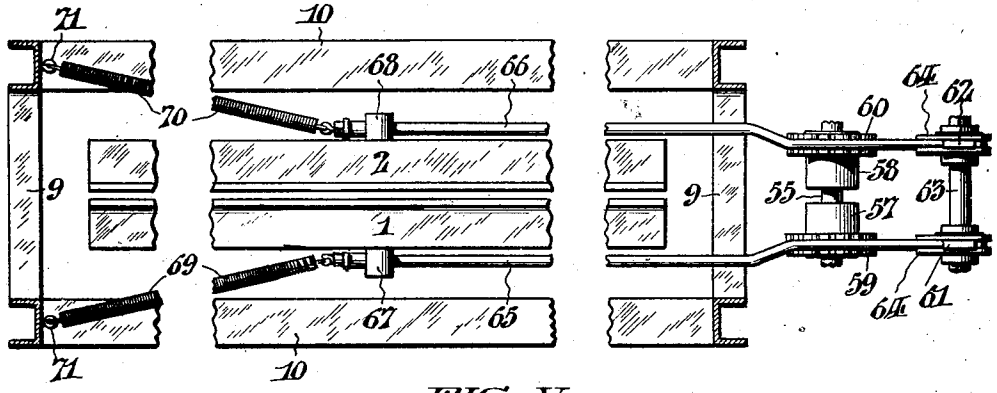
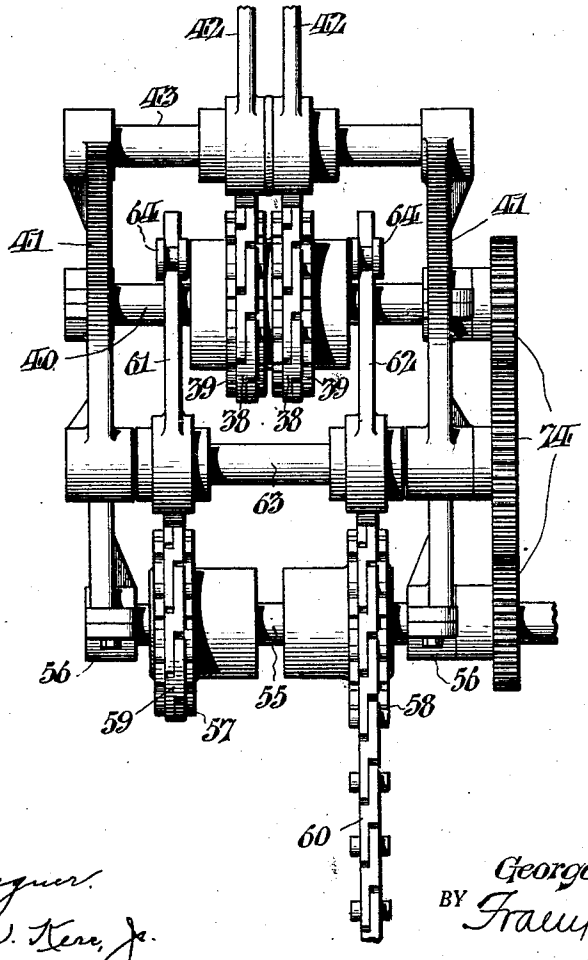


FIG. V.



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UNITED STATES PATENT OFFICE.

GEORGE W. LINDLEY, OF PHILADELPHIA, PENNSYLVANIA.

PATTERN-CONTROL MEANS FOR WARP KNITTING MACHINES.

Application filed June 8, 1923. Serial No. 644,117.

To all whom it may concern:

Be it known that I, GEORGE W. LINDLEY, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Pattern-Control Means for Warp Knitting Machines, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates generally to knitting machines, and more particularly to that type known as warp knitting machines with two banks of opposed needles designed for production of ribbed fabrics; or, in other words, fabrics with similar, and therefore reversible faces.

In machines of the type to which reference is made, stitch formation is effected through vertical movement of the needle banks, while pattern effects are predetermined by shifting of the thread guides (corresponding in number to that of the needles) laterally, to different extents across the hooks of the needles, and also by systematic selective shifting of guides carrying yarns characterized either by differences in quality or color; but the variety of pattern effects obtainable with this arrangement is, as well known to those skilled in the manufacture of knit wares, very limited in extent.

The prime object of my invention is to enhance the utility of such machines beyond the limits heretofore imposed as above noted, so that greater choice may be had in pattern or design composition, and to attain this desideratum without requiring any serious or radical changes in the construction of the machines. The ends, to which attention has just been directed, I attain by provision of means whereby the opposed needle banks of the machine may be shifted longitudinally relative to each other as well as with respect to, or in conjunction with the shifting of the guides whereby the yarn is directed or fed to the needles, as a consequence of which, pattern effects may be secured which were impossible of attainment heretofore with aid of automatic means.

Other subsidiary objects, together with their attendant advantages, will become readily apparent from the detailed description which follows of a typical embodiment of my invention; while the appended claims serve to clearly define the scope of said invention in so far as it comes within my present knowledge.

In the drawings, Fig. I is a front elevation of a knitting loom conveniently showing the novel features of my invention.

Fig. II is a cross sectional view of the structure taken as indicated by the arrows II—II in Fig. I.

Fig. III is a view partly in elevation and partly in section showing the manner in which the needle banks are mounted and supported for relative shifting in accordance with my invention.

Fig. IV is a fragmentary plan view, more or less diagrammatically represented, showing the connections whereby the two opposed needle banks are relatively shifted to vary the pattern of the fabric produced by the machine; and

Fig. V is a detail illustration, on an enlarged scale, of the mechanism for inducing and controlling the shifting of the needle banks as it appears when viewed from the right in Fig. I.

The machine herein illustrated can at once be recognized as being generally of standard construction, but it will perhaps be best, by way of introduction, to first briefly describe its essentials so that the relation of my invention to them may be better understood. In the drawings, the opposed needle banks are comprehensively indicated at 1, 2, each comprising a longitudinal angle bar 3 whereto the needle blocks 4 are removably secured in the well known manner. The needle banks 1, 2 are adapted for vertical reciprocation relative to face plates 5, 5 against which they slide, said plates being spaced apart as best shown in Fig. II to afford an interspace 6 for passage of the knitted fabric conventionally indicated at "F", and complementarily inclined or sloped slightly to the vertical to bring the needle hooks 7 into closer proximity. The face plates 5 are fixedly secured at opposite ends, to brackets 8 attached to, or forming parts of the end members or standards 9 of the machine frame which frame is otherwise completed by a series of longitudinal bars 10 extending between, and bolted to said end members. Reciprocatory movement is independently imparted to the needle banks 1, 2 by cams 11 and 12 which are fixed upon a shaft 13 journalled for rotation in appropriate bearings of the frame end

standards 9. These cams 11, 12 are provided with appropriately configured face grooves which determine rocking movement of arms 15, 16 freely fulcrumed intermediate their ends upon common shafts 17 rigidly supported by cross beams 17ª in the lower portion of the machine frame. The arms 15 and 16 are coordinated by means of adjustable links 18, 19 with slides 20—21 whereby the needle banks 1, 2 are respectively supported, said slides being squared as shown so as to be non-rotative within guide brackets 22—23 which are bolted or otherwise secured in pairs to the inner sides of the frame ends 9, the respective brackets of each pair occupying tilted positions corresponding in inclination to the slope of said needle banks. The grooves of the cams 11, 12 are so allocated relatively as to determine alternative reciprocation of the needle banks 1 and 2 after approved practice in forming the fabric loops or stitches and effecting the shedding of successive courses of the knitting over the tops of the face plates 5. The cam shaft 13 derives its motion, through an interposed train of intermeshing spur gears 25, from the main shaft 26 which extends across the front of the machine at a height convenient for the operative and is provided with a hand wheel 27 whereby it may be manually actuated for the purpose of making any necessary incidental adjustments when required. The main shaft 26 is, in practice, ordinarily driven by power either by pulley connection with a power shaft, or by a reducing gear connection for example with an electric motor, as may be found most convenient.

Yarn is directed to the needles 1, 2 by individual feeds 30 of which there may be several sets (two being shown in the present instance by way of example, see Fig. II) permitting use of differently colored or otherwise distinguishable yarns or threads as may be desired. The feeds 30, it will be noted, are secured in groups to bars 31 individual to the respective sets, said bars being slidable endwise under support of appropriate hangers 32 depending from an overhead rock shaft 33 journalled in bearings 34 at the tops of the frame end members 9, and adapted to swing the feeds 30 bodily back and forth through the needles 1, 2 as the two series are successively presented to receive the threads. Oscillation of the shaft 33 is effected through the medium of an arm 35 secured to its left hand end (Fig. I), which arm is coupled with a vertically disposed thrust rod 36 arranged to be actuated by a rotary cam 37 fixed upon the corresponding end of the shaft 13. The feed bars 31 are given the incidental shog which results in laying the threads alternatively crosswise of one or several of the needle hooks 7 (as the case may be) at a time in accordance with the pattern or design desired and previously determined upon. Control of the feed bars 31 is relegated after standard and accepted practice, to individually associated pattern chains 38 trained about sprockets 39 that are upon a shaft 40 journalled in appropriate bearings afforded by outstanding brackets 41 of the machine frame. The pattern chains 38 are made up of special, interchangeable, cam links which influence bell crank levers 42, fulcrumed for free rocking movement on a shaft 43 secured in the brackets 41 aforesaid, and connected, with capacity for adjustment, by means of draft rods 44 respectively with the individual feed bars 31. The fabric "F" produced by the machine and passing downward through the interspace 6 is redirected over a guide roll 45 toward a take-up mechanism 46 comprising a succession of cooperative draft rollers 47 which may be intermittently progressed through appropriate means (not shown) deriving motion from the main shaft 26.

With assumption that the cooperation of the various instrumentalities constituting a standard form of straight frame knitting machine, such as just outlined, to be thoroughly understood, I will now proceed to describe in detail those features which are novel to my invention and whereby the hereinbefore pointed out advantages may be secured.

Attention is now directed more particularly to Figs. I and III of the drawings wherefrom it will be observed that the longitudinal angle bars 3 of the needle banks 1 and 2 are not directly fixed to their respective supporting slides 20, 21, but are capable of endwise shifting relative thereto by reason of slotted connections at the ends of their horizontal flanges 50, as indicated at 51, with cap screws or bolts 52 threaded into said supporting slides. At these end regions, the flanges 50 are reinforced preferably both top and bottom by supplemental plates 53 and 54 as shown. As a consequence of the aforedescribed mounting of the needle banks 1, 2, the same, it will be seen, may be shifted one relative to the other or in concert depending upon the effect which is desired in the fabric F, such shogging resulting in relative transposal of the fabric stitches in the wales produced by the needles of the respective banks 1, 2 so that a great variety of new pattern effects may be secured independent from, or in connection with those made possible by manipulation of the yarn feeds 30. The means which I employ to actuate the needle banks 1, 2 are similar to those whereby the feed bars 31 are controlled and will be best understood from Figs. I, III, IV and V. Fixed side by side upon a shaft 55 journalled in bearings

56 in the brackets 41 and located immediately below, and in line with the shaft 40 of the feed bar actuating mechanism, are sprockets 57, 58 whereupon are hung chains 59, 60 with interposed cam links designed to induce rocking motion of bell crank levers 61, 62. These levers 61, 62 are supported by, and swing about a fixed axis 63 and their vertical arms have adjustable connection, as at 64, with draft rods 65, 66 whose opposite ends are in turn pivotally connected to the needle banks 1 and 2 preferably at, or near, the longitudinal centers of said banks as shown at 67, 68 in Figs. I and IV. Lost motion in the linkage connections is prevented by contractile springs 69, 70 in tension between the inner ends of the draft rods 65, 66 and fixed anchorages 71 on the left hand standard 9 of the machine frame, said springs incidentally maintaining the anti-friction rollers 72 on the horizontal arms of the bell cranks 61, 62 at all times in engagement with the pattern chains 59, 60. The arrangement of the cam links of the respective pattern chains 59, 60 controlling the needle banks 1, 2 can of course be varied at will so that the induced shogging of said banks may be relatively uniform, irregular or complex as desired. The sprocket shaft 55 is driven through a reducing bevel gear couple 73 from the cam shaft 13, see Fig. I, and motion is in turn imparted from said sprocket shaft 55 to the sprocket shaft 40 of the feed control mechanism through a spur gear train 74 as best shown in Fig. V.

The operation of my invention and its possibilities will be clearly apparent, from what has already been said, to skilled knitters without necessity for further description, but it is to be particularly noted that in addition to the advantages already pointed out, that my improvements may be readily incorporated in standard existent machines, only very slight changes and some few additions being required to this end.

Having thus described my invention, I claim:

1. In a warp knitting machine, the combination of a plurality of needle banks, means for actuating said needle banks to form fabric stitches, and means for longitudinally shifting each needle bank relative to its support to effect selective transposition of the stitches of the knitting wales respectively produced by them.

2. In a warp knitting machine the combination of a pair of opposed needle banks, means for actuating said needle banks to form fabric stitches, and means for longitudinally shifting each needle bank relative to its support to effect selective transposition of the stitches of the knitting wales respectively produced by them.

3. In a warp knitting machine the combination of a pair of opposed needle banks, means for actuating said banks to produce fabric stitches, and pattern control means for longitudinally shifting each said bank relative to each other to effect selective transposal of the fabric stitches in the knitting wales respectively produced by them.

4. In a warp knitting machine the combination of a pair of opposed needle banks, means for actuating said banks to produce fabric stitches, selectively shiftable feeds for directing yarn to the needle banks, and means whereby each said needle bank may be longitudinally shifted relative to the other as well as with respect to the yarn feeds aforesaid to effect selective transposition of stitches in the knitting wales respectively produced by them simultaneously with manipulation of yarns.

5. In a warp knitting machine the combination of a pair of opposed needle banks, means for reciprocating said needle banks to produce fabric stitches, and means whereby each said needle bank may be shifted at right angles to the direction of reciprocation to effect selective transposal of the fabric stitches in the wales respectively produced by them.

6. In a warp knitting machine the combination of a pair of opposed needle banks, means for actuating said banks to produce fabric stitches, and means whereby each said bank may be independently shifted longitudinally to effect selective transposal of the stitches in the knitting wales respectively produced by them, the latter means including individually associated pattern chains, and interposed connections whereby said banks are shifted in accordance with the dictates of said pattern chains.

7. In a warp knitting machine the combination of a pair of opposed needle banks, mounting supports for said needle banks, means for reciprocating said mounting supports to vibrate the needle banks in order to produce fabric stitches, and connections between said needle banks and their mountings for guiding the banks for longitudinal movement relative to one another to effect selective transposal of the fabric stitches in the wales produced by them, and pattern control means for dictating the shifting of the needle banks.

In testimony whereof, I have hereunto signed my name at Philadelphia, Pennsylvania, this 5th day of June, 1923.

GEORGE W. LINDLEY.