March 8, 1938. A. S. WINTER ET AL 2,110,541

PATTERN MECHANISM

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FIG. 1

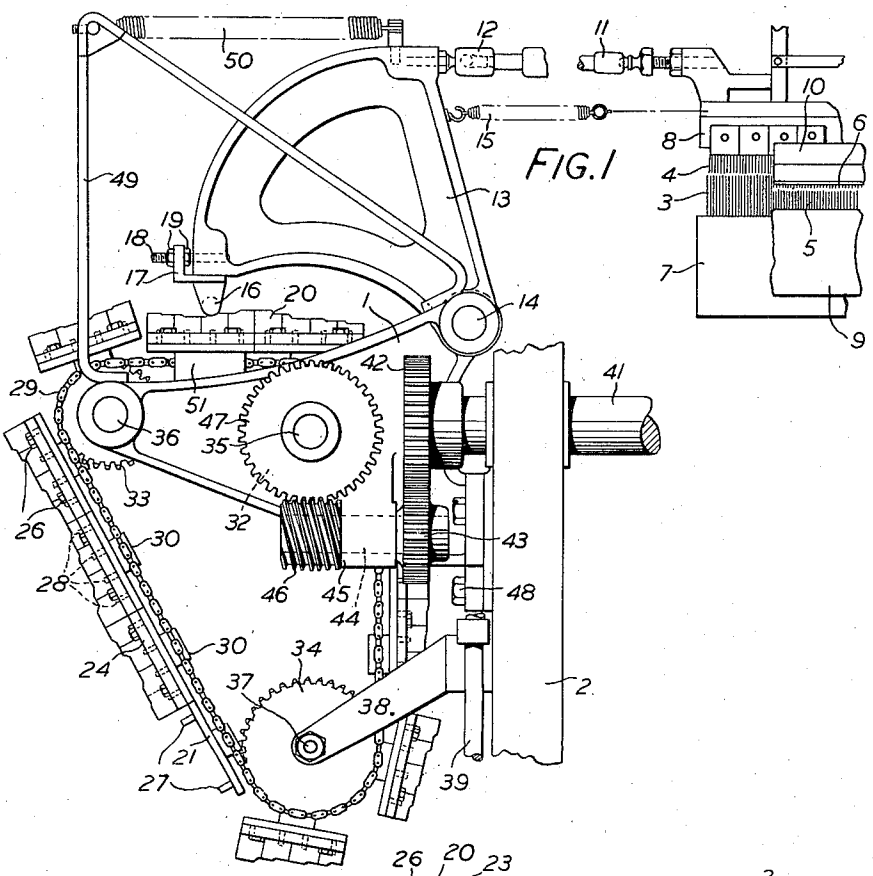
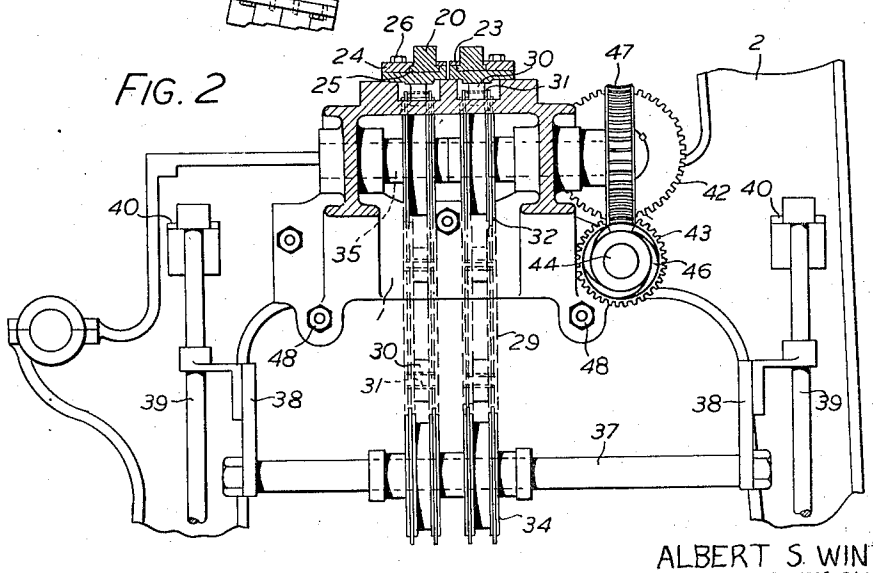


FIG. 2



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FIG. 3

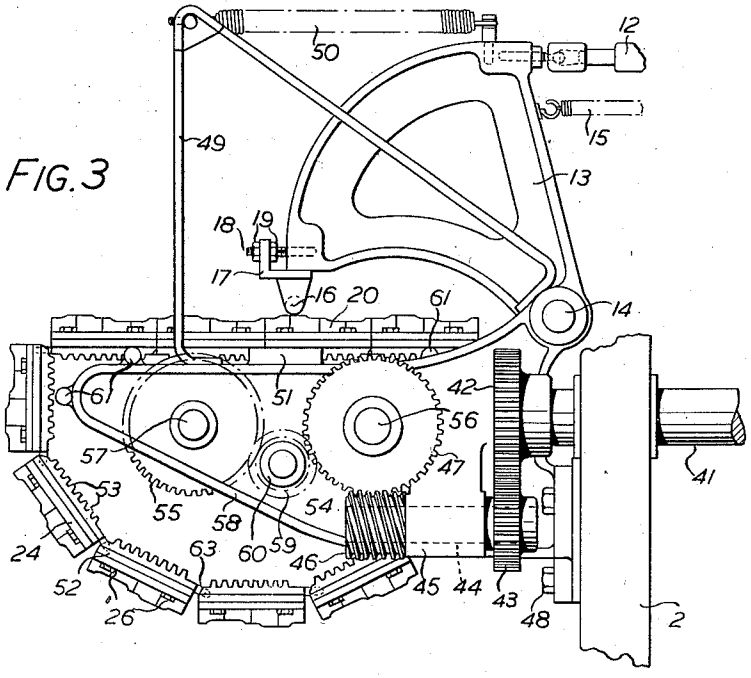


FIG. 4

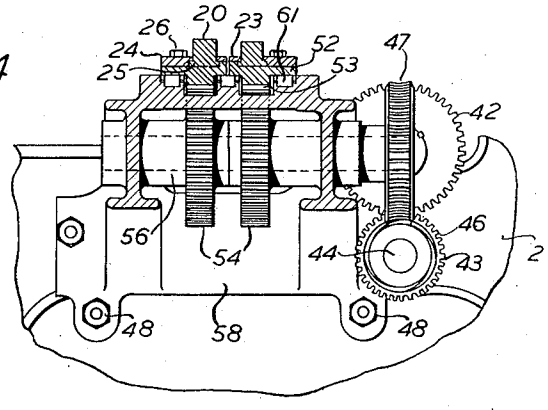


FIG. 6

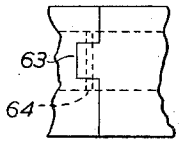
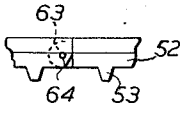


FIG. 5



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2,110,541

PATTERN MECHANISM

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Application March 12, 1936, Serial No. 68,401
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12 Claims. (Cl. 66—86)

This invention relates to pattern mechanisms and is particularly concerned with an improved form of pattern mechanism adapted to replace pattern wheels and like devices presenting an operating surface of varying radius, such as are employed, for example, in warp knitting machines.

The pattern wheels on warp knitting machines are used for imparting to the thread guides the movements endwise with respect to the machine that are necessary to produce the desired pattern in the fabric. The wheels are generally of large diameter and have a periphery whose radius varies in steps so as to give, between adjacent steps, a dwell during which the guides may move at right angles to the length of the machine, and knitting may take place. The range of variation of the radius of such a wheel is equal (in steps) to the total range of needles (e. g. 40 needles) over which the guides are required to be moved according to the pattern. Since the wheel is rotated through the same angle in the course of each knitting operation, the angle subtended between adjacent steps at the centre of the wheel must be constant, and as a result, on account of the variation in radius of the steps the peripheral lengths between the steps vary correspondingly. On account of this variation, difficulties arise both in the construction of the wheels and in their operation. Particular difficulty arises in deciding the slope of the steps, which must not be too steep on account of operating difficulties and yet, when the height of the steps is large and the radius of the wheel comparatively small, must still be short enough to permit the provision of a dwell between adjacent steps. This limits the possible range of variation of radius, and in consequence, limits the scope of patterning obtainable. Moreover, when large patterns are to be produced the wheel required is correspondingly large and operating difficulties with large pattern wheels prevent the use of patterns of more than a certain length.

Another form of patterning mechanism, which is generally used as a temporary expedient in trying out patterns, comprises a chain of links of varying height which passes round a drum, and is supported thereby at the working point. This expedient, however, introduces further difficulties, since the looseness inherent in the chain construction is apt to introduce wear in the links and corresponding inaccuracies. Moreover, the links must be curved to fit the drum, and must be of varying height, as a result of which difficulties occur similar to those arising from the varying radii of the pattern wheels referred to above.

According to the present invention a pattern mechanism comprises a series of straight pattern pieces of varying heights which are adapted to be passed successively in engagement with connecting means for driving controlled elements, for example the thread guides of a warp knitting machine. The pattern pieces may conveniently be mounted upon a chain or flexible band, or connected together in the form of a chain, and engaged by the connecting means at a point in a straight run of the chain or band. Since, according to the invention, the pattern pieces are straight, and not curved like the periphery of a pattern wheel or the links of a chain passing round a pattern drum, the difficulties in construction and operation arising from such curvature are avoided.

Conveniently the pattern pieces may be of substantial length and either secured to each other at their ends, or secured to the chain or band at their mid-points. Each pattern piece may be built up of a number of units, each unit representing a stage in the pattern. In this way from a stock of units of different total heights and of different heights of step the pattern pieces for any desired pattern may quickly be built up.

By way of example two forms of pattern mechanism according to the present invention will now be described in greater detail with reference to the accompanying drawings, the specific mechanisms being particularly designed for use in connection with warp knitting machines. It is to be understood, however, that the invention is not limited in its application to warp knitting machines, but may be applied to other forms of knitting machines and, indeed, to machines of entirely different type.

In the accompanying drawings

Fig. 1 is a rear elevation of the mechanism according to the invention applied to the end frame of a warp knitting machine;

Fig. 2 is a side elevation in part section of the mechanism shown in Fig. 1;

Fig. 3 is a view similar to Fig. 1 of an alternative form of apparatus;

Fig. 4 is a part sectional view similar to Fig. 2; and

Figs. 5 and 6 show details of the apparatus illustrated in Figs. 3 and 4.

Referring to Fig. 1 the apparatus according to the present invention comprises a bracket 1 which is secured to the end-frame 2 of a warp knitting machine. The needles 3, guides 4, sink-

ers 5 and presser 6 of the machine are shown at the right-hand side of Fig. 1, mounted respectively upon the needle bar 7, the guide bar 8, the sinker bar 9 and presser bar 10. The present invention is concerned with the operation of the guides 4 by the longitudinal reciprocation of the guide bar 8.

The guide bar 8 is connected by means of suitable flexible connections 11, 12 to a quadrant 13, pivoted at the point 14 on the bracket 1. A spring 15 is provided to maintain the connection 11, 12 between the guide bar 8 and the quadrant 13. The quadrant 13 carries a cam bowl 16 mounted on a bracket 17. A screw 18 secured to the quadrant 13 passes through a portion of the bracket 17 and carries two nuts 19 by means of which the position of the bracket 17, and consequently of the cam bowl 16 relative to the quadrant 13, may be adjusted.

The cam bowl 16 is acted upon by pattern units 20 which are mounted on pattern piece members 21, of which one is shown without the pattern units 20 towards the bottom of Fig. 1. The pattern units 20 are secured to the members 21 in a manner shown more clearly in Fig. 2, in which plates 23, 24 are shown, mounted on the members 21, the said plates overlapping flanges 25 provided at the bottom of each of the pattern units 20. The plates 24 are fixed in position by means of nuts 26 which pass through slots in the plates 24, so that the lateral position of the plates can be adjusted, and the pattern units 20 held firmly. The pattern units are also secured in place by means of pins 27, two of which are carried on each of the members 21 as shown in Fig. 1. The pins 27 fit into dowel holes 28 in the pattern units, each unit being provided with such a dowel hole, although of the four units mounted on each of the members 21 only two have pins 27 entering them.

The members 21 are carried at equal intervals upon a pair of chains 29, an extension 30 below each of the pattern piece members 21 lying between the chains, and being held by means of long pins 31 which extend from one chain to the other. Each of the extensions 30 has two such pins passing through it, one at each end of a link of the chain, so that although the members 21 are held parallel to the chains, the flexibility of the chains is in no way impaired.

As will be seen in Fig. 2, two sets of pattern pieces 20 and members 21 are provided for the operation of two guide bars 8, so that it is necessary to provide four chains 29. Each of the chains 29 passes round three sprockets 32, 33, 34, the sprockets 32 and 33 being carried on shafts 35, 36 on the bracket 1, while the sprockets 34 are carried on a shaft 37 mounted in brackets 38 slidably secured to rods 39 attached to brackets 40 secured to the machine frame 2. By these means the height of the shaft 37 and the sprockets 34 can be adjusted as desired, and any length of chain 29, according to the length of pattern required, can be accommodated. The shaft 35 carrying the sprockets 32 is driven from the main drive or cam shaft 41 of the warp knitting machine. For this purpose a spur gear 42 on the cam shaft 41 drives the spur gear 43 mounted on a shaft 44 in a bearing 45 carried by the bracket 1. The shaft 44 also carries a worm 46 engaging with a worm wheel 47 secured to the shaft 35.

By these means the chains 29 and the pattern pieces 20 are driven in timed relation with the knitting elements 3, 4, 5 and 6. Any small adjustments in timing may be made by shifting the point of engagement of the cam bowl 16 by means of the nuts 19 on the screw 18. The bracket 1 is secured to the machine frame by means of bolts 48, and carries extension strips 49 for the securing of a spring 50 adapted to hold back the quadrant 13 so that the cam bowl 16 is kept in engagement with the pattern units 20.

In operation the rotation of the cam shaft 41 of the warp knitting machine drives the sprocket 32 through the gears 42, 43, 46, 47 and consequently drives all the chains 29. This brings each of the members 21 in turn under the cam bowl 16, the members 21 being supported from beneath by means of an abutment 51 carried on the bracket 1. Each of the members 21 as it passes round the sprocket 33 comes smoothly into alignment with the preceding piece 21 before it reaches the cam bowl 16, so that the cam bowl 16 is steadily operated in the desired manner. The pattern units 20 constitute standard stock, being of various heights, and having at their mid-point steps of varying heights, but are in other respects similar to each other, and therefore interchangeable and reversible. A pattern can be built up of any desired number of pattern piece members 21 carrying the requisite pattern units 20, a chain 29 of suitable length being provided, while the sprocket 34 is adjusted to a suitable level by shifting the brackets 38 up or down on the rods 39.

In the modification shown in Figs. 3 to 6 the pattern units 20 are mounted on pattern piece members 52 of different form from the members 21 in Figs. 1 and 2, although the manner of the attachment of the pattern units 20 to the members 52 is similar to that described with reference to the members 21 in Figs. 1 and 2. The members 52 are provided with straight rigid teeth 53 on their under sides, and are driven by means of two gears 54, 55 mounted on shafts 56, 57 carried in a bracket 58 of slightly different shape from the bracket 1 of Figs. 1 and 2. The shaft 56 is driven from the main shaft 41 of the loom by means of gears 42, 43, 46 and 47 in the same way as the shaft 35 described with reference to Figs. 1 and 2. The gear 55 is driven from the gear 54 by means of an intermediate idler gear 59 carried in bearings 60 in the bracket 58. Abutments 51 are provided on the bracket 58, as in Figs. 1 and 2, to support the members 52 and the pattern units 20 thereon as they pass under the cam bowl 16. Along the remainder of their path the members 52 are guided by means of rollers 61 carried by the bracket 58, or hang freely below the bracket.

The successive members 52 are connected directly to each other to form a chain in the manner illustrated in Figs. 5 and 6, in which it will be seen that a tongue 63 at one end of each member 52 fits into a slot at the other end of the other member 52 and is secured by means of a pin 64. As in Fig. 1, two pattern chains comprising members 52 and pattern units 20 are shown for the operation of two guide bars 8 the two chains being driven by the common shaft 56. By the employment of the modification shown in Figs. 3 to 6 the use of a chain 29 is avoided.

Having described our invention what we desire to secure by Letters Patent is:—

1. A pattern mechanism for actuating controlled elements in a predetermined manner, comprising a series of straight pattern piece members, means for guiding said series along a path including a straight run, a plurality of pattern units detachably mounted on each of said members and building up thereon a working surface of varying height so as to present a continuous unbroken

surface along said straight run, connecting means for actuating the controlled elements and means for passing said pattern piece members successively into operative engagement with said connecting means in the course of said straight run, whereby said connecting means and the elements controlled thereby are moved by the varying height of said working surface.

2. A warp knitting machine, comprising at least one guide bar capable of longitudinal movements, a series of guides mounted thereon, a series of straight pattern piece members, means for guiding said series along a path including a straight run, a plurality of pattern units detachably mounted on each of said members and building up thereon a working surface of varying height so as to present a continuous unbroken surface along said straight run, connecting means for actuating the said guide bar and means for passing said pattern piece members successively into operative engagement with said connecting means in the course of said straight run, whereby said guide bar is moved longitudinally at each change of height of said working surface.

3. A pattern mechanism for actuating controlled elements in a predetermined manner, comprising a series of straight pattern piece members, means for guiding said series along a path including a straight run, dowel pins upon said members, a plurality of pattern units mounted on each of said members and building up thereon a working surface of varying height so as to present a continuous unbroken surface along said straight run, said pattern units being provided with dowel holes so as to be held in place by said dowel pins, connecting means for actuating the controlled elements and means for passing said pattern piece members successively into operative engagement with said connecting means in the course of said straight run, whereby said connecting means and the elements controlled thereby are moved by the varying height of said working surface.

4. A pattern mechanism for actuating controlled elements in a predetermined manner, comprising a series of straight pattern piece members, means for guiding said series along a path including a straight run, a plurality of pattern units detachably mounted on each of said members and building up thereon a working surface of varying height so as to present a continuous unbroken surface along said straight run, abutments having plane surfaces adapted to support said pattern piece members in the course of said straight run, connecting means for actuating the controlled elements and means for passing said pattern piece members successively into operative engagement with said connecting means between said connecting means and said abutments, whereby said connecting means and the elements controlled thereby are moved by the varying height of said working surface.

5. A pattern mechanism for actuating controlled elements in a predetermined manner, comprising a chain, a series of straight pattern pieces mounted on said chain, means for guiding said chain along a path including a straight run, a plurality of pattern units detachably mounted on each of said members and building up thereon a working surface of varying height so as to present a continuous unbroken surface along said straight run, connecting means for actuating the controlled elements, a plurality of sprockets adapted to carry said chain, and means for driving said sprockets so as to cause said pattern pieces to pass successively into operative engagement with said connecting means in the course of said straight run, whereby said connecting means and the elements controlled thereby are moved by the varying height of said working surface.

6. A pattern mechanism for actuating controlled elements in a predetermined manner, comprising a series of straight pattern piece members connected together end to end to form an endless chain, means for guiding said chain along a path including a straight run, rack teeth on one face of each of said pattern piece members, a plurality of pattern units on the other face of each of said pattern piece members, said units building up thereon a working surface of varying height so as to present a continuous unbroken surface along said straight run, connecting means for actuating the controlled elements, at least one gear adapted to engage the rack teeth on said pattern piece members, and means for driving said gear so as to cause said pattern piece members to pass successively into operative engagement with said connecting means in the course of said straight run, whereby said connecting means and the elements controlled thereby are moved by the varying height of said working surface.

7. A pattern mechanism for actuating controlled elements in a predetermined manner, comprising a series of straight pattern piece members connected together end to end to form an endless chain, a series of rollers adapted to guide said chain along a path including a straight run, rack teeth on one face of each of said pattern piece members, a plurality of pattern units on the other face of each of said pattern piece members, said units building up thereon a working surface of varying height so as to present a continuous unbroken surface along said straight run, connecting means for actuating the controlled elements, at least one gear adapted to engage the rack teeth on said pattern piece members, means for driving said gear so as to cause said pattern piece members to pass successively into operative engagement with said connecting means in the course of said run, whereby said connecting means and the elements controlled thereby are moved by the varying height of said working surface, said rollers being adapted to bring each pattern piece member into alignment with the preceding pattern piece member while said preceding member is engaged by said connecting means.

8. A pattern piece mechanism for actuating controlled elements in a predetermined manner, comprising a series of straight pattern piece members, a pair of endless chains together adapted to carry said pattern piece members, means for guiding said chains along a path including a straight run, a plurality of pattern units detachably mounted on each of said pattern piece members, said units building up a working surface of varying height so as to present a continuous unbroken surface along said straight run, abutments having plane surfaces for supporting said pattern piece members in the course of said straight run, connecting means for actuating the controlled elements, a plurality of sprockets adapted to carry said chains and means for driving at least one of said sprockets so as to cause said pattern piece members to pass successively into operative engagement with said connecting means between said connecting means and said abutments, whereby said connecting means and

the elements controlled thereby are moved by the varying height of said working surface.

9. A warp knitting machine comprising at least one guide bar capable of longitudinal movements, a series of thread guides mounted thereon, a series of straight pattern piece members, a pair of endless chains together adapted to carry said pattern piece members, means for guiding said chains along a path including a straight run, a plurality of pattern units detachably mounted on each of said pattern piece members, said units building up a working surface of varying height so as to present a continuous unbroken surface along said straight run, abutments having plane surfaces for supporting said pattern piece members in the course of said straight run, connecting means for actuating said guide bar, a plurality of sprockets adapted to carry said chains and means for driving at least one of said sprockets so as to cause said pattern piece members to pass successively into operative engagement with said connecting means between said connecting means and said abutments, whereby said guide bar is moved longitudinally at each change of height of said working surface.

10. A pattern mechanism for actuating controlled elements in a predetermined manner, comprising a series of straight pattern piece members connected together end to end to form an endless chain, means for guiding said chain along a path including a straight run, said pattern piece members having rack teeth on one face thereof, a plurality of pattern units on the other face of each of said members, said units building up a working surface of varying height so as to present a continuous unbroken surface along said straight run, abutments having plane surfaces for supporting said pattern piece members in the course of said straight run, connecting means for actuating the controlled elements, at least one gear adapted to engage said rack teeth, and means for driving said gear so as to cause said pattern piece members to pass successively into operative engagement with said connecting means between said connecting means and said abutments, whereby said connecting means and the elements controlled thereby are moved by the varying height of said working surface.

11. A warp knitting machine comprising at least one guide bar, a series of guides mounted on said guide bar, a series of straight pattern piece members connected together end to end to form an endless chain, means for guiding said chain along a path including a straight run, said pattern piece members having rack teeth on one face thereof, a plurality of pattern units on the other face of each of said members, said units building up a working surface of varying height so as to present a continuous unbroken surface along said straight run, abutments having plane surfaces for supporting said pattern piece members in the course of said straight run, connecting means for actuating the said guide bar longitudinally, at least one gear adapted to engage said rack teeth, and means for driving said gear so as to cause said pattern piece members to pass successively into operative engagement with said connecting means between said connecting means and said abutments, whereby said guide bar is moved longitudinally at each change in height of said working surface.

12. Apparatus according to claim 2, comprising a jockey pulley adapted to guide the series of the straight pattern piece members, and means for adjusting said pulley so as to allow for series of different lengths.

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