

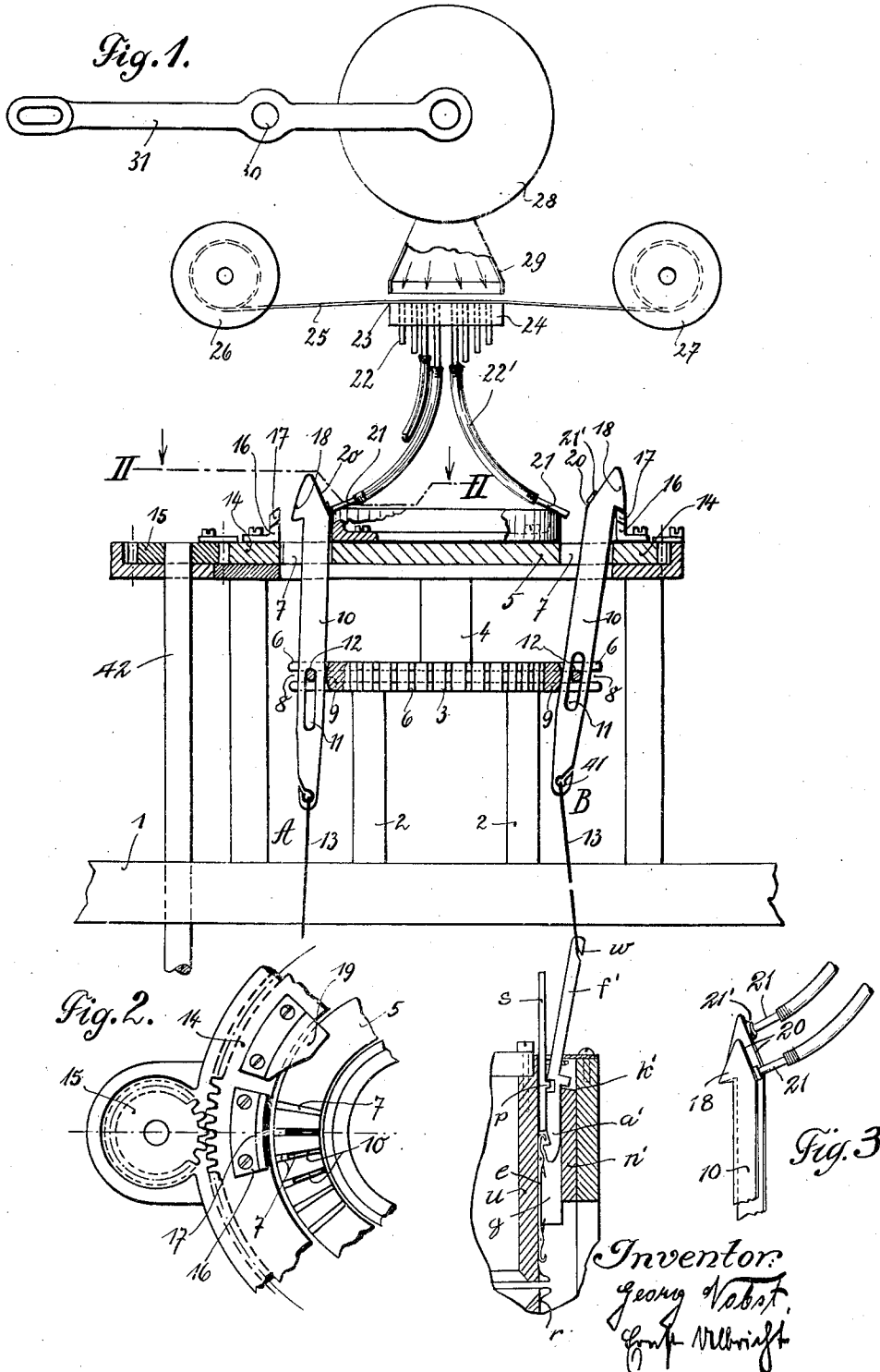
April 5, 1932.

G. NOBST ET AL.

1,852,256

PATTERN FORMING MECHANISM FOR CIRCULAR KNITTING MACHINES

Filed Jan. 26, 1928



UNITED STATES PATENT OFFICE

GEORG NOBST AND ERNST ULBRICHT, OF MITTWEIDA, GERMANY, ASSIGNORS, BY MESNE ASSIGNMENTS, TO SCOTT & WILLIAMS INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF MASSACHUSETTS.

PATTERN FORMING MECHANISM FOR CIRCULAR KNITTING MACHINES

Application filed January 26, 1928, Serial No. 249,629, and in Germany January 27, 1927.

This invention relates to pattern mechanism for circular knitting machines and more particularly to mechanism in which holes punched in a card determine whether or not the individual knitting instrumentalities shall be selected for designing purposes. Heretofore pattern chains, wheels and drums have been the principal types of selecting mechanisms used on circular knitting machines, but these types have obvious limitations—especially in cases where a large number of changes are desired or the individual knitting instrumentalities have to be selected at every course. It has heretofore been impossible to embody satisfactorily in a circular knitting machine any known device of the jacquard type.

One object of the present invention is to provide a type of jacquard apparatus which will avoid all the difficulties and objections heretofore met in embodying jacquard devices in circular knitting machines, and which at the same time will provide means for extending the scope and variety of possible patterns. Another object is to provide jacquard apparatus which is particularly suitable for circular purl knitting machines. Another object of the invention is to provide mechanism of this type which is simple, light, efficient and very flexible. Such a device includes broadly pattern jack means arranged compactly and preferably in some definitely uniform or symmetrical relation to the knitting instrumentalities, the action of which they are intended to control. Suitable means are provided for actuating the individual jack means, such means being shown pneumatically operated and comprising for each needle, sinker or ordinary jack a corresponding pattern jack connected thereto and mounted in such relation to a tube that its position will be changed whenever a perforation in a suitable pattern card is brought into register with the admission port of the tube. It provides for the individual selection and operation of each pattern jack and thereby eliminates the very undesirable intermittent or jerky pull of the pattern jacks in the ordinary jacquard apparatus. This eliminates the noise and vibration which are

unavoidably associated with the ordinary jacquard and greatly reduces the number of operated parts, and simplifies the operation of parts, concerned in determining the operation of pattern-controlled needles.

For purposes of illustration the invention is shown and described embodied in a circular purl knitting machine with a revolving cam cylinder, but it should be understood that we do not limit ourselves to that type of machine.

In the drawings:

Fig. 1 is an elevation partly in section and partly diagrammatic of part of a circular purl knitting machine, showing the new type of jacquard apparatus connected to the sliders;

Fig. 2 is an enlarged fragmentary plan view on the line 2—2 of Fig. 1; and

Fig. 3 is an enlarged view in perspective illustrating the relation of the pattern jacks and the discharge ends of the pneumatic tubes.

Referring to the drawings, the co-axial circular needle cylinders u and r are provided with the usual purl knitting instrumentalities including double-ended needles and two part "sliders" each comprising a pusher s and a hook f' such as form the subject matter of our copending application Ser. No. 23,135 filed September 15, 1927 (Patent No. 1,720,606 July 9, 1929). A cam cylinder n' has the usual cams and paths for effecting longitudinal movement of the needle jacks a' , f' in the needle cylinder u , while a lower cam cylinder (not shown) effects a longitudinal movement of the jacks in the lower cylinder r . It will be noted that each hook f' of a needle jack in the upper cylinder u is provided at its upper or exposed end with a recess w to which is attached one end of a harness thread 13, the other end thereof engaging a similar recess 41 in a corresponding pattern jack 10 hereinafter described.

An annular bridge 1 surrounds the needle cylinder u in a well known manner and supports posts 2 upon which is mounted a ring or annular jack carrying member 3 provided near its periphery with radially extending slots 6 in which a series of pattern jacks 10

are mounted vertically. As shown, there is an annular groove or recess 8 in the periphery of said ring 3 and this recess forms with the slots 6 a series of fork-like projections. The pattern jacks 10 having hooks 41 for cord or wire tension links 13 are retained normally in aligned circular relation in said slots and between said fork-like projections by means of a ring 12 which passes through longitudinally extending slots 11 in the pattern jacks. The inner edge of each pattern jack 10 engages a rounded shoulder 9 forming the inner edge of each slot 6, thus permitting each of the jacks 10 independently to have a rocking oscillatory motion about a point below the vertical center of the inner edge of the jack as well as a longitudinal movement limited by slot 11 and annular pivot ring 12. An upper jack guiding ring or plate 5 is supported above the ring 3 by any suitable means, and the upper ring 5 is provided along its peripheral edge with a series of slots 7 (Fig. 2) each of which is aligned vertically with a corresponding slot 6 in the lower ring, and adapted to receive and guide the upper portions of the jacks 10.

In order that these jacks 10 may be pneumatically selected each jack is provided at the top with a shoulder portion 20 which, in the normal position of the jack, indicated at A, (Fig. 1), bears against the lower open end of a small tube 21. If desired pads 21' may be placed on the shoulders 20 of the jacks to form better contact with the tubes 21. As indicated in Fig. 3, the tubes may end behind and if desired engage their respective jacks at different levels, thus permitting the use of this device on machines operating with very closely-spaced jacks 10 for closely-spaced and fine needles. Above the tubes 21 ducts 22 are mounted in fixed relation in a retainer or tracker plate 24 and with their upper ends forming holes in the upper surface 23 thereof. A flexible or other suitable tube 22' connects the outer or lower end of each duct 22 with the ends of the tubes 21. Coacting with the holes in the surface 23 is a perforated pattern card or strip 25. The holes in the tracker plate 24 are in line with perforations in strip 25, so that motion of strip 25 will cover or uncover the holes in the tracker plate according to the perforations in strip 25. This strip is unrolled from a suitable support such as a roll 27 by any suitable intermittently operative feeding device and rewound on roll 26, being driven in synchronism with the needle actuating and pattern jack actuating mechanism.

Differential air pressure as between the tubes 21 and the outside atmosphere is provided by any suitable means. In operation, as the pattern strip moves across the plate 24, the perforations in said strip will, by registering with the openings of the ducts 22 permit the differential air pressure to be-

come effective at the lower opening of tube 21. In the illustrated device, it is contemplated that the pattern jack 10 will be actuated by impact of compressed air against the shoulder 20, although it is contemplated that a similar or equivalent movement of the jacks may be effected by suction with a correspondingly different arrangement of the parts. Compressed air is produced in a suitable air confining device such as a tank 28 from which it is transmitted through an exhaust outlet 29 in operative contact with the pattern strip 25. The air tank 28 is pivotally mounted on a lever 31 fulcrumed at 30 so that the exhaust outlet 29 may be conveniently moved toward and away from operative position with respect to the pattern strip. This adjustment is desirable for the convenient insertion and removal of different strips and for convenient inspection of the accuracy of operation of the pattern strip as it passes the upper openings of the ducts 22.

In operation, the pattern jacks normally occupy the position indicated at A in Fig. 1. Assuming that the movement of the pattern strip 25 across the plate 24 brings a perforation into register with the opening of a tube 21, the corresponding jack 10 will be blown outwardly by the compressed air with a rocking movement which carries its upper end toward a toothed ring 14 mounted for rotation outside the guide plate 5. It will be observed that the jacks 10 are balanced upon annular pivot 12 and lightly retained only by the pull of their flexible linkage with connections 13, the effect of which in the normal position A, at the left of Fig. 1, is merely sufficient to avoid accidental outward displacement of the upper ends of jacks 10. A relatively feeble blast from one of the tubes 21 is thus sufficient to tip a jack 10 outwardly against the slight forces holding it upright. When a jack 10 is so displaced, gravity tends to hold it in its displaced position. The ring 14 carries a jack lifting cam 16 having an inclined upper cam surface 17 positioned to engage an under-surface of the head 18 of the pattern jack 10 when the latter is in the position to which it was tipped by the pneumatic means. Surfaces 17 and the under surface of head 18 may be inclined to the horizontal as shown in Fig. 1 to prevent their disengagement after cam 17 has engaged head 18, until the cam 17 shall have passed by. Continued rotation of the ring 14 advances the cam 16 so that any displaced jack 10 is lifted or moved longitudinally to the position marked B in Fig. 1. This movement is sufficient to draw the draw jack f' in cylinder u up to a position where the butt of said jack will lie in the path of jack actuating means such as a stitch cam forming part of the cam cylinder u' . As indicated more

clearly in Fig. 2, the plate 14 also carries a resetting device comprising in effect a cam 19 positioned to engage and push back jack 10 to its normal position A where it is again ready for displacement by virtue of the operation of the selecting means hereinabove described. The toothed ring 14 carrying the cams 16 and 19 is driven from a spur gear 15 mounted on a shaft 42 from which the pattern strip and the moving rotating parts of the cylindrical knitting machine may also be driven by suitable connections. This connection is desirable in order that operation of the parts may be properly coordinated or synchronized and so that the displacing and repositioning of the pattern jacks may take place in proper sequence with respect to the actuation of the loop-forming instrumentalities.

The cooperation of the pattern jacks with the sliders and the double-ended needles, in the production of purl and other fabrics will be obvious to those skilled in the art.

It will be obvious that our mechanism can be used to actuate needles, sinkers or jacks in any type of circular knitting machines, and it will also be obvious that many modifications will occur to those skilled in the art which do not depart from the scope of our invention.

We claim:

1. A circular knitting machine having individual knitting instrumentalities, and a plurality of pattern jack means severally for selecting said instrumentalities severally to determine their operation or inoperation, in combination with pneumatic means adapted to move said pattern jack means severally and selectively according to a predetermined pattern.

2. In a circular knitting machine, the combination of individual knitting instrumentalities, a plurality of pattern jacks severally for actuating said instrumentalities, and pneumatic means for selectively moving individual pattern jacks from inoperative to operative position with respect to said knitting instrumentalities.

3. A circular knitting machine having a needle cylinder, a plurality of pattern jacks arranged coaxially with said cylinder, and pneumatic means severally adapted on occasion to deliver a pneumatic impulse radially of said cylinder against said jacks to move said jacks selectively.

4. In a circular knitting machine, the combination of individual knitting instrumentalities, a plurality of pattern jacks for selecting said instrumentalities for actuation, pneumatic means for selectively moving individual pattern jacks from inoperative to operative position with respect to said knitting instrumentalities, means for moving the selected pattern jacks to work said instrumentalities,

and means for resetting said jacks in inoperative position.

5. In a circular knitting machine, the combination of individual knitting instrumentalities, a plurality of pattern jacks for selecting said instrumentalities for actuation, pneumatic means for selectively moving individual pattern jacks from inoperative to operative position with respect to said knitting instrumentalities, actuating means for operating pattern jacks operatively positioned, and means operated independently of said pneumatic means for resetting said jacks in inoperative position.

6. In a circular knitting machine, the combination of a pattern jack actuating cam, a plurality of pattern jacks normally out of the path of movement of said cam, and pneumatic means for selectively moving said jacks severally into the path of said cam.

7. In a circular knitting machine, the combination of a needle cylinder, needle actuating sliders mounted for movement therein, slidable pattern jacks, pneumatic pattern means for selectively effecting transverse movement of individual pattern jacks into operative position, means for imparting needle controlling movement to pattern jacks displaced into operative position, connections for transmitting needle operating movement of each pattern jack to a corresponding needle actuating slider, and means for retracting pattern jacks from their operative position.

8. In a circular knitting machine, the combination of a jack actuating cam, a plurality of pattern jacks normally out of the path of movement of said cam, means for selectively moving individual jacks by an air current into the path of said cam, and means for resetting said jacks in normal position.

9. In a circular knitting machine, the combination of a needle cylinder, needle actuating jacks mounted for sliding movement therein, pneumatic means for selectively effecting positioning movement of individual pattern jacks in one direction, means for imparting endwise needle actuating movement to said needle actuating jacks in accordance with the position of the pattern jacks, and means operative independently of said pneumatic means for effecting repositioning movement of said pattern jacks in the opposite direction.

10. A circular purl knitting machine having two needle cylinders with tricks, needle actuating jacks, sliders and double-ended needles in said tricks, means for positioning said needle jacks operatively or inoperatively in combination with a cam cylinder adapted to actuate said needle jacks and sliders, and pattern means having pneumatic connections to said means for positioning said needle jacks operatively or inoperatively.

11. Pattern mechanism for circular knitting machines comprising a series of pattern

jacks normally positioned in an axial dimension of the machine in circular alignment, pneumatic means for selectively displacing individual jacks radially out of said circular alignment, means rotatably mounted to engage and longitudinally move said relatively displaced jacks, and means rotatably mounted to engage said selectively displaced jacks, and return them to their respective normal positions.

12. Pattern mechanism for circular knitting machines comprising a plurality of pattern jacks mounted for rocking and longitudinal motions, pneumatic means for rocking said jacks severally by movement in one direction, a cam for effecting rocking movement thereof in the opposite direction, and a cam for effecting longitudinal motion of said selected jacks.

13. In a circular knitting machine, the combination of individual instrumentalities, means for activating the same for loop forming operations, a plurality of longitudinally slotted pattern jacks operatively connected to said instrumentalities, supporting and bearing means disposed within the slots of the jacks, means for selectively rocking individual jacks about said supporting and bearing means into an operative position, means for moving said operatively positioned jacks longitudinally with reference to said supporting and bearing means, and means for moving said selected jacks out of said operative position.

14. Pattern mechanism for circular knitting machines comprising a series of pattern jacks normally positioned in circular alignment for freedom of movement transversely and longitudinally of the axial dimensions of the machine, means for confining a supply of compressed air, a series of tubes interposed between said air supply and said jacks, each of said tubes having an inlet opening positioned to communicate with said supply and an outlet opening to direct an air blast toward a jack to displace it, a pattern strip having pattern perforations, means for moving said strip between said supply of compressed air and said tubes selectively to expose the inlet openings of predetermined tubes to said compressed air supply, a cam ring mounted coaxially with said series of jacks, said ring being rotatable relatively to the series of jacks, a lifting cam on said ring for imparting movement in one dimension to displaced jacks, and a resetting cam on said rotatable ring for returning said individual jacks to normal position.

15. In a circular knitting machine, the combination of a needle cylinder having tricks and double-ended needles therein, sliders for said needles, a series of pattern jacks mounted in circular alignment concentrically with said cylinder, each jack being movable in response to an air pressure differential, wires opera-

tively connecting said jacks and said sliders, a series of air tubes each arranged with an opening in operative relation to one of said jacks, means for effecting a differential air pressure as between the terminal openings of selected conduits including a perforated pattern strip, and means for advancing the same across openings in said tubes.

16. In a knitting machine of the kind having selecting devices for slider-actuated needles, the actuation of any slider, depending upon its position in relation to operating cams, the combination of a pattern jack and connection for positioning a slider, means for moving the jack and connection when the pattern jack is displaced to said effect; an air pipe adapted to blow a blast against said pattern jack to displace it, and pattern controlled means for admitting air under pressure to said pipe.

17. In a pneumatic pattern mechanism for knitting machines, the combination with needle-actuating jacks of pattern jacks, connections between said jacks and actuating means for said pattern jacks, said pattern jacks being normally held for displacement against slight stabilizing forces in a position out of contact with said actuating means, a blast-pipe positioned and adapted to blow upon a jack to displace it, in combination with a source of air under pressure, and a movable perforated pattern device therein movable on a tracker plate having an orifice leading to said blast pipe, whereby to displace said jack on passage of a pattern perforation by said orifice.

18. Pattern mechanism for circular knitting machines comprising a series of pattern jacks normally positioned in the axial dimension of the machine in circular alignment, pneumatic means for selectively displacing individual jacks radially out of said circular alignment, means rotatably mounted to engage and longitudinally move said relatively displaced jacks, and means rotatably mounted to engage said selectively displaced jacks, and return them to their respective normal positions, and means operated by a longitudinally displaced jack to effect a change in operation of a knitting instrumentality.

In testimony whereof we have signed our names to this specification.

GEORG NOBST.
ERNST ULBRICHT.