L. N. D. WILLIAMS.
NEEDLE PICKING DEVICE FOR KNITTING MACHINES.
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NEEDLE-PICKING DEVICE FOR KNITTING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 774,124, dated November 1, 1904.

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To all whom it may concern:

Be it known that I, LOUIS N. D. WILLIAMS, a citizen of the United States, and a resident of Ashbourne, Montgomery county, Pennsylvania, have invented certain Improvements in Needle-Picking Devices for Knitting-Machines, of which the following is a specification.

My invention consists of certain improvements in knitting-machines which are provided with mechanism for picking needle after needle at the opposite ends of a "fashioning" set first out of operation and then into operation again for the purpose of first narrowing and then widening a knitted web formed by reciprocating the cam-cylinder or other cam-carrier of the machine, so as to produce a knitted bag or pocket constituting the heel or toe of a stocking, of which the tubular web constitutes the leg or foot; and my invention relates especially to that class of needle-picking mechanism in which the picker is pivotally mounted upon a carrier on the cam-carrier and as said carrier is reciprocated is arrested by contact with a needle-butt at one end or the other of the fashioning set of needles and is then moved by means of a cam which continues to travel with the needle-carrier, whereby the picker either moves the needle out of operative relation with the knitting-cams, if it was before operative, or into operative relation with said knitting-cams, if it was before inoperative. In this class of machines the picker is either movable on its carrier in the direction of travel of the same, as in the machine shown in Fig. 6 of the patent of Robert W. Scott, No. 410,859, dated September 16, 1889, or the picker-carrier is mounted on but movable independently of the cam-cylinder or other carrier, as in the machines shown in the subsequent patents, No. 575,191, dated January 12, 1897, and No. 657,953, dated April 15, 1902. My present improvements are applied particularly to a machine of the latter type, so that when the movement of the picker is arrested by contact with a needle the picker-carrier will yield as the cam-carrier continues its movement and will permit a cam on the cam-carrier to act upon the picker so as to move the needle whose bit has been engaged thereby out of or into operative relation with the knitting-cams. The present machine, however, resembles one type of the machine described in Patent No. 410,859 in that the picker is held in its normal position by means of a spring and is restored to its normal position again by the spring after it has been moved out of such position by engagement with the cam, although gravity may be relied upon to restore the lifting-picker to normal or operative position, if desired.

My present invention consists, mainly, in a modification of the picker-carrier of the later types of machine before referred to, the present machine having in place of the friction ring or band upon which the pickers were pivotally mounted in such prior machines a simple swinging arm which is lighter than the ring or band, and consequently susceptible of easier movement than the latter when the picker strikes the butt of the needle and which provides for a quicker movement of the picker or a greater extent of movement of the same within a given time.

The invention also consists in so mounting this swinging arm upon a cam-cylinder that as the picker mounts the cam whereby it is caused to move the needle into or out of operative position it will automatically clear itself from the butt of the needle and can then be again moved into operative position under the action of a spring or weight.

The invention also comprises certain means for moving the pickers to operative position while the machine is knitting round and round for the production of tubular work.

In the accompanying drawings, Fig. 1 is a view illustrating in a flat plane the inner side of the cam-cylinder with its needle-operating cams and needle-pickers. Fig. 2 is a similar view of the outside of the cam-cylinder, illustrating the swinging arms upon which the pickers are mounted, the springs for restoring the pickers to operative position, and the cam structure whereby the pickers may be moved to a neutral position dur-
ing round-and-round knitting; and Fig. 3 is a sectional plan view of the cam-cylinder equipped with needle-operating cams and needle-picking devices in accordance with my invention.

I represents the cam-carrier of the machine, which in the present instance is represented as a cylinder, although certain features of my invention may be adopted in connection with straight machines, if desired.

The knitting-cams may be of any desired character, as they form no essential part of the present invention. As shown they comprise a central duplex lift-cam 2 and on each side of the same a lift-cam 3, terminating at the top in a horizontal ledge or shelf 4, upon which the butts of the needles rest when they are not under control of the knitting-cams or have not been lifted out of range of the same.

On each side of the cam 2 and between the same and the cam 3 on that side is another cam 5, the inner or lower face of which serves as a depressing-cam, while its back or outer face serves as a lifting-cam, these cams being so disposed in respect to the cams 3 and 2 as to form a groove for the passage of the needle-butts, the mouths of the grooves between the cams 3 and 5 being normally closed by blocks 6, acted upon by gravity or by suitable springs, so that the butt of a needle approaching either cam 5 from a cam 3 will be delivered onto the back of said cam 5, while the butt of a needle rising on either of the cams 3 will lift the block and pass up onto the ledge 4. Above the cams 5 is a longitudinally-sliding cam 7, with central depending portion serving to direct downwardly the butt of a needle leaving the back of either of the cams 5, and thereby bring it under the influence of the depressing-face of the opposite cam 5, this depending portion of the sliding cam 7 being in contact with one or other of the cams 5 when the machine is knitting round and round and moving from one cam 5 to the other alternately when the cam-cylinder is being reciprocated.

The machine is intended to be equipped, as usual, with some needles having longer butts than the others, the needles having the shorter butts constituting the fashioning set upon which to-and-fro knitting and narrowing and widening of the web is effected and the needles having the longer butts extending around the remaining portion of the cylinder and being lifted out of action prior to to-and-fro knitting and restored to action again prior to the resumption of round-and-round knitting. The cam for acting upon the long-butted needles to raise them out of operative position is represented at 8, and the cam for acting upon the long-butted needles for again restoring them to operative position is represented at 9, both of these cams sliding radially through slots in the cylinder and being moved into or out of position to engage the long needle-butts at appropriate times by any ordinary mechanism—such, for instance, as that shown in the Patent No. 697,508, before referred to.

Two sets of pickers are employed in the machine—namely, those for lifting the end needles of the fashioning set from operative to inoperative relation with the knitting-cams and those for engaging the end needles of the raised or inactive set and restoring them to operative relation with the knitting-cams.

The lifting-pickers are represented at 10 and the depressing-pickers at 11 in Fig. 1. Each picker consists of a finger pivoted to the upper end of an arm 12, which is pivoted upon the needle-cylinder by means of a radial pin 13, so that said arm will swing in a plane parallel to a tangent from the periphery of the cylinder, a spring 14 acting upon each picker-finger 10 or 11, so as to tend to maintain the same in operative position and at the same time to maintain its pivoted carrying-arm 12 in a normal position or position of rest. The cam-cylinder is provided with cams 15 for operating the lifting-pickers, with cam 16 for operating the depressing-pickers, and on the outside of the cam-cylinder is mounted a cam ring or segment 17, which has cams 18, whereby the lifting-pickers can be moved to an intermediate or neutral position, and other cams, 19, whereby the depressing-pickers can be similarly actuated.

As shown in the drawings, the lifting-pickers are in operative position and the depressing-pickers in neutral or inoperative position. Supposing that the cam-cylinder is being moved in the direction of the arrow, Fig. 1, with the foremost picker 10 in lowered or operative position, said picker 10 will come in contact with the butt of the end needle of the fashioning set resting upon the supporting-ledge 4 and further forward movement of said picker with the cam-cylinder will be arrested. As the pivot-pin 13 of the picker-carrying arm 12 still continues to move forward with the cam-cylinder, however, the upper end of said arm will have, in effect, a rearward movement, and at the same time the advancing cam 15 will lift the inner end of the picker and also the needle whose butt is engaged thereby. Owing to the fact that the upper end of the arm 12 swings in a plane parallel with a tangent from the periphery of the cam-cylinder, it gradually increases its distance from said cam-cylinder, with the effect of drawing outward the picker-finger until by the time the butt of the needle has been raised so as to pass over the back of the cam 7 the picker will be disengaged with said butt and will be drawn forwardly and downwardly under the action of the spring 14 until it rests upon the butts of the active needles of the fashioning set and then drops from the same as the end of the set is reached. The
fact that the picker-finger swings upon a pivot which travels in the plane defined aids in effecting withdrawal of the inner end of said picker-finger from engagement with the butt of the needle. As the needles of the active set rise on the rearmost cam 3 they will lift the opposite picker 10 and pass under the same; but as soon as the direction of movement of the cam-cylinder is reversed this picker becomes the foremost picker and acts, as in the manner before described, to lift out of action a needle at the opposite end of the active seat. During this time the cams 19 of the cam ring or segment 17 have held the depressing-pickers 11 in the inoperative position, (shown in Fig. 1;) but when the desired narrowing of the knitted web has been effected and it becomes necessary to restore to action those needles which have been raised out of action by the pickers 10 the cam ring or segment 17 is moved in the direction of the arrow, Fig. 2, so that the cams 18 will raise the lifting-pickers to inoperative position and the cams 19 will permit the depressing-pickers to rise into operative position. The depressing-pickers then act to restore the inoperative needles of the fashioning set to operative relation with the knitting-cams—that is to say, the butt of an end needle of said inoperative set is struck by one of the pickers 11, the movement of the latter is thereby arrested, its carrying-arm is caused to swing, and the picker is depressed by the action of the cam 16, so as to restore the needle to operative position, the picker gradually freeing itself from engagement with the butt, owing to the plane in which the end of the picker-carrying arm swings. When it is desired to knit round and round, the cam ring or segment 17 is adjusted to an intermediate position, so as to retain both lifting and depressing pickers in inoperative relation with the butts of the needles.

One of the advantages of the present construction as compared with that of the previously-patented structures to which I have referred is that the picker can lift or depress the needles more rapidly or to a greater extent in a given time than in such previous structures, owing to the fact that the pivot of the picking-finger on the free end of the swinging arm 12 has vertical movement in respect to the face of the cam 15 or 16, because of the arc in which said free end of the arm swings. Hence the movement of the inner end of the picker which engages the needle-butt is a compound of the movement due to the angle of the cam and of the lever action due to the vertical movement of the pivot of the lever, the face of the cam for this movement acting as a fulcrum-bearing for the picker.

Although I have shown and prefer to use springs for acting upon the pickers and picker-carrying arms for maintaining them in and restoring them to normal position, gravity may take the place of springs for this purpose, if desired, the arms 12 being suitably counterweighted, so as to normally tend to assume the position into which they are now drawn by the springs.

Having thus described my invention, I claim and desire to secure by Letters Patent—

1. The combination of the knitting-cam carrier of a knitting-machine, with an arm pivoted thereto so as to swing thereon, a picker pivotally mounted upon said arm and adapted to come into contact with the needle at one end of an operative or inoperative set of needles, and a cam moving with the knitting-cam carrier of the machine and acting upon said engaging picker so as to move the same and the needle engaged thereby, and thereby change the position of said needle in respect to the knitting-cams of the machine, substantially as specified.

2. The combination in a knitting-machine, of the knitting-cam carrier, an arm hung thereto so as to be free to swing thereon, means acting on said arm so as to retain it in or restore it to normal position, a picker pivoted to the free end of said arm and adapted to engage the end needle of an operative or inoperative set of needles in the machine, and a cam moving with the knitting-cam carrier and acting upon the picker which is in engagement with the needle, so as to move the same and the needle and thereby change the position of the latter in respect to the knitting-cams of the machine, substantially as specified.

3. The combination of the knitting-cam carrier of a knitting-machine, an arm hung thereto so as to swing thereon, a picker pivoted to the free end of said arm and adapted to engage with a needle at one end of an active or inoperative set of the needles of the machine, a cam movable with the knitting-cam carrier and acting upon the picker which is in engagement with the needle so as to move the picker and needle and change the position of the needle in respect to the knitting-cams, a spring acting upon said picker and tending to move the same in a direction the reverse of that in which it is moved by the cam, and means for maintaining the picker-carrier in and restoring it to normal position, substantially as specified.

4. The combination in a knitting-machine, of a knitting-cam carrier, an arm hung thereto so as to be free to swing thereon, a picker pivoted to the free end of said arm and adapted to engage the end needle of an operative or inoperative set of needles in the machine, a cam movable with the knitting-cam carrier and acting upon said engaged picker so as to move the same and the needle and change the position of said needle in respect to the knitting-cams, and a spring acting both upon the picker and upon its carrying-arm and serving to move
the picker in a direction the reverse of that in which it is moved by the cam and also serving to maintain the picker-carrying arm in or restore it to a normal position, substantially as specified.

5. The combination of the cam-cylinder of a knitting-machine and its knitting-cams, with an arm pivoted to said cam-cylinder so as to swing in a plane parallel to a tangent from the periphery of the cylinder, a picker pivotally mounted upon the free end of said arm and adapted to engage the end needle of an active or inactive set of needles in the machine, and a cam movable with the knitting-cam carrier and acting upon said engaged picker so as to move the same and the needle engaged thereby and change the position of said needle in respect to the knitting-cams of the machine, substantially as specified.

6. The combination of the cam-cylinder of a knitting-machine and its knitting-cams, with an arm pivoted to said cam-cylinder so as to swing in a plane parallel to a tangent from the periphery of the cylinder, a picker pivotally mounted upon the free end of said arm and adapted to engage the end needle of an active or inactive set of needles in the machine, a cam movable with the knitting-cam carrier and acting upon said engaged picker so as to move the same and the needle engaged thereby and change the position of said needle in a direction the reverse of that in which it is moved by the cam, and means for retaining the picker-carrying arm in or restoring it to normal position, substantially as specified.

7. The combination of the knitting-cam carrier of a knitting-machine, an arm pivoted thereto so as to swing thereon, a picker pivotally mounted upon the free end of said arm and adapted to engage the end needle of an active or inactive set of needles in a machine, a cam acting upon said picker so as to move the same and the needle engaged thereby and change the position of said needle in respect to the knitting-cams of the machine, and another and independently-movable cam for acting upon the picker to move it to inoperative position, substantially as specified.

8. The combination of the knitting-cam carrier of a knitting-machine, raising and depressing pickers adapted to engage with the end needles of a set in the machine, arms pivoted to the cam-carrier so as to swing thereon, and having pivotal connection with said pickers at their free ends, cams movable with the cam-carrier and acting upon the engaged pickers so as to move the same and the needles engaged thereby and thus change the position of said needles in respect to the knitting-cams, and other independently-movable cams acting on said pickers so as to move one into operative position and the other into inoperative position, substantially as specified.

9. The combination of the knitting-cam carrier of a knitting-machine, raising and depressing pickers adapted to engage with the end needles of a set in the machine, arms pivoted to the cam-carrier so as to swing thereon, and having pivotal connection with said pickers at their free ends, cams movable with the cam-carrier and acting upon the engaged pickers so as to move the same and the needles engaged thereby and thus change the position of said needles in respect to the knitting-cams, and other independently-movable cams acting on said pickers so as to move one into operative position and the other into inoperative position, or both into inoperative position, substantially as specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

LOUIS N. D. WILLIAMS.

Witnesses:
F. E. BECHTOLD,
ELIAS H. WHITE.