

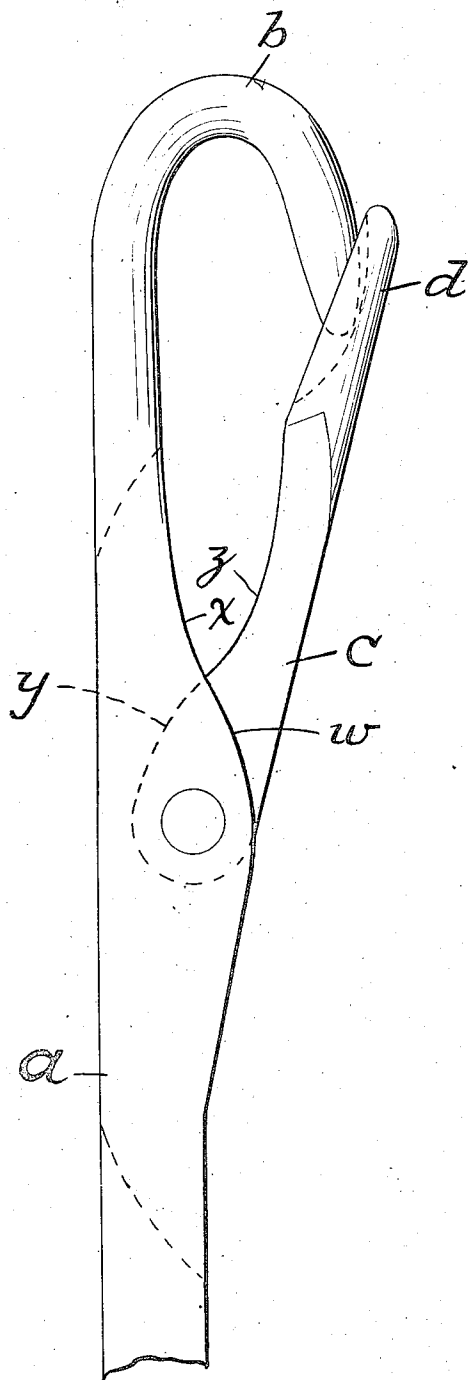
May 17, 1927.

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1,629,275

LATCH NEEDLE

Filed March 30, 1925



WITNESS:

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Patented May 17, 1927.

1,629,275

UNITED STATES PATENT OFFICE.

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LATCH NEEDLE.

Application filed March 30, 1925, Serial No. 19,270.

In the operation of knitting machines equipped with the ordinary latch needles, much difficulty arises in the production of perfect fabric. There are also serious limitations with respect to the effects that can be produced on fine hook needles and with respect to the different sizes of yarn that can be used without changing the needles or the cut of the cylinder. These defects and limitations, so far as they are recognized to be due to the construction of the needle, are generally deemed to be inherent in latch needles; notwithstanding which this type of needle is almost universally used, due to its many advantages.

Among the defects in fabric knit on latch needle machines may be mentioned the production of holes in the fabric, the occurrence of drop stitches, and the roughness of and weakness in the fabric due to the abrasion of the thread or the cutting of the individual strands of which a thread may be composed. In plaiting there is often a tendency to a reversal of the positions of the thread, resulting in the production of imperfect goods. The ordinary latch needle of a given size can accommodate different sized yarn within only a very narrow range, thus restricting the scope of work that can be produced on a single machine without going to the expense of changing needles or altering the gauge of the machine. With fine hook needles it would be possible to produce many new effects if such needles were not strictly limited to handling correspondingly fine yarns.

Prolonged experiment satisfied me that these defects and limitations are not inherent in latch needles, but are due to the sharp V angle formed between the shank of the needle and the latch when the latter is closed against the hook, and also to the relatively short distance between the angle of the V and the hook. In general, the finer the needle, the sharper the acuteness of the angle. My efforts, therefore, were directed to the production of a needle having structural features which, without reduction in the length of the latch or enlargement of the hook or any modification that would affect the fineness and efficiency of any given size of needle, would reduce the acuteness of the angle between the needle shank and

the closed latch, and maintain the point of intersection between the inner faces of the shank and the latch at the greatest practicable distance from the hook.

In view of the simplicity of the invention, I shall first describe the construction of the improved needle which I have devised to accomplish the said objection and then explain why such construction is effective to overcome the defects and the limitations of the ordinary needle.

The drawing shows a preferred embodiment of the invention.

The needle comprises the shank *a*, the hook *b*, and the pivoted latch *c* provided with a spoon *d*.

The invention is capable of embodiment in a needle having an ordinary shank and hook, but it is distinctly advantageous to modify the contour of the inner face of the shank so that, beyond the convexity which exists in the ordinary needle shank opposite the axis of the hook, there is a concavity which is substantially below, and independent of, the concavity of the hook proper. In other words, the shank of the latch knitting needle is formed with a pivoting jaw or supporting portion and has a reduced extension with a hooked end. This permits that part of the inner face of the shank above the latch pivot to have a somewhat less acute angle to the inner opposing face of the latch. This convexo-concave portion of the inner face of the shank is indicated by the reference letters *w* and *x*.

The principal feature of the improved needle resides in the contour of the latch. The outer face of the latch and its spoon need not be different from the ordinary latch, but the inner face of the latch below the spoon (namely, that face which opposes the shank of the needle below the hook and above the latch pivot) has a distinctly convexo-concave contour. The convex contour starts approximately opposite the latch pivot, but extends for a short distance. Beyond this short convex contour, the contour is distinctly concave. The concavity may extend entirely up to the spoon, but it need not extend that far. Preferably the lower end of the concavity begins at, near or below the point of the angle that the latch forms

with the shank when the latch is closed. This convexo-concave portion of the latch is indicated by the reference letters *y* and *z*.

It will be observed that the angle between the inner faces of the shank and latch when the latch is closed is by no means acute. As contrasted with the ordinary latch needle, especially those of fine gauge, the angle approximates that between the blades of scissors when they are well open as compared with the angle between such blades when nearly closed. Or, from another aspect, the angle approximates a U-shape rather than a sharp V-shape. It will also be observed that the distance between the crotch of the angle and the hook is substantially increased, and a comparatively roomy space is afforded between needle shank and latch immediately above the point of intersection of their inner faces.

Certain important advantages of my improved latch needle, as compared with the latch needle of ordinary construction, will now be described. No attempt will be made to develop exhaustively all its minor advantages.

In the case of the ordinary latch needle, after the yarn is fed over the needle and the needle starts on its downward movement, the latch begins to close and in so doing the V-shape referred to is formed too rapidly, which, in effect, has the same result as a pair of shears in cutting the yarn, except in the case of soft well oiled yarns of great elasticity, when the V pinches the ends of the fibres, causing the yarn to either break or tear, thus producing holes. The high percentage of waste resulting from such holes has made it heretofore impracticable to knit certain classes of fabrics with many yarns which could have been more economically employed. My improved latch, in closing, has no shearing effect, due to the great angularity between shank and latch and the consequent slowness in closing and the increased distance between the point of the angle and the hook when the latch is closed. It will be noted that the pivoted hook closing latch, when closed, provides a substantially straight line loop escape guide. The concave portion in the inner face of the shank and the concave portion and the inner face of the latch adjacent their point of intersection, together with this increased distance from the point of the angle and the hook when the latch is closed, form a relatively long yarn eye having an enlarged base portion.

Drop stitches arise from lack of sufficient room, when the latch is closed, to allow for the unevenness and lack of smoothness in yarns, thereby preventing the latch from closing properly on the hook of the needle. Unevenness in yarns is brought about by the variation in the diameter of the yarns be-

ing too great for the space allowed for the yarn when the latch is closed, while the lack of smoothness in yarns permits the ends of the fibres to lodge between the latch and side of the saw-slot, causing the latch to bind or stiffen and stopping the free movement required of the latch in the formation of the loop or stitch. In my improved needle, the extra space that is provided makes possible the free use of yarns which heretofore have been a source of waste. Pinching or flaying the yarn, and binding of the latch, are altogether avoided.

Rough fabric is frequently produced by fraying or abrasion. Some of the fibres of the yarn, or individual strands of which the yarn is composed, are severed by the scissors action of the latch and shank hereinbefore explained. With my improved needle, this action is substantially avoided, and a perfectly smooth fabric is produced.

In plaiting, it is difficult, with the ordinary needle, to produce smooth and even work. On the ordinary needle, as the latch closes to allow for the loop or stitch to be cast off, the inside surface of the latch has a decided tendency to rub or roll the threads thus changing their proper positions in relation to one another, which positions are necessary to accomplish proper plaiting. My improved needle allows freedom for the thread already held by the needle as the stitch is being formed. By removing the bearing of the latch on the threads, the described rolling effect is overcome, and there is no unevenness in the finished fabric.

The additional space, measured both longitudinally and transversely, and especially with the comparatively ample room afforded in the angle between shank and latch, permit the use of a much wider range in the size of yarns that can be used without changing the needles or the gauge of the machine. This greatly enlarges the scope of the work that can be economically produced on one machine.

The number of effects that can be produced on fine hook needles of ordinary construction is strictly limited, due to inability to utilize relatively large size yarn with relatively fine hook needles. It is obvious that my improved needle permits, within a wide range, a considerable variation in the weight of yarn that can be knit by the same needles in the same fabric, thereby greatly increasing the capacity of the needles to produce different effects.

Having now fully described my invention, what I claim and desire to protect by Letters Patent is:

1. A latch knitting needle comprising a shank formed with a latch-pivoting jaw and having a reduced extension with a hooked end, and a pivoted hook-closing latch adapted to provide a substantially straight line

loop escape guide, the portion of said extension which is adjacent to said latch-pivoting jaw being spaced-away from the closed latch to provide a free-yarn space between them adjacent their intersection.

2. A latch knitting needle comprising a shank formed with a latch pivoting supporting portion and having an extension therebeyond with a hooked portion, and a pivoted hook closing latch secured to said latch supporting portion of the shank and adapted to provide a substantially straight line loop escape guide, the inner face of the extension and the inner face of the latch adjacent their points of intersection being spaced away from each other when the latch is closed so as to provide a relatively wide free yarn space between them adjacent their intersection.

3. A latch knitting needle comprising a shank formed with a latch pivoting supporting portion and having an extension with a hooked end, a pivoted hook closing latch secured to said latch supporting portion of the shank and adapted to provide a substantially straight line loop escape guide, one of the adjacent faces of the latch and the shank from or slightly below the point of intersection of the adjacent faces being concave so as to provide, when the latch is closed, a relatively wide free yarn space between them adjacent their intersection.

4. A latch knitting needle comprising a shank formed with a latch pivoting supporting portion and having an extension with a hooked end, a pivoted hook closing latch secured to said latch supporting portion of the shank and adapted to provide a substantially straight line loop escape guide, the inner face of the extension and the inner face of

the latch at and above their points of intersection being spaced away from each other when the latch is closed to provide a relatively long yarn eye having an enlarged base portion adjacent said point of intersection.

5. A latch knitting needle comprising a shank formed with a latch pivoting supporting portion and having an extension with a hooked end, a pivoted hook closing latch secured to said latch supporting portion of the shank and adapted to provide a substantially straight line loop escaping guide, the inner face of the latch from a point slightly below the point of intersection of the adjacent faces of the latch and shank to a point well above said intersection being concave, whereby a yarn eye is provided which has an enlarged base portion forming a relatively large free yarn space.

6. A latch knitting needle comprising a shank formed with a latch pivoting supporting portion and having an extension with a hooked end, a pivoted hook closing latch secured to said latch supporting portion of the shank and adapted to provide a substantially straight line loop escape guide, the inner face of the shank adjacent the intersection thereof in the inner face of the latch having a concavo-convex contour, and the inner face of the latch immediately above and below its point of intersection with the inner face of the shank being concave in contour, whereby when the latch is closed, a relatively wide free yarn space between the latch and shank is formed.

In testimony of which invention, I have hereunto set my hand, at Newark, Delaware, on this 17th day of March, 1925.

EDWARD C. KENNEDY.