



Patented May 17, 1927.

1,629,454

# UNITED STATES PATENT OFFICE.

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## LATCH KNITTING NEEDLE.

Application filed November 18, 1925. Serial No. 69,773.

My invention relates to latch needles employed in knitting machines, such needles, as usual, having a shank portion, a hooked yarn-engaging end, and a pivoted latch adapted at one extreme of its swinging movement to lie substantially parallel with its needle shank, and at the opposite extreme of its swinging movement to engage and close its yarn hook.

This type of needle is commonly formed from a thin strip of metal adapted to slidably fit in a narrow groove of the needle cylinder, and ordinarily has knitting movements imparted thereto by cam mechanism operating upon projecting needle butts; each longitudinal needle movement carrying a hook-engaged yarn or yarns through a previously formed loop, and the latter escaping over the hook by first swinging the latch to close the hook and then riding upon the inclined latch.

The shank of the needle as ordinarily known, is grooved edge-wise to form a jaw or latch-receiving chamber, in which the pivot end of the latch is engaged, and the terminally hooked shank extension naturally forms, in connection with the closed latch, a yarn-eyed needle end upon which the escaping loop may easily ride to pass over the closed hook, which free action is essential to satisfactory clearing of the loops; while the shape of the yarn-eye, as naturally and customarily formed by the closing of the latch, is triangular, with a crotch at the apex formed by the intersecting lines of the chambered shank and of the latch. I have found, particularly where a plurality of yarns are employed as for plaiting or reenforced knitting, that this crotch formation in the yarn-eye is responsible for frequent trouble and imperfections, because the closing latch acts against the chambered shank much like a shear blade to crowd and pinch and even cut the yarn or thread, particularly the plaiting yarn, which results in imperfections and roughened and frayed appearance in the finished fabric. By discovery of the cause, experimental shaping of the needles, and subsequent special manufacture of them, as hereinafter more fully set forth in connection with the accompanying drawings, I have found that this apparently slight and readily overlooked difficulty, though productive of really

harmful results, can be overcome with decided benefit both in economy of production and the quality of the knitted product.

Fig. 1 is a greatly enlarged side elevation of a straight latch needle embodying my invention, the proportionate length of the shank shown however being shorter than that commonly employed; dotted lines indicating the old triangular shape of the latch-closed yarn-eye.

Fig. 2 is a corresponding view of a bent or set-forward needle, with the latch in open position, but the closed position indicated in dotted lines.

Fig. 3 is a front edge view corresponding with Fig. 2 showing.

Fig. 4 is a partial view of the hooked end of a needle like that shown in Fig. 2, and indicating in dotted lines several positions and action of the latch upon the strands of yarn used, and also indicating in dotted lines the old form of shank extending into the reduced hooked end.

The showings in Figs. 1 and 2 are identical except for the position of the hook end, Fig. 1 being straight or regular, while Fig. 2 is bent or set forward as sometimes desired, and both show knitting needles having the ordinary groove-fitting shank *a*; provided with a cam-engaging butt *b* and a top yarn-engaging hook *c*; a freely swinging hook-closing latch *d* being mounted in an edgewise latch-pivoting jaw *e* in the shank and held therein by a pivot pin *i*.

In this known construction, as indicated in Fig. 1, and the dotted line position of the latch in Fig. 2, a closed yarn-eye *f* is formed between the hooked shank extensions *g* *c* and the inclined hook-closing latch *d*; the exterior lines of the extension *g* and latch *d*, above the pivoting jaw *e* of the shank, providing required easy and unobstructed guides for the clearance of a shank-engaged loop over the hook. In my improved construction I retain this desired exterior shape of the yarn-eye, but change the interior shape therefor to give more room for the yarn and avoid all danger of harmful action thereon by the closing latch, as will now be described.

Referring to Figs. 1 and 4, I have indicated by dotted lines *g'* the usual extension of the needle shank into the hooked end *c* as heretofore commonly made, such extension

sion having been thought necessary for strength, or being a customary construction process of long and unquestioned standing. This extension  $g'$  however, as clearly seen in Figs. 1 and 4, forms a harmful angular crotch  $f'$  between the pivoted latch  $d$  and the walls of the jaw  $e$ , the latter being necessarily extended in this old construction as indicated by dotted lines  $e'$ . And, as clearly seen in Fig. 3, such old formation with its crotch  $f'$  acts harmfully upon the yarn or threads  $m$ , especially where a plaiting thread  $n$  is employed, the closing of the latch crowding and pinching and even cutting the latter; such closing movement of the latch, as indicated, acting much like a shears blade against the walls of the jaw, and resulting in at least fraying, if not frequently severing, the yarn, thus causing annoying and time-consuming delays in knitting, and production of roughened and knotted fabric.

To overcome this harmful shearing action of the heretofore commonly formed needles, I have so shaped the shank extensions, above the pivot pins  $i$ , as to provide a set back portion  $h$  adjacent the latch pivoting jaw  $e$ , as shown, such set back portion leaving sufficient metal to adequately support the hook  $c$ , as proved by long tests. And such set back portion  $h$ , as indicated clearly in Fig. 4, forms a substantially parallel-sided yarn space at the base of the yarn-eye, and practically eliminates the crotch  $f'$  and consequently any shearing action by the closing latch  $d$ , the yarns  $m$  and  $n$ , as indicated having ample room in said enlarged base of the yarn-eye  $f$ , and being free from any pinching action by the latch even when in fully closed position against the hook  $c$ . Such freedom from injury to the yarn I have found highly desirable and it insures a noticeable improvement in production and the appearance of the finished fabric. This

improved shape of the interior of the yarn-eye is secured without change in the old and desirable outer shape thereof, so as to secure all the benefits of the latter in easy passing of loops over the closed hook.

It will be readily understood that the special shaping of the shank extension  $g$  required to provide the yarn-eye space  $h$  adjacent the pivot end of the closed latch, in connection with unobstructed exterior guides for the clearing loop, may be effected by swaging, dieing, or cutting operations as desired.

What I claim 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 substantially parallel-sided yarn space between them adjacent their intersections.

2. A latch knitting needle comprising a shank formed with a latch-pivoting jaw and having an 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 interiorly reduced to form an enlarged base portion to the yarn-eye formed by the latch-closed hook.

3. A latch needle having the inside of the back of the hook approximately in the same plane as the front of the cheek and a section between the two depressed below said plane.

In testimony whereof I affix my signature.

HARRY E. KATZENMOYER.