Nov. 13, 1962 K. KOHL 3,063,274

RASCHEL WARP KNITTING MACHINE WITH NOVEL LATCH NEEDLES

Filed Feb. 23, 1960 2 Sheets-Sheet 1

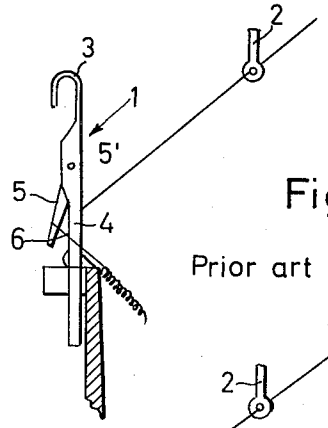


Fig.1.

Prior art

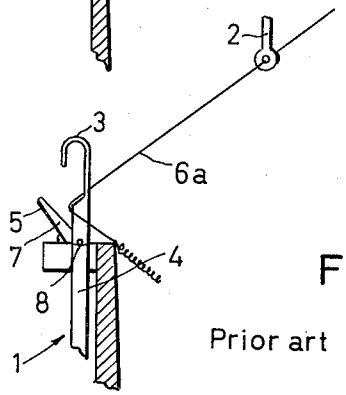


Fig.2.

Prior art

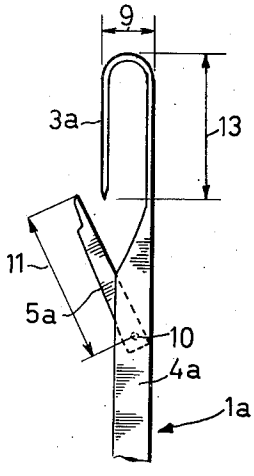


Fig.3.

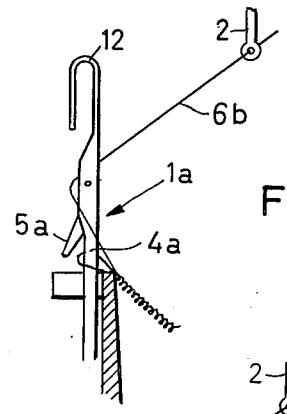


Fig.5.

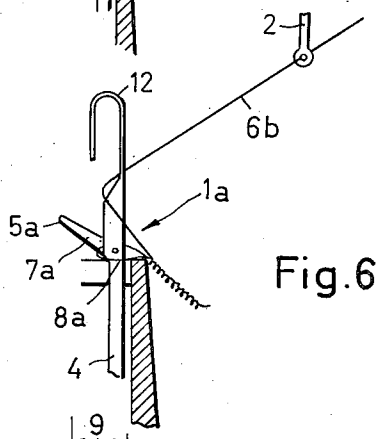


Fig.6.

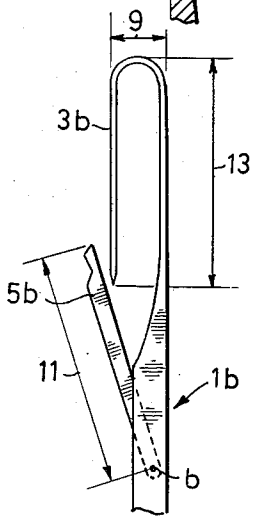


Fig.4.

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RASCHEL WARP KNITTING MACHINE WITH NOVEL LATCH NEEDLES

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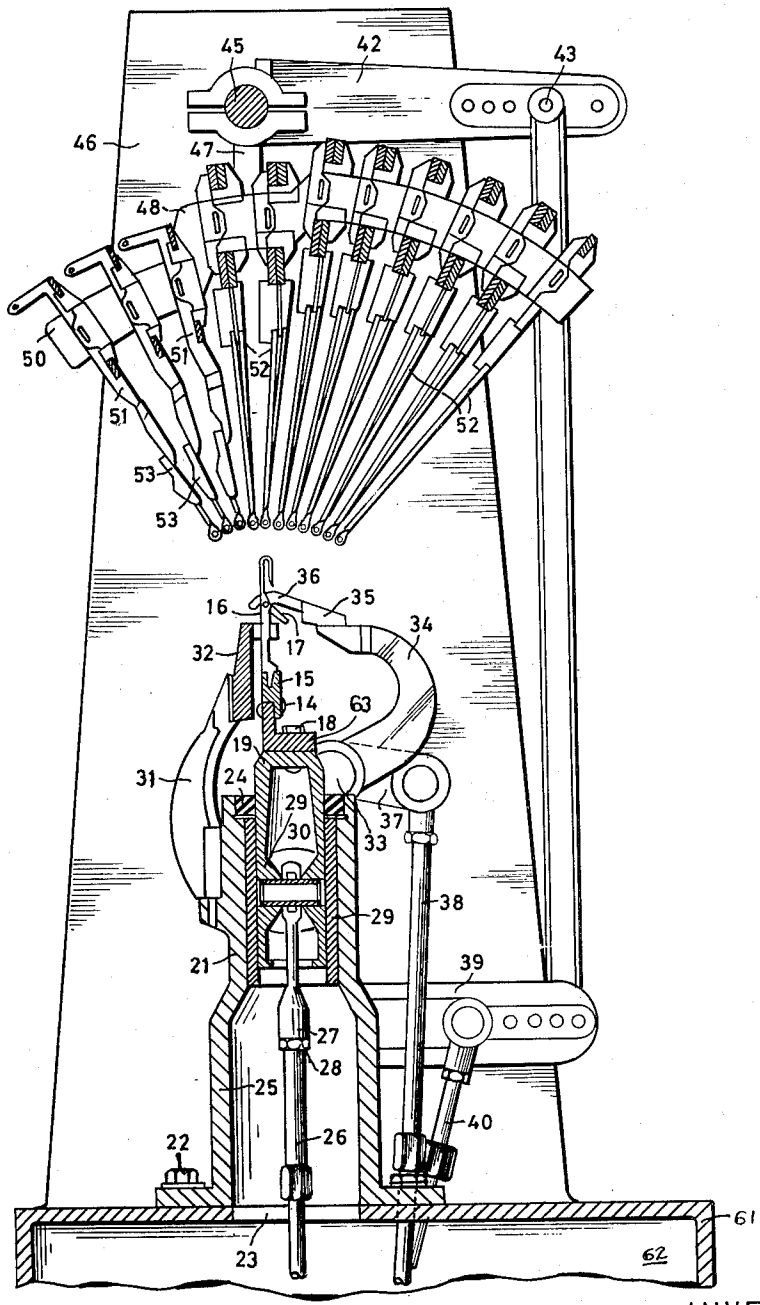


Fig. 7.

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RASCHEL WARP KNITTING MACHINE WITH NOVEL LATCH NEEDLES

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3 Claims. (Cl. 66—86)

The present invention relates to improvements in Raschel warp knitting machines and, more particularly, to a novel combination of latch needles not heretofore used in Raschel warp knitting machines.

This is a continuation-in-part of my application Serial No. 651,700, filed April 9, 1957, now abandoned.

In Raschel warp knitting machines, latch needles with a relatively long latch and a relatively short bill have been used. It has been found that such long latches, which are pivoted almost 180° by the knitting yarns during the knitting operation, are too heavy for very low denier yarns and that the yarns, therefore, often break, particularly in high-speed knitting machines. Therefore, an attempt has been made to decrease the size of the latches, which, however, leads to a correspondingly smaller yarn catch angle of the latch.

It is the principal object of the present invention to overcome these disadvantages of knitting needles used in Raschel warp knitting machines and to provide a latch needle of superior operating quality.

This object is accomplished by lengthening the bill in relation to the bight of the needle hook, the bill length being at least thrice the bight and not exceeding the latch length.

In one embodiment of the invention, the lengths of the bill and the latch of the needle are about equal and the length of the bill is about five to seven times the width of the hook.

The objects, features and advantages of the invention will be more fully described in the following detailed description of prior art Raschel machine knitting needles and certain preferred embodiments of the Raschel machine latch needle of this invention, taken in conjunction with the drawing wherein

FIGS. 1 and 2 show the structure and operation of latch needles in known Raschel machines;

FIGS. 3 and 4 illustrate two embodiments of a Raschel machine latch needle according to the invention;

FIGS. 5 and 6 show the operation of the latch needles of the invention as compared to the operation illustrated in FIGS. 1 and 2; and

FIG. 7 schematically illustrates a conventional Raschel warp knitting machine combined with latch needles according to the invention.

As shown in FIGS. 1 and 2, the yarns from the outermost guide bars run to the latch needle in a strongly inclined direction in Raschel warp knitting machines which have several guide bars to form the knitted design. The distance from the yarn guide **2** to the needle shank **4** of latch needle **1** is relatively short so that the yarn **6** frequently slides off the already opened latch **5** whereby knitting defects occur. The latch is pivoted at **5'** on the cheek of the needle and the needle hook is indicated at **3**.

As is further illustrated in FIG. 2, if the yarn **6***a* does not slide off the latch **5**, it does not move up from the bottom **7** of the latch fast enough because of the above-described oblique path of the yarn. Therefore, the latch **5** severs the yarn when it is closed by the previously formed loop **8**.

An additional disadvantage of this type of needle with a small hook is the fact that the end of the bill of the knitting needle comes into the range of the yarn guide

when an oblique pull is exerted on the needle whereby the bill is broken off by the yarn guide because of the relative motions of the needles.

FIG. 3 illustrates a latch needle used in a Raschel machine according to the invention to overcome all of the above disadvantages. As shown, the needle **1***a* consists of a shank **4***a* and a hook whose bill **3***a* has the length **13** and whose bight has the overall width **9**. Latch **5***a* is pivoted on the needle shank at **10** and has the length **11**. The length **13** of bill **3***a* is about thrice the bight **9** of the needle hook. The lengths **11** of the latch and **13** of the bill are about equal.

FIG. 4 illustrates a somewhat differently dimensioned knitting needle **1***b*, wherein the length **13** of the bill **3***b* is approximately five times the bight **9** of the needle hook. On the other hand, the length **11** of the latch **5***b* is about the same as the hook length **13**. The needle latch is pivoted on the needle shank at **10'**.

The length of the hook in relation to the bight and to the length of the latch may be widely varied as long as it is at least about three times its bight and does not exceed the length of the latch. Minor deviations from dimensions are possible if the needle still accomplishes the advantageous results of the present invention.

I have found the preferred length of the needle hook to be about seven times the bight of the hook and about equal to the length of the latch.

The operation of the needle **1***a*, as compared to needle **1** of FIG. 1, is exemplified in FIG. 5. As can be seen, the distance of upper end **12** of the needle from shank **4***a* below latch **5***a* is considerably increased so that the yarns **6***b* have a much less inclined path from needle **1***a* to yarn guide **2** than in case of the known short-hooked needles **1** used in Raschel machines with several needle bars. This will prevent the sliding off of the yarn from the opened latch and, furthermore, as shown in FIG. 6, the yarn **6***b* moves outside the range of bottom **7***a* of the latch so that it will not be cut by the latch as it is closed by loop **8***a*.

Also, the yarn guide **2** will no longer break off the hook of the latch needle **1***a* since the tip of the hook is positioned considerably lower than in known Raschel machine needles so that it is not contacted by the eye in the yarn guide **2**.

FIG. 7 is a schematic side elevation, partly in section, of a conventional Raschel warp knitting machine whose latch needles **16** have the above-mentioned dimensions, such as illustrated in FIGS. 3 and 4, for instance.

As is well known, a Raschel machine is supported on a housing **61** enclosing a chamber **62** holding the power source and motion transmitting means (not shown) for actuating the knitting operation in a conventional manner, many suitable actuating means being known and one such means being shown, for instance, in my copending application Serial No. 753,978, filed August 8, 1958, now Patent No. 3,008,314.

The needle bar **63** is bolted at **18** to cylinder **19** which is glidably reciprocable in cylinder **20**. Cylinder **20** is fixedly mounted in tubular support **21** which is bolted at **22** to housing **61**. A gasket **24** seals off the rims of cylinders **20** and **21**. Bolts **14** fix the needle bed **15** to the needle bar **63**, bed **15** carrying latch needles **16** with their latches **17**, these needles having the dimensions claimed herein.

As shown, the vertical guide cylinder **21** has a widened bottom portion **25** in registry with an opening **23** in housing **61** to permit a push rod **26**, actuated by the actuating means in housing **61**, to be connected to connecting rod **27** by means of a nut **28**. Connecting rod **27** engages the pin **30** which is fixedly held between the bearing flanges **29** extending inwardly from the piston cylinder **19**. In this manner, a vertical motion imparted to push rod **26**

will vertically reciprocate piston cylinder **19** and the latch needles **16** carried thereon.

Support **21** also carries an upwardly directed arm **31** which supports trick plate **32** at its upper end. The trick plate is stationary. Furthermore, the bearing **33**, which is mounted on support **21**, has pivotally journaled therein an arcuate arm **34** carrying the bar **35** with its latch detent webs **36**.

The arcuate arm **34** is actuated by means of lever **37** linked to push rod **38** which extends into the chamber of housing **61** and is actuated by the means therein in a manner well known per se and forming no part of the present invention, cam means being provided to coordinate the motions of the various knitting elements in the desired cycle.

The pivotal lever **39** is journaled to support **21** intermediate its ends, for instance at the widened portion **25**, and is actuated by the same cam means in chamber **62** according to the knitting cycle, push rod **40** being operably engaged by the cam means. As shown, the lever **39** has a row of holes to make it possible to adjust the pivot connection between connecting rod **41** and lever **39**, the pivot being demountably fixed in any of the holes in the lever. Connecting rod **41** is adjustably linked with its other end to lever **42**, this lever also having a series of holes for the demountable attachment of the connecting rod pivot **43** therein. In this manner, the linking of connecting rod **41** to levers **39** and **42** may be adjusted so as to shorten or lengthen the effective lengths of the levers.

The other end of lever **42** engages shaft **45** which is journaled in side walls **46** of the machine. The downwardly extending web **47** is fixed to shaft **45** and carries the arcuate member **50** having shoulders **48** and **49**. As is well known, the support member **50** carries the members **51** which are glidable in a direction perpendicular to the plane of the drawing and have the yarn guides **53** mounted thereon, as well as the yarn guides **52** for producing the knitted design.

The structure and operation of the illustrated Raschel machine is entirely conventional, except for the dimensions of the latch needles used therein, and requires, therefore, no further explanation.

The combination of latch needles of the indicated dimensions with a Raschel warp knitting machine makes it possible to have a relatively steep yarn path from the latch needles to the yarn guides while the latches are relatively short. In this manner, low denier yarns may be knitted at high speed since the steep yarn path prevents the yarn loops from gliding off the downwardly pivoted latches as well as from being clamped between the closing latch and the needle shank near the latch pivot when the latch needle is moved down again. Finally, it eliminates the danger of the latch needle bight being seized and torn off by the yarn guide because the free hook end of the latch needles remains always outside the range of the eye of the yarn guides.

I claim:

1. In a Raschel warp knitting machine, the combination of a plurality of yarn guides, a plurality of elongated latch needles, a respective yarn being guided from a respective one of said yarn guides to a respective one of said latch needles, means for reciprocating the yarn guides and latch needles in a longitudinal direction in relation to each other, and each needle consisting of a shank, a latch and a hook defining a plane, the latch being pivoted about an axis on the shank, the pivoting axis being perpendicular to said plane and the yarn pivoting the latch throughout an arc of more than 90° during reciprocation of the yarn guide and latch needle, and the hook having a bill whose length is at least three times the width of the hook, the extremity of the bill being shaped to permit the yarn freely to slide off the bill.

2. The combination of claim 1, wherein the length of the latch is at least as great as that of the straight bill.

3. The combination of claim 1, wherein the length of the bill is about five to seven times the width of the hook.

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