

June 11, 1963

R. R. MATTHEWS
FLAT BED WARP KNITTING MACHINE HAVING A PILE
FORMING AND CUTTING ATTACHMENT

3,092,985

Filed March 7, 1960

4 Sheets-Sheet 1

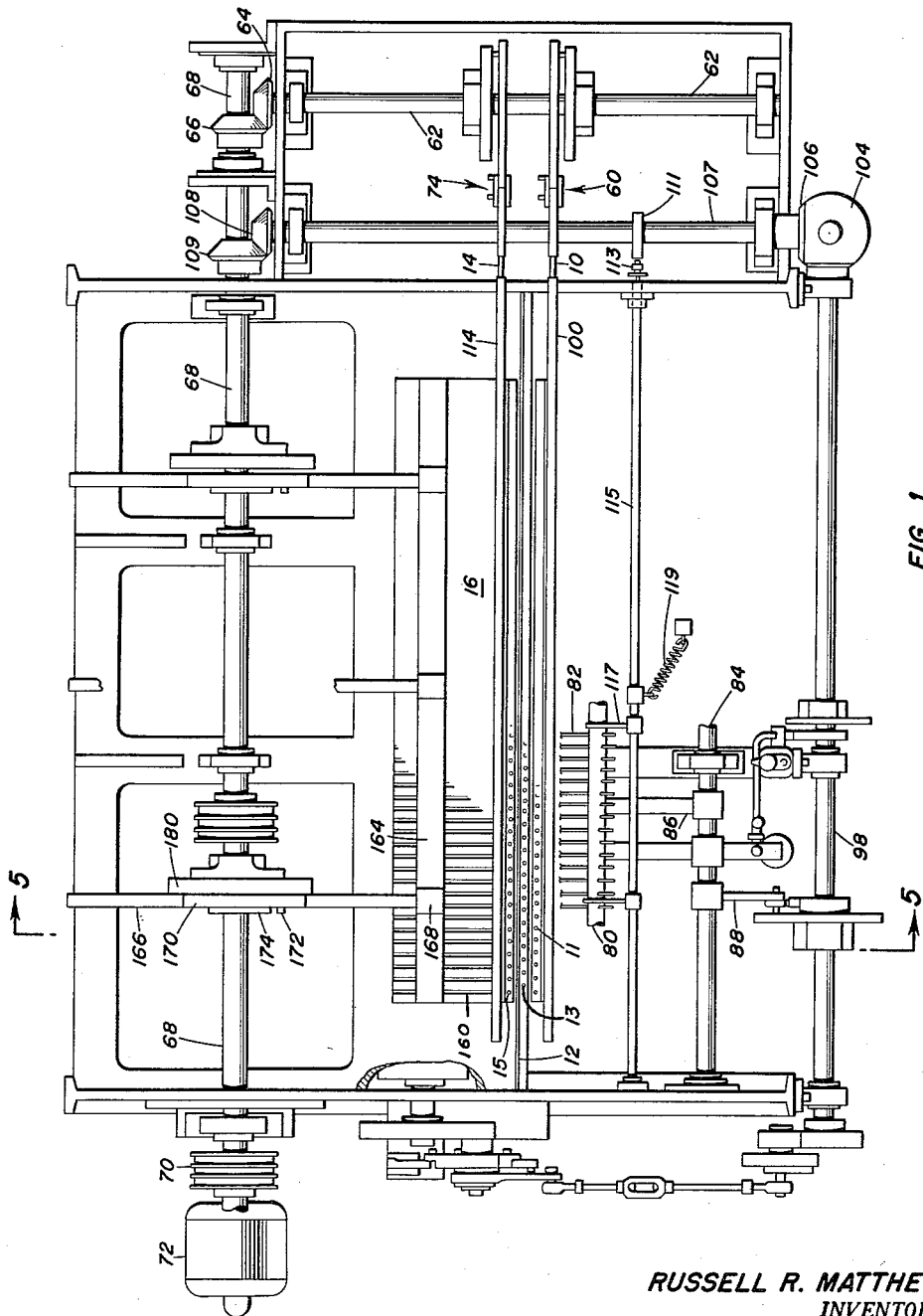


FIG. 1.

RUSSELL R. MATTHEWS
INVENTOR.

BY
Fred L. W. Hetspoon, Jr. &
Fred E. Shoemaker
ATTORNEYS

June 11, 1963

R. R. MATTHEWS
FLAT BED WARP KNITTING MACHINE HAVING A PILE
FORMING AND CUTTING ATTACHMENT

3,092,985

Filed March 7, 1960

4 Sheets-Sheet 2

FIG. 2.

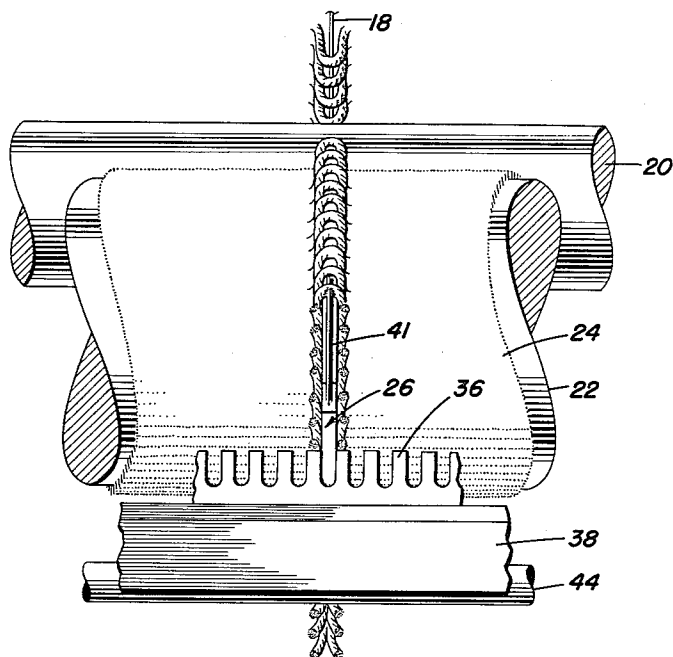
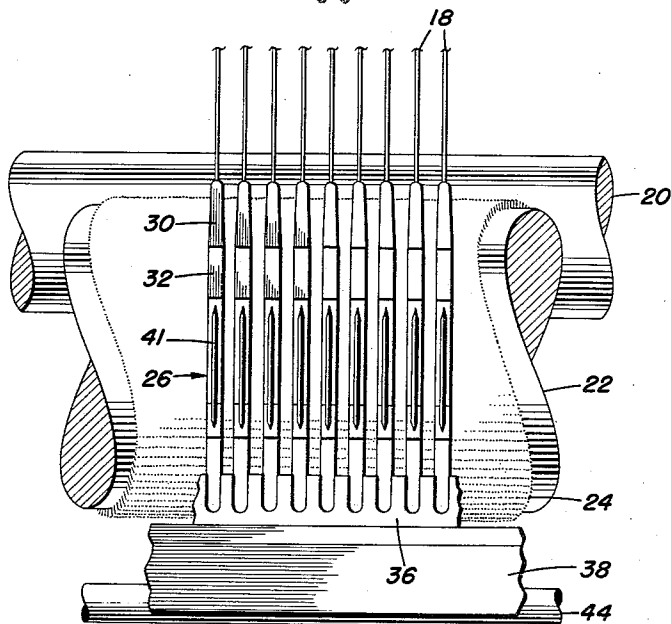


FIG. 3.



INVENTOR
RUSSELL R. MATTHEWS

BY *Leech and Radue*

ATTORNEYS

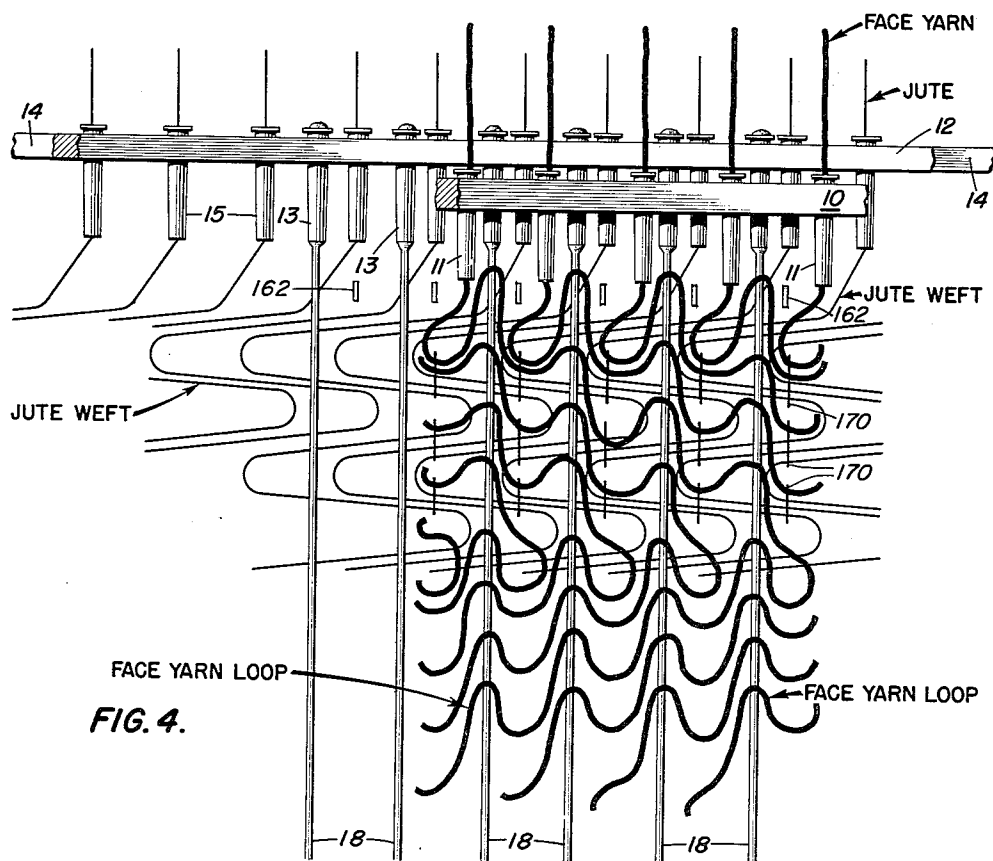
June 11, 1963

R. R. MATTHEWS
FLAT BED WARP KNITTING MACHINE HAVING A PILE
FORMING AND CUTTING ATTACHMENT

3,092,985

Filed March 7, 1960

4 Sheets-Sheet 3



INVENTOR
RUSSELL R. MATTHEWS

BY *Leach and Radue*
ATTORNEYS

June 11, 1963

R. R. MATTHEWS

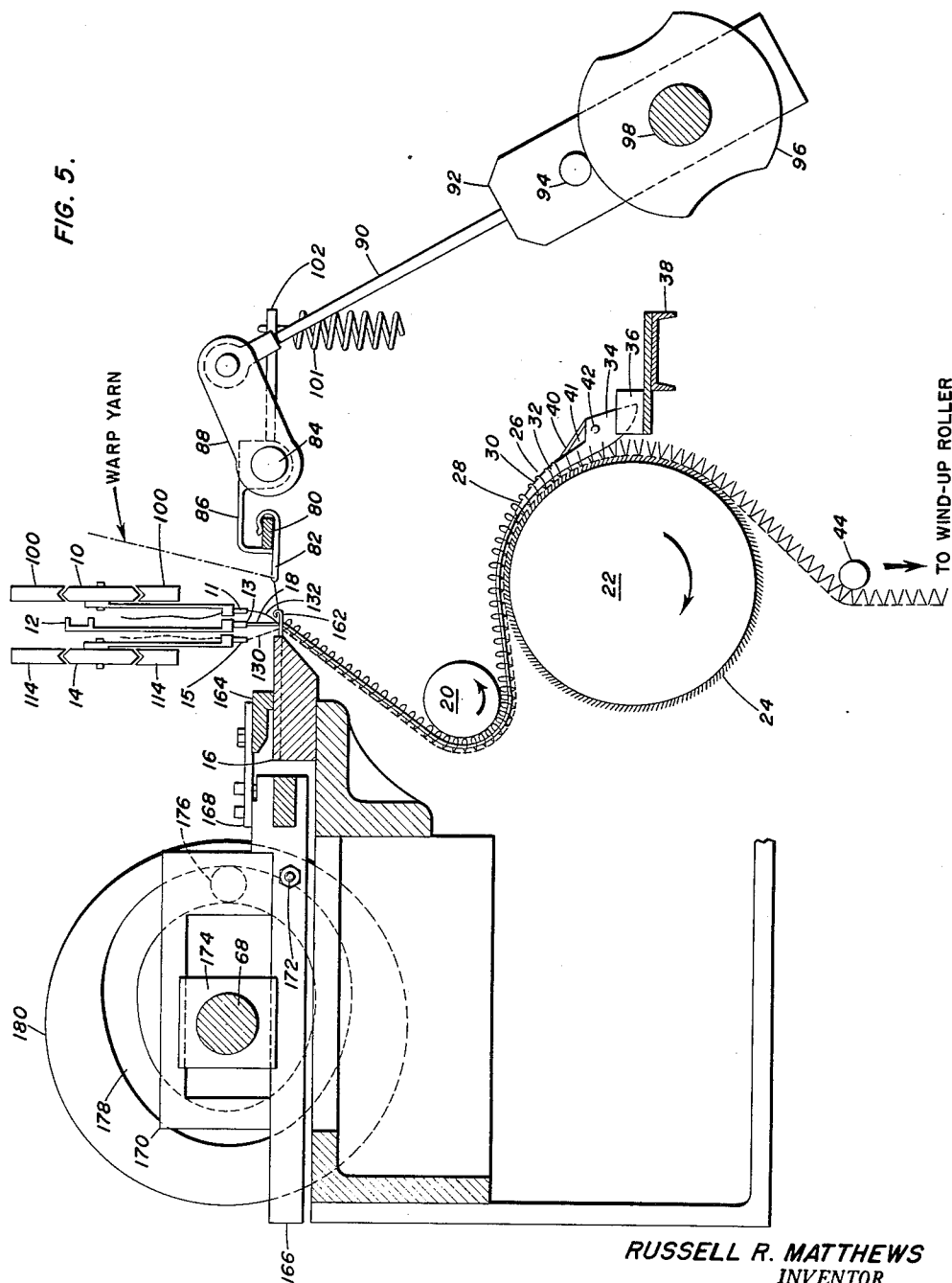
3,092,985

FLAT BED WARP KNITTING MACHINE HAVING A PILE
FORMING AND CUTTING ATTACHMENT

Filed March 7, 1960

4 Sheets-Sheet 4

FIG. 5.



RUSSELL R. MATTHEWS
INVENTOR.

BY

Fred L. Witherspoon, Jr. &
Fred E. Shoemaker

ATTORNEYS

1

3,092,985

FLAT BED WARP KNITTING MACHINE HAVING A PILE FORMING AND CUTTING ATTACH- MENT

Russell R. Matthews, Cornwall, N.Y., assignor, by mesne
assignments, to Mohasco Industries, Inc., Amsterdam,
N.Y., a corporation of New York

Filed Mar. 7, 1960, Ser. No. 13,389

6 Claims. (Cl. 66—84)

The present invention pertains to the manufacture of pile fabrics on a flat bed knitting machine provided with a cutting attachment adapted to produce a knitted pile fabric having a cut pile.

Flat bed or warp type-knitting machines such as embodied in this invention are well adapted to the making of carpet or rug fabrics that simulate a Velvet or Wilton carpet with much greater speed and corresponding economy that cannot be achieved in the ordinary weaving of Velvet or Wilton carpets.

The novel knitting machine and cutting attachment combination of this invention is especially designed for, but not limited to, flat warp knitting of single face and single back construction exemplified by J. R. Little, Jr., et al. Patent 2,476,153; W. A. Rice Patent 2,531,718; and G. E. Herrnsstadt Patent 2,718,132. The fabrics shown in each of said patents have loop tufts, although that to G. E. Herrnsstadt also includes cut pile tufts.

It is, therefore, an object of this invention to provide a pile forming and cutting attachment for a flat bed knitting machine that is capable of producing cut pile tufts without reduction in the ordinary operating speed of such machines.

Another object of this invention resides in the production of an attachment for knitting machines making loop pile fabrics, which may readily be installed on such machines so as to cut the loops and form them into V- or U-shaped tufts.

A further important object of the invention is achieved by the use of attachment adapted to form loop piles and to cut the pile or to remain passive and permit the loops to slide above it without disturbance.

One of the more specific purposes of the present invention is to provide a cutting attachment for knitting machines used in the production of broadloom type soft surface floor covering of such character as to enable the users of machines of this type to make a product that imitates Velvet type carpeting.

A still further object of the invention is achieved by the provision of cutting attachments adaptable to a warp type knitting machine upon which they may be rigidly secured in such a manner as to avoid disturbing the fabric in any way other than cutting the pile.

Another specific object of the invention is to be found in the provision of cutting devices having cutting members or elements that are readily accessible and easily replaceable upon becoming dull.

An additional and specific purpose of this invention is to supply a pile loop cutting attachment that is capable of severing heavy pile yarns.

These and other objects of the invention will be more fully understood from the following detailed description of a preferred embodiment, taken in conjunction with the accompanying drawings, wherein:

FIGURE 1 is a plan view showing a flat bed type knitting machine modified in accordance with this invention;

FIGURE 2 is a partial front elevational view of the knitting machine of FIGURE 1 showing a row of face yarn pile elements as they are cut;

FIGURE 3 is a partial front elevational view of FIG-

2

URE 1 illustrating the position and relative arrangement of a plurality of adjacent pile loop guiding means and the corresponding cutting blades and blade holders with which they are associated;

FIGURE 4 is an elevational diagrammatic view showing the relative positions of the pile yarn feeding tubes, the juté feeding tubes, the wire tube holders and the wire guides depending therefrom and the needles, together with a diagrammatic representation of the fabric produced thereby; and

FIGURE 5 is a semi-diagrammatic and partially sectioned elevational view taken along line 5—5 of FIGURE 1 showing the novel pile forming and cutting attachment of this invention, and its relation to the modified knitting machine.

Referring to FIGURES 1 and 5, face yarn guide bar 10 carries downwardly extending face yarn guide tubes 11 which are uniformly spaced lengthwise thereof. Stationary wire support bar 12 extends in parallel relation to face yarn guide bar 10 and is spaced rearwardly thereof to support downwardly extending wire holding tubes 13 arranged in spaced and parallel relation along the length thereof. Backing yarn guide bar 14 carries a plurality of downwardly extending backing yarn guide tubes 15 disposed in spaced parallel relation lengthwise thereof. The backing yarn guide bar 14 is positioned rearwardly of the wire holding tubes 13 adjacent the nose of needle bed 16.

The face yarn guide bar 10 is slidably carried in upper and lower channels 100 for reciprocation laterally of the machine bed. Channels 114 serve to similarly support backing yarn guide bar 14.

Face yarn guide bar 10 with its guide tubes 11 is reciprocated in channels 100 by cam means 60 actuated by shaft 62 which in turn derives its power through bevel gears 64 and 66 and shaft 68 rotated by pulley 70 which is belt-connected to motor 72. Backing yarn guide bar 14 with its guide tubes 15 is likewise reciprocated in its channels 114 by cam means 74 actuated by shaft 62.

Warp yarn guide carrier 80 has a plurality of guides 82 secured thereto in spaced parallel relation lengthwise thereof. The guides 82 face and are spaced from the nose of needle bed 16. The carrier 80 is oscillatably mounted on shaft 84 by means of bracket 86. For oscillation of the carrier 80 about shaft 84, arm 88 is secured to said shaft and its outer end is fastened to rod 90 whose other end is secured to plate 92 carrying cam pin 94 actuated by cam 96 secured to rotating shaft 98. Spring 101 is fastened to the machine frame at one end and to bracket 102 at the other. This bracket is mounted on and secured to the shaft 84 and thus serves to exert a positive pressure on rod 90 thus causing pin 94 to always engage cam 96. Rotation of cam 96 produces oscillation of shaft 84 thereby causing warp yarn guides to oscillate vertically about shaft 84. Shaft 98 receives rotational power through bevel gears 104 and 106, shaft 107, and bevel gear 108 engaging bevel gear 109 on shaft 68.

Lateral reciprocation of warp guide carrier 80 is accomplished through cam 111 on shaft 107, said cam engaging cam follower 113 on the end of shaft 115. This shaft mounts brackets 117 which are secured to the warp yarn guide bar 80. Return spring 119 is fastened to the shaft 115 and to a suitable part of the machine bed to cause the cam follower 113 to always engage cam 111. The amount of reciprocation produced by the arrangement is of small magnitude, in this instance being approximately .200 of an inch.

The needle bed 16 has a plurality of spaced parallel needle guides 160 formed therein with latch needles 162 reciprocally carried therein. The needles 162 are reciprocated in their guides 160 by a return pull 164 secured across the needle bed in engagement with the needles.

This return pull 164 is secured to needle driver member 166 by means of bracket 168. Needle driver member 166 is connected to slide bar 170 by connecting pin 172 and is slidably carried by bearing block 174 mounted on shaft 68. Slide bar 170 carries cam follower 176 which rides in groove 178 in cam 180 secured to shaft 68. Rotation of cam 180 through this linkage serves to reciprocate the needles 162.

While the making of pile fabrics on knitting machinery of the flat bed type has been practiced for a number of years, considerable improvement of such machinery has been required in order to attain a high rate of speed and produce a satisfactory product.

Each wire holding tube 13 has a guide wire 18 firmly secured thereto and extending from the lower end thereof rearwardly of the knitting machine and over an idler roller 20, leaving the underside thereof to pass over a substantially larger main take-up roller 22 in a special manner that will be described in more detail. It is to be noted at this point that the take-up roller 22 is covered with a friction surface of card cloth 24, or the like, in order positively to advance the pile fabric made on the knitting machine clockwise around said roller for purposes of cutting.

Lengths of jute weft backing 130 are continuously supplied through the tubes 15 as indicated in FIG. 5. Similarly face yarn 132 is fed from the yarn tubes 11, formed into pile loops in the "loop forming area," and passed over the loop guide wires 18 as a knitted pile fabric as shown in FIG. 5.

At the top arcuate portion of the take-up roller 22 each guide wire 18 has its end firmly secured in smooth union to the top edge of the adjacent end of a narrow pile loop guide 26 having the shape of an arcuately curved blade with its inner edge in substantially concentric and spaced relation to a major top arcuate portion of the roller 22. By this means the pile fabric loops pass down the guide wires 18 to the idler roller 20 and the jute backing into which said loops are knitted, pass over the main take-up roller 22 as a fabric having the backing engaged by the card cloth surface 24 of said roller, and the loops are received on the leading end portion 28 of the guide 26 that is of substantially uniform vertical height.

In order to form the knitted loops to a substantially uniform loop height, the guide blade 26 is formed to provide an intermediate ramp portion 30 increasing in vertical height in a direction away from the end portion 28. The ramp portion 30 is followed by a gathering portion 32 of substantially uniform height. Each blade shaped guide 26 is formed with an enlarged rear end 34 that is deeper or wider than any other portion thereof for firm mounting in a holder 36 of bar shape extending in parallelism to the axis of the main take-up roller 22 and carried by a channel support assembly 38. This rear end portion 34 also extends away from the roller 22, as shown in FIG. 5, so as to provide a substantial free space for a purpose to be described.

The outer edge periphery of the guide 26 is provided with a cutting edge 40 extending as a ramp from an advanced part of the loop height forming area of the blade gathering portion 32. This knife edge 40 may be an integral part of the loop guide member 26 or, as shown in the preferred embodiment of FIG. 5, it may comprise a detachable blade 41 that can readily be removed for sharpening or replacement. The inner end of the blade 41 is inset in a peripheral groove or notch of the guide 26 and retained therein by the action of a screw or rivet 42 passing through the enlarged end 34 in the corresponding end portion of said blade 41.

A small guide roller 44 spaced below the main take-up roller 22 and arranged in substantial vertical alignment therewith engages the pile surface of the pile fabric, the initially formed loops of which have been cut by being drawn progressively up the ramp-like cutting edge 40 of

the blade 41. The positive driving force applied to the backing side of the knitted pile fabric by the friction surface 24 of the roller 22 is such as to insure cutting of the loops upon passage over the inclined cutting edge 40. As soon as the pile loops have been cut, the backing side of the pile fabric which has been lifted away from the friction surface 24 of the main roller 22, will drop back toward it and be led over the guide roller 44 to a constantly driven wind-up roller that is indicated by an arrow, but not shown.

The operations of loop guiding, gathering, and cutting are illustrated more specifically in FIGS. 2 and 3 showing a partial front elevation of the basic components which are involved. Previously formed loop pile move downwardly over the parallel guide wires 18 and after passing over the idler roller 20 are carried to the main take-up roller 22 in a backing lowermost and loops uppermost relation. Upon leaving the corresponding ends of the guide wires 18, the parallel rows of loops are received on and pass over the respective blade shaped guides 28, ramp portion 30, height forming area portion 32 and, with a draw cutting action, over the blades 41 supported by the knife holder 36 on the channel support member 38.

The operative relation of the cut pile guide roller 44 to the roller 22 and blade shaped guides 26 is illustrated further in FIG. 4 which shows its application to a particular knitted pile fabric that may be produced on a flat bed knitting machine. This fabric comprises a flatly knitted base formed by a plurality of wefts extending individually back and forth laterally over a plurality of chain stitch warps in successive courses, and having superimposed pile face yarns formed as raised tufts between adjacent chain stitch warps as disclosed in U.S. Patent No. 2,718,132 to G. E. Herrstadt. In the illustrative figure, the fabric is shown as it would be seen if viewed from the right side of FIG. 5. A guide wire 18 is provided for each vertical row of face yarn loops, jute weft material is fed through the backing yarn tubes 15 and the face yarn is fed from guide tubes 11. Needles 162, indicated diagrammatically, are positioned between adjacent guide wires 18 to form chain stitches, indicated diagrammatically by lines 170, using warp fed from warp yarn guides 82 shown in FIG. 5.

As illustrated in FIG. 4, the fabric is made by reciprocating backing weft guide bar 14 so that the guide tubes 15 pass behind a plurality of guide wires 18 to form the fabric backing. The face yarn guide bar 13 reciprocates to feed face yarn over guide wires 18 and then the needles 162 are pushed outwardly from the needle bed and the warp guide 82 loops the warp around the needle after which the needle moves back toward the needle bed to form a chain stitch 170 which gathers in and grips the backing weft and pulls the face yarn down over the guide wires 18 to form loop piles. The manner in which the pile loops are passed in rows over the blade shaped guides 26, and cut by drawing over the knife edges 40 of the respective blades 41 will also be understood from the previous detailed description of the treatment of the knitted pile fabric shown semi-diagrammatically in FIG. 5 and pictorially in FIG. 3.

While it has been found possible to catch the pile loops without using the guide wires 18, the use of such wires is a practical necessity because otherwise too many irregularities would occur in a carpet of substantial width. It will be understood that the thickness or diameter of the guide wires will depend on the number of needles used per inch.

In attaining the objectives of this invention as previously set forth there has been provided in a flat bed knitting machine a pile fabric cutting attachment of simplicity and rugged dependability that makes it possible to manufacture knitted pile fabrics having cut piles on a machine that would otherwise be limited to the production of pile fabrics having a loop pile surface. At the same time, the higher production speed achievable with flat bed

knitting machines offers a major economic advantage as over ordinary weaving of Velvet or Wilton practice.

Another important advantage resulting from this invention is that of making available a pile fabric cutting attachment that may be readily utilized with the flat bed knitting machines in present use.

Further, the novel attachment herein disclosed may be used without the loop pile cutting elements so that the guide wires will carry the knitted pile fabric and its backing with the loops sliding along said guide wires so as to maintain said loops in undisturbed condition.

From the foregoing detailed description of a preferred embodiment of this invention and the manner in which it is to be used it will be apparent to those skilled in this art that various changes and modifications can be made in the construction and arrangement of parts without departing from the inventive principles and the scope of the appended claims.

This application is a continuation-in-part of my application entitled "Flat Bed Warp Knitting Machine Having Pile Fabric Cutting Attachment," Serial No. 581,600, filed April 30, 1956, now abandoned.

I claim:

1. A loop pile cutting attachment for a flat bed warp knitting machine having a guide bar supporting a plurality of parallel pile loop guide wires extending from fixed positions adjacent the outer edge portion of the needle bed; a holder bar extending in spaced parallel relation below the guide bar; and a plurality of parallel, pile loop guiding and cutting members having their adjacent inner ends anchored to the holder bar and their adjacent outer end portions secured to the free ends of respective loop guide wires, the length of each pile loop guide wire being such that a plurality of courses of knitted pile fabric will be spaced thereover whereby the loop cutting lags behind the loop forming by a plurality of courses.

2. A loop pile cutting attachment for a flat bed warp knitting machine having a guide bar supporting a plurality of parallel pile loop guide wires extending from fixed positions adjacent the outer edge portion of the needle bed; a knife holder bar extending in spaced parallel relation below the guide bar; a plurality of parallel, pile loop cutting blades having their adjacent inner ends anchored to the knife holder bar and their adjacent outer end portions secured to the free ends of respective loop guide wires the length of each pile loop guide wire being such that a plurality of courses of knitted pile fabric will be spaced thereover whereby the loop cutting lags behind the loop forming by a plurality of courses, the outer end portion of each of said loop cutting blades being of uniform height and having a ramp portion and a loop forming portion of constant height extending thereafter, and the inner end portion of each loop cutting blade having an outwardly sloped cutting edge on its outer periphery for cutting pile loops passing thereover.

3. A loop pile cutting attachment for a flat bed warp knitting machine for making pile fabrics and having pile loop forming elements and a main fabric take-up roller: a plurality of guide wires for forming pile loops, said guide wires being adapted for location above the backing wefts of the pile fabric and below the pile loops formed between two adjacent warp lines, said guide wires extending in parallel relation from fixed points of origin towards the main take-up roller; a guide blade attached to each of said guide wires, said guide blades having an inner circumference corresponding substantially to the outer circumference of the main take-up roller, and the outer part of said blade guide increasing progressively in height

beyond the point of guide wire attachment to form the guided loops to required height; a cutting blade forming an extension of each of the blade loop guides; and means maintaining the cutting blades in spaced parallel relation the distance between the origin of the guide wire and the cutting blades being such that there is a lag of a plurality of courses between the loop forming and loop cutting.

4. A loop pile cutting attachment for a flat bed warp knitting machine adapted to make loop pile fabrics, the combination comprising: an idler roller; a fabric take-up roller; a plurality of arcuate loop guide blades extending concentrically around a portion of the take-up roller in spaced relation thereto and parallel to each other; means adjacent the take-up roller fixedly supporting one end portion of the loop guide blades, each loop guide blade being provided with a cutting edge extending rampwise and outwardly as a continuation of the outer edge surface of the loop guide blade adjacent the fixed end portion and a pile loop guide wire secured at the free end of each guide blade, said wires extending under the idler roller and upwardly to the machine bed where they are held in fixed parallel relation to each other the length of each pile loop guide wire being such that a plurality of courses of knitted pile fabric will be spaced thereover whereby the loop cutting lags behind the loop forming by a plurality of courses.

5. The combination of claim 4 in which the cutting edge of each loop guide blade is a detachably mounted knife blade.

6. In a flat bed warp knitting machine for making pile fabrics and having a needle bed, the combination comprising: an idler roller mounted in parallel relation beneath the needle bed; a fabric take-up roller extending in spaced parallel relation to the idler roller and arranged to engage the outer side of fabric leaving the idler roller; a first guide bar for face yarn tubes, a second guide bar for backing yarn tubes, and a third guide bar for wire holding tubes, said guide bars being arranged in spaced parallel relation with the backing yarn guide bar adjacent the working edge portion of the needle bed and the wire guide bar being intermediate the other two guide bars; a plurality of guide wire holding tubes on the guide bar; a guide wire extending from each guide wire tube under the idler roller and over the take-up roller; an elongated support member extending in spaced parallel relation to the axis of the take-up roller on the side opposite the idler roller; a plurality of arcuate-like loop guide and loop cutting members each having one end anchored to the elongated support member and the other end extending in spaced relation over the take-up roller and having an end of a guide wire secured to the extending end portion of the outer periphery as a continuation thereof, said loop guide and loop cutting members being of progressively increasing height toward and adjacent the elongated support member to form pile loops of predetermined height, and each of said loop guide and loop cutting members being provided with a cutting edge as a continuation of the said portion of increasing height the length of each pile loop guide wire being such that a plurality of courses of knitted pile fabric will be spaced thereover whereby the loop cutting lags behind the loop forming by a plurality of courses.

References Cited in the file of this patent

UNITED STATES PATENTS

484,844	Buhlmann	Oct. 25, 1892
2,057,615	Hall	Oct. 13, 1936