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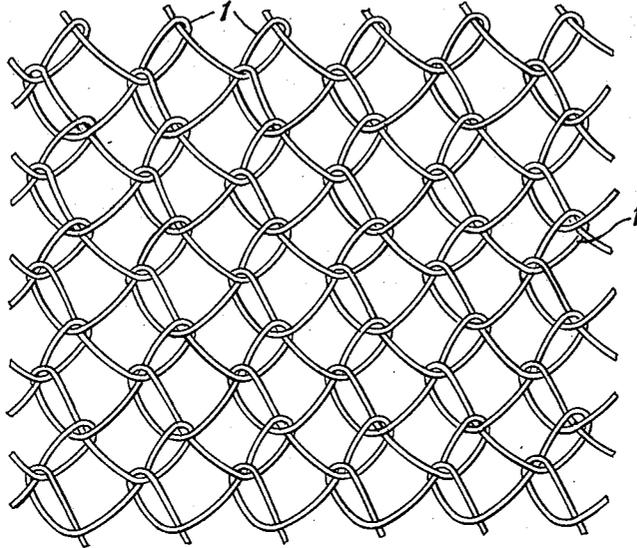
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METHOD OF AND MEANS FOR MAKING FABRIC WITH A PILE SURFACE

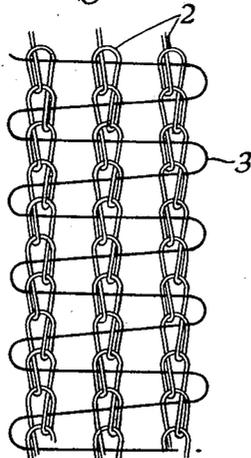
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*Fig. 1.*



*Fig. 2.*



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Fig. 3.

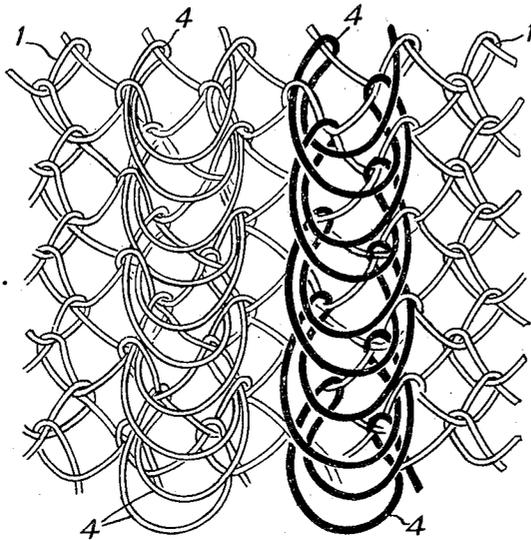


Fig. 5.

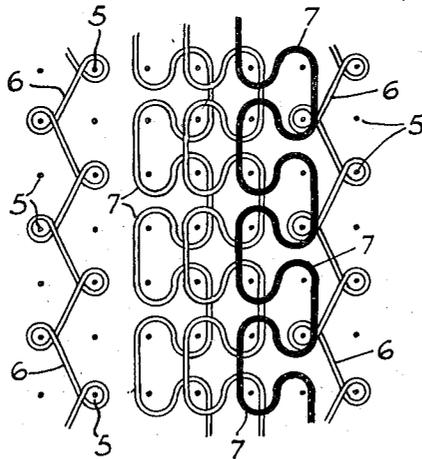
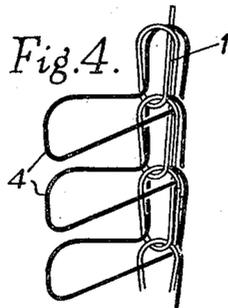


Fig. 4.



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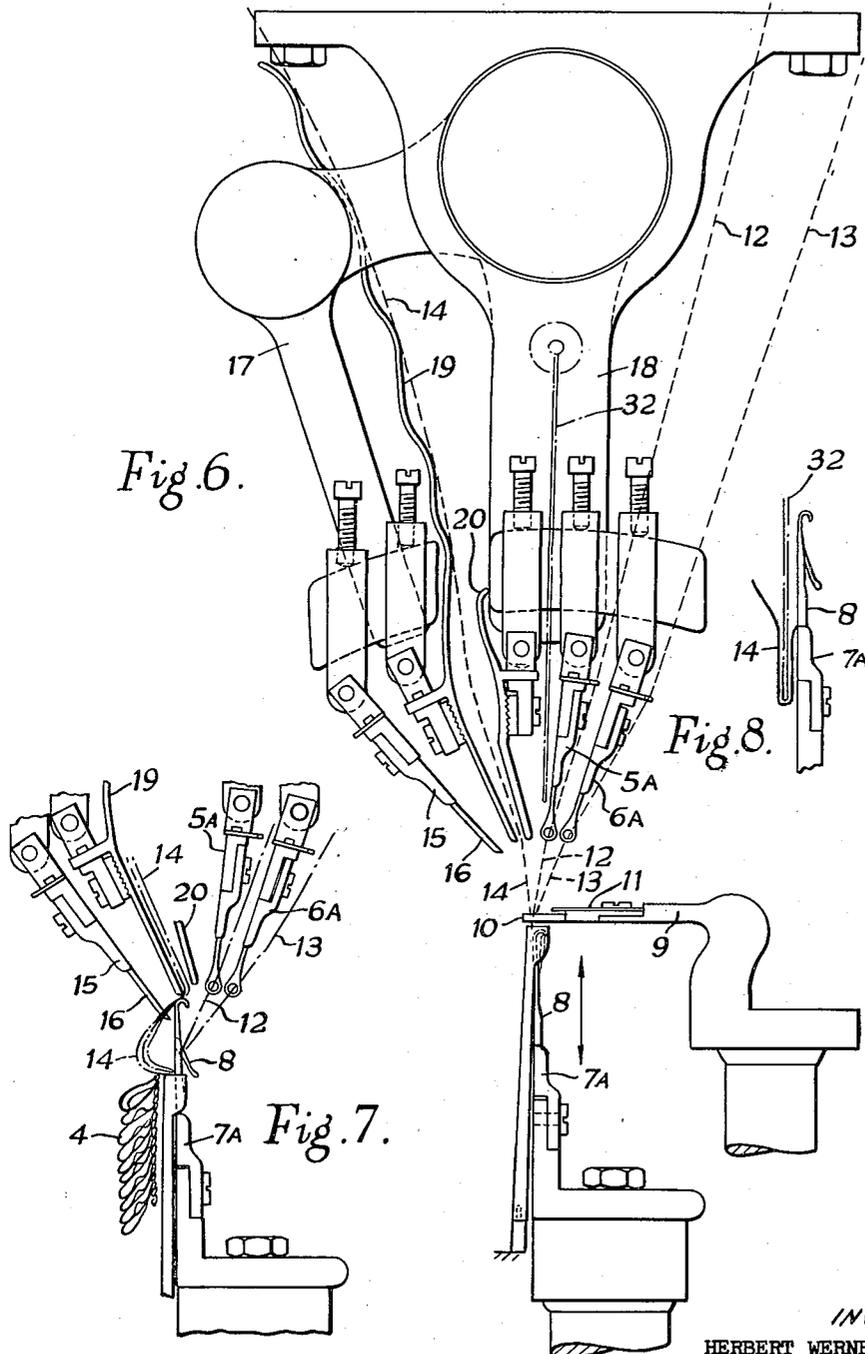


Fig. 6.

Fig. 8.

Fig. 7.

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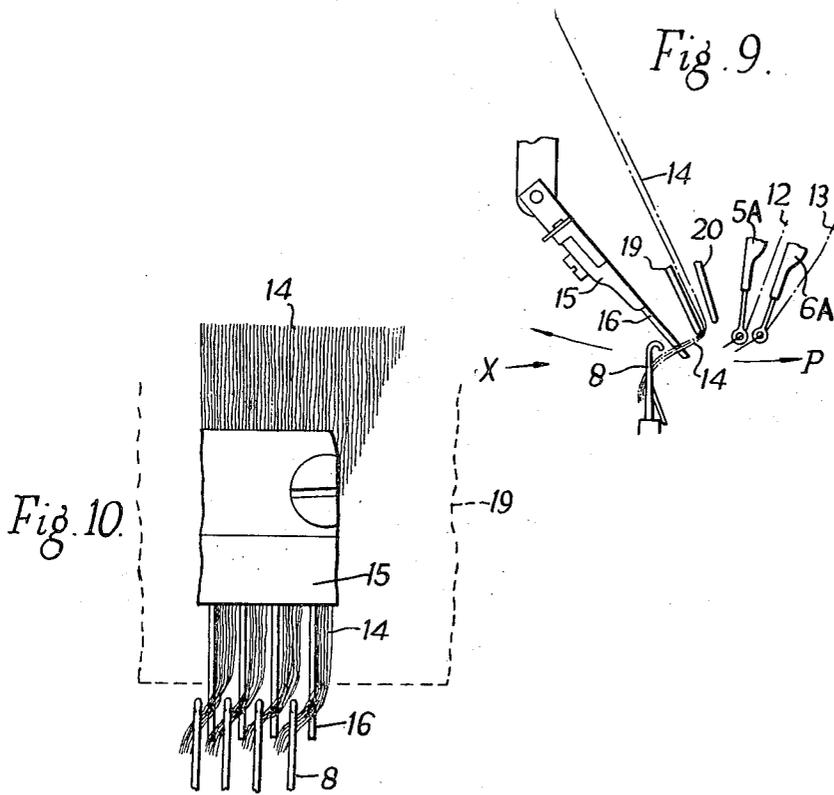
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4 Sheets-Sheet 4



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2,993,353

**METHOD OF AND MEANS FOR MAKING FABRIC WITH A PILE SURFACE**

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4 Claims. (Cl. 66-84)

This invention relates to the manufacture of fabric with plush, pile, fleecy and fur-like effects, hereinafter referred for brevity as a pile surface.

The object of the invention is to provide a new method and means for producing fabric with a warp pile surface on a knitting machine or knitting loom.

The method according to the invention involves the feeding of a staple fibrous web to the needles of a knitting machine in conjunction with ground threads so that the fibrous web becomes interknitted with the ground threads thereby producing a knitted fabric comprising pile surface of fibrous web and a backing of conventional stitch formation.

In carrying the invention into practical effect in a warp knitting machine equipped either with bearded needles, or with latch needles, e.g. a warp knitting machine of the Raschel type, there are provided a web feeder and a series of web engaging elements so arranged as to be adapted for operation in conjunction with the needles and in conjunction with the means for supplying ground threads to the needles so as to cause the web to be formed into loops conjointly with formation of loops of the ground threads, whereby the web loops and the ground loops are interknitted and the web thus becomes incorporated in the ground fabric.

Thus, in warp knitting machine, the web engaging elements are employed in combination with the thread guides whereby the web and the warp threads are lapped onto the needles so that the web loops are interknitted with the warp loops and there is thus formed a fabric comprising a pile surface of fibrous web, and a backing of warp knitted fabric. For example a series of elements for engagement with the fibrous web are arranged for swinging and endwise movement so as to thrust the web between the needles and lap the same on the needles so that the web loops are taken by the needle hooks. Below these elements is a horizontally movable bar with holding down elements adapted to engage the fabric as the needles rise to receive the web and the ground threads which are supplied and lapped round the needles by guides in a guide bar or bars in the conventional manner in a warp knitting machine. The length of the web loops and consequently the length of the pile in the finished fabric may be determined by the amount of movement imparted to the web engaging elements. If desired, however, there may be provided between the web feeding means and the thread guides means so constructed and operable in timed relation with the operation of the needles as to be adapted to act upon the web, suchwise as to increase the feed thereby lengthening the web loops and consequently producing a longer pile in the fabric.

In further describing the invention, reference will be made to the accompanying drawings, wherein

FIGURES 1 and 2 show fragmentary portions of ground fabrics before incorporation of the fibrous web,

FIGURE 3 is a face view, and

FIGURE 4 is a sectional side view of a fragmentary portion of fabric with the fibrous web incorporated in the ground fabric,

FIGURE 5 is a diagrammatic representation of the portion of fabric shown in FIGURE 3,

FIGURE 6 is a side elevation of one example of mechanism for producing the fabric,

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FIGURE 7 is a side elevation of the essential parts of the said mechanism in another position,

FIGURE 8 shows a needle and a member for determining the length of the pile,

FIGURE 9 shows the essential parts of the mechanism in a position in which the web engaging elements have crossed the series of needles, and

FIGURE 10 is a fragmentary elevation on an enlarged scale of the mechanism as viewed in the direction of the arrow in FIGURE 9, and represents, diagrammatically, the lapping of the web on the needles.

Referring to the drawings, FIGURE 1 shows a portion of a simple close warp knitted fabric with plain warp stitches 1.

FIGURE 2 shows a portion of a ground fabric composed simply of warp chains 2 and laid-in threads, only one of which 3 is shown; interlooped with the warp chains. These portions of fabric are shown simply for the purpose of illustrating examples of a variety of conventional close and open warp knitted fabrics which may constitute ground fabrics.

Referring to FIGURES 3 and 4, these show a portion of a complete fabric which comprises a ground fabric with the plain warp stitches 1 and incorporated elongated loops 4 of fibrous web.

The formation of this fabric is represented in FIGURE 5, which shows diagrammatically needles 5 lapped with ground threads 6 to form a plain warp, and the lapping of regular strands of the staples of the fibrous web 7 on the needles so that the said strands become interknitted with the ground threads to form a regular looped pile surface as shown in FIGURES 3 and 4. In the production of the fabric, the fibrous material is fed to the needles of the knitting machine, for example, the latch needles of a warp knitting machine of the Raschel type, in the form of a continuous film or sliver, which is produced by combing the staple fibres.

Referring to FIGURES 6 and 7, which show an illustrative example of a mechanism applied to a warp knitting machine of the Raschel type, the thread guide bar 5A is employed to produce the ground fabric shown in FIGURE 1, and the guide bars 5A, 6A are employed to produce the ground fabric shown in FIGURE 2. 7A is the needle bar carrying latch needles 8, and 9 is the bar carrying conventional holding down elements 10 and a conventional latch opener 11 which serves to open any latches which may flick up when released by previously formed stitches which are under tension. 12 represents the threads from which the warp stitches 1 are formed, 13 represents the threads interlooped with the stitches 2, and 14 represents the fibrous web. In FIGURE 6 the mechanism is shown in the initial or basic position with the needles in a low position, and with the holding down elements and latch opener respectively in position for holding down previously formed fabric and for opening latches if need be as the needles rise to receive the web and the ground threads. In FIGURE 7 the said mechanism is shown in the position in which the needles are raised with their latches opened to receive the threads 12 or threads 12, 13 and the staples of the combed fibrous web 14.

According to the illustrative example of the mechanism, a bar 15 carrying a series of web engaging elements 16 for engagement with the fibrous web 14 is carried by arms 17 connected with the hanging cheeks 18 which carry the thread guide bars 5A, 6A. The web 14 is fed to the needles by means of a feeder constituted by plates 19, 20, respectively, mounted on the arms 17 and hanging cheeks 18.

The thread guide bars are swung back and forth and moved endwise conjointly with the knitting movements of the needles, and the elements 16 are moved in similar

manner so that the ground threads and regular strands of staples of the fibrous web are lapped on the needles and are interknitted. There is thus formed a fabric comprising face loops 4 composed of staples of the web and a backing of warp knitted fabric, as represented diagrammatically in FIGURE 7. FIGURE 7 shows the web engaging elements 16 in the position in which the regular strands of staples of the web 14 are being formed preparatory to being lapped on the raised needles so as to be knitted with the warp thread or threads supplied by the thread guides.

In the following more specific description of the operation of the mechanism, reference is made to FIGURES 6, 7 and 10.

At the start of a knitting cycle to incorporate the web with the ground fabric, the needles 8 are in a low position (FIGURE 6) with their hooks below the level of the trick plates, the web 14 extends downwards through the feeder 19, 20, to the knitted fabric, and the web engaging elements 16 and the feeder are at the front of the machine. When the thread guide bars 5A, 6A are oscillated the bar 15 with the web engaging elements 16 and the feeder 19, 20 swing conjointly with the thread guides on an arcuate path P (FIGURE 9), i.e. from the position shown in FIGURE 6 through FIGURE 7 to the position shown in FIGURE 9, and vice versa, in timed relation with the movements of the needle bar 7A. On swinging from position FIGURE 6 through FIGURE 7 to position FIGURE 9, the web engaging elements 16 pass through that portion of the web 14 which extends from the feeder 19, 20 to the knitted fabric, so that said portion is correspondingly divided into regular strands of staples, which, when the bar 15 is shogged endwise, e.g. one needle to the right, or one needle to the left, with the needles 8 fully raised (FIGURE 9), are correspondingly pushed sideways by the web engaging elements 16 (FIGURE 10) so as to be lapped on the said needles, below the hooks, whereby when the needle bar descends the needles take the strands so that they are knitted into the ground stitch formation and loop out on the face of the fabric, as shown in FIGURE 7.

The endwise movements of the bar 15 are derived from conventional shogging mechanism of the kind usually to be found on most Raschel machines, for example, a gear driven pattern drum arrangement, which includes chain links of different lengths, and spring controlled intermediate connections.

When the needles have descended, i.e. to knit, and the web engaging elements 16 revert to their original position, the bar 15 remains stationary so far as endwise movement is concerned, until needed again for another knitting cycle to knit the web into the ground fabric. The lowest position of the needle bar 7A determines the quality, i.e. tightness or slackness of the fabric.

The properties and behavior of wool and other staple fibers in a combed fibrous web are such that it is possible for the web, after initial engagement with the needles to be drawn downwards through the feeder 19, 20, by the knitting action, as knitting proceeds.

Concerning the means (when provided) for increasing the feed of the web these, according to one example, comprise a blade-like presser 32 (which may be technically described as a fall-plate) mounted for movement vertically between the web feeder 19, 20 and the thread guides, and appropriate mechanism (not shown) for operating the presser suchwise that when the needles 8 are raised the presser 32, on the operative stroke pushes the web 14 down loopwise to a prearranged extent behind the needles, as represented in FIGURE 8, before the next course of stitches is knitted, and in consequence predetermines the length of the pile in the ultimate fabric. As these means are optional the presser 32 is represented by dot and dash lines in FIGURE 6, wherein it is shown out of action. The operating mechanism may be adjustable so as to vary the stroke of the member 32 in order

to produce piles of different lengths according to particular requirements.

As will be appreciated the bar 15 with the web engaging elements 16, the web feeder (19, 20) and when provided the means for predetermining the length of the pile, constitute improved mechanism for use in conjunction with the needles and thread guides of a straight bar warp knitting machine for the production of the fabric.

The fibrous web may be of any staple fibrous material, or mixtures of fibrous materials, either naturally, or chemically or otherwise artificially produced. That is to say, the web may consist of natural staple fibres of animal or vegetable origin, or of synthetically produced fibres of cellulosic origin, or of nylon or other man-made fibres, or of mixtures of any two or more of these materials. The fibres may be self-coloured, or they may be dyed to provide solid colours or variegated effects so that by appropriate selection or mixture of coloured fibres the plush, pile, fleecy or fur-like effect presents patterns or designs when interknitted with the ground thread or threads, which may be coloured or not so as to provide a ground fabric of desired character. If desired provision may be made for producing pattern effects or designs by means of stitch variations as by appropriate operation of the thread guides. The surface of the fabric may be brushed or teased to increase the plush, pile, fleecy or fur-like effect.

The fabric provided by this invention may be produced as narrow ware, or as piece goods of any desired width, say up to 180" in width and in continuous lengths or in shorter sections for use as or in the manufacture of carpets, furnishing fabrics, upholstery, bed covers, articles of clothing such as bedjackets, outerwear, underwear, gloves, footwear, house or morning coats, and linings for such articles, in fact for any and all general purposes for which such a fabric is suitable.

I claim:

1. In a warp knitting machine, for producing a pile fabric composed of continuous strands from a staple fibrous web and a series of ground threads, interknitted, mechanism comprising a series of needles, a series of thread guides for lapping the ground threads on the needles, a feeder for feeding the web to the needles, and a series of web engaging elements arranged for operation conjointly with the operation of the needles and the thread guides so as to form continuous regular strands of staples of the web and to lap the said strands on the needles, whereby warp knitted staple loops of the web and warp knitted loops of the ground threads are interknitted so as to produce a ground fabric with a regular looped pile surface.

2. In a warp knitting machine, for producing pile fabric composed of continuous strands from a staple fibrous web and a series of ground threads, interknitted, mechanism comprising a series of needles, a series of thread guides for lapping the needles with the ground threads, a feeder for feeding the web to the needles, and a series of web engaging elements, the said web feeder and the said web engaging elements being arranged for swinging movements, and the series of web engaging elements being also arranged for movement endwise, conjointly with the conventional movements of the thread guides and the needles, so as to form continuous regular strands of staples of the web and to lap the said strands onto the needles, whereby when the needles are caused to knit both warp knitted loops composed of regular strands of staples of the web and warp knitted loops composed of the ground threads are interknitted to produce a ground fabric with a regular looped pile surface.

3. A method of producing a pile fabric consisting of continuous strands from a staple fibrous web and a series of ground threads, interknitted, on a warp knitting machine, which comprises the steps of feeding ground threads to the needles of the machine, feeding the web to the machine and separating the web into individual

strands of staples, lapping said strands of the fibrous web onto the needles of the machine, lapping the ground threads on the said needles, and causing the needles to knit both the said strands and the ground threads, whereby regular warp knitted staple loops are knitted into the warp knitted ground stitch formation. 5

4. A method of producing a pile fabric consisting of continuous strands from a staple fibrous web, and a series of ground threads, interknitted, on a warp knitting machine, which consists of feeding ground threads to the needles, feeding the web to the machine and separating the web into individual strands of staples, lapping warps composed of said strands of the fibrous web onto the needles conjointly with the lapping of the ground threads 10

onto the needles, and causing the needles to knit, whereby regular loops of staple warps of the fibrous web are knitted into the warp knitted ground fabric.

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