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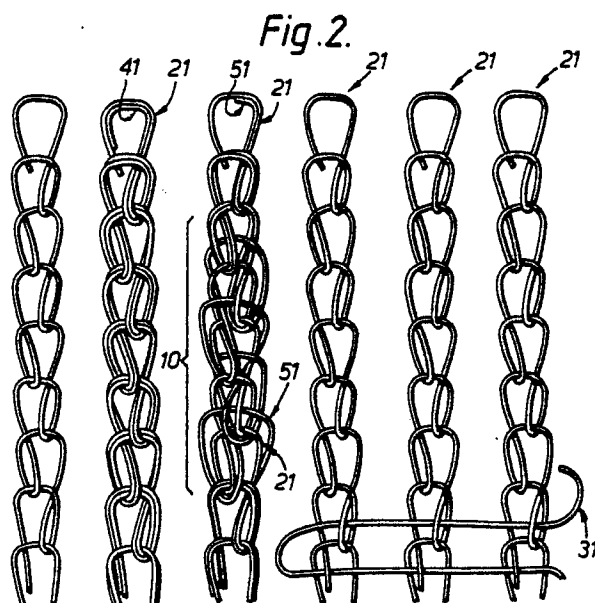
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⑤④ **Knitting method, knitting machine and knitted fabric.**

⑤⑦ A method of knitting in which warp threads (41) and effect threads (51) are formed together into loops and locked by inlay threads (31), and the tension in the effect threads (51) is varied so as to cause some of the stitches (10) into which the effect threads are formed to be looser than others, so producing an imitation slub effect.



KNITTING METHOD, KNITTING MACHINE AND KNITTED FABRIC

This invention relates to a method of knitting in which pillar threads and effect threads are formed together into loops and locked by inlay threads, a machine for carrying out the method, and a fabric produced thereby.

It is known to manufacture a knitted fabric by forming loops in parallel pillar threads drawn from a warp beam and then locking the loops by inlay threads drawn from an inlay beam. Patterns may be produced by using pattern beams to supply additional threads, each of which is associated with a respective pillar thread as it passes through a pillar beam, the pillar and pattern threads being formed into double loops.

It is also known to provide a knitted fabric with randomly thickened regions by incorporating into the fabric a slub yarn which varies in thickness along its length. Conventionally the slub yarn is made to run the width of the fabric at right angles to the direction of feed of the pillar threads, in a similar fashion to the weft in weaving. The special slub yarn is expensive and its incorporation into the fabric increases the complexity of the knitting operation.

It is known from patent specification GB 242 000 to vary the tension in threads supplied to a knitting machine in order to produce patterned fabric. The variations in tension may be caused by a brake mechanism acting on a thread beam at periodic time intervals determined by a pattern cam. This arrangement adds to the cost of the machine, and moreover the cam must be replaced to change the pattern.

An object of the present invention is to provide a method of knitting and a knitting machine in which the effect produced by the incorporation of a slub yarn may be simulated, but without the expense of a braking mechanism and a control device therefor.

According to the invention the tension in some of the effect threads is periodically varied so as to cause some of the stitches into which the effect threads are formed to be looser than others and so produce an imitation slub effect, the tension being varied as the result of a predetermined imbalance in a beam from which the threads are supplied.

The invention also provides a knitting machine including a pillar bar, a warp beam, an inlay beam and effect beams, and means for balancing the effect beams to establish tension in threads supplied to the pillar bar from the beams characterised in that the means for balancing at least one of the beams is arranged to cause the said beam or beams to be unbalanced to periodically vary the tension in the threads supplied therefrom.

The invention may be carried out extremely economically by using asymmetrically arranged balance weights to unbalance the effect beam or beams used to produce the simulated slub effect. The appearance of the slub effect may be varied easily by re-arranging the balance weights so as to alter the nature of the imbalance.

In the drawings:

Figure 1 is a diagrammatic view of a knitting machine modified in accordance with the present proposal;

Figure 2 shows diagrammatically rows of stitches formed on the machine;

Figure 3 shows a counterweight for an effect beam;

Figure 4 illustrates fabric produced by the method, also enlarged.

Referring to Figure 1 of the drawings, a knitting machine 1 has a warp beam 2 and an inlay beam 3, from which parallel rows of threads 21 and 31 respectively are drawn into the machine and knitted into a fabric. As shown on the right-hand side of Figure 2, the threads 21 are formed into loops which are locked by the threads 31, only a short length of one of which is shown for clarity. The machine described above and the knitting operation which it carries out are conventional and need not be explained in detail.

The machine also includes four effect beams 4, 5, 6 and 7 from which parallel rows of threads 41, 51, 61 and 71 are drawn into the machine. Each of these threads is passed through a pillar bar together with a respective one of the threads 21 and formed with that thread 21 into a series of double loops, as shown in Figure 2 for threads 41 and 51. The effect threads are conventional threads and may be identical to the threads 21 and 31.

The effect beams are rotated as the threads are drawn from them. Each beam is provided at one or both of its ends with three, equi-angularly spaced radial arms 8 for balance weights 9. Provided that the three arms of an effect beam are weighted identically, the threads are subjected to a constant tension as illustrated in the case of the beam 4. The threads 21 and 41 thereby formed into loops of identical size and produce in the fabric a rectilinear thickened line running in the warp direction. If the arms of an effect beam are weighted differently, as shown for beam 5, the threads are subjected to tension during the period that the weight counterbalances the pull applied to the threads, i.e. during travel of the weight through the arc A in Figure 3. When the weight is travelling through the arc B in Figure 3, the tension is removed and the effect beam over-runs to some

extent. Consequently the loops formed by the threads 51 are looser than those formed by the thread 21 during this period, and the groups of stitches indicated at 10 in Figures 2 and 4 result in localised loosening of the stitches formed by the effect threads thereby giving the fabric a simulated slub effect. In the remaining regions the effect threads combine with the threads 21 to provide a thickened line of stitches.

By arranging for a number of the pattern beams to be unbalanced in this way, and for the single weights of all unbalanced pattern beams to be out of alignment, fabric may be produced as illustrated in Figure 4 in which the thickened regions are out of line and enhance the slub effect. The imbalance may be caused by providing only one of the arms with a balance weight, or by providing the arms with weights of differing magnitude.

Although the machine has been illustrated with four effect beams, the machine may be provided with additional such beams, for example, eight to enhance the random appearance. Moreover, the lengths of the thickened regions 10 may be altered by changing the diameters of the effect beams.

4. A knitted fabric comprising stitches formed from warp, inlay and effect threads (21,31 and 41-71, respectively), characterised in that groups of stitches (10) formed from some lengths of effect threads (51) are looser than the stitches formed from the remaining lengths of effect threads, such as to provide an imitation slub effect.

Claims

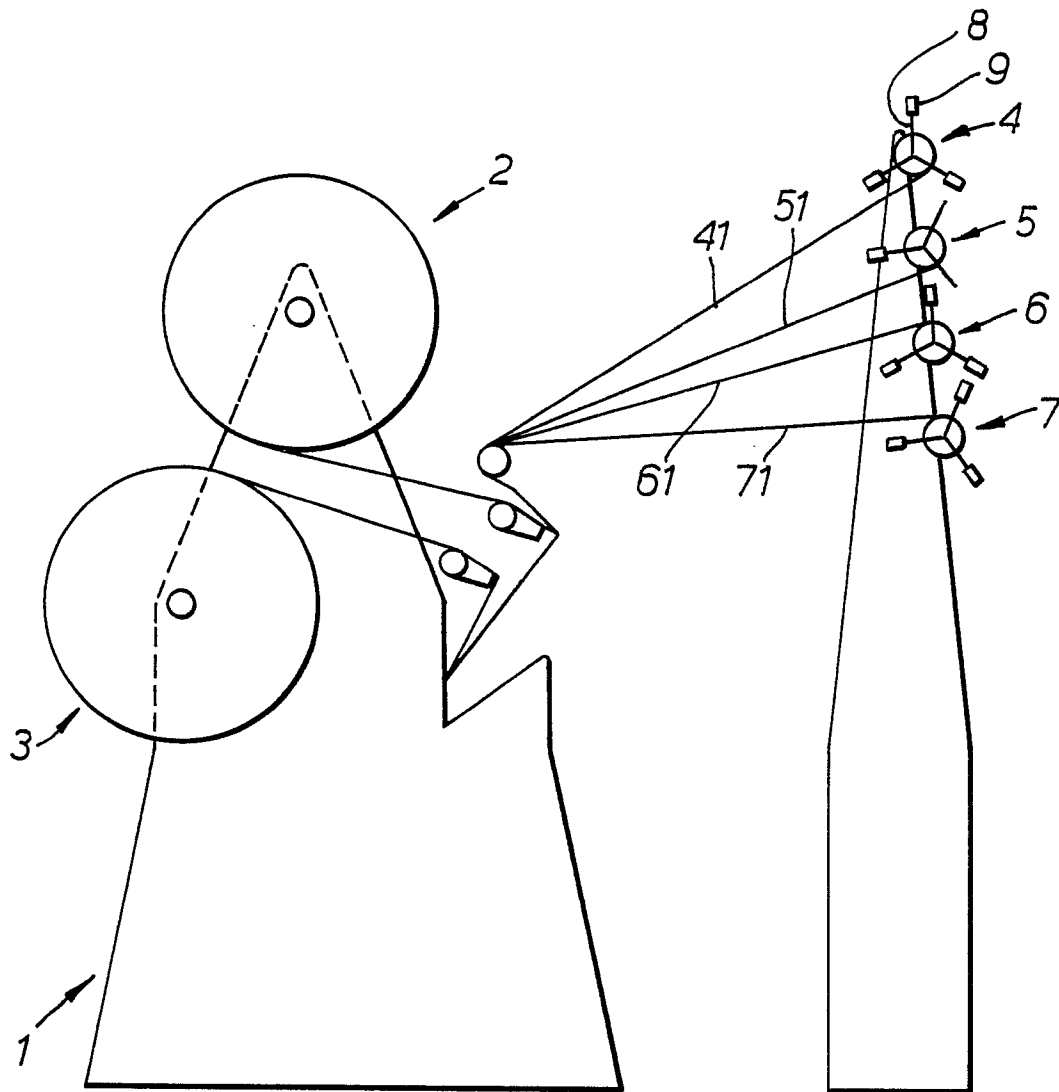
1. A method of knitting in which pillar threads (21) and effect threads (41,51,61,71) are formed together into loops and locked by inlay threads (31), characterised in that the tension in some of the effect threads (51) is periodically varied so as to cause some of the stitches into which the effect threads are formed to be looser than others and produce an imitation slub effect, the tension being varied as the result of imbalance in a beam (5) from which the threads (51) are supplied.

2. A knitting machine including a pillar bar, a warp beam (2), an inlay beam (3) and effect beams (4-6), and means (9) for balancing the effect beams to establish tension in threads (41,51,61,71) supplied to the pillar bar from the beams (4-6), characterised in that the means (9) for balancing at least one of the beams (51) is arranged to cause the said beam or beams (51) to be unbalanced to vary the tension periodically in the threads supplied therefrom.

3. A knitting machine as claimed in claim 2, wherein each of the effect beams is provided with equiangularly spaced supports (8) for balance weights, one or more of the supports of a beam (51) being provided with no balance weight or with a balance weight different from the other support or supports.

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Fig. 1.



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Fig. 2.

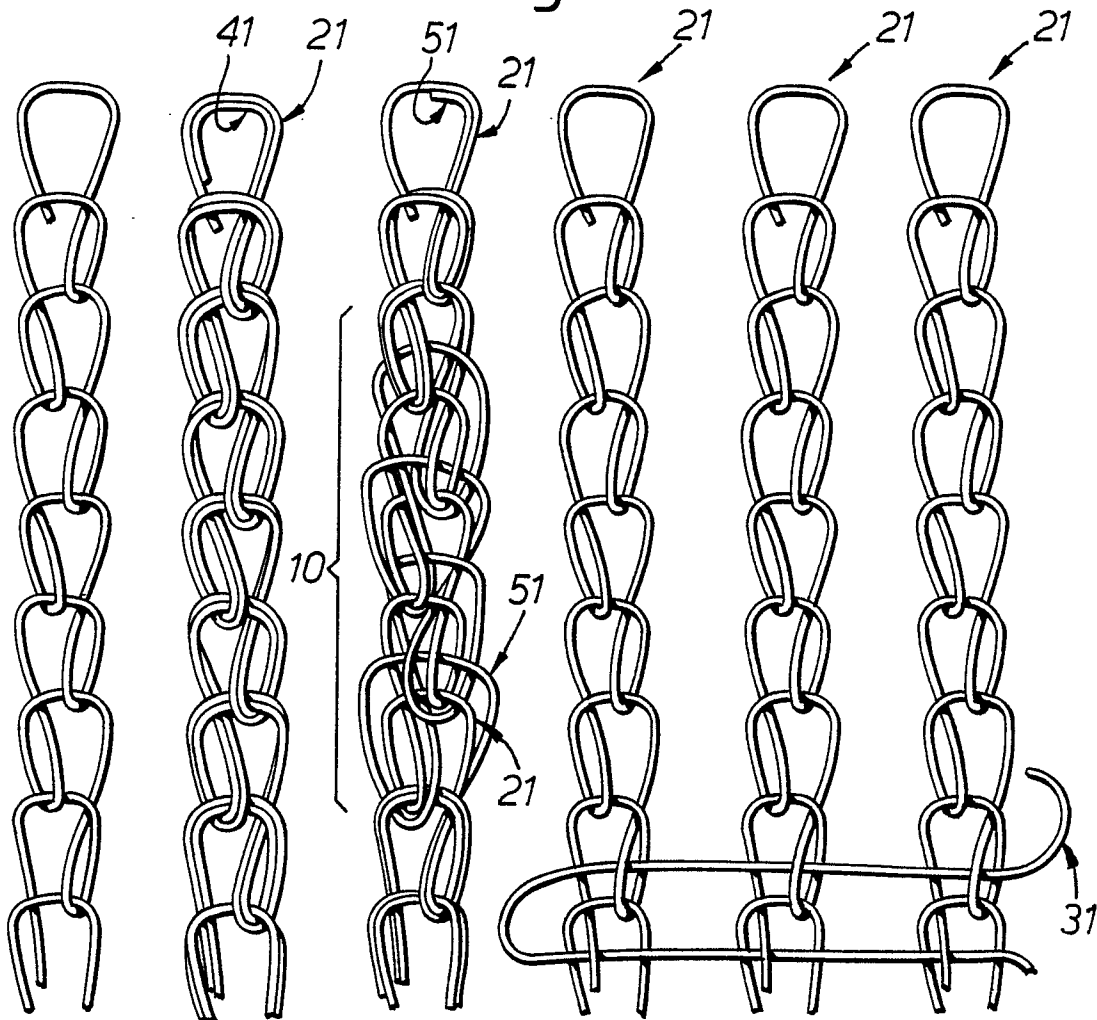
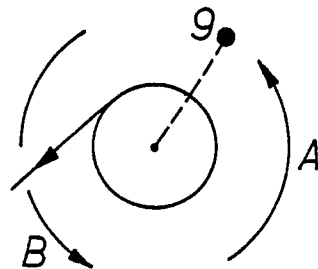
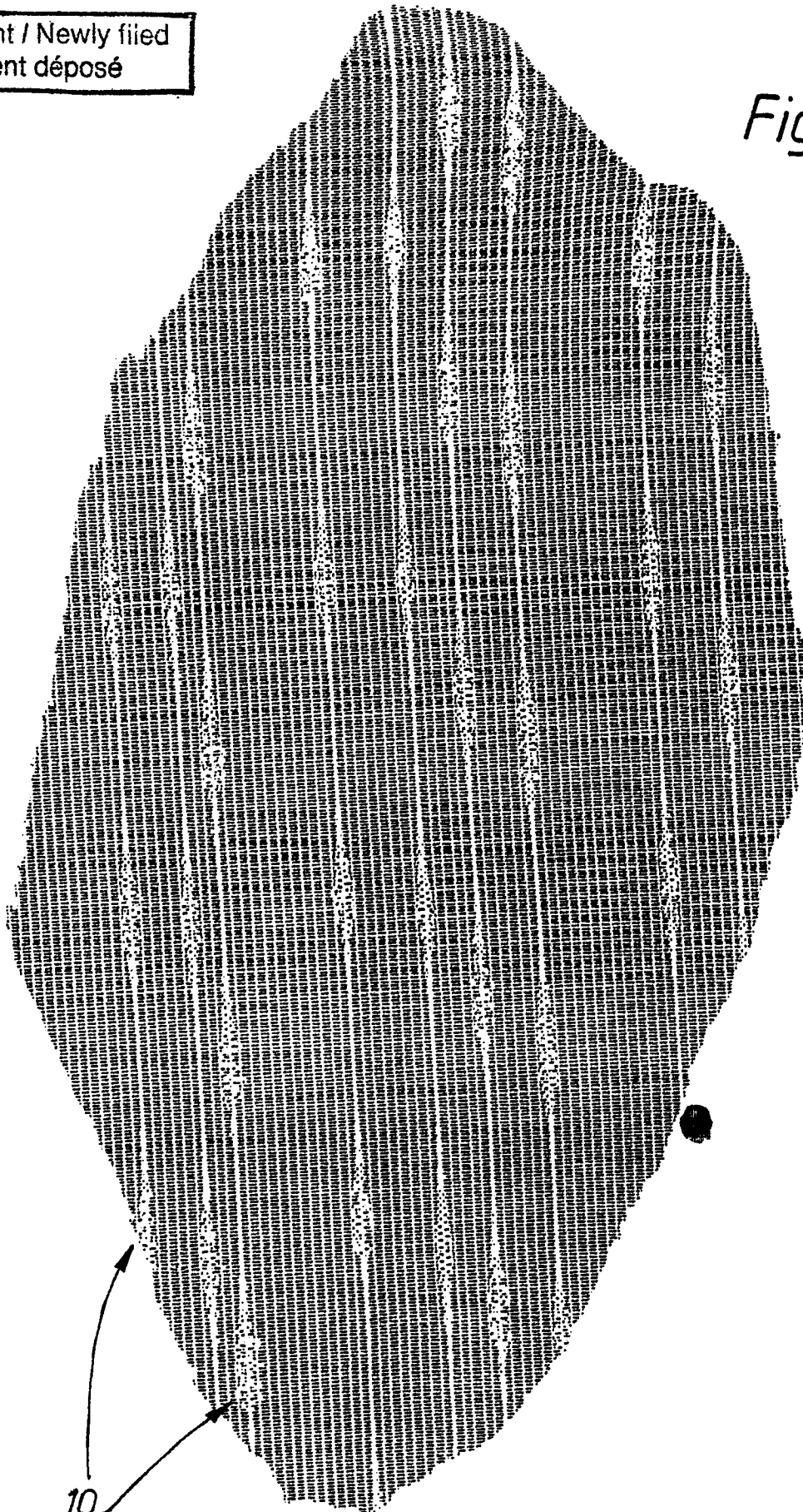


Fig. 3.



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Fig.4.





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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	DE-A-3 111 113 (KARL MAYER) * Claim 1; page 5, lines 9-19; figure 1 *	1	D 04 B 27/16
A	DE-C- 554 806 (OTTO SEIFERT WIRKMASCHINENFABRIK AG) * Claim 3 *	1	
X	DE-A-3 015 003 (ARMENGOL RODO) * Page 7, lines 9-18 *	4	
A	US-A-3 036 448 (CUNDIFF)		
A	FR-A-1 560 862 (DEERING MILLIKEN RESEARCH CORP.)		
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			D 04 B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 07-03-1988	Examiner VAN GELDER P.A.
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			