

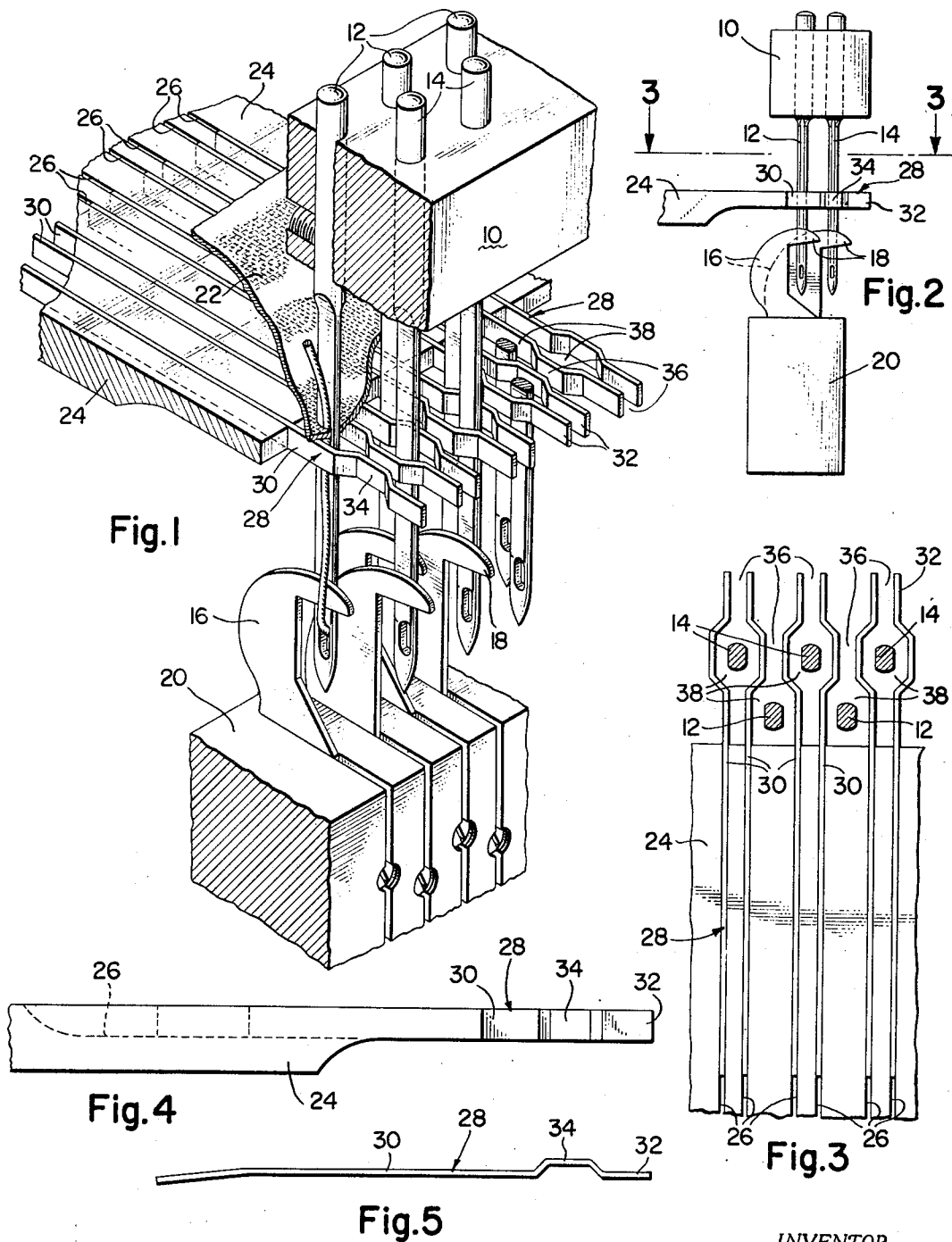
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TUFTING MACHINE WITH NEEDLE PLATE

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5 Claims

ABSTRACT OF THE DISCLOSURE

This disclosure relates to needle plates for multiple needle tufting machines. The disclosure is more specifically directed to a novel needle plate for tufting machines adapted for relatively fine gauge tufting and wherein the affects on tuft production due to the needle plate are substantially uniform for each tuft formed while still maintaining sufficient room at each needle position between adjacent needles and the yarn carried thereby with minimum interference from the needle plate.

Brief summary of invention

This invention is directed to an improvement over the needle plate constructions for tufting machines shown in prior United States Patent Nos. 2,976,829 and 3,064,600, both of which are assigned to the same assignee as the present invention. As is disclosed in the aforementioned patents, it is conventional in multiple needle tufting machines to provide a needle plate which includes a plurality of spaced finger elements with each finger extending between an adjacent pair of needles. These fingers are adapted to provide a support for the fabric immediately beneath the needles and simultaneously to permit the free reciprocation of the needles between the fingers. In fine gauge tufting machines, it is common to locate the needles in two transverse rows with the needles in one row being staggered with respect to the needles in the second row. Thus, the needles may be set on a finger gauge and yet have ample room between adjacent needles so that the needles and yarn carried thereby will not interfere with each other. However, even though there is ample space between the staggered rows of needles for producing a finer gauge material, the effectiveness of the machine is limited by the gauge of the needle plate fingers which cannot be substantially less than the thickness of the needle plus the double thickness of the yarn reciprocating between adjacent fingers without the yarn binding between the needles and adjacent needle plate fingers. The aforementioned two patents were directed to improvement over prior type needle plates wherein straight needle plate fingers were used which were uniformly spaced and had limitations in that due to the construction of the needle plate fingers, it was not possible to satisfactorily tuft while using finer needle gauges.

It has been found that even while using the improved structures of the aforementioned patents, that when the needle gauge is further reduced such as, for example, to one tenth inch gauge, the loops formed during the tufting process in one row are not uniform with respect to the loops formed in the staggered second row. It has been particularly noticed that when producing relatively low nap fabrics, that the effect of loop production is not the same in each row and these varying effects become

more prominent on this type of fabric. When the loops formed during the tufting process leave the needle plate fingers they have a tendency to bloom with the degree of blooming being a determining factor in the appearance of the finished product. With the prior art needle plates, the blooming of the tufts for adjacent loops was different due to the fact that the needle plate openings downstream of the needles were different. Thus, as the loops left the needle plate finger openings they could be turned at relatively different angles to each other than that to which they were originally formed by dragging on the fingers as the material advanced and their appearance would thus be different as they left the needle plate. Thus, the final appearance of the loop production would not be uniform in appearance with the nap not being as smooth as desired and the distribution of the loops not being uniform.

It is accordingly an object of the invention to provide a novel and improved needle plate construction which overcomes the disadvantages enumerated above and which needle plate is adapted for use on conventional tufting machines.

It is a further object of the invention to provide a novel and improved needle plate construction for a tufting machine wherein the effect of loop production caused by the needle plate is uniform for each loop produced.

It is another object of the invention to provide a novel and improved needle plate construction for a tufting machine wherein ample room is provided between adjacent needles and the yarn carried thereby for relatively free loop production and wherein a uniform restriction is provided downstream of each needle for producing a uniform appearance for each tufting loop produced across the multiple needle machine.

Other objects and advantages of the invention will become apparent upon reading the following detailed description taken in conjunction with the drawings wherein:

Brief description of the drawing

FIG. 1 is a partial perspective view of the tufting mechanism in a tufting machine embodying the present invention;

FIG. 2 is a side view of a portion of the mechanism shown in FIG. 1;

FIG. 3 is a sectional view taken along line 3—3 of FIG. 2;

FIG. 4 is a side elevational view of a portion of a needle plate receiving one of the needle plate fingers of the invention; and

FIG. 5 is a plan view of a needle plate finger before insertion into the needle plate.

Detailed description of the invention

Referring now to the drawings, there is illustrated in FIG. 1 a portion of a conventional tufting machine including a needle bar 10 which extends transversely across the width of the tufting mechanism of the tufting machine which needle bar mechanism supports a plurality of needles disposed in a staggered relationship to form a first uniformly spaced row of needles 12 and a second row of uniformly spaced needles 14 which needles 14 are preferably offset midway between the needles 12 to provide a uniform needle gauge. It is known in the tufting machine art to dispose needles in a staggered relationship such as illustrated in FIG. 1 in order to reduce the space between adjacent rows of tufting while

accommodating the requisite tuft forming mechanism for producing relatively fine gauge tufted fabrics.

In order to from the loops or tufts during successive penetrations of the needles, it is customary to provide a looper or loop hook for holding the loop or tuft during the upward stroke of the needles. Thus, each needle 12 is provided with an associated looper 16 and each loop needle 14 is provided with an associated looper 18 which loopers are adapted to reciprocate in unison with their associated needles in order to form loops with the yarn carried by the needles in a well known manner. The loopers 16 and 18 are suitably disposed in a reciprocable looper supporting bar 20 in a conventional manner, as illustrated in FIG. 1.

As further illustrated in FIG. 1, a base fabric 22, which forms a portion of the backing of the finished fabric product, is disposed for traversal beneath the needles 12 and 14 and above the loopers 16 and 18, and is fed by any conventional means, not shown, in order that the needles 12 and 14 may reciprocate through the base fabric 22 to form loops therein. Although not illustrated, it is well-known to provide a cutting mechanism in conjunction with the loopers in order to form cut pile in lieu of closed loop pile and it is intended that such structure should come within the scope of the invention. As will be apparent below it is customary to provide a needle plate mechanism for supporting the base fabric 22 as it traverses across the needle path.

The needle plate 24 illustrated in FIG. 1 includes a plurality of longitudinal spaced straight grooves 26, suitably milled in the top surface thereof and which grooves 26 are adapted to receive associated needle plate fingers 28. As illustrated in FIGS. 3, 4 and 5, each needle plate finger 28 includes a first straight inner portion 30 for insertion into each groove 26 and a second straight outer portion 32. The inner and outer portions 30 and 32, respectively, are connected by a double offset or bent portion 34 in order to offset the inner and outer portions and preferably formed so that the longitudinal axis of the inner and outer portions will be substantially in a straight line, or approximately so. As shown in FIG. 5, the inner portion 30 is bent slightly at its inner most extremity in order to retain the inner portion 30 within the groove 26 provided within the needle plate 24.

Referring to FIG. 3, as shown therein, the needles 12 and 14 are disposed in staggered rows with the needle plate fingers 28 being inserted in the grooves 26 in such a manner that the outer portions 32 of the finger elements form relatively restricted spaces 36 between adjacent pairs of needle plate fingers 28 axially outwardly of each needle 14 disposed between said pairs of needle plate fingers 28.

Likewise, the needle plate fingers 28 are disposed with their offset portions 34 aligned such that a restricted area or space is provided axially outwardly of each needle 12 associated with each said pair. Further with reference to FIG. 3 it will be seen that at the position between each pair of needle plate fingers 28 at the position wherein the needles project therethrough, a space 38 is provided which is greater than the width of the needle plus double the yarn width so as to provide ample room for the needles and associated yarn to pass therethrough without interference between adjacent needles and their associated needle plate fingers. This is accomplished through the novel construction of the needle plate fingers including the double offset portions 34 and by orienting them in the particular manner illustrated in FIG. 3 with each double offset portion 34 of a needle plate finger 28 being disposed oppositely from its adjacent needle plate finger 28. Thus, by alternating the needle plate fingers 28 as illustrated in FIG. 3, the maximum spacing, greater than the needle gauge, will be provided between said needle plate fingers wherein the needles reciprocate through the base fabric 22, while providing an equal restricted area

axially downwardly from each needle so that when a tuft is formed it will pass through said restricted areas 36 upon leaving the needle plate fingers.

Through the construction of the present invention, it will be apparent that as each tuft loop is formed by the needle and its associated looper, as the fabric is moved through the machine in the direction from the needle plate to the needle plate fingers, it will leave the spacing between its associated pair of needle plate fingers 28 through a restricted portion 36. This is true for both rows of staggered needles 12 and 14 so that the traversal of the formed loop from its needle through the needle plate fingers will be substantially identical. As the loop leaves the restricted portions 36, the loops will drag slightly against the surfaces of the needle plate fingers at the restricted portion so that there will be a slight turning of the loop as it passes through the said restricted portion. However, as opposed to prior type needle plates wherein the loop travel through the needle plate fingers was not uniform, this turning of the loops will be uniform for each needle position and thus provide a uniform loop appearance in the nap of the fabric. Further, as the loops leave the restrictions 36, they will bloom or expand a substantially equal amount relative to their appearance as they pass through the needle plate fingers. It will be apparent, that in absence of a uniform restriction for each loops, the blooming or expanding of the individual loops would not be uniform as was the prior case other devices. Due to the structure of the present invention each loop will bloom substantially the same as its adjacent loop and thus the appearance of the loops will be substantially uniform as well as their distribution brought about by the slight turning thereof. These features are particularly important, although not restricted to, the appearance on relatively low nap fabrics. Results of tuft production to the present invention is a smoother nap fabric with a more uniform distribution of loops.

Having thus set forth the nature of the invention, what is claimed herein is:

1. A needle plate for a tufting machine or the like having a plurality of staggered yarn carrying reciprocable needles for projecting yarn through a base fabric and means for feeding the base fabric across the needle plate for successive penetrations by said needles to form tufts in said base fabric, said needle plate comprising a fabric support plate, a plurality of finger elements mounted in said support plate and extending therefrom, said finger elements being disposed in spaced relationship to define open ended passageways therebetween for permitting formation of a tuft and passage thereof between adjacent finger elements, and said passageways being characterized by a first portion for each needle position having sufficient width to permit the penetration of a needle and its yarn through said first portion and a second portion of reduced width for each needle position and disposed downstream of its associated needle position said first and second portions of each passageway being staggered with respect to the first and second portions of adjacent passageways such that after formation of a tuft by each needle at said first portion it will pass through said second portion whereby the effects of said finger elements on tuft formation will be the same for each needle position.

2. A needle plate for a tufting machine as recited in claim 1 wherein the width of said second portion is reduced from said first portion to form a restriction such that each tuft is caused to turn as it passes through said second portion.

3. A needle plate for a tufting machine as recited in claim 1 wherein each finger element comprises a first straight section, a second offset section extending from said first section and a third straight section substantially in line with said first section and extending from said second section.

4. A needle plate for a tufting machine as recited in claim 3 wherein said finger elements are mounted in said

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support plate with said offset sections alternately extending in opposite directions to form therebetween alternating first portions and second portions.

5. A needle plate for a tufting machine as recited in claim 1 wherein said tufting machine is further characterized as having parallel transverse rows of needles, said finger elements comprising a first straight section, a second double offset section and a third straight section, and said finger elements being mounted in said support plate with their second double offset sections alternately extending in opposite directions such that a first portion is

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formed between adjacent finger elements at each needle position and a second portion is formed immediately downstream of each needle position.

References Cited**UNITED STATES PATENTS**

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