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TUFTING MACHINE WITH NEEDLE PLATE

Filed May 1, 1961

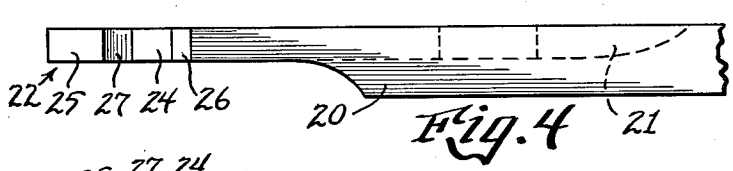

Fig. 4

Fig. 5

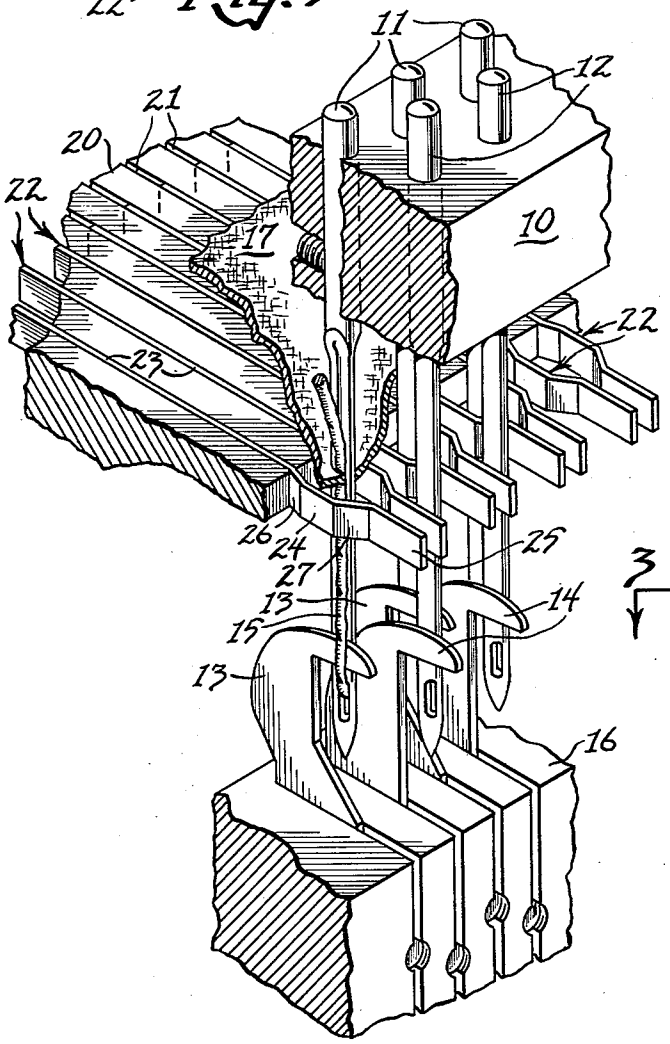

Fig. 1

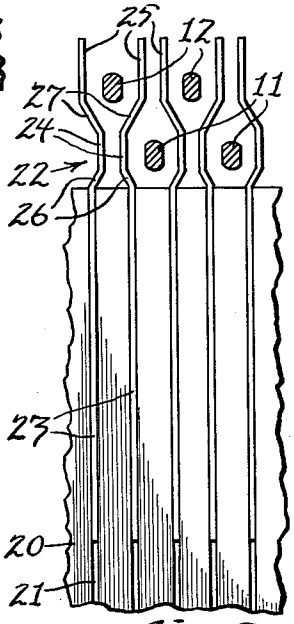

Fig. 3

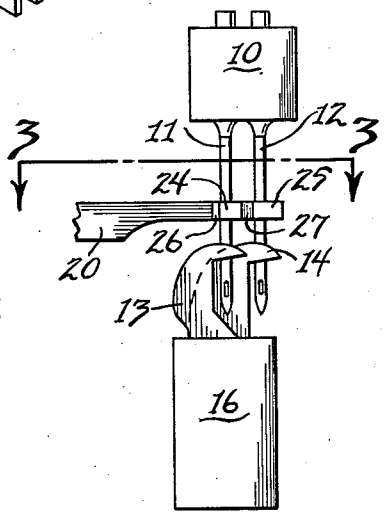

Fig. 2

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TUFTING MACHINE WITH NEEDLE PLATE

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This invention relates to a needle plate for a multiple needle tufting machine, and more particularly to a needle plate especially adapted for a fine needle gauge in a tufting machine. This invention is an improvement over that disclosed in U.S. Patent No. 2,976,829.

In a conventional multiple needle tufting machine, a needle plate is provided for supporting the base fabric which is fed thereover beneath the needles and above the loop forming mechanism which cooperates with the needles to form tufted pile fabric. The conventional needle plate is provided with a plurality of uniformly spaced straight fingers extending from the edge of the needle plate in the direction of the fabric feed, 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 a conventional multiple tufting machine, the needle plate fingers are uniformly spaced at the same gauge as the needles.

Where it is desired to produce fine gauge tufted fabric, such as a 5/32 inch gauge and smaller, it is customary 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 finer 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 spacing between the staggered rows of needles for producing a finer gauge material, the effectiveness of the machine is limited by the gauge of the straight 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.

In U.S. Patent No. 2,976,829, a finer needle gauge between staggered needles was possible because of the structure of the novel needle plate fingers. Each of these fingers had a straight outer portion offset from an inner portion and connected by a bent portion. By spacing each finger so that the outer portions of adjacent fingers were alternately disposed in opposite directions, the portions of the fingers on opposite sides of each needle had a spacing greater than the needle gauge, while the spacing between those portions where no needle reciprocated were less than the needle gauge. However, the inner portions of these fingers which were alternately bent in opposite directions had to be received in slots in the needle plate whose spacing was alternately less than and greater than the gauge. As a result of such spacing requirements, a tufting manufacturer who wishes to convert a conventional multiple needle tufting machine to a machine having staggered needles to provide a narrower gauge, and who wishes to use the alternately bent needle plate fingers, is forced to substitute the entire needle plate because of the differences in spacing of the slots for the needle fingers.

It is therefore an object of this invention to overcome the disadvantages enumerated and to provide an improved needle plate finger which can be used in a conventional needle plate having means for receiving needle fingers at a uniform spacing equal to the needle gauge.

Another object of this invention is to provide an improved needle plate finger having an inner shank portion adapted to be received in the milled slot in the conventional needle plate and having an intermediate and an outer portion, each of which is offset on opposite sides from said inner portion.

A further object of this invention is to provide needle plate fingers adapted to be received in said needle plate on a uniform needle gauge and which are provided with intermediate and outer portions alternately bent in opposite directions to provide spaces greater than said needle gauge for each staggered needle.

Further objects and advantages of the invention will be apparent from the following description taken in conjunction with the drawings, wherein:

FIG. 1 is a perspective view of the invention;

FIG. 2 is a side elevation of the invention;

FIG. 3 is a section taken along the line 3—3 of FIG. 2;

FIG. 4 is a side elevation of the needle plate receiving a needle plate finger; and

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

Referring now to the drawings in more detail, FIG. 1 discloses a portion of a transverse needle bar 10 in a conventional multiple needle tufting machine, supporting a first row of uniformly spaced needles 11 and a second row of uniformly spaced needles 12 offset preferably midway between the needles 11, to provide a uniform needle gauge. Each needle 11 may be provided with a loop hook 13, and each needle 12 may be provided with a loop hook 14, adapted to reciprocate in unison with the needles in order to form loops with yarn 15 carried thereby, in a well-known manner. The loop hooks 13 and 14 may be set in a reciprocable loop hook bar 16 in a conventional manner, as shown in FIG. 1.

A base fabric 17, a fragment of which is shown in FIG. 1, is fed beneath the needles 11 and 12 and above the loop hooks 13 and 14, by any conventional means, not shown, in order that the needles 11 and 12 may reciprocate through the base fabric 17 to form loops therein. It is of course also within the scope of this invention to form cut pile by providing cut pile hooks instead of the loop hooks 13 and 14. In order to support the fabric 17 being fed beneath the needles 11 and 12, a conventional needle plate 20 is provided. Longitudinal straight grooves 21 are milled in the top of a plate 20 in a conventional manner and having a uniform spacing equal to the needle gauge.

A needle plate finger 22 of novel construction is provided to be inserted in each groove 21. A finger 22 comprises a first straight inner portion 23, a second straight intermediate portion 24 and a third straight outer portion 25. The inner portion 23 of each finger is connected to the intermediate portion 24 by means of a first bent portion 26, and the intermediate portion 24 is connected to the outer portion 25 by means of a second bent portion 27 in such a manner that the intermediate portion 24 and the outer portion 25 are offset on opposite sides of the inner portion 23 substantially the same amount. Moreover, the axes of the portions 23, 24 and 25 are substantially parallel. As best disclosed in FIG. 5, the inner portion 23 is bent slightly at its free end 28 in order to provide a tight fit for the inner portion 23 within the groove 21.

As best disclosed in FIG. 3, with the needles 11 and 12 being staggered in two rows, the fingers 22 are inserted in the grooves 21 in such a manner that the outer portions 25 will be alternately offset toward and away from each other. Where the spacing between the intermediate portions 24 is greatest, i.e. greater than the needle gauge, the outer portions 25 of the same pair of fingers 22 will automatically be offset toward each other

and spaced less than the needle gauge. Likewise, where the intermediate portions **24** of a pair of adjacent fingers **22** are spaced less than the needle gauge, the outer portions **25** of the same fingers will be offset away from each other by a distance greater than the needle gauge. As disclosed in FIG. 3, maximum spacing greater than the needle gauge will be provided alternately between adjacent pairs of outer portions **25** and adjacent intermediate portions **24** across the paths of the needles **11** and **12**, to provide ample clearance for the reciprocating needles **11** and **12** and the yarns **15** carried thereby. Such a construction permits production of tufted fabrics of extremely fine gauges, without the disadvantage of having the yarns **15** bind between the needle plate fingers **22** and the needles **11** and **12**.

Although the outer portions **25** do not have to be absolutely straight, they are preferably straight in order to permit the passage of the tufted stitching formed by the needles **11** in the first row between the fingers, as the fabric **17** is fed in the direction of the fingers **22** toward the rear of the machine.

In practicing the invention, the spacing between adjacent portions of the fingers **22** receiving the needle has been uniform and approximately 20% greater than the needle gauge.

It will be noted that although the base of the loop hooks **13** and **14** are in substantial transverse alignment, the shank of the loop hook **13** is offset forward, or in the direction opposite the direction of the fabric feed from the shank of the hook **14**, by substantially the same distance as the spacing between the rows of needles **11** and **12**.

It will be apparent to those skilled in the art that various changes may be made in the invention, without departing from the spirit and scope thereof, and therefore the invention is not limited by that which is shown in the drawings and described in the specification, but only as indicated in the appended claims.

What is claimed is:

1. In a multiple needle tufting machine having first and second transverse rows of reciprocable needles for carrying yarn through a base fabric, the needles in said first row being staggered with respect to the needles in said second row, all said needles having a uniform gauge, a needle plate for supporting said fabric having spaced fingers, each finger having an outer first portion, an intermediate second portion, and an inner third portion, said first and second portions being offset transversely on opposite sides of said third portion, means for receiving said third portions in said needle plate at a uniform spacing equal to said needle gauge, adjacent fingers having first and second portions offset in opposite directions to provide alternate spacing greater than said needle gauge between said pairs of first portions and between said pairs of second portions, each needle in said first row having a reciprocable path between a pair of first portions spaced greater than said needle gauge, and each needle in said second row having a reciprocable path between a pair of second portions spaced greater than said needle gauge.

2. The invention according to claim 1 in which each finger comprises a first bent portion connecting said first and second portions and a second bent portion connecting said second and third portions.

3. The invention according to claim 2 in which said first, second and third portions are straight.

4. The invention according to claim 1 in which each third portion substantially bisects the gauge of the adjacent needles on opposite sides of said corresponding finger, and said second and third portions are substantially equally offset on opposite sides of said third portion.

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