This invention relates to a yarn guide for tufting needles, and more particularly to a device for guiding yarn substantially along the length of a tufting needle.

Heretofore, the yarn fed to a needle in a tufting machine has been supported in yarn guides so that the yarn is fed at an angle to the needle and directly to the needle eye. Some of these conventional yarn guides are mounted on the needle bar but laterally spaced from the axis of needle to provide a diagonal path to the needle eye. Thus, as the needle penetrates the base fabric, the needle pulls the yarn downwardly with the needle, but simultaneously it must also pull the yarn laterally toward the needle, so that both the needle and the yarn can pass through the same hole in the base fabric punctured by the needle. If the yarn is taught between the needle eye and the yarn guide, the yarn must be pulled or fed faster than the speed of the needle on its downstroke. If the yarn is not taught so that there is ample slack to be pulled through the hole in the base fabric with the needle, then such extra slack has a tendency to knot, tangle or obstruct the operation of adjacent needles.

It is therefore an object of this invention to overcome the above disadvantages by providing a yarn guide for a tufting needle in which the yarn supplied or fed to the needle is directed in a path to the upper portion of the needle and then downwardly along and in close proximity to the needle. In this manner, the yarn is always kept beside the needle as it penetrates the base fabric, without requiring any additional pull or jerking of the yarn.

Another object of this invention is to provide in a tufting machine a plate member fixed to the needle bar, with an aperture for each needle, the aperture being laterally spaced adjacent the upper portion of the needle for guiding yarn downward and along the needle.

Another object of this invention is to provide a yarn guide including a plate member disposed transversely of the needle along its upper portion and having an aperture therethrough for receiving a tufting machine having a plurality of vertically reciprocating push rods 11, only one of which is shown in FIG. 1. The bottom ends of the push rods 11 support an elongated needle bar 12 extending transversely of the machine. The particular needle bar 12 disclosed in FIG. 1 supports a plurality of needles in two staggered rows to accommodate a narrow gauge of stitching. The front row is represented by the needle 14, while the rear row is represented by the needle 15. The upper ends of the needles 14 and 15 are fixed in the needle bar 12 by conventional means, such as the set screws 16. Each needle, such as 14, includes an elongated groove 18 extending longitudinally down one side and terminating in the needle eye 19 in a conventional manner.

Yarn or yarn threads 20 and 21 are supplied or fed from any conventional source, such as creels or pattern feeding attachments, not shown, downwardly through a stationary yarn guide 23 fixed to and extending forwardly of the housing 10 and including an aperture 24 for each yarn or thread. The yarns 20 and 21 then pass downwardly through apertures 25 in a vertically movable yarn guide 26 fixed to the upper end of a forwardly extending arm 27 on a conventional yarn or thread jerker 28. The lower end of the jerker arm 27 is fixed to the top of the needle bar 12 by means such as clamps 29 and bolts 30. The parts thus far described are conventional in the art of tufting.

Secured to the rear face of the needle bar 12 is an elongated support plate 32, by means such as bolt 33. The support plate 32 extends transversely of the machine substantially the length of the needle bar 12 and is provided with a foot portion 34. The yarn guide made in accordance with the invention disclosed in FIGS. 1–3 comprises a flat, elongated plate 35, the rear portion of which is secured flush against the foot portion 34 by means, such as bolt 36. The yarn guide plate 35 includes a plurality of apertures 38 having a cross-section slightly larger than the cross-section of the needles 14 or 15, so that there is just sufficient clearance to permit a yarn 20 or 21 to pass through the aperture 38 with the corresponding needle 14 or 15 and in the groove 18 of the needle, as disclosed in FIGS. 1 and 3. The support plate 32 is of sufficient height to support the guide plate 35 for a substantial portion of the upper portion of the needles 14 and 15, but spaced below the needle bar 12 in a substantially horizontal position. The support plate 32 is located behind the needle bar 12 to eliminate any obstruction to the paths of the yarns 20 and 21 moving from the front of the machine to their corresponding apertures 38 in the guide plate 35.

It will be noted that the needle bar 12, the needles 14 and 15 and the guide plate 35, all reciprocate in unison with the push rod 11 so that guide plate 35 is always in the same position relative to the needles 14 and 15. By virtue of this construction, the guide plate 35 and their apertures 38 guide yarns 20 and 21 to a position closely adjacent the upper portions of the needles 14 and 15 so that yarns 20 and 21 will extend downwardly along the needles in their respective grooves 18 and through their corresponding eyes 19. Thus, as the needles 14 and 15 reciprocate through the base fabric 40 moving along the needle plate 41, the yarns or threads 20 and 21 will always be in place next to the needles 14 and 15, as best disclosed in FIG. 1. The yarns 20 and 21 and the needles 14 and 15 can then penetrate the base fabric 40 without any tendency on the part of the yarns to stretch or tear the needle holes because of yarn tension in a lateral direction.

In the modification disclosed in FIGS. 4 and 5, the needle bar 42 supports a single row of needles, such as the needle 44 having an elongated side groove 48 terminating in an eye 49. The yarn 50 is fed downwardly substantially the length of the needle in the groove 48 to the eye 49 by means of a yarn guide including an elongated plate member 52 bent to form an upper or mounting por-
tion 53 and a lower or depending portion 54. The mounting portion 53 is supported flush against the mounting face 56 of the needle bar 42, which is chamfered or otherwise formed to slope from the front face 57 of the needle bar 42 downwardly and rearwardly to the vicinity of the needle 44. This sloping construction permits the yarn 50 to be fed in a straight line, but diagonally from the guide, such as 25 on yarn jerker 28 (FIG. 1), to the upper portion of the needle 44, without interference of the needle bar 42. The depending portion 54 of the yarn guide 52 includes a series of apertures 60 extending longitudinally of the needle bar 42. The dimensions of each aperture 60 is just sufficient to permit the passage of yarn 50. Each aperture 60 is also spaced proximately in front of the upper portion of each needle 44 and slightly to one side of the needle axis as viewed from the front in FIG. 5, so that the yarn 50 will be received longitudinally in the groove 48.

Although the structure of the plate member 52 is substantially different from the plate member 35, they both function in substantially the same manner to feed the yarns 20, 21 and 50 directly to the upper portion of the corresponding needles in 14, 15 and 44 so that the yarns may be guided downwardly substantially the entire length of the corresponding needles in their respective grooves and will lay against the sides of their respective needles as they reciprocate through the needle holes formed in the base fabric 40.

The guide plate 35 is perhaps better adapted for guiding the yarns to needles when they are arranged in staggered rows for narrow gauge stitching. On the other hand, the plate member 52 has been found very economical and adaptable for use with a single row of needles in the wider gauge tufting machine.

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 tufting machine having yarn supply means, a needle bar and a needle, yarn guide means comprising:
   (a) a plate member having an aperture slightly larger than the cross-section of said needle,
   (b) means supporting said plate member in fixed spaced relation below said needle bar and transversely of said needle,
   (c) said needle depending from said needle bar axially through said aperture, with clearance between one side of said needle and the edge of said aperture for receiving the passage of yarn therethrough from said supply means and downwardly along said needle substantially parallel to the needle axis.

2. The invention according to claim 1 in which said plate support means includes an elongated bar fixed on the rear of and depending from said needle bar, and means for fixing the lower portion of said support bar to the rear edge of said plate member so that said plate member extends forwardly transversely of said needle.

3. In a tufting machine having yarn supply means, a needle bar and a needle supported on and below said needle bar, yarn guide means comprising:
   (a) a plate member forming a mounting portion and a guide portion,
   (b) said guide portion having an aperture therethrough slightly larger than the diameter of said needle,
   (c) means fixing said mounting portion on said needle bar so that said guide portion extends substantially transversely of said needle and is spaced closer than said mounting portion to said needle,
   (d) said needle depending through said aperture, and
   (e) said aperture being spaced proximately adjacent the upper portion of said needle to guide said yarn from said supply means through said aperture and downwardly to the needle eye against said needle substantially throughout its length from said aperture to said needle eye.

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