Dec. 23, 1969 R. M. TORRENCE 3,485,195

TUFTING MACHINE NEEDLE ASSEMBLY

Filed May 9, 1967

FIG.1

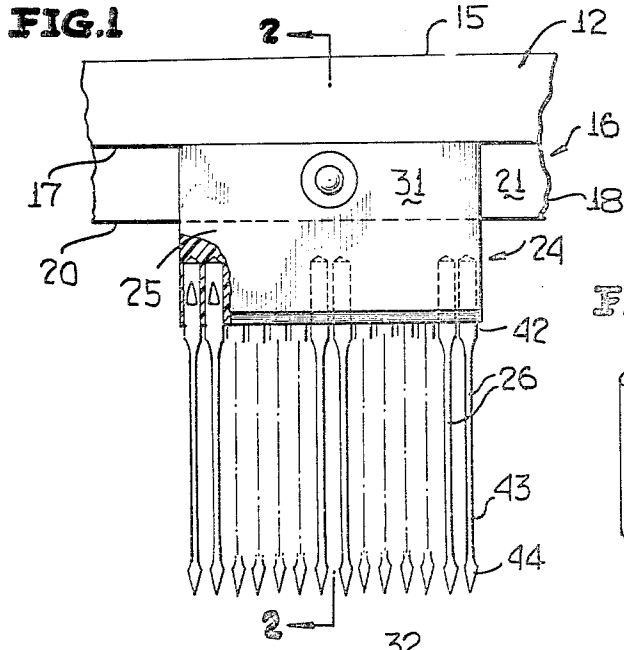


FIG.2

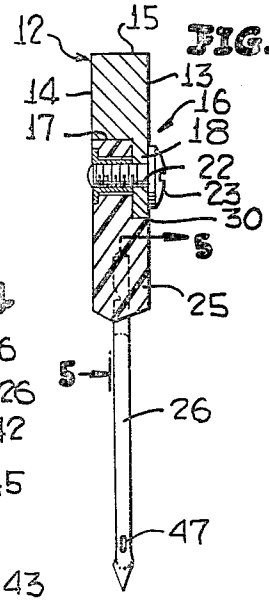


FIG.4

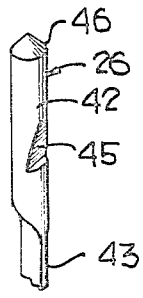


FIG.3

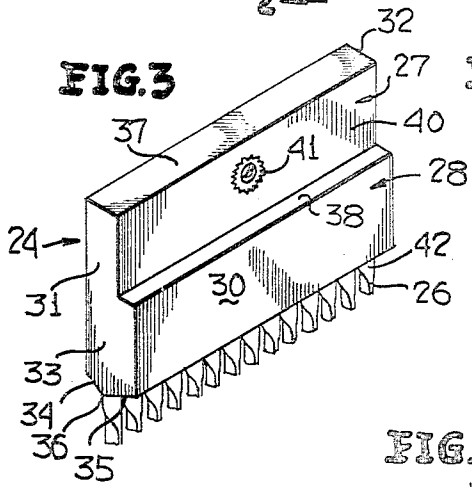


FIG.5

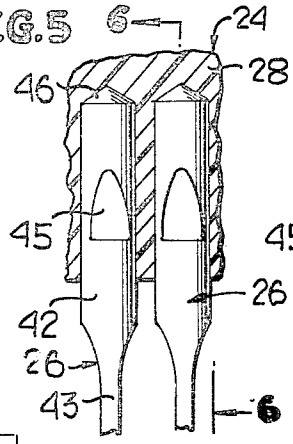


FIG.6

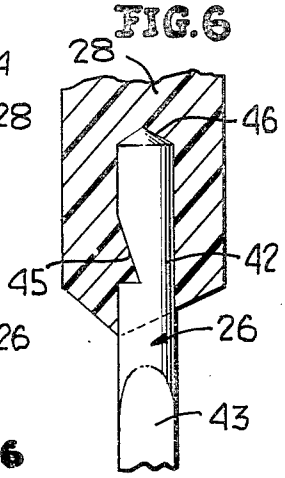


FIG.8

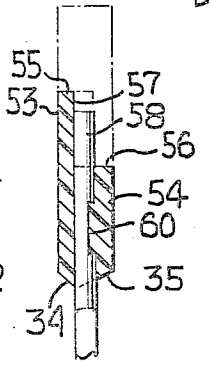


FIG.7

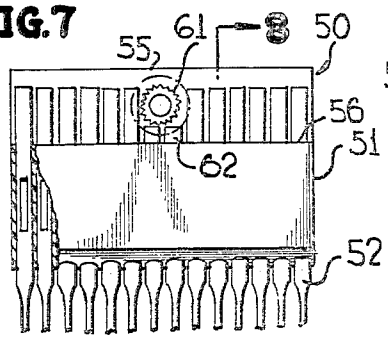
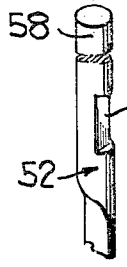


FIG.9



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TUFTING MACHINE NEEDLE ASSEMBLY

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U.S. Cl. 112—226 4 Claims

ABSTRACT OF THE DISCLOSURE

This disclosure relates to tufting needles, needle units comprising a plurality of needles cast into a single carrier member, and needle unit assemblies including a plurality of needle units mounted on a needle bar. The needles have thrust surfaces on their shanks and are molded or cast into carrier members. The shank ends may also provide thrust surfaces, or may extend between spaced thrust surfaces of their carrier member. The needle units are mounted onto a bar, each by a single fastener, the bar having spaced thrust surfaces, at least one of which may be aligned beyond the shank end, or the free ends of the needles extending between carrier member thrust surfaces may be clamped against a vertical surface of the bar.

This invention relates to tufting machine needle assemblies, and in particular to needle units each including a plurality of needles, adapted to be easily mounted on a needle bar.

Tufting machines in general are quite large and utilize many needles for sewing rows of stitches in close relation, one to the other. Generally, the stitches contemplate the use of a heavy yarn-like thread, and loops made in the stitching operation have hooks spaced from a base fabric to provide the effect of a carpet pile. These loops may remain uncut to form a loop pile, or may be slit, in which case a cut pile is effected.

Tufting machines are substantially large, in width, the desired width of the tufted material determining the length of the row of needles required. The density of needles in this row thereby determines how close the stitches are made and thus the density of the pile of the tufted material. Generally speaking, when the tufted material is carpet or the like, the more dense the pile is, the better is the quality of the carpet. It is therefore desirable, where quality of the tufted material is an essential element, that the ratio of needles per length of bar be as high as possible.

In tufting machines of the prior art type, a bar may, for example, be 16 feet long and contain over 1,000 needles. Each needle is generally inserted in a drilled hole, and locked in the hole by means of a set screw or the like. In addition to the needle holes, other holes are provided, to attach the bar to the machine. The needle bar thus requires two holes for each needle utilized; one to house the needle, and one to house a set screw, in addition to the holes necessary to clamp the bar to the machine. Thus, if a thousand needles are to be required on a given needle bar, over 2,000 precisely located holes must be machined into a very long piece of machine steel. Furthermore, each needle must be separately rotationally oriented by visual inspection, and its set screw must be separately tightened.

Tufting machine assemblies of the prior art have been found to be undesirable, in that this needle arrangement is highly expensive, in requiring a large number of machined holes. Such machining operations cannot be quickly effected, and thus render the cost of the needle bar to be quite expensive. Furthermore, because adjacent needles must have a wall of at least a minimum thickness therebetween, a necessary limitation is placed on the closeness of the needle holes. This reflects upon the quality of the carpet or other tufted material, as has been mentioned above. Even further, because the needle positions must be manually adjusted, they are often inaccurately oriented, and there may be inconsistencies in needle length, due to the limitations on visual alignment and inaccuracies in the depth of the drilled needle holes. These inaccuracies result in corresponding irregularities in loop heights of the tufted material.

A particularly undesirable feature of prior art types of tufting needle assemblies is that no variation may be obtained in needle spacing without the design and manufacture of an entire new bar. Also, variations in the type of needle to be utilized with a given bar are quite restrictive, in that the shanks of all needles to be utilized must fit in the needle holes which exist in the bar.

The present invention seeks to obviate the above and other undesirable features of prior art types of tufting machine needle assemblies, in providing a plurality of tufting needle units mounted on a bar, the units being adapted for replacement as desired, and each unit including a plurality of needles molded therein, depending upon the particular pile desired for the tufted material.

Accordingly, it is a primary object of this invention to provide a tufting needle unit for adaptation to a needle bar of a tufting machine, wherein needle shanks are cast or molded into a carrier member, the needle shank having at least one substantially transverse thrust surface in engagement with a corresponding carrier member surface.

It is a further object of this invention to provide a tufting needle unit including needles which are molded or cast into a carrier member, with the shank ends of the needles as well as notches in the needle shanks providing abutment surfaces, in molded engagement with the carrier member.

It is a further object of this invention to provide a tufting needle unit comprising a plurality of tufting needles, with their shanks cast or molded to a carrier member, each carrier member being provided with a single fastening means for attachment of the tufting needle unit to a needle bar.

It is yet another object of this invention to provide a tufting needle unit, whereby needle shanks are cast or molded into a needle carrier member, each of the needle shanks having at least one thrust surface in abutting relation to a corresponding surface on the carrier member, molded thereabout, wherein the needles may be positioned as close together as desired, even in touching relation, one to the other.

It is a further object of this invention to provide a tufting needle assembly wherein needle shanks are cast or molded into a carrier member, whereby shank portions of the needles may be clamped between a carrier member surface and an adjacent surface of a needle bar.

It is yet another object of this invention to provide a tufting needle comprising a point-ended needle portion at a shank portion, with the shank portion having a thrust surface spaced from a free end of the shank.

It is a further object of this invention to provide a tufting machine assembly including a needle bar and a plurality of needle units of the types described above, wherein a single attachment hole is provided on the needle bar for each needle unit, and the needle bar has at least one thrust surface adapted to be in abutting engagement with a corresponding thrust surface on the needle unit.

With the above and other objects in view that will hereinafter appear, the nature of the invention will be more clearly understood by reference to the following detailed description, the appended claimed subject matter,

and the several views illustrated in the accompanying drawing.

In the drawings

FIGURE 1 is a rear elevational view showing a fragmentary portion of a needle bar, with a single tufting needle unit secured thereto, the needle unit being partially illustrated in section, to show disposition of needle shanks molded therein.

FIGURE 2 is a sectional view taken along the line 2—2 of the tufting needle assembly illustrated in FIGURE 1, and wherein the carrier member is illustrated with portions molded into engagement with notches in needle shanks, and with the means of attachment of a needle unit to a needle bar being best illustrated.

FIGURE 3 is a front perspective view of a needle unit of this invention, wherein spaced upper and lower thrust surfaces are illustrated, with the needle shanks being entirely embedded within the carrier member at their upper ends.

FIGURE 4 is an enlarged fragmentary perspective view of a tufting needle of this invention, wherein a wedge-shaped notch is illustrated in the needle shank portion.

FIGURE 5 is an enlarged fragmentary sectional view through the carrier member and a pair of needles of this invention taken along the line 5—5 of FIGURE 2, and wherein wedge-shaped notches in the needle shanks are illustrated.

FIGURE 6 is an enlarged fragmentary cross-sectional view through a needle unit of this invention, taken along the line 6—6 of FIGURE 5.

FIGURE 7 is a front elevational view of a modified form of tufting needle unit of this invention, with a portion thereof shown in sections, wherein the needle points are not illustrated, but illustrating an extension of the needle shanks between upper and lower thrust surfaces of the carrier member.

FIGURE 8 is a vertical sectional view taken along the line 8—8 of the modified needle unit illustrated in FIGURE 7, wherein a needle bar is illustrated in phantom, with the needle unit disposed in position for attachment to the needle bar.

FIGURE 9 is an enlarged fragmentary top perspective view of a modified form of tufting needle, adapted for use with the unit illustrated in FIGURE 7, wherein the notch in the shank is generally rectangular.

Referring now to the drawings in detail, reference is first made to FIGURE 1, wherein there is illustrated a needle bar **12** of this invention, having front and rear surfaces **13** and **14** respectively, an upper surface **15**, and a generally inverted L-shaped lower portion **16**. The L-shaped portion **16** includes an upper thrust surface **17**, a depending leg portion **18**, terminating in a lower thrust surface **20**, and a vertical surface **21**, extending transversely of and connecting the thrust surfaces **15** and **20**.

The depending leg portion **18** of the carrier member **12** is provided with a plurality of transverse bore holes **22**, extending between the surfaces **13** and **21** of the needle bar, each bore hole **22** being adapted to receive a fastener **23** therein, for attachment of a needle unit (later to be described) to the needle bar **12**.

Each needle unit generally designated by the numeral **24**, includes a carrier member **25** and a plurality of needles **26**. The carrier member **25** includes an upper connection portion **27** and a lower needle retention portion **28**. The carrier member **24** is defined by front and rear surfaces **30** and **31**, end surfaces **32** and **33**, lower sloped surface portions **34** and **35**, terminating in an apex **36**, an upper thrust surface **37**, a ledge or lower thrust surface **38**, and a vertical surface **40**, extending transversely of and connecting the thrust surfaces **37** and **38**. The upper portion of the carrier member **24**, comprising the attachment portion **27** and an upper end of the needle securing portion **28** are of generally L-shaped configuration, terminating in the surfaces **40** and **38**, also of generally L-shaped configuration.

The fastening portion **27** of the carrier member **24** has a corrugated, drilled and threaded bushing **41**, extending therethrough, approximately centrally located with respect to the vertical surface **40**, for attachment of the carrier member **24** to the depending leg-like portion **18** of the needle bar **12** by means of the fastener **23**, in the manner illustrated in FIGURE 2.

Each needle **26** comprises a shank portion **42**, a generally flat portion **43**, and a point-ended portion **44**. The shank **42** is substantially enlarged with respect to the flat portion **43**, to facilitate the transmission of thrust from the needle **26** to the carrier member **24**. The needle shank portion **42** is provided with a generally wedge-shaped notch **45**.

Each carrier member **24** is constructed of cast metal or molded plastic, each unit **24** being approximately 2 inches long and containing, for example, between 10 and 15 needles, depending upon the size and density of pile desired on the tufting material. The carrier member is molded about the shank portions **42** of the needles **26**, the mold or cast material filling the void created by the wedge-shaped notch **45** of each needle **26**, for providing a thrust surface of the needle, against the mating molded surface portion of the carrier member, as well as presenting a "flat," for prevention of rotation of each needle **26**, relative to the carrier member **24**, due to the cast material of the carrier member **24** filling the wedge-shaped notch **45**. The needles **26** terminate at their upper ends in end surfaces **46**, and the upper ends of the shanks **42** are entirely encased within the needle securing portion **28** of the carrier member **24**, thereby providing an additional thrust surface **46** for each needle **26**, against that portion of each carrier member **24** which is molded against each needle and surface **46**.

It is to be noted that the shank portion **42** of each needle **26** is substantially larger than the flattened portion **43** of each needle **26**, and that this feature provides a greater area for both the notch **45** and the end surface **46**, to reduce the thrust per square inch of needle surface against the molded material, thereby preventing the needles from pounding themselves loose during operation. Additionally, it is to be noted that the point of emergence of each needle shank portion **42** from the needle securing portion **28** of the carrier member **24**, through the sloped surface **35**, is rounded, thereby allowing the needles to be rotated to their proper stitching orientation, either before molding of the carrier member **24** thereabout, or during the molding operation, and prior to the setting of the molded material. The needles **26** are generally aligned within their carrier member **24** by visual inspection, setting the needle point-ended portions **44** at a closely controlled distance from the thrust ledge **38** of the carrier member **24**, thereby providing a degree of precision not previously attained in tufting needle machines, and facilitating the alignment of needle eyes **47**. This type of accurate visual setting of the needles **26** within the carrier member **24** also allows the needles to be purposely misaligned, when misalignment is desirable, as when making a variable pile height pattern, without necessitating the manufacture of special needles for achieving a pattern of variable pile height.

In molding the needles **26** into the carrier members **24**, the needles may be placed together as closely as desired, even in adjacent touching relation to one another, if desired.

The above-mentioned locking position of the needles **26** within the carrier member **24** thus facilitates the transmission of needle stress to the notches **45** and end surfaces **46**, to the carrier member **24**, then to the needle bar **12** by abutting engagement of the upper and lower thrust surfaces **37** and **38** with corresponding thrust surfaces **17** and **20** of the needle bar.

It is to be noted that the thrust surface **37** of the carrier member **24** and its mating thrust surface **17** of the needle bar **12** are positioned directly above, or beyond

the upper end 45 of each needle 26, thereby facilitating a transmission of needle thrust in a direct line to the needle bar 12.

A single fastening means 41 is provided in the fastening portion 27 of each carrier member 24, and is molded therein during the molding of the carrier member 24 about the needles 26, but it is to be noted that a plurality of fastening bushings 41 may be provided, if desired, secured within a corresponding plurality of holes 22 in the needle bar 12 although a single such fastening bushing 41 has been found to be desirable, in reducing the number of holes 22 to be machined in the needle bar 12, to a minimum.

In FIGURES 7 through 9, is illustrated an alternative embodiment of the invention, wherein there is provided a needle unit 50 comprising a carrier member 51 and a plurality of needles 52. The carrier member 51 includes an upper fastening portion 53 and a lower needle housing portion 54, with the upper portion 53 terminating in an upper thrust surface 55, and the portion 54 terminating in an upper thrust ledge, or surface 56. A generally vertical surface 57 connects the thrust surfaces 55 and 56. It is to be noted that the upper fastening portion 53 is of substantially reduced thickness, as compared to the corresponding fastening portion in the embodiment illustrated in FIGURES 1 through 6, in order to facilitate the passage of substantially elongated shanks 58 of needles beyond the thrust surface 56 of each carrier member 51.

Each needle 52 is provided with a generally rectangular notch or "flat" 60, to provide surfaces for the transmission of thrust from each of the needles 52 to the carrier member 51.

The carrier member 51 is provided with a threaded fastening bushing 61, the needles 52 positioned therebeneath having substantially shortened shanks 62, as compared to the shanks 58 of the remaining needles, in order to facilitate securing of a fastening member 23 to the bushing 61, during assembly of the units 50 on a needle bar.

The units 50, with the extended shank portions 58 of the needles 52 are adapted to be fastened to a needle bar 12, identical to the one discussed above, with the extended shank portions 58 of the needles 52 clamped between the surface 57 of the carrier member 51, and an adjacent vertical surface of the needle bar, similar to vertical surface 21 of the needle bar 12. Also, the thrust surfaces 55 and 56 of the carrier member 51 are in abutting engagement with corresponding thrust surfaces of the needle bar, when the carrier member 51 is secured to the needle bar 12 by means of a fastening member, such as fastener 23.

While preferred forms and arrangement of parts have been shown in illustrating the invention, it is to be clearly understood that various changes in details and arrangement of parts may be made without departing from the spirit and scope of the invention as defined in the appended claimed subject matter.

I claim:

1. A tufting needle unit for use in a tufting machine comprising a plurality of similarly disposed elongated needles, the needles having shank portions cast or molded into a carrier member, with point ended needle portions extending therefrom, each needle having at least one substantially transverse thrust surface cooperatively disposed against a corresponding carrier member surface, said carrier member including an uppermost abutment surface and a ledge surface spaced therefrom, said needle shanks extending through said ledge surface against a longitudinal surface connecting said ledge and abutment surfaces.

2. A tufting machine assembly comprising a needle bar and a plurality of needle units mounted thereon, each needle unit containing a plurality of needles having shanks cast or molded into a carrier member, wherein each carrier member is secured to said bar by a single fastener extending through an associated single hole in the bar, each said carrier member having upper and lower spaced thrust surfaces in abutting engagement with corresponding portions of complementary upper and lower bar surfaces, and needle shanks extending upwardly beyond each said carrier member lower thrust surface, said carrier member having a vertical surface extending between said upper and lower spaced thrust surfaces, said needle bar having a vertical surface adjacent to said carrier member vertical surface, and means for clamping said needle shanks between the vertical surface of said carrier member and the vertical surface of said needle bar.

3. The combination of a needle bar and a plurality of needle units, each needle unit comprising a plurality of needles having a shank thereof fixedly molded into a carrier member, said carrier member having upper and lower thrust surfaces thereon cooperatively disposed in engagement with a pair of complementary thrust surfaces on said needle bar, and said complimentary thrust surfaces of said needle bar and needle units being of equal transverse widths whereby the total available areas of the respective thrust surfaces are utilized.

4. A combination as defined in claim 3 wherein each of said needle units is fixedly secured to said needle bar by fastener means integrally molded in said carrier member below said upper thrust surface and above said lower thrust surface.

References Cited

UNITED STATES PATENTS

204,294	5/1878	Cook et al.	112—226
2,722,904	11/1955	Platt	112—226
2,834,310	5/1958	Hleb	112—226
3,301,205	1/1967	Card	112—79
3,387,577	6/1968	Spanel et al.	112—79

FOREIGN PATENTS

1,147,781	6/1957	France.
842,818	12/1959	Great Britain.

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U.S. Cl. X.R.

112—79