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TUFTING MACHINE HAVING VERTICALLY ADJUSTABLE NEEDLE PLATE

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Fig. 1.

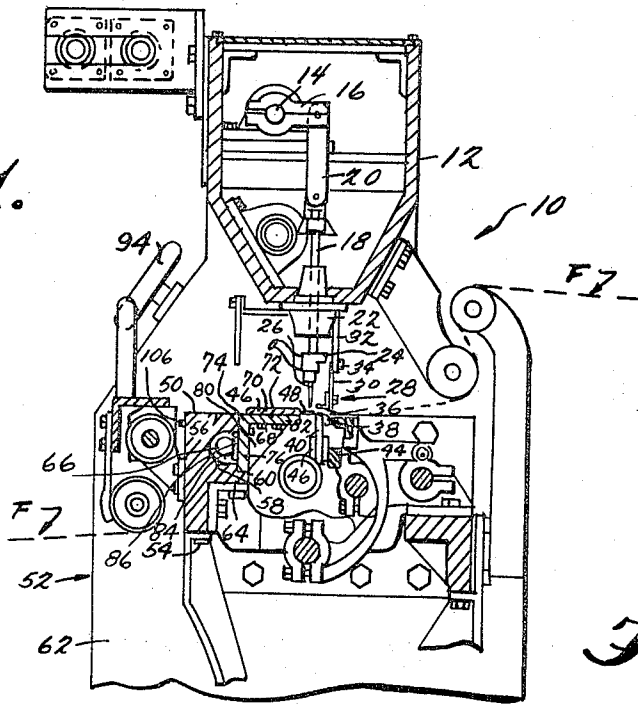


Fig. 3.

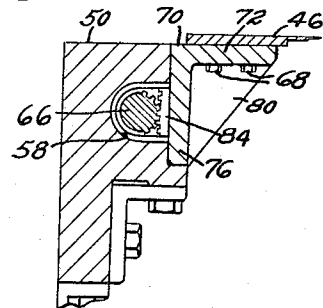
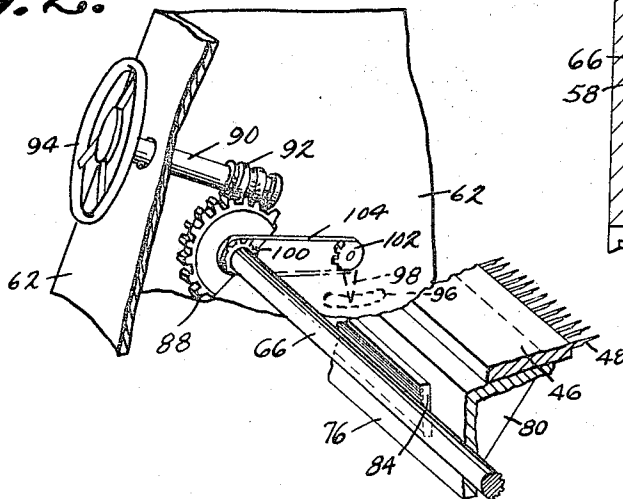


Fig. 2.



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TUFTING MACHINE HAVING VERTICALLY ADJUSTABLE NEEDLE PLATE

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6 Claims. (Cl. 112-79)

The present invention relates to tufting machinery and more particularly to an improved vertically adjustable needle plate for facilitating production of tufted textile products such as carpeting, bedspreads, toweling and the like having desired pile height.

Conventional tufting machines operate upon previously produced backing fabric, usually a woven reticulated strip which is conveyed through the machine and through the openings of which are projected loops of yarn or similar fiber bodies. The loops may be cut in order to form cut pile and a backing coating may be applied to the opposite side of the tufted fabric from the pile in order to insure retention of the yarn by the backing fabric.

Conventional tufting machines usually include a gang of thread or yarn carrying needles, a gang of thread engageable members, such as loopers and/or cutters, below the needles and operatively associated therewith, and a bed plate and needle plate disposed intermediate the needles and loopers or cutters. The needles usually are reciprocated in a vertical stroke to pass yarn through a backing moving through the machine and supported by the bed plate and needle plate. The loopers and/or cutters engage the yarn after it has passed through the backing and form the appropriate cut pile tufts or uncut pile loops. Thus each of the needles and its associated looper and/or cutter can form a line of stitching in the backing to provide the face pile.

In some conventional tufting machines, when it is desired to change the depth of the pile being produced, the vertical position of the needle plate has to be adjusted, as by removing it from the bed plate and shimming it up or down to the right position. At the same time, however, it is necessary for the stroke of the needles to be increased for increased pile depth or decreased for decreased pile depth. Heretofore, such change in the stroke of the needles would alter the stroke at both ends, that is, if the stroke were increased, the needles would go down to a lower position than before and to a higher position than before. This obviously changed the relationship of the needles to the loopers and/or cutters when the needles were at the bottom of their stroke, thereby necessitating some further adjustment, usually effected by appropriately changing the vertical position of the needles in the needle carrier, in order that the bottom of the needle stroke would be maintained in proper relation to the loopers and/or cutters.

Understandably, this procedure makes the operation of adjustment of the machines for changes in pile depth arduous, time consuming and demanding.

Accordingly, various structures have been proposed as exemplified by the United States patent to Cobble et al. No. 2,977,905 for simplifying and facilitating the adjustment of tufting machines to obtain desired changes of the depth of pile of tufted articles produced on such machines. Specifically, that patent provided means for adjusting the stroke of the needles so that upon changing the length of path of reciprocation of the gang of needles, their lowermost extent of travel remains unchanged and only the

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uppermost extent of travel changes. Accordingly, the relationship between the needles and the loopers and cutters remains unchanged. The remaining adjustment involves changing the position at which the backing fabric is supported relative to the needles at the point where the pile loops are inserted in the backing fabric. The Cobble et al patent aforementioned provided a vertically adjustable needle plate support secured to an outer face of the bed plate of the tufting machine and cantilevered thereover to a point above the loopers and cutters.

Although the structure just described has found wide acceptance, the attempted inclusion of this structure in tufting machinery designed to be operated at higher speeds has brought to light certain limitations of the structure just described, particularly limitations resulting from excessive vibration of the long cantilevered section of the adjustable needle plate support. Such high amplitude vibration at high speeds tended to produce pile of unacceptably uneven height.

It is an important object of the present invention to provide an improved adjustable bed plate support for effecting facile height adjustment of the pile of tufted fabric articles while materially reducing such high amplitude vibration of the apparatus as would produce undesirably uneven pile height.

Stated positively, it is an object of the invention to provide apparatus for producing desirably even pile tufted articles at rapid rates and with desired, adjustable pile depths.

These and further objects of the invention will become more clearly apparent during the course of the following detailed discussion relating to a preferred embodiment of the invention as shown in the attached drawings.

In the drawings:

FIGURE 1 is a vertical sectional view through a tufting machine having an adjustable bed plate assembly which embodies principles of the present invention; and

FIGURE 2 is a fragmentary perspective view of the adjustable bed plate assembly of FIGURE 1.

FIGURE 3 is a sectional view on an enlarged scale of a portion of the machine of FIGURE 1.

In the tufting machine 10, the head 12 encloses a rocker shaft 14 to which a plurality of rocker arms 16 are keyed so as to drive push rods 18 through connecting links 20.

The needle drive mechanism for allowing fine adjustment of the needle stroke form no part of the present invention and are not shown. Suitable needle drive means are disclosed in the aforementioned United States patent to Cobble et al. No. 2,977,905 whose disclosure is now expressly incorporated by reference.

The push rods 18 extend from the head 12 through packing 22 and receive a needle bar 24 secured to the lower extent of the push rods. The needle bar in turn receives a plurality of vertically oriented needles 26 which are spaced along the needle bar for reciprocation toward and away from backing fabric to be tufted.

A needle stripper 28 in the form of an angle iron is shown secured to the packing assembly 22 by an adjustable bracket 30, 32 so as to depend therefrom to a position just downstream from the path of reciprocation of the needles 26. By virtue of a pin and slot arrangement 34, the bracket is height adjustable so that the stripper 28 can be independently oriented so that its lower surface 36 is just above the upper surface of the backing fabric F just tufted and below the lower ends of the needles 26 at the upper extent of their path of travel. The needle stripper 28 accordingly restrains the backing fabric from being pulled

upwardly by the needles as they ascend through the backing fabric. This convenient mounting of the needle stripper eliminates the need for a back rail thus effecting a substantial saving of parts.

A plurality of loopers 38 are mounted for oscillatory motion beneath the path of travel of the needles 26 to intercept the yarn inserted through the backing fabric F by the needles 26 and retain it as the needles ascend in order to form loops thereof. A plurality of knives 40, mounted in knife blocks 42 in turn mounted in a knife block bar 44 are mounted for oscillatory movement, each in side by side resilient engagement with a looper 38 to cut the loops of yarn by scissors action against the sides of the loopers when cut pile is desired.

The needle plate 46 includes a flat strip to which a plurality of parallel, horizontally projecting fingers 48 are secured so as to support the fabric F at the tufting point. The fingers 48 are each positioned between the path of travel of two adjacent needles 26 so that damage to the needles from striking the needle plate is avoided.

According to the present invention the upstream bed plate 50 of the tufter 10 is fixedly secured to the base 52 of the machine by bolts 54 or the like so as to present the upper surface 56 thereof adjacently underlying the fabric F just upstream of the tufting point. The bed plate 50 includes means defining a generally horizontal channel 58 in the face 60 thereof which is presented toward the loopers. The channel 58 extends the length of the bed plate 50 i.e. across the producing width of the machine between the left leg 62 and right leg (not shown) thereof.

As shown the bed plate 50 is preferably quite massive and includes a horizontally extending inwardly projecting lip 64 on the inner face 60 thereof below the channel 58. This lip provides a stop to limit downward adjustment of the needle plate 46 by abutment of the lower end of the support 74 with the upper surface of the lip 64.

A shaft 66 is received in the channel 58 for rotation about its own longitudinal axis. The shaft 66 is suitably journaled for rotation, for instance in bearings (not shown) in the left and right legs of the machine.

The needle plate 46 is secured for instance by bolts 68 to the upper surface 70 of the horizontally directed leg 72 of an adjustable needle plate support 74. This support also includes a vertically directed leg 76 joined to the leg 72 at generally right angles so as to form a member of generally L-shaped transverse cross-section. To provide rigidity for the support 74 a plurality of triangular webs 80 are secured between the legs 72 and 76, for instance by welding. The webs 80 effectively preclude fluttering the end 82 of the leg 72 during high speed operation of the machine 10. Such fluttering as could occur in prior art constructions, for instance as shown in the aforementioned Cobble et al. patent, because of the long cantilevered legs necessitated by the orientation of the bed plate and needle plate support of such machines, resulted in vibration being imparted to the backing fabric at the tufting point with resultant uneven pile height across rows and from row to row.

The support 74 is vertically adjustable for adjusting the position of the needle plate with respect to the bed plate to maintain proper relationship among the needles, needle plate and stripper when the stroke of the needles is changed. The adjustment means includes a plurality of racks 84 spaced along and secured to the rear face 86 of the support leg 76. The teeth of the racks 84 intermesh with corresponding teeth formed on the shaft 66. As shown the height of each rack is somewhat less than the vertical distance between the walls of the channel 58 at its mouth to allow limited vertical movement of the racks within the channel mouth. If further adjustability is desired material can be removed from the inner face 60 above and below the channel 58 at the points where the racks are adjacent the bed plate.

As best seen in FIGURE 2, the height of the support 74 and needle plate 46 are conveniently adjustable by rota-

tion of the shaft 66. Exemplary means shown for rotating the shaft 66 include a worm gear 88 mounted on the shaft 66, and a shaft 90 journaled in the left leg of the machine, having a worm 92 at its lower end engaged with the worm gear 88. A hand wheel 94 received on the upper end of the shaft 90 permits easy rotation of the shaft 66 through the mechanism just described.

As shown in FIGURE 2 the adjustment assembly may also include an indicator plate 96 with actual pile height measurement designations marked thereon. This plate may conveniently be mounted on the outside of the machine's left leg.

An indicator 98 journaled in the leg is operatively connected to the shaft 66, for instance by sprockets 100, 102 on the shaft 66 and indicator respectively and an endless chain 104 received on the sprockets 100 and 102.

To increase or decrease the pile height, the operator loosens the clamp bolts 106 secured to the bed plate through vertical slots in the support 74, turns the hand wheel 94 until the indicator 98 points to the desired pile height, retightens the bolts 106 to relieve strain on the worm 92 and worm gear 88, and checks to see if the needles at their uppermost extent of travel clear the cloth. If there is proper clearance tufting recommences, if not the clearance is adjusted by changing the needle stroke, for instance in the manner set forth in the aforementioned Cobble et al. patent.

It should now be realized that the apparatus described efficiency achieve each of the objects of the invention as set forth hereinbefore and well illustrate the principles of the invention. Inasmuch as the specific embodiment shown is susceptible of considerable modification without departing materially from these principles the present invention should be understood as encompassing all such modifications as are within the spirit and scope of the following claims.

We claim:

1. In a tufting machine having a plurality of needles mounted for reciprocation toward and away from a plurality of yarn intercepting loopers: support means for supporting backing fabric above and adjacent said loopers, said support means comprising a bed plate having a generally vertically face thereof presented toward said loopers, a needle plate support having a vertical face thereof in face to face engagement with said bed plate face, and a needle plate secured to said needle plate support; and means cooperatively carried between said bed plate and said needle plate support for adjusting the vertical relationship between said needle plate and said loopers to thereby vary the depth of pile produced in the backing fabric by said machine.

2. The tufting machine of claim 1 wherein the needle plate support comprises a vertically directed leg and a horizontally directed leg secured thereto so that said needle plate support has an inverted L-shaped transverse cross-section, said needle plate support vertical face being on the outside of said vertical leg and said needle plate being mounted on said horizontal leg.

3. The tufting machine of claim 2 further comprising means defining a plurality of generally triangular webs each secured to the vertical leg and the horizontal leg of said needle plate support to prevent fluttering of said horizontal leg and needle plate.

4. The tufting machine of claim 1 wherein the means for adjusting the vertical relationship between the needle plate and loopers comprises means defining at least one rack gear on said needle plate vertical face, means defining an elongated recess in said bed plate vertical face, a shaft rotatably mounted in said elongated recess, gear teeth means on said shaft engageable with said rack gear, and means for rotating said shaft to effect a vertical movement of said needle plate support and needle plate with respect to said bed plate wherein said needle plate support vertical face slides along said bed plate vertical face.

5. The tufting machine of claim 4 further including a needle stripper mounted on said machine adjacent and above said needle plate and independently movable with respect thereto.

6. The tufting machine of claim 4 further including means operatively connected to said shaft and providing a visual indication of the depth of pile produceable on said machine at the position of the shaft.

References Cited**UNITED STATES PATENTS**

2,977,905 4/1961 Cobble et al. ----- 112-79

JORDAN FRANKLIN, *Primary Examiner*.

J. R. BOLER, *Assistant Examiner*.