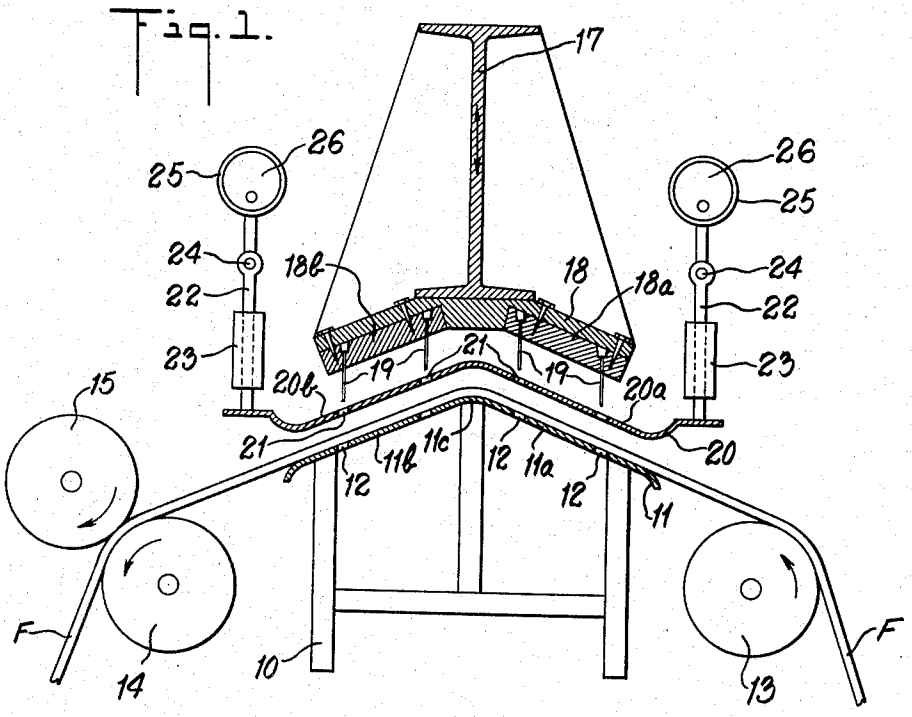
July 28, 1959 F. B. MORRILL 2,896,303

NEEDLE LOOM

Filed April 16, 1958

Fig. 1.



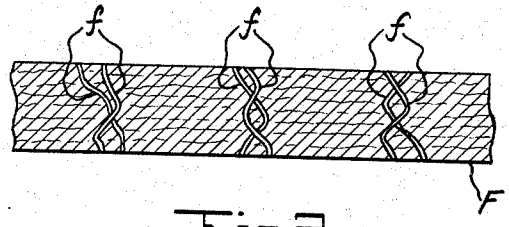


Fig. 2.

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NEEDLE LOOM

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5 Claims. (Cl. 28—4)

This invention relates to needle looms, such as those used for punching felt. The invention has particular reference to an improved needle loom which is adapted to relocate the punched fibers in a more favorable manner than is possible with conventional needle looms.

Needle looms as commonly constructed comprise a flat bed plate over which the felt or other material to be punched is moved. This bed plate has a series of holes for receiving the barbed ends of the needles, which are mounted on a board secured to a reciprocating beam above the bed plate. The needles project downwardly from the board in parallel relation to each other and to the reciprocating movements of the beam. A flat stripper plate is interposed between the needle board and the bed plate and has holes through which the needles extend, the stripper plate serving to strip the fibers from the needles as the latter are withdrawn from the material on the bed plate.

With a loom of this conventional type, the needles pick up the fibers which are in a horizontal plane and turn them at right angles by pulling them through the other fibers. Once a fiber has been pulled through the material and is at right angles to the remainder of the horizontal fibers, the needles will generally have little or no further effect upon it, particularly if the material is repunched from the same side. In some instances, the felt is turned over and repunched from the other side, but even in such instances, the needle barbs will usually have no substantial effect upon the vertical fibers. In order to arrange the fibers so that they will hold in the felt, it is not uncommon to run the felt through the conventional needle loom as many as twenty times. Obviously, it would be a distinct advantage if, in a single pass of the material through the loom, the punched fibers could be relocated so that they would hold adequately in the felt.

The principal object of the present invention is to provide a needle loom affording the advantage noted above.

A needle loom made in accordance with the invention comprises spaced needles secured to the reciprocating beam and projecting therefrom in parallel relation to each other and to the reciprocating movements of the beam, as in conventional needle looms. However, opposing the needles is a bed plate section inclined in one direction from a plane normal to the needles, this section having the usual holes for receiving the needles. The new loom also comprises an inclined stripper plate section disposed substantially parallel to the inclined bed plate section and having holes through which the needles extend toward the latter section, the stripper plate section being spaced from the bed plate section to form a passage for the material to be punched. Means are provided for moving the material through this passage at intervals between the punching operations.

With the new construction, the needles enter the material on the bed plate section while inclined at an acute angle to the plane of the material, so that the punched fibres will extend in one direction at an angle to the plane of the material. By re-running the material through the loom and re-punching it at the opposite angle, the needles will catch the previously punched fibers and relocate them at a still different angle, whereby the holding action of the punched fibers in the material is greatly increased.

In one form, the new loom has two bed plate sections inclined downwardly and away from each other, so that the lower edges of these sections are disposed at the feed and discharge ends, respectively, of the passage through which the material is moved between the bed plate sections and correspondingly inclined stripper plate sections. Consequently, the tendency for the needles to displace the material on the first bed plate section downwardly toward the feed end of the passage, during the punching operation is counter-balanced by the tendency for the needles to displace the material on the second section downwardly toward the discharge end of the passage. Thus, the material is held firmly down during the punching operation to prevent the material from slipping and thereby causing breakage of the needles. Also, such slipping of the material on the bed plate sections is resisted by the tendency for the needles to force the material into the holes in these sections, although these sections, if desired, may be further roughened to provide a more suitable non-slipping surface. Such slippage of the material can be further resisted by providing slight tension in the material, and for this purpose I prefer to provide means including a driven roller operable to draw the material under tension through the passage between the inclined bed plate sections and the inclined stripper plate sections.

In extreme cases, where the material exhibits a slipping tendency on the bed plate sections in spite of the expedients described above, I provide means for reciprocating the stripper plate sections parallel to the needles but relative thereto, so that these plate sections can be actuated to press the material against the bed plate before the needles enter the material.

For a better understanding of the invention, reference may be had to the accompanying drawings, in which

Fig. 1 is a longitudinal sectional view, partly schematic, of a preferred form of the new needle loom, and

Fig. 2 is a detail sectional view of felting, showing an arrangement of fibers resulting from the angled punching with the new apparatus.

Referring to the drawing, the loom illustrated in Fig. 1 comprises a frame **10** supporting a bed plate **11** which consists of two sloping sections **11***a* and **11***b*. The section **11***a* slopes downwardly to the right while the section **11***b* slopes downwardly to the left, the two sections being joined at a ridge or hump **11***c*. As shown, each bed plate section **11***a*—**11***b* is inclined to the horizontal at an angle of approximately 22½°, although this angle is not critical. Each bed plate section is provided with a series of holes or perforations **12** for receiving the needles to be described presently. A horizontal roller **13** is mounted opposite the feed end of the loom, and horizontal nip rollers **14** and **15** are mounted opposite the discharge end of the loom. These rollers are rotatable in suitable bearings (not shown), and at least one of the nip rollers **14** and **15** is positively driven intermittently so as to draw the felt F (or other material) through the loom with a step-by-step motion. Thus, the rollers **14**—**15** form in effect a means for moving the felt F through the loom under a slight tension, the felt moving first to the bed plate section **11***a* from the idler roller **13** and then to the bed plate section **11***b*.

A vertically reciprocating beam **17** extends transversely of the loom above the ridge or hump **11***c* of the inclined bed plate sections. This beam may be mounted in any suitable manner on the frame **10** and may be driven by

eccentric or other suitable means (not shown) to provide the vertical reciprocating motion. Since suitable means for mounting and driving such reciprocating beams are well known in the art, it is unnecessary to describe or illustrate them here.

A needle plate or board **18** is secured to the lower portion of the reciprocating beam **17** and carries depending needles **19** arranged in suitable pattern only some of the needles being shown in the interest of clarity. The needles **19** are divided into two series, which are mounted, respectively, in sloping blocks **18***a* and **18***b* secured to the needle board **18**. As shown, the block **18***a* overlies and is parallel to the bed plate section **11***a*, while the block **18***b* overlies the bed plate section **11***b* and is parallel thereto. The needles **19** of both series may be of conventional form having the usual barbed ends, and they are aligned with the holes **12** in the two bed plate sections. The needles, of course, extend parallel to each other and to the reciprocating movements of the beam **17**, that is, in the vertical direction as illustrated.

Between the needle board **18** and the bed plate sections **11***a* and **11***b* is a stripper **20** having inclined plate sections **20***a* and **20***b*. The stripper has holes **21** through which the needles **19** extend from the needle board toward the corresponding holes **12** in the inclined bed plate sections. The stripper plate sections **20***a* and **20***b* overlie and are parallel to the bed plate sections **11***a* and **11***b*, respectively. Thus, the angled space between the bed plate **11** and the stripper **20** forms a passage through which the felt F is drawn by the material moving means including the driven nip rollers **14—15**; and the lower edges of the bed plate sections **11***a* and **11***b* are disposed at the feed and discharge ends, respectively, of this passage. If desired, the angled stripper plate **20** may be mounted in a stationary position to perform its function of stripping the fibers from the barbed ends of the needles **19** when they are withdrawn from the felt F during the upward movement of the reciprocating beam **17**. However, in some instances it may be advantageous to use the stripper plate also as a means for pressing the felt against the sloping bed plate sections while the needles enter the felt during the downward movements of the reciprocating beam; and for this purpose the stripper plate is shown mounted for vertical reciprocating movements relative to the needles. The means for thus reciprocating the stripper plate **20** may take any desired form, but as illustrated they comprise vertical rods **22** secured at their lower ends to the corner portions of the stripper plate and guided vertically in fixed bushings **23**. At its upper end, each rod **22** is connected through a pivot **24** to a yoke **25** surrounding a driven eccentric **26**.

It will be understood that the eccentrics **26** are driven synchronously but intermittently so as to press the the angled stripper plate **20** downward against the felt F upon each interruption of the feeding movement by the rollers **14—15**, and to raise the stripper plate from the felt upon withdrawal of the needles therefrom in preparation for the next feeding movement by the rollers **14—15**. In this way, the felt is clamped firmly against the inclined bed plate sections **11***a*—**11***b* when the needles enter the felt, thereby resisting any tendency for the downwardly moving needles to displace the felt toward the lower edges of the inclined bed plate sections.

In the operation of the needle loom, the needles **19** opposing the sloping bed plate section **11***a* will first punch the felt F at an acute angle to the plane of the felt in one direction (67½° as shown). Then, when the rollers **14—15** have drawn this punched portion of the felt over the hump **11***c* to the oppositely inclined bed plate section **11***b*, and the feed has again been interrupted, the needles **19** will enter the previously punched felt at an acute angle to its plane in the opposite direction. In this second punching of the felt, the needles **19** can catch at least some of the previously punched fibers and relocate them at a still different angle, since in general the previously punched fibers will not extend parallel to the needles **19** but will be inclined thereto at an angle of about 45°. Thus, the disposition of the punched fibers *f*, as a result of the second punching on the inclined bed plate section **11***b*, may be generally as illustrated in Fig. 2. As there shown, the punched fibers *f* do not extend completely vertically in the felt F but are inclined to the vertical at different angles, whereby they have a better holding action in the felt. In addition, by avoiding a vertical arrangement of the fibers after the final punching, the fibers are more readily affected by any subsequent fulling operation.

It is important, of course, to avoid any shifting of the felt F on the bed plate sections **11***a*—**11***b* during the interruptions of the feed through the loom, when the needles **19** are lowered to and through the felt and then raised from the felt, because otherwise the needles could be broken due to bending. However, due to the aforementioned tension in the felt between the driven nip rollers **14—15** and the idler roller **13**, the felt is drawn down against the inclined bed plate sections so as to resist shifting of the felt during the punching operation. Moreover, the downward movement of the needles into the felt tends to force the latter into the holes **12** of the bed plate sections, thereby providing a gripping action which further resists displacement of the felt on these sections during the punching operation.

It will also be apparent that during the punching operation the tendency for the needles to displace the felt F downwardly on the bed plate section **11***a* (toward the feed end of the passage) is counterbalanced by the tendency for the needles to displace the felt downwardly on the bed plate section **11***b* (toward the discharge end of the passage), which is a further factor tending to stabilize the felt against displacement as the needles enter the felt. As previously mentioned, the angled stripper plate **20** may also be used to resist such displacement by pressing the felt downwardly against the bed plate sections as the needles enter the felt.

I claim:

1. In a needle loom, the combination of a reciprocating beam, spaced needles secured to the beam and projecting therefrom in parallel relation to each other and to the reciprocating movements of the beam, a bed plate section opposing a series of the needles and inclined in one direction from a plane normal to the needles, a second bed plate section opposing another series of the needles and inclined in the opposite direction from said plane, the plate sections having holes aligned with the needles for receiving the same upon reciprocation of the beam, inclined stripper plate sections disposed substantially parallel to the respective bed plate sections and having holes through which the needles extend toward the bed plate sections, the stripper plate sections being spaced from the bed plate sections to form a passage, and means for moving material through said passage from one to the other of the bed plate sections between reciprocations of the beam.

2. The combination according to claim 1, in which the needles are substantially vertical, the bed plate sections being inclined downwardly and away from each other, the lower edges of the bed plate sections being disposed at the feed and discharge ends, respectively, of said passage.

3. The combination according to claim 1, in which said material moving means include a driven roller operable to draw the material under tension through said passage.

4. The combination according to claim 1, comprising also means for reciprocating the stripper plate sections parallel to the needles but relative thereto.

5. In a needle loom, the combination of a vertically reciprocating beam, spaced needles secured to the beam and projecting downward therefrom in parallel relation to each other and to the reciprocating movements of the beam, an inclined bed plate underlying the needles,

said plate being inclined in one direction from a plane normal to the needles and having openings aligned with the needles for receiving the same upon reciprocation of the beam, an inclined stripper plate disposed substantially parallel to the inclined bed plate and having holes through which the needles extend toward the bed plate, the stripper

plate section being spaced from the bed plate section to form a passage therewith, and means for moving material through said passage between reciprocations of the beam.

No references cited.