

March 29, 1960

E. C. RUST, JR
NEEDLE LOOM STRUCTURE

2,930,100

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2 Sheets-Sheet 1

Fig. 1.

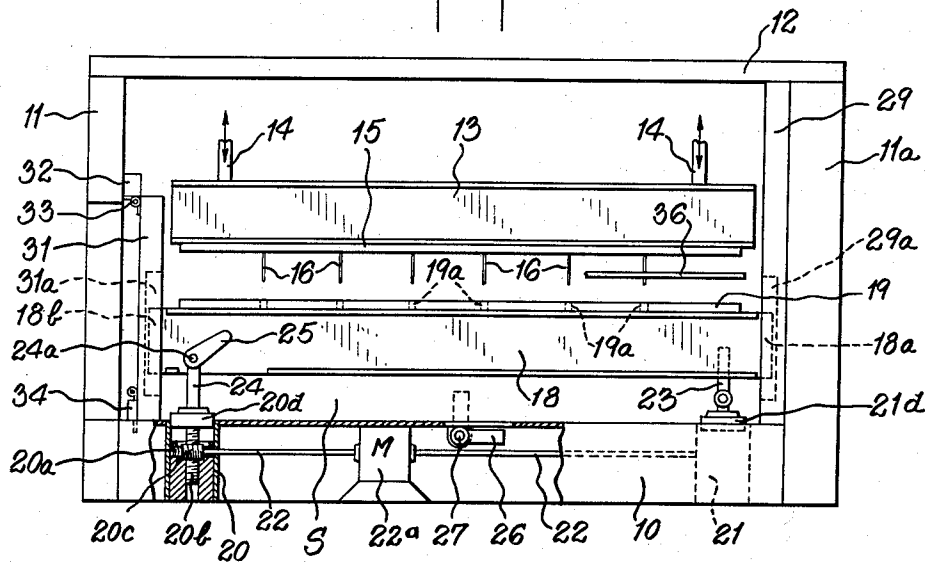
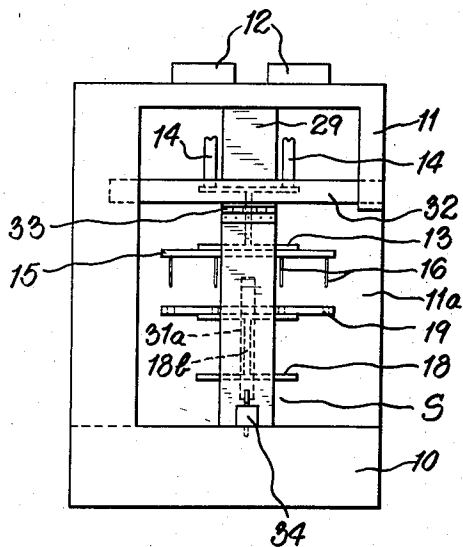


Fig. 2.

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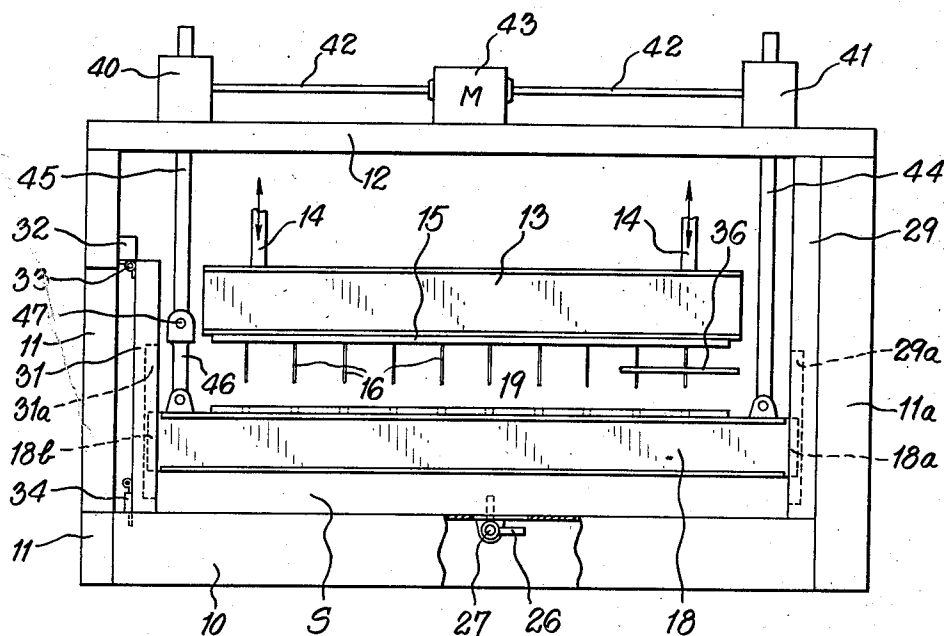
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Fig. 3.



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NEEDLE LOOM STRUCTURE

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11 Claims. (Cl. 28—4)

This invention relates to needle looms for punching felt and other materials, of the type having means for raising and lowering the bed plate or support for the material so as to adjust the penetration of the needles into the material. The invention has particular reference to an improved loom of this type in which the means for raising and lowering the bed plate also serve to facilitate placing an endless loop of the material on the loom and removing the loop from the loom.

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 openings 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through which the needles extend, the stripper plate serving to strip the fibers from the needles as the latter are withdrawn from the material on the bed plate. In order to permit adjustment of the extent to which the needles penetrate into the material on the bed plate, the loom is provided with means for raising and lowering the bed plate relative to the needle board.

It is frequently desirable to pass the felt or other material in an endless loop through the loom, as when making paper-makers' felts. However, the use of such endless loops has been presented as a problem due to the difficulties encountered in placing the loop on and removing it from the conventional needle looms.

The principal object of the present invention is to provide an improved needle loom which overcomes the above-noted problem.

A loom made according to the invention comprises the usual vertically reciprocating needle board having depending needles overlying a bed plate which has openings to receive the needles. The bed plate is mounted on a lower beam which is supported above a base by a pair of vertically adjustable members. These adjustable members support opposite end portions, respectively, of the lower beam so as to provide spaces above and below this beam for passage of an endless loop of the material between the two adjustable supporting members. Thus, the loop of material may pass over the bed plate and back through the space below the lower beam, the adjustable supporting members being located at opposite sides of the loop. By adjusting these supporting members, the lower beam may be raised and lowered to vary the penetration of the needles into the material on the bed plate during reciprocation of the needle board. The beam is supported by the first of the two beam supporting members through means adapted to be separated to form a gap through which the looped material may be passed laterally when placing it in or removing it from the loom. For this purpose, I provide a fulcrum engageable with the beam between its two supporting members and on which the beam may be tilted by adjustment of the second

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supporting member, whereby the separable means can be separated to form the aforesaid gap. This fulcrum is preferably located in the space below the beam but is movable to an inoperative position to clear this space and thereby permit normal passage of the endless loop during the loom operation.

The two adjustable supporting members may be mounted on the base so as to support the bed plate beam from below, or they may be mounted on an upper structure so as to support this beam from above. Also, the fulcrum may be suspended from such an upper structure or mounted on the base. Preferably, the fulcrum when in its operable position is located between the center of gravity of the beam and the second supporting member which is remote from the gap formed by the tilting movement. With this arrangement, a greater space is provided below the beam for gathering the looped material prior to movement of the fulcrum to its operative position in preparation for the tilting movement.

The preferred construction includes a hinged element through which the first supporting member (the one at which the gap is formed by the tilting movement) supports the corresponding end portion of the beam, and this hinged element is adapted to swing to an inoperative position when the beam is tiltably mounted on the fulcrum, thereby forming an enlarged gap for lateral passage of the loop material incident to placing it in or removing it from the loom. In addition, the preferred construction includes a pair of vertical guides engaging the opposite end portions, respectively, of the lower beam for guiding it in its vertical adjustment by the supporting members to vary the needle penetration; and means are provided for movably mounting the vertical guide which is adjacent the end portion of the beam where the gap is made by the tilting movement. Thus, the latter guide is movable between an operative position for guiding the beam and an inoperative position for lateral passage of the endless loop of material.

For a better understanding of the invention, reference may be made to the accompanying drawing, in which

Fig. 1 is a front elevational view of a preferred form of the new loom, with parts broken away;

Fig. 2 is a side view of the loom shown in Fig. 1, and Fig. 3 is a view similar to Fig. 1 but showing a modified form of the new loom.

Referring to the drawing, the loom shown in Figs. 1 and 2 comprises a base 10 and uprights 11 and 11a secured to the ends of the base. Frame members 12 are connected to the upper ends of the uprights and extend parallel to the base. Below the frame members 12 is a vertically reciprocating beam 13 which is supported and reciprocated by rods 14. The latter are adapted to be moved up and down in unison by any suitable reciprocating means (not shown) supported on the frame members 12, such means being conventional and well known in the art. The needle board 15 is secured to the bottom of beam 13 and has a series of depending needles 16 arranged in a suitable pattern, only a few of the needles being shown in the interest of clarity. The needles 16 may be of the conventional type which is barbed at the lower end portion.

It will be understood that the needle board 15 is reciprocated vertically by the supporting rods 14, the reciprocating parts being guided in the conventional manner.

A lower beam 18 is located below the needle board 15 and substantially in line with the reciprocating upper beam 13. The lower beam 18 supports a flat bed plate 19 having holes 19a for receiving the needles 16 during the vertical reciprocation of the needle board. The base 10 contains jacks 20 and 21 located under the opposite end portions, respectively, of the lower beam 18. These jacks may be of any suitable type, but as shown they are

of the conventional mechanical screw type. Since the two jacks are identical, only the jack 20 will be described. It comprises a worm gear 20a through which a vertical shaft 20b is threaded, the latter being movable vertically but held against rotation in the jack housing. The gear 20a is rotatable in the housing by a worm 20c but is held against vertical movement in the housing. At its upper end, the shaft 20b carries a jack pad 20d. Thus, the threaded shaft 20b raises the pad 20d upon rotation of the worm 20c in one direction and lowers the pad upon rotation of the worm in the opposite direction. The worms of the respective jacks 20 and 21 are adapted to be driven synchronously in either direction from shafts 22 connected to a common motor 22a.

The pad 21d of jack 21 is secured to the vertical screw shaft of this jack and is connected through a hinged connection 23 to the corresponding end portion of the beam 18. The connection 23 may be threaded or otherwise secured to the beam, so that the jack 21 is operable to raise and lower the beam 18 in conjunction with jack 20 and also to draw the corresponding end of the beam downward. Thus, the jack or vertically adjustable supporting member 21 has a tension and compression transmitting connection 23 with the corresponding end portion of beam 18. The jack 20 supports the corresponding end of the beam 18 through a hinged element 24 pivoted at 24a on the beam and adapted to rest at its lower end on the underlying jack pad 20d. As will be described in greater detail presently, a handle 25 is provided for swinging the supporting element 24 from its illustrated depending position to a raised position in which it is withdrawn from the space between the beam 18 and the base 10.

By operating the jacks 20 and 21 in unison, the lower beam 18 may be raised and lowered so as to adjust the vertical position of bed plate 19 relative to the needle board 15 and thereby vary the penetration of the needles 16 into the material on the bed plate. Also, since the jacks or adjustable supporting members 20 and 21 support the lower beam 18 well above the base 10, a space "S" is provided directly below the lower beam and between the two beam supporting members. With this arrangement, the felt or other material may be passed through the loom in an endless loop, the upper section of the loop extending over the bed plate 19 while the lower section of the loop extends back through the space S between the adjustable supporting members 20 and 21. By providing suitable guide rollers (not shown) in front and in back of the loom, the endless loop may be made of any desired length. It will be understood that the looped material is drawn over the bed plate 19 and back through the space S with a step-by-step motion, in the conventional manner; and during interruptions of the feed, the upper beam 15 is reciprocated vertically to punch the underlying material on the bed plate. Because of the endless loop of the material, the latter may be readily passed through the loom as many times as desired.

A movable fulcrum 26 is hinged on the base 10 under the lower beam 18, as by means of a pivot pin 27, as shown, the fulcrum 26 is normally in an inoperative position wherein it is retracted from the space S and lies within the base 10. However, when the loop of material is to be removed from the loom, the material is folded or gathered into the left-hand side of the space S as viewed in Fig. 1; and then the fulcrum 26 is swung to its operative or raised position indicated by the broken lines in Fig. 1. Thereupon, the jacks or beam supporting members 20—21 are adjusted to lower the beam until it engages the top of the raised fulcrum 26. Further downward movement of the jacks 20—21 will then cause the right-hand end of the beam 18 to be drawn downwardly around the fulcrum 26 so that this beam tilts clockwise and raises the opposite end of the beam, whereby the supporting element 24 is lifted from its jack pad 20d. As a result, a gap is formed between the parts 24 and 20 through which the gathered material may be

passed laterally. This gap may be increased by swinging the supporting element 24 upwardly on its pivot 24a and out of the space S, thereby further facilitating lateral passage of the looped material from the space S.

A vertical guide 29 is mounted on the base 10 near the jack 21 and engages the corresponding end portion of the lower beam 18. As shown, the guide 29 has a vertical recess or groove 29a which receives a projection 18a on the corresponding end of the beam. The vertical guide 29 may be secured to the adjacent upright 11a.

The opposite end of beam 18 is guided by a vertical guide 31 having a similar vertical groove which receives the projection 18b on the corresponding end of the beam. The vertical guide 31, however, has means for movably mounting it adjacent the corresponding end of the beam. Such means, as shown, comprise a cross piece 32 connected to the upright 11, which is generally C-shaped, and a hinge 33 connecting the upper end of guide 31 to the cross piece 32. Thus, when the beam 18 has been tilted on the fulcrum 26 and the supporting element 24 has been swung to its raised position from space S, as previously described, the vertical guide 31 is swung outwardly and upwardly on its pivot 33. This allows the gathered or folded loop of material to be removed laterally from the loom through the open space provided by the C-shaped upright 11.

The new loop of material may be placed on the loom in the reverse manner. That is, the loop is first applied from the left side of the loom (as viewed in Fig. 1) so that the left-hand portions of the beam 18 and bed plate 19 extend through the gathered loop. The vertical guide 31 is then swung downward to its operative position, in which it is locked by a suitable holding device, such as a latch 34 engageable with the base 10. The handle 25 is then operated to swing the supporting element 24 downward to its operative position in line with jack 20, whereupon the jacks 20—21 are operated to raise their respective pads 20d. As a result, the beam will now be tilted counterclockwise on fulcrum 26 until the ascending pad of jack 20 re-engages the descending element 24, as shown in Fig. 1, whereupon continued upward movement of the jacks will lift the beam 18 from fulcrum 26. The latter is then swung from its vertical or operative position to its retracted position within the base 10. This allows the gathered loop to be spread out from the left-hand side of the space S and arranged smoothly across this space and across the bed plate 19. The latter may then be adjusted vertically for the desired needle penetration, so that the loom is ready for operation on the loop.

Mounted above the bed plate 19 is the usual stripper plate 36 having holes through which the needles 16 extend from the needle board. This stripper plate may be supported in the conventional manner on the framework 11—12, so that the stripper plate may be adjusted vertically to space it the desired distance from the bed plate 19.

In the loom as illustrated in Figs. 1 and 2, the movable fulcrum 26 is pivotally mounted between the center of gravity of beam 18 and the jack 21, so that the latter must pull the corresponding end of the beam downward about the fulcrum in order to separate the parts 20 and 24. I prefer this arrangement because it allows more space for gathering the looped material between the fulcrum 26 and the jack 20, incident to removing the loop from or placing it on the loom. However, the fulcrum 26 could be mounted at the opposite side of the center of gravity, if desired, in which case it would be unnecessary to provide a tension transmitting connection 23 between jack 21 and the beam 18. Also, while the movable fulcrum 26 is shown mounted on the base 10, it could be movably mounted on the upper structure 12 of the loom, as by means of removable attachments. In fact, the fulcrum 26 could be supported in its operative position quite independently of the loom, as by suspend-

ing it from auxiliary apparatus, and it could be completely removed from the loom while the latter is in normal operation.

The loom illustrated in Fig. 3 differs from that shown in Figs. 1-2 in that the adjustable supporting members for the lower beam 18 are mounted on the upper framework 12 instead of on the base 10. More particularly, the two jacks 40 and 41 are secured on the framework 12 above the opposite end portions of the lower beam 18. The vertical screw shaft of jack 41 has a downwardly projecting extension 44 which is pivotally connected at its lower end to the corresponding end portion of beam 18. The screw shaft of the other jack 40 has a downward extension 45 connected at its lower end to a link 46 through releasable means comprising a quick-release pin 47, which may be readily withdrawn from the parts 45-46 to disconnect them. At its lower end, the link 46 is pivotally connected to the corresponding end portion of lower beam 18. The jacks 40-41 are operable synchronously to raise or lower beam 18 by a reversible motor 43 mounted on the framework 12 and connected to the jacks through driving shafts 42.

In removing the punched material from the loom shown in Fig. 3, it is gathered into the left-hand portion of the space S so that fulcrum 26 can be raised to its operative position, whereupon jacks 40-41 are operated to lower the beam 18 upon this fulcrum. The releasable pin 47 is then withdrawn so that link 46 can be swung counterclockwise about its pivot on beam 18. The resulting gap between parts 45-46 enables the looped material to be removed laterally from the loom when guide 31 is swung to its raised position, as previously described. Through operation of jacks 40-41, the lower beam 18 can be tilted in either direction on the fulcrum 26, to adjust the clearances through which the looped material is passed laterally when placing it in or removing it from the loom.

It will be apparent that in Figs. 1-2, the hinged element 24 and the underlying jack pad 20d form separable means through which the first supporting member 20 supports the corresponding end portion of beam 18; and in Fig. 3 the hinged element 46 and the overlying part 45 form separable means through which the first supporting member 40 supports the corresponding end portion of beam 18.

I claim:

1. In a needle loom, the combination of a vertically reciprocating needle board, needles depending vertically from the board, a beam underlying said board, a bed plate on the beam having openings for receiving the needles upon downward movement of the board, a base underlying the beam, first and second vertically adjustable members supporting the opposite end portions, respectively, of the beam to provide a space below the beam, whereby an endless loop of material may pass lengthwise through a path extending over the bed plate and through said space below the beam, said supporting members being located at opposite sides of said path and adjustable to raise and lower the beam and thereby vary the penetration of the needles into the material on the bed plate during the reciprocation of the needle board, separable means through which the first supporting member supports the corresponding end portion of the beam, and a fulcrum engageable with the beam intermediate

said opposite end portions and on which the beam is adapted to be lowered by said supporting members, thereby enabling separation of said means to provide a gap for lateral passage of said loop, the beam being tiltable on the fulcrum by adjustment of the second supporting member to vary said gap.

2. The combination according to claim 1, in which the fulcrum is located in said space and is movable therefrom.

3. The combination according to claim 1, in which the fulcrum is pivotally mounted on the base.

4. The combination according to claim 1, in which said separable means include a hinged element movable to increase said gap.

5. The combination according to claim 1, in which the fulcrum is located between the center of gravity of the beam and the second supporting member, said second member having a tension and compression transmitting connection with the corresponding end portion of the beam.

6. The combination according to claim 1, comprising also a pair of vertical guides engaging, respectively, the opposite end portions of the beam and operable to guide the beam in its vertical adjustment by the supporting members, and means movably mounting one of said guides adjacent the end portion of the beam corresponding to said first supporting member, whereby said movable guide is movable between an operative position for guiding the beam and an inoperative position for lateral passage of said loop.

7. The combination according to claim 6, in which said mounting means include a hinge.

8. The combination according to claim 1, in which the adjustable supporting members are mounted on the base to support the beam from below.

9. The combination according to claim 1, in which the adjustable supporting members support the beam from above.

10. The combination according to claim 1, comprising also uprights at opposite ends of the base, and an upper framework on the uprights from which the reciprocating needle board is suspended, the upright nearest said first adjustable supporting member being generally C-shaped to provide a free space for lateral passage of said loop to and from said gap.

11. The combination according to claim 1, comprising also uprights at opposite ends of the base, an upper framework on the uprights from which the reciprocating needle board is suspended, the upright nearest said first adjustable supporting member being generally C-shaped to provide a free space for lateral passage of said loop to and from said gap, vertical guides engaging, respectively, the opposite end portions of the beam to guide the same in its vertical adjustment by the supporting members, and means movably mounting one of said guides adjacent the end portion of the beam corresponding to said first supporting member, whereby said movable guide is movable to permit said lateral passage of the loop to and from said gap.

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