

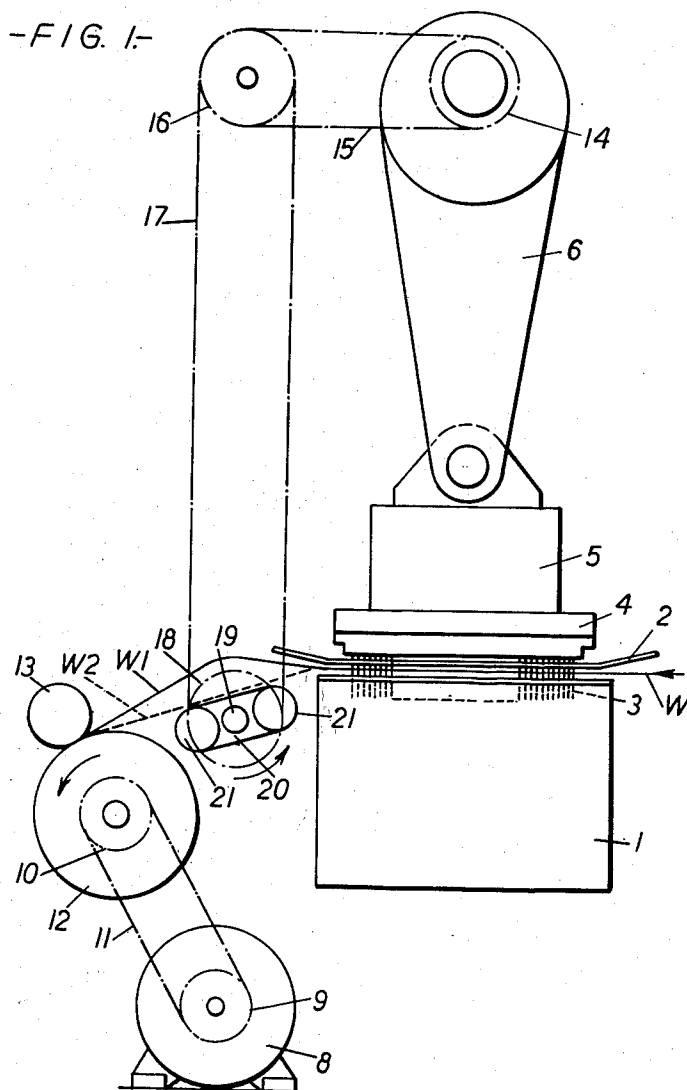
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B. O'BYRNE
WEB NEEDLING MACHINES

3,116,534

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4 Sheets-Sheet 1



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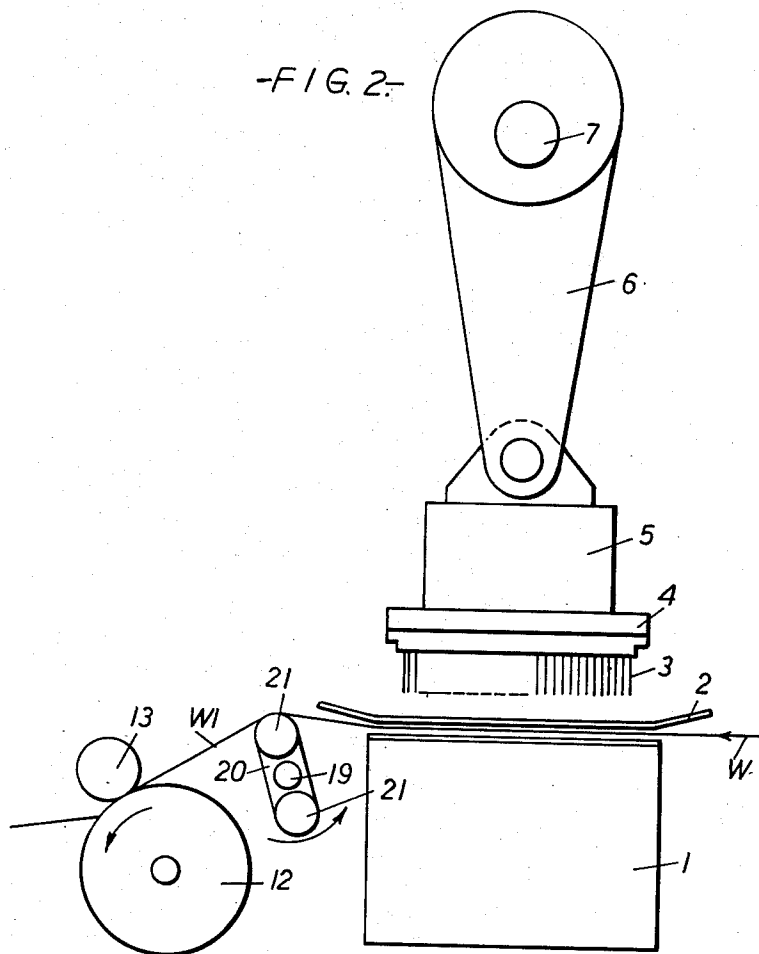
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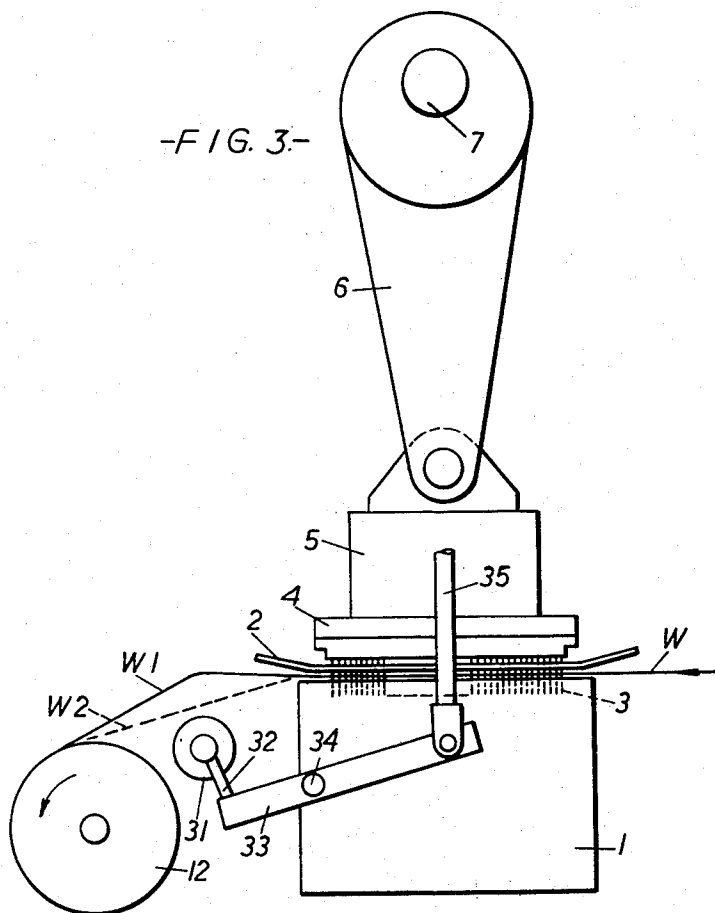
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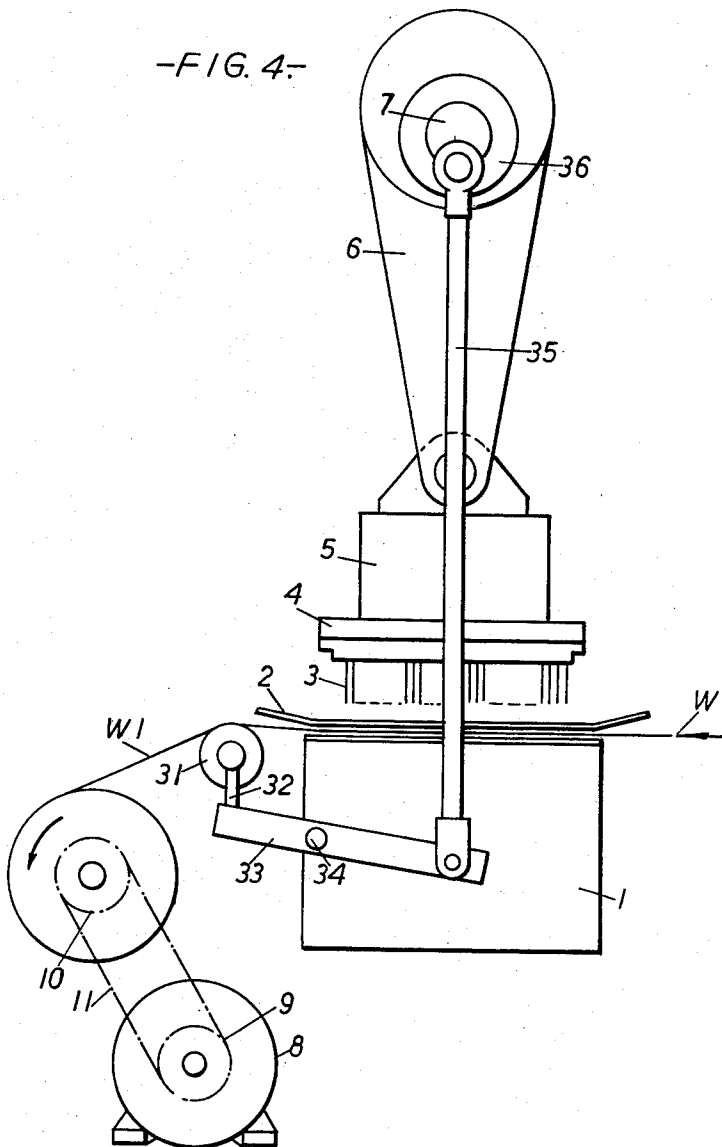
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4 Sheets-Sheet 4



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3,116,534

WEB NEEDLING MACHINES

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4 Claims. (Cl. 28—4)

This invention relates to web punching or needling machines for treating webs of fibrous material so as to intermingle the fibres and provide sufficient cohesion for the webs to be used as felts and for like purposes.

To enable the needle punching to take place without tearing or otherwise damaging the web, the draw-through is intermittent in phase with the action of the needle arm, necessitating intermittent drive mechanism and means for relating this drive to the needle arm drive.

The chief object of the present invention is to enable the web to be wound on or over the draw-roller or rollers continuously and yet at the same time to enable the part of the web being at any time needled to dwell stationary.

To achieve this result a machine according to this invention includes means arranged to displace a part of the web between the needle bed and the continuously rotating draw-roller so that the web can be drawn across the bed with the needles withdrawn faster than the draw-roller can take it up and so that the surplus length of web thus made available can be wound on to the draw-roller whilst the part of the web being needled dwells stationary.

The effect of this arrangement is to produce a "slack" or surplus length of web between each needling operation and to pass this to the continuously rotating draw-roller whilst the stationary part of the web is being needled.

The means for displacing the web to produce and release the "slack" may include a rotary mechanism or a reciprocatory one, either linear or angular. For example, a rail or free roller extending the length of the bed below or above the stretch of web passing from the bed to the draw-roller may be arranged for substantially vertical and substantially linear reciprocation in phase with the action of the needle arm.

Alternatively, and preferably from the point of view of reduction of vibration, one or more freely rotatable rollers, rods or the like extending similarly to the aforesaid rail or roller are mounted for rotation in an orbit about a horizontal axis at such a speed relative to the action of the needle arm as to alternately produce and release the "slack." Two, three or four such rollers or the like may be equidistantly spaced around the orbital axis, to give two, three or four displacements of the web during each revolution of the roller system around its orbital axis.

Any simple form of driving mechanism for such roller system (or the reciprocatory rail) may be connected to any suitable part of the machine, such as an eccentric shaft which reciprocates the needle arm.

The deflection of the web will take place preferably away from the bed so that the stripper plate serves to hold in place the part of the web lying or passing across the bed. It will be clear that the invention may be applied to machines using either upward or downward needling.

Any other suitable form of means may be used for displacing the web for the desired purpose. For example, the web may be taken around a system of rollers, rods or the like which may be reciprocated or moved relatively to one another either linearly, angularly or otherwise.

In order that the invention may be clearly understood and readily carried into effect the same will now be more fully described with reference to the accompanying drawings, which illustrate diagrammatically and merely by way of example two embodiments of the invention. In the drawings:

FIGURES 1 and 2 represent similar end views of such

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parts of a web needling machine incorporating one form of the invention as are necessary to an understanding of the invention, FIGURE 1 showing positions occupied by the parts when the web is stationary and being needled and FIGURE 2 showing alternative positions when the web is being traversed over the bed between needling strokes;

FIGURES 3 and 4 represent similar views to FIGURES 1 and 2 of a machine incorporating another form of the invention.

In the diagrammatic representation of FIGURES 1 and 2, 1 is the needle bed, 2 is the stripper plate through which the needles 3 operate, 4 is the needle board carried by the needle arm 5 which is arranged to be reciprocated vertically by two or more crank arms 6 whose upper ends are mounted eccentrically upon a main drive shaft 7. This shaft is mounted on a frame of the machine and arranged to be driven by suitable means, all the foregoing elements being known in web needling machines and requiring no further description.

A variable speed electric motor 8 drives through chain wheels 9, 10 and chain 11 a draw-through roller 12 upon which or over which the web W is wound after being drawn over the bed 1. A pressure roller 13 is shown to assist the drawing action of roller 12 where the web is not being wound on to the latter, for example where an endless web is being treated.

A chain wheel 14 on shaft 7 drives through a chain 15 a double chain wheel 16 which transmits the drive by a chain 17 to a chain wheel 18 secured on a shaft 19, whereby shaft 19 is driven at half the speed of main shaft 7. These driving arrangements for roller 12 and shaft 19 are illustrated only in FIGURE 1.

On shaft 19 near each end thereof are secured two frames or arms 20 each carrying the ends of two freely rotatable displacer rollers 21 or a series of rollers extending the width of the web. When the shaft 19 is rotated, these displacer rollers at one stage in their orbit around the shaft can contact the web and elevate it and at another stage can leave the web to pass by undisplaced.

When the machine is operating on a web, the draw-through roller 12 is driven continuously as is the rotary displacer device on shaft 19. While the needles are raised clear of the web as in FIGURE 2 one of the rollers 21 moving in its orbit is displacing the web out of its direct path to the roller 12 so that the web is drawn across the bed at a greater rate than that at which the roller takes it on. However, while the needles are penetrating the web, which must remain stationary over the bed during this part of the operating cycle, the rotary displacer device is moving through the position shown in FIGURE 1 where the rollers 21 leave the "slack" or surplus length of web indicated at W¹ free to be drawn on to or round the continuously rotating draw-through roller 12 until the web takes the path indicated by broken lines W².

It will be appreciated that, by thus enabling the draw-through roller to be rotated continuously, considerable savings in cost of intermittent drive mechanism may be made since the displacer device and its driving means may be comparatively simple and cheap to construct. Also a saving in power requirements may be achieved.

In the alternative embodiment of the invention illustrated by FIGURES 3 and 4, in which like parts to those of FIGURES 1 and 2 are indicated by like reference numerals, the web displacer device includes a reciprocatable displacer roller 31 supported for free rotation in arms 32 mounted on the ends of levers 33 which are pivoted at 34 on the machine frame and have their other ends pivotally connected by links 35 to rotatable eccentric devices 36 driven by the main shaft 7.

This mechanism is so arranged and driven that, during the upper part of the needle arms' reciprocation and when

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the needles are clear of the web, the reciprocating displacer roller 31 presses up on the web as shown in FIGURE 4 to produce the slack or surplus length hereinbefore referred to, but during the needling part of the cycle the roller 31 is retracted to permit the draw-through roller 12 to continue to draw in the web.

Whilst the hereinbefore described embodiments of the invention have been mentioned merely by way of example, it is to be understood that other suitable embodiments may be evolved for carrying out the invention and that protection is hereby claimed for all such embodiments within the scope of the appended claims.

I claim:

1. In a web needling machine in which a web of fibrous material is arranged to be drawn by a draw-roller across a needle bed where it is needled by needles mounted on a reciprocating needle arm, the combination of means for continuously rotating the draw-roller, means for intermittently displacing a part of the web between said needle bed and said draw-roller, and means for driving said displacing means in phase with the action of said needle arm, whereby when the needles are withdrawn from the web the web can be drawn across said bed faster than the draw-roller can take it up and whereby a surplus length of said web is made available which can be wound on to said draw-roller while the part of the web being needled remains stationary.

2. In a web needling machine as claimed in claim 1, the combination including for said web-displacing means

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a main shaft and a driving transmission mechanism drivably connected to said main shaft and eccentric devices connected to said main shaft driven by said transmission mechanism and arranged to reciprocate said needle arm.

3. In a web needling machine as claimed in claim 1, the combination wherein said web-displacing means is constituted by at least one displacer member which extends across the width of the web adjacent the stretch thereof passing from the bed to the draw-roller, said member being mounted for rotation in an orbit about a horizontal axis at such a speed relative to the action of said needle arm as to alternately produce and release said surplus length of web.

4. In a web needling machine as claimed in claim 1, the combination wherein said web-displacing means is constituted by a displacer member which extends across the width of the web adjacent the stretch thereof passing from the bed to the draw-roller, said member being mounted for substantially linear reciprocation in a direction transverse to the general path of said stretch of the web and at such a speed relative to the action of the needle arm as to alternately produce and release said surplus length of web.

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