

April 18, 1967

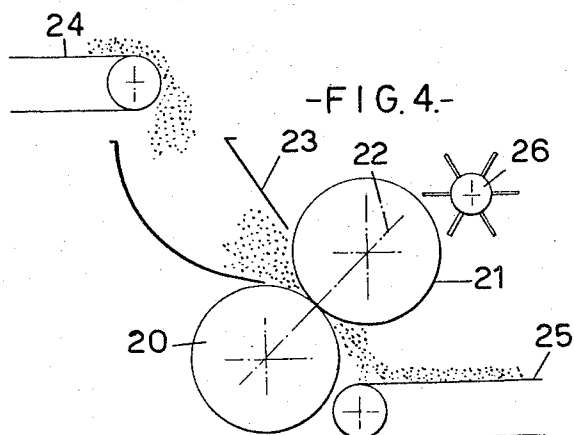
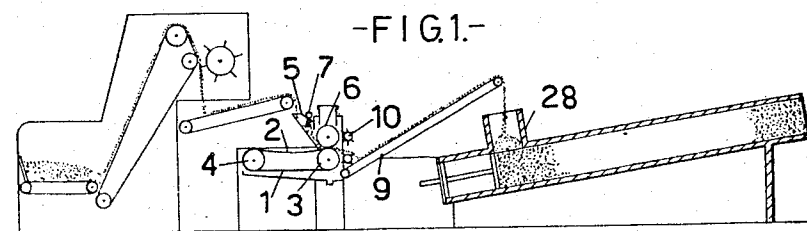
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3,314,256

DYEING AND SIMILAR LIQUID TREATMENT OF TEXTILE MATERIALS

Filed June 29, 1964

4 Sheets-Sheet 1



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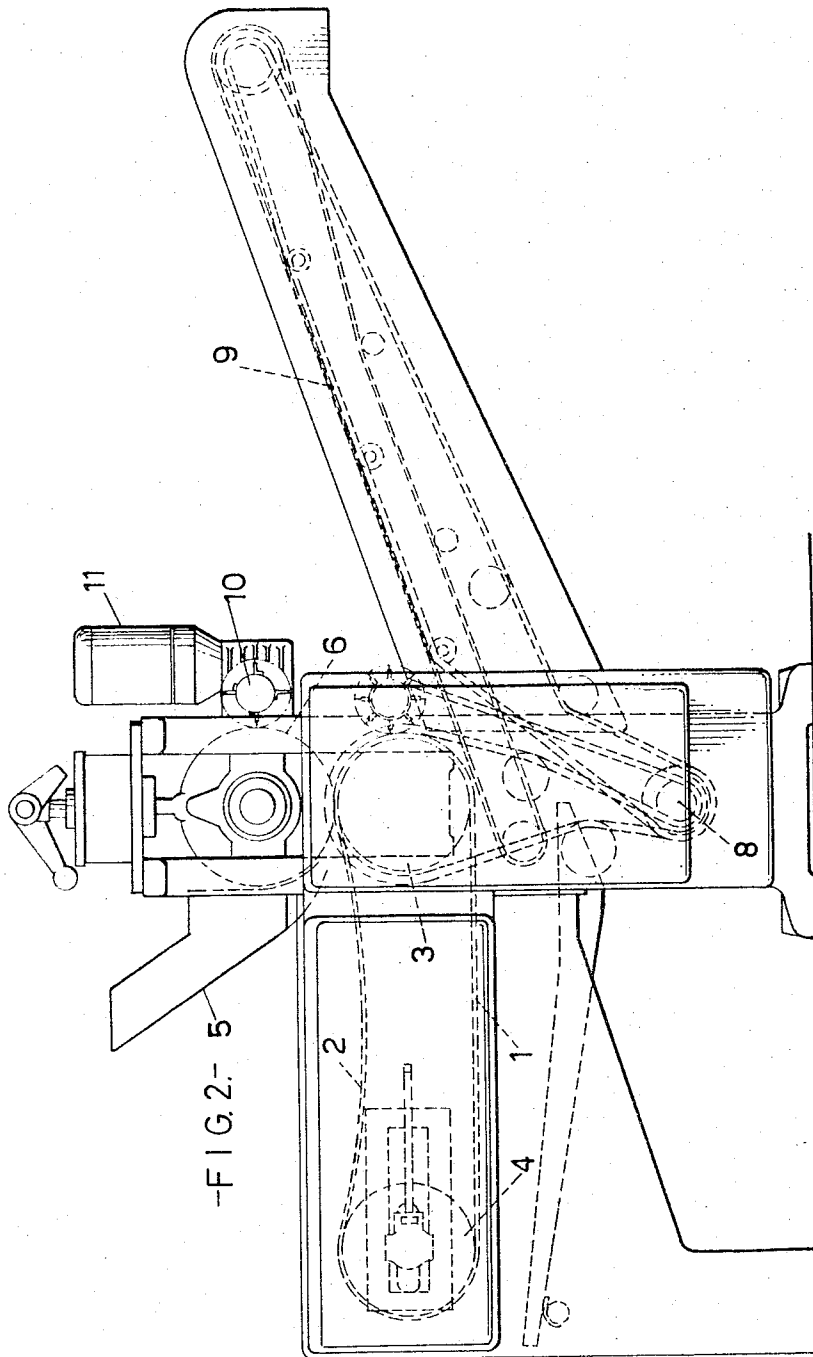
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3,314,256

DYEING AND SIMILAR LIQUID TREATMENT OF TEXTILE MATERIALS

Filed June 29, 1964

4 Sheets-Sheet 2



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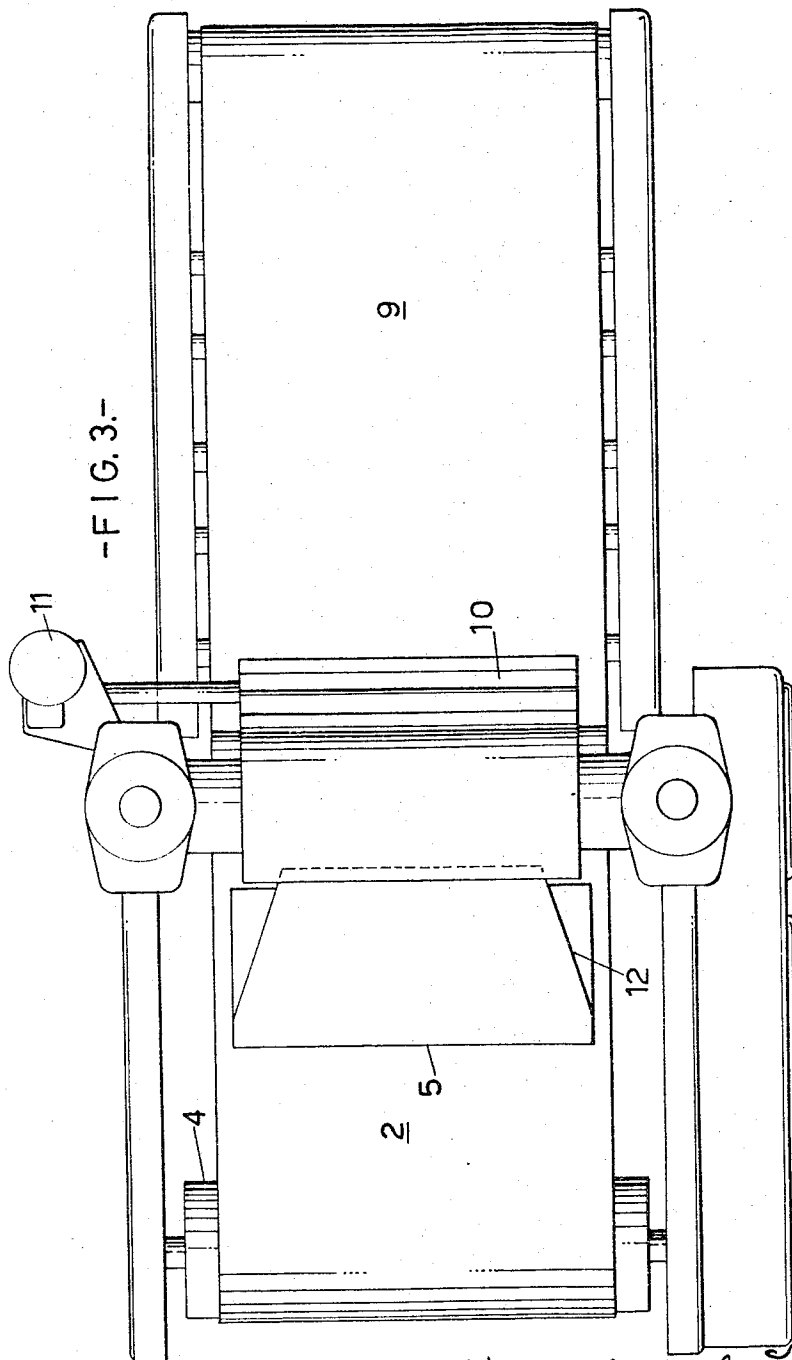
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3,314,256

DYEING AND SIMILAR LIQUID TREATMENT OF TEXTILE MATERIALS

Filed June 29, 1964

4 Sheets-Sheet 3



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DYEING AND SIMILAR LIQUID TREATMENT OF TEXTILE MATERIALS

Filed June 29, 1964

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Fig. 5.

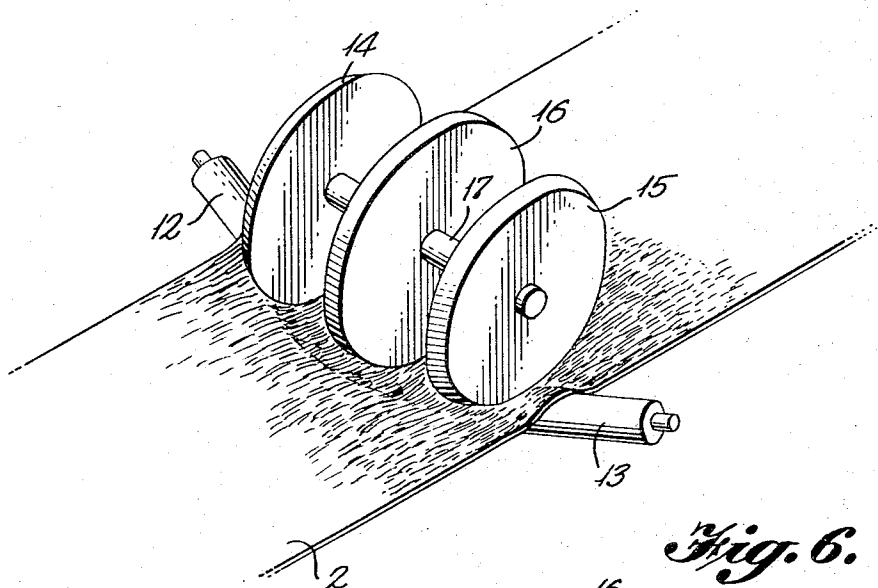


Fig. 6.

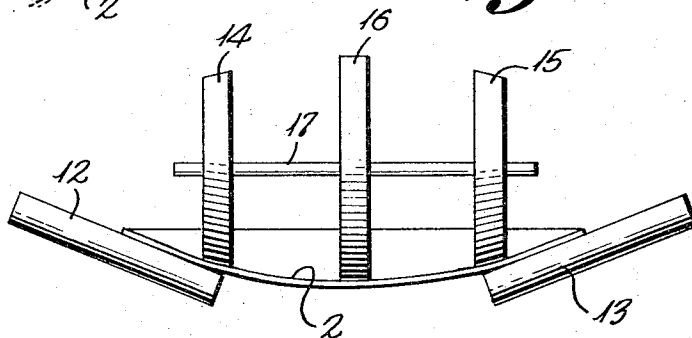
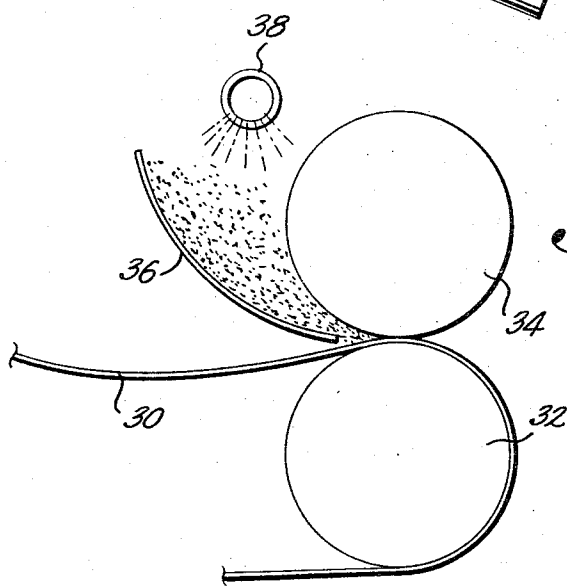


Fig. 7.



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DYEING AND SIMILAR LIQUID TREATMENT OF TEXTILE MATERIALS

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Filed June 29, 1964, Ser. No. 378,547

Claims priority, application Great Britain, July 1, 1963, 26,011/63

13 Claims. (Cl. 68—22)

This invention relates to the dyeing and similar liquid treatment (e.g. bleaching, impregnating and the like) of textile materials, and is concerned with the treatment of loose fibrous materials, for example unspun fibres at whatever stage of preparation they may have reached, slivers, tow and the like. The invention will be described as applied to dyeing processes for loose fibre stock, its uses for other liquid treatments of textile fibres and the like being substantially identical with that described.

Until quite recently there had been no completely satisfactory process in vogue for the continuous dyeing of loose textile fibres, it having been the practice to dye these fibres batch by batch in closed vessels. However, in U.S. Patent No. 3,199,317 a process and apparatus is set forth according to which the continuous dyeing of loose textile stock in a controllable manner is possible, and that invention has been proved to be a commercially practicable one. According to the arrangements described in the said patent the materials to be treated are fed to an endless supporting belt so arranged as to have a concavity which, with suitable side seals, holds a shallow pool of the treatment liquor, and said belt is so arranged as to be carried through the nip between a pair of padding rollers after leaving said pool, the material on the belt being taken through the nip with the belt, immediately after leaving the pool, and any excess liquor expressed from the material at the nip tending to run backwards into the said pool, in so far as the continually on-coming material will allow of this.

In the aforementioned patent, the material to be treated is fed to the belt at a point remote from the nip of the padding rollers so as to have the pool disposed between the point of arrival of the material and the rollers so that the material has to travel through the pool of liquor held in the cavity of the belt, before passing to and through the nip.

The present invention provides improvements in this continuous treatment process, in particular in the manner of feeding the material to the machine and of applying the treatment liquor to it; and in the manner of controlling the level of treatment liquor in said pool, and of controlling the rate of application of the liquor to the material.

According to this invention a padding machine having an endless belt shaped to hold a pool of treatment liquor in advance of the nip between padding rollers, and itself passing through said nip, has means for feeding treatment liquor to the material just in front of or even at the point where, with the belt, it passes through the said nip between the padding rollers, without the material having had to pass through said pool of liquor.

Conveniently, the liquor is applied to the material by being sprayed on the top or outer surface of the material, and this becomes supplemented from the under surface of the material as the latter contacts the surface of the belt wet with liquor from the pool and/or with expressed liquor running back to the pool. Alternatively, in some cases it may suffice for the belt to bring liquor to the material by means of its (the belt's) having passed through said pool of liquor.

The feeding arrangements for the material to be treated

may be such as to cause the material to dam up in front of the roller nip and thereby be made to pass through the nip as a uniform layer. Such means for feeding the material to the treatment zone may be a chute or guide or a lead conveyor or otherwise adapted to deliver the materials on to the belt in some cases at and in other cases just in front of the padding nip.

In one such arrangement a chute or guide is arranged above the said belt forwardly of the concavity in the belt, and directed towards the nip between the padding rollers. The material to be treated is caused to descend such chute and is brought up to the roller nip by its coming into contact with the belt and the treatment liquor is directed on to the material as it descends the chute or guide, excess liquor expressed at the nip flowing back in to the said concavity of the belt. Any known means may be employed to deliver the untreated material to the entrance end of the chute, and any suitable means may be employed to apply the treatment liquor to the material. This application of the liquor may be effected by spraying the liquor on to the material as described above, or merely by the endless band bringing liquor to the material by its having been wetted in the said pool, or both these methods may be used in combination.

In many cases the rear wall of the said chute or guide and the descending surface of the upper padding roller constitutes opposite walls of a hopper from which the material is taken partly by said descending roller surface and partly by the advancing movement of the belt towards the roller nip.

The invention may be characterized in that said chute or guide may be vibrated or otherwise agitated to improve the traverse of the materials being fed. In the case of a chute or guide, any known type of vibrator may be applied to it, for example an electro-magnetic vibrator or an out-of-balance rotor, or there may be a jiggling or like motion imparted to the chute in any known manner.

With this invention a continuous traverse of material through a dyeing or like process is obtained, whether the material in its initial form is in separate batches or otherwise, and a uniform penetration of the material by the treatment liquor is obtained, with only a small quantity of liquor being required to be held in the pool in the belt at any one time. This last feature is important because it avoids the accumulation in the liquor of large deposits of separated fibres which have become detached from the main stream. Any detached fibres which do find themselves in the expressed liquor are taken forward by the belt to the nip and re-join the main stream of fibres about to pass through the nip. As in the said patent, this present invention is especially useful with the very rapid wetting agents now available because, with such agents only minimum duration of contact between the fibrous material and the treatment liquor is necessary.

According to a further feature of the invention the rate of application of the treatment liquor to the fibres as they are fed to the roller nip is regulated in dependence on the quantity of liquid in the pool on the concave belt, whereby an avoidance of waste treatment liquor is made possible. For effecting this control there could be, for example, an electronic control including a photo-electric device responding to the level of liquor in the pool and effective to increase the flow when that level falls below and decrease the flow when the level rises above a pre-selected optimum position.

Devices of this kind are well known in the art and can easily be adapted to this particular level control problem.

The invention will now be described as embodied in a particular example of machine, this being shown in the accompanying drawings:

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FIG. 1 is a diagrammatic longitudinal section through the machine as arranged in tandem with a steaming etc. apparatus;

FIG. 2 is an enlarged side view of the improved padder;

FIG. 3 is a plan of the padder; and

FIG. 4 is a diagrammatic representation of an alternative form of padder.

In the drawing the improved padder has an endless belt 1 mounted as set forth in the said patent, so as to have a concavity 2 in its upper run. In FIG. 1 the belt returns immediately around the lower roller 3 of the nip of a padding mangle and to the supporting roller 4. In other cases the belt could be made to continue forwards through the nip to carry the material to a further treatment or delivery zone as explained in said patent. The nip roller 3 is driven. Above the concave portion 2 of the belt is an inclined chute 5, which inclines downwardly and forwardly towards the roller nip. The outer wall of this chute is flat in the drawing but it could be slightly curved. It terminates just in front of the bight between the two nip rollers 3, 6 so that the material sliding down the chute collects in such bight and dams up on the lower part of the chute, being then taken from there through the nip in a uniform layer. Provision may be made for varying the position of the chute relatively to the roller nip.

As will be seen in FIG. 1 a sprinkler pipe 7 for spraying dye liquor on to the fibrous material as it passes down the chute is placed across the chute. There may be more than one such pipe and these may be adjustable to various positions. Any excess liquor in the material is expressed by the nip rollers and flows along the belt into the concavity or pool 2 formed on the belt.

The lower nip roll 3 is driven from a motor shaft 8 in the normal way, and a conveyor 9 which takes the treated material away is driven from the same source. A doctor roll or clearer 10 is shown adjacent the upper nip roll, driven by a motorised gear unit 11.

As will be seen from FIG. 3, the chute or guide 5 is covered in at the inner corners by walls or fillets 12 which have the effect of driving the material away from the extreme ends of the padding rollers.

In said patent the cavity 2 in the belt was arranged by causing the marginal parts of the belt to travel below arcuate guides or seals fixed on the side walls of the machine. We have now found an improved method of forming the concave pool, according to which the margins of the belt are caused to pass over upwardly inclined supporting rollers and the centre part of the belt is caused to pass below a series of discs of graded sizes mounted on a cross shaft with the largest one at the centre. These rollers and discs combine to give the belt a hollow formation both lengthwise and crosswise, resulting in a pool-holding cavity. As seen most clearly in FIGS. 5 and 6, a pair of upwardly inclined supporting rollers 12 and 13 are provided at opposite edge portions of the belt. A pair of discs 14 and 15 of approximately the same size are provided at either side of a central disc 16 of larger diameter, all of these discs being mounted upon a shaft 17, whereby it will be apparent that the rollers 12 and 13 plus the discs 14, 15 and 16 cooperate to form a concavity in the belt as it passes in contact with these members.

The improved padder may be arranged to deliver the padded goods to any desired receiver, whether a mere container or a conveyor or further treatment machinery. In FIG. 1 the padded goods are taken by a conveyor 9 to the inlet hopper of a steamer 28. This steamer may be such that the total machinery (as in FIG. 1) makes possible a continuous dyeing, steam and thermofixing of loose stock materials.

The invention also provides a machine for the dyeing and similar treatment of loose textile materials in which the materials are caused to dam up in the nip between squeezing rollers which have their axes in parallel ver-

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tical planes, the treatment liquor being applied in part by application to the materials as they approach or are in the damming up zone and in part by the lower roller of the mangle running in a trough of the liquor. Excess liquor expressed at the nip runs down the roller surface towards the trough, and the level of liquor in the trough is controlled by any suitable means. Here also the rate of application of the liquor to the material approaching the nip may be controlled in dependence on the level of liquor in the trough.

One such arrangement is shown very diagrammatically in FIG. 4. The nip rollers 20, 21 have their axes in a plane 22 which is at 45° to the vertical and the material is fed to the damming up zone down a chute or guide 23, which may be vibrated if desired. The material is fed to the upper end of the chute from a conveyor 24 (other suitable feeding means may be used) and the treated material issuing from the nip is taken away on another conveyor 25. A clearer roll or doctor 26 may be applied to the upper roll of the mangle.

Referring now to FIG. 7, a modification is illustrated wherein an endless belt 30 corresponds to the belt 2 previously described. This belt passes around a lower roller 32 corresponding to the previously discussed roller 3. An upper roller 34 is disposed directly over lower roller 32, and an arcuate wall portion 36 defines with the descending surface of the upper roller 34 opposite walls of a hopper from which the material is taken partly by the descending roller surface and partly by the advancing movement of the belt towards the roller nip. A sprinkler pipe 38 is provided for spraying dye liquor onto the fibrous material as it passes downwardly within said hopper.

What we claim is:

1. A padding machine comprising, two padding rollers arranged in parallel adjacent disposition and defining a roller nip therebetween, an endless belt passing through said nip, deflector means arranged to cause said belt to assume an upwards concave form over a part of its length thereat to hold a pool of treatment liquor, material feed means adapted to feed material to be processed to the belt at a position between the concavity and the said nip, and liquor feed means adapted to apply a treatment liquor to the material in advance of the roller nip.

2. A padding machine as claimed in claim 1 wherein the said liquor feed means comprises a spray means adapted and arranged to discharge a treatment liquor to the region of the material feed means.

3. A padding machine as claimed in claim 1 wherein the said material feed means includes an inclined chute disposed adjacent the roller nip and adapted to discharge material for treatment to the said nip.

4. A padding machine as claimed in claim 3 wherein the liquor feed means is disposed adjacent the said chute and is adapted to feed treatment liquor thereto.

5. A padding machine as claimed in claim 4 wherein the said feed means is adapted to spray treatment liquor into the said chute.

6. A padding machine as claimed in claim 4 wherein the deflector means comprises inclined rollers disposed beneath the band and so positioned and arranged as to form the concavity therein.

7. A padding machine as claimed in claim 6 wherein the said deflector means further includes at least one disc disposed above the belt in the central region thereof and bearing downwardly upon such belt so as to depress such central region.

8. A padding machine comprising upper and lower padding rollers arranged in adjacent parallel disposition and defining a roller nip therebetween, an endless belt passing through the said nip, a plurality of upwardly inclined rollers below a part of the said belt and so positioned and arranged as upwardly to displace the edge thereof in the said part thereby to form a concavity in the belt, material feed means disposed adjacent the padding rollers and between such rollers and the said con-

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cavity, and treatment liquor feed means adapted to apply a treatment liquor to material within the said material feed means, the said material feed means being adapted to discharge material to be processed onto the belt adjacent to and immediately in advance of the said roller nip.

9. A padding machine as claimed in claim 8 wherein the said material feed means comprises a guide positioned adjacent to but spaced from the upper padding roller and defining with such roller a chute through which material is fed to the belt.

10. A padding machine as claimed in claim 9 wherein the liquor feed means comprises a spray adapted to apply treatment media to the material feed means.

11. A padding machine as claimed in claim 9 wherein the liquor feed means is adapted to apply treatment media to the endless belt in the region of the concavity.

12. A padding machine as claimed in claim 2 wherein

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the material feed means has an inner wall thereto and the said liquor feed means is adapted to discharge a treatment liquor against the said inner wall.

13. A padding machine as claimed in claim 12 wherein said inner wall comprises the surface of the uppermost padding roller.

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