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APPARATUS FOR PADDING ABSORBENT MATERIALS

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FIG. 1.

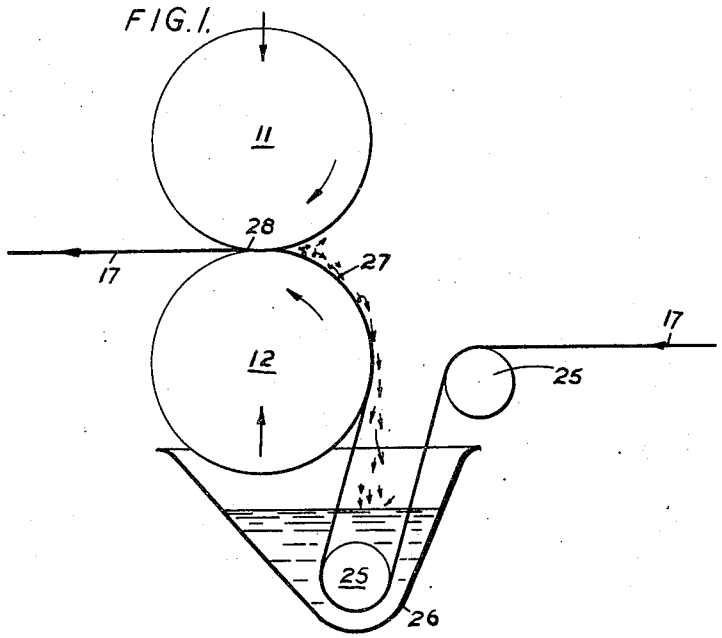

FIG. 3a.

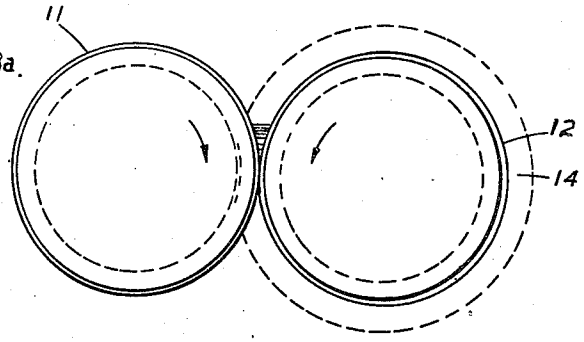

FIG. 3.

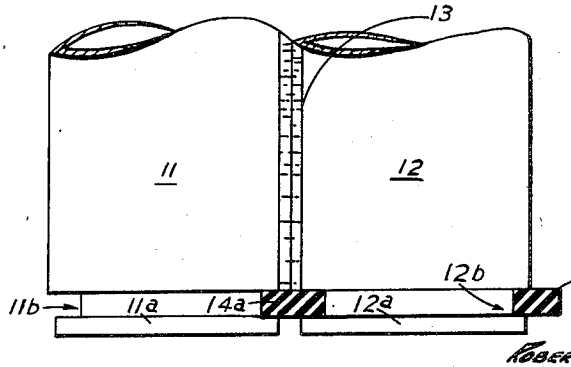

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FIG.2a.

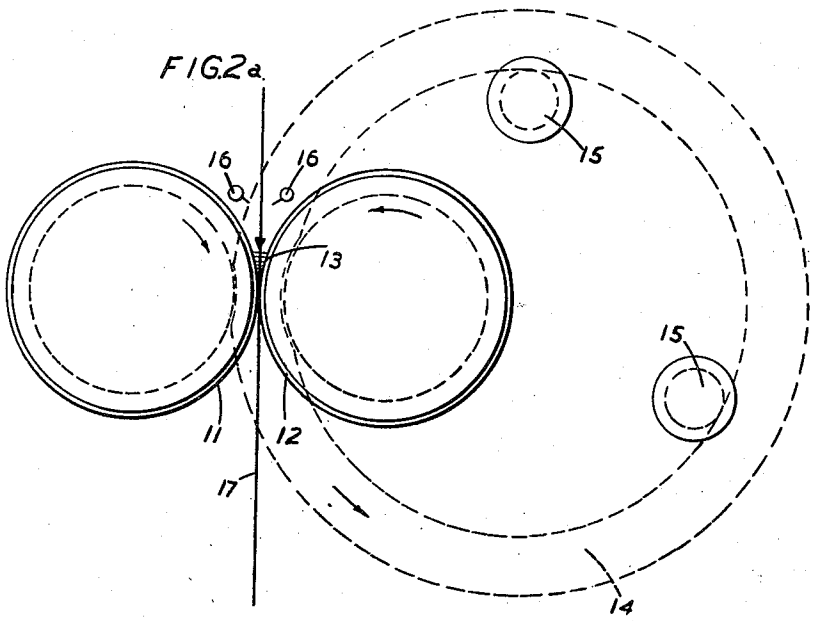
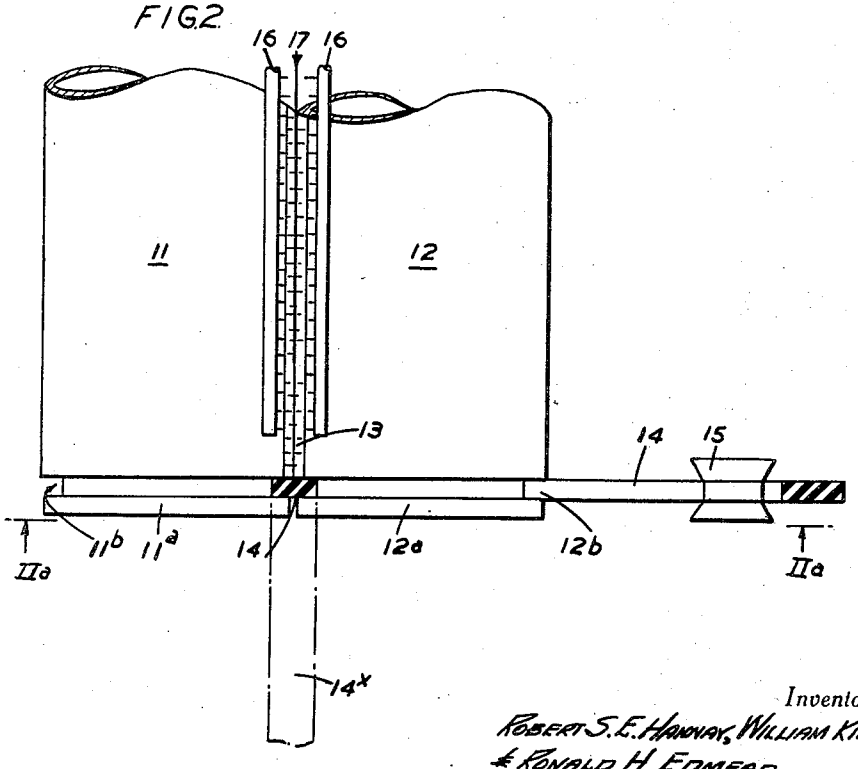


FIG.2



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APPARATUS FOR PADDING ABSORBENT MATERIALS

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FIG.4a

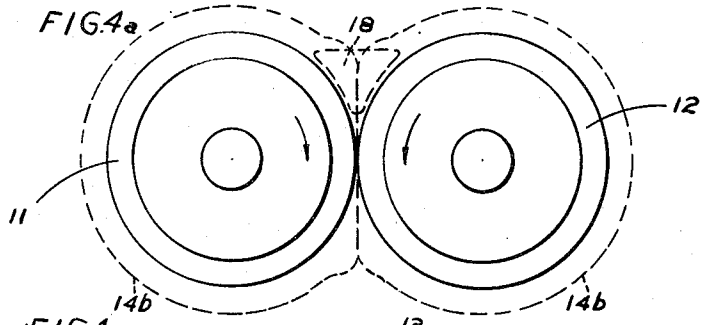


FIG.4

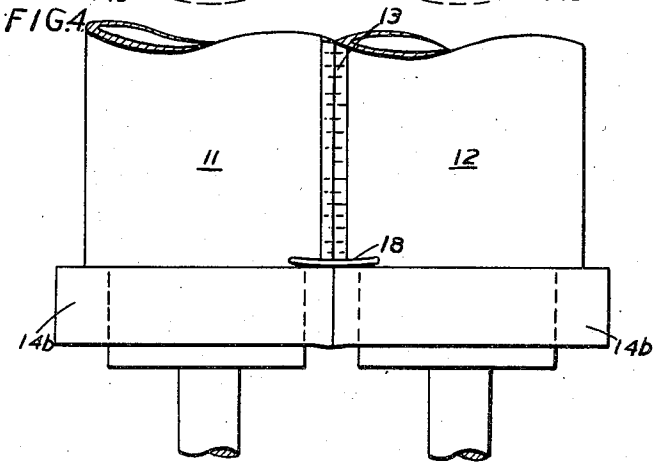
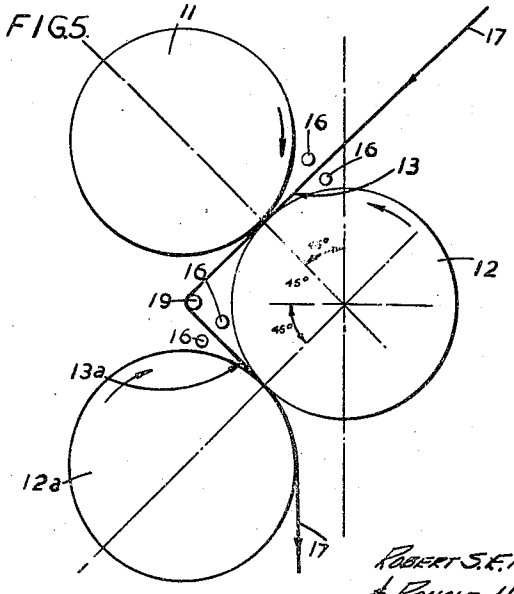


FIG.5



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APPARATUS FOR PADDING ABSORBENT MATERIALS

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FIG.6.

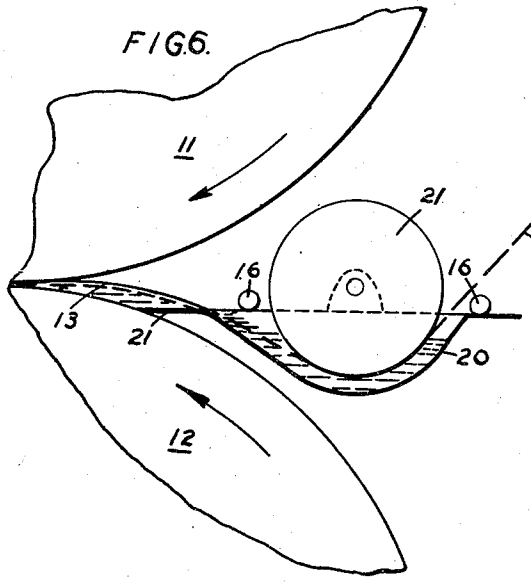


FIG.7.

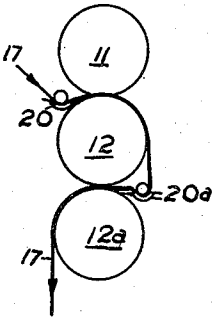
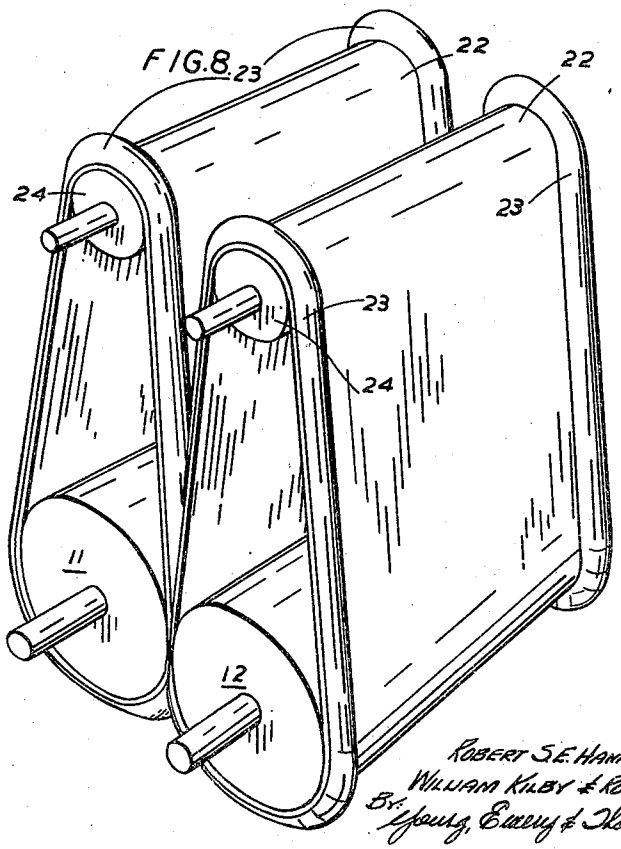


FIG.8.



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APPARATUS FOR PADDING ABSORBENT MATERIALS

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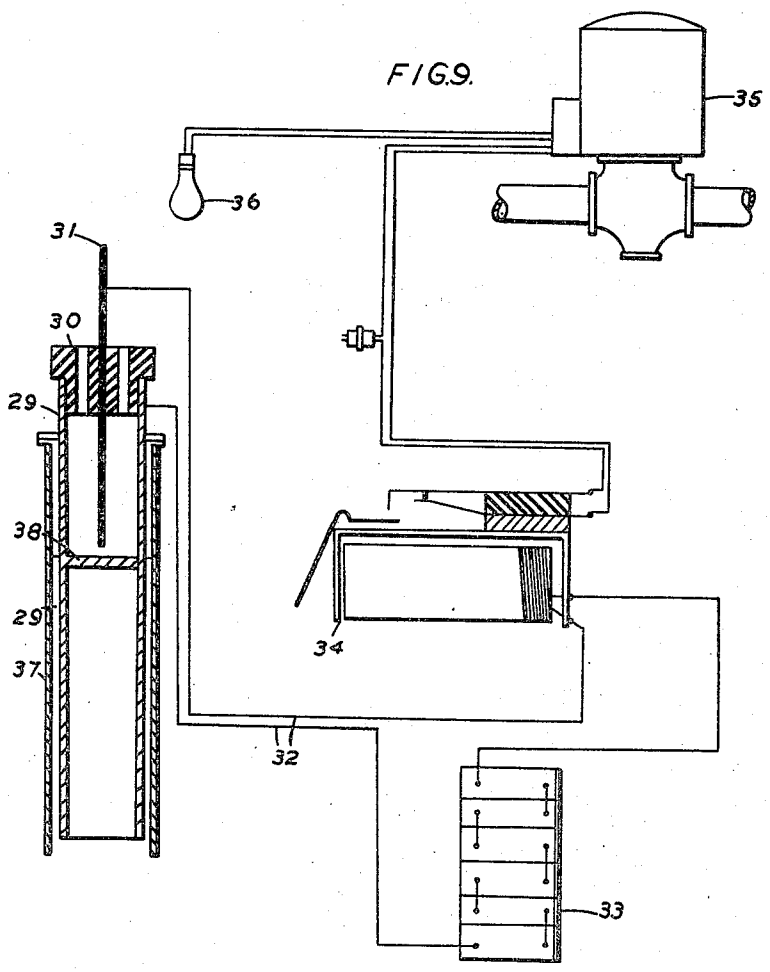
FIG.9.



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2,562,457

UNITED STATES PATENT OFFICE

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APPARATUS FOR PADDING ABSORBENT MATERIALS

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Application October 5, 1948, Serial No. 52,942
In Great Britain July 25, 1947

9 Claims. (Cl. 91—48)

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This invention relates to an apparatus for carrying out padding, dyeing, impregnating or like treatment with a treating liquor (hereinafter and in the claims referred to simply as padding) on cloth, yarn, or other textile, paper, or like absorbent materials in continuous length. The term "textile materials" is intended to embrace various materials as used in the textile industry, for example, cotton, wool, rayon, nylon, and other natural or artificial materials, and fabrics, felt, sheets, webs or yarns made from glass or synthetic plastic materials. The term "textile" is not intended to restrict the scope of the invention to woven material. Such materials are all hereinafter and in the claims embraced within the term "materials."

In the conventional form of textile padding mangle the material in the form of cloth passes through the liquor contained in a vessel, becoming saturated with the liquor, and then passes through a nip to squeeze out the excess liquor not required for the operation. The extent to which the excess liquor is squeezed out can, within limits, be adjusted by the pressure between the nip rollers.

In some cases a double nip is provided consisting of three rollers arranged so that the cloth first passes between the first and second rollers and subsequently between the second and third rollers.

It is fundamental to the operation of such padding mangles that the cloth should, in its passage through the liquor, absorb more liquor than is ultimately needed, the excess being squeezed out by the nip or nips. When the liquor contains particles that have an affinity for the cloth or the particles are of such a size that the cloth acts as a partial filter, it is evident that the liquor squeezed from the nips and returning to the vessel will be deficient in particles as compared with the fresh liquor, and the effect will be a gradual decrease in the concentration of particles in the vessel. If the squeezed liquor flows down the incoming cloth the danger arises of streaks due to the further absorption of liquor on certain parts of the cloth in rivulet form and thereby providing an excess of particles in that zone.

It will be clear that if the liquor squeezed from the nips can be diverted and collected in another vessel, this effect will be largely overcome, the only diluting effect then being the extent to which the particles tend to adhere to the cloth during its passage through the vessel in excess of the correct quantity relative to the volume of liquor absorbed. However, in most cases such an arrangement

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would be wasteful as it is usual for the liquor expressed from the nips still to contain a substantial amount of the particles and these would be wasted or would require expensive treatment to restore them to the desired density.

In accordance with the present invention we provide a method of padding absorbent material in continuous length with a treating liquor, comprising passing the material through a liquor bath which is fed with fresh liquor at substantially the same rate as it is taken up from the bath by the material, and maintaining only as much liquor in the bath as would be taken up by the material in a very short time of passage through the bath, for example, thirty seconds.

The effect of this diminution in the bath size is that within a very short time of starting the ultimate dilution has taken place and a condition of stability has been reached in which the rate of, for example, particle absorption by cloth is exactly balanced by the rate of input of the particles through the fresh liquor supply. Any variation therefore takes place solely in the first few yards of the process and if objectionable can be overcome by the use of an end cloth.

In further accordance with the invention we provide apparatus for padding absorbent material in continuous length, comprising a bath through which the material is adapted to pass, preferably prior to removal of excess liquor therefrom, means for feeding fresh liquor to said bath continuously or at frequent intervals and means for maintaining the volume of liquor in said bath at not more than that which would be taken up by the material in a very short time of passage through the bath, for example, thirty seconds.

Preferably provision is made to introduce the fresh liquor into the bath along its width and not only at either or both ends. If the fresh liquor is introduced at one point only, parts of the liquor remote from the point of supply will receive partially diluted liquor to replace that removed by the material and consequently will be further diluted, causing uneven application to the material.

Preferably the bath is so arranged that the squeezed out or otherwise removed excess liquor does not travel back across the incoming cloth or material in rivulets.

In further accordance with the present invention we provide apparatus for padding absorbent material in continuous length with a treating liquor characterised by the fact that a bath of said liquor is formed between two co-operating rollers defining a nip through which the material

passes. Preferably the bath is formed at that side of the nip where the material enters the same whereby the nip automatically squeezes excess liquor from the material.

Some embodiments of the apparatus in accordance with the invention will now be described simply by way of example with reference to the accompanying drawings, in which—

Fig. 1 is a diagrammatic vertical section showing the hitherto conventional single nip padding apparatus.

Fig. 2 is a diagrammatic plan view showing one end of padding apparatus in accordance with the invention, Fig. 2*a* being a corresponding end elevation but showing the part **14** in dotted lines for clearness.

Figs. 3 and 4 are views similar to Fig. 2 but of modifications, Figs. 3*a* and 4*a* being corresponding respective end elevations but with the parts **14** and **14***b* shown in dotted lines for clearness.

Figs. 5, 6 and 7 are diagrammatic vertical transverse sectional elevations of three other modifications.

Fig. 8 is a perspective view of a further modification.

Fig. 9 is a diagram partly in section illustrating a means for controlling the supply of treating liquor.

In the various figures like references indicate like parts.

In Fig. 1 which shows the hitherto conventional arrangement, there are two main or nip rollers **11**, **12** urged together as indicated by the arrows to form a nip at **28**. The material, for example, cloth, is indicated at **17** and passes over guide rollers **25** through treating liquor, such as dyestuff, in a bath vessel **26** and then up through the nip at **28**. As indicated at **27** the liquor squeezed out at the nip **28** runs back over the cloth and drops again into the bath.

In Figs. 2 and 2*a* the axes of the two nip rollers **11**, **12** are in the same horizontal plane and the bath **13** of liquor is formed in the V-shaped space on the upper side of the nip, the ends of this space being closed as described below.

Each of the rollers at each end is formed with a flange **11***a*, **12***a* each defining an annular groove **11***b*, **12***b*, and a soft rubber endless belt **14** is borne in guide pulleys **15** and passes vertically down in line with the bath so as to fill the space between the two roller grooves and thereby seal the bath **13** at each end. The belt **14** is of considerably greater height than width and is also made a little wider and thicker than the space defined by the two grooves, so that the rubber is squeezed sidewise against the walls of the grooves and against the roller ends. Small variations between the centres of the rollers arising from adjustments of the degree of nip will not, owing to the elasticity of the belt, prejudice the seal. The cloth **17** passes vertically through the bath as shown.

The dye or other treating liquor is supplied through pipes **16** on each side of the bath and extending the full width of the nip, and each pipe is provided with perforations along its length so that the liquor is supplied evenly throughout the length of the nip, that is, the width of the bath.

At least one of the rollers of the nip is rubber covered, but if very thick cloths have to be processed both rollers must be rubber covered or its equivalent so that a satisfactory seal is provided at the cloth selvedge.

The means for adjusting the supply of fresh liquor may be by manual control or alternatively by automatic means as illustrated in Fig. 9, in which an outer tube **37** dips in the liquor bath **13** and carries an inner tube **29** in which the liquor rises and falls and supports a float **38**. The top of the tube **29** carries a closure **30** mounting an electrode **31** connected through leads **32** and a resistance **33** to a relay **34** adapted to actuate a liquor-feed valve **35**.

Tube **29** is electrically conductive but closure **30** is of electrically insulating material, while float **38** is also electrically conductive. Thus when float **38** contacts electrode **31**, the circuit is completed and the feed valve **35** is closed, while when float **38** drops the circuit is broken and the relay acts to open the feed valve. A warning light **36** may be associated with the feed valve.

In a modification the belt may be arranged to move in a vertical plane containing the nip, as indicated in chain dot lines at **14***x*, instead of as above described in a vertical plane at right angles to the bowl axes.

In another embodiment as in Figs. 3 and 3*a* the ends of the bath **13** may each be sealed by a somewhat softer rubber ring **14***a* (shown in horizontal mid section) which fits completely around the groove in one of the rollers and may be secured therein or may be loose. In the region of the nip the ring **14***a* fills the space between the two opposite grooves in the manner described above. In this case the rubber or other material should be somewhat softer to allow some distortion owing to the difference in speed between the periphery of the ring and the periphery of the groove in the other bowl.

In a further embodiment as in Figs. 4 and 4*a*, the sealing is effected by mounting at the ends of each roller a ring **14***b* of enlarged section of relatively soft rubber or the like, for example sponge rubber with the outer surface thereof sealed by a covering of thin rubber. The rings are secured to the respective rollers and the peripheries of the two rings at each end squash each other but they are prevented from turning into the nip proper by a guard plate **18** located just above the nip.

Alternatively, pneumatic tubular rings may be used for example of square section.

If the axis of one roller is arranged lower than another, it has been found that even with the line joining the axes of the two rollers forming an angle of say 45° with the horizontal, it is still possible to retain at the nip a substantially static bath of liquor sufficient for the purposes of the invention.

It will be appreciated that any convenient number of nips in succession may be arranged.

For giving double impregnation to the fabric, three rollers **11**, **12**, **12***a* may be arranged, as in Fig. 5, with the axes of the first and last in the same vertical plane and the axis of the middle roller **12** staggered relative to the other two, the lines joining the axis of the middle roller with those of the other two rollers being at 45° to the horizontal. The cloth **17** passes downwardly to the first nip bath **13** and then around a guide roller **19** at 90° and enters the lower nip bath **13***a*. Liquor-feeding pipes **16** are provided at each nip bath above and below the cloth.

In some cases it may be necessary to locate two adjacent rollers with their axes in the same vertical plane, thus rendering it impossible to maintain a static bath. In such case, however, referring to Fig. 6, a shallow trough **20** may be provided to act as a bath vessel and through

which the cloth 17 is guided on a guide roller 21, the cloth contacting the under surface of the roller in the liquor.

The side of the trough adjacent the nip is provided with a lip 21 which lies against the lower roller in like manner to a doctor blade. The cloth passes up over this lip, and then into the nip at 13. In this arrangement the cloth carriers forward or entrains some of the liquor into the nip and a liquor bath is thus formed at the nip; as this is formed only when the cloth is running there is no tendency for the bath to form outside the selvedge of the cloth, and when the machine stops the liquor immediately flows back into the bath vessel. The liquor level is maintained as aforesaid in the vessel by feed pipes 16 feeding along the length thereof.

Obviously any number of arrangements of the foregoing types can be arranged in series to provide multiple nips.

In Fig. 7 are shown three rollers 11, 12, 12*a* forming between them two nip baths of the type shown in Fig. 6, one being formed by each of the troughs 20, 20*a*. This arrangement thus forms a duplication of the Fig. 6 arrangement forming a two-nip mangle.

In a further embodiment, in which the axes of the two bowls are in the same horizontal plane, as shown in Fig. 8, an endless rubber blanket 22 is passed round each of the rollers, each blanket being tensioned by a jockey or guide roller 24. Said jockey rollers are smaller in diameter than the rollers, and the axis of each is arranged substantially in the same plane as the axis of the associated roller. The liquor is fed into the trough or nip between the blankets 22 and the inter-blanket trough is sealed at each side by raised tires 23 provided at both edges of each blanket and formed either of soft sponge rubber or of air-inflated rubber. Each type is squeezed hard against the co-operating tyre on the other blanket and in this way forms the requisite seal. The distance between the two jockey rollers can be adjusted to vary the width of the trough of liquor.

We claim:

1. Apparatus for padding absorbent material in continuous length with a treating liquor comprising two parallel rollers cooperating to form a nip through which the material is adapted to be passed and at least one resilient endless element at each end of the pair of rollers and movable with the peripheries of the rollers in sealing engagement therewith so as to form a seal at the ends of the nip during rotation of said rollers, said rollers and endless element forming a bath for the treating liquor on one side of the nip through which the material passes into the bath spaced from the rollers until said material reaches the nip of the rollers to treat both sides of the material simultaneously in the passage of the material through the treating liquor.

2. Apparatus for padding absorbent material in continuous length with a treating liquor comprising two parallel rollers, said rollers cooperating to form a nip through which the material is adapted to be passed and forming a space between said two cooperating rollers on the intake side to said nip to receive a bath of treating liquor, means for feeding fresh liquor to said bath, means for maintaining the volume of fresh liquor in said bath at a predetermined amount, at least one resilient endless element at each end of the pair of rollers, said elements being movable with the peripheries of the rollers and in sealing engagement therewith so as to form a seal at the ends of the bath during rotation of said rollers, and means for feeding the material to the rollers out of contact therewith until said material reaches the nip of the rollers so as to treat both sides of the material simultaneously.

3. Apparatus for padding absorbent material in continuou length with a treating liquor comprising two parallel rollers, said rollers cooperating to form a nip through which the material is adapted to be passed and forming a space between said two cooperating rollers on the intake side to said nip to receive a bath of treating liquor, at least one feed conduit extending parallel to the nip for feeding fresh liquor to the bath substantially throughout the width thereof, means for automatically controlling the supply of treating liquor to said bath whereby the volume of liquor in said bath is maintained at a predetermined amount, at least one resilient endless element at each end of the pair of rollers, said elements being movable with the peripheries of the rollers while remaining in sealing engagement therewith, so as to form a seal at the ends of the bath during rotation of said rollers, and means for feeding the material to the rollers out of contact therewith until said material reaches the nip of the rollers so as to treat both sides of the material simultaneously.

4. Apparatus for padding absorbent material in continuous length with a treating liquor comprising two cooperating rollers, the axes of said rollers being parallel and disposed in a horizontal plane, said rollers cooperating to form a nip through which the material is adapted to pass, means for guiding said material to the nip from above in a vertical plane at an angle substantially equal to 90° with respect to the horizontal plane defined by the axes of said rollers, said rollers in a space above the nip forming a bath for a treating liquor formed between said two cooperating horizontal rollers above said nip, means for feeding fresh liquor into said bath on both sides of said vertical plane throughout the width of the nip, means for maintaining the volume of fresh liquor in said bath at a predetermined amount, and at least one resilient endless element at each end of the pair of rollers, said elements being movable in cooperation with the peripheries of the rollers while remaining in sealing engagement therewith so as to form a seal at the ends of the bath during rotation of the rollers, said material being fed through said bath to said nip and out of contact with the rollers until said material reaches said nip so as to simultaneously treat both sides of said material.

5. Apparatus for padding absorbent material in continuous length with a treating liquor comprising three cooperating rollers having identical diameters, the axes of the first and third rollers being in the same vertical plane and the axis of the second roller being in a vertical plane parallel to said vertical plane of said first and third rollers, said second roller being so arranged intermediate said first and third rollers that the plane containing the axes of the first and second rollers is perpendicular to the plane containing the axes of the second and third rollers, said first and second rollers cooperating to define a first nip therebetween and said second and third rollers cooperating to define a second nip therebetween, the entry side of each of said nips between the respective cooperating rollers forming baths through which baths said material is adapted to be passed successively,

means for feeding fresh liquor into each of said baths throughout the widths thereof, means for maintaining the volume of liquor in each of said baths at a predetermined amount, at least one resilient endless element at each end of the first and second, and second and third rollers respectively, said elements being movable in cooperation with the peripheries of the respective cooperating rollers while remaining in sealing engagement therewith so as to form a seal at the ends of the respective baths during rotation of the corresponding rollers, and means for guiding the material to said successive first and second nips at an angle substantially equal to 90° with respect to the planes defined by the axes of said first and second, and said second and third rollers respectively whereby said material is fed through said baths to said nips and out of contact with said rollers until said material reaches said nips so as to simultaneously treat both sides of said material.

6. Apparatus for padding absorbent material in continuous length with a treating liquor comprising two nip rollers disposed side by side, two guide rollers parallel to and spaced from said nip rollers and laterally spaced from one another, two endless resilient blankets, one of said blankets passing around one of said nip rollers and said guide rollers and the other of said blankets passing around the other of said nip rollers and guide rollers respectively, said blankets cooperating to form a nip between said two nip rollers and defining a V-shaped area immediately above said nip to receive a bath of treating liquid in said V-shaped area directly above said nip, means for supplying fresh liquor into said bath throughout the width thereof, means for maintaining the volume of liquor in said bath at a predetermined amount, resilient tires along the edges of each of said blankets, said tires located along the edges of one blanket

cooperating in sealing engagement with the respective tires located along the edge of the other blanket to form a seal for the ends of the bath, and means for feeding the material to the nip and out of contact with said blankets until said material reaches the nip so as to treat both sides of the material simultaneously.

7. Apparatus according to claim 1, in which each roller is provided with a groove at each end thereof and the resilient element is in the form of a single rubber belt rotating in the adjacent grooves of the two rollers at the nip thereof.

8. Apparatus according to claim 1, in which a resilient element in the form of a rubber band is provided on each end of each roller so that two adjacent bands cooperate to contact each other at the nip of the rollers.

9. Apparatus according to claim 1, in which a guide roller is provided for each roller and a resilient element in the form of a rubber band is provided on each end of each of said parallel rollers and passing over the respective guide roller so that two adjacent bands cooperate to contact each other at the nip of the parallel rollers.

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