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T. D. PACKARD
TREATING MATERIALS

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2 Sheets-Sheet 1

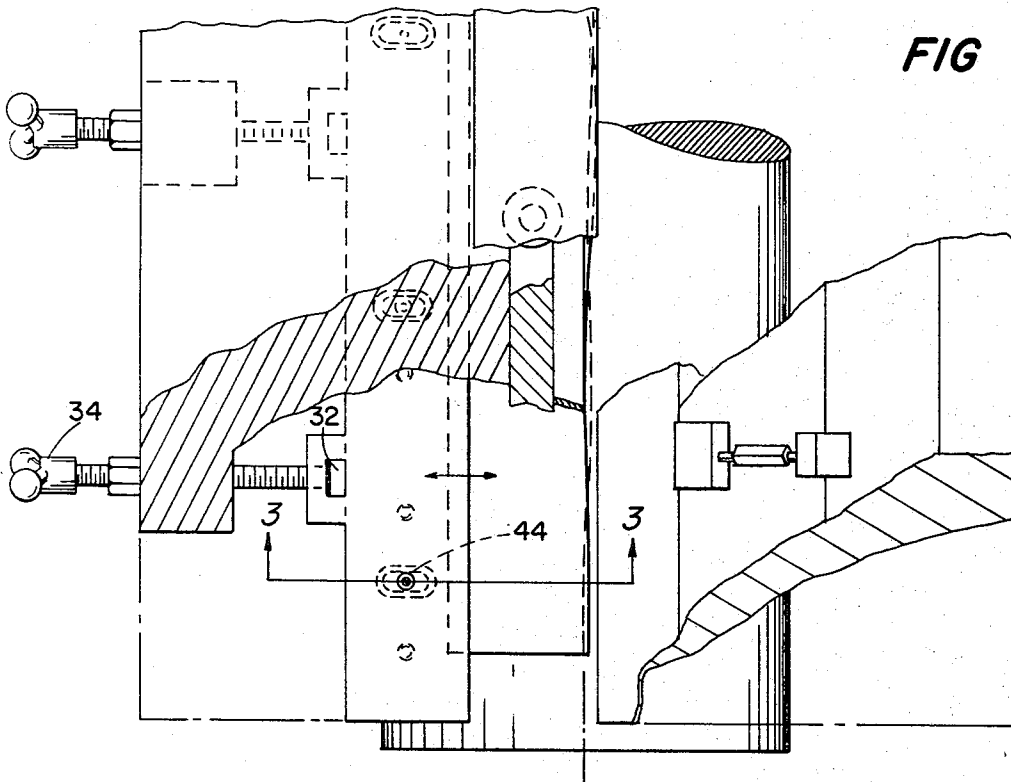


FIG 2

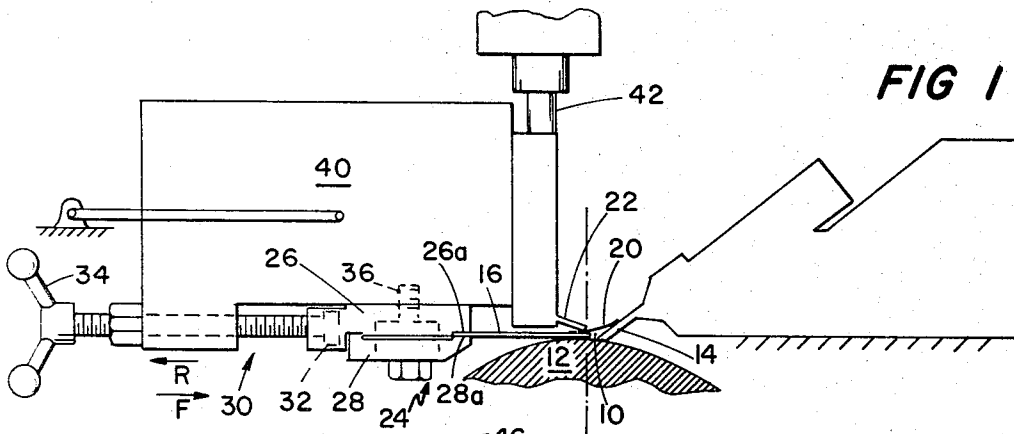


FIG 1

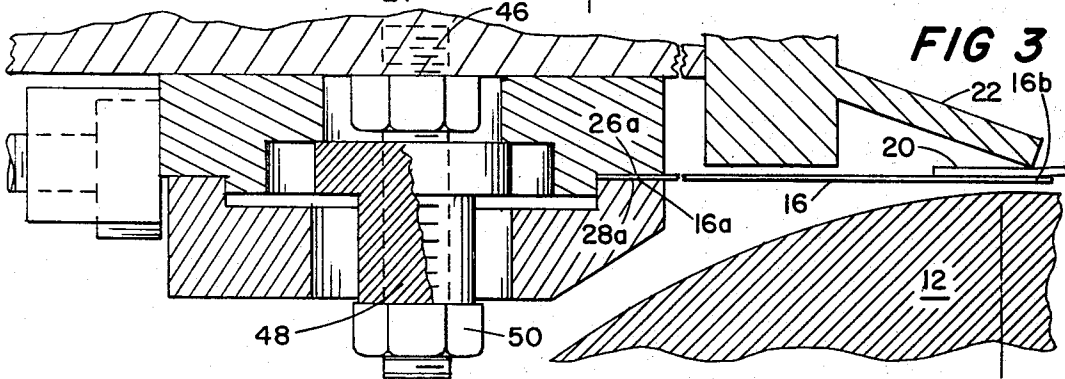


FIG 3

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TREATING MATERIALS

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ABSTRACT OF THE DISCLOSURE

Shown is a machine for applying lengthwise compressional forces to materials confined in a treatment cavity while moving on a drive roll. Preceding the retarding device is a sheet form member, the face of which presses the material against the drive roll. Adjustment forces applied in the direction of the plane of the sheet member at a number of points, with the end portion of the sheet member supported against deflection away from the roll surface, provide a means of regulating the treatment in the cavity to compensate for variations in the material and in the machine surfaces. Shown also are a bar secured to the sheet member for applying the forces; the sheet member extending over a substantial unsupported length to its end portion; and a retarder device comprising a stationary retarder and a resilient cooperating member in the form of a flexible sheet member.

This invention relates to the treating of materials and in particular to machines applying lengthwise compressional forces to confined materials or materials moving on a roll.

A principal object of the invention is to provide means adjusting and regulating the treating of materials to obtain the desired degree, and especially uniformity, of treatment. Particular objects include the provision of an adjustment means which is simple, reliable, inexpensive and accurate. Another object is to improve machines which employ thin metal sheet members as control and confining surfaces and make such machines more applicable to wide width materials. Another object is to provide an accurate control for the feeding and treatment of a textile, paper or plastic material as it enters a retarding region.

According to the invention it is discovered in a machine as described that a sheet-form member, though very thin, can receive spaced apart and varied adjustment forces parallel to the plane of the sheet to shift local portions of the sheet in its plane and adjust the position of local portions of the edge of the sheet, without wrinkling of the edge region of the sheet or otherwise disturbing the critical geometry of the treatment cavity.

It is found that such adjustment can apply to treatment cavities of extremely small dimensions, i.e., cavities for treating web materials one or a few thousandths of an inch thick, as well as being adapted to materials of substantially greater thickness. The invention is of particular usefulness in those cavities in which the sheet member is employed to press the material against a roll, and the edge of the sheet member marks the region where the material is permitted to expand against retarded material.

The invention relates to machines for subjecting a running length of material to compressional forces, the machine defining a treatment cavity or opening into which the material is driven and from which the material is removed after being subjected to compressional forces. Such machines advantageously employ a thin sheet member which has an edge region lying in the vicinity of the treatment cavity such that the position and relation of the edge region affects the treatment of the material, i.e., as

regards uniformity of treatment, degree of treatment, or amount of degradation of the material. The cavity, the sheet member and its edge region have a substantial lengthwise extent in a direction transverse to the direction of movement of said material to accommodate the full width of the material to be treated. According to the invention a plurality of adjustment means are secured to the sheet member in a spaced apart relationship along the length of the sheet member at locations spaced from the edge of the sheet member. Each adjustment means is arranged to apply an adjustment force in a direction having a substantial component in the direction of the plane of the sheet member, and the adjustment means are so secured to the sheet member that movement of one adjustment means does not affect the position of another. The adjustment means are thereby adapted to apply force to distort the sheet member in its plane and locally alter the position of a corresponding portion of the edge region of the sheet without altering the position of other portions of the edge region of the sheet member.

In preferred embodiments the machine includes means for applying a lateral force to the edge region of the sheet member in the direction of a reactant surface, this means serving to assist in maintaining the edge region of the sheet member in its desired position; for instance it counteracts any wrinkling tendency whenever substantial shifts of portions of the sheet occur.

In preferred embodiments the sheet member lies substantially tangential to the surface of a driven roll, the sheet member and the roll defining means for feeding material forward into the treatment cavity, the edge of the sheet member defining an initial surface of the treatment cavity. In such an embodiment the means for applying a lateral force to the edge region of the sheet member is of particular significance.

Preferred embodiments of the invention employ a retarder member located adjacent the roll, and the adjustment means serve to adjust the distance between the initial surface of the treatment cavity and the retarder member. This is found to be particularly effective in controlling the uniformity of treatment. Advantageously the retarder member comprises a thin sheet member whose edge is held adjacent the roll; also a further flexible sheet member is disposed above the first mentioned sheet member and extends forwardly therefrom to define with the retarder member a further portion of the treatment cavity.

For mounting the sheet member, in preferred embodiments, a bar means is secured to a second margin of the sheet member on the opposite side from the first mentioned margin, and the adjustment means comprise at least three spaced apart threaded adjustment members adapted to apply force to respective portions of the bar, thereby to apply the adjustment forces to the sheet member.

It is particularly preferred that the bar means comprises a pair of clamping bars secured tightly together to prevent relative movement between the clamping bars and the clamped surface of the sheet member. Preferably the bar means is slidably secured to a support which is stationary relative to the members defining the cavity and the clamping bars have mating clamping surfaces which are substantially flat and engage surfaces on the opposite faces of the sheet member.

It is of particular importance, in all of the various embodiments that the sheet member can extend rearwardly a substantial distance free from lateral support from its edge region to a mounting device, with the mounting device adapted to transmit the adjustment forces to the sheet member.

These and other objects and features of the invention will appear from the following description of a preferred embodiment.

FIG. 1 is a side view partially in cross-section of a preferred embodiment of the invention;

FIG. 2 is a plan view taken on lines 2—2 of FIG. 1;

FIG. 3 is a cross-sectional view taken on line 3—3 of FIG. 2;

FIG. 4 is an over-all plan view of the adjustment mechanism according to the invention;

FIG. 5 is a vertical cross-sectional view taken on line 5—5 of FIG. 4;

FIG. 6 is a diagrammatic view showing the treatment cavity of the embodiment of the preceding figures.

Referring to FIG. 1 the treatment cavity 10 (FIGS. 1 and 6) is defined on one side by a roll 12 and a stationary retarder element 14 having a leading edge adjacent the roll, and is defined on the other side by a first or primary sheet member 16 having an edge 18 spaced from the edge 15 of the retarder member and a second sheet member 20 extending forwardly of the sheet member 16 converging with the surface of retarder member 14. The two sheet members are pressed downwardly by presser member 22.

The material 24 is pressed against the traveling roll 12 and is driven forward into the treatment cavity 10 in which it is subjected to compressional treatment.

The end 18 of the primary surface member 16 (in this embodiment) defines the first part of the treatment cavity. This edge extends the full length of the roll, i.e., 76 inches, and the treatment of a similar width web occurs in advance of that edge.

Referring in particular to FIGURES 1 through 3 the primary sheet member 16 comprises a thin member, i.e., .010 inch blue tempered spring steel and extends rearwardly from edge 18 a substantial distance relative to its thickness, i.e., 3 or 4 inches to a support 24. In this embodiment the support comprises upper member 26 and lower member 28 which grip the rearward margin 16a of the primary member.

As shown in the figures the member 26 and 28 extend the full length of the primary member 16. Spaced along the length L of these members is a plurality of adjustment screws 30 each bearing on the clamp assembly 24 and, in this instance, having lugs 32 captured within slots associated with assembly 24 to permit the application of forces in both the forward F and rearward R directions, these directions being substantially parallel to the plane of the thin primary member 16.

The thinness of member 16, and the fact that it is rigidly held throughout its length at the rearward margin, surprisingly does not result in detrimental buckling or wrinkling of the member 16, or at least its forward portion 16b. Rather the primary member 16 uniformly engages the material, or rather can be made to uniformly engage and treat the material by means of visual inspection of the product and selective manipulation of the hand wheels 34.

In this embodiment the upper and lower clamping members 26 and 28 are secured tightly together by bolts 36, FIG. 5. At the forward portion of the clamping assembly opposed flat surfaces 26a, 28a engage corresponding face portions of the sheet member 16.

The sheet member is preferably free of lateral support; i.e., free of contact with supporting elements from the point of clamping forward to the point near the edge 18 where the presser member 22 bears upon it.

The presser member is particularly important in cases of substantial adjustment, being capable, by reason of its narrow region of contact and its concentration of forces near the end, to prevent detrimental wrinkling in the critical end region. The presser member 22, and the reactant member, the roll, confine the edge of the sheet member and the material together.

In order to permit shift of local portions of the sheet member 16 when adjusting the respective hand wheels 34, in this embodiment, the clamping assembly 24 is slidably supported upon stationary (in operation) head

40. As indicated by the diagrammatic link, this head is pivotally mounted for movement away from roll 12 for threading the machine. In operation pneumatic presses 42 spaced along the head are arranged to exert substantial downward force upon the presser member 22.

The slidable mounting is accomplished by means of slots 44 in the clamping assembly which are elongated in the sliding direction. Bolts 46 extend through these slots and are locked to the head member. Retainer bushings 48 on these bolts engage the under surface of the upper clamp, and are held in place by nuts 50. The pressure of the nuts 50 is sufficiently light to permit the upper clamp member 26 to slide locally with respect to head 40 and bushing 48 whenever a hand wheel 34 of one of the adjustment means is turned. The lower clamping member 28, being bolted at 36 to the upper clamping member, moves bodily with it under the influence of the adjustment means.

It will be appreciated that the clamping assembly 24 has a substantial cross-sectional area in the direction of adjustment, is advantageously made of steel, and extends uniformly throughout the length of the sheet member 16. Accordingly the clamping assembly serves to distribute the adjustment forces so that they do not act upon the sheet member 16 at a point, but rather more or less uniformly throughout a local region. In some important applications this construction and effect is of important significance.

It will be appreciated that the adjustment means 30 can apply forward and rearward forces to the assembly, and that motion of one does not affect the setting of another, so that a relative shift of the corresponding portions of the sheet member will occur.

In a preferred embodiment the adjustment threads are fine, e.g., 18 or more threads per inch, permitting quite fine adjustments. It has been reported that a difference of even less than .001 inch in the position of the front edge 18 of the sheet member relative to the retarder 14 can make a significant difference in the grade of textiles being processed by the machine. It is contemplated therefore that the invention will be of great importance with respect to textiles. With papers it is capable of ensuring uniformity in crepe height and caliper of the product, very important features for many end uses.

It will be understood that the sheet member may be made of various materials, i.e., spring steel, molybdenum, nickel or Invar, and can be of various thicknesses depending upon the particular application.

In its broadest aspects the invention is not limited to the location shown, nor to the particular treatments suggested.

Numerous changes can be made within the spirit and scope of the invention.

What is claimed is:

1. In a machine for subjecting a running length of material to compressional forces, said machine including a drive roll, a thin sheet member disposed in a converging relationship to the surface of said roll, means urging the surface of said sheet member toward the surface of said drive roll whereby said material can be driven forward, and a retarder device disposed adjacent the surface of said drive roll in the vicinity of the end of said sheet member to provide a treatment cavity, said retarder device arranged to retard the movement of material through said cavity, said thin sheet member having an edge region lying in the vicinity of said treatment cavity such that the position and relation of said edge region affects the treatment of the material, said treatment cavity including said sheet member and its edge region having a substantial lengthwise extent in a direction transverse to the direction of movement of said material, the improvement combined therewith comprising a plurality of more than two adjustment means secured to said sheet member in a spaced apart relationship along the length of said sheet member at locations spaced from said edge of said sheet member, each adjustment means arranged to apply an

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adjustment force in a direction having a substantial component in the direction of the plane of said sheet member, said adjustment means so secured to said sheet member that movement of one adjustment means does not affect the position of another, said edge region of said sheet member being supported against deflection away from said roll surface, said adjustment means thereby adapted to apply force to distort the sheet member in its plane and locally alter the position of a corresponding portion of the edge region of said sheet to provide a localized regulation of the treatment of material passing through said treatment cavity.

2. The machine of claim 1 wherein said retarder device comprises the combination of a stationary retarder blade held with an edge immediately adjacent the surface of said roll and having a material-engaging surface extending at an acute forward angle to the local tangent of said drive roll, and a resilient member converging toward said surface of said retarding member, arranged to resiliently press exiting material against said surface of said retarding member.

3. The machine of claim 2 wherein said resilient member comprises a flexible sheet member which is disposed above said first mentioned sheet member and extends forwardly therefrom defining with said retarder member the outlet end portion of said treatment cavity.

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4. The machine of claim 1 wherein a bar means is secured to said sheet member spaced from said edge region, and said adjustment means comprise at least three spaced apart threaded adjustment members adapted to apply force to respective portions of said bar, thereby to apply said adjustment forces to said sheet member.

5. The machine of claim 1 wherein said sheet member extends rearwardly a substantial distance free from lateral support from said edge region to a mounting device, said mounting device adapted to transmit said adjustment forces to said sheet member.

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