

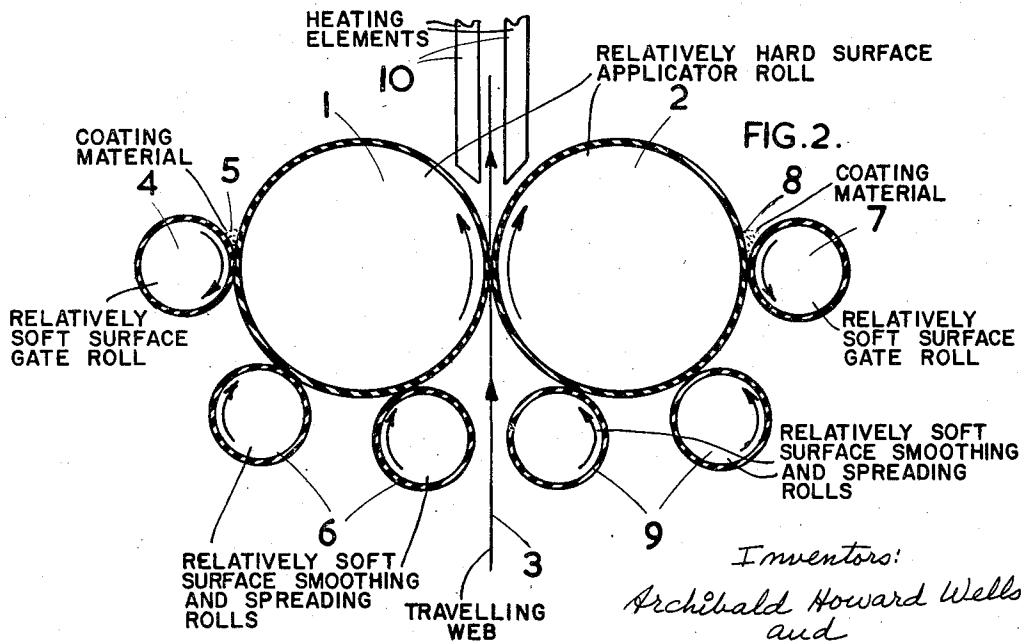
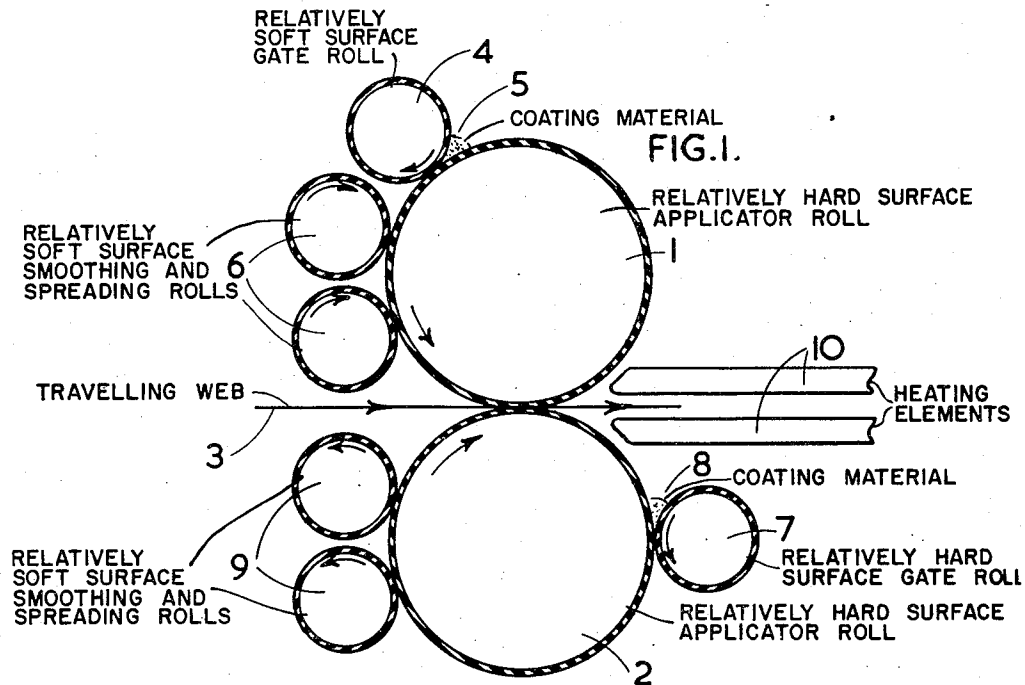
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APPARATUS FOR COATING PAPER

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APPARATUS FOR COATING PAPER

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This invention relates to apparatus for applying a fluid coating composition to a travelling web of material, such as paper or the like.

It is known to coat a travelling web of paper or like material by means of apparatus comprising an applicator roll, a gate roll in contact with said applicator roll, whereby the pool of fluid coating material may be maintained over the nip of said rolls, and one or more rolls in contact with the applicator roll to spread the coating material across the surface of the applicator roll. This type of apparatus, using rolls, the surfaces of all of which are smooth and hard, has the disadvantage that striations are formed in the layer of coating material on the applicator roll prior to being applied to the travelling web of material.

Proposals have been made to prevent the formation of striations by providing at least one roll in contact with the applicator roll with a heterogenous etched or roughened surface. Although the provision of a roll with a heterogeneous surface satisfactorily prevents the formation of striations in the coating material, it has the disadvantage that the surface of said roll quickly becomes fouled and clogged with the coating material which causes irregularities in the layer of coating material on the applicator roll and necessitates frequent roll washing.

It is an object of the present invention to provide an apparatus which does not have the aforementioned disadvantages.

According to the present invention, apparatus for coating a travelling web of material comprises an applicator roll, having an even and smooth surface, adapted to be contacted by the web in the course of its travel, a gate roll co-operating with said applicator roll to meter the amount of fluid coating material passing through the nip of said rolls and on to the applicator roll, and at least two rolls in contact with the applicator roll and adapted to smooth and spread evenly the coating material across the surface of the applicator roll, the gate roll and smoothing and spreading rolls having an even and smooth surface of resiliently deformable material which is soft as compared with the surface of the applicator roll.

Preferably, the gate roll co-operates with the applicator roll on the down-run side thereof and a pool of fluid coating material is maintained over the nip of said rolls.

The surface of the gate roll preferably is harder than that of the smoothing and spreading rolls and the surface of the applicator roll is preferably of resiliently deformable material.

In the preferred embodiment of the invention the applicator roll, gate roll and smoothing and spreading rolls are provided with surfaces, the hardnesses of which lie within the following ranges as indicated on the Pusey and Jones plastometer using a 1/8 inch ball.

Applicator roll	-----	35/70
Gate roll	-----	70/110
Smoothing and spreading rolls	-----	190/270

The resiliently deformable material forming the surface

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of the various rolls may be natural rubber or a synthetic elastomer, e.g. butadiene polymers or co-polymers. The gate roll and smoothing and spreading rolls may be provided with means whereby their respective contact pressures on the applicator roll may be adjusted.

A backing roll may be provided in contact with the applicator roll whereby the web may be passed through the nip of said rolls and thus held in close contact with the applicator roll. The backing roll may be mounted above or underneath the applicator roll or alternatively may be at the side of the applicator roll. If desired the backing roll may be in the form of another applicator roll so that the web may be coated on both sides, said applicator roll being associated with a gate roll and smoothing and spreading rolls as hereinbefore described.

The invention is now described, by way of example, with reference to the accompanying schematic drawings, in which:

Figure 1 shows in end elevation one arrangement of apparatus for simultaneously coating a web of material on both sides, roll surface material being shown in section, and

Figure 2 shows an alternative arrangement of apparatus for simultaneously coating a web of material on both sides, roll surface material being shown in section.

Referring to Figure 1, a pair of rotatable applicator rolls 1 and 2 are mounted one above the other and in contact with each other whereby a travelling web of material 3 may be passed through the nip thereof. A gate roll 4 is positioned in contact with the applicator roll 1 and on the down-run side thereof is rotatable oppositely to the direction of rotation of the applicator roll 1, whereby a pool of coating material 5 may be maintained over the nip of said rolls. The gate roll 4 is provided with means (not shown) whereby its pressure contact on the applicator roll 1 may be adjusted to meter the coating material in the pool 5 on to the surface of the applicator roll 1. By maintaining the gate roll 4 in pressure contact with the applicator roll 1 wetting of the surface of the applicator roll 1 is ensured which partly assists in the prevention of striations in the coating material applied to said surface. A pair of smoothing and spreading rolls 6, rotatable oppositely to the direction of rotation of the applicator roll 1, are positioned in pressure contact with the surfaces of the applicator roll 1 between the gate roll and the nip of the applicator roll 1 with the applicator roll 2. The two smoothing and spreading rolls 6 are provided with means (not shown) whereby the pressure contact with the applicator roll 1 may be varied. The pressure contact is adjusted, depending upon the type of coating material used, so that a layer of coating material of desired thickness is smoothly and evenly formed on the surface of the applicator roll. If desired, the two smoothing and spreading rolls 6 and also the gate roll 4 may have peripheral speeds different from that of the applicator roll but this is not essential and their peripheral speeds may be the same as that of the applicator roll.

It is pointed out above that the surface of the applicator roll is preferably of resiliently deformable material, and that the resiliently deformable material forming the surfaces of the various rolls may be natural rubber or a synthetic elastomer. The applicator rolls 1 and 2 may thus be surfaced with such a material, but the specific material employed is not critical provided the gate roll 4 and smoothing and spreading rolls 6 have even and smooth surfaces of resiliently deformable material which is soft as compared with the surface of the applicator roll 1.

The applicator roll 2 is provided with a gate roll 7 in pressure contact with said applicator roll whereby a pool of coating material 8 is maintained over the nip of said rolls. A pair of smoothing and spreading rolls 9

are positioned in pressure contact with the applicator roll 2 between the gate roll 7 and the nip of said applicator roll with the applicator roll 1. The gate roll 7 and smoothing and spreading rolls 9 are provided with means (not shown) to vary the respective pressure contacts with the applicator roll 2 and they function in a similar manner as hereinbefore described with regard to the gate roll 4 and smoothing and spreading rolls 6.

The surfaces of the applicator rolls, gate rolls and smoothing and spreading rolls are formed from natural or synthetic rubber, the hardness of the rubber of the surfaces being graded to lie within the range quoted hereinbefore.

A pair of heating elements 10 may be provided so that the coated travelling web of paper will be partially or completely dried on emerging from the nip of the applicator rolls 1 and 2.

An alternative arrangement is shown in Figure 2, which arrangement allows the web to be coated simultaneously on both sides whilst travelling vertically. This alternative apparatus is similar to that shown in Figure 1 except the web is coated whilst travelling vertically as opposed to horizontally and like reference numerals are used to indicate like components.

The apparatus may be incorporated in a papermaking machine, without recourse to an after process and, although preferably carried out at the stage where the paper has been dried down to approximately 10% or less, by weight of water, it can be used at an earlier stage. The apparatus may be used to coat a web of paper with any aqueous coating composition containing essentially a mineral pigment and an adhesive. Paper coated with such a composition is widely used for magazines, books, periodicals and the like and also for advertising matter in pamphlet and catalogue form where detailed reproduction is desired.

What we claim is:

1. Apparatus, for coating a travelling web of material, comprising a rotatable applicator roll, having an even and smooth surface, adapted to be contacted by the web in the course of its travel, a gate roll rotatable oppositely to the direction of rotation of said applicator roll and co-operating with said applicator roll whereby a pool of fluid coating material may be maintained at the nip of said rolls and metered onto the applicator roll, at least two rolls in pressure contact with the applicator roll and being rotatable oppositely to the direction of rotation of said applicator roll and adapted to smooth and spread evenly the coating material across the surface of the applicator roll, the gate roll and smoothing and spreading rolls having even and smooth surfaces of resiliently deformable material which is soft as compared with the surface of the applicator roll, and means for keeping the web in contact with said applicator roll.

2. Apparatus according to claim 1, wherein the surface of the gate roll is harder than that of the smoothing and spreading rolls.

3. Apparatus, for coating a travelling web of material, comprising a rotatable applicator roll, having an even and smooth surface of resiliently deformable material, adapted to be contacted by the web in the course of its travel, a gate roll co-operating rotatable oppositely to the direction of rotation of said applicator roll and with said applicator roll on the down run side thereof, whereby a pool of fluid coating material may be maintained over the nip of said rolls and metered onto the applicator roll, at least two rolls in pressure contact with the applicator roll and being rotatable oppositely to the direction of rotation of said applicator roll and adapted to smooth and spread evenly the coating material across the surface of the applicator roll, the gate roll and the smoothing and spreading rolls having even and smooth surfaces of resiliently deformable material which is soft as compared with the surface of the applicator roll, and means for keeping the web in contact with said applicator roll.

4. Apparatus according to claim 3, wherein the applicator roll, gate roll and smoothing and spreading rolls are provided with surfaces the hardnesses of which lie within the following ranges, as indicated on a Pusey and Jones plastometer using a $\frac{1}{8}$ " ball:

Applicator roll	35/70
Gate roll	70/110
Smoothing and spreading rolls	190/270

5. Apparatus, for coating a travelling web of material, comprising a rotatable applicator roll adapted to be contacted by the web in the course of its travel, a gate roll rotatable oppositely to the direction of rotation of said applicator roll and co-operating with said applicator roll on the down run side thereof, whereby the pool of fluid coating material may be maintained over the nip of said rolls and metered onto the applicator roll, at least two rolls in pressure contact with the applicator roll and being rotatable oppositely to the direction of rotation of said applicator roll and adapted to smooth and spread evenly the coating material across the surface of the applicator roll, all of said rolls having surfaces of resiliently deformable material the respective hardnesses of which lie within the following ranges, as indicated on a Pusey and Jones plastometer using a $\frac{1}{8}$ " ball:

Applicator roll	35/70
Gate roll	70/110
Smoothing and spreading rolls	190/270

and means for keeping the web in contact with said applicator roll.

6. Apparatus according to claim 5 wherein the resiliently deformable material used to surface the rolls is selected from the group consisting of natural rubber, and synthetic elastomer.

7. Apparatus, for coating a travelling web of material, comprising a rotatable applicator roll, having an even and smooth surface, adapted to be contacted by the web in the course of its travel, a gate roll rotatable oppositely to the direction of rotation of said applicator roll and co-operating with said applicator roll on the down run side thereof whereby a pool of fluid coating material may be maintained over the nip of said rolls and metered onto the applicator roll, at least two rolls in pressure contact with the applicator roll and being rotatable oppositely to the direction of rotation of said applicator roll and adapted to smooth and spread evenly the coating material across the surface of the applicator roll, and a backing roll for keeping the web in contact with said applicator roll, whereby the web may be passed through the nip of said backing rolls and said applicator roll and thus held in close contact with the applicator roll, the gate roll and smoothing and spreading rolls having even and smooth surfaces of resiliently deformable material which is soft as compared with the surface of the applicator roll.

8. Apparatus for coating a travelling web of material comprising a rotatable applicator roll, having an even and smooth surface of resiliently deformable material, adapted to be contacted by the web in the course of its travel, a gate roll rotatable oppositely to the direction of rotation of said applicator roll and co-operating with said applicator roll on the down run side thereof, whereby a pool of fluid coating material may be maintained over the nip of said rolls and metered onto the applicator roll, at least two rolls in pressure contact with the applicator roll and being rotatable oppositely to the direction of rotation of said applicator roll and adapted to smooth and spread evenly the coating material across the surface of the applicator roll, and a backing roll for keeping the web in contact with said applicator roll, whereby the web may be passed through the nip of said backing roll and said applicator roll and thus held in contact with the applicator roll, the gate roll and smoothing and spreading rolls having even and smooth sur-

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faces of resiliently deformable material which is soft as compared with the surface of the applicator roll, the surface of the gate roll being harder than that of the smoothing and spreading rolls.

9. Apparatus for coating a travelling web of material comprising rotatable applicator roll adapted to be contacted by the web in the course of its travel, a gate roll rotatable oppositely to the direction of rotation of said applicator roll and co-operating with said applicator roll on the down run side thereof whereby a pool of fluid coating material may be maintained over the nip of said rolls and metered onto the applicator roll, at least two rolls in pressure contact with the applicator roll and being rotatable oppositely to the direction of rotation of said applicator roll and adapted to smooth and spread evenly the coating material across the surface of the applicator roll, and a backing roll for keeping the web in contact with the applicator roll whereby the web may be passed through the nip of said backing roll and said applicator roll and thus held in close contact with the applicator rolls, the surfaces of all of said rolls being formed of resiliently deformable material the hardnesses of which lie within the following ranges, as indicated on a Pusey and Jones plastometer using a $\frac{1}{8}$ " ball:

Applicator and backing rolls.....	35/70
Gate roll	70/110
Smoothing and spreading rolls.....	190/270

10. Apparatus according to claim 9 in which the backing roll is underneath the applicator roll.

11. Apparatus according to claim 9 in which the backing roll is at the side of the applicator roll.

12. Apparatus according to claim 9 in which the backing roll is above the applicator roll.

13. Apparatus, for coating a travelling web of material on both sides thereof, comprising two rotatable applicator rolls each having an even and smooth surface in contact with each other whereby the web, in the course of its travel, may pass through the nip of said rolls, and be kept by each in contact with the other, two gate rolls cooperating respectively with each applicator roll, each gate roll being rotatable oppositely to the direction of rotation of the application roll with which it cooperates, whereby a pool of fluid coating material may be maintained at the nip of each applicator roll and its associated gate roll and metered onto the applicator rolls and at least two rolls in pressure contact with each ap-

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plicator roll and being rotatable oppositely to the direction of rotation thereof and adapted to smooth and spread evenly the coating material across the surface thereof, the gate roll and smoothing and spreading rolls having even and smooth surfaces of resiliently deformable material which is soft as compared with the surfaces of the applicator rolls.

14. Apparatus according to claim 13, wherein the surfaces of the gate rolls are harder than those of the smoothing and spreading rolls.

15. Apparatus, for coating a travelling web of material on both sides thereof, comprising two rotatable applicator rolls, each having an even and smooth surface of resiliently deformable material, in contact with each other whereby the web, in the course of its travel may pass through the nip of said rolls and be kept by each in contact with the other, two gate rolls cooperating respectively with each applicator roll on the down run side thereof, whereby a pool of fluid coating material may be maintained over the nip of each applicator roll and its associated gate roll and metered onto the applicator rolls, and at least two rolls in pressure contact with each applicator roll, and being rotatable oppositely to the direction of rotation thereof and adapted to smooth and spread evenly the coating material across the surface thereof, the gate rolls and the smoothing and spreading rolls having even and smooth surfaces of resiliently deformable material which is soft as compared with the surface of the applicator rolls.

16. Apparatus according to claim 15, wherein the applicator rolls, gate rolls and smoothing and spreading rolls are provided with surfaces the hardnesses of which lie within the following ranges, as indicated on a Pusey and Jones plastometer using a $\frac{1}{8}$ " ball:

Applicator roll	35/70
Gate roll	70/110
Smoothing and spreading rolls.....	190/270

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