

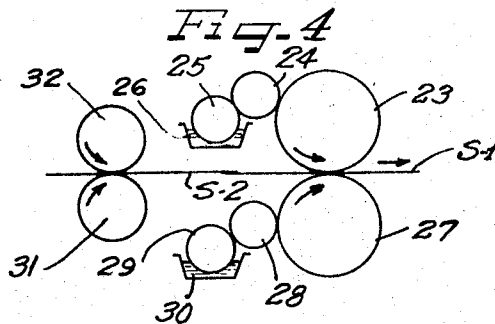
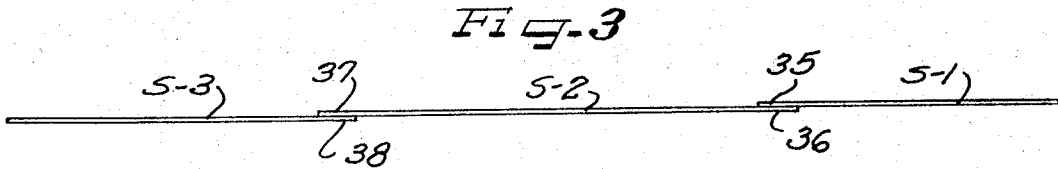
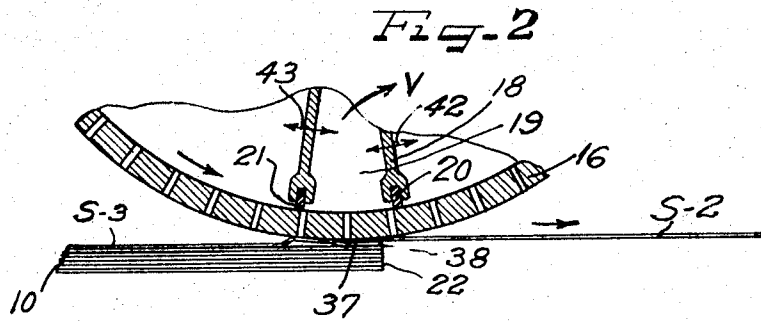
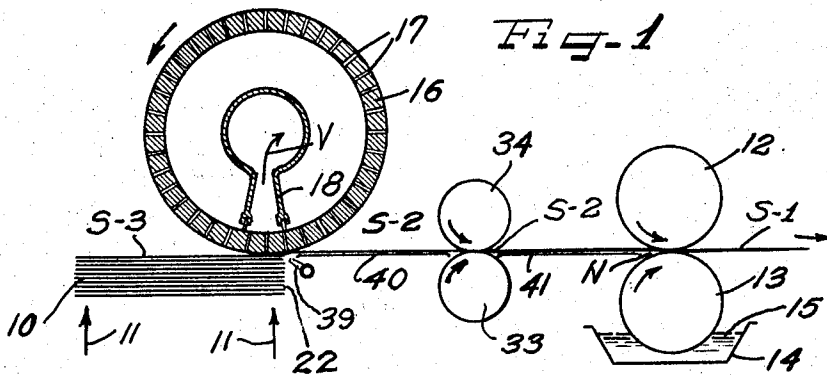
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SHEET FEEDER

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SHEET FEEDER

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8 Claims

ABSTRACT OF THE DISCLOSURE

A continuous coating apparatus for applying a coating on a surface of individual sheets having a pair of fixed coating rolls and sheet feeding device to feed successive sheets between the coating rolls with the leading edge of the following sheet overlapping the trailing edge of the preceding sheet to prevent the coating rolls from contacting each other. The feeding device includes a perforated roll shell having an adjustable suction gland positioned therein to create a suction on an arc of the shell's periphery disposed over a leading edge of a stack of sheets.

DISCLOSURE

The present invention relates to an improved apparatus for applying coating to paper sheets and particularly to a continuously operating sheet coater wherein individual sheets are continuously moved from the top of a stack and coated on both surfaces.

Although the instant invention may be adapted for use in coating various types of traveling flexible sheets the features of the invention afford particular advantages in applying coating to the surfaces of paper sheets and the invention will be described and illustrated in this environment.

In the coating of individual sheets, as contrasted with coating a continuous web, the sheets are individually handled such as by being removed from the top of a stack and passed through a coating nip. Coating may be applied to one or both sides and conventionally the coating nip is formed between a pair of coating rolls which are brought together to form the coating nip on the sheet as soon as the sheet is admitted between the rolls and the rolls are separated as soon as the trailing edge of the sheet reaches the nip. Whether coating one or both sides of the sheet, the rolls are conventionally separated when a sheet is not present. When coating only one side it is essential that the rolls be separated so that the backing roll which does not apply coating does not receive a layer of coating on its surface. When both rolls are applying coating, they are conventionally separated so as to avoid building up a small ridge or collection of coating on the on-running side of the nip, which will occur when a sheet is not present to remove the coating on the surface of the coating roll.

In a preferred embodiment of the present invention means are provided for continuously feeding successive sheets between coater rolls which operate on a fixed center and are continuously closed. The sheets are preferably fed so that the trailing edge of a first sheet overlaps the leading edge of a successive second sheet and a continuous uninterrupted train of sheets is passing through the coating nip. The mechanism for delivering the sheets operates off the top of a sheet stack and embodies a perforate continuously rotating roll shell with a suction gland therein that extends inwardly from the leading edge of the sheet a distance so that as the trailing edge of the first sheet is leaving the stack the leading edge of a second sheet will be drawn up against the roll shell and will engage beneath the trailing edge of the first sheet so that the sheets will remain in their overlapped relationship as they are fed to the coating nip.

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Accordingly, an object of the present invention is to provide an improved coating mechanism having continuous sheet feed means wherein a pair of coating rolls can operate continuously and do not have to be separated between sheets.

A further object of the invention is to provide an improved sheet delivering mechanism for a coater or the like wherein successive sheets are removed from the top of a stack in slightly overlapped relationship.

A general object of the invention is to provide an improved sheet coater which can operate continuously at higher speeds than heretofore obtained and requires simplified mechanism and can operate continuously over long operational periods without requiring attention, adjustment, or repair.

Other objects, advantages and features will become more apparent with the teaching of the principles of the invention in connection with the disclosure of the preferred embodiment thereof in the specification, claims and drawings in which:

FIGURE 1 is a side elevational view shown in schematic form with portions in section of a sheet delivering mechanism constructed and operating in accordance with the principles of the present invention;

FIGURE 2 is an enlarged fragmentary view of a portion of the delivery mechanism of FIGURE 1;

FIGURE 3 is a side elevational view showing the relative position of successive sheets delivered by the mechanism; and

FIGURE 4 is a schematic side elevational view showing an arrangement for coating both sides of sheets.

ON THE DRAWINGS

FIGURE 1 illustrates sheets being individually removed from the top of a stack 10 in order to be coated on one or both sides. In the arrangement of FIGURE 1 a coating mechanism is shown for coating only the lower sides of the sheets and in FIGURE 4 the mechanism is adapted for coating both surfaces of the sheets. In each arrangement the same sheet delivery mechanism is employed and therefore this mechanism is shown in detail only in FIGURES 1 and 2.

In FIGURE 1 a first sheet S-1 is shown passing between coater rolls 12 and 13. The upper roll 12 is a backing roll and the lower roll 13 carries a layer of coating on its surface. The coating is received from a coating pan 14 containing a pool of coating 15 therein. It will be appreciated that the coating may be applied to the coating roll 13 by various suitable coating arrangements. It will further be appreciated that while the sheet delivery mechanism which will be described and which is shown can be used in various environments where the delivery of sheets at a rapid rate with the sheets slightly overlapping, it is particularly well adapted to use with a paper sheet coating mechanism and will be described in that use. Various mechanisms have heretofore been employed for applying coating to one or both surfaces of sheets and one arrangement which has been commonly used employs coating rolls which must separate as each of the sheets passes. As will be observed with the delivery of sheets at spaced intervals, when the interval occurs between sheets if the rolls are not separated a coating from the lower roll will be applied to the surface of the upper roll, and the upper roll must be kept dry for a satisfactory coating and for preventing coating from getting on the upper side of the sheet and preventing the sheet from sticking to the upper roll.

In accordance with the method of the present invention the sheets are rapidly and successively withdrawn from the top of a stack with the leading and trailing edges of the sheets slightly overlapped preventing contact between coating roll surfaces since continuous flow of sheets

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will occur between the rolls. This eliminates the necessity of separating the rolls and permits operating and maintaining the rolls on fixed centers.

The relationship between successive sheets is shown in FIGURE 3 wherein a first sheet S-1 is closely followed by a second sheet S-2. The trailing edge 35 of the first sheet S-1 slightly overlaps the leading edge 36 of the following sheet S-2. Similarly, the trailing edge 37 of the second sheet S-2 slightly overlaps the leading edge 38 of the third sheet S-3. As will be observed and further become apparent the amount of overlap can be reduced to a very small amount and this will be controlled in accordance with the necessity of having the coating extend as close to the edge of the sheet as possible. In the arrangement shown, there will be a small area on the trailing edge of each of the sheets which will not be coated.

The individual sheets are removed from the top of the stack 10 by rotating roll shell 16 having radial perforations 17 therein. Within the roll shell is a suction gland 18 which covers a predetermined arc of the inner surface of the shell so that a predetermined area at the lead end of the sheets on the stack 10 is subjected to vacuum. The sheet stack 10 is continually and gradually elevated by supporting and elevating means shown schematically by the arrowed lines 11. The elevating mechanism need not be illustrated or described in detail inasmuch as various suitable mechanisms of this type are well known to the art.

As the roll shell 16 is rotated in a forward direction as indicated by the arrowed line adjacent the surface thereof, FIGURES 1 and 2, the sheets are carried forwardly and transferred to the coating nip N between the coating rolls 12 and 13 and this may be aided by a pair of pull rolls 33 and 34. A plurality of sets of pull rolls may be provided depending upon the length of the sheets handled and in some instances with shorter sheets and sheets of greater stiffness the pull rolls may be omitted.

An important feature of the invention is the handling of the sheets at the top of the stack in such a manner as to cause an overlap between the trailing edge of a sheet which is ahead and the leading edge of a succeeding sheet. As shown in FIGURE 2, as the trailing edge 37 of the sheet S-2 passes beneath the suction gland 18, the surface of the following sheet S-3 just behind its leading edge becomes exposed to the suction created by the suction gland 18 so as to draw it against the outer surface of the suction roll shell 16. This pulls it up beneath the trailing edge 37 of the sheet S-2 so that it immediately follows the sheet S-2.

The suction gland 18 is provided with walls which form a suction chamber 19 that is connected to a suitable vacuum source V such as a pump. The suction gland has a leading seal 20 and a trailing seal 21 between the gland walls and the inner surface of the roll shell 16. The position of the seals 20 and 21 is adjustable by suitable mechanism, illustrated schematically by the arrowed lines 42 and 43. The leading seal 20 is preferably positioned substantially at just outwardly from the leading edge 22 of the sheet stack 10, and the trailing seal 21 is preferably positioned slightly rearwardly from the leading edge 22 of the sheet stack 10. The distance that the trailing seal 21 is positioned back of the leading edge of the stack will determine the amount of overlap between the sheets.

The lead end 38 of the following sheet S-3 is aided in being lifted from the stack 10 by an air jet 39 positioned to blow upwardly beneath the sheet. This will also prevent it from frictionally dragging a sheet below it in a forward direction with it. The sheets are aided in being supported by lower guides 40 and 41 extending in the space between the stack and pull rolls 33 and 34 and between the pull rolls and coating rolls 12 and 13.

As illustrated in FIGURE 4, both surfaces of sheets S-1 and S-2 are coated between an upper coating roll 23 and a lower coating roll 27. Coating is applied to the upper roll 23 by transfer roll 24 engaging a coat-

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ing pick-up roll 25 running in a pool of coating in a coating pan 26. Coating is similarly applied to the lower roll 27 by a coating transfer roll 28 receiving coating from a coating pick-up roll 29 running in a pool of coating within a coating pan 30. The sheets are carried forwardly toward the coating rolls by a pair of pull rolls 31 and 32 to which the sheets are delivered by apparatus similar to that shown in FIGURES 1 and 2.

Thus it will be seen that I have provided an improved apparatus for handling sheets which meets the objectives and advantages above set forth. The device is particularly well suited for high speed coating reducing the amount of apparatus needed for devices heretofore available and capable of satisfactorily operating at much higher speeds than previously possible, and providing a more satisfactory uniform coated product. The coated sheets are delivered from the mechanism shown in the drawings to a stacking mechanism and may first pass through a coating and drying unit.

I claim as my invention:

1. A continuous sheet coater mechanism comprising: a pair of rotatable coater rolls forming a continuously closed coating nip therebetween,

means for supporting a stack of sheets to be coated,

a continuous rotatable perforate sheet delivery roll shell positioned above the stack at a leading edge thereof,

a suction gland within the roll shell extending behind the leading edge of the sheet stack so that before the trailing edge of a first sheet leaves the stack a second sheet will be picked up with its leading edge projecting beneath the trailing edge of the first sheet, an air jet directed upwardly at the leading edge of the stack for lifting the edge of the sheets against the roll shell, and

a pair of rotatable pull rolls forming a pulling nip therebetween positioned between the stack and the coating nip for delivering the sheets to the coating nip with their leading and trailing edges overlapped, whereby the sheets prevent the coater rolls from contacting each other.

2. A continuous sheet coater mechanism comprising: a pair of rotatable coater rolls forming a continuously closed coated nip therebetween,

means for supporting a stack of sheets to be coated,

a continuously rotatable perforate sheet delivery roll shell positioned above the stack at a leading edge thereof,

a suction gland within the roll shell extending behind the leading edge of the sheet stack so that before the trailing edge of a first sheet leaves the stack a second sheet will be picked up with its leading edge projecting beneath the trailing edge of the first sheet, and

a pair of rotatable pull rolls forming a pulling nip therebetween positioned between the stack and the coating nip for delivering the sheets to the coating nip with their leading and trailing edges overlapped, whereby the sheets prevent the pair of coater rolls from contacting each other.

3. A continuous sheet coater mechanism comprising:

a pair of rotatable coater rolls forming a continuously closed coating nip therebetween,

means for supporting a stack of sheets to be coated,

a continuously rotatable perforate sheet delivering roll shell positioned above the stack at a leading edge to deliver the sheets from the stack to the coating nip, and

a suction gland within the roll shell extending behind the leading edge of the sheet stack so that before the trailing edge of a first sheet leaves the stack a second sheet will be picked up with its leading edge projecting beneath the trailing edge of the first sheet, whereby the sheets are delivered with their leading

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and trailing edges overlapping to prevent the coater rolls from contacting each other.

4. A continuously operating sheet feeder for a coater or the like comprising:

means supporting a stack of sheets,

a continuously rotatable tubular perforate hollow roll shell positioned above and at the edge of the stack, and

a suction gland within the roll shell for subjecting a limited arc of the shell to suction extending to a location spaced inwardly from the stack edge so that a second sheet will be picked up by the shell before a trailing edge of a first sheet has left the stack and said sheets will overlap.

5. A continuous sheet coater mechanism comprising: coating means for applying coating to both sides of sheets delivered thereto,

means for supporting a stack of sheets to be coated, and

means successively withdrawing individual sheets from the top of the stack and delivering them to said coating means with successive sheets withdrawn before the preceding sheet has cleared the stack so that the leading edge of a succeeding sheet is beneath the trailing edge of a preceding sheet to present a continuous flow of overlapped sheets between the coating means.

6. A continuous sheet coater mechanism comprising:

a pair of rotatable coater rolls forming a continuously closed coating nip therebetween,

means for supporting a stack of sheets to be coated, a continuously rotatable perforate sheet delivering roll shell positioned above the stack at a leading edge thereof, a suction gland attached to a vacuum source and disposed within the roll shell extending from the leading edge of the stack closest to the coater rolls back a distance so that before the trailing edge of a first sheet leaves a stack a second sheet will be picked up with its leading edge projecting beneath the trailing edge of the first sheet,

means continuously elevating the stack for maintaining the uppermost sheet adjacent said roll shell, an air jet directed angularly upwardly toward the leading edge of the stack for lifting the edge of the uppermost sheet against the roll shell, and

a pair of continuously rotatable pull rolls forming a pull-

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ing nip therebetween positioned between the stack and the coating nip for delivering the sheets to the coating nip with their leading and trailing edges overlapped, whereby the sheets prevent the coater rolls from contacting each other.

7. A continuously operating sheet feeder for a coater or the like comprising:

means supporting a stack of sheets,

a continuously rotatable tubular perforate hollow roll shell positioned above and at the leading edge of the stack,

a suction gland within the roll shell having a leading seal and a trailing seal sealingly related to the inner surface of the roll shell for subjecting a limited arc of the shell to suction with the trailing seal extending to a location spaced inwardly from the leading edge of the stack so that a second sheet will be picked up by the shell before a trailing edge of the first sheet has left the stack and said sheets will overlap, and

means for adjusting the position of the trailing seal within the shell for controlling the amount of overlap.

8. A continuous sheet coating mechanism comprising: a pair of rotatable coating rolls forming a coating nip, said rolls being mounted on fixed centers,

means to rotate said rolls, and

means delivering successive sheets between the nip of said rolls with a leading and trailing edge of the sheets slightly overlapped so that the sheets prevent the rolls from contacting each other.

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