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G. P. COLGAN

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PAPER COATING APPARATUS

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FIG. 1

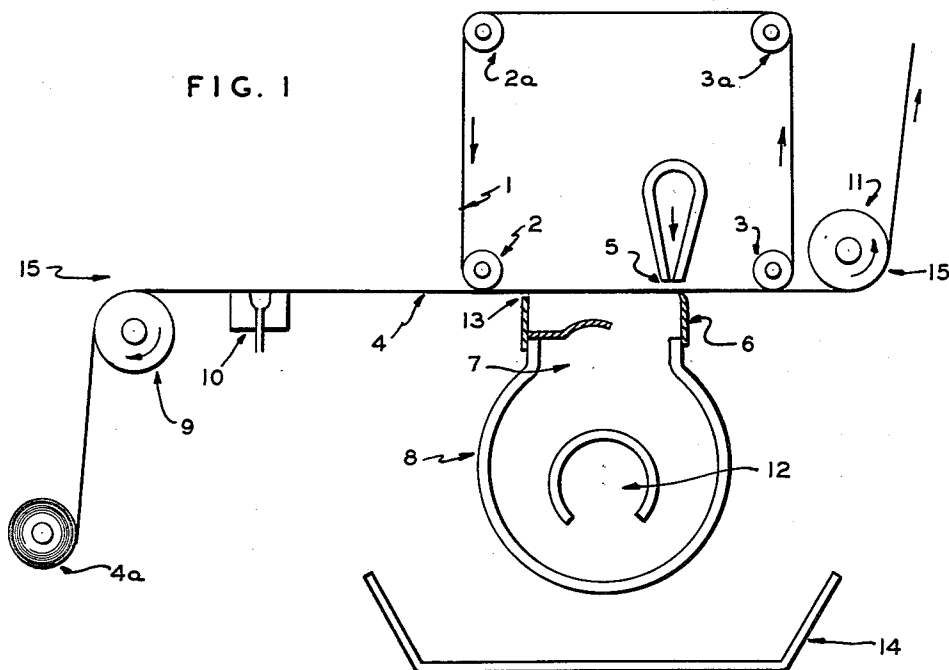
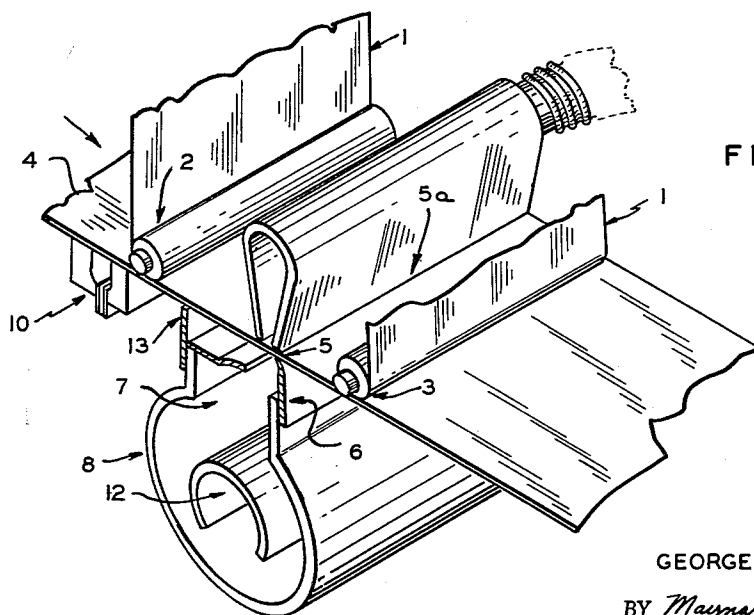


FIG. 2



INVENTOR.  
GEORGE P. COLGAN

BY *Maynard L. Young*  
Attorney

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## PAPER COATING APPARATUS

George P. Colgan, Whippany, N.J., assignor to Air Reduction Company, Incorporated, New York, N.Y., a corporation of New York

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This invention relates to improved apparatus for the coating of sheet materials; and relates more particularly to improvements in an apparatus for coating papers.

In the Kohler coating method, a continuous coating process, described in an article by John B. Kohler, TAPPI, volume 43, No. 2, pages 183 to 187 (February, 1960), paper is fed into the Kohler apparatus and brought in contact with the surface of a pond of coating color or other coating material. The coating, thus applied to the under-surface of the paper, is smoothed and metered by a rigid blade, usually situated transversely across and slightly under the path of the advancing paper webbing. The knife edge of this blade is adjusted to approximately the level of the surface of the pond. The metering action is controlled by an air jet, known as the air knife, which is in juxtaposition to the rigid blade and which is directed against the upper-surface of the paper webbing. The air knife thus regulates the pressure which the rigid blade exerts along its knife edge against the moving, coated sheet of paper.

Although the Kohler coating method is highly successful and has gained acceptance in the paper coating art, one particular disadvantage is inherent in the process. If a break should occur in the paper webbing in the vicinity of the air knife, the air jet impinges directly on the surface of the coating pond, splashing color or other coating material into the air and on the apparatus and paper. This necessitates a cleanup operation as well as a shut-down of the apparatus.

It is an object of this invention to provide improvements in the Kohler coating apparatus which will prevent the air jet from impinging directly on the surface of the pond in the event the paper webbing ruptures.

It is also an object of this invention to prevent difficulties resulting from a web break in the vicinity of the air knife and hence eliminate a cleanup operation.

It is a further object of this invention to improve the speed and efficiency of the Kohler Coating Process.

Another object of this invention is to provide improvements in the Kohler coating apparatus when used generally in the coating art to coat any sheet material adaptable to the coating techniques of the said Kohler process.

In the accompanying drawings the apparatus for carrying out the coating process is illustrated with the improvements of this invention. In the drawings:

FIG. 1 is a vertical section of the Kohler coating apparatus and the improvements of this invention.

FIG. 2 is an isometric perspective view of the coating apparatus with the inventive attachment.

Referring now to FIG. 1, the overall operation of the Kohler apparatus of the prior art, functions as follows: The continuous sheet material or a roll of paper webbing 4 is fed into the apparatus, referred to generally as 8, over roller 9, and over a vacuum box 10. Said vacuum box exerts a slight suction on the under-side of the webbing 4 and thus stabilizes web tension and smooths out wrinkles. The web 4 passes over the coating pond 7, contacting the surface thereof, passes through to roller 11 where it then leaves the apparatus 8. The web 4 is fed continuously into the apparatus 8, from a roll of the material 4a, thus providing for the coating of one continuous sheet of web material 4.

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The web line 15 is horizontal, primarily because the surface of the coating pond 7, is of necessity, horizontal. Moreover, any deviation of the web line 15 from the horizontal would create a component of downward force, at the rigid blade 6 causing web rupture. Constant uniform tension on the web 4 is maintained at all times by proper adjustment of rollers 9 and 11.

At the coating pond 7, the web 4 receives a coating on its under-surface, by contacting the surface of said pond 7. The pond 7 is maintained at a constant level at the web line 15, by the introduction of coating material through the inlet 12. Excess coating material runs out at the back weir 13 into the catch pan 14. The back weir 13 is adjusted to a height slightly below the web line 15. This insures a steady outflow of coating material and consequently a uniform coating of the web material 4. The flow of coating material is thus counter-current to the movement of the webbing 4. The back weir 13 is also adjustable to compensate for the rheology of the coating material.

An adjustable, removable, rigid blade 6 smooths and meters the coating thus applied to the surface of the webbing 4. The knife edge of said blade is thus approximately on the web line 15. The rigid blade 6, usually made of hardened, cutlery grade stainless steel, is specifically designed for the Kohler apparatus, its construction being well known in the art. The position of blade 6 with respect to the webbing 4 is also adjustable like the back weir 13, since its position as well as its design will influence the quality, thickness and weight of the coating.

The metering action of blade 6 in apparatus 8 of the prior art, was controlled by the pressure exerted by the air flow from the air knife 5 on the webbing 4, pressing said webbing along a line 5a (FIG. 2) transverse to the movement of the webbing 4, against the knife edge of the rigid blade 6.

The improvement of this invention comprises a barrier or belt 1 which is interposed between the moving paper web 4 and the air jet or air knife 5 and which, in its preferred form, is supported by rollers 2, 2a, 3, 3a. Referring to FIG. 2, it is seen that the belt is of a width equal to or slightly greater than the width of the paper webbing 4. The belt 1 is made of a soft, impervious, flexible material of high tensile strength. The belt must not have a particular affinity for dirt or grit, and should be easily cleaned. Such material may be thin plastic such as polyethylene terephthalate, rubber, metal or throw-away paper.

In its preferred form, the belt 1, is mounted on the rollers 2, 2a, 3 and 3a, in such a way as to offer minimum resistance to the movement of the webbing 4. The air knife 5 impinges on the belt 1, forcing it against the webbing 4, which is then forced against the knife edge of blade 6. Metering of the coating takes place as described above. In the event of a break in the webbing 4, it is clear that the air flow from the air knife 5 will impinge only upon the belt 1, and not upon the surface of the coating pond 7. This will obviate the difficulties of the apparatus of the prior art.

The barrier 1 may also take the form of an ordinary sheet of thin plastic, metal, or rubber, or throw-away paper, suspended by stationary supports, substituted for and in the same location as rollers 2 and 3. The form illustrated in FIGS. 1 and 2, of an endless belt 1, is preferred, since said belt can move with the webbing 4, thus offering minimal resistance to the forward motion of said webbing.

The rollers 2, 2a, 3, 3a are attached to the apparatus 8 by ordinary mounting means. Referring to FIG. 1, rollers 2, 2a are affixed to positions on the left side of the air knife 5, roller 2a being directly above roller 2. Rollers 3 and 3a are mounted in a similar fashion

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on the right side of air knife 5. In effect, the said rollers define corners of a quadrilateral figure enclosing the said air knife, although the invention is not limited to such a configuration.

The rollers 2 and 3 should be mounted in close proximity to the web line 15 such that the belt passing around the rollers contacts the webbing when the air knife impinges upon the belt. The rollers should not be positioned such that the belt rubs against the plenum chamber of the air knife. The belt 1 is placed on rollers 2, 2a, 3, 3a, so that it is firmly seated thereon, but with just enough slack to permit the air knife 5 to force it firmly and snugly against the webbing 4, and thus force the webbing 4 against the knife edge of the rigid blade 6. The rollers 2a and 3a should have means for adjusting their positions, in order to provide means for adjusting the slack and tension in the belt 1 prior to start-up and during operation.

The said rollers should also be of the free-rolling type, preferably mounted on bearings, and hence offering little resistance to the belt 1, as it is moved by the force of the moving webbing 4. The length of said rollers should be slightly greater than the width of the belt 1.

I claim:

1. In an apparatus for coating at least one surface of a sheet material, wherein the surface of said material to be coated is contacted with a body of a coating liquid, a device for controlling the characteristics of said coating, which comprises a rigid metering blade, extending across the coated side of said sheet material, from edge to edge, in contacting relation thereto, an air knife positioned in edge alignment with said metering blade, said air knife spaced from said metering blade, the improvement comprising a flexible belt, the lower reach of which is interposed between said air knife and said sheet material, in contacting relation with said sheet material and disposed across the entire width thereof.

2. In an apparatus for coating at least one surface of

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paper, wherein the surface of said paper to be coated is contacted with a body of a coating liquid, a device for controlling the characteristics of said coating, which comprises a rigid metering blade, extending across the coated side of said paper, from edge to edge, in contacting relation thereto, an air knife positioned in edge alignment with said metering blade, said air knife spaced from said metering blade, the improvement comprising an endless flexible belt, the lower reach of which is interposed between said air knife and said paper, across the entire width of said paper, and means for supporting said belt to travel in a path in contacting relation with the uncoated surface of said paper.

3. In an apparatus for coating at least one surface of paper, wherein the surface of said paper to be coated is contacted with a body of a coating liquid, a device for controlling the characteristics of said coating, which comprises a rigid metering blade, extending across the coated side of said paper, from edge to edge, in contacting relation thereto, an air knife positioned in edge alignment with said metering blade, said air knife spaced from said metering blade, the improvement comprising an endless flexible belt, the lower reach of which is interposed between said air knife and said paper, across the entire width of said paper, and adjustable roller means for supporting said belt to travel in a path in contacting relation at the surface of said paper upon which the air flow from said air knife impinges.

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