

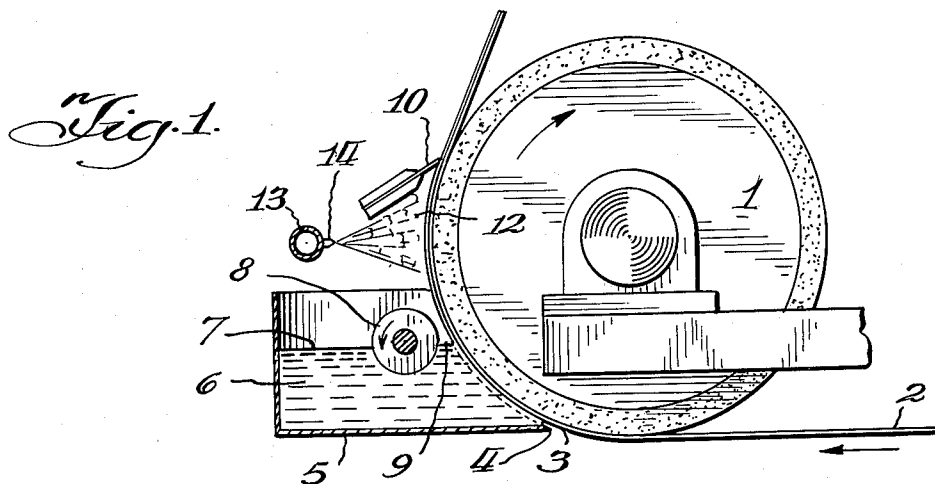
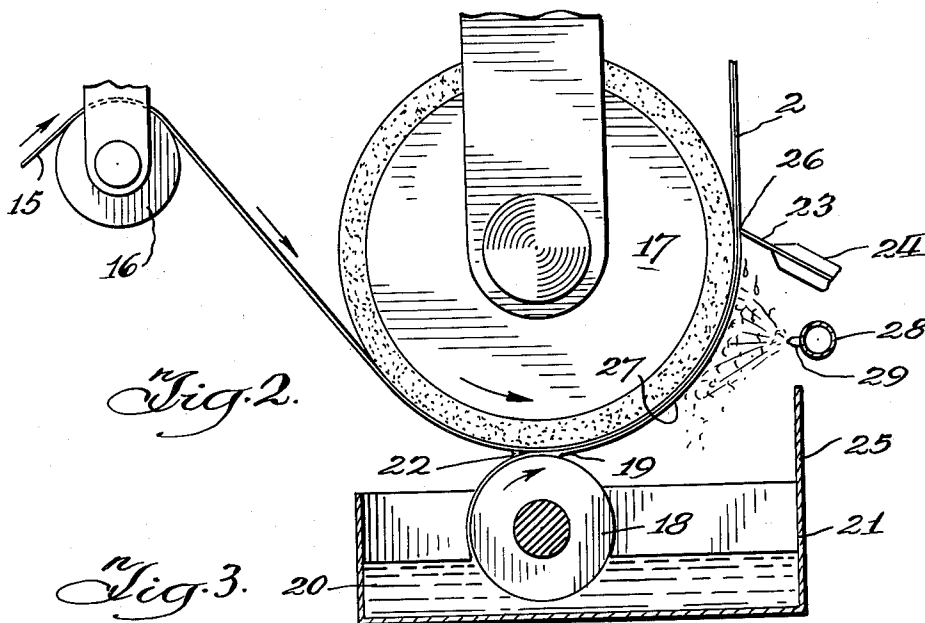
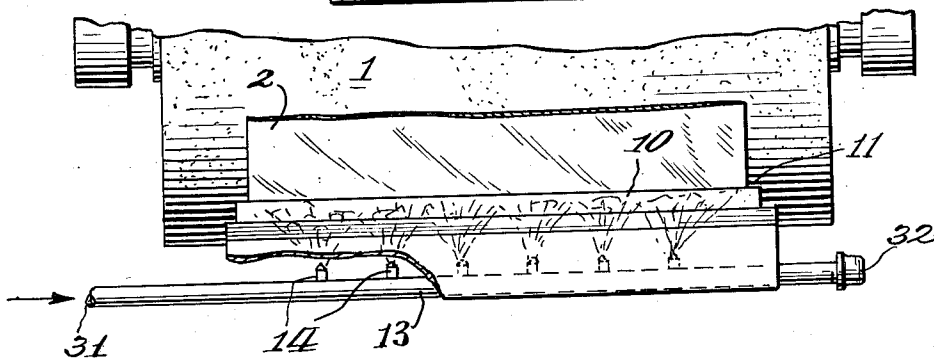
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PROCESS OF COATING PAPER WITH A TRAILING BLADE

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## 3,152,918 PROCESS OF COATING PAPER WITH A TRAILING BLADE

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This invention relates to a papermaking process. More specifically, the invention relates to trailing blade coating procedures and is directed to the application of aqueous mineral coatings to paper webs and the like.

Aqueous mineral coating material commonly contains a combination of pigment and adhesive and is dispersed or slurried in water. Customary pigments include clay, calcium carbonate, titanium dioxide, and the like; the usual adhesives are starch and casein although occasionally glues of various types may be employed.

These coating materials are applied to paper webs either on the papermaking machine itself or on a separate coating device. In either case it is customary to recirculate the excess of coating material troweled, bladed, or otherwise removed from the web in its passage. The blading action, of course, smooths the coating material on the web.

The aqueous mineral coatings, when freshly prepared, occasionally contain or develop some agglomerates; recirculated coating material is more subject to the formation of hardened and enlarged particles which pass in the system with the fluid coating material.

In trailing blade processes the applicator device for the coating is spaced from the blade and the blading action is exerted on a coating which has passed through a short but significant distance. While the time of passage, that is, the dwell period between the applicator and the blade, is usually of short duration, it is sufficient to introduce factors which apparently contribute to fine scratches in the finished sheet. While these scratches are intermittent and do not affect the paper for many printing operations, they are undesirable. Among the factors influencing the development of the fine scratches are the enlarged particles already mentioned as well as the fact that the substantially dried web absorbs liquid from the coating very rapidly, thus causing a continuous viscosity change in the coating material as it approaches the blade.

Additionally, in coating applications which are performed on the papermaking machine, the web is usually heated as it approaches the coating device and the coating material itself is customarily applied in a heated condition. Thus, the temperature of the web and coating as it leaves the coating applicator in its passage to the blade is normally in the range of 130-140° F. Accordingly, liquid is lost from the coating to the surrounding atmosphere in the form of vapor, since the surrounding atmosphere is normally at a lower temperature and relatively dry.

The combination of the foregoing factors, of course, does not have a constant effect on the coating material on the web as it approaches the blade; rather, these factors exert a variable effect if the web temperature and atmospheric temperature, for example, change. Agglomerates by their very nature occasion variable conditions in the coating material.

It has been found that a fine uniform spray or fog of a lubricant directed toward the coated web as it passes from the coating applicator to the blade, and through which the coated web must pass, is effective to materially assist the troweling or blading action. It appears that the addition to the coating composition surface softens the surface itself sufficiently to let agglomerates or grit parti-

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cles depress under the blade. The softened coating surrounding the particles tends to fill in adjacent to the particles, more or less enveloping them. The action is considered to be somewhat similar to that of moistening a finished plaster coating just prior to the final troweling of the plaster.

The added moisture may counteract to some extent the tendency of the solids in the coating to increase. The added moisture, however, itself does not serve apparently to reconstitute the coating, but rather inhibits some water evaporation from the coating as well as providing the noted lubricant function.

The lubricant, as well as improving the paper quality over that produced in similar runs without the fog or spray, tends also to inhibit caking and buildup of dried coating on the blade holder. This minimizes the opportunity for dried coating to pass to the recirculation system where such a system is employed.

The lubricant may have a number of forms but preferably is simply provided as an atmosphere or fog shower containing primarily, or containing only, water vapor or steam at a low, readily condensable temperature. The lubricant may also be in the form of a fine spray of an aqueous dispersion of a water soluble dispersing agent such as a soluble pyrophosphate, tetrphosphate, or hexametaphosphate, preferably as the sodium salt. A lubricant soap in low concentration in aqueous solution such as about 0.1% to 1% of an oleate may also be utilized.

Water vapor alone, however, derived from a spray or from steam is more suitable as it does not in any way alter the basic coating formulation, is economical, and has no tendency to adhere to the trailing blade.

It is accordingly, a primary object of this invention to provide a novel and improved process for coating applications, utilizing a trailing blade.

This and other allied objects of the invention will be more fully understood by reference to the following detailed description and accompanying drawings wherein:

FIG. 1 is a diagrammatic elevational view of apparatus useful in the practice of one embodiment of the invention;

FIG. 2 is a view similar to that of FIG. 1 but illustrating other apparatus useful in the practice of the invention; and

FIG. 3 is a plan view illustrating the arrangement of a trailing blade and the means for attaining a fog or spray shower.

Referring to the drawings, the numeral 1 in FIG. 1 designates a rubber covered, longitudinally extending (FIG. 3) backing roll of approximately 28 inch diameter. Suitably, this roll is driven at a controlled speed of about 300 to 2000 feet per minute and forms a component of the papermaking machine as well as of the coating apparatus in known manner. A paper web 2 is passed in the direction indicated by the arrows from the driers or breaker stack (not shown) if such are employed, and is in a heated condition that is approximately 130° F.

The web is passed on to the backing roll 1 and through a narrow aperture 3 defined by the backing roll and the forward lip 4 of a retaining trough 5. Trough 5 holds a pond of coating 6. The movement of the web upwardly into the pond and the viscosity of the coating composition 6 itself prevent loss of composition through the aperture 3. The aperture 3 in practice suitably has a width of about .05 inch and the web itself customarily has a thickness of about 0.003 inch in publication grades of coated paper and may be as thick as 0.010 inch in commercial grades.

The coating composition is itself conventional; for example, the composition to which the web is passed suitably has a solids content of about 59%, a viscosity of

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69.5° Brookfield (measured at 100 r.p.m. with #6 spindle at 50° C.) and is suitably composed of about 100 parts by weight of coating clay, 16% by weight of pearl starch (enzyme converted), 1% soap, caustic to adjust the pH to about 7.2, and water sufficient to make the noted solids content of 59%. The specific gravity of such a composition is approximately 1.42. Further, the composition is supplied in a heated condition, that is, at about 135° F. and at nearly the same temperature as the web.

Supported in any convenient manner in the trough 5 and projecting above the level 7 of the coating composition is a metering roll 8 which defines a slight gap 9 with the backing roll 1. Metering roll 8 is driven in the direction indicated by the arrow at a much slower speed than the backing roll. As is clear from the figure, the web 2 passes in the coating operation upwardly and is carried by the backing roll in the direction indicated by the arrows through gap 9 to a resilient flexible troweling blade 10 pressured into contact with the backing roll and web.

The angle of blade contact with a tangent to the backing roll at the line of blade contact may be between about 30-60°.

The surface 7 of the coating composition is spaced from the line designated at 11 of blade contact with the backing roll. This spacing is designated by the numeral 12 and, in the specific example under consideration, may suitably have a length of between about 14-17 inches along the periphery of the backing roll.

Positioned between the surface 7 and the line of contact 11 and arranged to project a shower or spray toward the spacing 12 is a shower head 13 having nozzle openings 14. Suitably, steam at a temperature of about 240° F. is ejected from the shower head and the vapor or condensate fills the area traversed by the web which is carrying an excess of coating composition from the surface 7 to the blade 10. The moisture-laden atmosphere not only inhibits evaporation from the coating excess but condenses to a slight degree on the composition surface, providing a lubricant action for the coating as it passes beneath the blade 10.

In the arrangement illustrated in FIG. 2, the web 15 heated to a temperature of approximately 150-160° by the driers (not shown) of the paper machine is passed over a tension roll 16 in the direction of the arrows. The web is directed onto the downwardly moving surface of the rubber covered backing roll 17. Backing roll 17 defines with applicator roll 18 an applicator nip 19. Nip 19 may be fed with coating material in any suitable manner but, as shown, is fed by the rotation of applicator roll 18 in the direction indicated by the arrows. Roll 18 is itself driven independently of backing roll 17. The nip pressure is suitably low, approximately 0-15 pounds per lineal inch, and the outgoing side of the web from the nip carries an excess of coating toward the flexible blade 23. Excess coating material flows along the blade and its holder, designated at 24, to the pan 21. Elongated side 25 of the pan assists the directing of the flow of the excess coating material.

Between applicator nip 19 and the line of pressure contact 26 of the blade with the web on the backing roll, a dwell space 27 is provided similar to that already described in connection with FIG. 1. Positioned to project a fine aqueous vapor spray toward the spacing 27 is a duct 28 having nozzle openings 29. Thus the space between the nip 19 and the blades 23 contains a fog atmosphere which is effective for the purposes already noted.

As illustrated in FIG. 3, duct 13 extends the full length of the backing roll with nozzles 14 spaced along the duct. Any convenient duct serves the purpose, the conduit inlet being designated at 31, and the dead end of the conduit at 32.

The utilization of the fog shower does not affect the

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coating weight applied. The coat weight per side per ream, while dependent in large measure on web speed, is customarily between about 3-8 pounds per side; commonly, increasing web speed increases coat weight.

The spray itself is so fine and so controlled that it does not deposit to any extent in the coating ponds beneath the spray.

It will be understood that this invention is susceptible to modification in order to adapt to different usages and conditions and, accordingly, it is desired to comprehend such modifications within the invention as may fall within the scope of the appended claims.

What is claimed is:

1. In a process in which aqueous mineral coating material containing a pigment and adhesive, and which coating material is subject to the development therein of hardened particles, is applied to a moving web and the web with the coating material thereon is directed from a coating applicator to a trailing blade for removal of excess aqueous coating material from the web, the steps of supporting the moving web on a backing roll, passing the web on the backing roll from the coating applicator to the said trailing blade, passing the web with excess coating material thereon to said trailing blade through a fog shower consisting of an atmosphere of water vapor to maintain the coating material other than hardened particles softened and hardened particles surrounded with said soft coating material, and continuously moving the said web from the said coating applicator through said shower and trailing blade to trowel the coating material on the web while hardened particles are surrounded.

2. In a process of coating paper, the steps of:

(a) supporting a traveling paper web on a resiliently covered rotating backing roll;

(b) carrying the web on the backing roll to a coating applicator;

(c) applying an aqueous mineral coating composition containing pigment, adhesive and soap to the traveling paper web, said coating composition being subject to the development therein of hardened particles;

(d) applying said aqueous coating composition to said web in excess;

(e) carrying said web with the excess of said aqueous coating composition thereon to a trailing blade spaced well around the periphery of the backing roll from the coating applicator and which trailing blade is pressed against the web on the backing roll;

(f) carrying the web with the excess of coating composition thereon to the trailing blade through an atmosphere consisting of water vapor while the coating composition on the web is flowable to cause hard particles in the coating composition on the traveling web to be surrounded and enveloped with coating composition; and

(g) troweling the said flowable coating composition on the web with the flexible blade as the web passes from the fog shower to the blade to remove the excess of aqueous coating composition from the traveling web.

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