

March 18, 1952

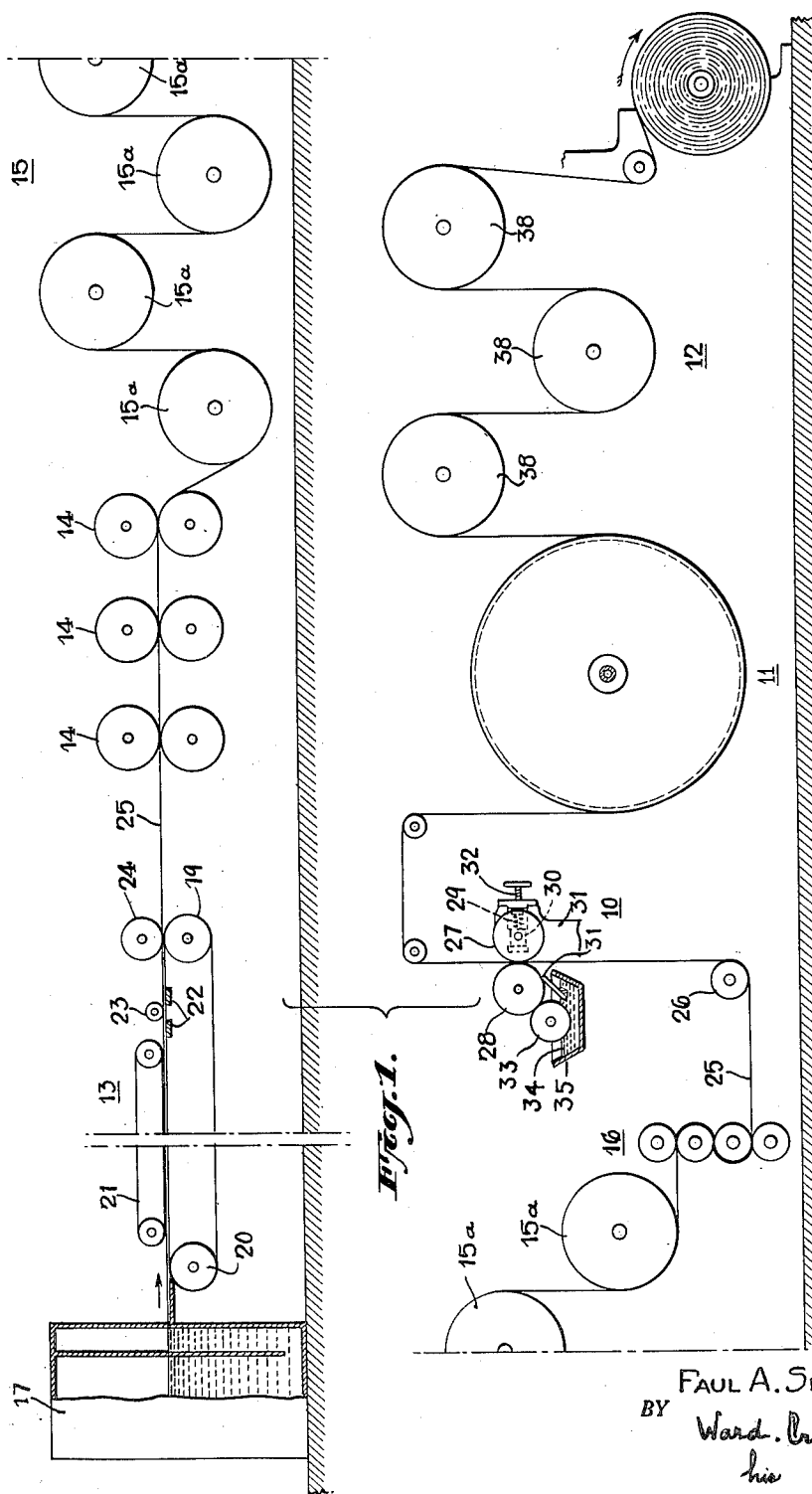
P. A. SNOWMAN, JR

2,589,302

METHOD OF APPLYING A DISCONTINUOUS COATING TO PAPER

Filed Aug. 5, 1948

3 Sheets-Sheet 1



INVENTOR.

PAUL A. SNOWMAN JR.
BY *Ward. Crosby & Neal*
his ATTORNEYS.

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P. A. SNOWMAN, JR

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3 Sheets-Sheet 2

Fig. 2.

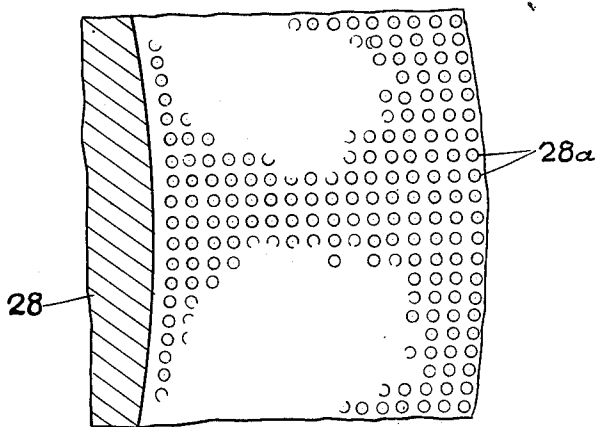


Fig. 2a.

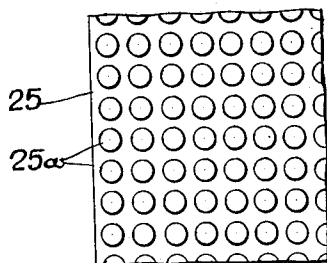


Fig. 2b.

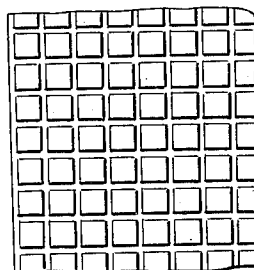
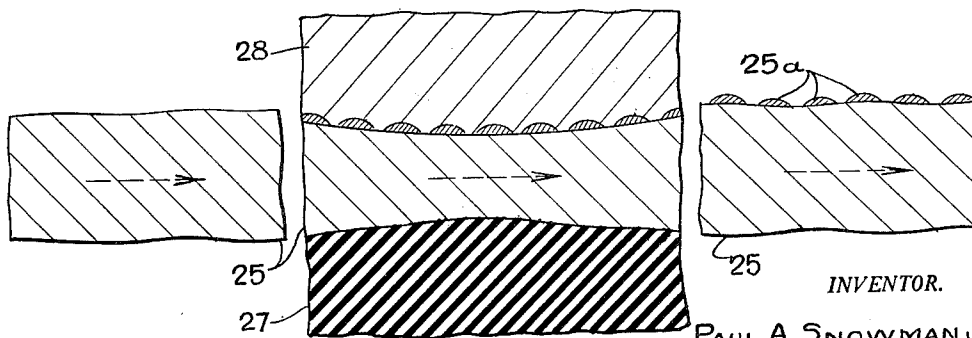


Fig. 3.

APPLICATOR ROLL



INVENTOR.

BY PAUL A. SNOWMAN JR.
Ward, Crosby & Neal
his ATTORNEYS.

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3 Sheets-Sheet 3

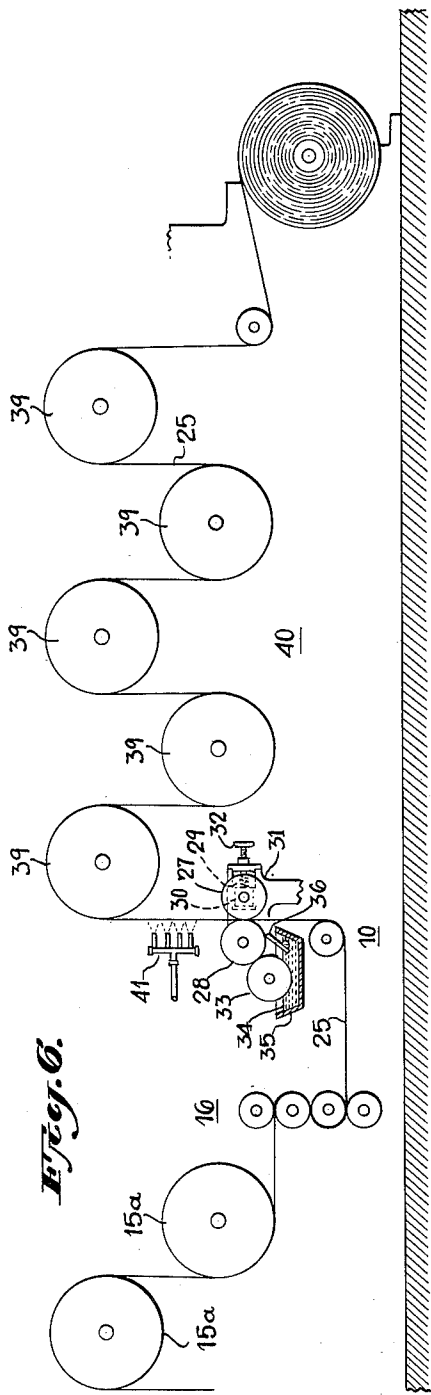


Fig. 4.

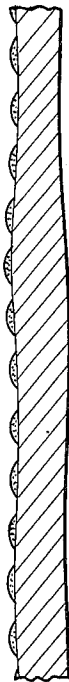
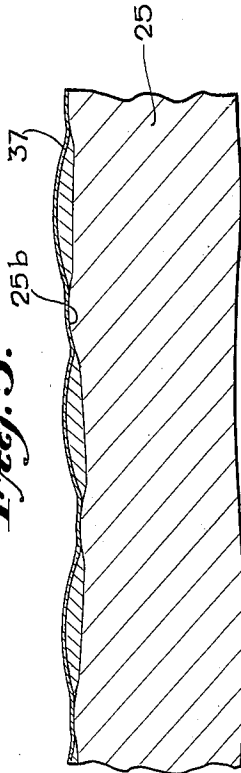


Fig. 5.



INVENTOR.
PAUL A. SNOWMAN JR.
BY *Ward, Crosby & Ward*
his ATTORNEYS.

UNITED STATES PATENT OFFICE

2,589,302

METHOD OF APPLYING A DISCONTINUOUS
COATING TO PAPER

Paul A. Snowman, Jr., Glen Ridge, N. J., assignor
to North American Paper Process Company,
Inc., New York, N. Y., a corporation of Dela-
ware

Application August 5, 1948, Serial No. 42,656

3 Claims. (Cl. 117—38)

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This invention relates to the coating of paper, and more particularly to novel methods for applying to paper a coating of extremely light weight. The invention also relates to methods for applying to paper such a coating and creating thereupon a novel glazed skin or film. Furthermore, the invention relates to the products of such methods.

The invention makes possible the production of a paper which gives the appearance of being uniformly and attractively coated, yet the coating film is discontinuous in that according to a uniform, predetermined pattern there are fine areas which are uncoated separated by areas of very small dimension which are coated. The discontinuous coating is constituted by, for example, fine mounds of coating material of finite height. The fine coated and uncoated areas, respectively, are of such small dimensions that they are not independently readily noticeable as viewed with the naked eye at the intended distance for vision and consequently the paper presents the appearance of being entirely uniform. The intended distance for vision with respect to a sheet bearing printing of normal size is approximately fourteen inches. However, since a considerable percentage of the total area is not actually coated with a coating mixture this appearance of a uniform coating is achieved by the use of a substantially smaller amount of such mixture than would be required to provide a continuous coating having good printing qualities.

It has been impossible in the past satisfactorily and economically to coat certain grades of paper, particularly the lower grades. One reason for this is that certain lower grades such as kraft have highly irregular surfaces containing hills and valleys of accentuated character as compared to other grades. The coating apparatus and methods of the prior art are unable uniformly to spread the coating mix upon both the high and the low surfaces. It has not been possible in the past to apply a satisfactory lightweight coating, for example, of the order of two to three pounds of coating per ream (26" x 38"—500 sheets) per side, by conventional coating methods, which coating will appreciably improve the appearance and/or the printing qualities of the sheet.

Past apparatus and methods have produced coatings, for example, wherein peaks or ridges have shown through the coating and in some cases extended above the level of the coating. Thus such past methods and apparatus have accentuated the surface irregularities of the paper

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and have been incapable of applying a lightweight coating uniformly.

According to the present invention, a coated paper and method for producing same are provided for satisfactorily avoiding the above noted difficulties.

One form of the invention illustrated in the accompany drawings and in the description, by way of example, comprises a novel method for applying a coating by intaglio means to a travelling web of sheet material, whereby the above-described discontinuous fine coating is achieved, thereafter the coating is dried, a skin is formed thereon and glazed by means of a highly polished, moving surface such as a heated glazing-drying roll or glaze roll. Said coating is applied in accordance with a uniform, minute pattern formed upon an applicator or coating roll. Such pattern can comprise, for example, a minute grid design or a plurality of minute, uniformly spaced, separate depressions formed in the surface of the applicator roll. A backing roll is employed with the applicator roll, these two rolls being urged together at a desired pressure and the travelling web passing therebetween. A fountain roll, which is partially immersed in a bath of coating mix, is preferably in sufficiently close contact with the applicator roll to transfer the coating mix to the latter. In order to scrape off of the applicator roll all of the coating mix except that which is contained in said depression, a doctor blade is employed whereby said roll can deposit directly upon the travelling web a plurality of minute portions or mounds of coating mix, thus forming areas of very fine dimension which are coated and which are separated by areas of very fine dimension which are uncoated.

The travelling web is next subject to said heated glazing-drying surface to form said glazed skin. One of the main reasons for subjecting the travelling web to such a surface is to produce a glazed sheet which meets the requirements, for example, of paper adapted for roto-gravure printing and the like. After the web has passed over the heated glaze roll it can be subjected to a plurality of drier rolls as desired.

Paper which, for example, is adapted for roto-gravure printing should have as nearly a perfect plane surface as possible. Such a surface has been achieved with continuous coatings in the past, but heretofore it has been impossible to provide such a surface having a discontinuous coating. The novel method herein described produces a coating of a lighter weight than heretofore possible at a cost lower than heretofore

attained and yet such a surface, for practical rotogravure purposes, is substantially a perfect plane having a glazed skin superposed upon said fine discontinuous coating.

A sheet adapted for rotogravure printing, in addition to having the above-mentioned smooth surface, should have a hardened skin or surface in order to achieve the desired printing reproduction qualities. The novel method herein described provides such a hardened skin upon the top surfaces of the mounds and upon the intervening uncoated areas. The latter areas are provided with an adequate hardness by virtue of: (a) the "fanning out" or dispersion of the binder which tends to permeate the paper beneath such uncoated areas; and (b) the flowing or migrating of some of the binder from the mounds of coating mix onto and over the uncoated areas.

When said travelling web is pressed against the above-mentioned heated glazing-drying surface or glaze roll, the fine mounds are pressed while in a plastic state thereagainst, thereby tending to level and press same into the paper, but the pressing is accomplished in such a manner that the discontinuous nature of the coating is preserved. The heated glaze roll induces first a migration of the binder out of the fine mounds whereby such binder flows to the top surfaces of the mounds and also onto the fine uncoated areas therebetween. Secondly the heated glaze roll causes a drying and hardening of said binder over the top surfaces of said mounds and in said uncoated areas whereby the above-mentioned glossy hardened skin is created. Thus, a binder which flows out of a given fine mound and onto a contiguous uncoated area may there merge with binder from adjacent mounds, thereby forming said substantially continuous skin over all of the mounds and areas intervening therebetween. Such skin is normally substantially transparent. The polished surface of the glaze roll acting upon the above-mentioned skin produces thereupon the above-mentioned glaze effect.

The skin, after hardening and glazing, thus acts in the dual capacity of providing means for aiding in holding down each mound by virtue of its cooperation with the adjacent uncoated areas of the paper, and also as a device for greatly enhancing the printing qualities and appearance of the paper because of its glazed hardened finish.

The novel product of the above method thus consists in a paper having such a discontinuous coating which is provided with a substantially continuous glazed hardened skin which extends over the mounds and over the intervening uncoated areas to create a substantially plane glazed surface.

It has been mentioned above that in the past, many grades of paper, particularly lower grades such as kraft, have not been coated because of the high cost and excessive added weight of the coating. Many such lower grades of paper have badly needed to be coated in order, not only to enhance the appearance and to improve the printing qualities thereof, but to increase the abrasion resistance thereof. This latter quality is of particular importance with respect to such papers as kraft. The novel methods defined herein can also be used to advantage to apply certain materials to the paper to change the physical properties of the finished sheet, for example, (a) to control wax or oil adsorption and/or (b) as above mentioned, to increase abrasion of scuff

resistance. Also due to the very efficient method of application and distribution herein disclosed, materials which heretofore have been considered too costly, can be economically applied, and materials which are of such a thixotropic nature that even coatings or applications cannot be obtained by methods heretofore proposed, can be easily obtained by a practice of the present invention. Thixotropic as employed herein refers to the property of a material of becoming fluid when force is exerted thereupon, and of becoming non-flowable when such force is removed. The use of a mix having a desired thixotropic nature assists in preventing coalescence of the mounds.

Moreover, materials which are sensitive to a change in pH and which cannot be applied commercially to paper because of residual acidity in the sheet, can now be effectively applied over long periods at high speeds. For example, in connection with the application of non-coating mixes such as surface sizing, in prior methods an "excess" of such material has been allowed to collect at the input to the so-called "nip" between the application roll and the backing roll. Residual acid ions in the paper may affect chemically such excess and portions of the latter so affected fall back into the reservoir therefor and cause the pH of the material in the reservoir to diminish to or approach that of the paper. This can spoil the application of the material, for example, by causing a "gumming" thereof or if casein is present a precipitation thereof may occur or if an emulsion is desired in such material the emulsion may be broken.

The invention in another aspect thereof comprises another novel method which will justify and make commercially feasible the coating of low grade papers, and which will overcome the above-mentioned difficulties regarding the change in pH. The novel method will produce a novel product embodying the above-mentioned desired characteristics of enhanced appearance, high abrasion resistance, and improved printing qualities. Such invention is constituted by the above-described method and product with the distinctions:

(1) The glaze roll and its effects are eliminated; and

(2) The fine discontinuous coating is substantially dried entirely before the fine mounds thereof are pressed against a drying surface.

Thus the coating comprises a plurality of fine mounds of finite height separated by minute uncoated areas, the mounds being not readily noticeable at intended distances for vision and giving the appearance of a continuous coating.

The application of the coating as a direct print from an intaglio applicator roll substantially eliminates coalescence of the discontinuous coating which normally might occur if an offset roll were employed. This preserves the discontinuous nature of the coating. It is important to preserve this quality because it enables the applicator roll to apply a coating with a uniformity of pattern which normally would be impossible. The applicator roll, at the high or unpitted areas thereof, is in direct contact with the surface of the travelling web whereby the coating is laid upon the web in a manner which is not affected by the usual variations in thickness or surface contours of the web. The fact that the backing and applicator rolls are urged together at a desired pressure assists in the laying down of the hills or mounds in this manner because either

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the paper in effect is pressed to a substantial uniform thickness in passing between these rolls, or the low surfaces are urged or thrust against the applicator roll as by a resilient backing roll. The paper thereafter may possibly assume its original variations in thickness and surface contours.

Various, further and more specific features and further advantages of the invention will clearly appear from the following detailed description when the latter is read in connection with the accompanying drawings. It is to be expressly understood, however, that the drawings are for purposes of illustration only and are not intended as a definition of the limits of the invention, reference for this latter purpose being had to the appended claims.

In the drawings:

Fig. 1 is a side elevation illustrating somewhat schematically one form of apparatus for carrying out one form of the present invention;

Fig. 2 is a detailed view of a portion of an applicator or coating roll used with the present invention, the surface formation being shown greatly enlarged;

Fig. 2a is a greatly enlarged view of a fragment of a paper web coated in accordance with the invention by the feed roll of Fig. 2;

Fig. 2b is a greatly enlarged view of a fragment of a paper web bearing a discontinuous coating of uniform pattern of the grid type having substantially square mounds, the coating being applied in accordance with the present invention;

Fig. 3 is a greatly enlarged fragmentary detailed view of a paper web passing between a coating roll and a backing roll;

Fig. 4 is a greatly enlarged cross-sectional view of a paper web having mounds of coating mix applied thereto in accordance with one form of the invention, the mounds illustrating the porous structure which is obtained by allowing the coating to dry without the application of any substantial compacting force, such as in calendering;

Fig. 5 is a still further enlarged cross-sectional view of the web and coating shown in Fig. 4 after the same has been glazed in accordance with another form of the invention; and

Fig. 6 is a side elevation illustrating schematically one form of apparatus for carrying out the invention and for applying the coating, as shown in Fig. 4.

Referring now to Fig. 1, the apparatus for carrying out one form of the novel method is constituted by an intaglio coating device 10 employed in combination with a glaze roll 11 and a drier 12. These elements are employed, for example, in cooperation with and as parts of a paper making machine, including a Fourdrinier unit 13, a plurality of press rolls 14, a drier unit 15 and a breaker stack 16. Five drier rolls 15a are shown, but any desired number can be employed, depending, for example, upon the desired dryness of the web prior to coating, the grade and weight of the paper, and the speed of the web. For example, with certain types of kraft, it may be desirable for the web to be relatively damp in order to assist in the application of the discontinuous coating, the relatively damp web, of course being more easily pressed to a uniform thickness between a coating roll and a backing roll.

Paper bulk or stock is fed to the Fourdrinier unit from a head box 17, the pulp passing to a wire screen 18 which can be driven in a conven-

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tional manner by a couch roll 19 and supported by a breast roll 20. Suitable straps, as at 21, are provided to keep the stock within the edges of the wire 18. Suction boxes 22 are employed which act in a well known manner beneath the upper run of the screen 18 and the paper fibres are laid down on said screen by a dandy roll 23 and a couch roll 24 also in a conventional manner.

A web of paper 25 issues from between the couch rolls 19 and 24 and passes to the press rolls 14 above mentioned. Suitable felt support blankets (not shown) can be employed for guiding the web relative to the press rolls 14.

Thereafter the web 25 passes through the drier 15 and thence to the breaker stack 16 from which it issues in a dried or partially dried form to the coating unit 10.

The breaker stack 16 should not compress the web to any appreciable extent but performs only its conventional function of relieving drying strains and smoothing out cockles in the sheet.

It will be understood, of course, that power is applied by suitable gears, shafts and other mechanism to the rolls described herein.

The web 25 passes from said stack 16 over an idler roll 26 to the coating unit 10. The latter is constituted by a backing roll 27 and an applicator or coating roll 28, these rolls being urged against one another with the web 25 passing therebetween. Suitable means are provided for urging these rolls together, comprising, for example, springs 29, located one at each extremity of roll 27, which act against shiftable journals or bearings 30. The journals 30 are movable in a suitable slotted support member 31 whereby the roll 27 can be shifted toward or away from the applicator roll 28. A hand wheel and threaded shaft 32 at each extremity of the roll 27 provide means for adjusting the compression of springs 29.

A fountain roll 33 is partially immersed in a bath of coating mix 34 contained in a receptacle 35. The fountain roll 33, in the form shown, is sufficiently close to the coating roll to transfer the coating mix but preferably is not in direct contact therewith. A doctor blade 36 is employed for substantially entirely removing the coating mix from the roll 28 except for the small amounts which remain in the minute depressions outside the reach of the blade.

Two examples of coating mixes which have been found to be satisfactory are:

	Pounds
(1) Clay	100.
Coating starch	20.
Neutral white soap	0.2
Water	99.
(2) Clay	100.
Casein	15.
Ammonia (26° Baumé)	75
Water	94.5

The terms "coating mixture" and "coating material" as employed herein refer to such substances of the aqueous mineral variety. The term "binder" as employed herein excludes such substances as oils.

The weight of the coating applied per unit area, of course, is a function of the number and size of depressions of the applicator roll. The percentage of solids in the coating mix will also affect the weight of coating applied and I have found that good results are obtained when the coating mix contains solids at the highest practical percentage. This speeds the drying of the

coating and reduces the tendency thereof to coalesce and to become distorted.

As indicated in Fig. 2, the applicator roll 28 is provided upon the surface thereof with a plurality of uniformly spaced and uniformly arranged minute depressions 28a which, for example, can be knurled or engraved or etched therein.

I have found that the discontinuous coating of uniform pattern is better applied by the intaglio method, that is, as a direct print from an intaglio roll, because of the substantial avoidance of coalescence of the coating. This is important because a coalesced coating of this general character cannot be so uniformly applied, is subject to streaking, and furthermore, often permits unsightly defects to appear in the finished sheet caused, for example, by protruding fibres and shives.

As shown in Fig. 2a, the coating is applied to the web 25 without coalescence, the pattern being clearly preserved and comprising a plurality of uniformly spaced hills or mounds which, for example, are substantially circular when viewed from above. The hills or mounds, instead of being in this shape, can be substantially square and arranged in a grid pattern, as shown in Fig. 2b. Any substantially uniform arrangement of substantially uniform hills or mounds of this minute character can be employed. It is understood that the views of the discontinuous coatings in Figs. 2a and 2b are greatly enlarged and that normally the hills or mounds thereof are not readily discernible, as have been above described. The aggregate of the coated areas is preferably about thirty-five to seventy-five per cent. of the area of the coated side of the web.

Further, with respect to the size of the coated areas or mounds of coating material, I have found that the maximum length or diameter thereof should not exceed about .0080 inch, and the height after drying is preferably about .0005 inch. Regarding shape, any circumscribed figure can be used. As to spacing, the distance between two coated areas (having no intervening coated areas therebetween) should not exceed about .0080 inch nor be less than about .0020 inch. Of course, it is possible to apply mounds of the maximum length or diameter separated by the minimum distance. The minimum spacing dimension of about .0020 has reference to the distance to the nearest coated areas. If the above-mentioned limits of dimensions are employed, each coated and adjacent uncoated area will be of such size that they will subtend a visual angle less than that required for conscious resolution by the unaided eye at a normal distance, for example, fourteen inches, at which the surface is to be viewed.

After the paper web has received the fine discontinuous coating from the coating unit 10, the coated side thereof is passed over the heated glaze roll 11 which, for example, is provided with a highly polished smooth surface of a metal, such as chromium. The coated web is substantially dried while in contact with the glaze roll, the contact accomplishing the following:

(1) The coating is compacted, that is there is a tendency to level the fine mounds of coating material and to press same into the paper web but in a manner that does not cause a coalescence of the mounds.

(2) The heat of the glaze roll induces a migration of the binder out the fined mounds of

coating mix to form a skin over the entire surface of the sheet as shown at 37 (Fig. 5). Thus the binder is caused to migrate to the top surface of the mounds and also onto the fine uncoated areas therebetween. A binder which flows out of a given fine mound and onto a contiguous uncoated area may there merge with binder from adjacent mounds, thereby forming said substantially continuous skin.

(3) The heat of the glaze roll causes a contraction of the paper web passing thereover which assists in pressing the paper web upon the glaze roll and which also assists in forming a substantially level surface by forcing paper fibres above their normal levels between the mounds as at 25b (Fig. 5) and simultaneously the mounds of coating mix shrink due to a loss of water caused by heat while under pressure. A substantially level sheet is produced in so far as practical printing requirements are concerned. There is a smaller quantity of coating material required to fill in the valleys between the mounds than would be necessary if such contraction and such upheaval did not occur. The migrating binder tends to migrate into the paper beneath such uncoated areas, thereby assisting in hardening same, and, as above mentioned, a small amount of migrating binder will flow onto such uncoated areas and thus will tend to fill in the valleys between the mounds to provide a substantially continuous skin.

(4) The thin film of binder above described is made glossy or glazed and the pressure applied by the above-mentioned contraction assists in producing a substantially level glazed and hardened surface.

The solids and the pigments in the coating mix, because of their high viscosity and/or insoluble nature, undergo no migration or undergo such a small amount as to be of no significance. This assists in maintaining the discontinuous nature of the coating. The paper fibres are kept in a partially plastic condition because of water vapor escaping through the web during the glazing action and thus such fibres are forced into intimate contact with and thoroughly bound to the fine mounds of coating mixture.

After the web is passed over the glaze roll 11, it preferably is passed over a plurality of drier rolls 38, for example, three as shown in Fig. 1, which complete the drying of the paper web. Thereafter the web can be calendered, if desired, or can be wound upon a suitable core.

The novel product of the above-described method is indicated in cross-section in Fig. 5.

The apparatus for carrying out another form of the novel method described above is indicated in Fig. 6 and is substantially identical to the apparatus shown in Fig. 1, with the exception that the glaze roll 11 is omitted and (1) the coating is subjected to heat as in a hot air jet, and (2) the uncoated side of the paper web, immediately is passed over the first of a series of drier rolls 39 of a drier unit 40. In the form shown, five drier rolls 39 are employed. The drier unit 40 preferably includes means as at 41 for directing a plurality of jets of hot air upon the coated side of the web. The hot air jet and the first drier roll substantially dry and remove the plasticity of the fine mounds before the latter are pressed against the second drier roll.

The drier unit accomplishes a complete setting or solidifying of the coating, the solidification being sufficiently complete by virtue of the

hot air issuing from the jets 41 and the first drier roll 39 to prevent compacting or embedding of the mounds into the paper web in any substantial amount, a cross-section of such mounds upon the web being indicated in Fig. 4. This latter representation is of the coated web after passing over the last of the drier rolls 39.

Regarding the pressure between the applicator roll 28 and the backing roll 27, relatively light pressure can exist therebetween and the coating mounds can be applied properly, provided the web surface is relatively smooth. But if the web surface is wavy and rough, sufficient pressure should be applied: (1) to compress the web between said rolls to a substantially uniform thickness to insure even disposition of the mounds upon the hills and in the valleys thereof, or (2) to cause the backing roll because of its resilient nature to urge the valley surfaces against the applicator roll. The backing roll 27, as indicated in Fig. 3, is preferably of rubber, which can be of sufficient hardness either to compress the paper web as above described and/or to urge the relatively low surfaces thereof against the coating roll 28.

When pressure is applied as in (1) and (2) above, there is a forced penetration of the coating material into and around the paper fibers while such material is in a highly plastic state. This forced penetration occurs in a novel manner by virtue of the forcing of the lip of each depression or cup strongly against the paper whereby considerable pressure is brought about to urge the material into the paper.

Certain types of paper when greatly enlarged in cross-section can appear to have an undulating but relatively smooth surface, as shown in Figs. 3, 4 and 5. The proper compression of the web between the applicator and backing rolls enables an even disposition of the mounds over this entire surface regardless of its undulating nature.

The novel method permits the application of coatings, for example, of a conventional starch or casein variety, in amounts which are substantially less per unit area than heretofore possible. A coating which is approximately one-half to one-third of the weight of minimum coatings previously possible can be applied by means of the present invention, such a lightweight coating being of a heretofore unattained low cost and providing abrasion resistance in a high degree.

The uncoalesced coating constitutes only a light burden for the paper, thereby making it unnecessary to have fibres of high strength which heretofore have been required in relatively thin papers to support the added load of the coating. The intaglio application under pressure of the discontinuous coating permits of a highly uniform patterned, unstreaked, and generally unblemished coating which is substantially free from defects caused by slight variations in web thickness. Greatly enhanced printing qualities are achieved by virtue of the coating.

In the above-described embodiment of the invention, the application of the coating is applied in the middle of the drier bank of the paper machine. However, the coating can be applied at an earlier point in the drying of the web but not until about eighty per cent of the moisture has been removed therefrom. Of course, the coating also can be applied after the web is fully dry. Also coatings can be applied to both sides of the web, for example, by using two coating units 10 above described, one for each side.

Coatings can be applied by this method to paper

stock as a separate operation after the stock has been made in the usual manner, provided the paper has not been highly calendered.

While the invention has been described with respect to certain preferred examples which have given satisfactory results, it will be understood that various changes may be made without departing from the spirit and scope of the invention as the same will now be understood by those skilled in the art. For a definition of the limits of the invention, reference will be had to the appended claims.

What is claimed is:

1. The method for applying a lightweight discontinuous coating of uniform pattern to a traveling web of paper which includes: applying to said web by direct print fine relatively closely spaced but segregated and uniform quantities of an aqueous mineral pigment coating mix including a binder, water and inorganic filler, said coating mix binder being selected from the group consisting of starch and casein, said mix containing inorganic filler in an amount between about forty-five and seven-tenths and forty-seven and six-tenths per cent by weight and binder in an amount between about seven and one-tenth and nine and two-tenths per cent by weight, and thereafter while still moist urging the closely spaced but segregated quantities of coating mix against the web by means of a highly polished rotating glaze member traveling at the same speed as the web, with a preselected pressure adequate only to insure uniform even contact, the closely spaced quantities of mix maintaining separateness but being partially flattened against the web, said glaze member being heated to a preselected temperature whereby the heat of the glaze member when contacting such quantities causes portions of the binder to migrate to the surface of such closely spaced quantities of mix and onto the uncoated areas of the web and thereafter are glazed by said glaze member to form a substantially continuous skin over the web, the discontinuous coating including the residue of said mix after migration of such portions of the binder, the web having coated and uncoated areas of such fine dimension that they are not readily distinguishable at distances for normal vision between about twelve to sixteen inches.

2. The method for applying a lightweight discontinuous coating of uniform pattern to a traveling web of paper which includes: applying to said web by direct print fine relatively closely spaced but segregated and uniform quantities of an aqueous mineral pigment coating mix including substantially one hundred parts clay, twenty parts coating starch, two-tenths part natural white soap and ninety-nine parts water, such parts referring to weight, and thereafter while still moist urging the closely spaced but segregated quantities of coating mix against the web by means of a highly polished rotating glaze member traveling at the same speed as the web, with a preselected pressure adequate only to insure uniform even contact, the closely spaced quantities of mix maintaining separateness but being partially flattened against the web, said glaze member being heated to a preselected temperature whereby the heat of the glaze member when contacting such quantities causes portions of the binder to migrate to the surface of such closely spaced quantities of mix and onto the uncoated areas of the web and thereafter are glazed by said glaze member to form a substan-

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tially continuous skin over the web, the discontinuous coating including the residue of said mix after migration of such portions of the binder, the web having coated and uncoated areas of such fine dimension that they are not readily distinguishable at distances for normal vision between about twelve to sixteen inches.

3. The method of applying a lightweight discontinuous coating of uniform pattern to a traveling web of paper which includes: applying to said web by direct print fine relatively closely spaced but segregated and uniform quantities of an aqueous mineral pigment coating mix including substantially one hundred parts clay, fifteen parts casein, seven-tenths part ammonia and ninety-four and one-half parts water, such parts referring to weight, and thereafter while still moist urging the closely spaced but segregated quantities of coating mix against the web by means of a highly polished rotating glaze member traveling at the same speed as the web, with a preselected pressure adequate only to insure uniform even contact, the closely spaced quantities of mix maintaining separateness but being partially flattened against the web, said glaze member being heated to a preselected temperature whereby the heat of the glaze member when contacting such quantities causes portions of the

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binder to migrate to the surface of such closely spaced quantities of mix and onto the uncoated areas of the web and thereafter are glazed by said glaze member to form a substantially continuous skin over the web, the discontinuous coating including the residue of said mix after migration of such portions of the binder, the web having coated and uncoated areas of such fine dimension that they are not readily distinguishable at distances for normal vision between about twelve to sixteen inches.

PAUL A. SNOWMAN, JR.

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