United States Patent Office 2,934,467
Patented Apr. 26, 1960

2,934,467

DRY GLOSS PRE-CAST CLAY LAMINATED PAPER AND METHOD OF MAKING IT

Frank D. Bergstein, Wyoming, Ohio, assignor to Bergstein Packaging Trust, a trust composed of Robert M. Bergstein and Frank D. Bergstein, trustees

No Drawing. Application February 7, 1957
Serial No. 638,680

22 Claims. (Cl. 154—97.5)

This invention relates to mineral coated paper or paperboard and to a new method for applying a surface layer of mineral coating material so as to develop any dseired surface finish inclusive of a high gloss or cast surface.

Heretofore, the application of mineral coatings to paper or board has been performed in two ways:

(1) The coating material is applied to the paper or board in the form of a slurry, as by means of coating rolls, doctors or the like, whereupon the coated paper or board is passed through calender rolls or the like. The resultant product is characterized in that it has a mottled or relatively low finish.

(2) The paper or board is first coated with the mineral coating material, whereupon the coated surface is pressed against a polished surface, such as a chromium plated drum, and the coating dried while in contact with the drum. The resultant product has a surface finish corresponding to that of the drum and is known in the art as a "cast surface," being characterized in that it has a high gloss finish as oppsoed to the more or less mottled appearance of calendered stock.

The instant invention relates to a radical departure from the basic coating methods characterized above and incorporates a wholly new concept in the mode of application of a mineral coating to paper or paperboard. Basically, the instant invention contemplates the precasting of the mineral coating layer on a surface other than the paper or board web followed by the application of the pre-cast or pre-formed layer as such to the paper or board. This procedure results in numerous advantages and effects savings which have hitherto never been obtained in the field of mineral coated papers. This is particularly true as applied to the high gloss or cast surface types of coated paper and board.

In order to appreciate the problems solved by the instant invention, it may be pointed out that the usual mineral coating layer cannot exist apart from the surface on which it is formed. That is, conventional mineral coatings do not have sufficient internal binding strength or bonding power to form a self-sustaining web or sheet which can be handled as such. The conventional mineral coating composition comprises at least 70% finely divided mineral matter such as mineral clay or calcium carbonate and not more than 30% binding agent such as casein, starch or alpha protein in aqueous suspension, with minor additions of coloring matter and other minor ingredients. A thin layer or coating of such composition is frangible and will literally fall apart or powder when freed from the surface which supports it; and consequently, it has been heretofore generally regarded that a mineral coating by its very nature could not be transferred or removed from the surface upon which it is formed. Contrary to this accepted belief, I have found that under proper controls a conventional mineral coating can be transferred from one surface to the other without in any way disrupting the integrity of the coating and without destroying or detracting from any given surface characteristics, such as high gloss or the like, which has been imparted to the coating. In addition, I have found that pre-cast coatings formed in accordance with my invention effect substantial savings in the amount of coatnig material required and in addition overcome certain inherent disadvantages in mineral coating procedures as they are now practiced.

In accordance with my new process, a thin layer or coating of the mineral coating composition is initially formed on a rigid surface, such as a steel drum or belt, to which the desired surface characteristics have been imparted. The coating is rapidly dried in contact with the supporting surface, whereupon the coating, now a lamina, is brought into contact with the paper or board sheet to which it is to be transferred. This may be conveniently done by means of a roller positioned to bring the sheet into contact with the coated surface of the drum or belt. The contacting surface of the sheet carries a coating of stripping or bonding adhesive which adheres to the mineral coating layer or lamina and, as the sheet passes around the relatively small circumference of the combining roll, a stripping action occurs causing the coating layer or lamina to be bodily transferred from the relatively non-adherent supporting drum to the highly adherent adhesive surface of the sheet. A key factor in the success of the transfer of the coating layer or lamina from one surface to the other lies in the control of the moisture content of the combining adhesive so that insufficient moisture or solvent is present in the adhesive to strike through the mineral coating layer or lamina and disrupt its surface characteristics. Actually, two controls are involved. One is the degree of drying to which the coating layer or lamina is subjected and the other is the amount of moisture or solvent in the adhesive. A balance can be effected between these two controls such that the coating layer or lamina may be simultaneously removed from the surface against which it was formed and transferred to the sheet to be coated or laminated.

A comparison of the present day method of forming a high gloss or cast finish with my new process will serve to illustrate the inherent differences between the two procedures.

(1) In the conventional high gloss coating operation the coating is performed on a separate machine and requires special handling of the paper or board roll. Due to the relatively slow speed of the coating and drying steps, the process cannot be conducted as an incident of the paper making operation and consequently the paper must be formed and dried on the paper making machine and wound into rolls which are then transported to the coating machine where the rolls must be unwound, coated and the coated webs redried and re-rolled. As opposed to this, my process permits "on the machine" application of the pre-cast mineral coating immediately in advance of the winding station of a conventional paper making machine. Even as compared to the "on the machine" coating to provide a low finish board, my process does not require the use of multiple coating boxes and additional drier sections which are characteristic of a machine coating operation.

(2) As already indicated, in a conventional cast coating operation the mineral coating is applied directly to the paper or board web whereupon the wet or plastic coated surface is brought into contact with a heated drum and the sheet maintained in contact with the drum until the coating has become substantially dry or at least set to the extent that it is substantially nonplastic. In order to secure adequate drying of the coating, the coated sheet must be maintained in contact with the drum for a substan-

tial length of time and the moisture in the coating driven off through the back of the sheet. In order to do this, the drum must be of excessively large diameter and its speed of rotation relatively slow as compared, for example, to the lineal speed of a sheet running through a paper making machine. In addition, the conventional cast coating operation presents other problems due to shrinking and stretching of the paper while in contact with the drum.

As opposed to this, in accordance with my process the coating composition, which may be of conventional formulation is applied directly to a drum or other solid support having the desired surface characteristics, and a layer of coating composition formed and dried in situ on such surface. The drying of the coating can be effected in a matter of seconds since the moisture is driven off directly through the porous layer and does not have to be driven through the paper or board sheet. In addition, the drying time is speeded up since both sides of the coating may be dried, the inner surface being dried by the heated drum or the like and the outer or back surface by hot air, infra red lamps or other external heat applying means. The rapid drying of the mineral coating to at least non-plastic condition enables me to pre-cast and dry the mineral coating at a rate comparable to the speed of a paper or board making machine and hence apply the coating in an "on the machine" operation.

(3) The driving off of the moisture through the board in the conventional drum coating operation roughens the back surface of the sheet, whereas in my process the subsequent transferral of the coating layer to the sheet in no way alters the characteristics of the sheet as such.

(4) With my process the sheet need not be permeable to water vapor or moisture and hence the coating can be applied to any type of sheet no matter how impervious it may be. Thus the sheet could be any type of paper, board, film, foil-backed board or the so-called KB board in which a layer of bituminous material is interposed between the board surfaces.

(5) One of the major problems in casting a coated sheet against a drum lies in the necessity of maintaining all-over tight contact between the coated sheet and the drum. Variations in the caliper of the sheet will result in high or low spots in the coating which, unless perfectly tight contact is maintained, will result in irregularities in the surface finish. In addition, the irregularities in the thickness of the coating tend to result in non-uniform ink absorbency over the coated sheet. With my process the coating is applied directly to the drum or other support and hence can be made uniform throughout. Any variations in the caliper of the sheet itself will be compensated for by the adhesive bonding layer. The result is an excellent printing condition due to the uniformity of the coating with the resultant uniform ink absorbency over the entire sheet.

(6) My coating procedure permits substantial economy in the amount of coating composition required in that none of the coating material strikes into the sheet as in the conventional coating operation. The mineral coating is laid in its entirety on top of the sheet with the result that the amount of coating material required is substantially cut in half.

(7) While my procedure requires the use of an adhesive to bond the coating layer to the sheet, inexpensive water borne adhesive may be employed which does not add materially to the cost of the finished product. Of course, if desired for specific application, other more expensive types of adhsive may be employed but such are not generally required. Similarly, my process contemplates the use of conventional mineral coating compositions without special additives, although here again such additives may be employed where special effects are desired inclusive of the use of solvents or the like which might damage the paper stock if applied directly to the stock and driven out through it, as in the conventional high gloss coating operation. With my procedure, such solvents will have been driven off prior to the association of the coating layer with the sheet and hence there can be no deleterious results.

(8) Paper or board produced in accordance with my procedure will have superior flexibility and bendability as compared to conventional clay coated paper or board. The bending or foldability of mineral coated paper and board is a decided problem due in part to the fact that the clay or other mineral employed is inherently discrete particles held together by a small quantity of binder and as such does not readily bend. To achieve a satisfactory end result a relatively heavy coating must be employed. However, due to the fact that I employ an adhesive—which has high natural bending properties—to bond the mineral coating to the board, the inherent flexibility and bendability of the coating on a weight basis is materially enhanced.

It is, therefore, a principal object of my invention to provide a process of applying mineral coating to board having the advantages hereinbefore enumerated.

In carrying out my process, a conventional coating composition is first prepared. The coating formula consists basically of pigment and binder. The pigment may be clay, calcium carbonate, or titanium dioxide, or combinations of such pigments. The binder portions of the coating formula may be either casein, alpha protein, or an acrylic polymer such as an acrylic polymer resin emulsion or combinations of such adhesives. The percentage of pigment will be from 90% to 70% and the binder range will be from 10% to 30%. In addition to the basic ingredients, minor proportions of other ingredients such as dispersing agents, defoamers, or pH modifiers may also be employed.

The general procedure is to disperse the pigment in water thereby forming a slurry of from 50% to 65% solids. If casein or alpha protein is used, these are first cut in amonia water at about 15% to 25% solids. In the case of emulsions they are usually used in latex form as supplied. The binder solution or emulsion is then added to the clay slurry and sufficient water added to bring the overall solids content of the coating to between 45% and 65%.

The slurry so formed is coated directly on the surface of a revolving drum or other supporting surface against which the coating is to set. I have found that the coating may be applied either by spraying or by doctoring it on employing a wire-round rod or an air knife. The manner in which the coating is applied does not constitute a limitation on the invention although care should be taken to form a coating layer which is uniform and even throughout. While the coating may be of any desired thickness, I have found that a highly satisfactory coated board may be obtained employing a coating having a thickness of about 1 mil.

The coating is dried on the drum or other support. I have found that a drum temperature of from 180° to 200° F. will cause rapid drying of the coating composition and will cause it to set to a non-plastic condition. The drying time may be accelerated by applying external heat to the coating, as by means of heated air passing over the drum, such air being heated from 160° to 200° F. In lieu of heated air, infra red lamps or other suitable heat generating means may be employed, such means being preferably held to a maximum temperature at the coated surface of 200° F. When dried in this manner, I have found that the coating may be dried to a condition in which it may be readily transferred in a matter of about 5 seconds where the coating has a thickness of substantially 1 mil. Consequently, where the drum has a diameter of 12 feet, it may be rotated at a lineal speed of 250 feet per minute which is comparable to the normal running speed of a paper board machine. The mineral coating when dry and bonded to said paper should consist of from 10 to 25 pounds of solid per ream (24 x 36/500) of coated paper.

The drum lineal speed may vary from very slow speed of 1 or 2 feet per minute up to 350 feet per minute depending on thickness, heat, and type of mineral coating applied. The speed of drying will, therefore, vary from 30 seconds to 1 second or less.

As already indicated, the mineral coating so formed may be transferred to any desired surface inclusive but not limited to paper, paperboard, chipboard, internally proofed boards, foil laminated boards and the so-called non-fibrous films. The web or sheet will be fed from a suitably positioned roll stand into contact with the precast coating layer. A relatively small diameter roller juxtaposed to the coated drum may be used for this purpose, the roller serving to bring the sheet into contact with the coating and thereafter remove the sheet at an angle so as to, in effect, strip the adhered coating from the drum. As the sheet is fed from the roll stand, a stripping or bonding adhesive will be applied to the surface thereof which will be juxtaposed to the coating layer. The stripping or bonding adhesive may be applied in any conventional manner and may comprise a starch or protein base, polyvinyl acetate or polyvinyl alcohol in which the solids content of the adhesive is from 20% to 50% depending on type. Starch adhesives which consist of 35 parts dextrine (converted starch), 60 parts water and 5 parts glycerine have been found satisfactory. Excellent adherence has been obtained with only 2–3 pounds (solids) per ream (24 x 36/500). Polyvinyl acetate based adhesives containing approximately 37% solids consisting of polyvinyl acetate, tackifying resins, and plasticizers have also been used successfully. These too have been applied at a rate of 2–3 pounds (solids) per ream (24 x 36/500). Though 2–3 pounds seems to be most satisfactory, the discrete adhesive layer may consist of from 2 to 10 pounds per ream (24 x 36/500) of dry adhesive.

Drying of the stripping or bonding adhesive should take place immediately after application and before combining with the mineral coating. In the case of paper or paperboard this drying will take place mostly by absorption into the sheet, but external means such as warm air may have to be employed. This step is necessary so that the moisture in the adhesive layer does not disrupt the surface of the mineral coating. The combining should take place just before the adhesive becomes non-adhesive and at its maximum wettack.

It has also been proven practical to apply a hot melt stripping or bonding adhesive and reactivate it by means of heat at the instant of combining. The hot melt can be either applied in its melted state, in solvent solution, or in a suspended-in-water form. If applied in a suspended-in-water state, which is preferred, it must be dried completely before reactivation although since heat is used for both drying and reactivation it can be accomplished almost simultaneously. An example of this suspension is a polyamide suspensoid. Another example is vinylidene chloride and a plasticizer. This adhesive imparts to said paper a high degree of moisture-vaporproofness. The hot-melt adhesives may contain a percentage of wax to aid in moistureproofness or powdered aluminum, TiO_2, clay, or $CaCO_3$ in suspension to increase opacity of said adhesive film.

In transferring the coating layer from the drum or other support, it is essential that the layer be maintained in substantially dry or non-plastic condition. That is, the coating must be substantially dry at the time it is brought into contact with the adhesive layer and, as to its cast surface at least, it must remain dry. Consequently, the adhesive must be controlled both as to amount and as to water or solvent content so that it will not re-wet the coating layer to the extent that the solvent will penetrate to the cast surface thereof. If the cast surface is re-wet by the adhesive solvent, it will not part from the drum and, even if the re-wetting occurs subsequent to the transfer of the coating layer, the cast surface of the coating will be impaired. To avoid these difficulties, the moisture or

solvent content of the adhesive must be so controlled that it is insufficient to penetrate the coating layer. This control may be effected by (1) controlling the amount of water or solvent present in the adhesive and (2) correlating the amount of water or moisture present to the amount of residual heat in the coating layer at the time of transfer. Thus, a higher percentage of water or solvent may be present where the heat of the layer approaches 200° than where the layer is heated to 160°. In any event, the controlling factor lies in the maintenance of the cast surface of the coating layer in substantially dry condition during and subsequent to the transfer.

In accordance with my invention, the adhesive coating may serve a second function in addition to its primary function as a bonding medium. Thus, the color and brightness of the finished product may be enhanced by the addition of coloring agents to the bonding adhesive. Thus, satin white, blanc fixe and the like may be added to the adhesive which, in effect, provides a base for the coating layer which, as already indicated, may also contain dyes or other coloring agents. This is particularly advantageous where chipboard or other low grade stock is being coated which does not have the brightness and uniformity in appearance of some of the more high grade types of board.

The following examples are representative of coating mixtures which may be employed in accordance with my invention, it being understood that these formulations are exemplary only and do not constitute a limitation of my invention:

Coating mixtures of pigment and binder

Ingredients	No. 1	No. 2	No. 3	No. 4
Pigment:	*Parts*	*Parts*	*Parts*	*Parts*
Clay	72	42.5	30	68
Titanium Dioxide	8		15	12
Calcium Carbonate		42.5	30	
Binder:				
Casein		15		15
Alpha Protein	15		25	
Acrylic Polymer	5			4

Similarly, examples of stripping or bonding adhesive compositions which may be used to bond the coating layers to the stock are as follows:

Stripping or bonding adhesives

No. 1:
35 parts dextrine (converted starch)
60 parts water
5 parts glycerine

No. 2: plasticized polyvinyl acetate emulsion

No. 3:
20 parts casein
80 parts water
8 parts ammonia water

It will be understood, however, that the coating method disclosed herein is not limited to the use of coating compositions containing water nor is it limited to the use of adhesive compositions containing water. Either or both compositions may contain non-aqueous solvents or suspending agents which may be evaporated off either as an incident of the drying of the coating or subsequent to the bonding of the coating layer to the sheet. However, it is competent to point out that my invention is particularly adapted to use with water borne mineral coatings and water vehicle adhesives which, for the most part, are less expensive and more commonly available.

Having thus described my invention, what I claim is:

1. A process for producing a paperboard sheet having a cast mineral layer adhesively bonded to one surface thereof, which comprises forming a thin coating of aqueous mineral coating composition on a casting surface and drying it thereon, said coating composition consisting essentially of mineral pigment containing a minor

proportion of binder which when dried forms a frangible and porous mineral layer, feeding toward said mineral layer a web of paperboard and, as said paperboard is advanced, applying to one surface thereof a continuous coating of an adhesive material capable of adhering said paperboard to said mineral layer to form a bond therebetween which is stronger than the bond between said mineral layer and the said casting surface, bringing the adhesive coated surface of said paperboard into contact with said mineral coating layer under sufficient pressure to form an intimate bond therebetween, including the step of controlling the consistency of the bonding adhesive so that, upon contact with said mineral layer, said adhesive will be non-saturating with respect thereto, and thereafter stripping said mineral layer from said casting surface by stripping forces applied to the paperboard, whereby to transfer said mineral layer intact from said casting surface to said paperboard to provide a cast mineral layer intimately bonded to the surface of said paperboard.

2. A method of producing a clay surfaced paperboard characterized by a cast clay finish, which comprises the steps of applying a thin, substantially uniform layer of mineral coating composition directly to a casting surface and drying it thereon in the absence of external support for said mineral layer, said mineral layer consisting essentially of an aqueous dispersion of mineral pigment containing a minor proportion of binder which when dried on said casting surface, is essentially frangible and incapable of self-support, feeding into contact with said dried mineral layer a web of paperboard the contacting surface of which is coated with a continuous film of bonding adhesive, controlling the consistency of said bonding adhesive so that, upon contact with said mineral layer, said adhesive will be tacky and capable of intimately bonding to said mineral layer and yet incapable of saturating said mineral layer so as to wet the cast surface thereof, and thereafter utilizing said paperboard web to strip said mineral layer from said casting surface as a continuous discrete mineral coating layer the exposed surface of which has a cast finish corresponding to the finish of said casting surface.

3. A method of producing paper and paperboard having a cast mineral surface, which comprises the steps of applying a thin, substantially uniform layer of mineral coating composition directly on a continuously moving casting surface, said mineral composition comprising a water borne slurry composed essentially of a major proportion of mineral pigment and a minor proportion of binder, drying said mineral layer in contact with said casting surface with the surface of said mineral layer away from said casting surface exposed so as to rapidly remove substantially all of the moisture therefrom, thereby providing a substantially dry frangible mineral layer, advancing a web of paper for contact with the said mineral layer, and, as said paper web is advanced, applying to one surface thereof a continuous film of bonding adhesive, bringing the adhesive surface of said web into pressure contact with the dry mineral layer so as to effect an intimate bond therebetween, the said bonding adhesive, at the time of its contact with said mineral layer, being sufficiently free from moisture and other solvents capable of striking through the mineral layer to its cast surface, so that said cast surface will remain essentially dry, and thereafter stripping said mineral layer from said casting surface by means of said web, said mineral layer being firmly bonded to said web by said bonding adhesive to provide an uninterrupted mineral coating supported on the surface of said web and having its exposed face displaying the cast finish imparted to it by the said casting surface.

4. A method of producing paper and paperboard having a smooth, high gloss, cast clay surface, which comprises providing a continuously moving, polished, endless casting surface, continuously depositing on said casting surface a thin, substantially uniform layer of mineral coating material consisting primarily of mineral pigment containing a minor amount of binder, drying said mineral layer in contact with said casting surface with the outer surface of said layer exposed, thereby forming a frangible mineral layer supported by said casting surface, feeding a web of paper toward said casting surface and the dried mineral layer thereon, said web having on one surface thereof a continuous film of bonding adhesive, bringing the adhesive coated surface of said web into contact with the dry mineral layer and effecting an intimate bond therebetween, and thereafter stripping said web and the frangible mineral layer bonded thereto from said casting surface, whereby said mineral layer is transferred intact to said web to provide a cast clay surface thereon, including the step of maintaining the said mineral layer in substantially dry condition during its transfer to said web by controlling the saturating properties of the bonding adhesive.

5. A method of producing paper and paperboard having a smooth, glossy, cast clay finish, which comprises providing a revolving cylindrical drum having a smooth, polished, casting surface, continuously depositing on said casting surface a thin, substantially uniform layer of wet mineral coating material consisting essentially of a water borne dispersion of mineral pigment containing a minor amount of binder and drying said layer in contact with said drum with the outer surface of said layer exposed, including the step of smoothing the said outer exposed "surface" of mineral coating material while still wet, whereby to form a frangible mineral layer having a smooth exposed surface feeding a web of paper toward said drum and the dried mineral layer thereon, said web having on one surface thereof a continuous film of bonding adhesive, bringing the adhesive coated surface of said web into pressure contact with the dry layer at a time when the adhesive coating is sufficiently tacky to firmly bond to the mineral layer and yet contains insufficient moisture and other solvents to penetrate the mineral layer so as to wet the cast surface thereof, and thereafter stripping the mineral layer from said drum by leading the web away from said drum, said mineral layer being thereby removed intact from said drum to provide a cast layer of uniform thickness supported entirely on the surface of said web and intimately bonded thereto.

6. The method claimed in claim 2 wherein said mineral layer comprises from 70% to 90% of a pigment selected from the group consisting of clay, titanium dioxide and calcium carbonate, and from 10% to 30% binder selected from the group consisting of alpha protein, casein, and acrylic polymer.

7. The method claimed in claim 2 wherein said mineral layer is dried against said casting surface by heat applied in part, at least, to the exposed outer surface of said layer.

8. The method claimed in claim 2 wherein said bonding adhesive is subjected to heat immediately prior to the bonding together of said web and said mineral layer.

9. The method claimed in claim 2 wherein said bonding adhesive is a water-borne adhesive applied to said web as it is advanced toward said casting surface, and wherein said adhesive, prior to contact with said mineral layer, is subjected to heat in a quantity sufficient to retain its tack and yet reduce its moisture content to a point wherein its consistency is non-saturating with respect to said mineral layer.

10. The method claimed in claim 2 wherein said bonding adhesive is a hot melt adhesive applied in a melted state.

11. As an article of manufacture, a paperboard sheet having intimately bonded to one surface thereof a thin, continuous layer of essentially mineral matter having a cast surface, said mineral layer being of substantially uniform thickness throughout and bonded to said paperboard sheet by a continuous, thin film of bonding ad-

hesive, said mineral layer being characterized by being a pre-formed frangible layer dried on a supporting casting surface and, upon being thereafter adhesively bonded to said paperboard sheet, defining a discrete mineral coating layer supported in its entirety on the surface of said paperboard sheet.

12. As an article of manufacture, a sheet of paper stock having laminated to one surface thereof a thin, continuous, discrete and normally frangible layer of essentially mineral pigment having a pre-formed cast surface, said mineral layer being intimately bonded to the surface of said web by a continuous film of bonding adhesive interposed therebetween, said bonding adhesive serving to firmly anchor said otherwise frangible mineral layer to the surface of said web without disturbing the pre-formed cast surface of said mineral layer.

13. As an article of manufacture, a web of paperboard having adhesively bonded to one surface thereof a smooth, continuous and substantially uniform layer of essentially mineral composition having a cast surface, said mineral layer being characterized by having been deposited on and dried against a casting surface and having a smoothed surface opposite the cast surface thereof, and thereafter intimately bonded to said web by an interposed film of bonding adhesive, said mineral layer being further characterized by being normally frangible and having been bodily removed from the casting surface upon the application to said web of stripping forces sufficient to strip said mineral layer from the casting surface on which it was formed.

14. A porous clay coated paper suitable for printing in which the clay coating has a cast surface formed by drying the coating against a casting drum, said cast coating being characterized by having been preformed apart from its paper backing from an aqueous dispersion of mineral pigment containing a minor proportion of binder and, when dried, bonded to said backing by a continuous film of bonding adhesive, said cast coating being further characterized by a smoothed and even back surface which results in a coating of substantially uniform thickness throughout, thereby providing substantially uniform printing ink receptivity.

15. The clay coated paper claimed in claim 14 wherein said bonding adhesive contains a coloring agent.

16. The clay coated paper claimed in claim 14 wherein said bonding adhesive is of a moisture-vapor proofing character.

17. A process for the manufacture of mineral coated paperboard having a cast finish which comprises forming on a traveling casting support a thin substantially uniform layer of an aqueous mineral-adhesive composition having a solid content consisting essentially of mineral pigment and binder in a ratio of 70–90 parts pigment to 30–10 binder, drying said layer to render it, substantially free of liquid vehicle and characterized by porosity at least sufficient to accept printing inks, forming on a paperboard web a coating of adhesive material and tempering said coating to a substantially solvent free non-saturating consistency which nevertheless is characterized by surface tack, bringing the coated surface of said paperboard web against the coating on said casting surface, applying sufficient pressure to cause said adhesive to bond with said dried mineral-adhesive coating, and concurrently stripping said paperboard web and both coatings from said casting surface.

18. A process for making paperboard having a cast coating thereon involving the separate formation of a frangible and porous mineral coating layer in final dried form on a moving casting support and the removal of said frangible dried coating from said support onto the surface of a paperboard web in finished substantially dry form, therebeing interposed between said web and said coating a layer of adhesive substance having an affinity for the mineral coating but having a non-saturating consistency with respect thereto, in which process the paperboard layer bearing a coating of said adhesive in the form specified is laid against the dry coating on said support and in which adherence between the said adhesive layer and the said mineral coating is brought about primarily by the application of pressure prior to the stripping of the said board and both coatings concurrently from the said casting support.

19. A process of forming a cast coated paperboard printing stock which comprises producing upon a moving casting support a substantially uniform and porous layer of mineral coating composition which is frangible in dried condition, and thereafter transferring the said frangible mineral layer to the surface of a paperboard web and adhering it thereto by a non-saturating adhesive, said adhesive acting to bond said paperboard web to said mineral layer while the latter is in contact with said casting support, whereupon said mineral layer may be stripped intact from said casting support by pressure applied to said paperboard web.

20. The process claimed in claim 19 wherein said non-saturating adhesive is of moisture proofing character, whereby to establish a moisture proofing barrier immediately beneath said porous layer of mineral coating composition.

21. A method of making clay coated paper and board which comprises applying an aqueous mineral coating composition to a casting surface, the solids constituent of said composition consisting essentially of mineral pigment and a minor proportion of binder, smoothing and drying said mineral coating on said casting surface, thereby forming an essentially frangible coating supported by said casting surface, said coating being characterized by a smoothed surface opposite the cast surface thereof, and thereafter transferring said dried mineral coating intact onto the adhesive-coated surface of a web of paper or board.

22. A method making coated paper and board which comprises continuously applying a water borne slurry of mineral coating composition to a moving casting surface, said slurry containing solids consisting essentially of mineral pigment and binder in a ratio of 70–90 parts pigment to 30–10 parts binder, drying said slurry on said surface so that the dried mineral layer so formed acquires the surface characteristics of the casting surface, separately applying a film of adhesive to a moving paper web, bringing said adhesive film to a state wherein it is tacky yet non-saturating with respect to said dried mineral layer, and thereafter continuously pressing the adhesive film into contact with said dried mineral layer under sufficient pressure to effect a bond therebetween, and thereafter continuously stripping said mineral layer from said casting surface by means of said web, whereby to transfer said mineral layer to said web while retaining the cast surface imparted thereto by said casting surface.

References Cited in the file of this patent

UNITED STATES PATENTS

1,930,331	Zimmer	Oct. 10, 1933
2,158,987	Maloney	May 16, 1939
2,236,766	Schneider	Apr. 1, 1941
2,286,259	Cagle	June 16, 1942
2,295,814	Wagerle	Sept. 15, 1942
2,487,448	Kingerley	Nov 8, 1949
2,641,557	Green	June 9, 1953
2,704,735	Hedges et al.	Mar. 22, 1955
2,733,180	Pinto	Jan. 31, 1956
2,739,919	Artzt	Mar. 27, 1956
2,771,388	Rocky	Nov. 20, 1956
2,796,374	Donahue	June 18, 1957
2,801,949	Bateman	Aug. 6, 1957
2,813,052	Lancaster	Nov. 12, 1957
2,819,196	Munro	Jan. 7, 1958

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 2,934,467 April 26, 1960

Frank D. Bergstein

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 1, line 18, for "dseired" read -- desired --; line 35, for "oppsoed" read -- opposed --; column 2, lines 5 and 6, for "coatnig" read -- coating --; column 7, line 28, after "which" insert a comma; column 8, line 30, for '"surface"' read -- surface --; line 32, after "surface" insert a comma; column 9, line 54, after "30-10" insert -- parts --; same line 54, after "it" strike out the comma; same column 9, line 73, for "therebeing" read -- there being --.

Signed and sealed this 4th day of April 1961.

(SEAL)
Attest: ERNEST W. SWIDER

XXXXXXXXXX
Attesting Officer

ARTHUR W. CROCKER
Acting Commissioner of Patents