Oct. 18, 1932. C. M. BRYAN 1,883,526

METHOD OF AND APPARATUS FOR APPLYING DESIGNS TO PAPERS AND THE LIKE

Original Filed June 18, 1928

Fig. 1.

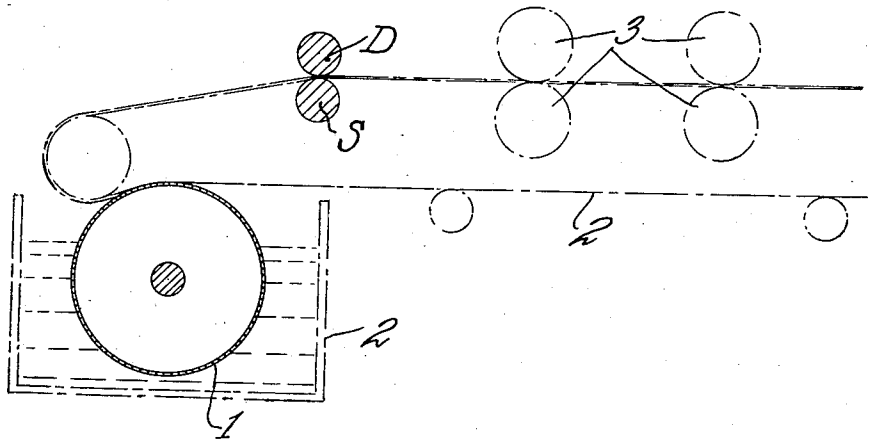


Fig. 2.

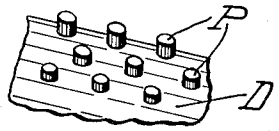


Fig. 3.

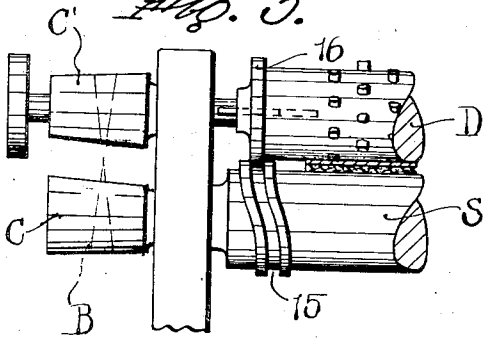
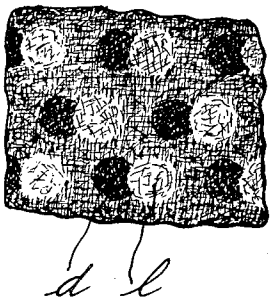


Fig. 4.



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UNITED STATES PATENT OFFICE

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METHOD OF AND APPARATUS FOR APPLYING DESIGNS TO PAPERS AND THE LIKE

Application filed June 18, 1928, Serial No. 286,439. Renewed May 9, 1932.

This invention relates to improvements in the method of and apparatus for applying designs to paper and the like and is directed more particularly to a method of decorating a web of paper during the manufacture thereof while the web is in moist condition.

As is well known, it is usual to watermark paper or impart designs thereto by providing projections or depressions on the cylinder of a cylinder machine or on the dandy of a Fourdrinier machine. These design forming elements press upon the stock so that the paper shows relatively thin or thick portions in the shape of the design or watermark. In either case the design must be repeated many times throughout the circumference and length of the cylinder or dandy, which results in great expense and, furthermore, there must be a separate roll for each separate design, all of which is objectionable.

It has been attempted heretofore to produce designs in a wet web of paper by a web roll having designs on the surface thereof which was located so as to press upon the wet web at a point somewhere between the cylinder or dandy and the pressing and drying rolls. While this functions to actually impress the design into the web because of the pressing action yet subsequently the design is lost because it is pressed out again by the pressing and drying rolls which are necessary to complete the paper making operation.

The present-day demands call for paper having designs called shadow marks or shadow designs—that is, designs in the paper which are formed by relatively light and dark or relatively thick and thin portions. These cannot be obtained except at great expense by the first method referred to and the results are not satisfactory according to the latter method just referred to.

Accordingly, therefore, the principal object of this invention is the provision of a novel method and apparatus for forming designs on paper which is arranged and adapted to act on a web while in wet condition. This is accomplished by displacing the fibres of the web in such a manner that they form a predetermined design so that when the web is subsequently pressed and dried the design is preserved and becomes a part of the web.

The invention is adapted for broad application and may be practiced by means of various forms of apparatus but will be described for purposes of disclosure in connection with the accompanying drawing in which

Fig. 1 is a diagrammatic representation of an apparatus for carrying out the novel features of the invention;

Fig. 2 is a fragmentary view of the surface of a design forming member of my invention;

Fig. 3 is a side elevational view of the same and

Fig. 4 is a plan view of a piece of paper having one form of a shadow mark applied thereto according to the novel features of my invention.

The invention will now be described with particular reference to the drawing which shows in a diagrammatic way merely a portion of a typical paper making machine of the cylinder type, but it will be understood that the invention is equally applicable to a machine of the Fourdrinier or any other type.

In the drawing, 1 represents a cylinder which takes up the paper stock from a vat 2 and delivers it to a felt or apron 2 which in turn carries the web in a more or less wet condition to a system of pressure and drying rolls indicated by 3 which are adapted to press out and dry the web. Various devices may be and usually are located between the cylinder 1 and press rolls to eliminate moisture, but are not herein shown.

At some point between the cylinder 1 and press rolls 3 according to one form of the invention, I provide a pair of rolls consisting of a lower web supporting roll S and an upper design applying roll D. The supporting roll may be rotated by the felt so as to have a peripheral speed equal to the lineal speed of the felt or it may be driven from any other convenient source.

The design roll carries on its periphery a

plurality of projections P for engaging or impinging the wet paper web and may be rotated either by the roll S below or from some other suitable means. According to one form of the invention it may be desired to rotate the roll D so that its peripheral speed is either faster or slower than the lineal speed at which the web is traveling so that as a projection thereof engages the fibers of the web there is a relative movement of the projection and web whereby the fibers are displaced in one direction or the other to provide relatively thin and thick or relatively light and dark portions in the web and thus create the so called shadow mark. The form of the projections may of course be varied within wide limits so as to produce a variety of designs and the speed or even the direction of rotation of the design roll may be varied so as to co-operate with a certain form of projection to produce a certain desired displacement and consequently a certain shadow effect design.

In the form of the invention illustrated, I have shown the rolls S and D as being provided with variable speed cones C and C' which have an endless belt B (shown on dotted line) in contact therewith which may be shifted laterally to vary the speed of the design roll D with respect to the lower roll S which in this case serves as the driver. Obviously the upper roll may be driven in various ways to obtain any desired speed or direction of rotation.

According to another novel feature of the invention the displacing of the fibers may be accomplished by moving the design roll D back and forth with respect to the wet web so that its projections move or displace the fibers laterally of the web. The roll may be moved in this way by a cam 15 carried on the lower roll which co-operates with a cam follower 16 in the form of a disc fixed to upper roll. According to the arrangement of the cam the design roll may be made to travel various distances back and forth and make any number of sidewise strokes during one revolution thereof.

In some cases it may be desirable to merely shift the roll D back and forth without rotating the roll or in fact I may employ a shiftable non-rotatable member which has projections of some form for displacing the fibers of the web.

By employing the rotatable roll D which is also shiftable it is possible to produce a great variety of effects either by merely rotating the roll at some desired speed in one direction or the other or by merely shifting it laterally of the web or by both rotating and shifting the design roll.

In the form of the invention shown the projections P are in the form of pins so that as they impinge the wet web with the roll D rotating at a slower speed than that of the web the fibers are displaced longitudinally of the web to provide relatively light and dark or thin and thick portions, l and d which create a design effect as in Fig. 4.

With the fibers displaced as described the web passes between the pressing and drying rolls so that the fibers are pressed in their displaced relation and the design preserved. This is distinguished from the prior art method referred to wherein the web is merely pressed by a design roller, the effects of which are subsequently eliminated by the pressing rolls.

If desired, instead of the design roller, a reciprocating member may be employed which will move towards the web and contact therewith, so that design forming elements thereof like the projections of the roll will drag on the wet web and displace the fibers after the manner previously explained. The particular form of the design forming elements may be varied within wide limits and arranged so that, when brought into contact with the web they will displace the fibers whenever there is a relative movement of the design elements and web, and thereby create the design effect.

The paper having the design consisting of relatively thick and thin portions or light and dark shadow effect, is useful for parchment effects when oil or some suitable liquid may be applied to the paper to bring out or emphasize the light and dark contrasting effect of the design.

From the foregoing it will be observed that according to the novel features of the invention the fibers of the web are displaced so as to produce relatively dark and light portions of the web or relatively thin and thick portions, and that the web is then pressed to preserve the relative disposition of the fibers and thereby preserve the design effect created thereby.

What I claim and desire to secure by Letters Patent is:

1. The method of decorating a web of paper which consists in, impinging said web when in a semi-fluid condition with a decorating device and then in moving said web and device at speeds which are relative to one another.

2. The method of decorating a web of paper which consists in, impinging a wet web of paper wherein the fibers thereof are relatively shiftable with a decorating device and then in moving said device and web relative to one another at different speeds to shift fibers of the web relative to others.

3. The method of decorating a web of paper which consists in, impinging a wet web of paper in which the fibers thereof are relatively shiftable with a decorating device, in shifting fibers in said web with respect to others to create a decorative effect by moving

said web and device transversely of one another.

4. The method of decorating a web of paper which consists in, impinging a wet web of paper wherein the fibers thereof are relatively shiftable with a decorating device and in moving said device and web relative to one another in substantially the plane of the web and at different speeds.

5. The method of decorating a web of paper which consists in, impinging a wet web of paper wherein the fibers thereof are relatively shiftable with a decorating device and in moving said device and web relative to one another in substantially the plane of the web and at different speeds in opposed directions.

6. Paper making apparatus comprising in combination, a movable web forming element for receiving paper making material movable in a certain plane, a movable design device for impinging material on said element, means for reciprocating said device transversely of said element.

7. Paper making apparatus comprising in combination, an element for receiving fibrous paper making material which is movable in a certain direction at a certain surface speed, a movable design device for impinging material on said element and means for moving said device at a surface speed different from that of said element whereby certain fibers of material thereon may be displaced with respect to others.

8. Paper making apparatus comprising in combination, an element for receiving fibrous paper making material which is movable in a certain direction and at a certain surface speed, a design device for impinging material on said element, means for moving said device at a surface speed which is different from that of the said element and means for moving said device in a direction opposed to the direction of movement of the said element.

9. The method of decorating a web of paper which consists in, impinging a wet web of paper wherein the fibers thereof are relatively shiftable with a decorating device and in moving said device and web relative to one another while the device is in contact with the fibers.

10. Paper-making apparatus comprising in combination, a movable web-forming element for receiving paper-making material, a movable design device for impinging materal on said element, means for reciprocating said device angularly with respect to said element, means for rotating said device into and out of engaging relation with material on said element at speeds relative to that of said element.

11. Paper-making apparatus comprising in combination, a movable web forming element for receiving paper-making material, a rotatable and reciprocable member having a design device for impinging a web on said element, rotating means for said member and means for reciprocating the same, whereby said design device may be moved angularly relative to said element.

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