WIPER MECHANISM FOR COATING MACHINES AND PROCESS

Filed Feb. 5, 1932

Inventor:

Donald B. Bradner

Byrne, Townsend & Potter

Attorneys
This invention relates to an improvement in coating machines adapted for use in 5 applying to a moving surface a coating or layer of coating composition containing a liquid vehicle, an element of which machine consists of a doctor member whose useful surface moves or rotates in contact with said layer of composition. More particularly, the invention is concerned with an improved method of, and apparatus for, continuously wiping or preparing the useful surface of the said doctor member.

In Patent No. 1,888,858, I have described a method of making coated paper according to which an excess of aqueous coating composition is applied to a web of paper and all except the desired quantity is removed from the paper by means of a doctor member whose surface moves in the opposite direction to the paper. Instead of applying the coating directly to the paper, the desired film of coating may be formed on an applicator member by applying an excess of the aqueous coating composition to said applicator member and removing the excess by means of a doctor member moving in the opposite direction to the applicator member, and thereafter transferring the film of coating from the applicator member to a web of paper moving in the opposite direction thereto. The latter process is disclosed in my copending application, No. 581,555, filed December 18, 1931.

In either case, for the proper functioning of the doctor member, it is essential that there be provided means associated therewith for wiping or cleaning the surface of the same whereby the doctor member may continuously present a relatively clean surface to the coating composition on which it acts. There has been provided for this purpose a wiper blade maintained in contact with the useful surface of the doctor member.

The heretofore suggested wiping or cleaning means has not proven to be wholly satisfactory in commercial operation: it (the aforesaid single wiper blade) is difficult to control, requires careful adjustment, and must be replaced rather frequently. Whenever the wiper blade fails to remove all of the coating adhering to the doctor member surface, the amounts not removed form streaks or spots in the resulting coating; such a result in the case of a fine coating operation requiring a high quality product makes necessary the rejection of relatively large amounts of the coated product. This is especially true in the production of high quality coated papers where any minute irregularity in the coating makes the product unsalable.

I have found that the above and other disadvantages resulting from an attempt to clean the doctor member surface by means of only a single wiper blade may be very largely overcome and that improved coated paper may be produced by providing the doctor member with a second wiper mechanism in series with the first and by treating, or at least thoroughly wetting, the doctor surface with a washing liquid between the two wipers. The said washing liquid may be water or some aqueous solution. I have found that a doctor member wetted with liquid is much more easily cleaned than one covered with a film of coating.

Furthermore, I have discovered that the second wiping in most instances need not remove the last traces of the washing liquid, but rather that the coatings may be improved in smoothness or flatness of lay by leaving over the whole surface of the doctor member a film of the washing liquid. It may be observed, in this connection, that if the doctor member surface carries a film of liquid in some portions but is wholly dry in other portions, there usually results a corresponding unevenness of smoothing of the coating with the consequent production of a spotted, streaked, or otherwise blemished coated product. Accordingly, rather than to attempt to
completely dry the doctor member surface in the second wiping operation, I may in the second wiping operation remove any adhering solids and excess of liquid while leaving said surface uniformly wetted with a minute quantity of the washing liquid. By the expression "uniformly wetted" it is meant that the entire useful surface of the doctor member is wetted. It does not appear to be essential that the wetting liquid be in a uniform layer; one portion or area of the doctor member surface may carry a somewhat greater quantity of the wetting liquid than another without detriment to the smoothness of the coating (provided, of course, that no relatively great quantity of the wetting liquid be carried past the second wiping means). This is especially advantageous, because it is a very difficult task continuously to wipe the doctor member surface wholly dry at all points thereon. Therefore, I prefer to take advantage of the phenomenon above noted by simply adjusting the second wiping means so that a thin film of the washing liquid passes the same at all times.

An embodiment of the invention is illustrated in the accompanying drawing, in which:

The figure is a diagrammatic representation of an apparatus for carrying out the process.

In the drawing 1 is a web of paper which passes around an applicator roll 2 in the direction of the arrow. 3 is a substantially rigidly surfaced doctor roll which is adjacent to roll 2 and is revolvable in the same angular direction as the applicator roll 2; that is to say, the surfaces of the two rolls are traveling in opposite directions at their points of closest approach, i.e., the "nip". Between rolls 2 and 3 is a pool of aqueous mineral coating composition 4 which is supplied by a delivery pipe 5. 6 and 7 are wiper blades, which may be of rubber or have a rubber edge. These wiper blades 6 and 7 are spaced apart from each other and are adjustably held in association with doctor roll 3 by any suitable means such as the adjustable supports 6a and 7a, respectively. At any suitable point between blades 6 and 7 is a pipe 8 connected to a source of water under pressure and having perforations through that portion of its wall which is adjacent roll 3. The pipe 8 is substantially parallel with the axis of roll 3.

In operation, the web of paper 1 to be coated is passed around roll 2 and through the nip between rolls 2 and 3, said rolls 2 and 3 being revolved in the same angular direction and at any desired speeds. A pool of aqueous mineral coating composition 4 is established between rolls 2 and 3, and maintained by delivery thereto of amounts of the composition from a source thereof by delivery pipe 5; the web of paper 1 thus passing through said pool. Coating composition which may be carried out of said pool by roll 3 is wiped off of said roll by wiper blade 6 and back into said pool. Thereafter, the surface of roll 3 is washed by a stream of water sprayed thereon from pipe 8, and any solids and excess of liquid thereon are removed by the second wiper blade 7, which is so adjustable as to pass only a very thin film of water, thus presenting a coating-free but water-filmed surface for smoothing the layer of coating carried into the nip between rolls 2 and 3 by the web 1. So long as the surface of doctor roll 3 is not dry in some areas and wetted in others, the resulting coating is not streaked or spotted. It is, of course, within the scope of the invention to so adjust the second wiper that there will be no film of water on the doctor surface after passing the second wiper, but this is not as convenient a method of operation.

Instead of passing the paper through the nip of the rolls 2 and 3, the desired film of coating may be formed directly on the applicator roll 2 and thereafter transferred to the paper by a wiping action. Also either the applicator member or the doctor member may be in the form of a belt. In any of these modifications of method and apparatus, the doctor member is given a double wiping treatment with a washing operation interposed between the wipers. Also in place of a wiper blade other wiping means may be employed, such as for example, a resilient surface roll, and the washing liquid may be delivered to and distributed on the surface of the doctor member by other means than the perforated pipe shown.

In this connection, I have observed that a somewhat higher doctor surface speed is required to avoid ridges in the coated paper when the doctor roll surface carries a film of water than when it is dry. On the other hand, if the doctor roll surface is wetted with a film of liquid having a lower surface tension than that of the aqueous mineral coating composition employed, a lower doctor roll speed is required to avoid rippled coatings.

I claim:

1. In a process of coating involving the operations of applying an excess of coating composition to a moving surface, removing all except the desired weight of coating therefrom by means of a doctor member moving in the opposite direction to said moving surface at the point of closest approach thereto, the method of cleaning the doctor member surface and preparing it for reuse, which consists essentially in wiping it, then thoroughly wetting it with a washing liquid and again wiping it.

2. In a process of coating involving the operations of applying an excess of coating composition to a moving surface, removing all except the desired weight of coating there-
from by means of a doctor member moving in the opposite direction to said moving surface at the point of closest approach thereto, the method of cleaning the doctor member surface and preparing it for reuse, which consists essentially in wiping it, then thoroughly wetting it with a washing liquid, and finally wiping any solids and excess of washing liquid from it whereby to present for reuse a surface free of solids and carrying thereon a film of the washing liquid.

3. In a process of coating involving the operations of applying an excess of coating composition to a moving surface, removing all except the desired weight of coating therefrom by means of a doctor member moving in the opposite direction to said moving surface at the point of closest approach thereto, the method of cleaning the doctor member surface and preparing it for reuse, which consists essentially in wiping it, then thoroughly wetting it with water, and finally wiping any solids and excess of water from it whereby to present for reuse a surface free of solids and carrying thereon a film of water.

4. In a process of coating involving the operations of applying an excess of coating composition to a moving surface, removing all except the desired weight of coating therefrom by means of a doctor member moving in the opposite direction to said moving surface at the point of closest approach thereto, the method of cleaning the doctor member surface and preparing it for reuse, which consists essentially in wiping it, then washing it with a stream of water, and finally wiping any solids and excess of water from it whereby to present for reuse a surface free of solids and carrying thereon a film of water.

5. In an apparatus for forming on a moving surface an even layer of coating composition containing a liquid vehicle, including a movable doctor member, the association with said doctor member of plural means for cleaning the surface of the latter and preparing it for reuse which in the order of their occurrence are a wiping means, a means for delivering a stream of washing liquid, and a second wiping means.

6. In an apparatus for forming on a moving surface an even layer of coating composition containing a liquid vehicle, including a rotatable doctor roll, the association with said doctor roll of plural means for cleaning the surface of the latter and preparing it for reuse which in the order of their occurrence are a wiping means, a means for delivering a stream of washing liquid, and a second wiping means.

7. In an apparatus for forming on a moving surface an even layer of coating composition containing a liquid vehicle, including a rotatable doctor roll, the association with