April 9, 1940. A. W. BATEMAN 2,196,692

COATING DEVICE

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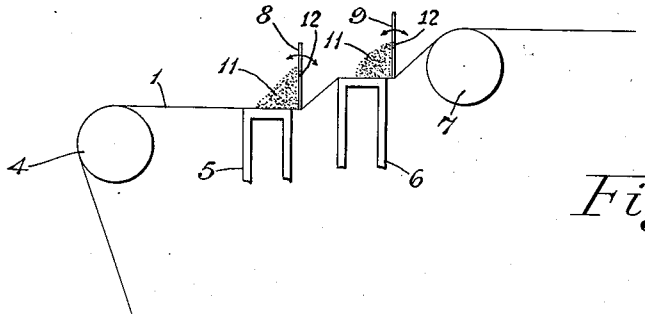


Fig. 2

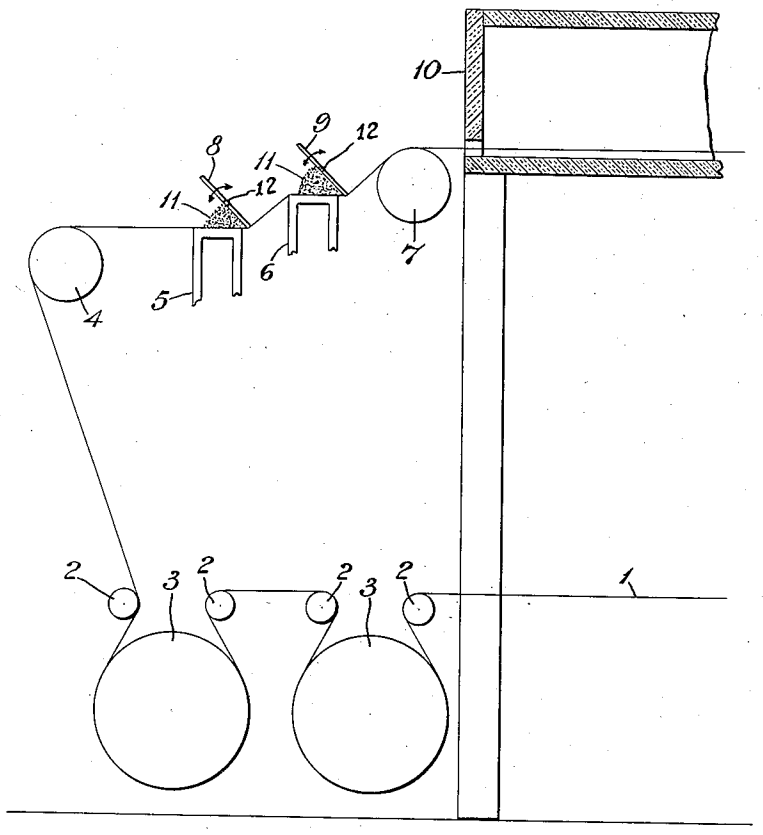


Fig. 1

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2,196,692

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COATING DEVICE

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2 Claims. (Cl. 91—53)

This invention relates to machines for coating flexible sheet material, and more particularly to improved equipment for coating textile fabrics with a liquid or semi-liquid composition.

The conventional coating head for coating textile fabrics consists of a doctor blade disposed between two transverse rolls in a horizontal plane in such a manner that the fabric passing over the transverse rolls and under the doctor blade forms a trough or V shape. An excess of coating composition is delivered to the fabric immediately in front of the doctor blade, so that the coating composition is spread over the sheet material in a more or less uniform layer.

It has previously been proposed to employ two doctor blades, one located immediately behind the other, in the coating of flexible sheets in a manner such that each doctor blade is disposed between two horizontal transverse rolls. The fabric being coated passes over the transverse rolls and under the two doctor blades to form two separate troughs. This type of apparatus is employed in the coating of loosely woven fabrics with large interstices or wherever it is desired to spread a coat of the composition on the surface of a sheet. An excess of the coating composition is delivered to the fabric immediately in front of the first doctor blade, the tension of the sheet under the knife being adjusted to spread an exceptionally thick coat on the surface. There is slightly more tension on the fabric as it passes under the second doctor blade which acts as a trowel to smooth the thick coat spread by the first doctor blade. A disadvantage of such coating devices is that the doctor blades must be in a vertical position.

The primary object of this invention is to provide a coating device which will apply a uniform surface layer of coating composition to a flexible sheet.

It is a further object of this invention to provide a coating device which will bridge large interstices in loosely woven fabrics with a film forming coating composition.

It is a further object to provide a coating device which permits the doctor blade to be set in several positions.

It is also an object to provide an apparatus which is adjustable and may be employed for driving the coating between the threads of the fabric as well as bridging the interstices.

Another object is to provide a means for preventing the coating composition from striking through the fabric at the point it is delivered to the sheet.

Another important object of this invention is the provision of an apparatus which reduces the tendency of the coating composition which collects on the back side of the doctor blade, to fall off on the freshly coated surface in the form of blobs or globules, and mar the appearance of the finished product.

A still further object is to provide an apparatus for spreading a plurality of coats of a liquid coating composition in succession before drying the preceding coats.

Other objects will appear hereinafter as the description of the invention proceeds.

The objectives of this invention are accomplished by providing a coating device comprising two or more doctor blades, each disposed between two transverse elements which are more fully described below, arranged in a manner such that the fabric passing over the elements and under the doctor blades approach the doctor blades in a horizontal direction, and leave the blades in a substantially vertical direction.

In the drawing, Figure 1 represents a diagrammatic section of a coating head showing the arrangement of the parts. Figure 2 is a similar but detailed view showing the doctor blades in different positions.

In Figure 1, 1 represents the fabric to be coated, 3 represents adjustable tension rolls to apply the necessary tautness to the fabric, 2 represents nip rolls to guide the sheet around the tension rolls 3. An idler roll 4 guides the sheet to the first table 5 located immediately in front of the first doctor blade 8. The separate tables 5 and 6 are arranged immediately in front of the separate doctor blades 8 and 9 in such a manner that the sheet 1 passing over the tables 5 and 6 and under the doctor blades 8 and 9 approaches the doctor blades in a horizontal direction and leaves at about 45° from the horizontal direction. The coating composition 11 is fed to the sheet immediately in front of each doctor blade and above the tables 5 and 6.

Members 5 and 6 are supports or tables to carry the weight or load of the roll of coating composition 11 which builds up in front of the doctor blades. The tables 5 and 6 reduce the tendency of the coating composition to strike through the fabric, especially when open mesh fabrics are being coated and enhance its tendency to bridge the interstices. After the sheet 1 passes over the last table 6, and under the doctor blade 9, the sheet moves in a substantially vertical direction to the driven pull roll 7. The coated fabric then enters a closed drying chamber 10 to expel the

volatile solvents in the usual manner. A drying chamber as described in Patent No. 2,107,275 issued to Anderson and Henry has been found to be satisfactory in this connection.

In the coating of open mesh fabrics where it is necessary to bridge the interstices of the fabric, the coating knives are set as shown in Figure 2. The doctor blade and the fabric approaching the blade forms a 90° angle and the angle formed by the blade and the fabric leaving the knife is 45°. The fabric approaching the blade and leaving the blade forms a 135° angle.

In the coating of tightly woven fabrics such as a drill, sateen, broken twill, etc., it is desired to drive or force the coating between the threads of the fabric to anchor the first coats of the coating to the base fabric. For this purpose the doctor blades are set as shown in Figure 1, that is, the approaching fabric and the blade form a 45° angle and the angle formed by the blade and the fabric leaving the blade is a 90° angle. The fabric approaching the knife and leaving the knife forms a 135° angle, the same as in Figure 2.

In practice it has been found that the preferred setting of the knife for general coating purposes varies through an angle of 45°. If the angle formed by the approaching fabric and the doctor blade is less than 45°, it is not possible to control the amount of coating deposited on the fabric, if the angle is more than 90°, a scooping or scraping results rather than a coating action.

The angle formed by the doctor blade and the fabric leaving the doctor blade varies between the range 45° and 90°. If this angle is less than 45°, there is a tendency for the coating composition which collects on the back side of the doctor blade to fall off on the freshly coated surface and mar the finished product.

The doctor blades or knives **8** and **9** are mounted on a worm gear (not shown) and are rotatable, as indicated by curved arrows, through 360° around pivots **12** to allow for different settings of the knives as shown by Figures 1 and 2, and also for cleaning the knives which is greatly facilitated by rotating the knife so that the coating edge is upright. Any means for accomplishing this purpose may be used. For example, the device shown in U. S. Patent 2,107,276, Figure 1 has been found to be satisfactory, but this does not form part of the present invention. During the coating the coating edge of the doctor blades **8** and **9** and the top of the tables **5** and **6** immediately in front of each knife, are in a horizontal plane. Since the doctor blades **8** and **9** are rotatable through 360°, the coating edge swings through an arc and it is necessary to provide means to lower or raise either the doctor blades or the tables **5** and **6**, in order that the doctor blades will clear the tables when rotated through 360°. For this reason, there is also provided means (not shown in drawing) to move the tables **5** and **6** in a horizontal or vertical direction, in order that the distance between the coating edge of the knife and the tables will always be constant during the coating operation.

There may or may not be provided "ears" (not shown in the drawing) mounted on each end of the knife holder. The "ears" are approximately 4" to 6" wide in the direction of the width of the material being coated so as to prevent the jelly roll from approaching the edges of the web being coated except in the limited amounts determined by undercutting the "ears" in a diagonal manner to taper the jelly roll slowly to a point near the selvage or edge of the web. Instead of "ears" as described above, blocks of wood or any other device known in the art may be used. These devices are well known and do not form a part of the invention.

Another modification from the preferred embodiment is to provide more than two doctor blades, all arranged in close relation; i. e., from about one to two feet apart as shown in the drawing. In this manner the liquid coating composition can be delivered directly to each knife and a plurality of coats applied with one pass through the drying machine. This arrangement makes possible the deposition of large thick coats in one pass through the machine which ordinarily would require four or five passes. The economic advantage of this arrangement is readily apparent. By depositing a plurality of coats of a coating composition without drying between each coat there is formed a smooth composite coating rather than a laminated coating.

In some cases such as coating tightly woven fabrics with a plurality of coats in one pass through the machine, the first knife or doctor blade is adjusted to the position as shown in Figure 1 to drive the coating between the threads or in the interstices to secure anchorage of the coating to the fabric, the succeeding knives are adjusted to the position shown in Figure 2 to spread smooth surface coats.

The apparatus herein described is particularly adapted to coating fabric with cellulose derivative compositions. These compositions are usually prepared in a viscous form and may be either clear or pigmented. The apparatus may also be used for coating of flexible sheet materials with other film forming substances such as resins, rubber, etc.

The present invention provides many improvements over the usual or conventional apparatus for coating fabrics. For example, it is possible to spread a relatively large amount of coating in one pass through the coating machine which is applied in several coats to obtain smoothness and uniformity. It is also possible to apply the several coats in such a manner that the succeeding coats are deposited on a wet surface and the several coats are dried at the same time to form a composite coating.

A further advantage is the flexibility of the apparatus, for example, the device may be used for surface coating fabrics as well as impregnation or penetration by adjusting the tension of the web and employing specially designed knives.

A still further advantage is the provision of an apparatus designed to bridge the interstices of textile fabrics with a film forming coating composition.

A still further advantage of the apparatus is to reduce the tendency for the coating composition which collects on the back side of the doctor blade to fall off in the form of globules or blobs, which mar the appearance of the finished product.

While the invention has been described in detail with specific designs, such designs are illustrative and not limitative of the invention.

It is apparent that many widely different embodiments of this invention may be made without departing from the spirit and scope thereof; and, therefore, it is not intended to be limited except as indicated in the appended claims.

I claim:

1. An apparatus for coating continuous lengths of fabric which comprises two horizontal tables, the second of which is higher than the first, a

rotatable doctor knife situated above each of the said tables, and means for passing the fabric under each knife.

2. Apparatus for coating fabrics with a viscous cellulose derivative composition which comprises a flat horizontal table, means for passing the fabric under tension over the said table and a doctor knife disposed above the table having its edge in contact with the fabric a short distance over the edge of the said table, means for passing the fabric in a direction having a vertical component after it leaves the doctor knife, a second table, a second doctor knife similarly disposed, and means for passing the fabric over the said second table and under the second doctor knife.

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