A. THOMA.

PROCESS FOR COATING FABRICS.

APPLICATION FILED SEPT. 12, 1916.

1,346,615.

Patented July 13, 1920.

2 SHEETS—SHEET 1.

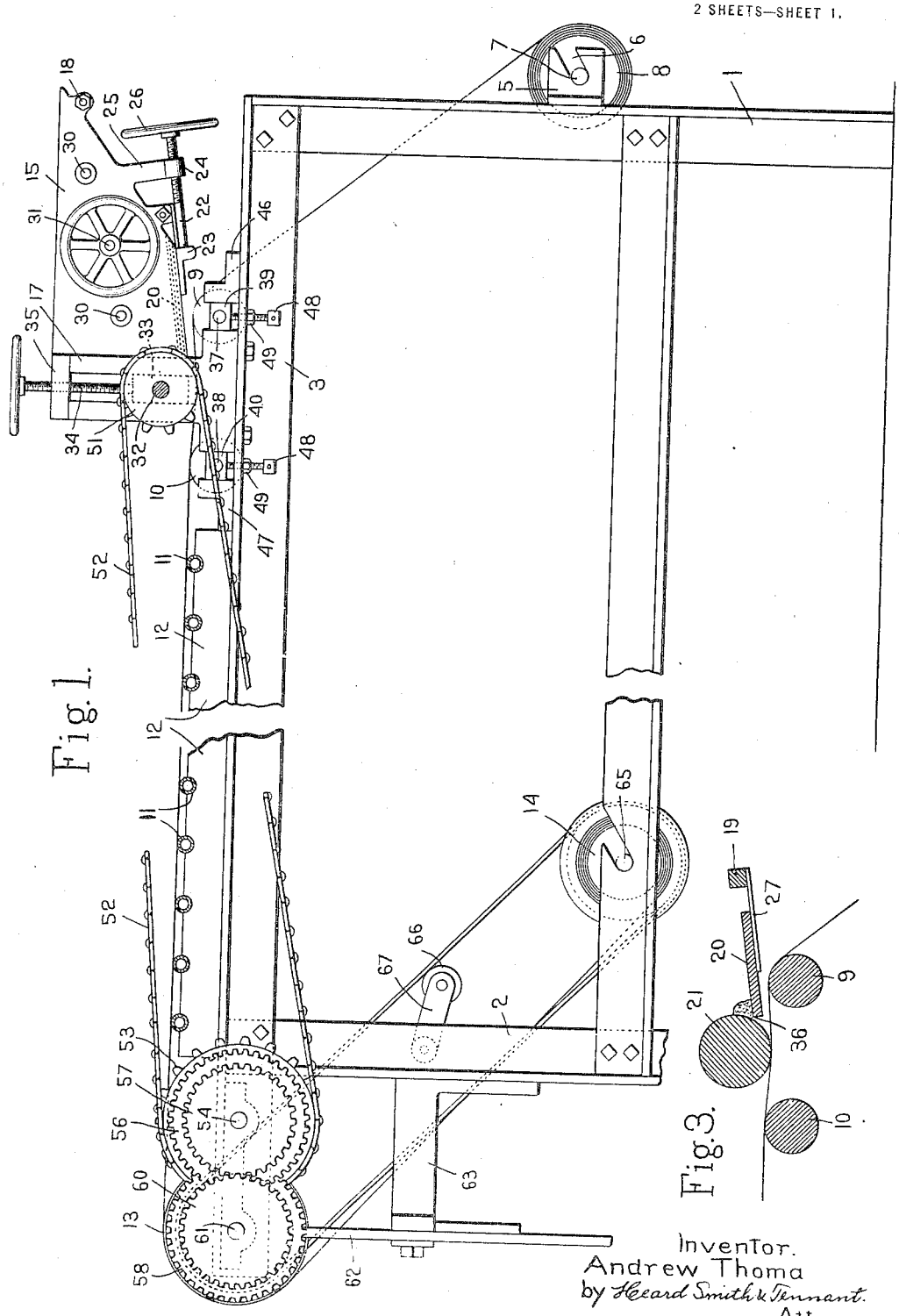


Fig. 1.

Fig. 3.

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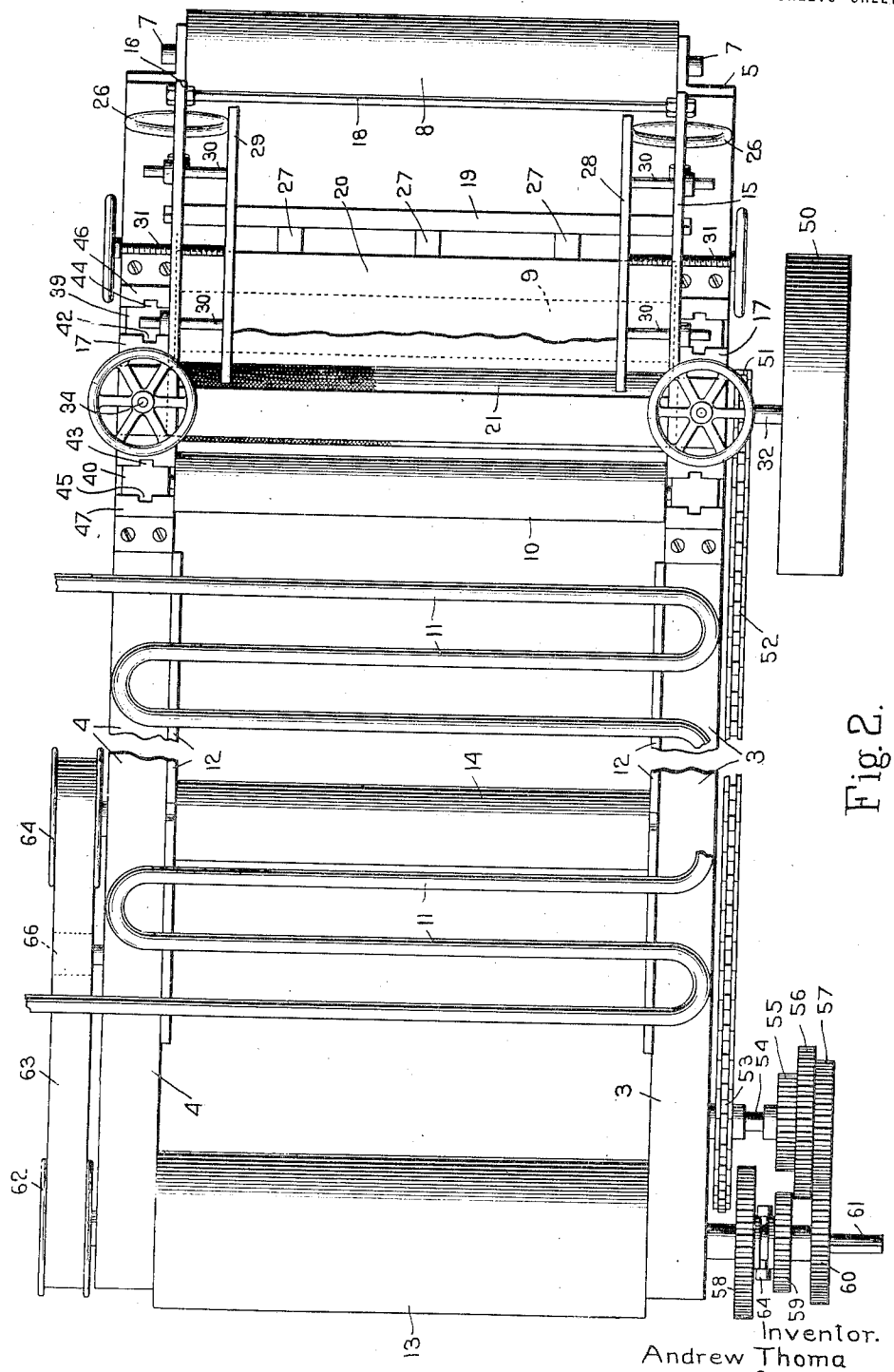


Fig. 2.

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UNITED STATES PATENT OFFICE.

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PROCESS FOR COATING FABRICS.

1,346,615. Specification of Letters Patent. Patented July 13, 1920.

Application filed September 12, 1916. Serial No. 119,751.

To all whom it may concern:

Be it known that I, ANDREW THOMA, a citizen of the United States, and resident of Cambridge, county of Middlesex, State of Massachusetts, have invented an Improvement in Processes for Coating Fabrics, of which the following description, in connection with the accompanying drawing, is a specification, like characters on the drawing representing like parts.

This invention relates to improvements in processes for coating fabrics and particularly those which are used in applying waterproof coating of rubber composition to light fabrics which are used for articles of apparel or for tops and covers of vehicles and for like purposes.

In the usual processes of manufacture of waterproof coated fabrics the coating composition or dope in a plastic or dough-like condition is scraped or rolled into the fabric under considerable pressure. In order to apply a fine coating it is necessary either to soften the composition so that it will flow rather freely, or to apply the stiffer composition under heavy pressure. Where fabrics which are thin or not tightly woven are coated in this manner some of the composition will percolate or be forced through the interstices in the fabric and show upon the uncoated side thereby destroying its appearance and finish and rendering it unsuitable for use in the manufacture of clothing or in other places where the uncoated side of the fabric is exposed to sight.

The principal object of the present invention is to provide a novel process for applying thin coatings to sensitive fabrics with the minimum amount of pressure necessary properly to incorporate the coating composition in the fabric but which will not force any of it through to the uncoated side.

This is accomplished by progressively passing the web of fabric across a suitable dope spreading means and sustaining the fabric in contact with the spreading means by the tension upon the web, the thickness of coating being controlled by varying the speed of movement of the fabric and the tension upon the web.

In the illustrative form of apparatus for performing the process which is disclosed herein the dope spreading means comprises a cylinder and in the operation a thin even smooth layer of the dope is placed upon the surface of the cylinder and transferred immediately therefrom to the fabric. The thickness of the coating is also controlled therefore by the thickness of the layer of dope supplied to and removed from the cylinder.

The features of employing a spreading cylinder, supplying the dope in the required thickness to the surface of the cylinder, transferring the dope immediately while in fresh condition to the fabric from the cylinder, of moving the web of fabric progressively past the cylinder, of varying the relative speed of the fabric relatively to the cylinder, of maintaining the cylinder and web of fabric in contact by the tension of the web, and of varying the pressure between the web of fabric and the cylinder together with the other features of the invention hereinafter described, enable all the desired advantages to be efficiently secured and a coating of any desired thickness to be spread evenly, smoothly and perfectly upon the thinnest and most delicate fabrics in a rapid and economical manner.

While various means may be employed to perform the process another feature of the invention consists in providing a suitable apparatus particularly adapted successfully and economically to perform the various steps in the process.

Other objects of the invention and the nature thereof will more fully appear in the following description and the accompanying drawings and will be pointed out in the annexed claims.

In the drawings;

Figure 1 is a side elevation of a machine embodying the preferred form of my invention,

Fig. 2 is a plan view of the same,

Fig. 3, is a detail vertical sectional view of the bottom of the dope hopper, the dope applying roller and the means for sustaining the fabric in contact with the dope applying roller by the tension imposed upon the fabric.

In processes of coating heretofore employed the coating composition or "dope" is used in the form of a plastic dough-like material which is fed from a suitable hopper upon the face of a moving web of fabric and is spread and pressed into the fabric by a roller or scraper which engages the coating, the fabric usually being rigidly supported in relation to a spreading roller or scraper by a roller or plate lying directly beneath the spreading means. The dope is thus squeezed into the fabric and not infrequently is squeezed through it.

I have discovered that by sustaining the moving web of fabric against the spreading means by the tension upon the web, sufficient pressure is provided properly to incorporate the coating composition into the fabric without forcing it through the interstices thereof, and that by varying the rate of movement of the fabric across the spreading device, or by varying the tension upon the web, or both, the thickness of the coating upon the fabric and the depth of its penetration into the texture of the material may be nicely regulated.

I have also discovered that the spreading action is facilitated and improved by using a moving spreading device, preferably a spreading cylinder having its surface moving at the line of contact with the fabric in the direction in which the web of fabric is traveling, preferably at a different speed so that it has a rubbing or smoothing effect upon the coating which not only produces a surface having an improved appearance and gloss but also tends to condense the coating composition and to force out bubbles which otherwise would cause pits or pin holes in the coating.

The use of a spreading cylinder as thus described enables the coating to be laid smoothly and evenly on the fabric and presents one means by which the thinness of the coating may be controlled. In the preferred form of this invention by use of an adjustable gate the dope is fed to the surface of the cylinder so as to lay upon the surface of the cylinder a coating of any required thinness and then this coating is transferred immediately in a most efficient manner from the cylinder to the surface of the fabric, thus laying it upon the fabric while in a fresh condition and in a smooth and even layer.

The fabric is carried immediately after coating to a suitable drying instrumentality and when thoroughly dry is rolled up for storage.

In the economical performance of the process the uncoated side of the fabric is engaged by a moving actuator, preferably a cloth covered roller which imposes the tension upon the web and draws it across the spreader and thence through the field of a drying instrumentality which preferably applies heat through the uncoated back of the fabric so that the surface of the coating is not seared but retains its plastic condition while the volatile constituents of the composition are driven off.

The spreader preferably is actuated in timed relation to the mechanism which moves the web of fabric so that the feeding of the dope upon the fabric and its spreading will remain uniform, and finally the coated fabric may conveniently be rolled up upon a reel actuated from the same power transmitting means.

The spreader preferably is provided with a rotary or other traveling spreading member and may be operated manually or by power, within the spirit and scope of the following process claims.

The apparatus disclosed in the accompanying drawing comprises a frame having pairs of end posts 1 and 2 the posts of each pair being connected by suitable cross bars, the tops of the pairs of posts being connected by girders 3, 4 which support the coating and drying mechanism.

A bracket 5 mounted upon the posts 1 and having oblique slots 6 provides means for removably supporting the shaft 7 of the roll 8 of uncoated fabric. The fabric is led from the roll 8 over guide rolls 9 and 10 which are located upon opposite sides of the spreading mechanism and yieldably sustain the fabric against the same in a manner which will hereinafter be more fully pointed out. From the spreading mechanism the fabric is led across or through a drying mechanism which desirably may comprise a series of pipes 11 supported in notches in plates 12 secured to the girders 3, 4 and thence to a driving drum 13 which is provided with a cloth or other frictional covering. From the drum 13 the coated cloth is led to a take-up roll 14 upon which the coated cloth is finally wound.

The spreading device comprises a hopper having suitable means for delivering a film or sheet of coating composition or dope upon the upper surface of the web of fabric as it is passed beneath the same.

The contact between the dope applying means and the web of fabric is effected by pressure due to the tension placed upon the web of fabric. To secure this tension the web is supported at each side of the dope applying means, as for example by the rolls 9 and 10 and the fabric is drawn through the machine by suitable means such as the drum 13 so that by reason of the adjustment and position of the parts the web of fabric is sustained against the dope applying means with the required pressure but without any direct support at the area where the dope is directly applied.

The hopper or dope pan and the dope ap-

plying means may be of any suitable character to deliver a thin film or sheet of dope upon the fabric. A convenient mechanism which is illustrated herein comprises a hopper having ends 15, 16 secured to stands 17 suitably mounted upon the girders 3, 4. The ends of the hopper are connected by a tie-rod 18 and a cross bar 19 to give rigidity to the construction. A gate 20 is slidably mounted in grooves adjacent the lower edges of the hopper ends and cooperates with a cylinder 21 which extends across the machine. This cylinder and gate which constitute the dope applying means in the preferred form of the invention constitute the closure for the receptacle or hopper.

The gate 20 is adjustable toward and from the cylinder 21. A convenient means for adjusting the gate comprises screws 22 rotatably secured in lugs 23 depending from said gate, said screws engaging internally screw threaded bosses 24 upon arms 25 depending from the ends 15, 16. Suitable hand wheels 26 may be provided for rotating the screws. A series of plates 27 connected to the cross bar 19 and extending under the gate serve more rigidly to support the gate and prevent it from bending during the operation of the machine so that the edge of the gate will remain straight and parallel with the surface of the cylinder and thus insure the feeding opening between the edge of the gate and the surface of the cylinder being maintained throughout its length accurately of the same width whereby the thinness of the layer of dope fed to the surface of the cylinder will be the same throughout.

In order to provide for coating fabrics of different widths the hopper may be provided with false end plates 28 and 29 which conveniently may be mounted upon guide rods 30, slidably mounted in the ends 15 and 16 thereof. The plates 28 and 29 may be adjusted by screws 31 threaded through the ends 15 and 16 respectively and rotatably engaging at their ends the central portions of the plates 28, 29. Suitable hand wheels may be provided for conveniently rotating the screws 31.

The spreading cylinder 21, which preferably is provided with a knurled or pitted surface, is mounted upon a shaft 32 which is journaled in boxes 33 slidably mounted in ways in the stands 17. The spreading cylinder 21 may be vertically adjusted by screws 34 threaded through the caps 35 of the stand 17 and at their lower ends rotatably engaging the boxes 33, suitable hand wheels being provided for rotating the screws 34.

The side of the gate 20 is provided with a relatively sharp edge 36 adapted to coöperate with the surface of the cylinder 21 so as to cause the formation of a thin film or sheet of coating on the surface of the cylinder. The gate preferably is so located that its edge 36 is but a short distance from the web of fabric so that the coating composition or dope will be applied to the fabric almost immediately after it leaves the hopper, thereby preventing the loss of any considerable amount of volatile solvent which retains the dope in a plastic condition and thus laying the dope in a thin smooth even sheet on the fabric while in fresh condition.

As before stated the fabric is sustained in engagement with the spreading device, which in the present instance is the cylinder 21, by the tension upon the web; and the thickness of the coating is controlled by varying the opening of the gate and thus the thickness of the dope on the surface of the cylinder, by varying the rate of movement of the fabric, and, by varying the pressure between the spreading roller and the surface of the fabric. It will be obvious that by varying the thickness of the dope which is supplied to the surface of the cylinder a greater or less thickness of dope may be transferred by the roll to the traveling web of fabric. By increasing the relative speed of the fabric to that of the surface of the roll the film of dope thus applied to the web will be caused to be spread over a greater area and consequently will form a thinner coating upon the fabric, furthermore by increasing the tension upon the web the film of dope thus applied to the fabric by the roll will be spread over a still greater area and a still thinner coating formed. This pressure may be adjusted by raising or lowering the cylinder 21 relatively to the guide rollers 9, 10 or by raising and lowering the guide rollers relatively to the cylinder 21 which may be retained in fixed position. Both adjustments are illustrated in the accompanying drawing, the adjustment of the cylinder 21 having been described.

The shafts 37, 38 of the guide rolls 9, 10 are journaled in boxes 39, 40 which are mounted in suitable guideways. These guideways may conveniently be formed by facing off sufficiently the ends of the base of the stand 17 and providing grooves 42, 43 therein to receive ribs upon the boxes 39, 40, the opposite sides of the boxes being guided in grooves 44, 45 formed in brackets 46, 47 suitably secured to the girders 3, 4. Adjusting screws 48 threaded through screw threaded apertures in the girders 3 and 4 and engaging respectively the bottoms of the boxes 39 and 40 serve to adjust the rollers 9 and 10 vertically, and locking nuts 49 carried respectively by the screws 48 and adapted to be jammed against the girders serve to retain the rollers in adjusted position.

By this construction either of the guide rollers 9 or 10 may be adjusted vertically so

that with the adjustability of the spreading cylinder 21 a sufficiently wide variation or adjustment may be made to obtain any desired amount or character of pressure between the fabric and the cylinder 21. Thus the fabric may be run across the guide rollers substantially tangential to the cylinder 21 in which case the spreading cylinder will press very lightly upon the surface of the fabric or by adjusting the cylinder 21 or one or both of the rollers 9, 10 the fabric may be caused to engage a substantial segment of the cylindrical surface of the cylinder 21 and this segment may be positioned either mainly in front of or behind the vertical plane of the axis of the cylinder 21.

In order to facilitate the spreading of the coating upon the fabric the spreading cylinder 21 desirably is rotated in such a manner that its surface shall travel in the direction of movement of the fabric at its line of contact therewith but at a different speed, so as to cause a spreading of the dope over a more extended area of the fabric and also to force the material into the surface of the fabric. To insure uniformity in the coating the relative speeds of travel of the fabric and of the surface of the spreading cylinder should be maintained uniform. In order to accomplish this purpose the drum 13 which advances the fabric may conveniently be driven from the shaft which rotates the cylinder 21.

As illustrated herein power is applied to the shaft 32 of the cylinder 21 by a pulley 50 secured to the end of the shaft 32, and a sprocket 51 fixed upon the shaft 32 serves to transmit power through a sprocket chain 52 to a sprocket wheel 53 mounted upon a stub shaft 54 journaled in bearings carried by the girder 4. The shaft 54 is provided with a series of gears 55, 56 and 57 adapted respectively to engage coöperating gears 58, 59 and 60 which are slidably feathered upon the shaft 61 of the drum 13. A suitable shifting mechanism such as a lever 62 mounted upon a bracket 63 on the end post 2 and having a yoke 64 engaging the common hub of the gears 58, 59 and 60 may serve to place any one of said gears into mesh with its coöperating driving gear 55, 56 or 57.

By thus shifting the gears the speed of movement of the fabric may be varied relative to the constant speed of the spreading cylinder 21 so that the dope which is applied by the cylinder may be distributed over a greater or less area according to the relative speeds of movement of the contacting surfaces of the web of fabric and the spreading cylinder. This system of change speed gearing is to be understood, however, simply as illustrative of a means for adjusting the relative speed of the fabric and cylinder periphery and any suitable means may be employed for this purpose.

The take-up roller 14 may conveniently be driven from the shaft 61 of the drum 13 through a pulley 62 secured to the shaft 61 of said drum and driving a belt 63 which passes over a pulley 64 upon the shaft 65 of the tension roller 14. The belt 63 engages the pulley 64 in slipping contact so that the coated fabric will be properly wound upon the take-up roll and the action of the drum insured. The desired tension upon the belt is regulated as by a guide roller 66 carried by brackets 67 secured in angular adjustment to the posts 2.

In the operation of the machine dope of the proper consistency is placed in the hopper and a web of uncoated fabric drawn from the roll 8 over the guide roll 9 beneath the spreading cylinder 21, over the guide roller 10, thence over the heating pipes 11 and drum 13 to the take-up roll 14. Power is then applied to the pulley 50 upon the shaft 32 of the cylinder, rotating the same so that its lower portion moves in the direction of the travel of the fabric. The web of fabric is driven by the cloth covered drum 13, through the gearing above described, at the desired rate of speed relatively to the speed of rotation of the spreading cylinder 21.

The gate 20 is adjusted relatively to the surface of the cylinder 21 in such a manner as to deliver a sheet of dope of a predetermined thickness upon the surface of the roller which carries the same into contact with the fabric, spreads it upon the fabric, condenses the coating thus applied and smoothes the same by its wiping contact so that a desirable finish is produced. The coated fabric thereupon passes over the drying coils 11 with the back or uncoated side of the fabric toward the coils so that the heat is applied through the fabric and back of the coating.

By this method also a light coating may be applied to the fabric to prepare it for receiving a heavier coating after the first has been allowed to dry and set. In such case the gently applied thin coating will act as a sizing to prevent the heavier coatings from striking through the fabric. If desired the texture thus lightly coated may be applied to heavier coated fabrics to form the well known "double textures" of "Mackintosh" cloths.

It will be understood that the particular embodiment of the invention disclosed herein is illustrative and not restrictive and that various other means may be utilized in the performance of the process claimed herein, and that various modifications may be made in the structure of the apparatus within the meaning and scope of the following claims.

Having fully described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A process of coating fabric which comprises supplying a dope spreading device with a film of dope of predetermined thickness, progressively moving a web of the fabric across said spreading device and sustaining said web in contact with the spreading device by the tension upon the web.

2. The process of coating fabric which comprises supplying a dope spreading device having a moving surface with a film of dope of predetermined thickness, progressively moving a web of fabric across the moving surface of said spreading device and sustaining the web of fabric in contact with the spreading device by the tension upon the web.

3. The process of coating fabric which comprises supplying a dope spreading cylinder with a film of dope of predetermined thickness, progressively moving a web of fabric across said spreading cylinder and sustaining the web in contact with a segment of the surface of said cylinder by means of the tension upon the web.

4. The process of coating fabric which comprises supplying a dope spreading cylinder with a film of dope of predetermined thickness, progressively moving a web of fabric across said spreading cylinder and sustaining the web in contact with a segment of the surface of said cylinder by means of the tension upon the web and varying the thickness of coating by varying the thickness of dope applied to the surface of the cylinder.

5. The process of coating fabric which comprises supplying a dope spreading cylinder with a film of dope of predetermined thickness, progressively moving a web of fabric across said spreading cylinder and sustaining the web in contact with a segment of the surface of said cylinder by means of the tension upon the web and varying the thickness of the coating by varying the speed of movement of the web of fabric.

6. The process of coating fabric which comprises supplying a dope spreading cylinder with a film of dope of predetermined thickness, progressively moving a web of fabric across said spreading cylinder and sustaining the web in contact with a segment of the surface of said cylinder by means of the tension upon the web and varying the thickness of the coating by varying the speed of movement of the web of fabric and the tension upon the web.

7. The process of coating fabric which comprises supplying the moving surface of a dope spreading cylinder with a film of dope of predetermined thickness, progressively moving a web of fabric across said spreading cylinder at a different speed than the peripheral speed of said cylinder and sustaining the web in contact with a segment of the surface of said cylinder by means of the tension upon the web.

8. The process of coating fabric which comprises supplying the moving surface of a dope spreading cylinder with a film of dope of predetermined thickness, progressively moving a web of fabric across said spreading cylinder at a different speed than the peripheral speed of said cylinder and sustaining the web in contact with a segment of the surface of said cylinder by means of the tension upon the web and regulating the thickness of the coating by varying the speed of movement of the fabric relatively to the peripheral speed of said cylinder.

9. The process of coating fabrics which comprises supplying a rotating dope spreading cylinder with a film of plastic dope of predetermined thickness, and progressively moving a web of fabric across the dope spreading cylinder.

10. A process of coating fabric which comprises progressively moving the fabric across a dope spreading device provided with a rotary dope applying cylinder having its surface at the line of contact rotating in the direction of movement of the web, sustaining the fabric in contact with the cylinder by the tension on the web and regulating the thickness of coating by varying the relative speed of the contacting surfaces of the cylinder and web.

11. A process of coating fabric which comprises progressively moving the fabric across a dope spreading device provided with a rotary dope applying cylinder having its surface at the line of contact rotating in the direction of movement of the web, sustaining the fabric in contact with the cylinder by the tension of the web and regulating the thickness of the coating by varying the relative speed of the contacting surface of the cylinder and web and the tension upon the web.

12. A process of coating fabric which comprises progressively moving the web of fabric across and in contact with a rotary dope applying cylinder, maintaining the linear speed of the web at a predetermined higher rate than the peripheral speed of the cylinder, supplying the surface of the cylinder with a film of dope of predetermined thickness in advance of the initial line of contact between the cylinder and the web, whereby the said film will be transferred from the cylinder to the web of fabric and during transfer will be thinned out to a predetermined extent.

13. A process of coating fabric which comprises progressively moving the web of fabric across and in contact with a rotary dope applying cylinder, maintaining the

linear speed of the web at a predetermined higher rate than the peripheral speed of the cylinder, supplying the surface of the cylinder with a film of dope of predetermined thickness in advance of the initial line of contact between the cylinder and the web, sustaining the web of fabric in contact with the cylinder by the tension of the web, whereby the thickness of the coating applied to the web is regulated by the thickness of the film applied to the cylinder and the relative speed of the web and cylinder.

In testimony whereof, I have signed my name to this specification.

ANDREW THOMA.