July 19, 1932. G. W. BUCHANAN 1,867,875

COATING AND DOUBLING APPARATUS

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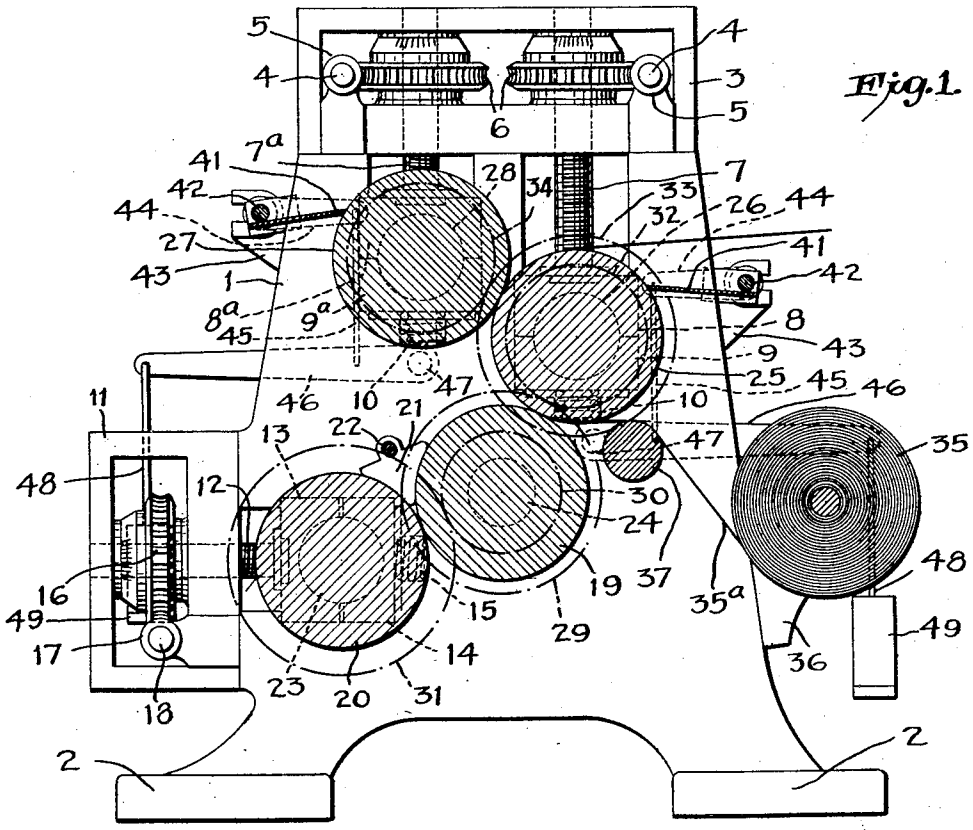


Fig. 1.

Fig. 2.

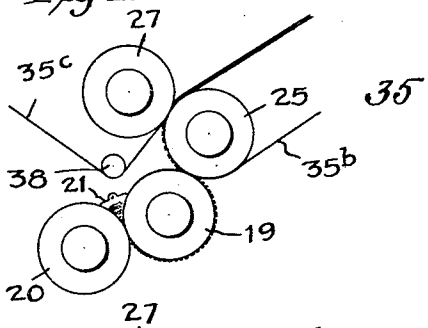
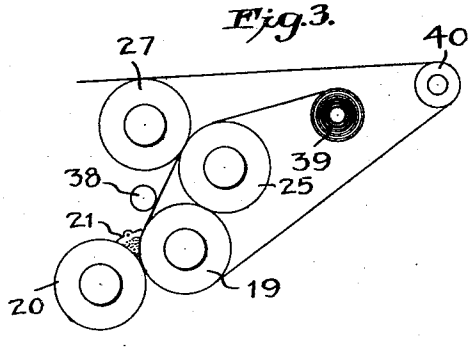


Fig. 3.



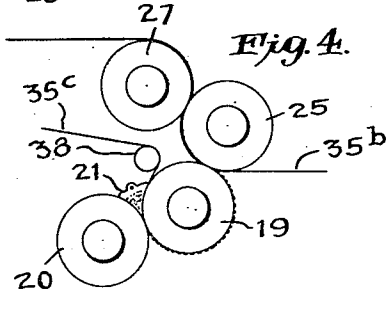


Fig. 4.

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UNITED STATES PATENT OFFICE

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COATING AND DOUBLING APPARATUS

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This invention has reference to the art of coating and doubting textile materials, fibrous materials, and fabrics generally, useful as wall decorations and coverings, floor covering, furniture covering and other domestic and commercial purposes, and relates particularly to an apparatus for coating, doubling and otherwise treating and constructing the particular fabric, including the employment of plastic materials, inspissated substances of predetermined kind, and viscous and siccative materials found suitable for the fabrication of articles of predetermined character.

Among the objects of my invention may be noted the following: To provide an apparatus by means of which both the doubling and coating operations can be carried out with facility, rapidly and effectively in the manufacture of many different kinds of fabrics adapted for useful, commercial and ornamental purposes; to provide an apparatus of the kind noted in the foregoing having a plurality of interacting rolls or cylinders so combined and differentially driven as to enable them to fabricate the articles with the desired characteristics; to provide an apparatus such as noted with means adapted to coat materials either singly or doubly, and interchangeably treat the materials referred to in the foregoing for predetermined results; and to provide an apparatus of the kind and for the purposes mentioned which is strong, durable, economical to operate and to manufacture, and provided with means enabling all the various adjustments required for the purposes intended.

With the above objects in view and others which will be detailed during the course of this description, my invention consists in the parts, features, elements and combinations thereof hereinafter described and claimed.

In order that my invention may be clearly understood, I have provided a drawing wherein:

Figure 1 is a view showing my coating and doubling machine in sectional elevation, the section being taken vertically through the rolls between the end supporting members of the frame; and

Figures 2, 3 and 4 are diagrammatic views showing various schemes of arrangement of the rolls, and the interaction of cooperating parts for doubling and for coating various materials.

Referring to the drawing, and particularly to Figure 1, it will be understood that I have omitted many details of construction which are not of the essence of my invention outlined in the following. In this figure I have shown only enough of my machine to enable the particular features of invention to be readily understood.

In Figure 1 the numeral 1 indicates an end member of the frame of which there are two properly bolted or cast together or so constructed as to give the frame strength, rigidity, and solidity, thus eliminating vibrations during operation of the mechanisms carried by said frame. It will be noted that the end members are symmetrical and evenly balanced so as to avoid excess of weight on one side or the other of the machine; and presently it will be also seen that the arrangement of the rollers utilized in my invention is such as to bring about symmetry, solidarity, sturdiness and to avoid vibration in the operation of the machine and to produce in the latter a perfectly balanced operation. The machine is provided with four base supports, such as indicated at 2, and at its top is provided with two crown members such as 3 supported by the two end members 1, between which extend adjusting rods 4 provided at opposite ends with worms 5 adapted to mesh, respectively, with worm gears 6, carried by adjusting screws 7 and 7^a threaded into the crown members 3 and suitably connected to the upper one 8 and 8^a of a pair of journal blocks, the one 9 and 9^a of which is supported by springs 10 suitably held in sockets of the end frame members 1 so as to elastically support the rolls mounted therein. The rods 4 may be rotated by suitable crank wheels or arms (not shown) carried at their ends.

A front supporting member 11 is secured to the front of each of the frame members 1 near their base, which members 11 carry adjusting screws 12 threaded into said members and carrying at their inner ends one

member 13 of a journal box, the other member of which is indicated at 14 under tension of springs 15. The screws 12 carry worm gears 16 with which cooperate the worms 17 on adjusting rod 18 supported by the members 11, said rod also having a rotary adjusting crank (not shown) for shifting the journal blocks 13 and 14. From the foregoing it will be seen that the opposite end of the machine, not shown, is a duplicate of the end shown in Figure 1, and said opposite end carries the driving crank and gears.

The arrangement of the rolls in my machine is important and is of the essence of my invention, since such arrangement gives solidity, balance and steadiness of operation of my machine eliminating vibration and enabling me to effectively produce the results desired in a strong, durable and compact machine. As shown in Figure 1, the master or coating roll is indicated at 19, and is supported by the two members 1 of the frame centrally thereof between the front and back edges of said frame, and practically in the center of gravity of said frame. The supporting and spreading roll 20 is journaled below the axis of the master roll 19 and in advance thereof near the front edges of the frame members 1. A triangular gage-block 21 is supported on opposite sides of the machine, each on a rod 22 suitably supported in a frame member and adapted to cooperate, with its two curved faces, intimately with the rolls 19 and 20, respectively. The rods 22 may be rotated in any suitable manner so as to shift the gages 21 longitudinally of the rolls 19 and 20, so as to regulate the coating surface to the width of the material being produced. The roll 20 is mounted on a shaft 23 carried in the journal blocks 13 and 14, enabling it thus to be adjusted laterally relatively to the master roll 19 mounted on the shaft 24 in fixed bearings of the frame members 1. The two rolls 19 and 20 and gage-blocks 21 form a gutter or sump in which the coating material is placed. A pressure roll 25 cooperates with the master roll 19 and is carried by the shaft 26 mounted in the bearing blocks 8 and 9, which are adjustable through the medium of the screws 7 so as to shift the roll 25 relatively to the master roll for the purpose of bearing more or less heavily upon the latter. The roll 25 is arranged near the rear edges of the supporting frame members 1, thus balancing the weight of the roll 20 on the front side of the machine. A fourth or glossing roll 27 is carried on a shaft 28 mounted in the journal blocks 8^a and 9^a near the front edges of the frame members at the top of the latter, and the adjustment of said roll 27 by the screw 7^a enables it to bear more or less against the surface of the roll 25. The roll 27 is arranged symmetrically relatively to the rolls 19 and 20 and in a plane between the axes of the latter and above said rolls. The four rolls 19, 20, 25 and 27 are driven by differential gearing, the master roll 19 carrying the master driving gear indicated by the outline 29. The gear 30 carried by the shaft 24 of the master roll meshes with the gear 31 on the spreading roll 20, and the gear 29 meshes with the gear 32 on the shaft of the pressure roll 25, and the gear 33 on the shaft of the roll 25 meshes with the gear 34 on the shaft of the glossing roll 27. As before stated, the interacting gearing of the several rolls is differential, the ratio being a single revolution of the roll 20 to two revolutions of the master roll 19; two revolutions plus of the roll 25 to two revolutions of the master roll 19; and three revolutions of the roll 27 to two revolutions plus of the roll 25. In other words, I may make the speed of the roll 25 relatively to the master roll 19 upwards of two revolutions relatively to the two revolutions of the master roll, and relatively to the three revolutions of the roll 27, this differential and ratio being for the purpose of putting a predetermined amount of torque or drag upon the material passing between the master roll 19 and the pressure roll 25 to keep the material smooth; and the ratio between the master roll 19 and the bearing roll 20 is for the purpose of enabling the material in the gutter between the two rolls to be properly smeared and spread upon the master roll 19 by the bearing roll 20, the thickness of such material thus evenly applied to the master roll 19 being regulated by the adjustment of the roll 20 relatively to the master roll 19. And the adjustment of the roll 25 relatively to the master roll 19 is for the purpose of giving to the material passing between the two rolls the proper thickness of coating; and the adjustment of the roll 27 relatively to the roll 25 regulates the pressure between the two and compensates for the difference in thickness of the coating applied to the material passing between the two rolls, while the roll 27 performs the additional function of uniformly spreading the coating on the said material and of glossing or calendering the same, said two rolls 25 and 27 being elastically mounted as previously stated.

It is believed to be unnecessary to portray the gearing any more in detail, since the gear wheels are of the common type and no importance is attached to them other than the differential or ratio thereof and the functions emanating therefrom.

In the arrangement shown in Figure 1 and for the purpose of coating the fabric or material passing between the several rolls 19, 25 and 27, a bolt of material 35 is suitably mounted in journal blocks 36 on the rear edges of the frame members 1, this being a convenient arrangement because of accessibility and because of its proximity to the master roll 19 and the bearing roll 25, avoiding a long stretch of the material leading to the latter two rolls, and also enabling the

bolt of material to be arranged at the proper angle or in the proper relation to said master and bearing rolls for the purpose of applying to the stretch of material 35ª the proper tension through the medium of a guiding and tension roll 37 mounted in the frame members 1 at the rear of the master roll directly under the bearing roll 25 and adjacent the point of contact between the two. This arrangement of the guiding and tension roll 37 enables the stretch of material 35ª to pass in approximately a horizontal plane to the bearing roll 25 and at a desired predetermined angle to the surface of the master roll 19 carrying the coating material. Thus it will be seen that coating substances arranged in the gutter or sump between the spreading roll 20 and master roll 19, gaged as to width by the blocks 21, will be carried directly to the stretch of material passing between the master roll and the bearing roll 25 over the tension and guiding roll 37, and that the said stretch of material is subjected to a drag or smearing strain between the two rolls because of the difference in speed thereof. Furthermore, it will also be seen that the difference in speed between the roll 27 and the bearing roll 25 causes the former to spread and gloss the coating on the fabric passing between the two rolls. Thus, uniformity of thickness of the coating on the material is provided for, together with a mechanical distribution of said coating over the surface of the material during the short period and distance of travel through the machine. It is, of course, understood that adjustment of the roll 20 relative to the roll 19 regulates the thickness of the coating applied to the fabric, while the gage blocks regulate the width of the coating applied to the fabric; and that the adjustment of the rolls 27 and 25 can be regulated to compensate for the thickness of coating, while the differential of speed between the several rolls provides for the smear of the coating on the master roll and the smear of the coating and uniform spread of the latter upon the fabric or material being coated.

My machine is adapted for doubling as well as coating and with the same arrangement of rolls shown in Figure 1; but, with a different arrangement of guiding and tension rolls and of the bolts of material to be coated, I can accomplish the production of many different kinds of fabrics.

For example, in Figure 2 I have shown my machine with the fabrics traveling therethrough in such manner as to perform the operation known as "doubling", by coating the surface of one fabric or stretch of material and applying another fabric or stretch of material thereto. In this figure, the bolt of material to be coated may be arranged at or about the point 35, and from thence the stretch of material will pass between the master roll 19 and the bearing roll 25, said fabric being indicated at 35ᵇ. Another stretch of fabric 35ᶜ will be led below a guiding and tension roll 38 arranged adjacent the master roll 19 at the front thereof and approximately midway of the space between the rolls 20 and 27, the stretch of material passing from the guide roll between the rolls 25 and 27, thus bringing the two fabrics 35ᵇ and 35ᶜ together between the rolls 25 and 27, the fabric 35ᵇ having received its coating from the master roll 19.

In Figure 4 I may use the same arrangement of elements as in Figure 2, for doubling purposes, and merely adjust the tension and guiding roll nearer to the master roll 19. In this arrangement, the material 35ᶜ will pass over the top of the tension roll 38 and downwardly over the master roll 19, receiving its coating on its outer surface directly from the sump or gutter between the gage blocks 21 and the roll 20. Thus the fabric 35ᶜ passes around the master roll 19 to the bearing roll 25, at which point the coating will be covered by the fabric 35ᵇ, the two coated fabrics thus passing between the said two rolls, and around the roll 25 to the roll 27, and around the latter and over its top to the receiving roll.

With the arrangement shown in Fig. 3, coating is accomplished by supporting the bolt of material 39 above the axis of the roll 25 and in the rear of the latter, the stretch of material being fed first between the rolls 25 and 27, then across the guide roll 38, then to the surface of the master roll 19 where the fabric will receive its coating in the same manner as in Figure 4. The fabric then passes around the surface of the master roll and around a tension and guiding roll 40 and across the top of the roll 27, utilized in this instance also as a guiding and supporting roll, the fabric then passing to the receiving roll.

It will thus be understood that the compact and intimate arrangement of rolls in my machine enable me to accomplish many results in coating and doubling fabrics with facility, accuracy and rapidity, together with uniformity of spread of coating material upon the fabrics, as well as regulation of the thickness of said coating.

In the operation of my machine, I find that the functions thereof are improved somewhat by adopting so-called "doctor" blades bearing upon the surface of the roll 25 and the roll 27, the blade bearing upon the roll 25 near the top and in rear thereof and upon the surface of the roll 27 near the top and in front thereof. In each instance, the structure consists of a blade 41 adapted to bear upon its adjacent roll and supported by and turning with a shaft 42 journaled in a bracket 43 of the machine, the shaft having an arm 44 connected therewith, the inner end of which has a link 45 depending into connection with

an arm 46 journaled at 47 in the frame and having its outer end provided with a pendent link 48 on which a weight 49 may be supported, said weight being interchangeable with others according to the pressure desired to impose upon the doctor blades. This structure is simple, effective, and is applied to the machine without in any manner interfering with the operation of the rolls or the materials passing through the machine regardless of the work being performed. These blades keep the rolls clean by scraping off any material which may be pressed through the fabrics or reach the rolls in any other way.

The materials referred to may be textile fabrics, paper or other fibrous material and combinations may be made thereof according to the particular product required. And my machine permits the use of coating materials without thinners, alkalies or glues and without a multiplicity of operations for cloth, burlap, paper or other desired and necessary materials, according to the product aimed at; and my machine is particularly adapted for producing oil cloth, using linseed oil, any siccative oil, with the usual fillers such as clay and coloring matter. In doubling, the two fabrics joined will, of course, have an appropriate adhesive applied.

In the operation of the machine, the coating material is placed in the sump between the two rollers and the gage-blocks, and with the master roller operating at twice the speed of the spreading or smearing roller, the master roller will have the coating properly applied thereto because the coating material always goes to the faster speed roller, the other one being left clean. In the arrangement of Figure 1, the master roller will apply the coating directly to the fabric, while in Figure 4 and also in Figure 3 the coating material will be applied to the fabric directly by the smearing roller 20. In either combination, the coating material is evenly and uniformly applied both as to width and thickness. The other rollers, as previously pointed out, place tension upon the fabric, smoothing it, and preventing all wrinkling, and burnishing or polishing it, giving it gloss and uniform appearance.

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

1. In a coating machine, the combination of a smearing roll mounted in a supporting frame at the lower front edge of the latter, a coating roll mounted in the frame centrally of the latter and above and to the rear of the smearing roll to produce a gutter, a third roll mounted above the coating roll and in rear of the latter near the rear of said frame, a fourth roll mounted above all the rolls at the front edge of the frame, means for driving the rolls, including master driving means mounted on the shaft of the coating roll, means for securing adjustments of the rolls relatively to each other, means for mounting two of the rolls yieldingly, and a guiding roll mounted adjacent the second and third rolls close to the junction of the latter with each other.

2. A coating machine comprising a frame and a plurality of rolls mounted therein, two of said rolls operating near the front of the frame and arranged to provide a gutter for holding coating material and the others of said rolls being arranged for feeding material between them, and receiving a layer of coating material thereon, and means for driving the rolls differentially so that the coating and smearing rolls will have a ratio of revolution of two to one, and a ratio of revolution between the other rolls and the coating roll will be such that one of said other rolls will create tension upon the material and another of said rolls will polish the surface of the material.

3. A coating machine comprising a frame having a plurality of interacting rolls journaled therein two of which are arranged to provide a gutter, and differential driving gearing between the said rolls adapted to produce between two of them a ratio of two revolutions to one, and between two others of said rolls more than two revolutions to two, and between two others of said rolls three revolutions to a little more than two, whereby one roll may be smeared with coating material from the gutter by another, another roll will place tension upon the material being coated, and another roll will operate upon the coat of material to polish the same.

4. In a coating machine of the character described, the combination of a coating roll mounted in fixed bearings and arranged in the vertical center of the frame; a spreading roll cooperating with the coating roll mounted in adjustable and yielding bearings and the two forming a gutter; a pressure roll mounted in adjustable and yielding bearings and cooperating with the coating roll; and a glossing roll mounted in adjustable and yielding bearings and cooperating with the pressure roll at one side of the vertical center of the frame, whereby a compact, balanced and sturdy structure is produced.

GEORGE W. BUCHANAN.