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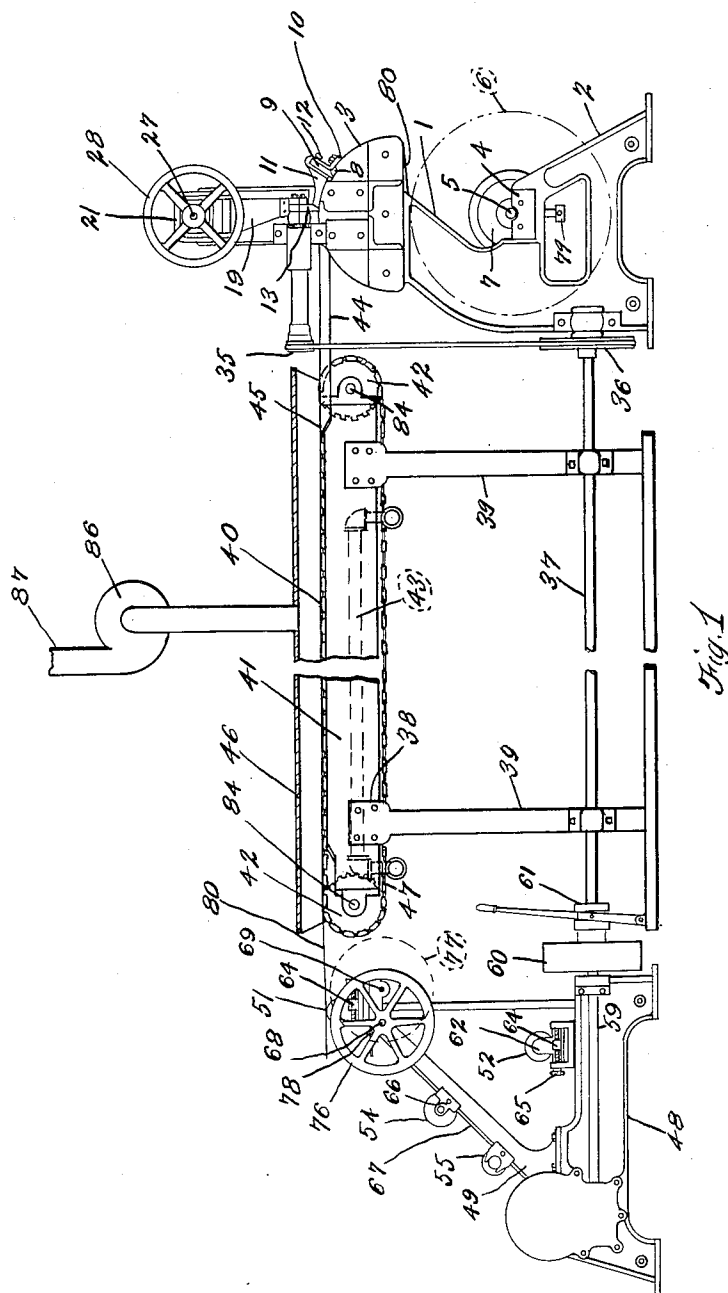
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1,937,164

MACHINE FOR COATING PAPER AND FABRIC

Filed Aug. 23, 1928

5 Sheets-Sheet 1



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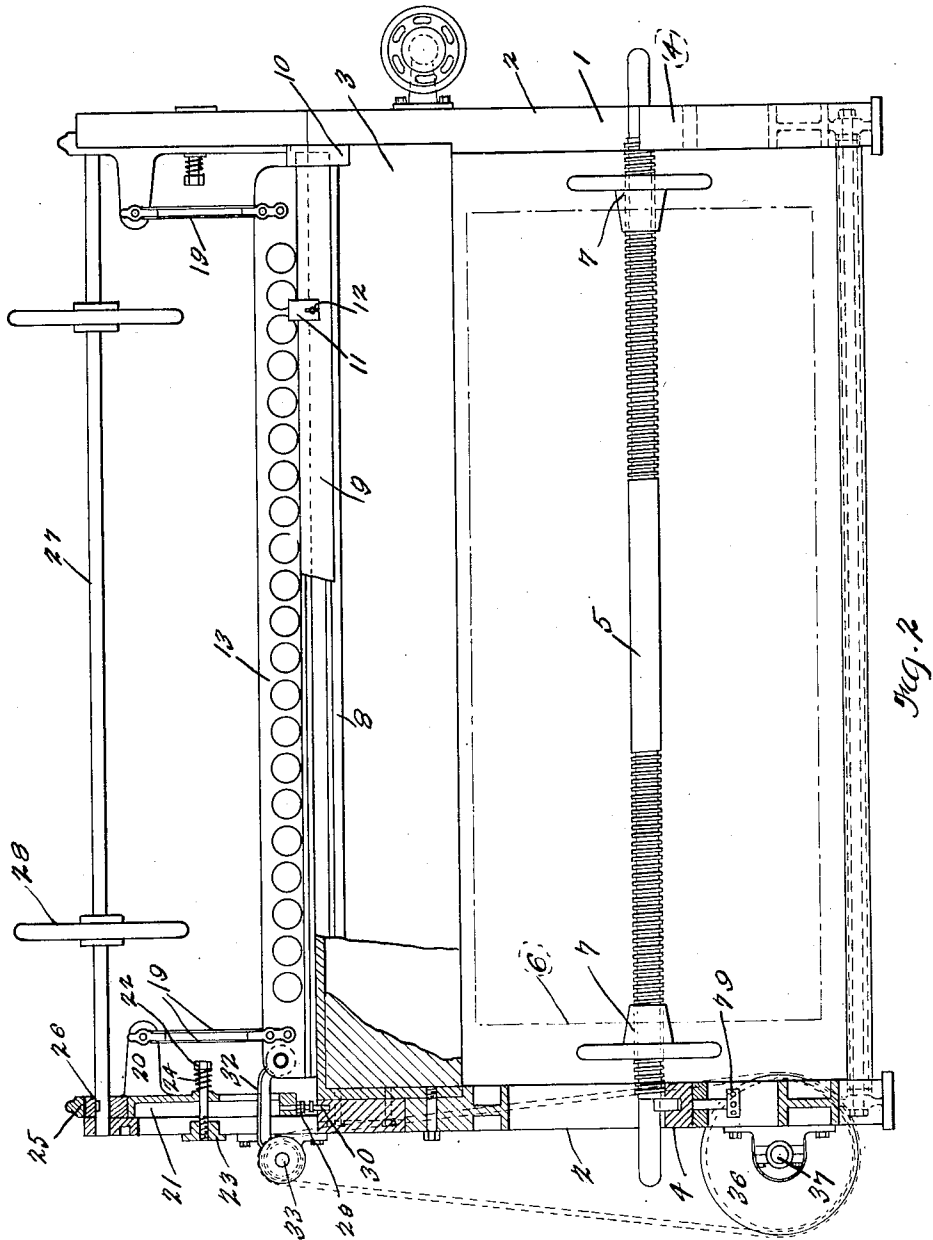
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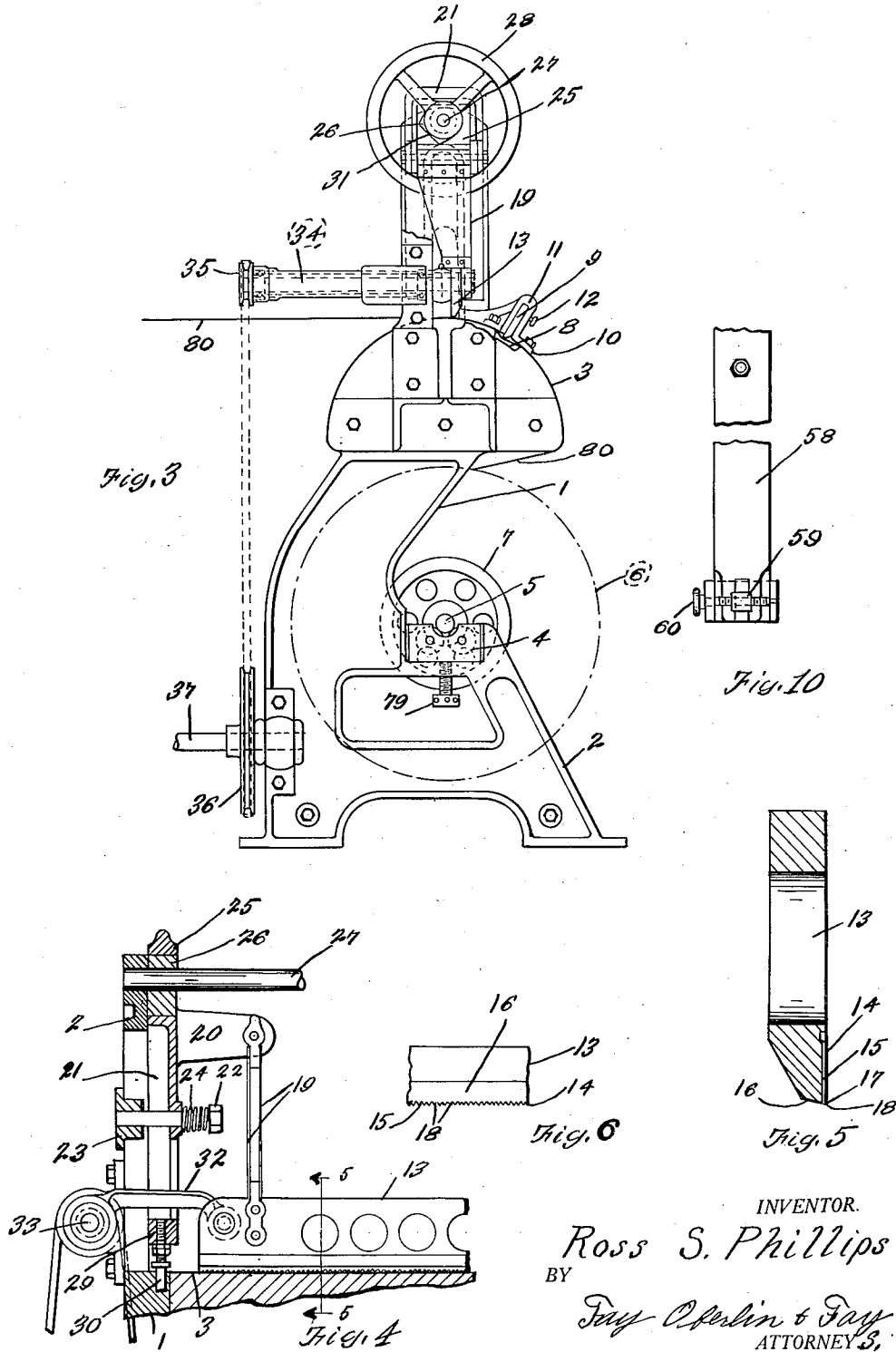
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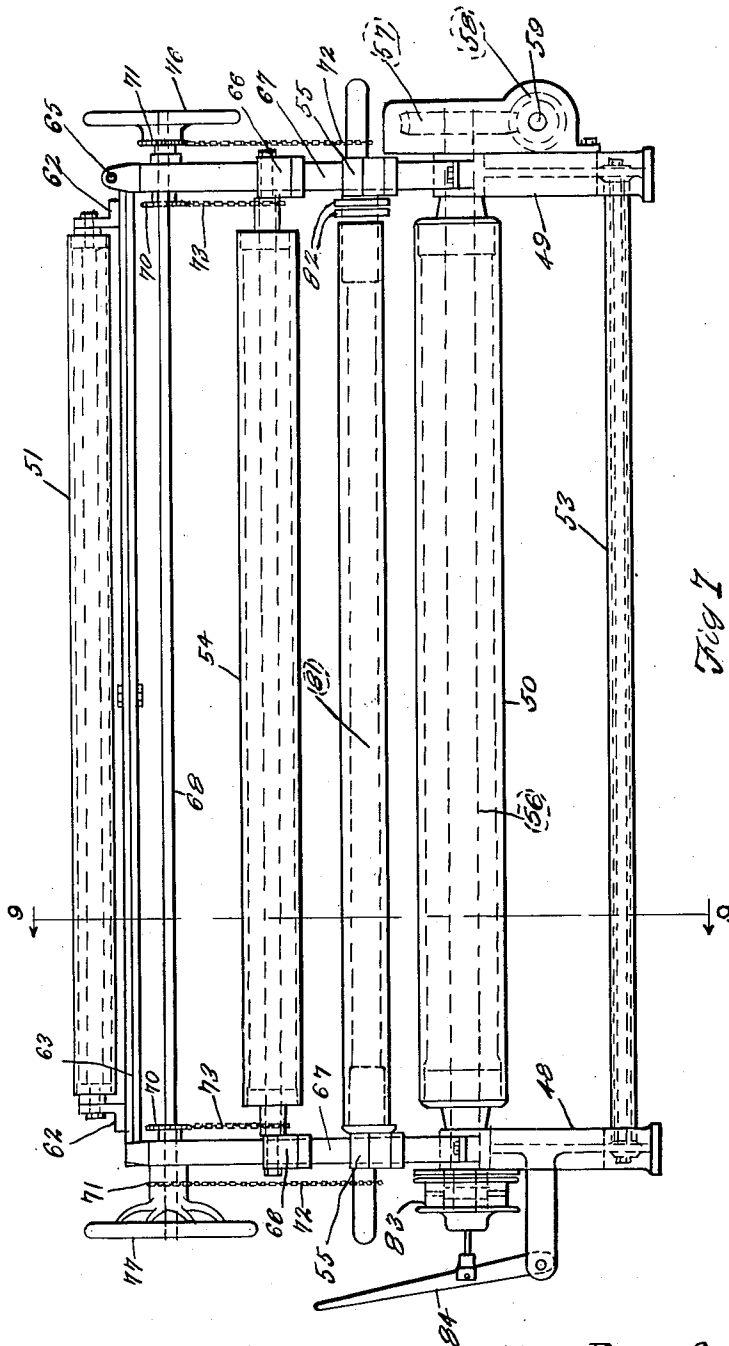


FIG. 1

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5 Sheets-Sheet 5

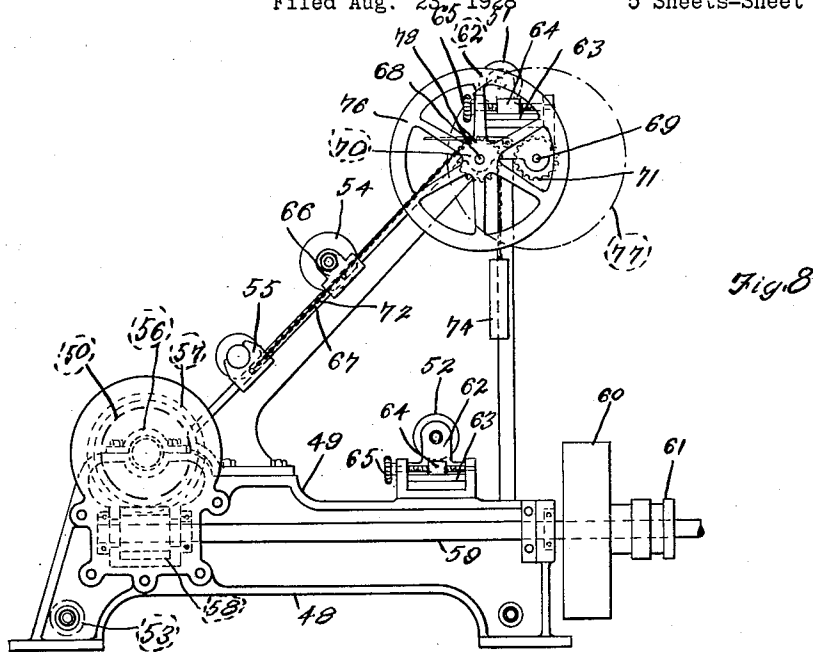


Fig. 8

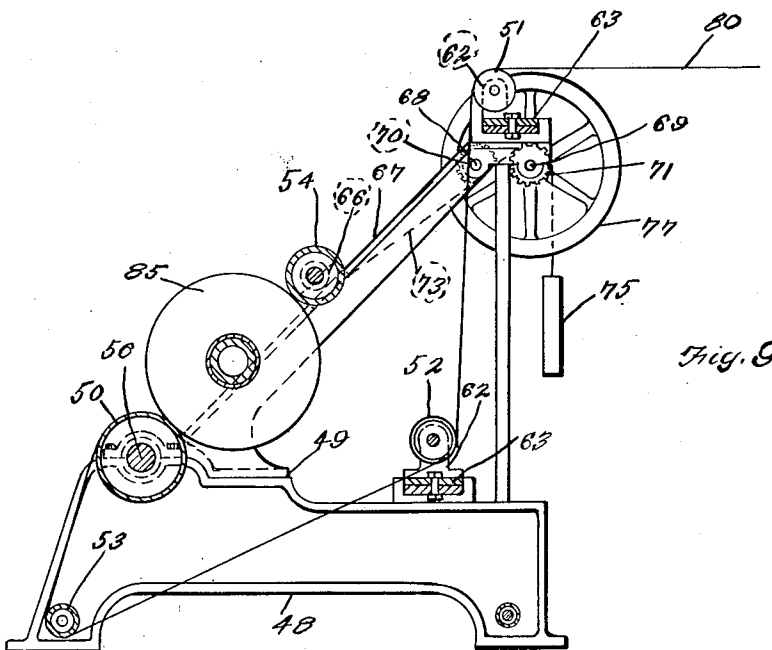


Fig. 9

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UNITED STATES PATENT OFFICE

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MACHINE FOR COATING PAPER AND FABRIC

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7 Claims. (Cl. 91—53)

The present invention, relating, as indicated to methods of and apparatus for coating paper and fabric, is more particularly directed to the provision of a process and suitable apparatus for applying coating materials which include a pigment or some such constituent as flaked or powdered aluminum of greater density than the liquid components.

It has heretofore been attempted to apply aluminum in the form of flakes or powder as a coating material for cloth and fabric but such attempts have not been successful because the aluminum could be rubbed off and the resultant product did not have the desired durability. This invention, with the object of forming permanent coatings containing aluminum or similar materials, contemplates mixing such aluminum with a binder such as a nitrocellulose compound, applying this mixture to a moving web of paper or cloth, for example, and then so treating the deposited coating that the aluminum flakes are interleaved or shingled into a layer of uniform thickness which, after the solvents have been evaporated, is covered and protected by a layer of material similar to celluloid. In the apparatus herein described such shingling or interleaving is effected by a toothed member which is reciprocated in a path transverse to the advancing web and which functions to arrange the individual aluminum flakes into a stratum below the top surface of the liquid. In a subsequent drying operation the volatile parts of the liquid are driven off and a stratum of solid binding material remains in superposed relation to the flakes, which are thereby protected from abrasion and permanently secured in place.

To the accomplishment of the foregoing and related ends, said invention, then, consists of the means hereinafter fully described and particularly pointed out in the claims; the annexed drawings and the following description setting forth in detail certain means and one mode of carrying out the invention, such disclosed means and mode illustrating, however, but one of various ways in which the principle of the invention may be used.

In said annexed drawings:—

Fig. 1 is a partly sectional and partly broken-away side elevational view of an apparatus suitable for use in carrying out the present invention; Fig. 2 is a partly sectional front elevational view of the coating machine shown in Fig. 1; Fig. 3 is a partly broken-away side elevation showing further details of the coating machine; Fig. 4 is a fragmentary section showing the distributing blade and illustrating its manner of suspension

and driving; Fig. 5 is a transverse section taken on a plane indicated by the line 5—5 of Fig. 4; Fig. 6 is a bottom plan view of a part of the distributing blade; Fig. 7 is a rear elevational view of the winding machine shown in Fig. 1; Fig. 8 is a side elevation of the winding machine; Fig. 9 is a vertical section taken on a plane indicated by the line 9—9 of Fig. 7; and Fig. 10 is a fragmentary plan view of a roll skewing mount for insuring even and regular winding of the finished stock.

As shown in the drawings, the coating machine 1 consists of side frames 2 which carry a semi-cylindrical surface member 3 and which are provided with bearing blocks 4. The bearing blocks 4 are adapted to removably support a revoluble shaft 5 which in turn carries a roll of paper or cloth 6, such roll being held in correct position by suitable cone nuts 7. The surface member 3 has a longitudinal groove 8, and projecting into this groove is a bar 9, such bar being held in the manner illustrated in Fig. 3 by suitable end mountings 10 which are attached to the surface member 2. Intermediate its ends the bar 9 is provided with a plurality of guards 11, these having concave surfaces adapted to fit the surface of the member 3 and being adjustably held in any selected position by screws or the like 12.

Mounted above and on the indicated side of the member 3 is a distributing blade 13 which has its lower and operating edge formed as shown in Fig. 5, the rear face 14 being provided with scorings or grooves 15 and such grooves terminating at their lower ends in the inclined face 16, thus providing openings 17 and teeth-like parts 18, the distance between such parts being desirably about one-sixteenth of an inch. As best shown in Fig. 4, the blade 12 is supported by flexible metal straps 19, and such straps at their upper ends are attached to the lugs 20, these lugs being formed on vertically movable blocks or slides 21 that are held against the upper extremities of the side members 2 by bolts 22 which have their threaded ends screwed into shiftable nuts 23 and their shanks encircled by the compression springs 24. Such springs frictionally hold the slides 21 in contact with the inner surfaces of the side members and yet permit of vertical reciprocation of said slides for the purpose of adjusting the blade 9. At their upper ends the slides 21 are provided with openings 25 and within such openings are the adjustable cams 26, such cams being secured to a transversely extending shaft 27 which is journaled in the side frames 2 and which carries the hand wheels 110

28. At their lower ends the slides 21 are provided with adjusting bolts 29 which seat on the stools 30 when the blade 13 is in its operating position, such blade being raised by turning the
 5 hand wheels 28 and being held in raised position by flats 31 on the cams 26 when the bolts 29 are being adjusted for determining the thickness of a deposited coating. For imparting an end-
 10 wise to-and-fro motion to the blade 13 the connecting rod 32 is provided, such rod being pivoted to the blade at one end and mounted on an eccentric or crank 33 at its opposite end. The
 15 eccentric 33 is formed on one end of a shaft 34 which at its other end carries a pulley 35, this pulley being belt-driven from a second pulley 36 which is mounted upon a shaft 37.

The dryer 38 consists of suitable standards 39 which support a flat drying surface 40, such surface being mounted upon a frame 41, which
 20 at its ends carries pairs of wheels or sprockets 42 and suitable heating coils or elements 43 beneath the surface 40. Between the coating machine and the dryer is a pivotally mounted bridge
 25 plate 44, the end 45 of which may be elevated in order to permit of the passage of pricker bars (not shown), by means of which the stock is initially carried beneath the hood 46 by the
 chains 47, such chains passing around the sprockets 42.

30 The winding apparatus 48 comprises side frames 49 which carry a driver roll 50, guide rolls 51, 52 and 53, a weight roll 54, and winding roll supporting bearings 55. The driven roll 50 is mounted upon a shaft 56 which carries a
 35 worm wheel 57, this wheel being meshed with a worm 58 secured to a shaft 59. The shaft 59 has a driving pulley 60 and is adapted to be connected with the shaft 37 by means of a clutch 61. The guide rollers 51 and 52 are desirably
 40 journaled in bearings 62 which are mounted upon centrally pivoted bars 63, and such bars have slidable nuts 64 which may be shifted by screws 65. As best shown in Fig. 9, the weight roll 54 is mounted in bearings 66 which are slidably
 45 attached to the inclined ways 67, and the winding roll supporting bearings 55 are also slidably mounted upon the ways 67. Near their tops the side frames 49 are provided with two cross shafts 68 and 69 and each of such shafts carries two
 50 sprockets 70 and 71. Over these sprockets pass the chains 72 and 73, the former connecting at one end with the bearings 55, and at their other ends with the weights 74, and the latter connecting at one end with the bearings 66 and at their
 55 other ends with the weights 75. The shaft 68 has a handwheel 76 and the shaft 69 a similar handwheel 77, such wheels enabling an operator to raise or lower the weight roll 54 and the bearings 55, suitable latches 78 being provided for
 60 holding such parts in any desired position.

In operation, a roll of paper, cloth or other material to be coated is placed upon the shaft or arbor 5, the cone nuts 7 being run into the
 65 ends of such roll for holding it securely in position, and one of the blocks 4 being vertically adjusted by means of a screw 79 for insuring that the unwound web or ribbon 80 will contact uniformly with the surface member 3. Such web is then passed beneath the lower edge of the bar
 70 9, up over the top of the surface 3, over the plate 44 and table 40, and then through the winding mechanism and onto a core tube secured on the arbor 81 by means of nuts 82, such arbor being revolvably and removably positioned within the
 75 bearings 55.

To start up the machine, the web material or paper is pulled past the spreading blade and attached to a pricker bar (not shown) mounted
 80 on the chains 47 with a loose end preferably extending in front of the pricker bar. The sprockets are then revolved as the machine is started and the paper or web carried under the hood 46 and moved along until the loose end reaches the roller 51. Where such loose end
 85 appears from under the hood it is passed over the roller 51 under rollers 52 and 53 up over the driver roll 50 and secured to the core on the arbor 81 at which time the pricker bar is disengaged from the paper. In this manner the
 90 amount of web wasted is merely that drawn through to be attached to the pricker bar and forming the loose end perhaps some 4 to 10 feet.

In finishing a roll the end of the paper is again attached to the pricker bar so as to maintain
 95 a drag on the paper as the end passes through the heater. The sprockets 42 are driven by a belt (not shown) which extends from a pulley 83 on the shaft 56 to a second pulley mounted upon one or the other of the transverse dryer
 100 shafts 84, and during "threading" such pulley 83 is clutched to the shaft 56 and the shaft 37 is disconnected, a clutch 84 being provided for connecting and releasing the pulley 83 and the clutch 61 serving the same purpose with respect
 105 to the shaft 37. If necessary to obtain proper winding of the finished stock the guide rollers 51 and 52 may be skewed by adjusting the screws 65. As best shown in Fig. 9, the finished roll of stock 85 rests against the surface of the driven
 110 roll 50 and is pressed downwardly by the pressure roll 66, the actual winding being effected by frictional engagement between the stock and the roll 50, and the necessary draft being obtained in the same manner. As the roll of winding
 115 stock continues to increase in diameter the bearings 55 and the roller 66 will move upwardly along the inclined ways 67, any necessary manual adjustments being made by turning the wheels 76 and 77.

As soon as the paper has been attached to
 120 the pricker bar and the machine started, a coating material may be introduced into the container formed between the stock 80, the guards 11, and the bar 9, such material adhering to the advancing web and passing upwardly towards the
 125 distributing blade 13. As the coating operation commences, the pulley 83 is released from its connection with the shaft 56 and the shaft 37 connected to the shaft 59, thereby setting the blade 13 in motion. The gearing is preferably such that
 130 this blade completes one stroke during every one-sixteenth of an inch of lineal stock movement, and such strokes are desirably one-eighth of an inch in length, one-sixteenth of an inch in each direction. It will be noted that the blade 13 is
 135 positioned in such manner that its operating edge is below the top of the surface 3, this being for the purpose of insuring that the paper or other stock is taut when and as the distributing blade operates. Surplus material carried upwardly
 140 by the stock will be prevented from passing the blade 13 by its closely spaced relation to such stock, a coating of the desired thickness (determined by adjustment of the bolts 29) being permitted to pass with the web and the remainder
 145 being held back by the blade. As the coated web moves over the extreme top of the surface 3 and continues over the plate 44 into the dryer tunnel, a draught of air is created by the fan 86 and moves over the surface of the deposited coating
 150

thereby evaporating the volatile components of such coating and forcing the resulting vapor through an outlet 87, such evaporation being desirably expedited by passing a heating fluid, such as steam, through the coils or pipes 43, these coils being preferably positioned near the exit end of the dryer in order to avoid too rapid evaporation and the formation of bubbles or blisters.

As previously stated, the method and apparatus provided by this invention, while generally applicable to the coating of paper, cloth and similar webs with the usual coating compounds, are particularly adapted to applying coatings, including relatively heavy pigments or flake materials, such as aluminum for example. When using aluminum powder or flakes mixed with a nitrocellulose binder, the scorings 15 may be formed with 60° included angles and be .054 inches deep while the reciprocatory motion of the distributing blade 13 may be one-sixteenth of an inch for each one-sixteenth of an inch of lineal web travel.

Under these conditions, the aluminum flakes and the binding compound will pass in a thin layer, say of the order of .004 of an inch in thickness under the operating edge of the blade 13, and the reciprocation of such blade will be effective to interleave the flakes and shingle them into a stratum or layer which will be covered by a layer of the liquid components of the mixture. When subsequently, the volatile parts of such liquid are evaporated while the sheet moves over the flat surface 40, a protective layer of a material similar to celluloid will be formed in superposed relation to the shingled stratum of metal flakes and such flakes will thereby be secured in position and so covered that the finished product can be used for all usual purposes without danger of ordinary abrasion or rubbing removing the flakes. The adjustments previously explained are provided for determining the thickness of a deposited coating and the interconnection of the winding mechanism and the distributing blade insures that for all speeds of the machine a predetermined relation will exist between the rate and amplitude of blade reciprocation and the lineal speed of stock movement, these factors being desirably of about the magnitude heretofore mentioned. During operation of the machine the flake material which is of course heavier than the liquid will be kept in uniform suspension by the moving web and the distributing blade, some of the material being carried upwardly by the web and held against the blade in such a manner that all surplus coating will be kept thoroughly mixed and separation of the pigment prevented.

Other modes of applying the principles of my invention may be employed instead of the one explained, change being made as regards the means and the steps herein disclosed, provided those stated by any of the following claims or their equivalent be employed.

I therefore particularly point out and distinctly claim as my invention:—

1. In apparatus of the class described, the combination of an upwardly inclined surface having

a groove, a bar associated with said groove, guards cooperating with said bar, said bar and said guards forming a materials receptacle, a blade in advance of said receptacle, means for reciprocating said blade, and means for vertically adjusting said blade.

2. In apparatus of the class described, the combination of means for applying a liquid coating material containing aluminum flakes to a moving sheet, means for moving the coating transversely to shingle such flakes to form a stratum of aluminum beneath the liquid components of such material, said means comprising a blade having a serrated material contacting edge and means for reciprocating such blade transversely of said sheet and means for then drying such material.

3. In apparatus of the class described, the combination of means for containing a supply of coating material and applying such material to a moving sheet, and means for then operating upon such applied material, said last means comprising a blade having one face formed with inclined surfaces and another face formed with scorings, said scorings forming teeth with one of said surfaces.

4. In apparatus for applying a coating to a moving sheet of paper or cloth, the combination of an upwardly curved surface, means for applying a coating to a sheet moving upwardly over said surface, a blade having a lower serrated edge adapted to move transversely of said sheet and inclined surfaces adapted to direct such coating towards said edge and means for reciprocating said blade rapidly across said sheet to operate upon such coating.

5. In apparatus for applying a liquid coating material to a moving web, the combination of a curved web supporting surface member, side guards and a rear bar on said surface forming a coating receiving receptacle, means for moving the web over said surface, means for distributing the coating material consisting of a blade mounted transversely of said surface member and spaced therefrom, and mechanism for reciprocating said blade across said surface member and the web.

6. In apparatus for applying a liquid coating material to a moving web, the combination of a curved web supporting surface member, side guards and a rear bar on said surface forming a coating receiving receptacle, means for moving the web over said surface, means for distributing the coating material consisting of a blade with a serrated lower edge mounted transversely of said surface member and spaced therefrom, and mechanism for reciprocating said blade across said surface member and the web.

7. In apparatus of the class described, a blade for operating upon the coated fabric, said blade comprising a front face terminating in an inclined portion and a rear face provided with grooves which terminate in the inclined portion thus providing teeth-like parts at the lower edge of the blade.

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