

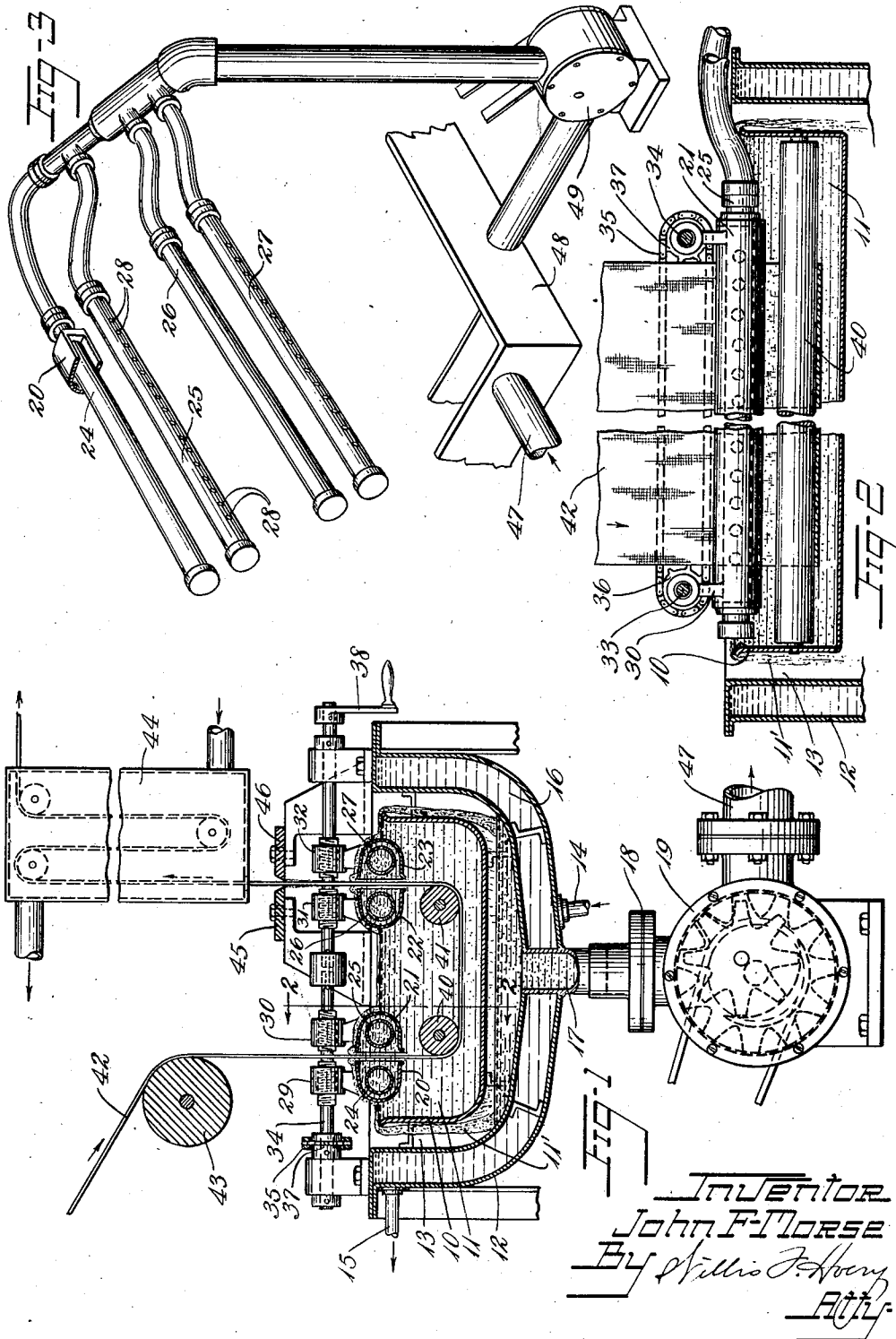
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METHOD OF AND APPARATUS FOR DEPOSITING FILMS

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METHOD OF AND APPARATUS FOR
DEPOSITING FILMS

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9 Claims. (Cl. 117—115)

This invention relates to the deposit of liquid dispersion of plastic materials to provide films or coatings of such plastic material on faces of a temporary or permanent pliable support.

In prior coating methods for a strip or web of fabric, paper, or other sheet material difficulty has been encountered, especially where the dispersed material has been sensitive to atmospheric conditions, in that thickening of the coating material has often occurred upon contact with air resulting in uneven thickness of deposit, and coagulation of some of the coating dispersion from contact with the atmosphere, or from contact with dust or other material has caused occlusion of skimmings, dust particles, and other foreign matter.

The present invention aims to overcome and avoid these and other difficulties encountered in prior procedures, and to provide an improved method and apparatus for depositing uniform films simultaneously on opposite sides of a flexible supporting member. The word film as herein used is intended to embrace not only an independent pellicle but also a coating permanently or temporarily secured to a flexible backing or permeating the same.

The principal objects of the invention are to provide uniformity of product, to avoid or eliminate waste, to provide simplicity of equipment and procedure, and to provide convenience of operation.

A further object is to provide for avoiding or reducing the depositing of objectionable foreign particles on the film as it is formed.

These and other objects will be apparent from the following description and the accompanying drawing.

Of the drawing:

Fig. 1 is a longitudinal sectional view of apparatus constructed according to and embodying the invention, parts being broken away.

Fig. 2 is a cross-sectional view thereof taken on line 2—2 of Fig. 1.

Fig. 3 is a diagrammatical view of the dispersion circulating apparatus.

In accordance with the invention, pliable material in web, sheet, wire, cord or other strip form is passed progressively through a bath of liquid dispersion of the plastic material and the material is agitated by being caused to flow away from the surfaces of the strip at the positions of entrance into and exit from the bath, and the liquid dispersion is supplied at a rate in excess of its use by deposit so that fresh material contacts with the strip at all times, thereby avoiding

objectionable lumps and other non-uniformity in the film.

Referring to the drawing, the numeral 10 designates a tank adapted to be filled with a bath 11 of dispersed material. A double walled steam or water jacket 12 surrounds the tank to keep the contents of the tank at proper temperature, a condition desirable with temperature sensitive dispersions. A space 13 separates the jacket from the tank and provides for receiving any overflow 11' of the dispersed material. Pipe openings 14, 15 permit circulation of heating fluid 16 to the jacket. A sump 17 is provided to collect the overflowed dispersion for reuse, and a filter 18 and rotary pump 19 are provided for removing foreign matter and returning the cleaned dispersion for reuse.

Suspended partly within the tank 10 near each end thereof are pairs of troughs or cupped members 20, 21 and 22, 23. The troughs of each pair are mounted with their open sides facing each other and slightly spaced apart, and each trough surrounds a pipe 24, 25, 26, 27 having a row of delivery apertures 28 in the side thereof facing the bottom of the trough. The troughs support the delivery pipes which they enclose, and are supported in turn by brackets 29, 30, 31, 32 which are threaded to engage horizontal screw shafts 33, 34. The screw threads of shafts 33, 34 are alternately right and left hand to engage the brackets of oppositely facing troughs. The arrangement is such that by turning the shafts 33, 34, the oppositely facing troughs may be moved closer together or farther apart. A chain 35 connects sprockets 36, 37 on shafts 33, 34 to turn them in unison and simultaneously adjust opposite ends of the troughs. A crank 38 is provided on one of the shafts for rotating them.

For guiding the supporting strip or web, rolls 40, 41 are rotatably suspended in suitable bearings in the tank 10 below the level of the liquid dispersion.

The web 42 of material is led over a roll 43 and downwardly between the troughs 20, 21 and around rolls 40, 41 then upwardly between troughs 22, 23. It may be drawn through a drying oven 44 by any suitable winding mechanism, (not shown).

To provide for gaging the deposit, doctor bars 45, 46 may be adjustably mounted opposite to each other so that the freshly coated material passes therebetween. The excess material is scraped off by the doctor bars and is returned to the tank 10.

From the pump 19, the returned dispersion may be delivered through a pipe 47 to a supply storage tank 48. For supplying the tank 10 a pump 49 of the rotary impeller type draws the dispersion from the storage tank 48 and delivers it through pipes 24, 25, 26, 27, at a rate exceeding that of its use by deposit.

In operation the strip is drawn over the roller 43 and is fed between troughs 20, 21, about rolls 40, 41 and between troughs 22, 23, then between doctor blades 45, 46. The troughs 20, 21 and 22, 23 are then adjusted close to each other. Doctor bars 45, 46 are adjusted for the proper gage. The leading end of the web is then pulled through the drier to the windup device. The pumps 19 and 49 are then started. The dispersion escapes from the pipes 24, 25 faster than it can flow from between the troughs and provides upwardly-flowing jets of dispersion at the positions of entering and exit of the web support from the bath and tank 10 becomes full. The flow of dispersion between the troughs wells up along the web of material and flows over the backs of the troughs into the tank 10. Any scum formed by contact of the dispersion with the air is forced away from the fabric by the flow of excess dispersion and floats on tank 10 where it overflows to the sump within the steam jacket. The deposited film is always formed from a fresh supply of dispersion and is free from dirt and scum particles due to the constant flow of the material away from the position of deposit. The dirt and scum particles are washed into the tank 10 and float thereon out of contact with the fabric. The deposited material, being free from dirt and scum particles, is of uniform thickness and quality.

Where it is desired to produce simultaneously films of deposited material, a smooth non-adhesive web or sheet may be used as a temporary support or form, and the liquid dispersed material may be progressively deposited on the web and stripped therefrom after it has dried. The invention is probably most useful, however, in coating fabric or other flexible strip material permanently.

Variations may be made without departing from the scope of the invention as it is defined by the accompanying claims.

I claim:

1. Apparatus for depositing a film of nonmetallic material from a liquid dispersion thereof upon both sides of a flexible support of sheet material, said apparatus comprising a container for said dispersion, means for leading said support into and out of said container while exposing both sides thereof to the dispersion, separating means substantially confining said support from contact with the dispersion in said container at the positions of entry and departure of said support therefrom, a separate supply of fresh dispersion, and means for causing a flow of fresh dispersion from said separate supply thereof to the space between said separating means and said support and outwardly of said separating means along and from said support at its positions of entering and leaving said dispersion with return of dispersion to said container.

2. Apparatus for depositing a film of nonmetallic material from a liquid dispersion thereof upon both sides of a flexible support of sheet material, said apparatus comprising a container for said dispersion, separating means in said container for substantially confining entering and departing portions of said support from the dispersion in said container, means for leading said support progressively in one direction into said

container through said separating means, means including the separating means for providing a flow of fresh dispersion along the support in the opposite direction at the position of entrance, means for leading said support progressively out of said container through said separating means at another position, and means including the separating means for providing a flow of fresh dispersion along the support in the direction of travel of the support at the position of departure.

3. Apparatus for depositing a film of nonmetallic material from a liquid dispersion thereof upon a flexible support of sheet material, said apparatus comprising a container for liquid dispersion, means for providing a plurality of upwardly flowing jets above the surface of the dispersion in said container with overflow of excess dispersion to said container at each jet, and means for directing the flexible support progressively into and out of the dispersion in said container through said upwardly flowing jets, said jets being directed lengthwise of said support.

4. Apparatus for depositing a film of nonmetallic material from a liquid dispersion thereof upon a flexible support, said apparatus comprising a container for a bath of dispersed material, means for vertically conducting a two-faced flexible support of sheet material into and out of said bath to provide a deposit thereon, and means for providing a copious supply of fresh dispersion directed toward each face of said support at the positions where the support enters and where it leaves the bath to prevent deposit of dirt or scum particles with overflow of excess dispersion both from above and below said means into said bath.

5. Apparatus for depositing a film of material from a liquid dispersion thereof upon a flexible support, said apparatus comprising means for guiding a support progressively along a determinate path, a pair of hollow members each having an open side with said open sides facing each other in spaced apart relation in the path of said support, means for supplying said hollow members with a liquid dispersion in excess of the amount required for coating said support, and means for adjusting said hollow members toward and from each other.

6. Apparatus for depositing a film of material from a liquid dispersion thereof upon a flexible support, said apparatus comprising means for guiding a support progressively along a determinate path, a pair of hollow members each having an open side with said open sides facing each other in spaced apart relation in the path of said support, means for supplying said hollow members with a liquid dispersion in excess of the amount required for coating said support, means for adjusting said hollow members toward and from each other, and doctor blade means for removing excess material from said support.

7. Apparatus for depositing a film of nonmetallic material from a liquid dispersion thereof upon both surfaces of a flexible support of sheet material, said apparatus comprising a container for a bath of liquid dispersed material, return means surrounding the sides of said container to receive material overflowing therefrom, means for leading a flexible support of sheet material into and out of said bath, flow means partially submerged in said bath for delivering a fresh supply of dispersion in an upwardly flowing stream at each side of said support at the positions of entrance to and exit from said bath of said support and by overflow for supplying said bath, and means for filtering material overflowing from

said bath to said surrounding means and returning it to said flow means under pressure.

8. The method of depositing a film of nonmetallic material from a liquid dispersion thereof upon both surfaces of a flexible support of sheet material, which comprises providing a bath of liquid dispersed material, continuously supplying fresh liquid dispersion to said bath at a plurality of positions by copious upwardly directed flow of jets of liquid along the support at the exposed surface of said bath at the level of the surface of the bath, to provide excess liquid material to the bath, permitting the bath to overflow continuously, recovering, filtering and returning overflow of said bath to said jets, and progressively submerging the flexible support in said bath by entrance thereto through one upwardly directed jet and removal therefrom through a second upwardly projected jet.

9. Apparatus for depositing a film of nonmetallic material upon a flexible support, said apparatus comprising a container for bath of coating liquid, means for guiding a support progressively into and out of the bath in said container, and means at the positions of entry and exit of said support from said bath at the surface thereof for supplying a flow of liquid to the surface of said support at a rate in excess of its use by deposit on said support with an upwardly directed flow of excess liquid along the support, said means each comprising a pair of open-sided hollow members partially immersed in said bath and having their open sides facing each other in spaced-apart relation and opposed to said support, and means for supplying liquid to said members.

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