June 25, 1957 A. R. TRIST 2,796,846

MEANS FOR APPLYING FLUENT COATINGS TO WEB MATERIAL AT OPEN WIDTH

Filed Aug. 31, 1953 2 Sheets-Sheet 1

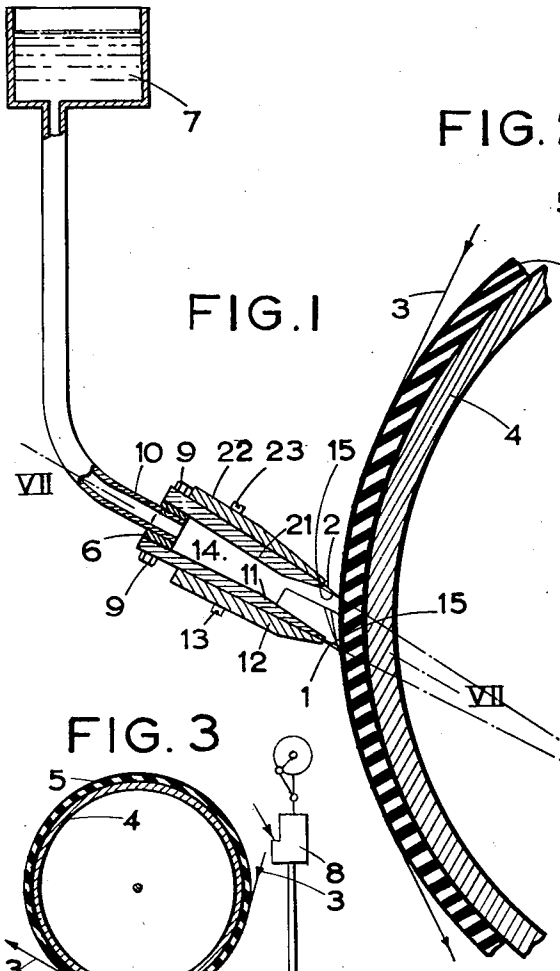


FIG. 1

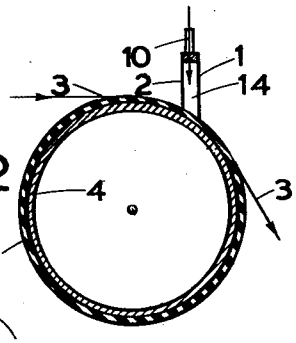


FIG. 2

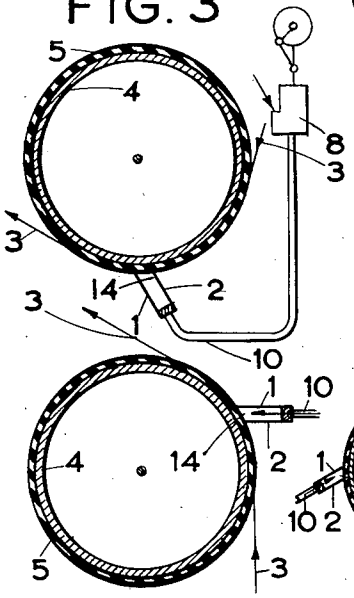


FIG. 3

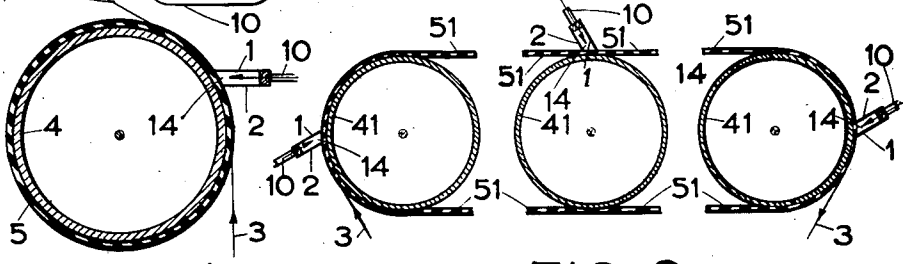


FIG. 4

FIG. 8

Inventor
ARTHUR RONALD TRIST

By Richardson, Davis and Norden
his Attorneys.

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MEANS FOR APPLYING FLUENT COATINGS TO WEB MATERIAL AT OPEN WIDTH

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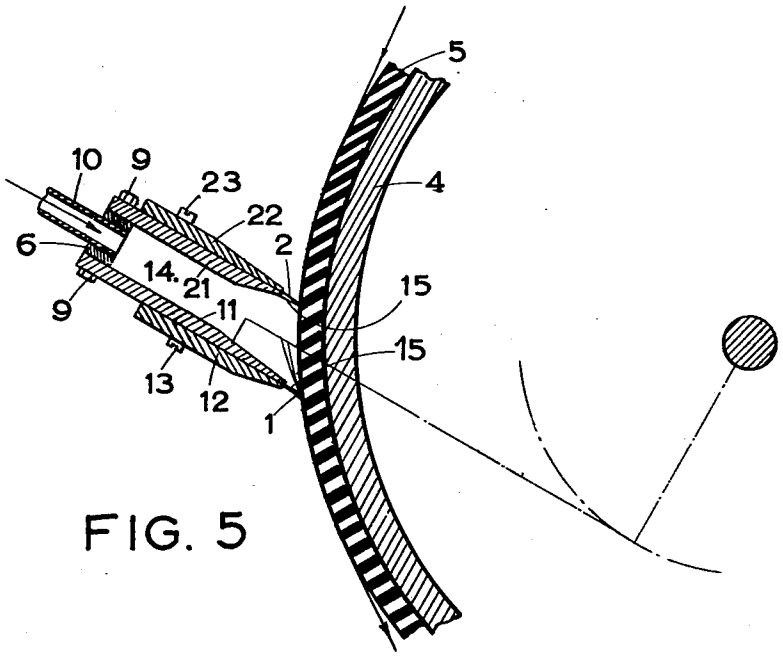


FIG. 5

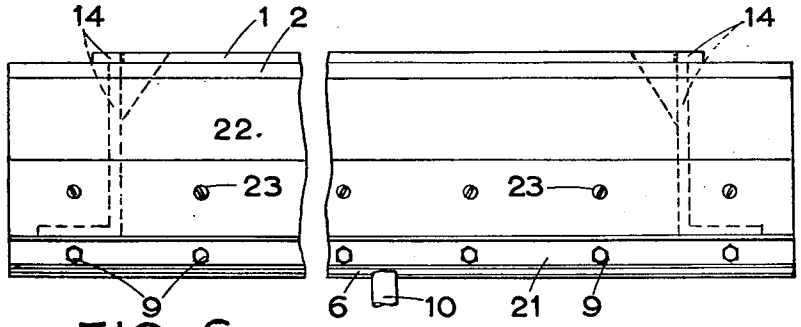


FIG. 6

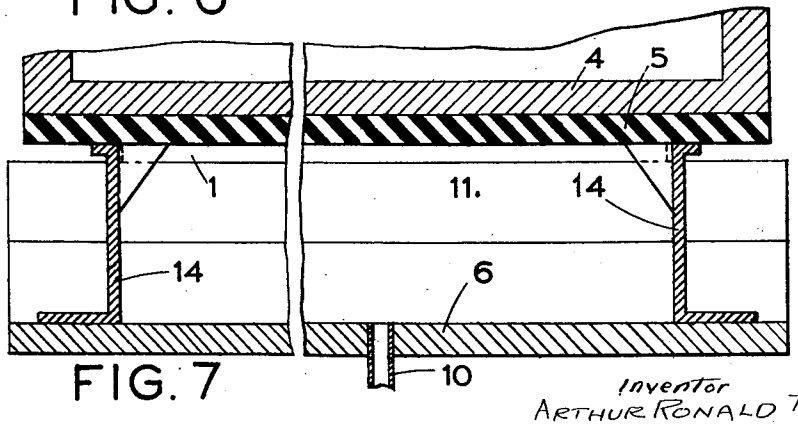


FIG. 7

Inventor
ARTHUR RONALD TRIST

By Richardson, David and Morton
His Attorneys.

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MEANS FOR APPLYING FLUENT COATINGS TO WEB MATERIAL AT OPEN WIDTH

Arthur Ronald Trist, Hamilton, Ontario, Canada

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7 Claims. (Cl. 118—410)

This invention relates to improvements in means for applying a fluent coating of any kind, that is to say, a vapour (heated or not), a hot or cold liquid or a composition that has a paste-like consistency when applied at a suitable temperature, to web material at open width and has for its principal object to provide means by which a coating of great tenuity, if necessary, can be applied to a web of cellulose, e. g. paper; fabric, e. g. woven material; or artificial substance, e. g. sheet plastic, in a simple, efficient and regular manner.

Another object of the invention is to provide coating means that can be arranged to operate efficiently when such means trails on the surface to be coated at any angle relatively to the vertical or horizontal without limitation of position or direction of web travel, thereby enabling coating machines of large operational capacity, i. e. of a plurality of coating operations, to be compactly arranged.

The regular coating of webs, supported on a bed, by a relatively stationary blade supplied from an open fountain introduces difficulties that are considerably augmented when the finished product needs successive layers or applications and when such successive layers or applications, e. g. treatment by vapour, sizing, undercoating, and overcoating, are necessary, the machine becomes excessively extensive.

One difficulty in practice with open fountains is that the coating material has to be sufficiently liquid to flow freely in the fountain under a gravity head and that due to the passage of the web past this liquid coating material in the open fountain, the contents of the fountain roll and the film of air on the web becomes incorporated in the liquid or liquid coating so that the liquid or liquid coating in the fountain is turbulated thereby and aerated with the result that the applied coating is irregular, thus producing blemishes in the coating.

Another difficulty in practice is that the relatively stationary coating blade must be applied to the web at a position that is limited in location, e. g. the blade cannot be located to trail on the upper or lower parts of a roller, or on the top or bottom of a flat bed, because the liquid or liquid coating must be retained in the open fountain and must flow to the contact edge of the blade by the force of gravity and practice shows that the arc within which the blade must be located or the permissible variation in the angle of a flat bed is small.

In view of the above, in machines for applying a succession of coatings, each roller must have only one relatively stationary blade and its associated open fountain, if two blades were applied in the available arc the time between the application of coatings would be so small as to introduce the risk of the second coating destroying the first, or of the first being ineffective to prepare for the second.

Another aspect of the same difficulty in practice is that when a web has been coated, the surface of the coating must not be touched by any roller or surface for a considerable period of time, otherwise the coating

receives blemishes, thus necessitating a continually progressing flow path for the coated web which calls for a very large expanse of valuable floor area.

All these difficulties are overcome by the present invention as the coating means forming the subject of the present invention can be arranged at any angle relatively to the vertical or horizontal, with the result that the web can be supported by a moving bed or by rollers to travel along a flow path with coating means on the top of the bed or of the roller, along a bed or over rollers with coating means on the sides of such bed or rollers and along a return flow path with coating means at the bottom of the bed or of each roller, thus enabling a compact machine with well spaced rollers to be arranged for a plurality of successive coatings and in which no roller contacts with a coated surface.

This invention consists in coating means having in combination a moving resilient bed, a relatively stationary trough having elastic sealing means and a springy lip closely spaced therefrom to form a narrow flexible mouth located to trail on the surface of the web material supported and advanced by the bed and means for forcing fluent coating into the trough for delivery through the flexible mouth on to the surface of the web.

In the drawings accompanying this complete specification:

Figure 1 is a fragmentary diagrammatic detail view showing substantially horizontally arranged coating means applied to a downwardly travelling web;

Figure 2 is a schematic view showing coating means similar to that shown in Figure 1, arranged to apply a coating to a web on the upper part of a cylindrical bed;

Figure 3 is a schematic view showing coating means similar to that shown in Figure 1, arranged to apply a coating to a web on the underside of a cylindrical bed;

Figure 4 is a schematic view showing the substantially horizontally arranged coating means of Figure 1, applied to an upwardly travelling web;

Figure 5 is a detail view of a modification with parallel blades;

Figure 6 is a plan view of the coating means shown in Figure 1;

Figure 7 is a longitudinal section of Figure 1 taken on the line VII—VII of that figure; and

Figure 8 is a diagrammatic view showing the invention applied to a flat moving resilient bed.

In the examples shown in the drawings, **1** is the first springy lip, hereinafter called the coating lip, **2** is the second springy lip, hereinafter called the sealing lip, **3** is the web and **4** is part of a rotatable cylinder with the clothing **5** of resilient material.

Needless to say, the rotatable cylinder **4** with the clothing **5** of resilient material may be replaced by an endless belt or band **51** of resilient material locally supported under each assembly of coating lip **1** and sealing lip **2** by a roller **41**, as shown in Figure 8, and in the following description any reference to the clothing **5** is to be read to include the band **51**.

The springy lips **1** and **2** are made of thin sheet material and are pressed against the surface of the clothing **5** so that, on the one hand, the lips **1** and **2** are slightly flexed and, on the other hand, the surface of the clothing **5** is slightly depressed, thus securing the yielding co-operation of the coating lip **1** with the web **3** supported by the resilient clothing **5** that is essential to the production of a perfectly even coating of microscopic thinness and also the yielding co-operation of the sealing lip **2** with the web **3** that in practice acts to smooth the surface of the web **3**, or the surface of any preliminary coating thereon, immediately preparatory to the application of the coating.

The lips **1** and **2** are made of any thin flexible springy

material, e. g. of steel or other metal, alloy or material of a kind that will not impart any blemish to the web or coating applied thereto and the clothing 5 is made of any resilient material, e. g. of natural or artificial india-rubber or other substance unaffected deleteriously by the conditions of use, the degrees of springiness and resilience being selected so that the slight flexure produces the slight depression necessary to the required mutual co-operation.

Certain kinds of plastic compositions have to be handled and applied to the web 3 in a melted condition and to facilitate this cylinder 4 or rotatable rollers 41 can be heated in any known manner by a heated gas or vapour, heated fluid, electrical heaters or such like, whilst in some cases the trough, mouthpiece and/or one or both of the lips also may be heated.

The coating lip 1 is mounted on the relatively stationary rigid stock 11 and is clamped thereto by the plate 12 secured in position by screws 13, bolts or other clamping means of a known kind, whilst the sealing lip 2 is mounted on the relatively stationary rigid stock 21, being clamped in position by a plate 22 secured by means such as the screws 23 or the like, it being understood that the unsupported margins of both the coating lip 1 and the sealing lip 2 in contact with the web 3 are quite free to be slightly flexed, are quite parallel and that the extreme contact edges of the lips 1 and 2 are straight.

The rear edges of the rigid stocks 11 and 21 are attached to the rear wall 6 by means of the bolts 9, screws or the like to form a trough, and the rear wall 6 is provided with the feed pipe 10, but it will be obvious that the stocks 11 and 21 and the rear wall 6 may be constructed as a single part.

The stocks 11 and 21, the flexible margins of the lips 1 and 2, the supported web 3 and the rear wall 6 form the longitudinal walls of a compartment that is used to distribute the supply from the feed pipe 10, and when the ends of such compartment are closed, e. g. by dykes 14, to apply coating material to the area of the web 3 exposed between the lips 1 and 2.

To prevent leakage of the coating composition past the ends of the lips 1 and 2, the surface of each of the dykes 14 adjacent to such lips is provided with packing material 15 impervious to the coating composition and sufficiently soft to yield readily to the small displacement of the lips 1 and 2 when slightly flexed, thus maintaining the perfection and regularity of the coating applied.

The stances of the lips 1 and 2 unflexed may be nearly radial or nearly tangential to the surface of the clothing 5 or band 51, usually at least one of the lips is arranged to be tangential to a circle of a diameter less than the diameter of the surface of the clothing 5, as shown in Figure 1, the other of the lips being similarly tangential, as shown in that figure, or parallel to the tangential lip, as shown in Figures 2, 3, 4 and 5, the only limiting condition being that both the lips 1 and 2 smoothly and consistently trail on the web 3 when it is in motion.

The compartment formed by the lips 1 and 2, the stocks 11 and 21, the rear wall 6, the dykes 14 and the web 3 may be supplied through the feed pipe 10 under the hydrostatic head of a gravity tank 7, as shown in Figure 1, when the web 3 is to be wetted with water, coated with a thin size or a very liquid coating composition that flows freely, in which case the volume of the compartment may be small to discourage the objectionable rolling and deleterious aeration of the liquid in the compartment.

When a paste-like composition is to be applied to the web 3, then the volume of the compartment may be larger and the composition can be forced into the compartment by any pump contrivance 8 exerting the requisite pressure, as schematically shown in Figure 3. Further, when a liquid is to be condensed from a vapour on to the web 3, then the compartment may be very small and be fed with the vapour in any convenient way.

From the above it will be obvious that the new coating means described above is in the form of a positively fed coating trough with springy lips that will apply a coating of any kind to any surface at any angle regardless of the direction of movement of such surface provided that the lips trail on the surface and have line contact therewith.

Moreover, the new coating means can apply a coating composition of any kind that is fluent, when heated or not, thus enabling compositions of paste-like consistency to be used, thereby saving some of the time usually absorbed in evaporating useless moisture as well as reducing the time period between successive coatings, so that a machine of a given output can be very compactly arranged.

What is claimed is:

1. For use in applying a fluid liquid coating to a moving web, an applicator and distributor for said coating comprising means including a resilient convex cylindrical backing surface over which said web passes with said web and said surface moving together at substantially the same speed, said web being of sufficient flexibility to be depressed into said backing surface, and means defining an elongated pressure-tight fluid dispensing chamber having an open mouth directed toward said backing surface and extending transversely across said web in direct communication therewith, said means defining said chamber comprising two parallel lip members disposed at the edges of said mouth and extending parallel to the axis of said cylindrical surface, said lip members being spaced apart in the direction of web travel, the leading one of said lip members which is first engaged by said web during the course of its movement being a sealing lip member which is maintained in pressing engagement with said web for yieldingly urging said web into said resilient backing surface and confining said liquid within said chamber, the other one of said lip members comprising a flexible applicator blade for distributing said liquid uniformly across said surface as said web leaves said mouth.

2. An applicator according to claim 1, and further comprising a duct communicating with the interior of said dispensing chamber and supply means connected with said duct for feeding said liquid coating to said dispensing chamber and maintaining said liquid coating under pressure within said chamber.

3. An applicator according to claim 2, wherein said supply means comprises a reservoir for holding a supply of said liquid coating, said reservoir being connected with said duct, and pump means serially included in said duct.

4. An applicator according to claim 1 in which said blade of said other lip member is formed of thin flexible springy material with a rectilinear free edge which exerts a pressure on said web, said other lip member being stressed so that said pressure exerted by its free edge is uniformly distributed across the width of said web.

5. A distributing device for applying a fluid coating to a moving web, said device comprising supporting means providing a resilient convex cylindrical supporting surface for the passage of said web thereover, a pair of parallel lip members formed of normally flat thin flexible springy material, said lip members being spaced apart in the direction of web movement and having rectilinear free edges extending parallel to the axis of said cylindrical surface transversely across said web and positioned to press said web yieldingly against said resilient supporting surface, means connected with said lip members and defining a closed pressure-tight chamber for receiving said coating, said chamber having a mouth defined in part by said lip members and closed by said web, said lip members being inclined at acute angles with respect to the approaching portion of said web, whereby fluid pressure applied to said coating within said cham-

ber increases the pressure exerted on said web by the leading one of said lip members for confining said coating in said chamber and decreases the pressure exerted on said web by the trailing one of said lip members for distributing said coating evenly across said web as it passes by said mouth.

6. A distributing device according to claim 5, in which said chamber defining means comprises two pairs of clamping bar members, extending transversely of said web and spaced therefrom, each of said lip members being clamped between a pair of said bar members.

7. A distributing device according to claim 5, further comprising supply means communicating with said chamber for continuously supplying said coating thereto, and

means included in said supply means for maintaining said coating in said chamber continuously under fluid pressure.

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