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AIR DOCTOR FOR WEB COATING MACHINES

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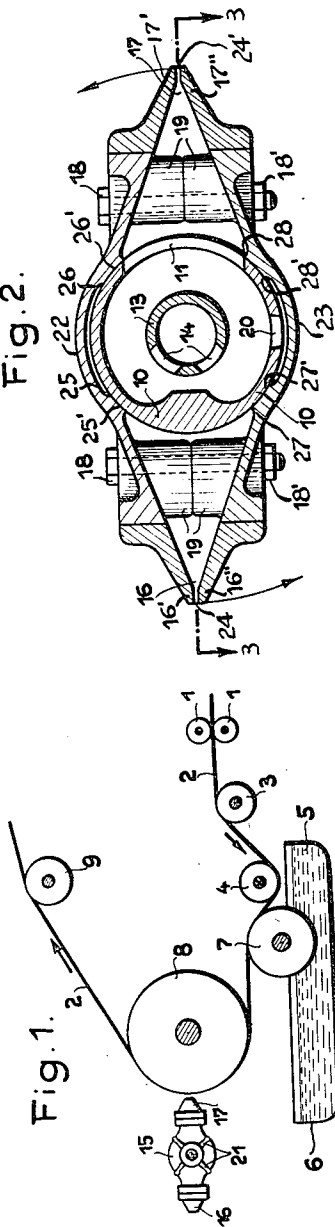


Fig. 2.

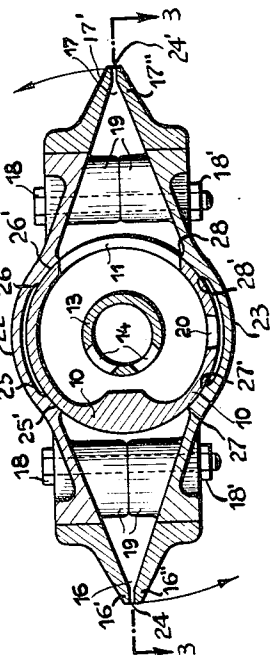
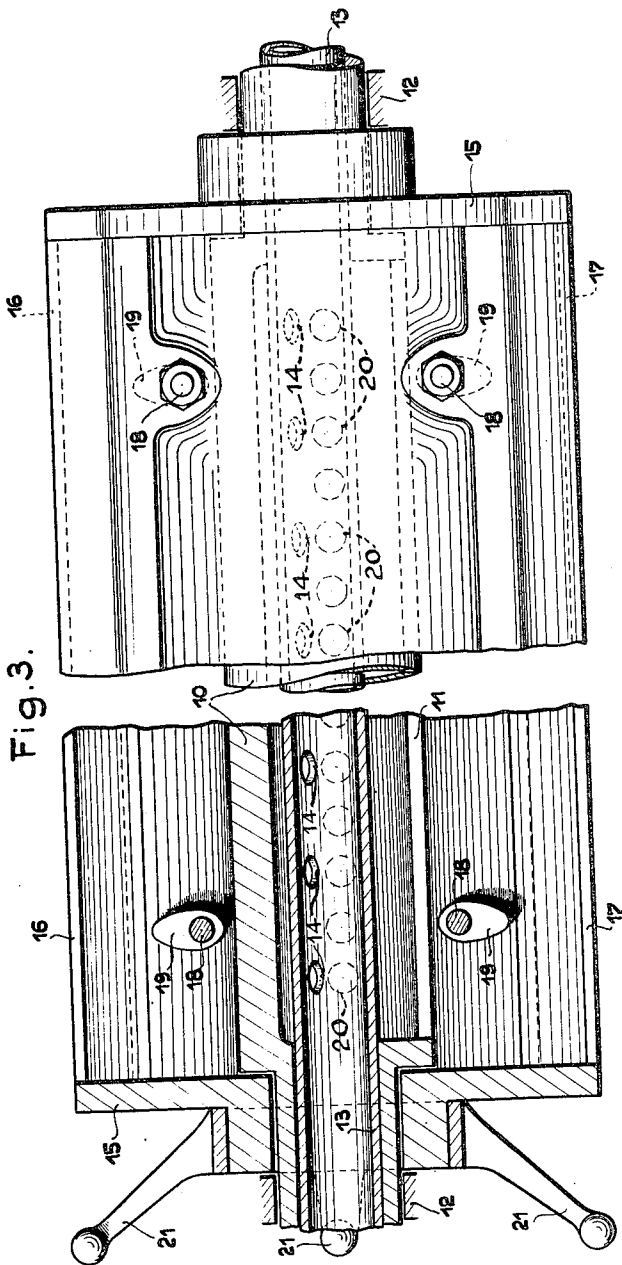


Fig. 3.



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AIR DOCTOR FOR WEB COATING MACHINES

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4 Claims. (Cl. 118—63)

The present invention relates broadly to the art of coating. More particularly the invention relates to the art of coating running lengths or webs of material.

Thus this invention relates to improvements in a machine or mechanism for applying liquid coatings to running lengths or webs of material.

Specifically this invention relates to improvement in such mechanisms in which the coating material after it has been applied to the running length or web is treated to remove excess material and to smooth the material remaining on the web and in which treatment the thickness of the coating is adjusted and controlled.

Specifically this invention relates to that phase of the art of coating in which an air jet or jets is directed against the surface of the web after it has been coated to remove the excess material and smooth the remaining coating material so as to obtain a uniform and uninterrupted layer of film or coating.

To accomplish this excess removal and smoothing, the art generally utilizes air nozzles having outlet apertures in the form of slots or one slot that extends over the entire width of the web to be treated. Generally the nozzles can be moved more or less toward the surface of the web in order to obtain the proper blowing effect or in some cases, the nozzles can be adjusted at a particular angle relative to the surface of the web. To efficiently treat a coated web in this fashion, that is by the utilization of a jet of air, it is necessary that the nozzle outlet aperture very closely approach the running web of material. However, this factor results in at least a partial choking of the outlet aperture by dirt or other matter especially since particles of the coating material are disassociated from the surface of the web by the centrifugal or spring effect of the jet.

As the degree of choking of the nozzle is increased during continued operation, this choking effect has an unfavorable influence on the jet of air issuing therefrom, consequently it is necessary to clean the nozzles from time to time. In the prior art and the machines in general use, cleaning of the smoothing and excess removal nozzles could not be effected unless the supply reel for the running length being treated had been emptied and the operation suspended until a new supply reel was mounted. Thus it was necessary to await the end of a working cycle. In doing this it was necessary to eliminate from consideration the fact that cleaning might have become necessary while the previously positioned supply of material was being coated. It does happen that cleaning should be done during a working cycle, that is between the start of the coating of a web from a supply reel until that supply reel is exhausted. Thus with the prior known arrangements during the time a particular supply or length of material was being coated or treated, the clogging of the nozzle resulted in an improper coating of some of the material passing through the machine, thereby increasing the waste factor.

Thus the present invention has for an object to provide

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in a coating machine, means for adjusting and controlling the thickness of the coating including air nozzle means for removing excess coating and smoothing the coating remaining on the running length of such construction and arrangement that the waste factor is eliminated and during a working cycle the choking of the nozzle is avoided.

Therefore this invention has for an object to provide two or more nozzles mounted on supporting means and constructed and arranged in such fashion that when a nozzle to be cleaned is moved from working position, that is the position where it is directed against the surface of the web, another nozzle will be automatically moved to the working position.

Consistent with the immediately foregoing object, the present invention has for an additional object to provide control means for the air that issues through the nozzle, such that when the one nozzle is moved from the working position the supply of air thereto will be automatically shut off while when the other nozzle is moving to working position and reaches the same, it will be automatically connected to the supply of compressed air.

In accomplishing the foregoing objects and advantages, the present invention provides a nozzle substantially defined by a stationary air duct extending over the entire width of the web to be treated and provided with an outlet aperture that is directed toward the surface of the running length of the web. Rockably mounted on this air duct in a coaxial disposition is a nozzle support having arranged along its longitudinal sides at least two nozzles displaced 180° relative to one another, whereby if one nozzle is in working position and directed toward the surface of the web the other nozzle is directed away therefrom and the first-mentioned nozzle is in communication with the outlet aperture in the duct, whereas the second nozzle is shut off from communication therewith.

The invention further embodies an arrangement in which the air duct is provided with one or more apertures, preferably directed downwardly, which will be closed by the nozzle support when one nozzle is in working position. These last-mentioned apertures are preferably provided throughout the longitudinal extent of the air duct. These additional apertures have a very important function in connection with the proper cleaning of the nozzles. With one nozzle in working position and the other in rest or cleaning position, neither is in communication with these last-mentioned apertures. Upon the cleaning of the nozzle that is in cleaning position it can occur that particles of the coating material may have penetrated within the nozzle to such an extent as to be difficult to remove, whereby if that nozzle were moved back to working position these particles would be blown out against the surface of the web with deleterious effect. By disposing the last-mentioned additional apertures in the air duct in the path of movement of the nozzles intermediate the rest and working positions, it will follow that when the nozzle that is to be moved from cleaning to working position passes these apertures before reaching working position the compressed air issuing therefrom will blow through the nozzle and blow out any particles which have penetrated into the interior of the nozzle.

It is therefore clear that with the present invention it is possible to move a cleaned nozzle into working position at any moment without interrupting the working cycle while the cleaning of the choked nozzle can be performed with the requisite care and efficiency.

Further and more specific objects and advantages will be apparent from the following description taken in connection with the accompanying drawings in which:

Figure 1 is a diagrammatical illustration of a coating arrangement including rockably mounted nozzle means

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for effecting excess removal and smoothing of the coating, Figure 2 is a cross sectional view and on an enlarged scale of the nozzle means,

Figure 3 is a fragmentary view on an enlarged scale partly in plan and partly in longitudinal section with the section being taken along lines 3—3 of Figure 2.

As apparent from the drawings, the coating machine includes a pair of feed rolls 1 between which the running length to be treated passes. The web or length is fed off of a suitable supply reel, not shown, and after passing the feed rolls it passes over guide rolls 3 and 4 and then over an applicator roll 7. The coating material 5 is present in a container 6 and the applicator roll 7 dips into the material or coating matter 5 and applies the coating to the web 2 as the web passes over the applicator roll. The further movement of the web consists in passage around a counter cylinder 8, over a further guide roll 9 and to a drying means, not shown, or to any other suitable treating mechanism. Adjacent the counter cylinder 8 is mounted the air jet or nozzle means for effecting excess coating removal and smoothing of the web. As shown, the air jet means are directed at least substantially vertically against or normal to the surface of the web so that the excess coating matter will not pass the jet but is retained on the web and flows back into the container 6 whereas the coating matter remaining on the surface of the web will be smoothed due to the air effect.

The air jet that is directed against the surface of the web 2 is supplied from a suitable source of supply or compressed air generator, not shown, to a pipe 13 having apertures 14 therein constituting outlet apertures. Coaxially surrounding the pipe 13 is a stationary air duct 10 which is provided with an air outlet opening 11 that is directed toward the surface of the web. In other words, the air outlet 11 is between the axis of the duct 10 and the periphery of the cylinder 8. This outlet opening 11 extends over the entire width of the web to be treated. The opposite ends of the air duct 10 are fixed in bearings 12.

Mounted on the stationary air duct 10 are combined nozzle forming and supporting means denoted generally at 15. These means comprise two component members or complementary halves 22 and 23. These members are provided with inwardly directed and facing supporting and spacing staves 19, having apertures therethrough within which are disposed bolt means 18. Suitable nut means 18' cooperate with the bolt means to clamp the two half members 22 and 23 together. Along each side of the respective half means are nozzles 16 and 17. These nozzles are displaced, as shown, 180° relative to one another. The complementary half members 22 and 23 each respectively include nozzle forming portions 16' and 17' and 16'' and 17'' so that when the halves are clamped together, there are provided nozzle outlet means 24 and 24' that extend at least co-extensive in length with the width of the running length to be doctored. It is further pointed out that the staves 19, as shown in Figure 3, are streamlined or have what could be termed a free air flow cross section so that they offer relatively little resistance to the air in its passage between the outlet 11 in the air duct and the nozzle outlet 24 and 24' depending upon the position of the forwarding means 15.

The air duct 10 is further provided with a series of apertures 20 having their axes directed downwards. These apertures are located in advance of the outlet 11, as regards movement in the direction of the arrow in Figure 2 when, for example, the nozzle 16 is being moved from rest or cleaning position to working position. Extending into the interior of the complementary half members 22 and 23 are pairs of projections. The projections 25 and 26 formed on the half member 22 and projections 27 and 28 formed on half member 23 terminate in arcuate journalling surfaces 25' and 26' and 27' and 28' respectively. Further, the projections of each

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pair are circumferentially spaced apart and the surfaces have such circumferential extent that the distance between the remote edges of the respective pairs of projections is greater than the circumferential extent of the outlet 11 in the air duct 10. Furthermore, the pairs of projections are arranged opposite to one another so that when nozzle 16 is moving from rest position to working position, the engagement of surfaces 27' and 28' on the periphery of the air duct 10 is such that these surfaces and the portion of the half member 23 between the projections 27 and 28 close opening 11 so that the air passes through the outlet means 20 and blows through nozzle 16 during the movement thereof to working position. Upon subsequent movement, that is, reversal of the position of the nozzles back to that shown in the drawings, the respective surfaces 25' and 26' and the portion of the half member 22 between projections 25 and 26 bridge or close the outlet 11 so that nozzle 17 is cleared when it is to be moved from working to rest position by air being discharged through outlet means 20. In other words, the respective pairs of surfaces or arcuate journalling portions have such individual circumferential extent and are mutually spaced apart a distance such that during movement of one nozzle from rest to working position the outlet 11 is closed.

In the operation of the invention, and assuming it becomes necessary to clean nozzle 17 shown in Figure 1 to be in working position, the nozzle support 15 is pivotally moved through an arc of 180°. This movement is facilitated by a hand grip 21 or other type handle. The pivoting movement places the nozzle 17 in its rest position. Simultaneous with this movement, the supply of air through the nozzle 17 is cut off since the body part of the nozzle support 15 will then move across the outlet opening 11. While the nozzle 17 is moving away from the surface of the web 2 the nozzle 16 is moved toward working position. It first passes and is placed in communication with aperture means 20 for clearing of the nozzle and finally at the end of its swinging motion assumes its working position where it is directed against the surface of the web 2.

It is thus clear that the present invention provides means for removing excess coating material or matter and smoothing the coating which includes oppositely directed nozzle means mounted for conjoint swinging motion and movable between a working position directed against the surface of the web to be treated and a rest position directed away therefrom and air supply means including an air duct upon which the nozzle means are pivoted having an outlet aperture directed toward the surface of the web to be treated whereby the nozzles are simultaneously and respectively moved away from and into the working position with the simultaneous shutting off and placing in communication of the air with the nozzles. Additional aperture means are provided in the air duct in spaced relation with respect to the main air outlet to effect an initial jet through the nozzle being moved to working position before it reaches the same to clear and clean the interior of the nozzle.

It is to be noted that from a specific standpoint the web to be treated passes over a counter cylinder the axis of which lies in the same plane as the axis of the air duct and thus the axis about which the nozzles swing.

What we claim is:

1. In coating mechanism, means for coating a running length of the material with liquid, a counter cylinder over which said length passes after it has been coated, excess coating material removing and smoothing means mounted adjacent said counter cylinder including plural nozzle means including at least two nozzles directed to have their outlets respectively 180° displaced relative to one another, means mounting the nozzles for rotary movement whereby when one nozzle is directed toward the length to be treated the other is directed away therefrom, the means mounting the nozzle including a sta-

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tionary air conduit means for supplying air to said nozzles and having an opening directed toward the length to be treated and only one of said nozzles being in communication with said opening at any one time during conjoint movement of the nozzles.

2. In a mechanism for coating running lengths of material, and which mechanism is of the type in which the thickness and smoothness of the coating is adjusted and controlled by an air jet which in working position is directed against the surface of the material to be treated after it has been coated with coating material, the improvement comprising at least two nozzles each having outlet means at least coextensive in length with the width of the running length, means mounting the nozzles for movement between a working position and an inoperative position, a stationary air duct having an air outlet opening directed toward the running length to be treated, the means mounting the nozzles including a support pivotally mounted in coaxial disposition on said air duct, each of said nozzles extending along opposite longitudinal sides of the support and being displaced respectively 180° relative to one another, means for supplying compressed air to said stationary air duct, said support including oppositely arranged pairs of mutually spaced surfaces, each pair of surfaces being disposed between the nozzles, the surfaces of each pair being spaced apart a distance such that at least a portion of the surfaces of each pair and a portion of the support between the same is of greater extent in a direction transverse to the axis of the air duct than the air outlet opening so that the respective pairs of surfaces and the portion of the support therebetween are adapted to sequentially close the outlet opening when the support is pivoted to cut off the supply of compressed air to one nozzle as it is moving to inoperative position and connect the supply means to the other nozzle as it is simultaneously moving to working position and said air duct means having additional aperture means therein circumferentially spaced from said air outlet opening, normally closed by the portion of the support between one pair of said surfaces when a nozzle is in working position and adapted to permit compressed air to flow into the other nozzle before the same reaches working position for clearing the said other nozzle.

3. In a mechanism for adjusting the thickness and smoothness of a coating on a running length of material passing over a drum comprising a stationary air duct means positioned alongside the drum and spaced therefrom and having an outlet opening extending therealong and directed toward the periphery of the drum, a means providing a second outlet circumferentially spaced from the first opening, combined nozzle forming and supporting means comprising a pair of complementary members each including opposite nozzle forming portions and between each of the same a pair of circumferentially spaced arcuate journaling portions adapted to mount the members on the air duct, each pair of portions having such circumferential extent and being spaced apart such that the circumferential extent comprised between the remote edges of a pair of journaling portions is greater than the circumferential extent of the outlet, said pairs of journaling portions being oppositely ar-

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ranged, each member further including streamlined spacing and supporting staves having apertures there-through and adapted for registry to assemble the members on the duct, means cooperating with the apertures

5 and the staves for securing the complementary members together about the duct with the opposite portions of the respective members defining opposed nozzles each directed in respectively opposite directions whereby with one nozzle directed toward the drum the other is directed away therefrom and in an inoperative position, means for supplying compressed air to the air duct for discharge through the first mentioned opening therein and through a nozzle aligned therewith, means for turning the combined nozzle support and nozzles to interchange the position of the oppositely directed nozzles and to simultaneously shut off the supply of air issuing from the first mentioned opening by moving the pair of journaling portions on one of said complementary members across the opening while one nozzle is moving to an inoperative position and to place the second outlet in the air duct means in communication with the other nozzle as it is moving to working position to clear the same, continued movement placing the said other nozzle in working position and closing said second outlet by moving the pair of journaling portions on the other of said complementary members across the second outlet.

4. In a mechanism for coating running lengths of material, and which mechanism is of the type in which the thickness and smoothness of the coating is adjusted and controlled by an air jet which in working position is directed against the surface of the material to be treated after it has been coated with coating material, the improvement comprising at least two oppositely directed nozzles having outlet means at least coextensive in length with the width of the running length, means mounting the nozzles for movement between a working position and an inoperative position, said means movably mounting the nozzles so that upon movement of one nozzle away from working position the other nozzle automatically assumes its working position, supply means for supplying compressed air to the nozzles, control means for automatically connecting the supply means to the said other nozzle as it is moving to working position and automatically cutting off the supply of compressed air to the said one nozzle as it moves to rest position, said supply means including a stationary air duct having an air outlet opening directed toward the running length to be treated, the means mounting the nozzles including a support pivotally mounting the nozzles in co-axial disposition on said air duct, each of the nozzles extending along an opposite longitudinal side of the support and the respective nozzles being displaced 180° relative to one another and said air duct being provided with additional aperture means adapted to permit compressed air to flow into the other nozzle before the same reaches its working position in order to clear said other nozzle.

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