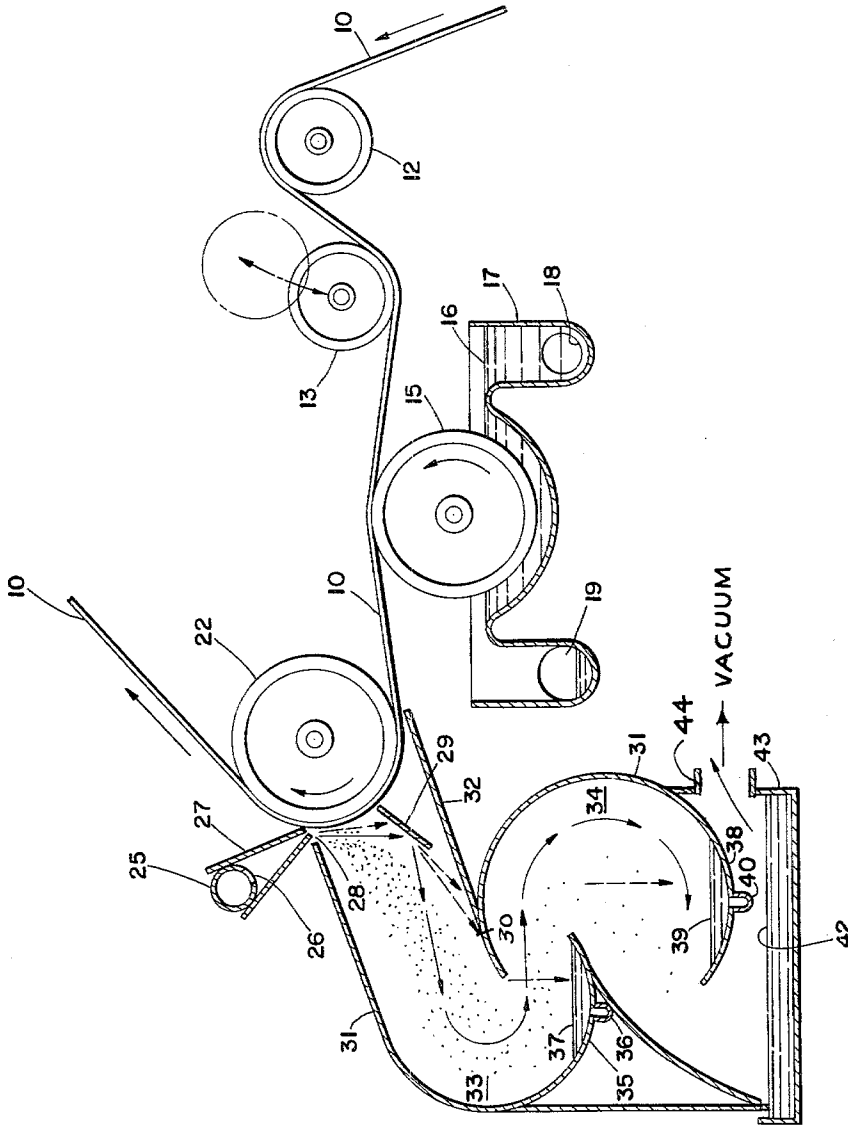


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METHOD FOR THE CONTROL OF EXHAUST AIR
AND/OR WEB COATING SPRAY
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METHOD FOR THE CONTROL OF EXHAUST AIR AND/OR WEB COATING SPRAY

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This invention relates to web coating and particularly to a method for the control and removal of coating composition laden exhaust air or gas or spray, initially applied as a high velocity gas or air knife utilizing in removing excess coating matter from a moving web.

In web coating operations an excess of a coating composition is generally removed by an air knife. The excess is picked up by a web moving through a trough containing a coating composition, then it is removed by means of a high velocity jet of gas or air acting as an air knife or doctor blade directed as a transverse narrow stream onto the coated web surface. The transverse and uniform application of high velocity gas or air is applied through a narrow slit or jet that is angularly positioned adjacent a coated moving web when traveling over a backing roll; the jet insures an even distribution of the applied coating composition while, simultaneously, it removes all excess.

Such levelling treatment of the coating by air or gas and the removal of excess material is highly desirable and advantageous but it results in atomization of the coating material with stray splattering. If uncontrolled, the atomized spray will not only coat adjacent and integral apparatus parts excessively wearing bearings, belts, etc., but it may return, due to uncontrolled air currents, to the web beyond the jet area to deposit held coating matter in small lumps causing streaking, unevenness, a poor quality final product. Various attempts have been made to constrain the spray and splattering, and direct the stream of used air to an exhaust point through the use of baffling. Although improved results are obtained through some available exhaust apparatuses substantial control of the exhaust coating laden gases could not be obtained. To be fully effective a method for such control should also successfully salvage, or take out, all suspended coating matter possible for subsequent reuse, if desired before exhaustion to the atmosphere. By means of this invention a method and apparatus have been developed to cleanly, effectively and substantially immediately control the air of gas emanating from the air knife or jet to eliminate undesirable and harmful splattering and, simultaneously, while flowing to an exhaust point cause the air stream to yield the suspended coating composition carried by it. Depending on the coating applied to a web, its cost and its reusability, it may be desirable from an economical standpoint to collect such coating material for subsequent reuse.

This invention advantageously provides for a method and apparatus that is adapted to substantially fully and cleanly control the flow of an air stream issuing from a coating even jet to a desired exhaust point which carries in suspension a coating composition, either as minute solid material or as a gaseous suspension. The method further provides for an effective yielding of its burden at convenient collecting zones or areas, exhausted for subsequent reuse or to waste. By immediately allowing an expansion of the jet stream issuing from a transversely positioned unit in a sufficiently enlarged enclosure its pressure is desirably reduced to nearly that slightly above the atmosphere leaving enough to effect its flow through in a predetermined path to an exhaust point. The path gently fully reverses the air stream direction at least once prior to exhaustion to the atmosphere. At the turn sus-

pending matter is caused to readily drop out into a sump area (or areas where more than one reverse is effected) from which sump it is readily exhausted, for reuse if so desired. A further desired feature of the applicant's flow control is an automatic classification of the size and weight of the coating material by means of the reversals of the coating laden air stream, the heavier dropping out into the first reversal sump, the lighter into the subsequent reversal sump or sumps. Further, the method and apparatus to be herein described is adaptable to a great range of web speeds of from about 300 f.p.m. to over 2000 f.p.m.

The invention will be better understood from the following description taken with the attached drawing where; the figure represents a schematic side-elevation of a part only of a web coating apparatus including the improved coating spray and exhaust control, some of the parts being shown in cross section.

Referring to the drawing a paper web 10 or the like traveling at from 300 f.p.m. to 2000 f.p.m. or more which it is desired to coat is advanced over a first idler roll 12 to a swing roll 13, utilized for advancement of the web into surface engagement with the top portion of the subsequent color or coating applicator roll 15. The lower section of the coating roll 15 is submerged in a bath 16 comprising a coating composition maintained to a desired depth or level in the container 17. The coating composition is continually fed through a pipe 18 to a desired level exhausted or discharged through a return pipe 19 to a back-up station. Upon being coated the web 10 then proceeds to the further backing roll 22 whereon its coated portion is exposed to an air knife, a stream of high velocity air or other desirable gas at pressures of up to 6 lbs. p.s.i. The gaseous fluid is supplied under pressure through pipe 25 and through openings therein into a nozzle 27 which directs it at the web 10 in a thin line at a tangent designed to wipe off any excess and effect an even spreading of the coating composition on the web.

As a further assurance for proper control and direction for the exhaust of the coating laden air through an exhaust path there is provided a deflector plate and seal 29, positioned at an angle, and in a close proximity, to the moving web designed to wipe off matter, seal and redirect the flowing air into and through such exhaust path. The plate 29 serves as a seal and doctor blade by initially removing whatever excess is on the moving web due to an uneven pick-up of a coating material being carried into the air knife area. It serves as a seal by being in close proximity to the web; and, as a deflector plate it prevents the air impinging on it from carrying suspended matter beyond it toward the incoming web.

Any build-up of unevenness of coating is, of course, highly undesirable. The high velocity impinging air emerging from the air knife is first deflected by the web on the backing roll 22 then immediately it impinges the deflector plate or seal 29 depositing thereon substantial quantities of coating matter it carried away from its contact with the web. This deposit plus that wiped off by the deflector seal 29 on its underside flows along the plate 29 surface by gravity dropping onto the inner surface 30 of the exhaust unit 31 and, continually urged by gravity, to a collection and removal area 37. The deflected and now expanded air stream carries with it, in suspension, a substantial amount of the coating composition. The matter continually drops out all along its path of travel. Any further matter dropping out of the air stream will join that flowing off the deflector 29 and all of its flow by gravity over the inner surfaces, particularly over the lower surface 30 of the reversing enclosure 31 to a sump 35. Desirably the lower surface 30 angularly extends under the backing roll 22 so that should some spray matter get

beyond the deflector seal 29 it will fall onto the inner wall of the enclosure 30 then, directed by gravity flow, to the sump 35 provided therefor in the interior thereof.

The pressure of the air stream due to its immediate expansion upon its impingement of the web roll is immediately reduced to that slightly above the atmosphere being sufficient only to continue to flow through the enclosure until exhausted to the atmosphere. Its flow path, as shown in the drawing is substantially fully reversing, at least once. The curved section 33, being a semi-circle, reverses the exhaust gases about 180°, and then further for further scrubbing of the air stream through a second similarly fully reversing section 34. During the first reversing step through section 33 the greater amount of suspended matter is given up and deposited in the catch basin 35 formed by the lower curved portion 35 of section 34 forming a pool 37. Also, the coating matter initially deposited on the deflector 29 and on the inner wall of conduit 30 flows there along and drops into the catch basin or sump 35. All matter in the pool 37 is continually exhausted through base exhaust conduit 36.

Whatever the suspended material solid, or in droplet form that has not been yielded in the first reversing section is generally given up when the air stream passes through the second reversing section 34. The stream velocity in this area is further decreased so suspended material continues to drop out being collected in the lower curved section 38, forming a sump, the accumulation 39 therefrom being carried off by the base exhaust conduit 40.

To fully assure a total elimination of suspended matter from the air stream it is caused to come into surface contact with a flowing liquid such as water. Whatever has remained in suspension is then given off in this last scrubbing action with the water surface 42 flowing in the open conduit 43. The gently curvilinear path into which the exhaust stream of air coming from the jet 27 is directed then finally exhausted to the atmosphere effects a freeing of any suspended matter that the air stream had picked up from the surface of the web 10 traveling over the backing roll 22. The herein described method also effectively causes the air stream to yield all heavier matter in the first catch basin and the lesser sized matter in the subsequent or second catch basin, thus a selected particle size is collected and is exhausted separately to wherever wanted. Desirably the entire exhaust system may be enclosed, including the final water scrubbing, and placed under a negative pressure (vacuum). The negative pressure, of low value, can be applied in the manner shown at the outlet 44.

Of course a substantial enclosure of the backing roll by the exhaust apparatus is desired and necessary to successfully eliminate any spraying or splattering of the coating material over the area adjacent the apparatus or on the apparatus parts. An immediate reduction of pressure and deflection of the air blast off the backing roll

and off the deflector seal and blade into a nearly straight line flow advantageously avoids turbulence near the backing roll. This initial control is benefitted by a pulling of secondary air through openings near the jet and from around the backing roll thus also preventing any deposition of coating material on nearby areas that, if permitted, may cause a build-up to subsequently spill over onto the web itself. For economic operation the exhaust unit 31 is advantageously positioned at a downward angle to utilize gravity in effecting the flow of the given up coating matter collected on the inner walls into the sumps provided in the reversal sections.

What is claimed is:

1. The method of freeing and salvaging suspended coating material from air issuing from an air blade used to remove excess coating material from a passing web comprising, passing the coated web through a separate zone wherein it is subjected to a downwardly directed air knife for removing excess coating, then substantially immediately expanding said coating-laden air by downwardly deflecting same into and through an enlarged area defining a downwardly inclined zig-zag progressing curvilinear path having several full flow reversing turns in descending relation for gravity separation of said coating matter, the lowest portions of the turns forming wells into which the gravity removed coating matter from the passing air is collected, maintaining said coated matter in said wells, and finally passing said flow reversed air over a water surface which is exhausted under vacuum.

2. The method of claim 1 where each reversal turn is curvilinear and about 180°.

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