

June 23, 1970

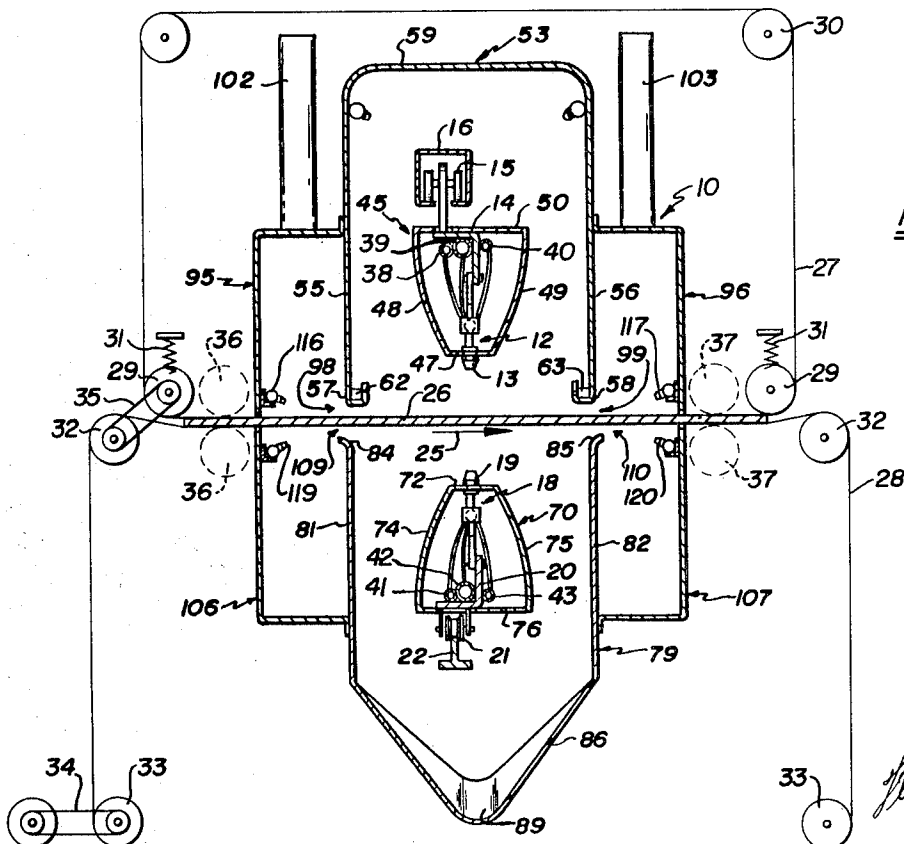
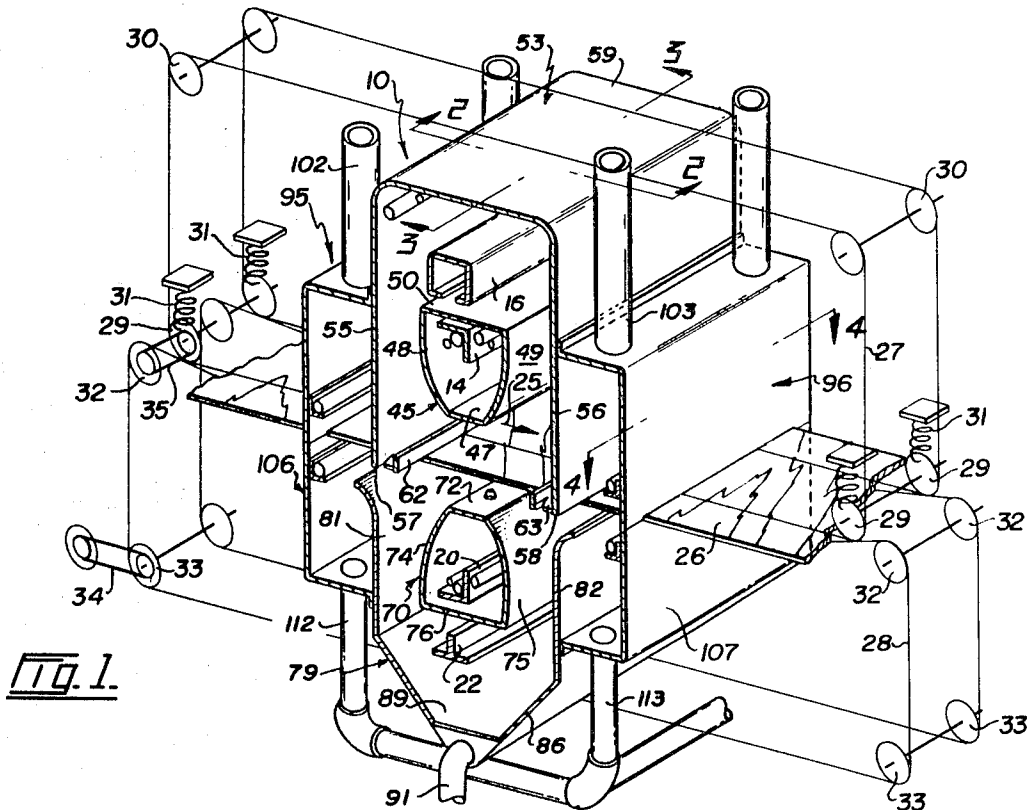
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APPARATUS FOR SPRAYING LIQUID ON MOVING ARTICLES

Filed March 18, 1968

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

FIG. 3.

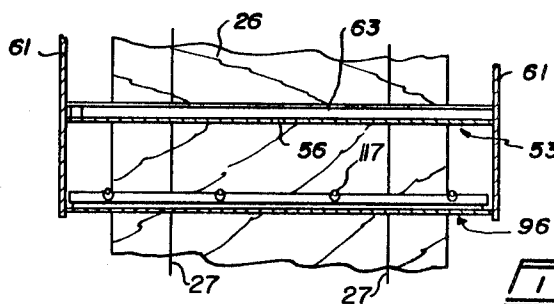
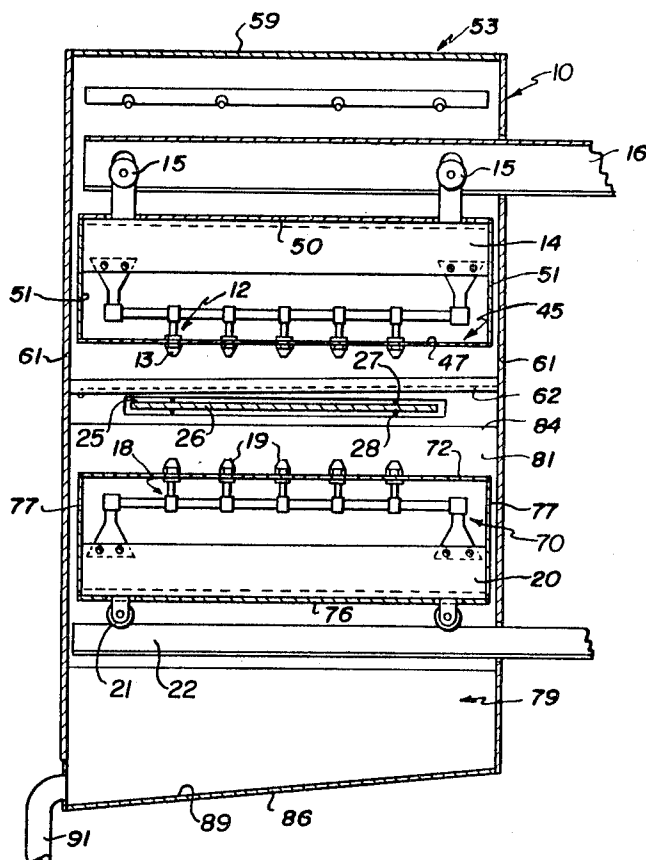


FIG. 4.

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3,516,388 APPARATUS FOR SPRAYING LIQUID ON MOVING ARTICLES

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Continuation-in-part of application Ser. No. 460,214, June 1, 1965. This application Mar. 18, 1968, Ser. No. 713,966

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21 Claims

ABSTRACT OF THE DISCLOSURE

Apparatus for spraying liquid, and particularly glue, on one or two surfaces of articles, such as plywood core veneers, moving through the apparatus including spray guns on one or both sides of a path along which the articles are moved, shield means for protecting the guns from atomized liquid and to confine liquid overspray rebounding from the articles, and means for retaining the articles in proper position relative to the spray guns without interfering with the application of the liquid to said articles.

CROSS-REFERENCES TO RELATED APPLICATIONS

This is a continuation-in-part of application Ser. No. 460,214 filed June 1, 1965, now abandoned.

BACKGROUND OF THE INVENTION

This invention relates to apparatus for spraying glue or other liquids on to moving articles, and particularly spraying glue on to wood core pieces used in the manufacture of plywood panels.

In the manufacture of plywood, glue is usually applied to cross banding core pieces and veneers by rollers or by hand. Spraying of the glue is desirable, but in the past it has not been very practical because of the difficulty involved with getting glue all over the spray guns, the glue lost as a result of overspraying, and getting rid of the excess air which is used in the atomizing of the glue.

SUMMARY OF THE INVENTION

Although this apparatus is particularly designed for spraying glue on to core pieces and panels, it can be used for spraying other liquids, such as paint or other coating materials. For the sake of convenience, the invention will be described herein in connection with glue.

The present apparatus is primarily designed to spray glue on to upper and lower surfaces of wood pieces and the like moved therethrough. The apparatus protects the spray guns from the glue, confines the overspray and gathers the overspray glue so that it can be used again, and when necessary, traps and removes the excess air, which would be dangerous if breathed in by a person and would be very objectionable if allowed to circulate through a plant owing to the fact that it carries fine glue with it. This gathering of the overspray prevents a financial loss that could make the spraying of the liquid uneconomical.

Spraying apparatus according to the present invention includes at least one set of spray guns, and in this example there are upper and lower sets of spray guns, having nozzles projecting towards a path along which the articles to be sprayed are moved. Shielding means is provided at each set of guns to enclose all of said guns, excepting the nozzles or portions of the nozzles thereof. The articles can be moved along the path in any desired manner, but it is preferable to provide for this purpose laterally-spaced multiple sets of upper and lower thin

wires extending along the path to maintain the articles in position relative to the gun nozzles as said articles or veneers are moved between the wires along the path. The wires can be driven to effect movement of the articles therebetween, or other means may be provided to move the articles between the wires, in which case the latter act as guides and keep the articles flat at this time.

It is preferable to provide outer shielding for each set of guns and enclosing the first-mentioned or inner shielding thereof, said outer shielding opening towards the path along which articles are moved so that glue overspray is confined within the outer shielding. This outer shielding is also provided with trough means into which the glue confined therein drains, said trough means conducting this glue away from the spray guns. Upper and lower exhaust hoods preferably are provided at the upper and lower outer shielding where the veneer enters and emerges from the latter, said exhaust hoods also opening towards the path. Exhaust means is connected to these hoods in order to withdraw any excess air and fine glue dust which is trapped thereby. An assembly of spray jets preferably is provided in each exhaust hood, said jets being positioned so as to provide an air curtain that acts to divert any atomizing air and fine glue dust therein which pass out of the outer shielding into the exhaust hoods in order to prevent said air and dust from leaving the apparatus with the veneer.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a diagrammatic perspective view of the glue spraying apparatus with near walls thereof broken away, to show parts of its interior.

FIG. 2 is an enlarged vertical cross section taken substantially on the line 2—2 of FIG. 1.

FIG. 3 is a vertical section taken on the line 3—3 of FIG. 1, and

FIG. 4 is a section taken on the line 4—4 of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings, 10 is the glue spraying apparatus which includes an upper set of spray guns 12, each having a nozzle 13 projecting downwardly therefrom, said guns 12 being mounted on a carriage 14 suspended from rollers 15 that ride on an upper track 16. A set of lower spray guns 18, each having a nozzle 19 project upwardly therefrom, is located below upper guns 12. Lower guns 18 are mounted on a carriage 20 which is supported by rollers 21 riding on a lower track 22. Nozzles 13 and 19 extend towards each other, but are spaced apart, so that articles to be sprayed can be moved along a path 25 therebetween. In this example cross banding core pieces 26 are moved along path 25 by any suitable conveying means, and this conveying means is preferably in the form of multiple sets of upper and lower thin conveyor wires 27 and 28 so arranged that the core pieces are gripped firmly therebetween. Wires 27 are endless and extend around sets of lower and upper pulleys 29 and 30, each set being mounted on a common shaft, and said lower pulleys 29, being spring-loaded downwardly in any desired manner, such as by springs 31 diagrammatically illustrated in FIGS. 1 and 2. Similarly, endless wires 28 extend around upper and lower sets of pulleys 32 and 33 mounted on common shafts. The wire conveyors are driven in any suitable manner, and a drive belt 34 is shown in FIGS. 1 and 2 for driving one set of pulleys 33, said belt being connected to a source of power, not shown. A belt 35 connects one of the sets of pulleys 32 to an adjacent set of pulleys 29. With this arrangement, all of the wires of the upper and lower conveyors are driven at the same speed.

If desired, the portions of wires 27 and 28 extending along path 25 may be stationary, and other means may be provided for moving the core pieces 26 between said wires and along the path. For example, pairs of upper and lower driven pressure rolls 36 and 37, shown in dotted lines in FIG. 2, may be provided at the beginning and end of path 25, for respectively pushing and pulling the core pieces along the path. The rolls are grooved to receive wires 27 and 28 so that the rolls press against core pieces located between the wires, and the wires act as guides for the core pieces and keep them flat as they travel along the path.

Spray guns 12 and 18 are preferably the internal air-mix type, and guns 12 have a glue header 38, an atomizing air header 39 and a control air header 40 connected thereto by suitable tubes, see FIG. 2. The operation of this type of gun is known and does not require description herein. Spray guns 18 have a glue header 41, an atomizing air header 42 and a control air header 43 connected thereto by suitable piping.

Inner shielding is provided around spray guns 12 to protect them from the glue discharged through their nozzles 13. The inner shielding is a shield 45 which is roughly V-shaped in cross section. The nozzles 13 of the guns project downwardly from a lower wall 47 of the shield, and said shield has side walls 48 and 49 which extend upwardly and outwardly from wall 47 to an upper cross wall 50 which is mounted on carriage 14. The ends of the shield 45 are closed by end walls 51, see FIG. 3. Thus, shield 45 completely encloses guns 12 while nozzles 13 of the guns projecting downwardly from said shield.

An outer shield 53 is provided for guns 12 and inner shield 45. This outer shield 53 is preferably in the form of an inverted U in cross section and has side walls 55 and 56 extending upwardly from lower edges 57 and 58, respectively, located near path 25. A cross wall 59 joins the upper parts of walls 55 and 56 and extends over track 16 and shield 45. Doors 61 close the opposite ends of shield 53, tracks 16 and 22 extending through holes in one of said doors. Shield 53 confines overspray from the gun nozzles. Overspray is glue spray which bounces off the core pieces and/or travels somewhat laterally from nozzles 13.

Troughs 62 and 63 are formed along the lower edges 57 and 58 of shield 53 inwardly of said edges. Any glue deposited on the inner surface of shield 53 runs down said surface into troughs 62 and 63. The glue drains from the troughs at both ends thereof either into a trough extending out from the apparatus, or into a bottom drain section. Any glue that deposits on the outer surface of walls 48 and 49 of inner shield 45 will flow down these walls and into the glue spray emerging from nozzles 13.

The lower set of spray guns 18 is provided with an inner shield 70 which is roughly in the form of an inverted V in cross section. Shield 70 has an upper wall 72 through which nozzles 19 project, and side walls 74 and 75 which extend downwardly and away from each other to a lower cross wall 76 which is mounted on carriage 20. The ends of shield 70 are closed by end walls 77. This shield encloses guns 18 while the nozzles 19 thereof project upwardly therefrom.

A lower outer shield 79 encloses track 22 and shield 70 of lower guns 18. Shield 79 is preferably in the form of a U in cross section and has side walls 81 and 82 extending downwardly from outwardly flaring upper edges 84 and 85 near path 25 to a cross wall or bottom 86 extending therebetween below shield 70. The ends of shield 79 are closed by doors 61. Wall 86 is substantially V-shaped in cross section to form a central trough 89 extending from one end to the other of shield 79. A pipe 91 is connected to trough 89 and extends out of the apparatus preferably to a pump and a 3-way valve that directs the overspray glue to the reservoir which supplies glue to the spray gun, or wash-water to a drain. In

this example, troughs 62 and 63 of upper shield 53 drain into trough 89.

Inner shield 70 projects lower guns 18 from the glue, and any glue which accumulates on the outer surfaces of walls 74 and 75 will flow down said walls and drop on to cross wall 86 of outer shield 79, whence it flows into trough 89 and out of the apparatus. Similarly, any glue which accumulates on the inner surfaces of side walls 81 and 82 of outer shield 79 flows down said inner surfaces to cross wall 86 and trough 89.

A pair of closed upper exhaust hoods 95 and 96 are mounted on the outer surfaces of upper shield walls 55 and 56 and open towards path 25 at 98 and 99. Stacks 102 and 103 extend from the top of hoods 95 and 96 either to atmosphere outside the building in which the apparatus is located, or to suitable separating apparatus, not shown, for reclaiming the fine glue from the atomizing air. A pair of closed lower exhaust hoods 106 and 107 are mounted on the outer surfaces of lower shield walls 81 and 82 and open towards path 25 at 109 and 110, respectively. Drain pipes 112 and 113 extend from the bottoms of hoods 106 and 107 and extend to a drain, not shown. It will be noted that outer shields 53 and 79, and hoods 95, 96, 106 and 107 extend laterally beyond the ends of inner shields 45 and 70 and the edges of core pieces 26, see FIGS. 1 and 3, so that there is intercommunication therein between the upper and lower outer shields and the upper and lower hoods. As a result, stacks 102 and 103 function for lower hoods 106 and 107 as well as for the upper hoods. Core pieces 26 are moved along path 25 between the adjacent edges of upper and lower shields 53 and 79, hoods 95 and 106, and hoods 96 and 107.

Upper air jets 116 and 117 are provided in hoods 95 and 96, and lower air jets 119 and 120 are provided in lower hoods 106, and 107. The jets in each pair of upper and lower hoods are located along the open edges of said hoods and are directed towards a point between the edges of these hoods and the adjacent shields 53 and 79, providing an angled air curtain that directs the outward rushing streams of atomizing air and glue dust, upwardly and downwardly into hoods 95-106 and 96-107. These hoods withdraw this excess air which is discharged from gun nozzles 13 and 19 as a result of atomizing the glue. Exhaust pipes 102 and 103 withdraw the entrapped air from all of the hoods.

The operation of spraying apparatus 10 is apparent from the above description. As core pieces 26 are moved along path 25 through apparatus 10, upper and lower guns 12 and 18 spray glue onto the upper and lower surfaces of said pieces through their respective nozzles 13 and 19. Guns 12 and 18 are aligned so that the spray therefrom covers the entire upper and lower surfaces of the core pieces.

The steel wires 27 and 28 are very narrow, preferably $\frac{1}{16}$ inch in diameter, and are preferably extended through the intersection of two spray patterns from guns 12 and 18. The wires do not materially affect the application of glue to the surfaces of the core pieces. These wires are cleaned of glue with any suitable wiping mechanism, not shown. Inner shields 45 and 70 protect the upper and lower guns and their associated parts from the glue and either direct any glue accumulating thereon back to the glue spray emerging from the nozzles or to the troughs leading out of the apparatus. Outer shields 53 and 79 confine the overspray, and glue accumulating on the inner surfaces of these shields is directed out of the apparatus by troughs 62, 63 and 89. Upper and lower hoods 95-96 and 106-107 trap the excess air from the spray nozzles, and this is exhausted out of the apparatus through pipes 102 and 103.

If desired, only one set of spray nozzles may be used for spraying either the upper or the lower surfaces of articles being moved past them. For example only upper guns 12 may be used, in which case lower guns 18 and lower shield 70 would not be required. If this were a

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permanent condition, lower shield 79 could be much shallower than shown. Conversely, guns 12 and upper shield 45 can be omitted, and guns 18 only used.

I claim:

1. Apparatus for spraying liquid onto moving articles directed therethrough, comprising a set of spray guns having nozzles projecting towards a path along which articles are moved, laterally-spaced multiple sets of upper and lower thin wires extending along said path and arranged to firmly grip the articles therebetween to maintain the latter flat and to support said articles in a horizontal plane and in position relative to the gun nozzles as said articles are moved between the wires along the path, said set of guns being adapted to be connected to a liquid source and to atomize liquid therefrom and to spray said atomized liquid through their respective nozzles onto surfaces of the moving articles, and shield means for the guns to shield said guns from the atomized liquid.

2. Apparatus as claimed in claim 1 in which each of said wires is endless, and including means for moving said wires along the path to move articles gripped thereby along said path.

3. Apparatus as claimed in claim 1 including a second set of spray guns having projecting nozzles and positioned on the side of said path and said wires opposite said first-mentioned guns, said second set of guns being adapted to be connected to liquid source means and to atomize liquid therefrom and to spray said atomized liquid through their respective nozzles onto the opposite surfaces of the moving articles, and shield means for the second set of guns to shield the latter from the atomized liquid.

4. Apparatus as claimed in claim 3 in which each of said wires is endless, and including means for moving said wires along the path to move articles gripped thereby along said path.

5. Apparatus for spraying liquid onto moving articles directed therethrough, comprising a set of spray guns having nozzles projecting towards a path along which articles are moved, laterally-spaced multiple sets of upper and lower thin wires extending along said path and arranged to firmly grip the articles therebetween to maintain the latter flat and to support said articles in a horizontal plane and in position relative to the gun nozzles as said articles are moved between the wires along the path, said set of guns being adapted to be connected to a liquid source and to atomize liquid therefrom and to spray said atomized liquid through their respective nozzles onto surfaces of the moving articles, inner shield means for said gun set extending from the nozzles thereof in the direction away from said path to shield the guns from atomized liquid, outer shield means for the set of guns extending substantially from said path away therefrom and around said gun set and the inner shield means thereof to confine liquid overspray rebounding from the articles, and opposed shield means on the opposite side of said path from said outer shield means and opening towards the path to catch any atomized liquid moving past the articles travelling along the path.

6. Apparatus as claimed in claim 5 including a closed hood outside said outer shield means and opening towards the path to trap any excess air introduced during the atomization of the liquid, and exhaust means connected to said hood for removing the entrapped air.

7. Apparatus as claimed in claim 6 including air jets in the hood arranged to provide air curtains in said hood to divert into the hood atomized liquid which passes out of said outer shield means.

8. Apparatus for spraying liquid on to moving articles directed therethrough, comprising sets of upper and lower spray guns having projecting nozzles and positioned above and below a path along which articles are moved, laterally-spaced multiple sets of upper and lower thin wires extending along said path and arranged to firmly

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grip the articles therebetween to maintain the latter flat and to support said articles in a horizontal plane and in position relative to the gun nozzles as said articles are moved between the wires along the path, said sets of guns being adapted to be connected to a liquid source means and to atomize liquid therefrom and to spray said atomized liquid through their respective nozzles on to opposite surfaces of the moving articles, inner shield means for each of said gun sets extending from the nozzles thereof in the direction away from said path to shield the guns from atomized liquid, and outer shield means for each of the upper and lower gun sets extending substantially from said path away therefrom and around said each gun set and the inner shield means thereof to confine liquid overspray rebounding from the articles.

9. Apparatus as claimed in claim 8 including closed upper and lower hoods outside the upper and lower outer shield means above and below said path and opening towards the latter to trap excess air introduced during the atomization of the liquid, and exhaust means connected to said hoods for removing the entrapped air.

10. Apparatus as claimed in claim 9 including air jets in the upper and lower hoods arranged to provide air curtains in said hoods to divert into said hoods liquid which passes out of said outer shield means.

11. Apparatus for spraying liquid on to opposite surfaces of articles directed therethrough, comprising sets of upper and lower spray guns having projecting nozzles and positioned above and below a path along which articles are moved, laterally-spaced multiple sets of upper and lower thin wires extending along said path and arranged to firmly grip the articles therebetween to maintain the latter flat and to support said articles in a horizontal plane and in position relative to the gun nozzles as said articles are moved between the wires along the path, said sets of guns being adapted to be connected to a liquid source means and to atomize liquid therefrom and to spray said atomized liquid through their respective nozzles on to opposite surfaces of the moving articles, an inner shield enclosing each of the gun sets and from which the nozzles of the guns of said sets project, said inner shields protecting the guns from atomized liquid, and an outer shield enclosing each of the upper and lower gun sets and the inner shields thereof, said outer shields being open to said path and confining liquid overspray rebounding from the articles.

12. Apparatus as claimed in claim 11 including closed upper and lower hoods outside the upper and lower outer shields above and below said path and opening towards the latter to trap excess air introduced during the atomization of the liquid, and exhaust means connected to said hoods for removing the entrapped air.

13. Apparatus as claimed in claim 12 including air jets in the upper and lower hoods arranged to provide air curtains in said hoods to divert into said hoods atomized liquid which passes out of said outer shields.

14. Apparatus as claimed in claim 11 in which the upper outer shield is in the form substantially of an inverted U in cross section and having side walls extending upwardly from lower edges near said path and a cross wall extending between said side walls, and including troughs formed along said lower edges of the side walls inwardly thereof.

15. Apparatus as claimed in claim 11 in which the lower outer shield is in the form substantially of a U in cross section and having side walls extending downwardly from upper edges near said path and a cross wall extending between said side walls, and including a trough formed in said cross wall beneath the lower set of guns and the inner shield thereof.

16. Apparatus as claimed in claim 15 in which the inner shield of the lower set of guns is in the form of substantially an inverted V in cross section having side walls extending downwardly and outwardly towards the

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cross wall of the lower outer shield, whereby liquid can drain off said side walls on to said cross wall.

17. Apparatus as claimed in claim 11 in which the inner shield of the upper set of guns is substantially in the form of a V in cross section having side walls extending downwardly and inwardly towards the nozzles of said upper gun set, whereby liquid can drain off said side walls into the atomized liquid being discharged by the nozzles.

18. Apparatus for spraying liquid on to moving articles directed therethrough, comprising a set of spray guns extending laterally across a path along which flat horizontally arranged articles are moved and having nozzles projecting towards said path, said set of guns being adapted to be connected to liquid source means and to atomize liquid therefrom and to spray said atomized liquid through their respective nozzles on to surfaces of the moving articles, an inner shield extending transversely of the path and enclosing the gun set and from which the nozzles of the guns project, said inner shield protecting the guns from atomized liquid, an outer shield extending transversely of the path and enclosing the gun set and the inner shield thereof and opening towards said path and confining liquid overspray rebounding from the articles, said outer shield having side walls perpendicular to and terminating at the path on opposite sides of the inner shield and a wall interconnecting said side walls outwardly of the inner shield, an exhaust hood on the outer surface of each of said side walls of the outer shield opening towards the path, each hood having an outer wall spaced from said adjacent side wall perpendicular to the path and terminating at the latter, exhaust stacks connected to the hoods, and air jets in the hoods across the path directed away from the hood side walls and towards the path and the adjacent outer shield side walls.

19. Apparatus as claimed in claim 18 including a second set of spray guns on the opposite side of said path from and similar to the first-mentioned set of guns and having nozzles projecting towards the path, an inner shield extending transversely of the path and enclosing

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the second gun set and from which the nozzles thereof project, a second outer shield extending transversely of the path and enclosing the second gun set and the inner shield thereof and opening towards the path similar to and opposing the first-mentioned outer shield, drainage means connected to said second outer shield, second exhaust hoods on outer surfaces of said second outer shield opening towards the path and similar to and opposed to the first-mentioned hoods, drainage means connected to said second hoods, and air jets in the second hoods across the path directed towards the path and the adjacent second outer shield.

20. Apparatus as claimed in claim 19 including laterally-spaced multiple sets of upper and lower thin wires extending along said path between the opposed gun sets, outer shields and hoods and arranged to grip said articles therebetween to maintain the latter flat and in position relative to the gun nozzles as said articles are moved between the wires along the path.

21. Apparatus as claimed in claim 20 in which each of said wires is endless, and including means for moving said wires along the path to move articles therebetween along said path.

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